Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe, Brno, Republika Czeska
Engineering Test Institute. Public Enterprise. Brno. Czech Republic

CERTYFIKAT Z BADAŃ
TEST CERTIFICATE

Number **O-B-01310-24**

Producent *Customer*	Rakoczy Stal Sp. z o.o. ul. Wtadystawa Grabskiego 41 37-450 Stalowa Wola POLAND
Produkt *Product*	Pompa Ciepła powietrze/woda – monoblok *Air/water heat pump – monobloc*
Rodzaj oznaczenie / znak towarowy *Type designation / Trade mark*	**Rakoczy 20 Monoblok**
Metoda testowa *Test methods*	ČSN EN 14511-2:2019, ČSN EN 14511-3:2019, ČSN EN 14825:2019; ČSN EN 12102-1:2018
Podstawy zaświadczenia *Basis of certificate*	Raport z badań - *Test reports*: 39-17844/2/T z dnia - *of* 2024-07-19 39-17844/2/H z dnia - *of* 2024-07-19 Dokumentacja techniczna przedstawiona przez - *Technical documents of* Rakoczy Stal Sp. z o.o.
Referencyjny okres grzewczy *Reference heating season*	**„A" = Średni - *„A" = average*** (Warunki obliczeniowe odniesienia dla ogrzewania $T_{designh}$ = -10 °C - *Reference design temperature $T_{designh}$ = -10 °C*)

Wyniki - Results:

NISKA TEMPERATURA *LOW TEMPERATURE*		ŚREDNIA TEMPERATURA *MEDIUM TEMPERATURE*
Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*		Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*
14.45	**$P_{designh}$ [kW]** … Obciążenie obliczeniowe dla trybu ogrzewania - *Full load heating*	**14.39**
4.48	**SCOP [-]** … Wskaźnik sezonowej efektywności - *Seasonal coefficient of performance*	**3.52**

Temperatura zewnętrzna *Outdoor temperature* T_j [°C]	Deklarowana wydajność grzewcza *Heating declared capacity* P_{dh} [kW]	Wskaźnik efektywności dla deklarowanej wydajności *Coefficient of performance at the declared capacity* COP_d [–]	Temperatura zewnętrzna *Outdoor temperature* T_j [°C]	Deklarowana wydajność grzewcza *Heating declared capacity* P_{dh} [kW]	Wskaźnik efektywności dla deklarowanej wydajności *Coefficient of performance at the declared capacity* COP_d [–]
T_j = -7	12.786	2.703	T_j = -7	12.733	2.105
T_j = +2	8.446	4.302	T_j = +2	8.144	3.381
T_j = +7	7.315	6.392	T_j = +7	7.042	4.908
T_j = +12	5.669	7.238	T_j = +12	6.050	5.963
T_j = TOL = -10	12.214	2.581	T_j = TOL = -10	12.015	1.907
T_j = $T_{bivalent}$ = -7	12.786	2.703	T_j = $T_{bivalent}$ = -7	12.733	2.105

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NISKA TEMPERATURA *LOW TEMPERATURE* Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*	ŚREDNIA TEMPERATURA *MEDIUM TEMPERATURE* Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*

Pobór mocy w trybach innych niż „tryb aktywny" - *Power consumption in modes other than „active mode"*

23.5	Tryb wyłączenia *Off mode*	P_{OFF}	[W]	**23.5**
23.4	Tryb wyłączonego termostatu *Thermostat off mode*	P_{TO}	[W]	**23.4**
23.5	Tryb czuwania *Standby mode*	P_{SB}	[W]	**23.5**
9.7	Tryb włączonej grzałki karteru *Crankcase heater mode*	P_{CK}	[W]	**9.7**

Roczne zużycie energii elektrycznej na potrzeby ogrzewania wg: - *Annual electricity consumption for heating according to*:

6662	ČSN EN 14825:2023	Q_{HE}	[kWh]	**8459**

Sezonowa efektywność energetyczna ogrzewania pomieszczeń - *Seasonal Space heating energy efficiency*

176.3	ČSN EN 14825:2023	η_s	[%]	**137.6**

Przepływ cieczy w zewnętrznym wymienniku ciepła - *Liquid flow rate in outdoor heating exchanger*

–	Ciecz obiegu źródła *Source liquid*	Min/Max	[m^3/h]	**–**

Przepływ cieczy w wewnętrznym wymienniku ciepła - *Liquid flow rate in indoor heating exchanger*

0.9847 / 2.5849	Woda grzewcza *Heating water*	Min/Max	[m^3/h]	**0.6556 / 1.5641**

Poziom mocy akustycznej dla warunków - Sound power level at condition A7W55* (at 2000 rpm):

Tryb ***Mode***	*„ErP"*				
		L_{WA}	54.3 ± 1.5	dB(A)	Klasa dokładności 2 (Techniczna) *Accuracy class 2 (Engineering)*

(*) Uwagi do skróconych oznaczeń: np. A7/W55: A (powietrze), 7 (temperatura wejściowa - temperatura termometru suchego w °C), W (woda), 55 (temperatura wyjściowa w °C).
Comment to abbreviated marking: e.g. A7/W55: A (air), 7 (input air – dry bulb temperature in °C) / W (water), 55 (output heating water temperature in °C).

Specyfikacja warunków - *Specification of conditions*:

Kontrola prędkości kompresora *Compressor speed control*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (wewnętrzny wymiennik ciepła) - *Rated liquid flow rate (indoor heat exchanger)*	**Zmienna** ***Variable***
Wylotowa temperatura wody (wewnętrzny wymiennik ciepła) - *Outlet water temperature (indoor heat*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (zewnętrzny wymiennik ciepła) - *Rated liquid flow rate (outdoor heat exchanger)*	–
Funkcja *Function*	**Odwracalna** ***Reversible***		

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe potwierdza niniejszym certyfikatem z badań, że badanie produktu, którego dotyczy dało wyniki wskazane powyżej. Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe jest akredytowanym Laboratorium 1045.1.
Engineering Test Institute, Public Enterprise, confirms by this Test Certificate that the testing of the product in question was performed with the results as stated above. Engineering Test Institute, Public Enterprise, is an accredited Testing Laboratory 1045.1.

Brno, 2024-08-05

Ing. Mario Jankola
Kierownik ds. Urządzeń Grzewczych i Wyrobów Budowlanych
Heating Equipment and Construction Products Manager

- KONIEC CERTYFIKATU Z BADAŃ -
- END OF TEST CERTIFICATE -

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe, Brno, Republika Czeska
Engineering Test Institute. Public Enterprise. Brno. Czech Republic

CERTYFIKAT Z BADAŃ
TEST CERTIFICATE

Number **O-B-01337-24**

Producent *Customer*	Rakoczy Stal Sp. z o.o. ul. Wtadystawa Grabskiego 41 37-450 Stalowa Wola POLAND
Produkt *Product*	Pompa Ciepła powietrze/woda – monoblok *Air/water heat pump – monobloc*
Rodzaj oznaczenie / znak towarowy *Type designation / Trade mark*	**Rakoczy 5 Monoblok, Rakoczy 7 Monoblok, Rakoczy 9 Monoblok, Rakoczy 12 Monoblok, Rakoczy 14 Monoblok, Rakoczy 16 Monoblok, Rakoczy 18 Monoblok, Rakoczy 20 Monoblok**
Metoda testowa *Test methods*	ČSN EN 14511-2:2019, ČSN EN 14511-3:2019, ČSN EN 14825:2019
Podstawy zaświadczenia *Basis of certificate*	Raport z badań - *Test reports*: 39-17844/1/T z dnia - *of* 2024-07-19 39-17844/2/T z dnia - *of* 2024-07-19 Dokumentacja techniczna przedstawiona przez - *Technical documents of* Rakoczy Stal Sp. z o.o.
Zastosowanie *Temperature application*	**NISKOTEMPERATUROWA - *LOW*,** Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C* **WYSOKOTEMPERATUROWA - *MEDIUM*** Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*
Referencyjny okres grzewczy *Reference heating season*	**„A" = Średni - *„A" = average*** (Warunki obliczeniowe odniesienia dla ogrzewania – *Reference design conditions for heating* $T_{designh}$ = -10 °C)

Specyfikacja warunków - *Specification of conditions*:

