

TEST REPORT

Report no.: 300-KLAB-24-023-1



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Init: PRES/RTHI/AAS
File no.: 249428
Enclosures: 2

Customer:

Component:

Dates: Component tested: April-June 2024

Brand name: Brand: KOSPEL
Type: Air to water heat pump
Model: HPMO2-16/23

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 report for the tested unit is named 300-KLAB-24-023 issued 2024.07.24 - Also see appendix 2.

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Division/Centre: Danish Technological Institute
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DIGITALLY SIGNED DOCUMENT

13 August 2024

DANISH TECHNOLOGICAL INSTITUTE



DANAK

Test Reg. nr. 300



Objective

The objective of this report is to document the following:

The Seasonal Coefficient of Performance (SCOP) at low and medium temperature application for average climate according to EN 14825:2022.

In order to calculate the SCOP, tests were carried out at the part load conditions stated in the tables on page 4 and 5.

COP test standard rating conditions A7/W35 and A7/W55 according to EN 14511:2022.

Sound power measurements according to EN 12102-1:2022.



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Test results

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

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

Rated heat output¹⁾	P_{rated}	13.01 [kW]
Seasonal space heating energy efficiency	η_s	185.5 [%]
	SCOP	4.71 [-]

Measured capacity for heating for part load at outdoor temperature T_j	Average Climate - Low temperature application	$T_j = -15\text{ °C}$	P_{dh}	- [kW]
		$T_j = -7\text{ °C}$	P_{dh}	11.62 [kW]
		$T_j = 2\text{ °C}$	P_{dh}	7.56 [kW]
		$T_j = 7\text{ °C}$	P_{dh}	7.40 [kW]
		$T_j = 12\text{ °C}$	P_{dh}	8.21 [kW]
		$T_j = \text{bivalent temperature}$	P_{dh}	11.62 [kW]
		$T_j = \text{operation limit}$	P_{dh}	10.11 [kW]

Measured coefficient of performance at outdoor temperature T_j	Average Climate - Low temperature application	$T_j = -15\text{ °C}$	COPd	- [-]
		$T_j = -7\text{ °C}$	COPd	3.04 [-]
		$T_j = 2\text{ °C}$	COPd	4.64 [-]
		$T_j = 7\text{ °C}$	COPd	6.07 [-]
		$T_j = 12\text{ °C}$	COPd	8.12 [-]
		$T_j = \text{bivalent temperature}$	COPd	3.04 [-]
		$T_j = \text{operation limit}$	COPd	2.43 [-]

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

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.022 [kW]
	Thermostat-off mode	P_{TO}	0.022 [kW]
	Standby mode	P_{SB}	0.022 [kW]
	Crankcase heater mode	P_{CK}	0.022 [kW]
Supplementary heater¹⁾	Rated heat output	P_{SUP}	2.90 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Fixed
	Water flow rate		2948 [l/h]
	Annual energy consumption	Q_{HE}	5704 [kWh]

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



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

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

Rated heat output¹⁾	P_{rated}	14.42 [kW]
Seasonal space heating energy efficiency	η_s	133.2 [%]
	SCOP	3.40 [-]

Measured capacity for heating for part load at outdoor temperature T_j	Average Climate - Medium temperature application	$T_j = -15\text{ °C}$	P_{dh}	- [kW]
		$T_j = -7\text{ °C}$	P_{dh}	13.58 [kW]
		$T_j = 2\text{ °C}$	P_{dh}	8.07 [kW]
		$T_j = 7\text{ °C}$	P_{dh}	6.71 [kW]
		$T_j = 12\text{ °C}$	P_{dh}	8.19 [kW]
		$T_j = \text{bivalent temperature}$	P_{dh}	13.58 [kW]
		$T_j = \text{operation limit}$	P_{dh}	14.02 [kW]

