TEST REPORT

Report no.:
300-KLAB-23-007-rev.2

DANISH TECHNOLOGICAL INSTITUTE

Teknologiparken
Kongsvang Allé 29
DK-8000 Aarhus C
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Init: PRES/TGTM/KAMA
File no.: 172861
Enclosures: 1

Customer:
Company: KLIMA-THERM AB
Address: Ögärdesvägen 17
City: S-433 30 PARTILLE
Tel.: +46 313366530

Component:
Brand: Kaisai
Type: Air to water heat pump (mono bloc)
Model: Unit: KHY-15PY3
Series no.: Unit: KHY-15PY3K000001
Prod. year: Unit: N.a.

Dates: Component tested: March - July 2023 and May 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. All tests were done with enabled defrost mode. This test report replaces test report 300-KLAB-23-007-rev.1 issued 2023.08.02. COP test condition A7W35 was added to this report.

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

Date: 2024.25.07

Signature:
Preben Eskerod
B. TecMan & MarEng

Co-reader:
Kamalathasan Arumugam
B.Sc. Engineer

DIGITALLY SIGNED DOCUMENT
25 July 2024
DANISH TECHNOLOGICAL INSTITUTE

ilac-MRA DANAK
Test Reg. 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 and colder 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 4 and 6.

COP test points at low temperature (heating mode) according to EN 14511:2018 at A7/W35.

COP test points at medium temperature (heating mode) according to EN 14511:2018 at A7/W55, A0/W55 and A-7/W55.

Operating requirements according to EN 14511-4:2018:
- 4.2.1 Starting and operating tests

Sound power measurements according to EN 12102-1:2017 for ErP labelling.

Contents:

Test conditions

SCOP test conditions for low temperature – EN 14825

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	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	$(-7 - 16) / (T_{designh} - 16)$	88	n/a	61	−7(−8)	20(12)	[a] / 35	[a] / 34	n/a	[a] / 30
B	$(+2 - 16) / (T_{designh} - 16)$	54	100	37	2(1)	20(12)	[a] / 35	[a] / 30	[a] / 35	[a] / 27
C	$(+7 - 16) / (T_{designh} - 16)$	35	64	24	7(6)	20(12)	[a] / 35	[a] / 27	[a] / 31	[a] / 25
D	$(+12 - 16) / (T_{designh} - 16)$	15	29	11	12(11)	20(12)	[a] / 35	[a] / 24	[a] / 26	[a] / 24
E	$(TOL - 16) / (T_{designh} - 16)$				TOL	20(12)	[a] / 35	[a] / [b]	[a] / [b]	[a] / [b]
F	$(T_{bivalent} - 16) / (T_{designh} - 16)$				$T_{bivalent}$	20(12)	[a] / 35	[a] / [c]	[a] / [c]	[a] / [c]
G	$(-15 - 16) / (T_{designh} - 16)$	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	Fixed

Climate	$T_{designh}$ [°C]	$T_{bivalent}$ [°C]	TOL [°C]	Outlet temperature	Flow rate
Colder	-22	-15	-22	Variable	Fixed

Test conditions	Compressor speed average climate (Hz)	Compressor speed colder climate (Hz)
A	62	42
B	31	30
C	30	30
D	30	30
E	82	90
F	62	73
G	N/A	73

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	$(-7 - 16) / (T_{designh} - 16)$	88	n/a	61	−7(−8)	20(12)	[a] / 55	[a] / 52	n/a	[a] / 44
B	$(+2 - 16) / (T_{designh} - 16)$	54	100	37	2(1)	20(12)	[a] / 55	[a] / 42	[a] / 55	[a] / 37
C	$(+7 - 16) / (T_{designh} - 16)$	35	64	24	7(6)	20(12)	[a] / 55	[a] / 36	[a] / 46	[a] / 32
D	$(+12 - 16) / (T_{designh} - 16)$	15	29	11	12(11)	20(12)	[a] / 55	[a] / 30	[a] / 34	[a] / 28
E	$(TOL - 16) / (T_{designh} - 16)$				TOL	20(12)	[a] / 55	[a] / [b]	[a] / [b]	[a] / [b]
F	$(T_{bivalent} - 16) / (T_{designh} - 16)$				$T_{bivalent}$	20(12)	[a] / 55	[a] / [c]	[a] / [c]	[a] / [c]
G	$(-15 - 16) / (T_{designh} - 16)$	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	Fixed

Climate	$T_{designh}$ [°C]	$T_{bivalent}$ [°C]	TOL [°C]	Outlet temperature	Flow rate
Colder	-22	-15	-22	Variable	Fixed

Test conditions	Compressor speed average climate (Hz)	Compressor speed colder climate (Hz)
A	66	40
B	33	30
C	30	30
D	30	30
E	78	90
F	66	65
G	N/A	65

Test conditions for COP test points at low temperature – EN 14511

N#	Heat source		Heat sink		Compressor speed (Hz)
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	7	6	30	35	67

Test conditions for COP test points at medium temperature – EN 14511

N#	Heat source		Heat sink		Compressor speed (Hz)
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	7	6	47	55	69
2	0	-1	47	55	69
3	-7	-8	47	55	69

Test conditions for starting and operating tests – EN 14511-4

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	-22	-	25	Minimum	Starting
2	-22	-	49	Minimum	Operating

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 (rpm)	Heating capacity (kW)	Power input (kW)
1	7/6	47/55	34	Na.	7.8	3.06

Test results

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

Model (Outdoor)	KHY-15PY3
Air-to-water heat pump mono bloc	Y
Low-temperature heat pump	N
Equipped with supplementary heater	N
Heat pump combination heater	N

Rated heat output[1)]	P_{rated}	**12.6** [kW]
Seasonal space heating energy efficiency	η_s	**160.8** [%]
	SCOP	**4.09** [-]

Measured capacity for heating for part load at outdoor temperature Tj	Average Climate - Low temperature application	Tj=-15 °C	Pdh	- [kW]
		Tj=-7 °C	Pdh	11.20 [kW]
		Tj=2 °C	Pdh	6.52 [kW]
		Tj=7 °C	Pdh	8.10 [kW]
		Tj=12 °C	Pdh	9.13 [kW]
		Tj=bivalent temperature	Pdh	11.20 [kW]
		Tj=operation limit	Pdh	12.43 [kW]

Measured coefficient of performance at outdoor temperature Tj	Average Climate - Low temperature application	Tj=-15 °C	COPd	- [-]
		Tj=-7 °C	COPd	2.46 [-]
		Tj=2 °C	COPd	3.91 [-]
		Tj=7 °C	COPd	5.95 [-]
		Tj=12 °C	COPd	7.46 [-]
		Tj=bivalent temperature	COPd	2.46 [-]
		Tj=operation limit	COPd	2.07 [-]

Bivalent temperature	Tbivalent	-7 [°C]
Operation limit	TOL	-10 [°C]
temperatures	WTOL	- [°C]
Degradation coefficient	Cdh	0.98 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.013 [kW]
	Thermostat-off mode	P_{TO}	0.028 [kW]
	Standby mode	P_{SB}	0.013 [kW]
	Crankcase heater mode	P_{CK}	0.013 [kW]
Supplementary heater[1)]	Rated heat output	P_{SUP}	0.17 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Fixed
	Water flow rate		2900 [l/h]
	Annual energy consumption	Q_{HE}	6359 [kWh]

[1)]For heat pump space heaters and heat pump combination heaters, the rated heat output, Prated, is equal to the design load for heating, Pdesignh, and the rated heat output of a supplementary heater, Psup, is equal to the supplementary capacity for heating, sup(Tj).

Tests performed by Preben Eskerod, Danish Technological Institute.

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

Model (Outdoor)	KHY-15PY3
Air-to-water heat pump mono bloc	Y
Low-temperature heat pump	N
Equipped with supplementary heater	N
Heat pump combination heater	N

Rated heat output[1)]	P_{rated}	**12.38** [kW]
Seasonal space heating energy efficiency	η_s	**130.2** [%]
	SCOP	**3.33** [-]

Measured capacity for heating for part load at outdoor temperature Tj	Average Climate - Medium temperature application	Tj=-15 °C	Pdh	- [kW]
		Tj=-7 °C	Pdh	10.87 [kW]
		Tj=2 °C	Pdh	6.82 [kW]
		Tj=7 °C	Pdh	7.85 [kW]
		Tj=12 °C	Pdh	9.07 [kW]
		Tj=bivalent temperature	Pdh	10.87 [kW]
		Tj=operation limit	Pdh	12.15 [kW]

Measured coefficient of performance at outdoor temperature Tj	Average Climate - Medium temperature application	Tj=-15 °C	COPd	- [-]
		Tj=-7 °C	COPd	1.92 [-]
		Tj=2 °C	COPd	3.32 [-]
		Tj=7 °C	COPd	4.56 [-]
		Tj=12 °C	COPd	5.73 [-]
		Tj=bivalent temperature	COPd	1.92 [-]
		Tj=operation limit	COPd	1.65 [-]

Bivalent temperature	Tbivalent	-7 [°C]
Operation limit	TOL	-10 [°C]
temperatures	WTOL	- [°C]
Degradation coefficient	Cdh	0.98 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.013 [kW]
	Thermostat-off mode	P_{TO}	0.028 [kW]
	Standby mode	P_{SB}	0.013 [kW]
	Crankcase heater mode	P_{CK}	0.013 [kW]
Supplementary heater[1)]	Rated heat output	P_{SUP}	0.23 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Fixed
	Water flow rate		1800 [l/h]
	Annual energy consumption	Q_{HE}	7681 [kWh]

[1)] For heat pump space heaters and heat pump combination heaters, the rated heat output, Prated, is equal to the design load for heating, Pdesignh, and the rated heat output of a supplementary heater, Psup, is equal to the supplementary capacity for heating, sup(Tj).

Tests performed by Preben Eskerod, Danish Technological Institute.

Test results

Test results of SCOP test at low temperature - heating season colder (C) – EN 14825

Model (Outdoor)	KHY-15PY3
Air-to-water heat pump mono bloc	Y
Low-temperature heat pump	N
Equipped with supplementary heater	N
Heat pump combination heater	N

Rated heat output[1)]	P_{rated}	**12** [kW]
Seasonal space heating energy efficiency	η_s	**146.2** [%]
	SCOP	**3.73** [-]

Measured capacity for heating for part load at outdoor temperature Tj	Colder Climate - Low temperature application	Tj=-15 °C	Pdh	9.79 [kW]
		Tj=-7 °C	Pdh	7.24 [kW]
		Tj=2 °C	Pdh	6.95 [kW]
		Tj=7 °C	Pdh	8.01 [kW]
		Tj=12 °C	Pdh	9.10 [kW]
		Tj=bivalent temperature	Pdh	9.79 [kW]
		Tj=operation limit	Pdh	9.58 [kW]

Measured coefficient of performance at outdoor temperature Tj	Colder Climate - Low temperature application	Tj=-15 °C	COPd	2.11 [-]
		Tj=-7 °C	COPd	3.26 [-]
		Tj=2 °C	COPd	4.52 [-]
		Tj=7 °C	COPd	5.80 [-]
		Tj=12 °C	COPd	7.41 [-]
		Tj=bivalent temperature	COPd	2.11 [-]
		Tj=operation limit	COPd	1.64 [-]

Bivalent temperature	Tbivalent	-15 [°C]
Operation limit	TOL	-22 [°C]
temperatures	WTOL	- [°C]
Degradation coefficient	Cdh	0.98 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.013 [kW]
	Thermostat-off mode	P_{TO}	0.028 [kW]
	Standby mode	P_{SB}	0.013 [kW]
	Crankcase heater mode	P_{CK}	0.013 [kW]
Supplementary heater[1)]	Rated heat output	P_{SUP}	2.42 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Fixed
	Water flow rate		2900 [l/h]
	Annual energy consumption	Q_{HE}	7928 [kWh]

[1)] For heat pump space heaters and heat pump combination heaters, the rated heat output, Prated, is equal to the design load for heating, Pdesignh, and the rated heat output of a supplementary heater, Psup, is equal to the supplementary capacity for heating, sup(Tj).