Kontrola prędkości kompresora *Compressor speed control*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (wewnętrzny wymiennik ciepła) - *Rated liquid flow rate (indoor heat exchanger)*	**Zmienna** ***Variable***
Wylotowa temperatura wody (wewnętrzny wymiennik ciepła) - *Outlet water temperature (indoor heat*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (zewnętrzny wymiennik ciepła) - *Rated liquid flow rate (outdoor heat exchanger)*	–
Funkcja *Function*	**Odwracalna** ***Reversible***		

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Spełnienie wymagań dotyczących sezonowej efektywności energetycznej ogrzewania pomieszczeń – *Completion of requirements for Seasonal Space heating energy efficiency*

Nazwa modelu – *Model names*		Niska temperatura – *Low temperature* (Minimalny wymóg 125 % – *Minimal requirement 125 %)*		Średnia temperatura – *Medium temperature* (Minimalny wymóg 110 % – *Minimal requirement 110 %)*		Spełnia wymagania – *Completion of requirements*
		Sezonowa efektywność energetyczna ogrzewania pomieszcze [%] – *Seasonal Space heating energy efficiency [%]*	Klasa efektywności – *Efficiency class*	Sezonowa efektywność energetyczna ogrzewania pomieszcze [%] – *Seasonal Space heating energy efficiency [%]*	Klasa efektywności – *Efficiency class*	
Rakoczy 5 Monoblok	(Nie badana / Not tested)	163.2	A++	122.9	A+	Tak – *Yes*
Rakoczy 7 Monoblok	(Nie badana / Not tested)	164.4	A++	123.1	A+	Tak – *Yes*
Rakoczy 9 Monoblok	(Badana / Tested)	167.8	A++	125.6	A++	Tak – *Yes*
Rakoczy 12 Monoblok	(Nie badana / Not tested)	167.3	A++	132.3	A++	Tak – *Yes*
Rakoczy 14 Monoblok	(Nie badana / Not tested)	178.3	A+++	139.8	A++	Tak – *Yes*
Rakoczy 16 Monoblok	(Nie badana / Not tested)	179.1	A+++	138.7	A++	Tak – *Yes*
Rakoczy 18 Monoblok	(Nie badana / Not tested)	177.6	A+++	138.7	A++	Tak – *Yes*
Rakoczy 20 Monoblok	(Badana / Tested)	176.3	A+++	137.6	A++	Tak – *Yes*

Spełnianie wymagań dotyczących poziomu mocy akustycznej – *Completion of requirements for sound power level*

Nazwa modelu – *Model names*		Znamionowa moc cieplna [kW] – *Rated heat output [kW]*	Wymagania dotyczące poziomu mocy akustycznej [dB(A)] – *Requirements for sound power level [dB(A)]*		Deklarowany poziom mocy akustycznej [dB(A)] – *Declared sound power level [dB(A)]*		Spełnia wymagania – *Completion of requirements*
			Jednostka zewnętrzna – *Outdoor unit*	Jednostka wewnętrzna – *Indoor unit*	Jednostka zewnętrzna – *Outdoor unit*	Jednostka wewnętrzna – *Indoor unit*	
Rakoczy 5 Monoblok	(Nie badana / Not tested)	5.17	65	60	56.0	–	Tak – *Yes*
Rakoczy 7 Monoblok	(Nie badana / Not tested)	5.54	65	60	56.0	–	Tak – *Yes*
Rakoczy 9 Monoblok	(Badana / Tested)	6.90	70	65	50.4 ± 1.5	–	Tak – *Yes*
Rakoczy 12 Monoblok	(Nie badana / Not tested)	8.33	70	65	52.0	–	Tak – *Yes*
Rakoczy 14 Monoblok	(Nie badana / Not tested)	9.84	70	65	53.0	–	Tak – *Yes*
Rakoczy 16 Monoblok	(Nie badana / Not tested)	12.60	78	70	54.0	–	Tak – *Yes*
Rakoczy 18 Monoblok	(Nie badana / Not tested)	13.57	78	70	54.2	–	Tak – *Yes*
Rakoczy 20 Monoblok	(Badana / Tested)	14.39	78	70	54.3 ± 1.5	–	Tak – *Yes*

(Badana - *Tested*) Tę próbkę analityczną/warunek zbadano w Laboratorium Badawczym. *This test sample was tested at the Testing Laboratory.*

(Nie badana - *Not tested*) Techniczne dane zostały zgłoszone przez Producenta zgodnie ze specyfikacją linii modeli i nie zostały zbadane przez Laboratorium Badawcze. *The technical data were declared by the Manufacturer according to the model range specifications and were not tested by the Testing Laboratory.*

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe potwierdza niniejszym certyficatem z badań, że badanie produktu, którego dotyczy dało wyniki wskazane powyżej. Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe jest akredytowanym Laboratorium 1045.1.

Engineering Test Institute, Public Enterprise, confirms by this Test Certificate that the testing of the product in question was performed with the results as stated above. Engineering Test Institute, Public Enterprise, is an accredited Testing Laboratory 1045.1.

Brno, 2024-08-09

Ing. Mario Jankola

Kierownik ds. Urządzeń Grzewczych i Wyrobów Budowlanych
Heating Equipment and Construction Products Manager

- KONIEC CERTYFIKATU Z BADAŃ -
- END OF TEST CERTIFICATE -

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L 1045.1

TEST REPORT
39-17844/2/H

Product:	Outdoor Air/Water Heat pump - monobloc
Type designation:	**Rakoczy 20 Monoblok**
Customer:	Rakoczy Stal Sp. z o.o. ul. Wtadystawa Grabskiego 41 37-450 Stalowa Wola POLAND
Manufacturer:	Rakoczy Stal Sp. z o.o. ul. Wtadystawa Grabskiego 41 37-450 Stalowa Wola POLAND
Report issue date:	2024-07-19
Distribution list:	1 copy to the Customer 1 copy to the Engineering Test Institute

This test report reproduces the test results of test report no. 39-14429/2/H of 2020-02-07.

I. Description of product tested

The Heat pump **Rakoczy 20 Monoblok** supplied by company **Rakoczy Stal Sp. z o.o.** is structurally adapted to operate in air/water system. Device is designed as monobloc unit placed outdoor and indoor control unit (electrical box hanging on inner wall) and indoor hydraulic part. Outdoor and indoor parts are connected by water pipes. Refrigerant R452B is used with charge 5.85 kg. Power supply is three-phase. Heat pump is able to work in heating/cooling mode. Heat pump is working with variable flow rate.

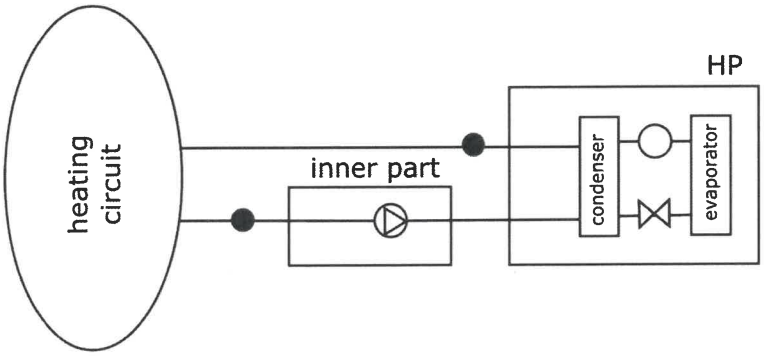
Main components of the outdoor unit **Rakoczy 20 Monoblok**:

- Serial number EEZ109DFZ
- Cuboid shape with dimensions 1350 × 580 × 1500 mm (W × D × H)
- Frame and casing made of varnished steel sheets
- 2× L-shaped evaporator, dimensions 840 × 70 × 800 mm (L × D × H), spacing 2 mm, 3 rows
- Compressor Emerson Copeland Scroll YHV0382P-4X9-XXX
- Refrigerant R452B (charge: 5.85 kg)
- Electric expansion valve Emerson EXM-125
- 4-way reversing valve Sanhua SHF-20D-46-02 with coil Sanhua
- Filter drier Sanhua DTGB 053s, Refrigerant accumulator denaline
- Sight glass
- Axial fan Ø630 mm with motor ebmpapst W3G630-GL06-G1
- 2× Pressure sensors Emerson PT5N
- Pressure switch Emerson PS4-W1-808261 PSH
- Temperature sensors on refrigerant, water pipes, on air suction
- Plate condenser with dimensions 120 × 160 × 530 mm (L × D × H), including insulation
- Air vent