Measured coefficient of performance at outdoor temperature T_j	Average Climate - Medium temperature application	$T_j = -15\text{ °C}$	COPd	- [-]
		$T_j = -7\text{ °C}$	COPd	2.28 [-]
		$T_j = 2\text{ °C}$	COPd	3.22 [-]
		$T_j = 7\text{ °C}$	COPd	4.34 [-]
		$T_j = 12\text{ °C}$	COPd	6.40 [-]
		$T_j = \text{bivalent temperature}$	COPd	2.28 [-]
		$T_j = \text{operation limit}$	COPd	1.85 [-]

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

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.022 [kW]
	Thermostat-off mode	P_{TO}	0.022 [kW]
	Standby mode	P_{SB}	0.022 [kW]
	Crankcase heater mode	P_{CK}	0.022 [kW]
Supplementary heater¹⁾	Rated heat output	P_{SUP}	0.40 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Fixed
	Water flow rate		1510 [l/h]
	Annual energy consumption	Q_{HE}	8750 [kWh]

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



COP test results - low temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W35	17.297	4.948

COP test results - medium temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W55	14.312	2.768

Test results of sound power measurements – EN 12102-1

N#	Test conditions	Sound power level LW(A) [dB re 1pW]	Uncertainty σ_{tot} [dB]
1 ^E	A7/W55	59.2	1.6

E) ErP labelling

The A-weighted total sound power level is determined for the measured frequency range from 100 Hz to 10 kHz. For the calculation of uncertainty, see appendix 1.

The sound power measurements are carried out by Kamalathan Arumugam (KAMA) and co-read by Patrick Glibert (PGL), Danish Technological Institut.



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	11.51	11.62	3.04	0.99	1.00	3.04
B	2	54	7.01	7.56	4.64	0.99	1.00	4.64
C	7	35	4.50	7.40	6.07	0.98	0.61	6.00
D	12	15	2.00	8.21	8.12	0.98	0.24	7.60
E	-10	100	13.01	10.11	2.43	0.99	1.00	2.43
F - BIV	-7	88	11.51	11.62	3.04	0.99	1.00	3.04

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

	Hours [h]	Power input [kW]	Applied to SCOP calculation [kW]	Energy consumption [kWh]
Off mode	0	0.022166	0.02217	0
Thermostat off	178	0.022344	0.02234	3.9772409
Standby	0	0.022166	0.02217	0
Crankcase heater	178	0.022168	1.9E-06	0.0003299



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	12.76	13.58	2.28	1.00	1.00	2.28
B	2	54	7.76	8.07	3.22	0.99	1.00	3.22
C	7	35	4.99	6.71	4.34	0.99	0.74	4.32
D	12	15	2.22	8.19	6.40	0.98	0.27	6.12
E	-10	100	14.42	14.02	1.85	1.00	1.00	1.85
F - BIV	-7	88	12.76	13.58	2.28	1.00	1.00	2.28

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

	Hours [h]	Power input [kW]	Applied to SCOP calculation [kW]	Energy consumption [kWh]
Off mode	0	0.022166	0.02217	0
Thermostat off	178	0.022344	0.02234	3.9772409
Standby	0	0.022166	0.02217	0
Crankcase heater	178	0.022168	1.9E-06	0.0003299



Measurement instruments

Id nr.	Manufacturer	Description	Calibration company
100864	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 1	Norsonic A/S, Norway
100865	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 1	Norsonic A/S, Norway
100866	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 1	Norsonic A/S, Norway
100867*	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 2	Norsonic A/S, Norway
100868*	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 2	Norsonic A/S, Norway
100869*	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 2	Norsonic A/S, Norway
100870	GRAS	Gras 40AE_26CA, ½" free field microphone, Roof monitor	Norsonic A/S, Norway
100873*	Brüel & Kjær	Acoustical calibrator, Brüel & Kjær 4231	Element Metech, Denmark
100859	Norsonic	Reference sound source, Norsonic Nor278 Room 1	RISE, Sweden
100872*	Norsonic	Reference sound source, Norsonic Nor278 Room 2	RISE, Sweden
100620*	Norsonic	Multi-channel measurement system Nor850	Norsonic A/S, Norway

*Instruments are used for the actual measurements for the calculation of the test results.

The other instruments are used for control measurements.
All microphones are equipped with windshields.