Tests performed by Preben Eskerod, Danish Technological Institute.

Test results

Test results of SCOP test at medium temperature - heating season colder (C) – EN 14825

Model (Outdoor)	KHY-15PY3
Air-to-water heat pump mono bloc	Y
Low-temperature heat pump	N
Equipped with supplementary heater	N
Heat pump combination heater	N

Rated heat output[1)]	P_{rated}	**11** [kW]
Seasonal space heating energy efficiency	η_s	**117.8** [%]
	SCOP	**3.02** [-]

Measured capacity for heating for part load at outdoor temperature Tj	Colder Climate - Medium temperature application	Tj=-15 °C	Pdh	8.68 [kW]
		Tj=-7 °C	Pdh	6.55 [kW]
		Tj=2 °C	Pdh	6.62 [kW]
		Tj=7 °C	Pdh	7.86 [kW]
		Tj=12 °C	Pdh	8.93 [kW]
		Tj=bivalent temperature	Pdh	8.68 [kW]
		Tj=operation limit	Pdh	8.84 [kW]

Measured coefficient of performance at outdoor temperature Tj	Colder Climate - Medium temperature application	Tj=-15 °C	COPd	1.75 [-]
		Tj=-7 °C	COPd	2.58 [-]
		Tj=2 °C	COPd	3.67 [-]
		Tj=7 °C	COPd	4.84 [-]
		Tj=12 °C	COPd	6.30 [-]
		Tj=bivalent temperature	COPd	1.75 [-]
		Tj=operation limit	COPd	1.18 [-]

Bivalent temperature	Tbivalent	-15 [°C]
Operation limit	TOL	-22 [°C]
temperatures	WTOL	- [°C]
Degradation coefficient	Cdh	0.98 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.013 [kW]
	Thermostat-off mode	P_{TO}	0.028 [kW]
	Standby mode	P_{SB}	0.013 [kW]
	Crankcase heater mode	P_{CK}	0.013 [kW]
Supplementary heater[1)]	Rated heat output	P_{SUP}	2.16 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Fixed
	Water flow rate		1800 [l/h]
	Annual energy consumption	Q_{HE}	8976 [kWh]

[1)] For heat pump space heaters and heat pump combination heaters, the rated heat output, Prated, is equal to the design load for heating, Pdesignh, and the rated heat output of a supplementary heater, Psup, is equal to the supplementary capacity for heating, sup(Tj).

Tests performed by Thor Mikkelsen, Danish Technological Institute.

Test results of COP test points at low temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W35	15.4	3.34

Test performed by Rasmus Thisgaard.

Test results of COP test points at medium temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W55	16.4	2.67
2	A0/W55	12.6	2.08
3	A-7/W55	11.2	1.85

Tests performed by Thor Mikkelsen Danish Technological Institute.

Test results of starting and operating tests – EN 14511-4

N#	Test conditions	Water flow rate at indoor heat exchanger (l/h)	Test validation
1	A-22/W25	700	Passed
2	A-22/W49	700	Passed

Tests performed by Thor Mikkelsen, Danish Technological Institute.

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

N#	Test conditions	Heat exchanger	Test validation
1	A7/W35	Indoor	Passed
2	A7/W35	Outdoor	Passed

Tests performed by Preben Eskerod, Danish Technological Institute.

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

N#	Test conditions	Test validation
1	A7/W35	Passed

Tests performed by Preben Eskerod, Danish Technological Institute.

Test results of sound power measurements – EN 12102

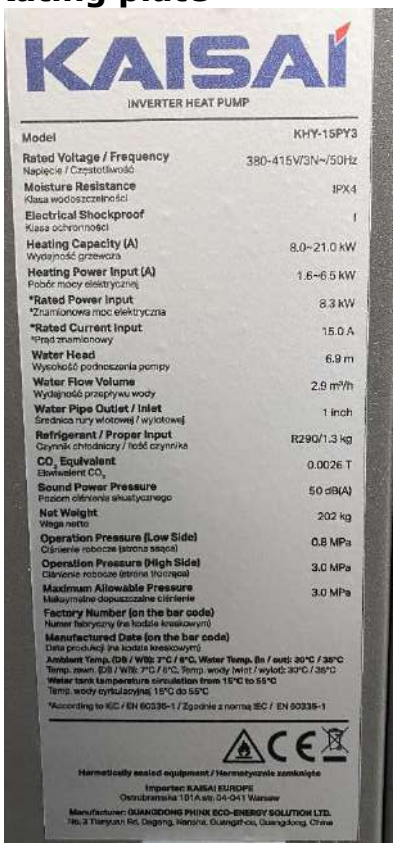
N#	Test conditions	Sound power level LW(A) [dB re 1pW]	Uncertainty (dB) (weighted value)
1	A7/W55	61.8	0.5

Test performed by Kamalathasan Arumugam, Danish Technological Institute, and co-read by Birger Bech Jessen, Danish Technological Institute.

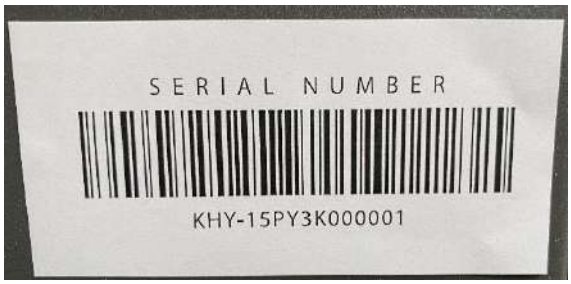
Photo

Unit

Rating plate



Serial no



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	11.15	11.20	2.46	0.99	1.00	2.46
B	2	54	6.78	6.52	3.91	0.98	1.00	3.91
C	7	35	4.36	8.10	5.95	0.98	0.54	5.85
D	12	15	1.94	9.13	7.46	0.98	0.21	6.88
E	-10	100	12.60	12.43	2.07	1.00	1.00	2.07
F - BIV	-7	88	11.15	11.20	2.46	0.99	1.00	2.46

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	0.01263	0.01263	46.37736
Thermostat off	178	0.02771	0.02771	4.93238
Standby	0	0.01263	0.01263	0
Crankcase heater	3850	0.01263	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	21	-10	1	12.60	12.43	0.17	0.17	2.07	12.60	6.17	12.43	6.00
	22	-9	25	12.12	12.00	0.11	2.83	2.20	302.88	139.22	300.05	136.39
	23	-8	23	11.63	11.57	0.06	1.30	2.33	267.51	115.55	266.20	114.25
A / F - BIV	24	-7	24	11.15	11.15	0.00	0.00	2.46	267.51	108.74	267.51	108.74
	25	-6	27	10.66	10.63	0.00	0.00	2.62	287.86	109.82	287.86	109.82
	26	-5	68	10.18	10.12	0.00	0.00	2.78	692.03	248.73	692.03	248.73
	27	-4	91	9.69	9.60	0.00	0.00	2.94	882.00	299.66	882.00	299.66
	28	-3	89	9.21	9.09	0.00	0.00	3.10	819.48	263.97	819.48	263.97
	29	-2	165	8.72	8.58	0.00	0.00	3.27	1439.31	440.75	1439.31	440.75
	30	-1	173	8.24	8.06	0.00	0.00	3.43	1425.25	415.93	1425.25	415.93
	31	0	240	7.75	7.55	0.00	0.00	3.59	1860.92	518.68	1860.92	518.68
	32	1	280	7.27	7.03	0.00	0.00	3.75	2035.38	542.93	2035.38	542.93
B	33	2	320	6.78	6.52	0.00	0.00	3.91	2171.08	555.26	2171.08	555.26
	34	3	357	6.30	6.09	0.00	0.00	4.30	2249.10	523.34	2249.10	523.34
	35	4	356	5.82	5.66	0.00	0.00	4.69	2070.28	441.88	2070.28	441.88
	36	5	303	5.33	5.22	0.00	0.00	5.07	1615.22	318.41	1615.22	318.41
	37	6	330	4.85	4.79	0.00	0.00	5.46	1599.23	292.88	1599.23	292.88
C	38	7	326	4.36	4.36	0.00	0.00	5.85	1421.86	243.14	1421.86	243.14
	39	8	348	3.88	3.88	0.00	0.00	6.05	1349.17	222.83	1349.17	222.83
	40	9	335	3.39	3.39	0.00	0.00	6.26	1136.42	181.49	1136.42	181.49
	41	10	315	2.91	2.91	0.00	0.00	6.47	915.92	141.60	915.92	141.60
	42	11	215	2.42	2.42	0.00	0.00	6.68	520.96	78.05	520.96	78.05
D	43	12	169	1.94	1.94	0.00	0.00	6.88	327.60	47.60	327.60	47.60
	44	13	151	1.45	1.45	0.00	0.00	7.09	219.53	30.97	219.53	30.97
	45	14	105	0.97	0.97	0.00	0.00	7.30	101.77	13.95	101.77	13.95
	46	15	74	0.48	0.48	0.00	0.00	7.50	35.86	4.78	35.86	4.78

SUM	26026.75	6306.35	26022.45	6302.05
SCOPon		4.13	**SCOPnet**	4.13

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	10.95	10.87	1.92	1.00	1.00	1.92
B	2	54	6.67	6.82	3.32	0.99	1.00	3.32
C	7	35	4.29	7.85	4.56	0.98	0.55	4.50
D	12	15	1.90	9.07	5.73	0.98	0.21	5.38
E	-10	100	12.38	12.15	1.65	1.00	1.00	1.65
F - BIV	-7	88	10.95	10.87	1.92	1.00	1.00	1.92