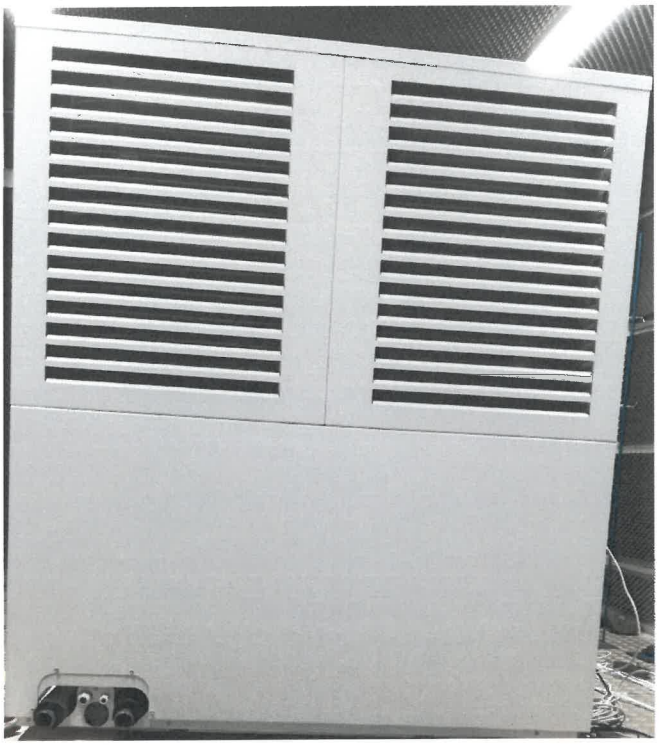
Main components of the outdoor unit **Rakoczy 20 Monoblok:**

- Circulation pump Wilo Para 25/9 – 87/IPWM1
- Flowswitch Sika
- Electrical box with control unit Frisko and touch display with user interface

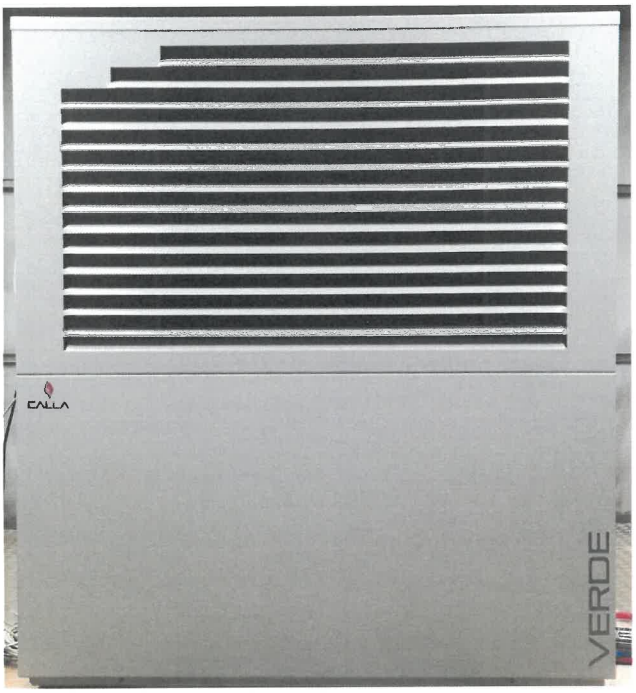
Scheme:



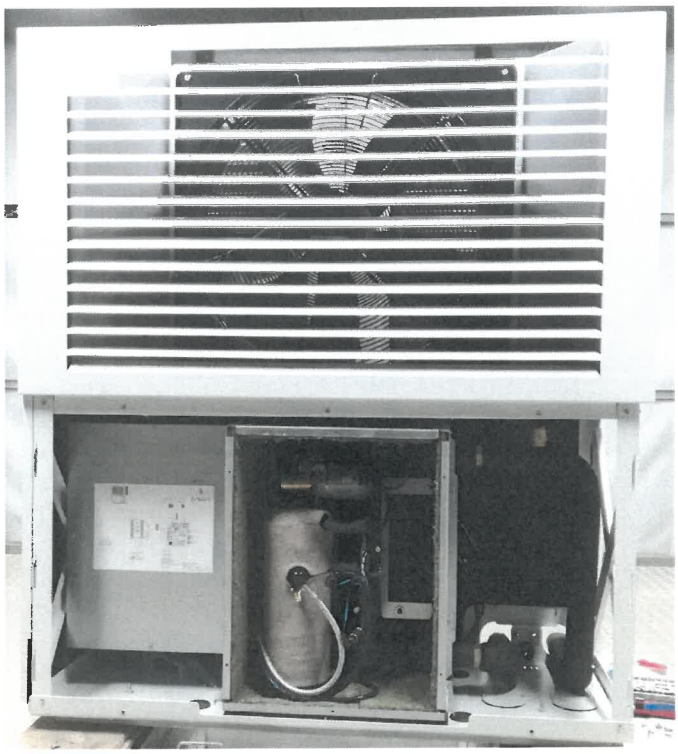
Photos:



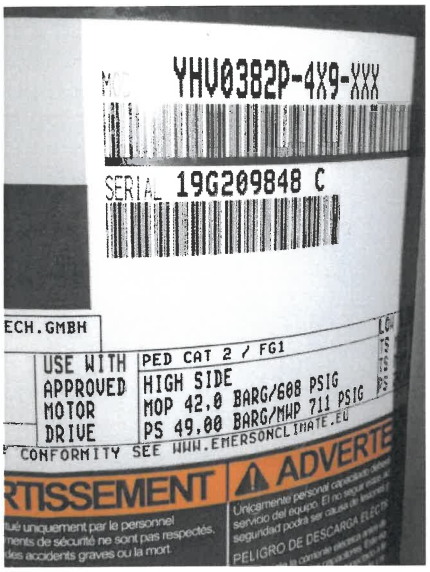
Heat pump **Rakoczy 20 Monoblok**
– Unit with cover /back view/ –



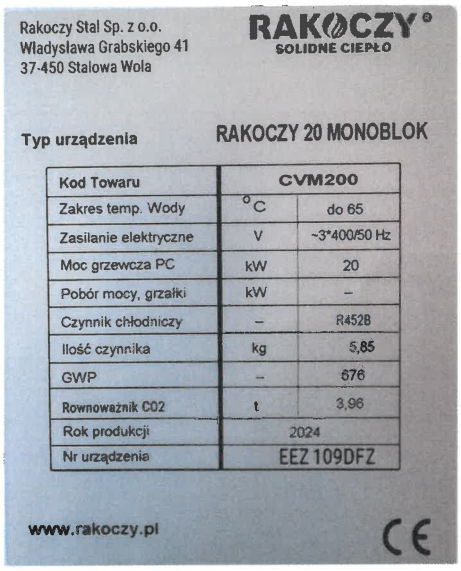
Heat pump **Rakoczy 20 Monoblok**
– Unit with cover /front view/ –



Heat pump **Rakoczy 20 Monoblok**
– Unit without cover –



Heat pump **Rakoczy 20 Monoblok**
– Compressor label –



Heat pump **Rakoczy 20 Monoblok**
– Unit label –

Heat pump **Rakoczy 20 Monoblok**
– Inner hydraulic part –

Heat pump **Rakoczy 20 Monoblok**
– Indoor control unit –

II. Sample tested

Reg. No. SZÚ	Product	Date of submission
0213.19.31904.001	Heat Pump **Rakoczy 20 Monoblok**	2019-11-26

The visual inspection, tests and verification were carried out by Ing. Antonín Kolbábek, Ph.D. – Test engineer at the test station of SZU Brno.

III. Methods, results of tests and verifications

The tests were carried out with the use of validly calibrated measuring and test equipment.

No.	Name:	Inventory number:	Calibration is valid to:	Accuracy see Calibration Sheet number:
1.	Electrical energy meter	022370/1	07/2022	082/12/E
2.	Digital watt meter	MaR01/EM01	07/2027	K17071728
3.	Flow meter Krohne Optiflux	022370/5	02/2022	6015-KL-P0077-18
4.	Barometer	022370/7	04/2024	4257/2019
5.	Differential pressure gauge	MaR01_TI	05/2021	KL-P-0056-19
6.	Temperature-humidity meter HC2-IC105	022370/12	08/2024	6036-KL-V0325-19
7.	Thermometers	022370/13	02/2020	KL-T-0014-19
8.	Tape measure	ME 475	10/2022	8799/2017
9.	Multianalyzer Brüel & Kjær 3560C	022293	04/2020	8012-KL-10198-17 8012-OL-10204-17
10.	Microphones Brüel & Kjær 4197, wind deflector	ME 533	11/2021	8012-OL-10560-19 8012-OL-10561-19
11.	Calibration kit Brüel & Kjær 3541	ME 349	11/2022	8012-KL-10562-19 8012-PT-10563-19

Accredited test number: **M 006*** Test title: **Measurement of noise characteristics**

Testing method	**ČSN EN 12102-1:2018;** **ČSN ISO 9614-2:1997**
Sample tested	Heat Pump **Rakoczy 20 Monoblok**
Measuring equipment used	See chapter II.