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	0.01263	0.01263	46.37736
Thermostat off	178	0.02771	0.02771	4.93238
Standby	0	0.01263	0.01263	0
Crankcase heater	3850	0.01263	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	21	-10	1	12.38	12.15	0.23	0.23	1.65	12.38	7.58	12.15	7.35
	22	-9	25	11.90	11.72	0.18	4.51	1.74	297.60	172.73	293.08	168.21
	23	-8	23	11.43	11.30	0.13	3.01	1.83	262.84	144.79	259.82	141.77
A / F - BIV	24	-7	24	10.95	10.87	0.00	0.00	1.92	262.84	136.68	262.84	136.68
	25	-6	27	10.48	10.40	0.00	0.00	2.08	282.84	136.12	282.84	136.12
	26	-5	68	10.00	9.94	0.00	0.00	2.23	679.95	304.56	679.95	304.56
	27	-4	91	9.52	9.47	0.00	0.00	2.39	866.60	363.00	866.60	363.00
	28	-3	89	9.05	9.00	0.00	0.00	2.54	805.18	316.74	805.18	316.74
	29	-2	165	8.57	8.53	0.00	0.00	2.70	1414.18	524.37	1414.18	524.37
	30	-1	173	8.09	8.07	0.00	0.00	2.85	1400.37	491.07	1400.37	491.07
	31	0	240	7.62	7.60	0.00	0.00	3.01	1828.43	608.17	1828.43	608.17
	32	1	280	7.14	7.13	0.00	0.00	3.16	1999.85	632.62	1999.85	632.62
B	33	2	320	6.67	6.67	0.00	0.00	3.32	2133.17	643.30	2133.17	643.30
	34	3	357	6.19	6.19	0.00	0.00	3.55	2209.83	622.14	2209.83	622.14
	35	4	356	5.71	5.71	0.00	0.00	3.79	2034.13	537.00	2034.13	537.00
	36	5	303	5.24	5.24	0.00	0.00	4.02	1587.02	394.40	1587.02	394.40
	37	6	330	4.76	4.76	0.00	0.00	4.26	1571.31	368.86	1571.31	368.86
C	38	7	326	4.29	4.29	0.00	0.00	4.50	1397.04	310.74	1397.04	310.74
	39	8	348	3.81	3.81	0.00	0.00	4.67	1325.61	283.75	1325.61	283.75
	40	9	335	3.33	3.33	0.00	0.00	4.85	1116.58	230.34	1116.58	230.34
	41	10	315	2.86	2.86	0.00	0.00	5.02	899.93	179.15	899.93	179.15
	42	11	215	2.38	2.38	0.00	0.00	5.20	511.87	98.45	511.87	98.45
D	43	12	169	1.90	1.90	0.00	0.00	5.38	321.88	59.88	321.88	59.88
	44	13	151	1.43	1.43	0.00	0.00	5.55	215.70	38.86	215.70	38.86
	45	14	105	0.95	0.95	0.00	0.00	5.73	99.99	17.46	99.99	17.46
	46	15	74	0.48	0.48	0.00	0.00	5.90	35.24	5.97	35.24	5.97

SUM	25572.32	7628.73	25564.56	7620.97
SCOPon		3.35	**SCOPnet**	3.35

Detailed SCOP calculation of low temperature and colder 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, 2465 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	61	7.26	7.24	3.26	0.99	1.00	3.26
B	2	37	4.42	6.95	4.52	0.98	0.64	4.48
C	7	24	2.84	8.01	5.80	0.98	0.35	5.60
D	12	11	1.26	9.10	7.41	0.98	0.14	6.50
E	-22	100	12.00	9.58	1.64	1.00	1.00	1.64
F - BIV	-15	82	9.79	9.79	2.11	0.99	1.00	2.11
G	-15	82	9.79	9.79	2.11	0.99	1.00	2.11

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	2208	0.01263	0.01263	27.88704
Thermostat off	106	0.02771	0.02771	2.93726
Standby	0	0.01263	0.01263	0
Crankcase heater	2314	0.01266	3E-05	0.06942

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	9	-22	1	12.00	9.58	2.42	2.42	1.64	12.00	8.26	9.58	5.85
	10	-21	6	11.68	9.61	2.07	12.44	1.71	70.11	46.24	57.66	33.80
	11	-20	13	11.37	9.64	1.73	22.46	1.77	147.79	93.14	125.33	70.68
	12	-19	17	11.05	9.67	1.38	23.50	1.84	187.89	112.82	164.40	89.32
	13	-18	19	10.74	9.70	1.04	19.70	1.91	204.00	116.31	184.30	96.62
	14	-17	26	10.42	9.73	0.69	17.97	1.97	270.95	146.08	252.98	128.11
	15	-16	39	10.11	9.76	0.35	13.48	2.04	394.11	199.89	380.63	186.41
F - BIV / G	16	-15	41	9.79	9.79	0.00	0.00	2.11	401.37	190.31	401.37	190.31
	17	-14	35	9.47	9.47	0.00	0.00	2.25	331.58	147.17	331.58	147.17
	18	-13	52	9.16	9.15	0.00	0.00	2.40	476.21	198.67	476.21	198.67
	19	-12	37	8.84	8.83	0.00	0.00	2.54	327.16	128.75	327.16	128.75
	20	-11	41	8.53	8.51	0.00	0.00	2.69	349.58	130.20	349.58	130.20
	21	-10	43	8.21	8.19	0.00	0.00	2.83	353.05	124.80	353.05	124.80
	22	-9	54	7.89	7.88	0.00	0.00	2.97	426.32	143.40	426.32	143.40
	23	-8	90	7.58	7.56	0.00	0.00	3.12	682.11	218.83	682.11	218.83
A	24	-7	125	7.26	7.24	0.00	0.00	3.26	907.89	278.41	907.89	278.41
	25	-6	169	6.95	6.93	0.00	0.00	3.40	1174.11	345.73	1174.11	345.73
	26	-5	195	6.63	6.61	0.00	0.00	3.53	1293.16	366.23	1293.16	366.23
	27	-4	278	6.32	6.30	0.00	0.00	3.67	1755.79	478.94	1755.79	478.94
	28	-3	306	6.00	5.99	0.00	0.00	3.80	1836.00	483.04	1836.00	483.04
	29	-2	454	5.68	5.67	0.00	0.00	3.94	2580.63	655.66	2580.63	655.66
	30	-1	385	5.37	5.36	0.00	0.00	4.07	2066.84	507.71	2066.84	507.71
	31	0	490	5.05	5.05	0.00	0.00	4.21	2475.79	588.65	2475.79	588.65
	32	1	533	4.74	4.73	0.00	0.00	4.34	2524.74	581.62	2524.74	581.62
B	33	2	380	4.42	4.42	0.00	0.00	4.48	1680.00	375.34	1680.00	375.34
	34	3	228	4.11	4.11	0.00	0.00	4.70	936.00	199.13	936.00	199.13
	35	4	261	3.79	3.79	0.00	0.00	4.92	989.05	200.82	989.05	200.82
	36	5	279	3.47	3.47	0.00	0.00	5.15	969.16	188.20	969.16	188.20
	37	6	229	3.16	3.16	0.00	0.00	5.37	723.16	134.56	723.16	134.56
C	38	7	269	2.84	2.84	0.00	0.00	5.60	764.53	136.56	764.53	136.56
	39	8	233	2.53	2.53	0.00	0.00	5.78	588.63	101.87	588.63	101.87
	40	9	230	2.21	2.21	0.00	0.00	5.96	508.42	85.33	508.42	85.33
	41	10	243	1.89	1.89	0.00	0.00	6.14	460.42	75.01	460.42	75.01
	42	11	191	1.58	1.58	0.00	0.00	6.32	301.58	47.73	301.58	47.73
D	43	12	146	1.26	1.26	0.00	0.00	6.50	184.42	28.38	184.42	28.38
	44	13	150	0.95	0.95	0.00	0.00	6.68	142.11	21.28	142.11	21.28
	45	14	97	0.63	0.63	0.00	0.00	6.86	61.26	8.93	61.26	8.93
	46	15	61	0.32	0.32	0.00	0.00	7.04	19.26	2.74	19.26	2.74

SUM	29577.16	7896.76	29465.19	7784.80
SCOPon		3.75	**SCOPnet**	3.78

Detailed SCOP calculation of medium temperature and colder 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, 2465 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	61	6.66	6.55	2.58	0.99	1.00	2.58
B	2	37	4.05	6.62	3.67	0.98	0.61	3.63
C	7	24	2.61	7.86	4.84	0.98	0.33	4.68
D	12	11	1.16	8.93	6.30	0.98	0.13	5.57
E	-22	100	11.00	8.84	1.18	1.00	1.00	1.18
F - BIV	-15	82	8.97	8.68	1.75	0.99	1.00	1.75
G	-15	82	8.97	8.68	1.75	0.99	1.00	1.75

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	2208	0.01263	0.01263	27.88704
Thermostat off	106	0.02771	0.02771	2.93726
Standby	0	0.01263	0.01263	0
Crankcase heater	2314	0.01263	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	9	-22	1	11.00	8.84	2.16	2.16	1.18	11.00	9.66	8.84	7.50
	10	-21	6	10.71	8.82	1.89	11.36	1.26	64.26	53.33	52.90	41.97
	11	-20	13	10.42	8.79	1.63	21.15	1.34	135.47	106.33	114.33	85.18
	12	-19	17	10.13	8.77	1.36	23.12	1.42	172.24	127.86	149.11	104.74
	13	-18	19	9.84	8.75	1.09	20.78	1.51	187.00	131.20	166.22	110.43
	14	-17	26	9.55	8.73	0.83	21.50	1.59	248.37	164.47	226.87	142.97
	15	-16	39	9.26	8.70	0.56	21.85	1.67	361.26	225.28	339.41	203.43
F - BIV / G	16	-15	41	8.97	8.68	0.00	0.00	1.75	367.92	210.24	367.92	210.24
	17	-14	35	8.68	8.41	0.00	0.00	1.85	303.95	164.00	303.95	164.00
	18	-13	52	8.39	8.15	0.00	0.00	1.96	436.53	223.09	436.53	223.09
	19	-12	37	8.11	7.88	0.00	0.00	2.06	299.89	145.57	299.89	145.57
	20	-11	41	7.82	7.62	0.00	0.00	2.16	320.45	148.12	320.45	148.12
	21	-10	43	7.53	7.35	0.00	0.00	2.27	323.63	142.77	323.63	142.77
	22	-9	54	7.24	7.08	0.00	0.00	2.37	390.79	164.87	390.79	164.87
	23	-8	90	6.95	6.82	0.00	0.00	2.47	625.26	252.77	625.26	252.77
A	24	-7	125	6.66	6.55	0.00	0.00	2.58	832.24	322.95	832.24	322.95
	25	-6	169	6.37	6.27	0.00	0.00	2.69	1076.26	399.43	1076.26	399.43
	26	-5	195	6.08	6.00	0.00	0.00	2.81	1185.39	421.54	1185.39	421.54
	27	-4	278	5.79	5.72	0.00	0.00	2.93	1609.47	549.39	1609.47	549.39
	28	-3	306	5.50	5.44	0.00	0.00	3.05	1683.00	552.34	1683.00	552.34
	29	-2	454	5.21	5.16	0.00	0.00	3.16	2365.58	747.52	2365.58	747.52
	30	-1	385	4.92	4.89	0.00	0.00	3.28	1894.61	577.26	1894.61	577.26
	31	0	490	4.63	4.61	0.00	0.00	3.40	2269.47	667.57	2269.47	667.57
	32	1	533	4.34	4.33	0.00	0.00	3.52	2314.34	658.02	2314.34	658.02
B	33	2	380	4.05	4.05	0.00	0.00	3.63	1540.00	423.70	1540.00	423.70
	34	3	228	3.76	3.76	0.00	0.00	3.84	858.00	223.23	858.00	223.23
	35	4	261	3.47	3.47	0.00	0.00	4.05	906.63	223.73	906.63	223.73
	36	5	279	3.18	3.18	0.00	0.00	4.26	888.39	208.48	888.39	208.48
	37	6	229	2.89	2.89	0.00	0.00	4.47	662.89	148.30	662.89	148.30
C	38	7	269	2.61	2.61	0.00	0.00	4.68	700.82	149.78	700.82	149.78
	39	8	233	2.32	2.32	0.00	0.00	4.86	539.58	111.09	539.58	111.09
	40	9	230	2.03	2.03	0.00	0.00	5.04	466.05	92.56	466.05	92.56
	41	10	243	1.74	1.74	0.00	0.00	5.21	422.05	80.96	422.05	80.96
	42	11	191	1.45	1.45	0.00	0.00	5.39	276.45	51.28	276.45	51.28
D	43	12	146	1.16	1.16	0.00	0.00	5.57	169.05	30.35	169.05	30.35
	44	13	150	0.87	0.87	0.00	0.00	5.75	130.26	22.67	130.26	22.67
	45	14	97	0.58	0.58	0.00	0.00	5.93	56.16	9.48	56.16	9.48
	46	15	61	0.29	0.29	0.00	0.00	6.10	17.66	2.89	17.66	2.89