Place of testing:	at the Engineering Test Institute	☒	at the Manufacturer´s premises	☐	at the Customer´s premises	☐	*other:*

a) Acoustic environment

The testing sample was placed inside acoustic climatic chamber (dimensions see below); on walls of the chamber were mounted sound absorption panels An outdoor unit of heat pump was placed in the middle of the chamber, at a sufficient distance from the surrounding walls, rotated by about 5 ÷ 10 °.

Testing chamber *(corresponds to free field over a reflecting plane)*			**For outdoor unit**	**For indoor unit**
Width of testing chamber	l_1	*[m]*	4.00	---
Length of testing chamber	l_2	*[m]*	6.00	---
Height of testing chamber	l_3	*[m]*	2.35	---

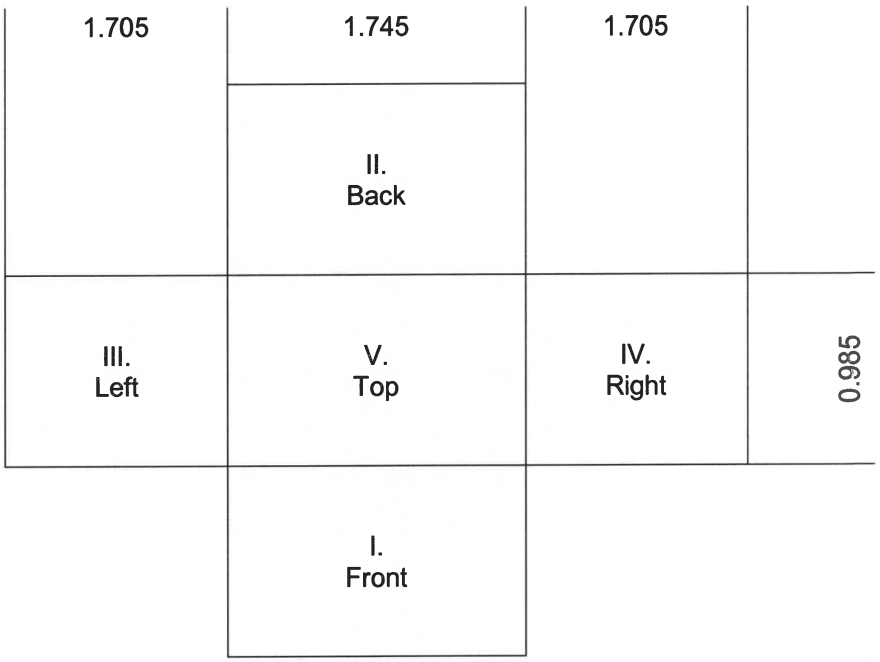
b) Measurement surface

Tested sample was surrounded by a cuboid-shape measuring surface set in distance d [m].

Test sample			**Outdoor unit**	**Indoor unit**
Distance from the test sample	d	*[m]*	0.200	---
Width of measurement surface	w	*[m]*	1.745	---
Depth of measurement surface	l	*[m]*	0.985	---
Height of measurement surface	h	*[m]*	1.705	---
Total measurement surface area	S	*[m²]*	11.0280	---
Minimal measuring time of scan	t_M	*[s]*	40	---

Sketch of measurement surface (not in scale):

Heat Pump **Rakoczy 20 Monoblok**
– Outdoor unit –



c) General overview

Date of testing			2020-01-02	
The measured values are in accordance with ČSN EN 12102-1:2018			YES	
The measured values are in accordance with ČSN ISO 9614-2:1997			YES	
Specification of the assessment condition			A7/W55*)	
Type of capacity control			Inverter	
Designation of operational mode of HP			*„ErP“*	*„Silent mode“*
Control settings of heat pump / compressor			2000 rpm	2000 rpm
Fan speed settings			45 %	39 %
Water pump settings – secondary circuit			Minimum	Minimum
Reference air temperature	t_{amb}	*[°C]*	7.1	7.0
Relative humidity of air	*RH*	*[%]*	73.4	65.9
Ambient pressure	p_{amb}	*[kPa]*	99.669	99.678
Overall sound power level (linear)	L_W	*[dB]*	60.8 ± 1.5	59.9 ± 1.5
Overall A-weighted sound power level	L_{WA}	*[dB]*	**54.3 ± 1.5**	**52.6 ± 1.5**
Accuracy class			**Engineering (grade 2)**	**Engineering (grade 2)**

(*) *Comment to abbreviated marking: i.e. A7/W35*
A (air), 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

A) **Measurement results** – one-third octave bands

Heat Pump **Rakoczy 20 Monoblok** – outdoor unit at A7/W55 */ compressor: 2000 rpm, fan: 45 %, circulation pump.: MIN /*	**Engineering** **(grade 2)**