SUM	27112.39	8944.08	26990.48	8822.16
SCOPon	3.03	**SCOPnet**	3.06	

Detailed test results

Detailed SCOP test results - low temperature application and average climate – EN 14825

Detailed result for 'EN14825:2018' Average Low (A and F) 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	-7
Tdesign	°C	-10
Pdesign	kW	12.61
Heating demand:	kW	11.15
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**11.193**
COP	-	**2.460**
Power consumption	kW	**4.551**
Measured		
Heating capacity	kW	11.298
COP	-	2.393
Power consumption	kW	4.721
During heating		
Air temperature dry bulb	°C	-6.96
Air temperature wet bulb	°C	-8.09
Inlet temperature	°C	30.80
Outlet temperature	°C	34.17
Outlet temperature (Time averaged)	°C	**34.17**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	82702
Calculated Hydraulic power	W	67
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	104
Calculated Power correction	W	171
Water Flow	m^3/s	0.000805

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	12.61
Heating demand:	kW	6.79
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**6.524**
COP	-	**3.906**
Power consumption	kW	**1.670**
Measured		
Heating capacity	kW	6.628
COP	-	3.602
Power consumption	kW	1.840
During heating		
Air temperature dry bulb	°C	2.06
Air temperature wet bulb	°C	1.12
Inlet temperature	°C	27.75
Outlet temperature	°C	29.82
Outlet temperature (Time averaged)	°C	**29.82**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	82423
Calculated Hydraulic power	W	66
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	104
Calculated Power correction	W	170
Water Flow	m^3/s	0.000805

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	-7
Tdesign	°C	-10
Pdesign	kW	12.61
Heating demand:	kW	4.36
CR:	-	0.5
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**8.103**
COP	-	**5.947**
Power consumption	kW	**1.363**
Measured		
Heating capacity	kW	8.206
COP	-	5.357
Power consumption	kW	1.532
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	5.99
Inlet temperature	°C	25.68
Outlet temperature	°C	28.13
Outlet temperature (Time averaged)	°C	**27.00**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	81795
Calculated Hydraulic power	W	66
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	103
Calculated Power correction	W	169
Water Flow	m^3/s	0.000805

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	12.61
Heating demand:	kW	1.94
CR:	-	0.2
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**9.134**
COP	-	**7.457**
Power consumption	kW	**1.225**
Measured		
Heating capacity	kW	9.237
COP	-	6.628
Power consumption	kW	1.394
During heating		
Air temperature dry bulb	°C	11.87
Air temperature wet bulb	°C	10.99
Inlet temperature	°C	23.39
Outlet temperature	°C	26.14
Outlet temperature (Time averaged)	°C	**23.98**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	81631
Calculated Hydraulic power	W	66
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	103
Calculated Power correction	W	169
Water Flow	m^3/s	0.000805

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	12.61
Heating demand:	kW	12.61
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**12.425**
COP	-	**2.070**
Power consumption	kW	**6.003**
Measured		
Heating capacity	kW	12.529
COP	-	2.030
Power consumption	kW	6.173
During heating		
Air temperature dry bulb	°C	-10.19
Air temperature wet bulb	°C	-11.23
Inlet temperature	°C	31.22
Outlet temperature	°C	35.22
Outlet temperature (Time averaged)	°C	**35.22**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	82677
Calculated Hydraulic power	W	67
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	104
Calculated Power correction	W	171
Water Flow	m^3/s	0.000805

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Detailed result for 'EN14825:2018' Average Medium (A and F) 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	12.38
Heating demand:	kW	10.95
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**10.865**
COP	-	**1.923**
Power consumption	kW	**5.651**
Measured		
Heating capacity	kW	10.937
COP	-	1.898
Power consumption	kW	5.763
During heating		
Air temperature dry bulb	°C	-7.01
Air temperature wet bulb	°C	-8.21
Inlet temperature	°C	46.79
Outlet temperature	°C	52.09
Outlet temperature (Time averaged)	°C	**52.09**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	80380
Calculated Hydraulic power	W	40
Calculated global efficiency	η	0.36
Calculated Capacity correction	W	72
Calculated Power correction	W	112
Water Flow	m^3/s	0.000500

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	12.38
Heating demand:	kW	6.67
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**6.817**
COP	-	**3.316**
Power consumption	kW	**2.056**
Measured		
Heating capacity	kW	6.889
COP	-	3.178
Power consumption	kW	2.168
During heating		
Air temperature dry bulb	°C	2.02
Air temperature wet bulb	°C	0.93
Inlet temperature	°C	38.74
Outlet temperature	°C	42.06
Outlet temperature (Time averaged)	°C	**42.06**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	80380
Calculated Hydraulic power	W	40
Calculated global efficiency	η	0.36
Calculated Capacity correction	W	72
Calculated Power correction	W	112
Water Flow	m^3/s	0.000500

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	12.38
Heating demand:	kW	4.29
CR:	-	0.5
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**7.846**
COP	-	**4.556**
Power consumption	kW	**1.722**
Measured		
Heating capacity	kW	7.917
COP	-	4.317
Power consumption	kW	1.834
During heating		
Air temperature dry bulb	°C	7.01
Air temperature wet bulb	°C	6.02
Inlet temperature	°C	33.99
Outlet temperature	°C	37.80
Outlet temperature (Time averaged)	°C	**36.07**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	80380
Calculated Hydraulic power	W	40
Calculated global efficiency	η	0.36
Calculated Capacity correction	W	72
Calculated Power correction	W	112
Water Flow	m^3/s	0.000500

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	12.38
Heating demand:	kW	1.90
CR:	-	0.2
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**9.065**
COP	-	**5.729**
Power consumption	kW	**1.582**
Measured		
Heating capacity	kW	9.137
COP	-	5.393
Power consumption	kW	1.694
During heating		
Air temperature dry bulb	°C	12.00
Air temperature wet bulb	°C	10.69
Inlet temperature	°C	29.21
Outlet temperature	°C	33.60
Outlet temperature (Time averaged)	°C	**30.13**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	80380
Calculated Hydraulic power	W	40
Calculated global efficiency	η	0.36
Calculated Capacity correction	W	72
Calculated Power correction	W	112
Water Flow	m^3/s	0.000500

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	12.38
Heating demand:	kW	12.38
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**12.150**
COP	-	**1.652**
Power consumption	kW	**7.357**
Measured		
Heating capacity	kW	12.221
COP	-	1.636
Power consumption	kW	7.468
During heating		
Air temperature dry bulb	°C	-10.00
Air temperature wet bulb	°C	-10.91
Inlet temperature	°C	49.18
Outlet temperature	°C	55.10
Outlet temperature (Time averaged)	°C	**55.10**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	80380
Calculated Hydraulic power	W	40
Calculated global efficiency	η	0.36
Calculated Capacity correction	W	72
Calculated Power correction	W	112
Water Flow	m^3/s	0.000500

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Detailed result for 'EN14825:2018' Colder Low (A) A -7 /W30		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Low
Condition name:		A
Condition temperature:	°C	-7
Part load:	%	61%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	12.00
Heating demand:	kW	7.26
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**7.238**
COP	-	**3.261**
Power consumption	kW	**2.219**
Measured		
Heating capacity	kW	7.341
COP	-	3.074
Power consumption	kW	2.388
During heating		
Air temperature dry bulb	°C	-7.00
Air temperature wet bulb	°C	N/A
Inlet temperature	°C	27.82
Outlet temperature	°C	30.01
Outlet temperature (Time averaged)	°C	**30.01**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	81666
Calculated Hydraulic power	W	66
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	103
Calculated Power correction	W	169
Water Flow	m^3/s	0.000806

Detailed result for 'EN14825:2018' Colder Low (B) A 2 /W27		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Low
Condition name:		B
Condition temperature:	°C	2
Part load:	%	37%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	12.00
Heating demand:	kW	4.42
CR:	-	0.6
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**6.946**
COP	-	**4.522**
Power consumption	kW	**1.536**
Measured		
Heating capacity	kW	7.049
COP	-	4.133
Power consumption	kW	1.706
During heating		
Air temperature dry bulb	°C	0.91
Air temperature wet bulb	°C	2.02
Inlet temperature	°C	25.71
Outlet temperature	°C	27.81
Outlet temperature (Time averaged)	°C	**27.05**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	81939
Calculated Hydraulic power	W	66
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	103
Calculated Power correction	W	169
Water Flow	m^3/s	0.000806

Detailed result for 'EN14825:2018' Colder Low (C) A 7 /W25		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Low
Condition name:		C
Condition temperature:	°C	7
Part load:	%	24%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	12.00
Heating demand:	kW	2.84
CR:	-	0.4
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**8.011**
COP	-	**5.803**
Power consumption	kW	**1.381**
Measured		
Heating capacity	kW	8.114
COP	-	5.237
Power consumption	kW	1.549
During heating		
Air temperature dry bulb	°C	5.99
Air temperature wet bulb	°C	7.00
Inlet temperature	°C	24.27
Outlet temperature	°C	26.69
Outlet temperature (Time averaged)	°C	**25.13**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	81666
Calculated Hydraulic power	W	66
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	103
Calculated Power correction	W	169
Water Flow	m^3/s	0.000806

Detailed result for 'EN14825:2018' Colder Low (D) A 12 /W24		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Low
Condition name:		D
Condition temperature:	°C	12
Part load:	%	11%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	12.00
Heating demand:	kW	1.26
CR:	-	0.1
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**9.100**
COP	-	**7.407**
Power consumption	kW	**1.229**
Measured		
Heating capacity	kW	9.203
COP	-	6.586
Power consumption	kW	1.397
During heating		
Air temperature dry bulb	°C	11.02
Air temperature wet bulb	°C	12.04
Inlet temperature	°C	23.50
Outlet temperature	°C	26.24
Outlet temperature (Time averaged)	°C	**23.88**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	81590
Calculated Hydraulic power	W	66
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	103
Calculated Power correction	W	169
Water Flow	m^3/s	0.000806

Detailed result for 'EN14825:2018' Colder Low (E) A -22 /W35		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Low
Condition name:		E
Condition temperature:	°C	-22
Part load:	%	100%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	12.00
Heating demand:	kW	12.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**9.581**
COP	-	**1.639**
Power consumption	kW	**5.845**
Measured		
Heating capacity	kW	9.683
COP	-	1.611
Power consumption	kW	6.012
During heating		
Air temperature dry bulb	°C	-22.03
Air temperature wet bulb	°C	N/A
Inlet temperature	°C	32.01
Outlet temperature	°C	35.07
Outlet temperature (Time averaged)	°C	**35.07**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	80617
Calculated Hydraulic power	W	65
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	102
Calculated Power correction	W	167
Water Flow	m^3/s	0.000806