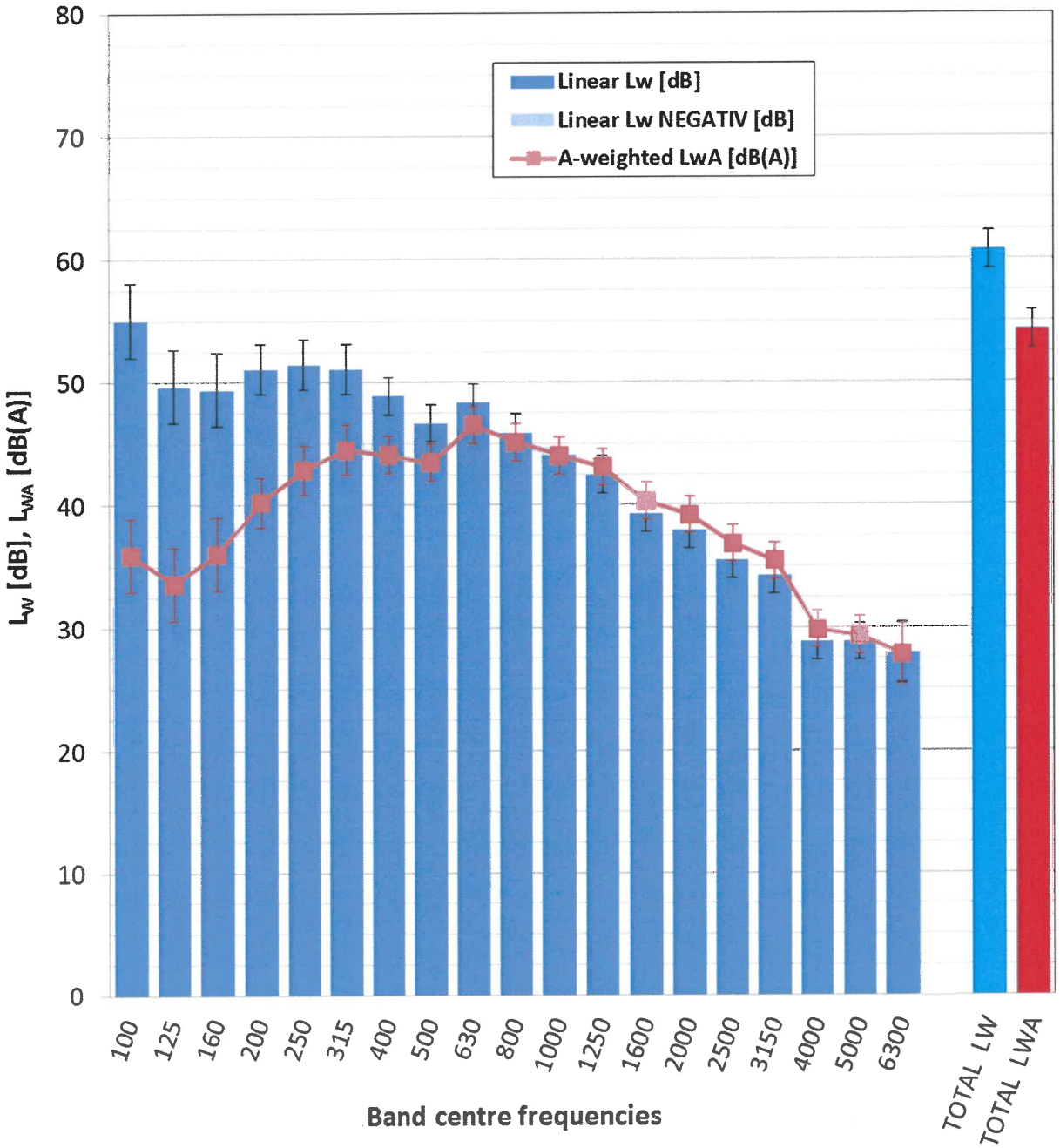
f_m	Criterion 1			Criterion 2		Criterion 3	All criteria passed ???	L_W	L_{WA}	U	Evaluation
[Hz]	L_d	F_{pl}	$L_d > F_{pl}$	$F_{+/-}$	$F_{+/-} \leq 3$	$L_{W(1)}-L_{W(2)} \leq s$		[dB]	[dB(A)]	[dB]	
100	21.2	4.0	YES	0.0	YES	YES	YES	55.0	35.9	± 3.0	c
125	21.4	4.0	YES	0.0	YES	YES	YES	49.7	33.6	± 3.0	c
160	21.9	4.0	YES	0.0	YES	YES	YES	49.4	36.0	± 3.0	c
200	22.0	4.4	YES	0.0	YES	YES	YES	51.1	40.2	± 2.0	passed
250	22.2	4.0	YES	0.0	YES	YES	YES	51.4	42.8	± 2.0	passed
315	22.2	4.3	YES	0.0	YES	YES	YES	51.1	44.5	± 2.0	passed
400	22.3	3.6	YES	0.0	YES	YES	YES	48.9	44.1	± 1.5	passed
500	22.3	3.0	YES	0.0	YES	YES	YES	46.7	43.5	± 1.5	passed
630	**22.5**	**3.1**	**YES**	**0.0**	**YES**	**YES**	**YES**	**48.4**	**46.5**	**± 1.5**	**passed**
800	22.0	3.3	YES	0.0	YES	YES	YES	45.9	45.1	± 1.5	passed
1000	22.1	2.9	YES	0.0	YES	YES	YES	44.0	44.0	± 1.5	passed
1250	22.1	3.0	YES	0.0	YES	YES	YES	42.5	43.1	± 1.5	passed
1600	22.0	2.7	YES	0.0	YES	YES	YES	39.3	40.3	± 1.5	passed
2000	21.1	2.6	YES	0.0	YES	YES	YES	38.0	39.2	± 1.5	passed
2500	20.1	2.6	YES	0.0	YES	YES	YES	35.5	36.8	± 1.5	passed
3150	20.5	2.9	YES	0.0	YES	YES	YES	34.2	35.4	± 1.5	c
4000	20.4	3.4	YES	0.0	YES	YES	YES	28.8	29.8	± 1.5	c
5000	20.1	3.8	YES	0.0	YES	YES	YES	28.8	29.3	± 1.5	c
6300	20.2	4.7	YES	0.0	YES	YES	YES	27.9	27.8	± 2.5	c
Total								**60.8**	**54.3**	**± 1.5**	

Legend:

passed	*Third frequency bands with this description are significant for calculation of A-weighted total sound power level L_{WA}. Required accuracy class is fulfilled in this band.*
not passed	*Third frequency bands with this description are significant for calculation of A-weighted total sound power level L_{WA}. Required accuracy class isn't fulfilled in this band.*
c	*Third frequency bands with this description are not significant for calculating of A-weighted total sound power level L_{WA}. These bands are evaluated in calculating of L_{WA}.*
nc	*Third frequency bands with this description are not significant for calculating of A-weighted total sound power level L_{WA}. This bands aren't evaluated in calculating of L_{WA}.*

Spectrum of Sound power level L_W – one-third octave bands

Heat Pump **Rakoczy 20 Monoblok** – outdoor unit at A7/W55 */ compressor: 2000 rpm, fan: 45 %, circulation pump.: MIN /*	**Engineering** **(grade 2)**



B) Measurement results – octave bands

Heat Pump **Rakoczy 20 Monoblok** – outdoor unit at A7/W55 */ compressor: 2000 rpm, fan: 45 %, circulation pump.: MIN /*	**Engineering** **(grade 2)**

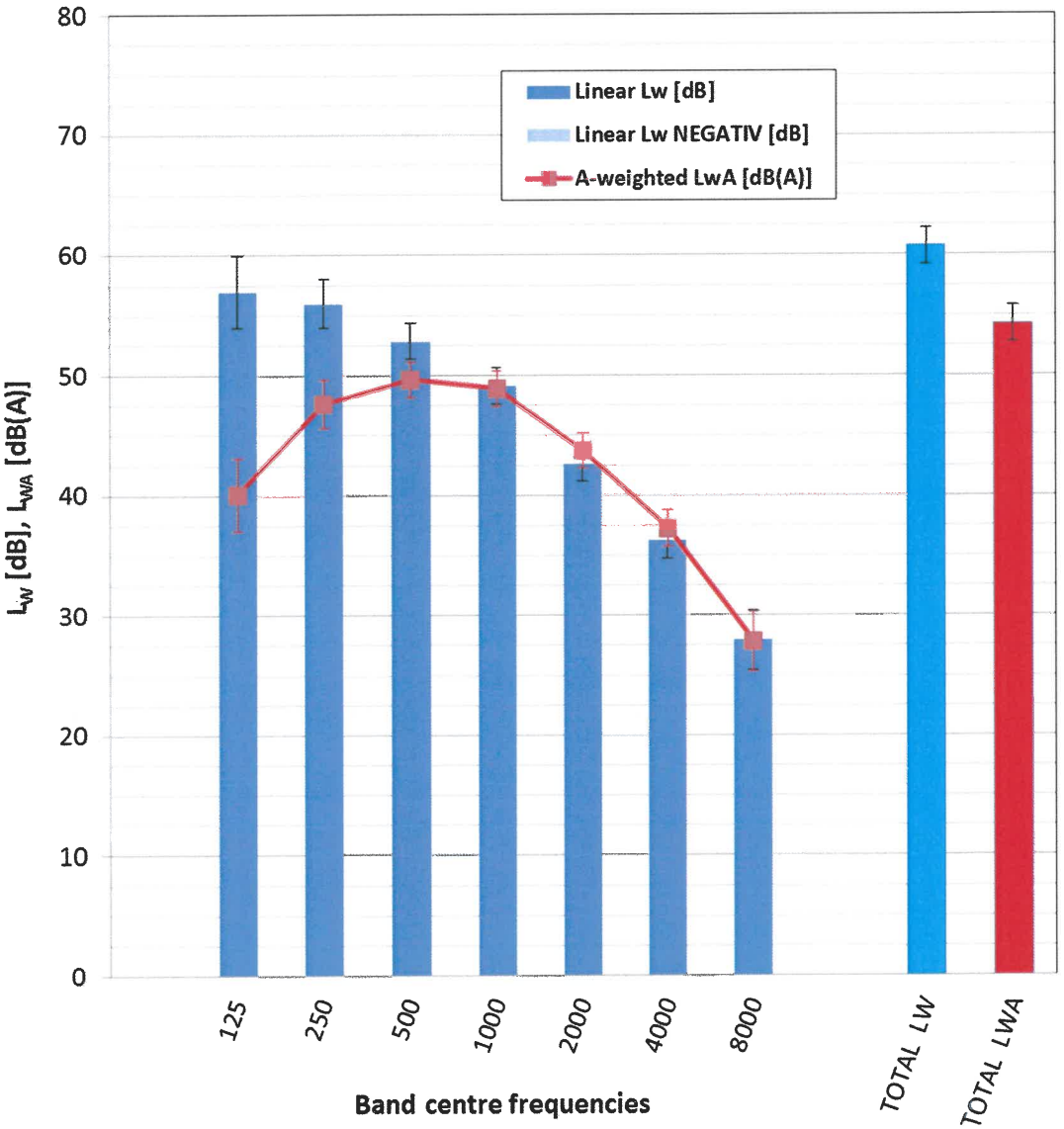
f_m	Criterion 1			Criterion 2		Criterion 3	All criteria passed ???	L_W	L_{WA}	U	Evaluation
[Hz]	L_d	F_{pl}	$L_d > F_{pl}$	$F_{+/-}$	$F_{+/-} \leq 3$	$L_{W(1)}-L_{W(2)} \leq s$		[dB]	[dB(A)]	[dB]	
125	21.4	4.0	YES	0.0	YES	YES	YES	57.0	40.1	± 3.0	c
250	22.2	4.0	YES	0.0	YES	YES	YES	56.0	47.6	± 2.0	passed
500	**22.3**	**3.0**	**YES**	**0.0**	**YES**	**YES**	**YES**	**52.8**	**49.7**	**± 1.5**	**passed**
1000	22.1	2.9	YES	0.0	YES	YES	YES	49.1	48.9	± 1.5	passed
2000	21.1	2.6	YES	0.0	YES	YES	YES	42.6	43.8	± 1.5	passed
4000	20.4	3.4	YES	0.0	YES	YES	YES	36.2	37.2	± 1.5	c
8000	20.2	4.7	YES	0.0	YES	YES	YES	27.9	27.8	± 2.5	c
Total								**60.8**	**54.3**	**± 1.5**	

Legend:

passed	*Third frequency bands with this description are significant for calculation of A-weighted total sound power level L_{WA}. Required accuracy class is fulfilled in this band.*
not passed	*Third frequency bands with this description are significant for calculation of A-weighted total sound power level L_{WA}. Required accuracy class isn't fulfilled in this band.*
c	*Third frequency bands with this description are not significant for calculating of A-weighted total sound power level L_{WA}. These bands are evaluated in calculating of L_{WA}.*
nc	*Third frequency bands with this description are not significant for calculating of A-weighted total sound power level L_{WA}. This bands aren't evaluated in calculating of L_{WA}.*

Spectrum of Sound power level L_W – octave bands

Heat Pump **Rakoczy 20 Monoblok** – outdoor unit at A7/W55 */ compressor: 2000 rpm, fan: 45 %, circulation pump.: MIN /*	**Engineering** **(grade 2)**



C) **Measurement results** – one-third octave bands

Heat Pump **Rakoczy 20 Monoblok** – outdoor unit at A7/W55 */ compressor: 2000 rpm, fan: 39 %, circulation pump.: MIN /*	**Engineering** **(grade 2)**

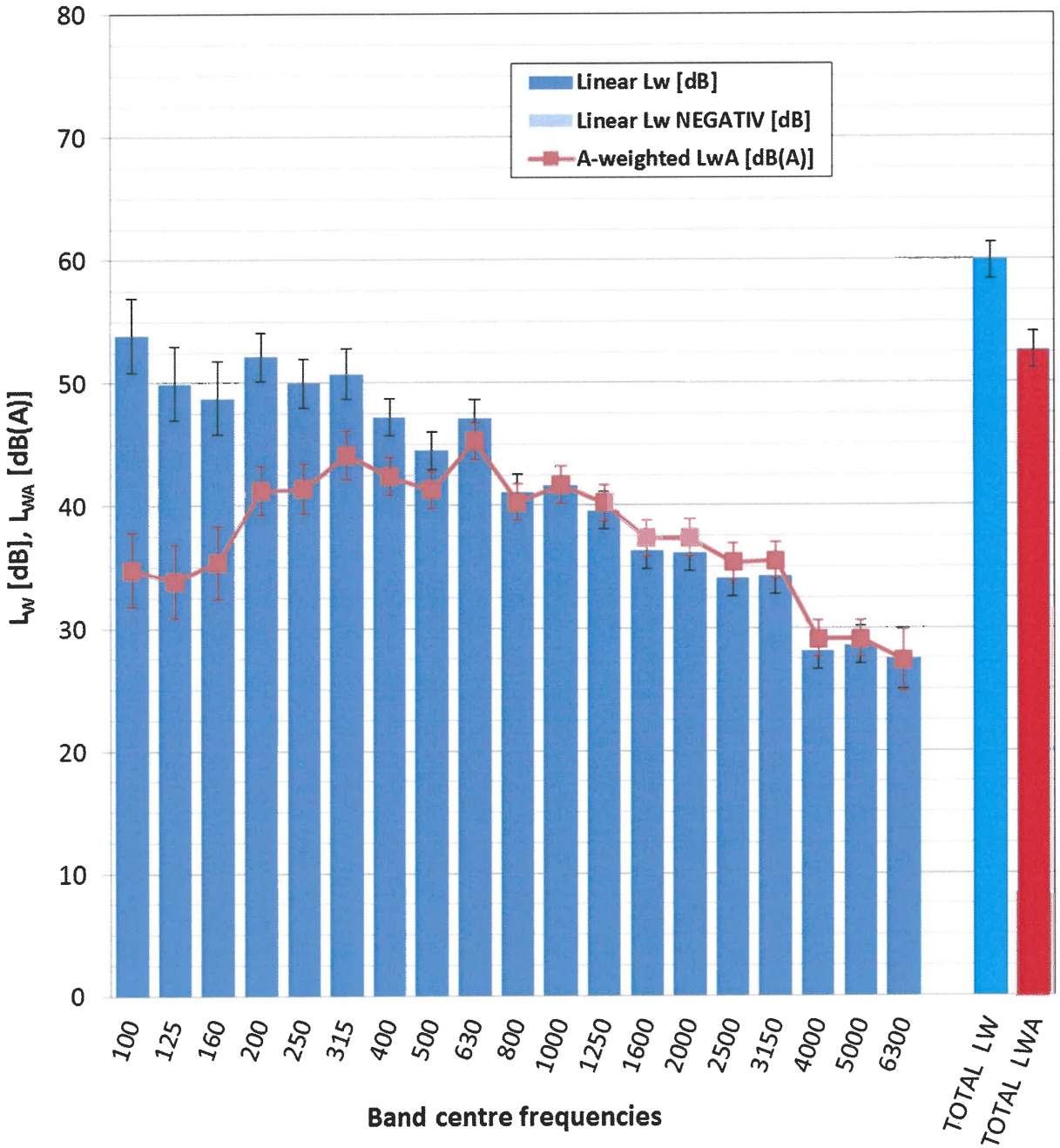
f_m	Criterion 1			Criterion 2		Criterion 3	All criteria passed ???	L_W	L_{WA}	U	Evaluation
[Hz]	L_d	F_{pl}	$L_d > F_{pl}$	$F_{+/-}$	$F_{+/-} \leq 3$	$L_{W(1)}-L_{W(2)} \leq s$		[dB]	[dB(A)]	[dB]	
100	21.2	3.5	YES	0.0	YES	YES	YES	53.9	34.8	± 3.0	c
125	21.4	3.2	YES	0.0	YES	YES	YES	49.9	33.8	± 3.0	c
160	21.9	3.2	YES	0.0	YES	YES	YES	48.8	35.4	± 3.0	passed
200	22.0	4.0	YES	0.0	YES	YES	YES	52.1	41.2	± 2.0	passed
250	22.2	4.4	YES	0.0	YES	YES	YES	50.0	41.4	± 2.0	passed
315	22.2	4.3	YES	0.0	YES	YES	YES	50.7	44.1	± 2.0	passed
400	22.3	3.9	YES	0.0	YES	YES	YES	47.2	42.4	± 1.5	passed
500	22.3	3.3	YES	0.0	YES	YES	YES	44.5	41.3	± 1.5	passed
630	**22.5**	**3.6**	**YES**	**0.0**	**YES**	**YES**	**YES**	**47.1**	**45.2**	**± 1.5**	**passed**
800	22.0	6.7	YES	0.0	YES	YES	YES	41.0	40.2	± 1.5	passed
1000	22.1	3.3	YES	0.0	YES	YES	YES	41.7	41.7	± 1.5	passed
1250	22.1	3.1	YES	0.0	YES	YES	YES	39.6	40.2	± 1.5	passed
1600	22.0	3.0	YES	0.0	YES	YES	YES	36.3	37.3	± 1.5	passed
2000	21.1	3.2	YES	0.0	YES	YES	YES	36.1	37.3	± 1.5	passed
2500	20.1	3.0	YES	0.0	YES	YES	YES	34.1	35.4	± 1.5	passed
3150	20.5	2.8	YES	0.0	YES	YES	YES	34.3	35.5	± 1.5	passed
4000	20.4	3.8	YES	0.0	YES	YES	YES	28.1	29.1	± 1.5	c
5000	20.1	3.8	YES	0.0	YES	YES	YES	28.6	29.1	± 1.5	c
6300	20.2	5.0	YES	0.0	YES	YES	YES	27.5	27.4	± 2.5	c
Total								**59.9**	**52.6**	**± 1.5**	