Detailed result for 'EN14825:2018' Colder Low (F and G) A -15 /W32			
Tested according to:	EN14511:2018		EN14825:2018
Climate zone:			Colder
Temperature application:			Low
Condition name:			F and G
Condition temperature:		°C	-15
Part load:		%	82%
Chosen Tbivalent		°C	-15
Tdesign		°C	-22
Pdesign		kW	12.00
Heating demand:		kW	9.79
CR:		-	1.0
Minimum flow reached:		-	No
Measurement type:			Transient
Integrated circulation pump:			Yes
Included corrections (Final result)			
Heating capacity		kW	**9.789**
COP		-	**2.109**
Power consumption		kW	**4.641**
Measured			
Heating capacity		kW	9.889
COP		-	2.058
Power consumption		kW	4.804
During heating			
Air temperature dry bulb		°C	-14.83
Air temperature wet bulb		°C	N/A
Inlet temperature		°C	29.03
Outlet temperature		°C	32.19
Outlet temperature (Time averaged)		°C	**32.19**
Circulation pump			
Measured: Static differential pressure, liquid pump		Pa	78645
Calculated Hydraulic power		W	63
Calculated global efficiency		η	0.39
Calculated Capacity correction		W	100
Calculated Power correction		W	163
Water Flow		m^3/s	0.000805

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Detailed result for 'EN14825:2018' Colder Medium (A) A -7 /W44		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Medium
Condition name:		A
Condition temperature:	°C	-7
Part load:	%	61%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	11.00
Heating demand:	kW	6.66
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**6.553**
COP	-	**2.577**
Power consumption	kW	**2.543**
Measured		
Heating capacity	kW	6.645
COP	-	2.469
Power consumption	kW	2.691
During heating		
Air temperature dry bulb	°C	-7.00
Air temperature wet bulb	°C	-7.97
Inlet temperature	°C	40.88
Outlet temperature	°C	44.09
Outlet temperature (Time averaged)	°C	**44.09**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	112947
Calculated Hydraulic power	W	56
Calculated global efficiency	η	0.38
Calculated Capacity correction	W	92
Calculated Power correction	W	148
Water Flow	m^3/s	0.000500

Detailed result for 'EN14825:2018' Colder Medium (B) A 2 /W37		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Medium
Condition name:		B
Condition temperature:	°C	2
Part load:	%	37%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	11.00
Heating demand:	kW	4.05
CR:	-	0.6
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**6.623**
COP	-	**3.670**
Power consumption	kW	**1.805**
Measured		
Heating capacity	kW	6.715
COP	-	3.438
Power consumption	kW	1.953
During heating		
Air temperature dry bulb	°C	2.00
Air temperature wet bulb	°C	0.99
Inlet temperature	°C	34.99
Outlet temperature	°C	38.23
Outlet temperature (Time averaged)	°C	**36.97**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	113226
Calculated Hydraulic power	W	57
Calculated global efficiency	η	0.38
Calculated Capacity correction	W	92
Calculated Power correction	W	148
Water Flow	m^3/s	0.000500

Detailed result for 'EN14825:2018' Colder Medium (C) A 7 /W32		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Medium
Condition name:		C
Condition temperature:	°C	7
Part load:	%	24%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	11.00
Heating demand:	kW	2.61
CR:	-	0.3
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**7.859**
COP	-	**4.840**
Power consumption	kW	**1.624**
Measured		
Heating capacity	kW	7.951
COP	-	4.486
Power consumption	kW	1.772
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	5.97
Inlet temperature	°C	30.70
Outlet temperature	°C	34.53
Outlet temperature (Time averaged)	°C	**31.97**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	113193
Calculated Hydraulic power	W	57
Calculated global efficiency	η	0.38
Calculated Capacity correction	W	92
Calculated Power correction	W	148
Water Flow	m^3/s	0.000500

Detailed result for 'EN14825:2018' Colder Medium (D) A 12 /W28		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Medium
Condition name:		D
Condition temperature:	°C	12
Part load:	%	11%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	11.00
Heating demand:	kW	1.16
CR:	-	0.1
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**8.930**
COP	-	**6.301**
Power consumption	kW	**1.417**
Measured		
Heating capacity	kW	9.022
COP	-	5.763
Power consumption	kW	1.566
During heating		
Air temperature dry bulb	°C	12.06
Air temperature wet bulb	°C	11.04
Inlet temperature	°C	27.31
Outlet temperature	°C	31.65
Outlet temperature (Time averaged)	°C	**27.87**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	113156
Calculated Hydraulic power	W	57
Calculated global efficiency	η	0.38
Calculated Capacity correction	W	92
Calculated Power correction	W	148
Water Flow	m^3/s	0.000500

Detailed result for 'EN14825:2018' Colder Medium (E) A -22 /W55		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Medium
Condition name:		E
Condition temperature:	°C	-22
Part load:	%	100%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	11.00
Heating demand:	kW	11.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**8.837**
COP	-	**1.179**
Power consumption	kW	**7.497**
Measured		
Heating capacity	kW	8.881
COP	-	1.175
Power consumption	kW	7.558
During heating		
Air temperature dry bulb	°C	-22.38
Air temperature wet bulb	°C	N/A
Inlet temperature	°C	50.59
Outlet temperature	°C	55.18
Outlet temperature (Time averaged)	°C	**55.18**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	34679
Calculated Hydraulic power	W	17
Calculated global efficiency	η	0.29
Calculated Capacity correction	W	43
Calculated Power correction	W	61
Water Flow	m^3/s	0.000500

Detailed result for 'EN14825:2018' Colder Medium (F and G) A -15 /W49		
Tested according to:		EN14511:2018 and EN14825:2018
Climate zone:		Colder
Temperature application:		Medium
Condition name:		F
Condition temperature:	°C	-15
Part load:	%	82%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	11.00
Heating demand:	kW	8.97
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**8.681**
COP	-	**1.750**
Power consumption	kW	**4.961**
Measured		
Heating capacity	kW	8.766
COP	-	1.720
Power consumption	kW	5.097
During heating		
Air temperature dry bulb	°C	-14.99
Air temperature wet bulb	°C	N/A
Inlet temperature	°C	44.80
Outlet temperature	°C	49.04
Outlet temperature (Time averaged)	°C	**49.04**
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	101623
Calculated Hydraulic power	W	51
Calculated global efficiency	η	0.37
Calculated Capacity correction	W	85
Calculated Power correction	W	136
Water Flow	m^3/s	0.000500

Detailed test results for COP test points – EN 14511

Detailed result for 'EN14511:2022' A7/W35		
Tested according to:		EN14511:2022
Minimum flow reached:		No
Measurement type:		Transient
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		Yes
Included corrections (Final result)		
Heating capacity	kW	**15.351**
COP	-	**3.357**
Power consumption	kW	**4.573**
Measured		
Heating capacity	kW	15.451
COP	-	3.262
Power consumption	kW	4.736
During heating		
Air_inlet temperature dry bulb	°C	6.96
Air temperature wet bulb	°C	5.73
Water_inlet temperature	°C	30.06
water_outlet temperature	°C	35.09
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	78853
Calculated Hydraulic power	W	63
Calculated global efficiency	η	0.39
Calculated Capacity correction	W	100
Calculated Power correction	W	163
Water Flow	m^3/s	0.000799

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	**16.399**
COP	-	**2.667**
Power consumption	kW	**6.148**
Measured		
Heating capacity	kW	16.491
COP	-	2.619
Power consumption	kW	6.297
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	6.00
Inlet temperature	°C	46.99
Outlet temperature	°C	54.98
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	113099
Calculated Hydraulic power	W	57
Calculated global efficiency	η	0.38
Calculated Capacity correction	W	92
Calculated Power correction	W	148
Water Flow	m^3/s	0.000500

Detailed result for 'EN14511:2018' A0/W55		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	**12.592**
COP	-	**2.076**
Power consumption	kW	**6.067**
Measured		
Heating capacity	kW	12.683
COP	-	2.041
Power consumption	kW	6.214
During heating		
Air temperature dry bulb	°C	-0.11
Air temperature wet bulb	°C	-1.01
Inlet temperature	°C	48.32
Outlet temperature	°C	54.93
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	112663
Calculated Hydraulic power	W	56
Calculated global efficiency	η	0.38
Calculated Capacity correction	W	92
Calculated Power correction	W	148
Water Flow	m^3/s	0.000500

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	**11.230**
COP	-	**1.847**
Power consumption	kW	**6.078**
Measured		
Heating capacity	kW	11.321
COP	-	1.818
Power consumption	kW	6.226
During heating		
Air temperature dry bulb	°C	-7.01
Air temperature wet bulb	°C	-7.99
Inlet temperature	°C	49.50
Outlet temperature	°C	54.99
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	112687
Calculated Hydraulic power	W	56
Calculated global efficiency	η	0.38
Calculated Capacity correction	W	92
Calculated Power correction	W	148
Water Flow	m^3/s	0.000500

Detailed test results of sound power measurement

Sound power levels according to ISO 3743-1:2010

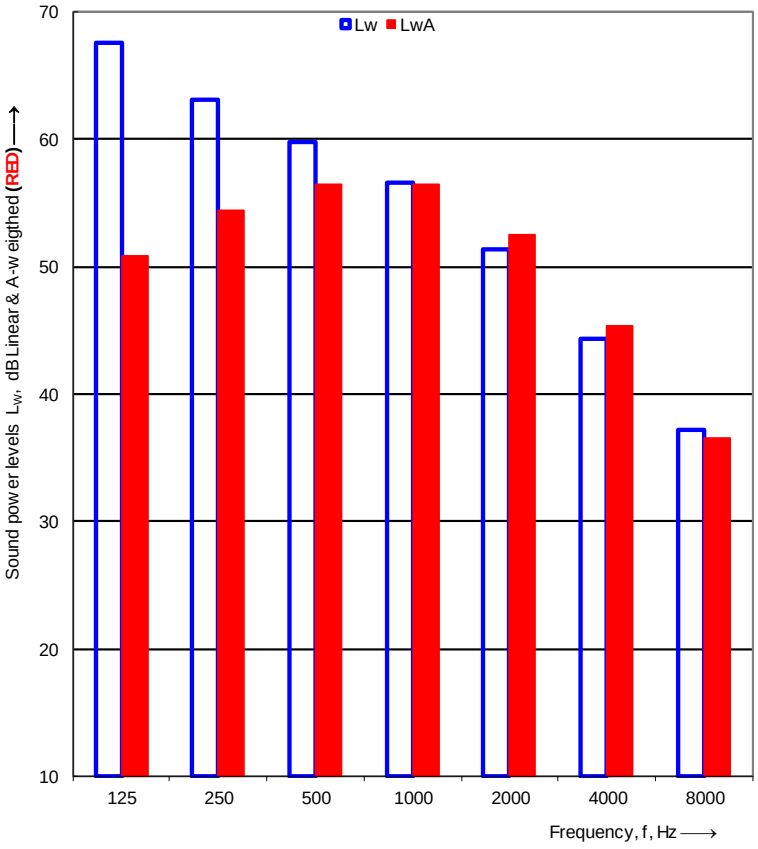
TEKNOLOGISK INSTITUT

Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms

Client:	Klima-Therm AB	Date of test:	17-04-2023
Object:	Type: Air to water heat pump, Model: KHY-15PY3		
Mounting conditions:	The out door unit is mounted on the supporting metal support frame using four vibration damping rubber feets, supplied by the manufacture. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.		
Operating conditions:	A7/W55, Compressor speed: 34 [Hz], Fan speed: na. [rpm], Heating capacity: 7.8 [kW], Power_input: 3.06 [kW], Water flow rate: 1800 [l/h], dP_water : 1111 [mBar]		
Static pressure:	1031 kPa	Reference box:	
Air temperature:	7.0 °C	L1:	1.3 m
Relative air humidity:	84.0 %	L2:	0.5 m
Test room volume:	102.8 m³ Room: Room 2	L3:	1.3 m
Area, S, of test room:	138.9 m²	Volume:	0.8 m³

Frequency f [Hz]	L_w 1/3 octave [dB]	1/1 oct [dB]
100	64.9	
125	61.9	67.5
160	60.1	
200	59.0	
250	58.5	63.1
315	57.2	
400	56.0	
500	54.9	59.8
630	54.0	
800	53.3	
1000	51.4	56.6
1250	50.3	
1600	48.6	
2000	46.1	51.4
2500	43.8	
3150	41.4	
4000	39.4	44.4
5000	36.9	
6300	34.7	
8000	31.4	37.2
10000	29.4	

[1] Diff. to backgr. noise < 6dB



Sound power level $L_w(A)$: **61.8 dB [re 1pW]**

Name of test institute:	DTI	Date:	17-04-2023
No. of test report:	300-KLAB-23-007		

Measurements are in full conformity with ISO 3743

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 14511:2018
- EN 12102-1:2017
- 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.

TEST REPORT

Report no.:
300-KLAB-23-007-rev.2

DANISH TECHNOLOGICAL INSTITUTE

Teknologiparken
Kongsvang Allé 29
DK-8000 Aarhus C
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Init: PRES/TGTM/KAMA
File no.: 172861
Enclosures: 1

Customer:
Company: KLIMA-THERM AB
Address: Ögärdesvägen 17
City: S-433 30 PARTILLE
Tel.: +46 313366530

Component:
Brand: Kaisai
Type: Air to water heat pump (mono bloc)
Model: Unit: KHY-15PY3
Series no.: Unit: KHY-15PY3K000001
Prod. year: Unit: N.a.

Dates: Component tested: March - July 2023 and May 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. All tests were done with enabled defrost mode. This test report replaces test report 300-KLAB-23-007-rev.1 issued 2023.08.02. COP test condition A7W35 was added to this report.

Terms: This test was conducted under accreditation in accordance with international requirements (ISO/IEC 17025:2017) and in accordance with the General Terms and Conditions of Danish Technological Institute. The test results solely apply to the tested item. This test report may be quoted in extract only if Danish Technological Institute has granted its written consent.

The customer may not mention or refer to Danish Technological Institute or Danish Technological Institute's employees for advertising or marketing purposes unless Danish Technological Institute has granted its written consent in each case.

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

Date: 2024.25.07

Signature:
Preben Eskerod
B. TecMan & MarEng

Co-reader:
Kamalathasan Arumugam
B.Sc. Engineer

DIGITALLY SIGNED DOCUMENT
25 July 2024
DANISH TECHNOLOGICAL INSTITUTE

ilac-MRA DANAK
Test Reg. 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 and colder 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 4 and 6.

COP test points at low temperature (heating mode) according to EN 14511:2018 at A7/W35.

COP test points at medium temperature (heating mode) according to EN 14511:2018 at A7/W55, A0/W55 and A-7/W55.

Operating requirements according to EN 14511-4:2018:
- 4.2.1 Starting and operating tests

Sound power measurements according to EN 12102-1:2017 for ErP labelling.

Test results

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

Model (Outdoor)	KHY-15PY3
Air-to-water heat pump mono bloc	Y
Low-temperature heat pump	N
Equipped with supplementary heater	N
Heat pump combination heater	N

Rated heat output[1)]	P_{rated}	**12.6** [kW]
Seasonal space heating energy efficiency	η_s	**160.8** [%]
	SCOP	**4.09** [-]

Measured capacity for heating for part load at outdoor temperature Tj	Average Climate - Low temperature application	Tj=-15 °C	Pdh	- [kW]
		Tj=-7 °C	Pdh	11.20 [kW]
		Tj=2 °C	Pdh	6.52 [kW]
		Tj=7 °C	Pdh	8.10 [kW]
		Tj=12 °C	Pdh	9.13 [kW]
		Tj=bivalent temperature	Pdh	11.20 [kW]
		Tj=operation limit	Pdh	12.43 [kW]

Measured coefficient of performance at outdoor temperature Tj	Average Climate - Low temperature application	Tj=-15 °C	COPd	- [-]
		Tj=-7 °C	COPd	2.46 [-]
		Tj=2 °C	COPd	3.91 [-]
		Tj=7 °C	COPd	5.95 [-]
		Tj=12 °C	COPd	7.46 [-]
		Tj=bivalent temperature	COPd	2.46 [-]
		Tj=operation limit	COPd	2.07 [-]

Bivalent temperature	Tbivalent	-7 [°C]
Operation limit	TOL	-10 [°C]
temperatures	WTOL	- [°C]
Degradation coefficient	Cdh	0.98 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.013 [kW]
	Thermostat-off mode	P_{TO}	0.028 [kW]
	Standby mode	P_{SB}	0.013 [kW]
	Crankcase heater mode	P_{CK}	0.013 [kW]
Supplementary heater[1)]	Rated heat output	P_{SUP}	0.17 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Fixed
	Water flow rate		2900 [l/h]
	Annual energy consumption	Q_{HE}	6359 [kWh]

[1)]For heat pump space heaters and heat pump combination heaters, the rated heat output, Prated, is equal to the design load for heating, Pdesignh, and the rated heat output of a supplementary heater, Psup, is equal to the supplementary capacity for heating, sup(Tj).

Tests performed by Preben Eskerod, Danish Technological Institute.

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

Model (Outdoor)	KHY-15PY3
Air-to-water heat pump mono bloc	Y
Low-temperature heat pump	N
Equipped with supplementary heater	N
Heat pump combination heater	N

Rated heat output[1)]	P_{rated}	**12.38** [kW]
Seasonal space heating energy efficiency	η_s	**130.2** [%]
	SCOP	**3.33** [-]

Measured capacity for heating for part load at outdoor temperature Tj	Average Climate - Medium temperature application	Tj=-15 °C	Pdh	- [kW]
		Tj=-7 °C	Pdh	10.87 [kW]
		Tj=2 °C	Pdh	6.82 [kW]
		Tj=7 °C	Pdh	7.85 [kW]
		Tj=12 °C	Pdh	9.07 [kW]
		Tj=bivalent temperature	Pdh	10.87 [kW]
		Tj=operation limit	Pdh	12.15 [kW]

Measured coefficient of performance at outdoor temperature Tj	Average Climate - Medium temperature application	Tj=-15 °C	COPd	- [-]
		Tj=-7 °C	COPd	1.92 [-]
		Tj=2 °C	COPd	3.32 [-]
		Tj=7 °C	COPd	4.56 [-]
		Tj=12 °C	COPd	5.73 [-]
		Tj=bivalent temperature	COPd	1.92 [-]
		Tj=operation limit	COPd	1.65 [-]

Bivalent temperature	Tbivalent	-7 [°C]
Operation limit	TOL	-10 [°C]
temperatures	WTOL	- [°C]
Degradation coefficient	Cdh	0.98 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.013 [kW]
	Thermostat-off mode	P_{TO}	0.028 [kW]
	Standby mode	P_{SB}	0.013 [kW]
	Crankcase heater mode	P_{CK}	0.013 [kW]
Supplementary heater[1)]	Rated heat output	P_{SUP}	0.23 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Fixed
	Water flow rate		1800 [l/h]
	Annual energy consumption	Q_{HE}	7681 [kWh]

[1)] For heat pump space heaters and heat pump combination heaters, the rated heat output, Prated, is equal to the design load for heating, Pdesignh, and the rated heat output of a supplementary heater, Psup, is equal to the supplementary capacity for heating, sup(Tj).

Tests performed by Preben Eskerod, Danish Technological Institute.

Test results of COP test points at low temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W35	15.4	3.34

Test performed by Rasmus Thisgaard.

Test results of COP test points at medium temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W55	16.4	2.67
2	A0/W55	12.6	2.08
3	A-7/W55	11.2	1.85

Tests performed by Thor Mikkelsen Danish Technological Institute.

Test results of starting and operating tests – EN 14511-4

N#	Test conditions	Water flow rate at indoor heat exchanger (l/h)	Test validation
1	A-22/W25	700	Passed
2	A-22/W49	700	Passed

Tests performed by Thor Mikkelsen, Danish Technological Institute.

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

N#	Test conditions	Heat exchanger	Test validation
1	A7/W35	Indoor	Passed
2	A7/W35	Outdoor	Passed

Tests performed by Preben Eskerod, Danish Technological Institute.

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

N#	Test conditions	Test validation
1	A7/W35	Passed

Tests performed by Preben Eskerod, Danish Technological Institute.

Test results of sound power measurements – EN 12102

N#	Test conditions	Sound power level LW(A) [dB re 1pW]	Uncertainty (dB) (weighted value)
1	A7/W55	61.8	0.5

Test performed by Kamalathasan Arumugam, Danish Technological Institute, and co-read by Birger Bech Jessen, Danish Technological Institute.