Legend:

passed	*Third frequency bands with this description are significant for calculation of A-weighted total sound power level L_{WA}. Required accuracy class is fulfilled in this band.*
not passed	*Third frequency bands with this description are significant for calculation of A-weighted total sound power level L_{WA}. Required accuracy class isn't fulfilled in this band.*
c	*Third frequency bands with this description are not significant for calculating of A-weighted total sound power level L_{WA}. These bands are evaluated in calculating of L_{WA}.*
nc	*Third frequency bands with this description are not significant for calculating of A-weighted total sound power level L_{WA}. This bands aren't evaluated in calculating of L_{WA}.*

Spectrum of Sound power level L_W – one-third octave bands

Heat Pump **Rakoczy 20 Monoblok** – outdoor unit at A7/W55 */ compressor: 2000 rpm, fan: 39 %, circulation pump.: MIN /*	**Engineering** **(grade 2)**



D) **Measurement results** – octave bands

Heat Pump **Rakoczy 20 Monoblok** – outdoor unit at A7/W55 */ compressor: 2000 rpm, fan: 39 %, circulation pump.: MIN /*	**Engineering** **(grade 2)**

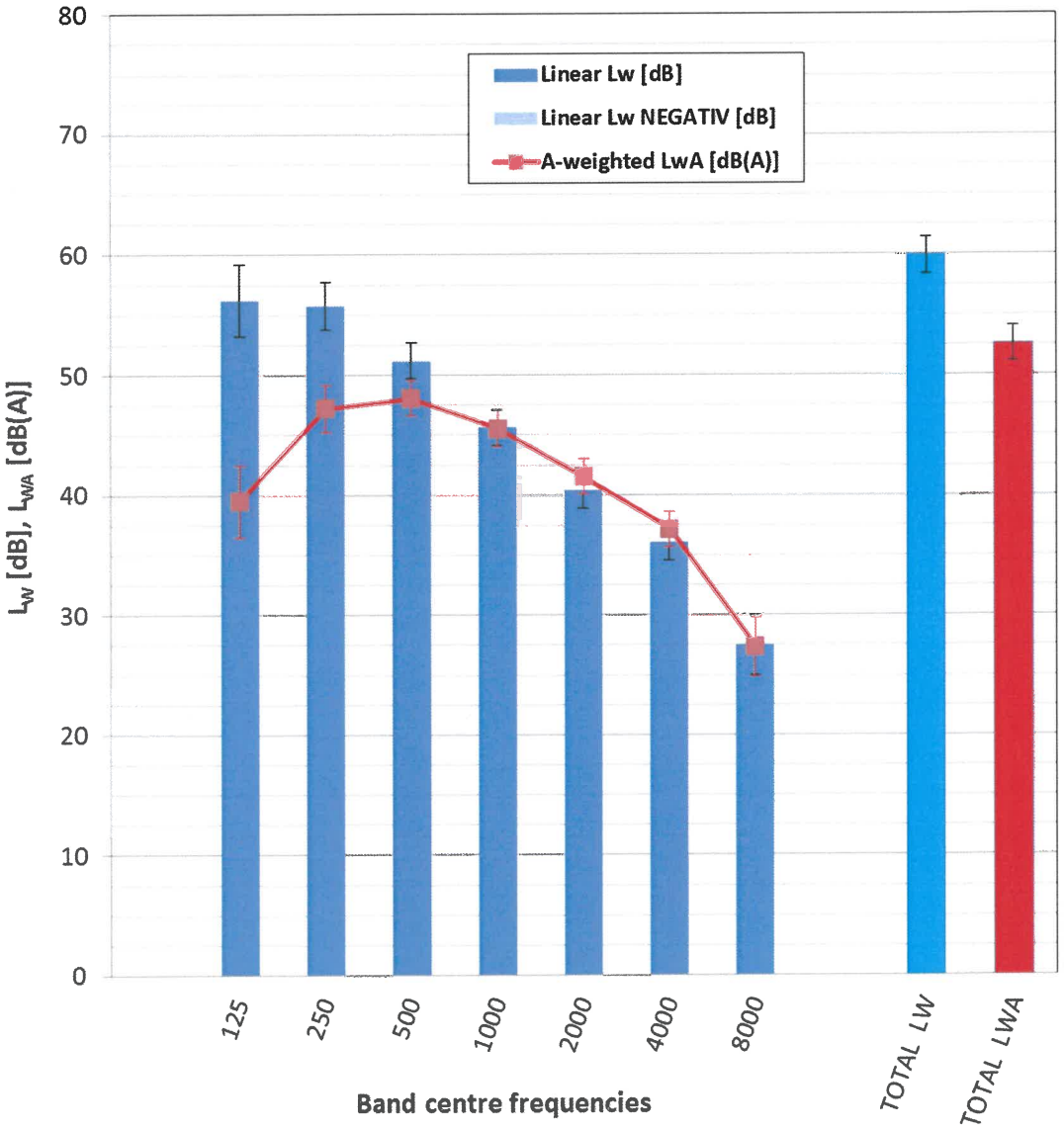
f_m	Criterion 1			Criterion 2		Criterion 3	All criteria passed ???	L_W	L_{WA}	U	Evaluation
[Hz]	L_d	F_{pl}	$L_d > F_{pl}$	$F_{+/-}$	$F_{+/-} \leq 3$	$L_{W(1)}-L_{W(2)} \leq s$		[dB]	[dB(A)]	[dB]	
125	21.4	3.2	YES	0.0	YES	YES	YES	56.2	39.5	± 3.0	c
250	22.2	4.4	YES	0.0	YES	YES	YES	55.8	47.2	± 2.0	passed
500	**22.3**	**3.3**	**YES**	**0.0**	**YES**	**YES**	**YES**	**51.2**	**48.1**	**± 1.5**	**passed**
1000	22.1	3.3	YES	0.0	YES	YES	YES	45.6	45.5	± 1.5	passed
2000	21.1	3.2	YES	0.0	YES	YES	YES	40.4	41.5	± 1.5	passed
4000	20.4	3.8	YES	0.0	YES	YES	YES	36.1	37.1	± 1.5	c
8000	20.2	5.0	YES	0.0	YES	YES	YES	27.5	27.4	± 2.5	c
Total								**59.9**	**52.6**	**± 1.5**	

Legend:

passed	*Third frequency bands with this description are significant for calculation of A-weighted total sound power level L_{WA}. Required accuracy class is fulfilled in this band.*
not passed	*Third frequency bands with this description are significant for calculation of A-weighted total sound power level L_{WA}. Required accuracy class isn't fulfilled in this band.*
c	*Third frequency bands with this description are not significant for calculating of A-weighted total sound power level L_{WA}. These bands are evaluated in calculating of L_{WA}.*
nc	*Third frequency bands with this description are not significant for calculating of A-weighted total sound power level L_{WA}. This bands aren't evaluated in calculating of L_{WA}.*

Spectrum of Sound power level L_W – octave bands

Heat Pump **Rakoczy 20 Monoblok** – outdoor unit at A7/W55 */ compressor: 2000 rpm, fan: 39 %, circulation pump.: MIN /*	**Engineering** **(grade 2)**



Tested by:	Ing. Antonín Kolbábek, Ph.D.	Date:	2024-07-19	Signed:	
Reviewed and approved by:	Ing. Petr Lindovský	Date:	2024-07-19	Signed:	

V. A list of referenced documents

- Order of 2024-06-20 (Order reg. no. B-82503, received on 2024-06-24)
- Contract B-82503/39
- ČSN EN 14511-2:2019 - Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 2: Test conditions
- ČSN EN 14511-3:2019 - Air conditioners, liquid chilling packages and heat pumps for space heating and cooling a process chillers with electrically driven compressors - Part 3: Test methods
- ČSN EN 14825:2019 - Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling - Testing and rating at part load conditions and calculation of seasonal performance
- ČSN EN 12102-1:2018 - Air conditioners, liquid chilling packages, heat pumps, process chillers and dehumidifiers with electrically driven compressors - Determination of the sound power level - Part 1: Air conditioners, liquid chilling packages, heat pumps for space heating and cooling, dehumidifiers and process chillers
- ČSN ISO 9614-2:1997 - Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scannig
- Background 39-14429
- Record measurement file: 39-14429 (31-10439) Novitera (AW-monoblok, eco-design).zip
- Test report 39-14429/2/H of 2020-02-07

Test Report compiled by: Ing. Ondrej Bilkovič

Test Report approved by: Ing. Antonín Kolbábek, Ph.D.
Hydraulic and Pressure Equipment Manager

– End of Test Report –

L 1045.1

TEST REPORT
39-17844/2/T

Product:	Outdoor Air/Water Heat pump - monobloc
Type designation:	**Rakoczy 20 Monoblok**
Customer:	Rakoczy Stal Sp. z o.o. ul. Wtadystawa Grabskiego 41 37-450 Stalowa Wola POLAND
Manufacturer:	Rakoczy Stal Sp. z o.o. ul. Wtadystawa Grabskiego 41 37-450 Stalowa Wola POLAND
Report issue date:	2024-07-19
Distribution list:	1 copy to the Customer 1 copy to the Engineering Test Institute

This test report reproduces the test results of test report no. 39-14429/2/T of 2020-02-07.