Detailed test results of sound power measurement

Sound power levels according to ISO 3743-1:2010

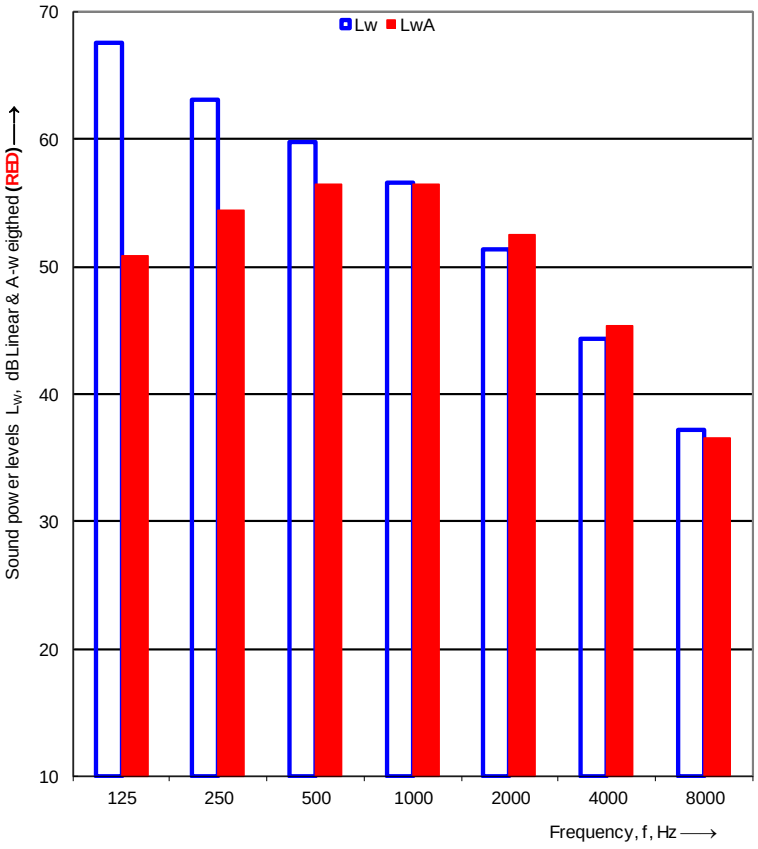
TEKNOLOGISK INSTITUT

Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms

Client:	Klima-Therm AB	Date of test:	17-04-2023
Object:	Type: Air to water heat pump, Model: KHY-15PY3		
Mounting conditions:	The out door unit is mounted on the supporting metal support frame using four vibration damping rubber feets, supplied by the manufacture. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.		
Operating conditions:	A7/W55, Compressor speed: 34 [Hz], Fan speed: na. [rpm], Heating capacity: 7.8 [kW], Power_input: 3.06 [kW], Water flow rate: 1800 [l/h], dP_water : 1111 [mBar]		
Static pressure:	1031 kPa	Reference box:	
Air temperature:	7.0 °C	L1:	1.3 m
Relative air humidity:	84.0 %	L2:	0.5 m
Test room volume:	102.8 m³ Room: Room 2	L3:	1.3 m
Area, S, of test room:	138.9 m²	Volume:	0.8 m³

Frequency f [Hz]	L_w 1/3 octave [dB]	1/1 oct [dB]
100	64.9	
125	61.9	67.5
160	60.1	
200	59.0	
250	58.5	63.1
315	57.2	
400	56.0	
500	54.9	59.8
630	54.0	
800	53.3	
1000	51.4	56.6
1250	50.3	
1600	48.6	
2000	46.1	51.4
2500	43.8	
3150	41.4	
4000	39.4	44.4
5000	36.9	
6300	34.7	
8000	31.4	37.2
10000	29.4	

[1] Diff. to backgr. noise < 6dB



Sound power level $L_w(A)$: **61.8 dB [re 1pW]**

Name of test institute:	DTI	Date:	17-04-2023
No. of test report:	300-KLAB-23-007		

Measurements are in full conformity with ISO 3743

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 14511:2018
- EN 12102-1:2017
- 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.

Tłumacz Przysięgły Języka Angielskiego– Danuta Zalewska, ul. Kossaka 6/1, 80-249 Gdańsk, tel./fax (058) 341 76 04

[Tłumaczenie przysięgłe z języka angielskiego.]

[na każdej stronie raportu umieszczono logo Duńskiego Instytutu Technologicznego – Danish Technological Institute, oraz na dole strony logo ilac-MRA DANAK Test Reg nr]

Raport z badań

Nr raportu:
300-KLAB-23-007-rev.2

Teknologiparken
Kongsvang Allé 29
DK-8000 Aarhus C
+45 72 20 20 00
Info@teknologisk.dk
www.teknologisk.dk

Init: PRES/TGTM/KAMA
Nr pliku: 172861
Załączniki: 1

Klient:	Firma:	Klima-Therm AB
	Adres:	Ögärdesvägen 17
	Miasto:	S-433 30 PARTILLE
	Tel:	+46 313366530
Komponent:	Marka:	Kaisai
	Typ:	Pompa ciepła powietrze-woda (mono blok)
	Model:	Jednostka: KHY-15PY3
	Nr serii:	Jednostka: KHY-15PY3K000001
	Rok prod:	Jednostka: NIE DOTYCZY
Daty:	Okres badań:	marzec-lipiec 2023 i maj 2024

Procedury Patrz cel (strona 2), aby zapoznać się z listą norm.

Uwagi: Urządzenie zostało dostarczone przez klienta. Instalacja i ustawienia testowe zostały wykonane zgodnie z instrukcjami producenta. Wszystkie testy wykonano z włączonym trybem odszraniania. Niniejszy raport z badania zastępuje raport 300-KLAB-23-007-rev.1 wydany 02.08.2023. Warunek testu COP A7W35 został dodany do tego raportu.

Warunki: Niniejszy test został przeprowadzony w ramach akredytacji zgodnie z międzynarodowymi wymogami (ISO/IEC 17025:2017) oraz zgodnie z Ogólnymi Warunkami Duńskiego Instytutu Technologicznego. Wyniki testu odnoszą się wyłącznie do testowanego produktu. Niniejszy raport z testu może być cytowany we fragmentach wyłącznie za pisemną zgodą Duńskiego Instytutu Technologicznego.

Klient nie może wspominać ani odnosić się do Duńskiego Instytutu Technologicznego lub pracowników Duńskiego Instytutu Technologicznego w celach reklamowych lub marketingowych, chyba że Duński Instytut Technologiczny wyrazi na to pisemną zgodę w każdym przypadku.

Oddział/Centrum: Duński Instytut Technologiczny
Energia i klimat
Laboratorium pomp ciepła, Aarhus

Data: 2024.07.25

Podpis:
Preben Eskerod
B.TecMan & MarEng

Współczytający:
Inż. Kamalathasan Arumugam

[logo]
ilac -MRA I DANAK
nr rejestru testu

[logo] dokument podpisany elektronicznie
25 lipca 2024
Duński Instytut Technologiczny

Cel

Celem niniejszego raportu jest udokumentowanie następujących kwestii:

Sezonowy współczynnik wydajności (SCOP) w niskiej i średniej temperaturze dla klimatu umiarkowanego i chłodnego zgodnie z normą EN 14825:2018.W celu obliczenia SCOP przeprowadzono badania w warunkach obciążenia częściowego podanych w tabelach na stronie 4 i 6.

Punkty testowe COP w niskiej temperaturze (tryb ogrzewania) zgodnie z normą EN 14511:2018 przy A7/W35.

Punkty testowe COP w średniej temperaturze (tryb ogrzewania) zgodnie z normą EN 14511:2018 przy A7/W55, A0/W55 i A-7/W55.

Wymagania eksploatacyjne zgodnie z normą EN 14511-4:2018:
- 4.2.1 Testy rozruchowe i eksploatacyjne

Pomiary mocy akustycznej zgodnie z normą EN 12102-1:2017 dla etykiet ErP.

Wyniki badań

Wyniki badań SCOP w niskiej temperaturze – umiarkowany sezon grzewczy (A) – EN 14825

Model (zewnętrzny)	KHY-15PY3
Pompa ciepła powietrze-woda, monoblok	Y
Niskotemperaturowa pompa ciepła	N
Wyposażona w dodatkową grzałkę	N
Kombinowana pompa ciepła i grzałka	N

Znamionowa moc cieplna [1]	P_{rated}	**12,6** [kW]
Sezonowa efektywność energetyczna ogrzewania pomieszczeń	η_s	**160,8** [%]
	SCOP	**4,09** [-]

Zmierzona wydajność ogrzewania dla częściowego obciążenia przy temperaturze zewnętrznej Tj	Klimat umiarkowany - Zastosowanie w niskiej temperaturze	Tj=-15°C	Pdh	- [kW]
		Tj=-7°C	Pdh	11,2 [kW]
		Tj=2°C	Pdh	6,52 [kW]
		Tj=7°C	Pdh	8,10 [kW]
		Tj=12°C	Pdh	9,13 [kW]
		Tj=temperatura dwuwartościowa	Pdh	11,20 [kW]
		Tj=graniczna temperatura robocza	Pdh	12,43 [kW]

Zmierzony współczynnik efektywności przy temperaturze zewnętrznej Tj	Klimat umiarkowany - Zastosowanie w niskiej temperaturze	Tj=-15°C	COPd	- [kW]
		Tj=-7°C	COPd	2,46 [kW]
		Tj=2°C	COPd	3,91 [kW]
		Tj=7°C	COPd	5,95 [kW]
		Tj=12°C	COPd	7,46 [kW]
		Tj=temperatura dwuwartościowa	COPd	2,46 [kW]
		Tj=graniczna temperatura robocza	COPd	2,07 [kW]

Temperatura dwuwartościowa	$T_{bivalent}$	-7 [°C]
Graniczna temperatura robocza	TOL	-10 [°C]
Temperatury	WTOL	- [°C]
Współczynnik strat	Cdh	0,98 [-]

Zużycie energii w trybach innych niż tryb aktywny	Tryb wyłączenia	P_{OFF}	0,013 [kW]
	Tryb wyłączenia termostatu	P_{TO}	0,028 [kW]
	Tryb czuwania	P_{SB}	0,013 [kW]
	Tryb włączonej grzałki karteru [2]	P_{CK}	0,013 [kW]
Grzałka dodatkowa [1]	Znamionowa moc ogrzewania	P_{SUP}	0,17 [kW]
	Rodzaj zasilania		Elektryczne

Inne pozycje	Regulacja wydajności	Zmienna	
	Regulacja przepływu wody	Stała	
	Prędkość przepływu wody	2900[l/h]	
	Roczne zużycie energii	Q_{HE}	6359 [kWh]

1) W przypadku ogrzewaczy pomieszczeń z pompą ciepła i wielofunkcyjnych ogrzewaczy z pompą ciepła – znamionowa moc cieplna, Prated, jest równa projektowemu obciążeniu ogrzewania, Pdesignh, a znamionowa moc cieplna grzałki dodatkowej, Psup, jest równa dodatkowej wydajności ogrzewania sup(Tj).

Badania wykonane prze Prebena Eskeroda, Duński Instytut Technologiczny.

Wyniki badań SCOP w średniej temperaturze – umiarkowany sezon grzewczy (A)– EN 14825

Model (zewnętrzny)	KHY-15PY3
Pompa ciepła powietrze-woda, monoblok	Y
Niskotemperaturowa pompa ciepła	N
Wyposażona w dodatkową grzałkę	N
Kombinowana pompa ciepła i grzałka	N

Znamionowa moc cieplna [1]	P_{rated}	**12,38** [kW]	
Sezonowa efektywność energetyczna ogrzewania pomieszczeń	η_s	**130,2** [%]	
	SCOP	**3,33** [-]	

Zmierzona wydajność ogrzewania dla częściowego obciążenia przy temperaturze zewnętrznej Tj	Klimat umiarkowany - Zastosowanie w średniej temperaturze	Tj=-15°C	Pdh	- [kW]
		Tj=-7°C	Pdh	10,87 [kW]
		Tj=2°C	Pdh	6,82 [kW]
		Tj=7°C	Pdh	7,85 [kW]
		Tj=12°C	Pdh	9,07 [kW]
		Tj=temperatura dwuwartościowa	Pdh	10,87 [kW]
		Tj=graniczna temperatura robocza	Pdh	12,15 [kW]

Zmierzony współczynnik efektywności przy temperaturze zewnętrznej Tj	Klimat umiarkowany - Zastosowanie w średniej temperaturze	Tj=-15°C	COPd	- [kW]
		Tj=-7°C	COPd	1,92 [kW]
		Tj=2°C	COPd	3,32 [kW]
		Tj=7°C	COPd	4,56 [kW]
		Tj=12°C	COPd	5,73 [kW]
		Tj=temperatura dwuwartościowa	COPd	1,92 [kW]
		Tj=graniczna temperatura robocza	COPd	1,65 [kW]

Temperatura dwuwartościowa	$T_{bivalent}$	-7 [°C]
Graniczna temperatura robocza	TOL	-10 [°C]
Temperatury	WTOL	- [°C]
Współczynnik strat	Cdh	0,98 [-]

Zużycie energii w trybach innych niż tryb aktywny	Tryb wyłączenia	P_{OFF}	0,013 [kW]
	Tryb wyłączenia termostatu	P_{TO}	0,028 [kW]
	Tryb czuwania	P_{SB}	0,013 [kW]
	Tryb włączonej grzałki karteru	P_{CK}	0,013 [kW]
Grzałka dodatkowa [1]	Znamionowa moc ogrzewania	P_{SUP}	0,23 [kW]
	Rodzaj zasilania		Elektryczne

Inne pozycje	Regulacja wydajności	Zmienna	
	Regulacja przepływu wody	Stała	
	Prędkość przepływu wody	1800 [l/h]	
	Roczne zużycie energii	Q_{HE}	7681 [kWh]

1) W przypadku ogrzewaczy pomieszczeń z pompą ciepła i wielofunkcyjnych ogrzewaczy z pompą ciepła – znamionowa moc cieplna, Prated, jest równa projektowemu obciążeniu ogrzewania, Pdesignh, a znamionowa moc cieplna grzałki dodatkowej, Psup, jest równa dodatkowej wydajności ogrzewania sup(Tj).

Badania wykonane przez Prebena Eskeroda, Duński Instytut Technologiczny.

Wyniki testów punktów testowych COP w niskiej temperaturze - EN 14511

Nr	Warunki testowe	Moc grzewcza [kW]	COP
1	A7/W35	15,4	3,34
Badania wykonane prze Rasmusa Thisgaarda.			

Wyniki testów punktów testowych COP w średniej temperaturze - EN 14511

Nr	Warunki testowe	Moc grzewcza [kW]	COP
1	A7/W55	16.4	2.67
2	A0/W55	12.6	2.08
3	A-7/W55	11.2	1.85
Badania wykonane prze Thora Mikkelsena, Duński Instytut Technologiczny.			

Wyniki testów rozruchowych i eksploatacyjnych - EN 14511-4

Nr	Warunki testowe	Natężenie przepływu wody w wewnętrznym wymienniku ciepła (l/h)	Walidacja testu
1	A-22/W25	700	Zaliczony
2	A-22/W49	700	Zaliczony
Badania wykonane prze Thora Mikkelsena, Duński Instytut Technologiczny.			

Wyniki testu odcięcia nośnika ciepła - EN 14511-4

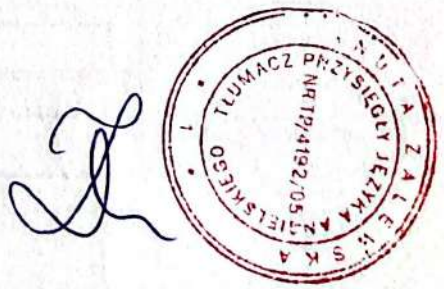
Nr	Warunki testowe	Wymiennik ciepła	Walidacja testu
1	A7/W35	Wewnętrzny	Zaliczony
2	A7/W35	Zewnętrzny	Zaliczony
Badania wykonane prze Prebena Eskeroda, Duński Instytut Technologiczny.			

Wyniki testu całkowitej awarii zasilania - EN 14511-4

Nr	Warunki testowe	Walidacja testu
1	A7/W35	Zaliczony
Badania wykonane prze Prebena Eskeroda, Duński Instytut Technologiczny.		

Wyniki pomiarów mocy akustycznej - EN 12102

Nr	Warunki testowe	Poziom mocy akustycznej LW(A) [dB re 1pW]	Niepewność (dB) (wartość ważona)
1	A7/W55	61,8	0,5
Badania wykonane prze Kamalathasana Arumugama, Duński Instytut Technologiczny, współczytający Birger Bech Jessen, Duński Instytut Technologiczny.			



Szczegółowe wyniki pomiarów mocy akustycznej

logo: ilac-MRA DANAK
Test reg nr 300

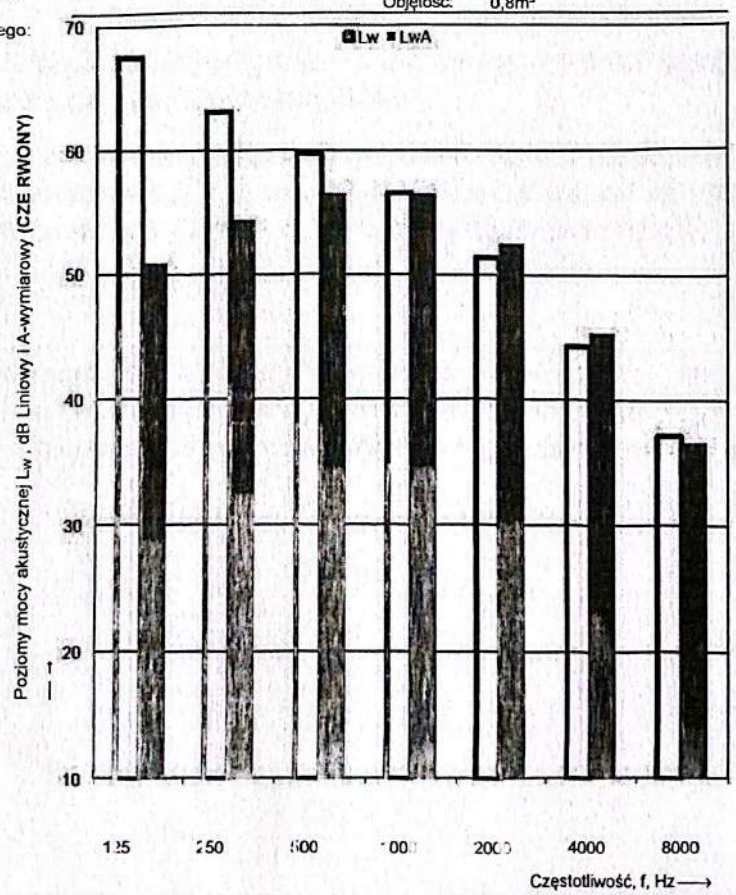
Poziomy mocy akustycznej zgodnie z normą ISO 3743-1:2010

TEKNOLOGISK INSTITUT

Metoda techniczna dla małych, ruchomych źródeł w polach pogłosowych - Metoda porównawcza dla pomieszczeń pomiarowych o ścianach odbijających dźwięk

Klient:	Klima-Therm AB
Data testu:	12-04-2023
Obiekt:	Typ: Pompa ciepła powietrze-woda, Model: KHY-15PY3
Warunki montażu:	Jednostka zewnętrzna jest zamontowana na metalowej ramie nośnej za pomocą sześciu sprężynowych wibroizolatorów dostarczonych przez producenta. Rama nośna jest umieszczone na tacy ociekowej na dwóch ciężkich betonowych płytach (90x90x10cm) ułożonych na macie tłumiącej drgania na podłodze. Dźwięk emitowany przez jednostkę zewnętrzną został zmierzony w pomieszczeniu testowym nr 2.
Warunki pracy:	A7/W55, Prędkość sprężarki: 34[Hz], Prędkość wentylatora: nie dot[obr/min], Wydajność grzewcza: 7,8 [kW], Moc_wej: 3,06[kW], Przepływ wody: 1800 [l/h] i dP_wody: 1111 [mbar]
Ciśnienie statyczne:	1031 kPa
Temperatura powietrza:	7.0 °C
Względna wilgotność powietrza:	84.0 %
Objętość pomieszczenia testowego:	102,8m³
Powierzchnia, S, pomieszczenia testowego:	138.9 m²
Pomieszczenie:	Pmieszczenie 2
Pole odniesienia:	
L1:	1.3m
L2:	0.5 m
L3:	1,3 m
Objętość:	0,8m³

Częstotliwość f [Hz]	L_W 1/3 oktawy [dB]	1/1 okt [dB]
100	64,9	
125	61,9	67,5
160	60,1	
200	59,0	
250	58,5	
315	57,2	63.1
400	56,0	
500	54,9	59,8
630	54,0	
800	53,3	
1000	51,4	56.6
1250	50,3	
1600	48.6	
2000	46,1	51.4
2500	43.8	
3150	41,4	
4000	39,4	44.4
5000	36,9	
6300	34.7	
8000	31.4	37,2
10000	29,4	



1 Różnica w stosunku do szumów tła < 6dB

Poziom mocy akustycznej L_{WA}: 61,8 dB [re 1pW]

Nazwa instytutu badawczego: DTI
Data: 17-04-2023
Nr raportu z badań: 300-KLAB-23-007
Pomiary są w pełni zgodne z normą ISO 3743

TŁUMACZ PRZYSIĘGŁY JĘZYKA ANGIELSKIEGO NR TP/4192/05

Załącznik 1: Procedura testowa

Pomiary poziomu mocy akustycznej emitowanej przez pompę ciepła są przeprowadzane zgodnie z poniższymi normami:

- DS/EN 14511:2018
- EN 12102-1:2017
- ISO/EN 3743-1

Podstawową normą pomiarów akustycznych ISO/EN 3743-1 jest metoda porównawcza wykorzystująca skalibrowane referencyjne źródło dźwięku. Dwie serie pomiarów ciśnienia akustycznego są wykonywane w dokładnie takich samych warunkach akustycznych, np. w tych samych pozycjach mikrofonu, temperaturze i wilgotności powietrza. Skalibrowane poziomy mocy akustycznej są znane dla referencyjnego źródła dźwięku w każdym paśmie częstotliwości i są wykorzystywane do oszacowania współczynnika korekcji akustycznej do obliczenia mocy akustycznej emitowanej przez testowaną pompę ciepła. Poziomy hałasu tła są mierzone i wykorzystywane do odpowiednich korekt.

Ostateczny całkowity poziom mocy akustycznej skorygowany charakterystyką A jest oparty na pomiarach i obliczeniach w poziomach 1/3-oktawowych, które następnie są sumowane do poziomów 1/1-oktawowych. Niepewność jest szacowana na podstawie ważonych odchyleń standardowych na poziomach 1/1 oktawy.

Rzeczywiste pozycje mikrofonów i wartości korekcji są zapisywane w plikach danych połączonych z pełną dokumentacją projektu zgodnie z akredytacją DANAK..

Kompletny system pomiarowy jest udokumentowany i regularnie kalibrowany zgodnie z DANAK. Szczegółowy opis metody pomiarowej jest podany w języku duńskim w systemie bazy danych jakości „QA Web" w Duńskim Instytucie Technologicznym, który jest dostępny przez DANAK.

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*Ja, **Danuta Zalewska**, tłumacz przysięgły języka angielskiego w Gdańsku, zarejestrowana na liście tłumaczy przysięgłych w **Ministerstwie Sprawiedliwości** pod numerem **TP/4109/05**, zaświadczam zgodność niniejszego tłumaczenia z treścią oryginału dokumentu okazanego mi w języku angielskim.*

Koniec tłumaczenia 10 stron *Gdańsk, 1/08/2024* *Rep.: 120/2024*