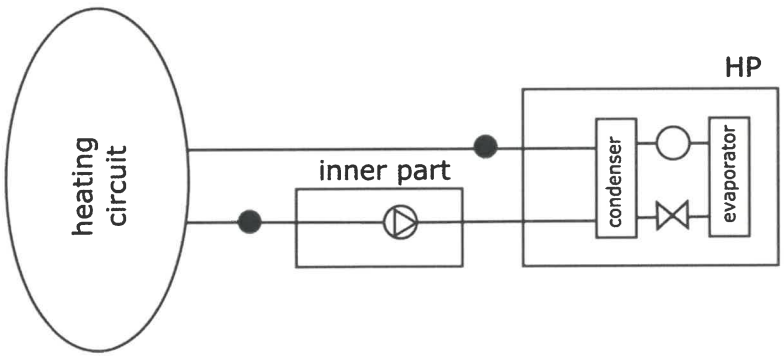
I. Description of product tested

The Heat pump **Rakoczy 20 Monoblok** supplied by company **Rakoczy Stal Sp. z o.o.** is structurally adapted to operate in air/water system. Device is designed as monobloc unit placed outdoor and indoor control unit (electrical box hanging on inner wall) and indoor hydraulic part. Outdoor and indoor parts are connected by water pipes. Refrigerant R452B is used with charge 5.85 kg. Power supply is three-phase. Heat pump is able to work in heating/cooling mode. Heat pump is working with variable flow rate.

Main components of the outdoor unit **Rakoczy 20 Monoblok**:
- Serial number EEZ109DFZ
- Cuboid shape with dimensions 1350 × 580 × 1500 mm (W × D × H)
- Frame and casing made of varnished steel sheets
- 2× L-shaped evaporator, dimensions 840 × 70 × 800 mm (L × D × H), spacing 2 mm, 3 rows
- Compressor Emerson Copeland Scroll YHV0382P-4X9-XXX
- Refrigerant R452B (5.85 kg)
- Electric expansion valve Emerson EXM-125
- 4-way reversing valve Sanhua SHF-20D-46-02 with coil Sanhua
- Filter drier Sanhua DTGB 053s, Refrigerant accumulator denaline
- Sight glass
- Axial fan Ø630 mm with motor ebmpapst W3G630-GL06-G1
- 2× Pressure sensors Emerson PT5N
- Pressure switch Emerson PS4-W1-808261 PSH
- Temperature sensors on refrigerant, water pipes, on air suction
- Plate condenser with dimensions 120 × 160 × 530 mm (L × D × H), including insulation
- Air vent

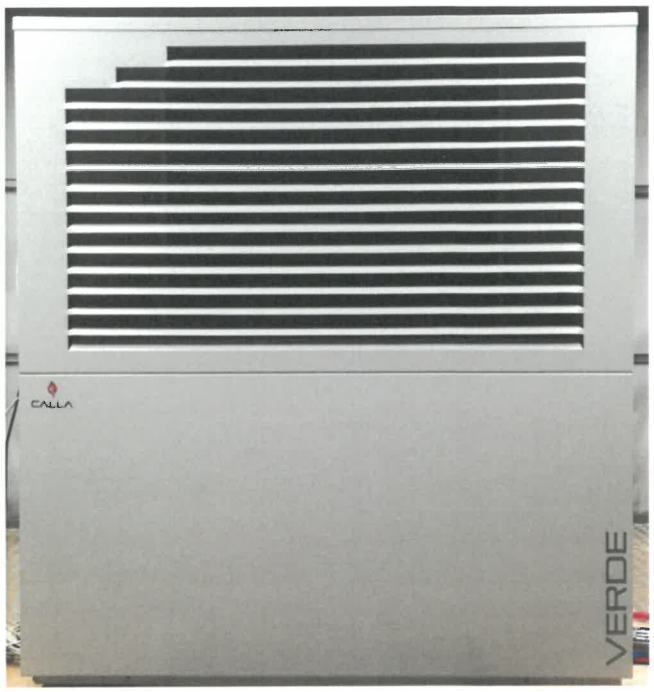
Main components of the indoor part of unit **Rakoczy 20 Monoblok**:
- Circulation pump Wilo Para 25/9 – 87/IPWM1
- Flowswitch Sika
- Electrical box with control unit Frisko and touch display with user interface

Scheme:



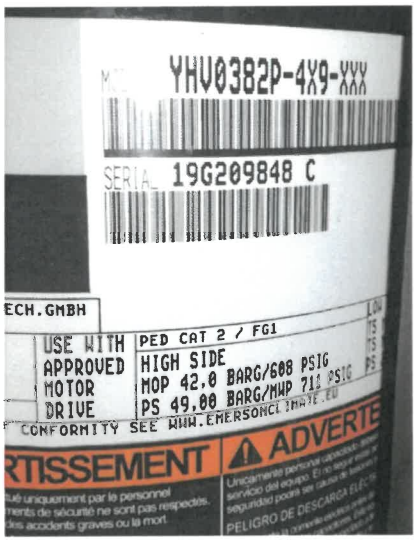
Photos:

Heat pump **Rakoczy 20 Monoblok**
– Unit with cover /back view/ –

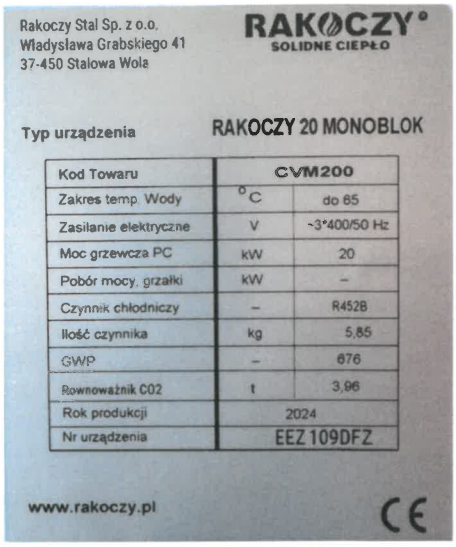


Heat pump **Rakoczy 20 Monoblok**
– Unit with cover /front view/ –

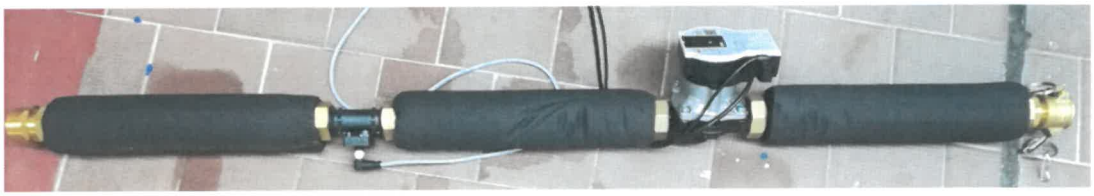
Heat pump **Rakoczy 20 Monoblok**
– Unit without cover –



Heat pump **Rakoczy 20 Monoblok**
– Compressor label –



Heat pump **Rakoczy 20 Monoblok**
– Unit label –



Heat pump **Rakoczy 20 Monoblok**
– Inner hydraulic part –

Heat pump **Rakoczy 20 Monoblok**
– Indoor control unit –

II. Sample tested

Reg. No. SZÚ	Product	Date of submission
0213.19.31904.001	Heat pump **Rakoczy 20 Monoblok**	2019-11-26

The visual inspection, tests and verification were carried out by Ing. Michal Faltýnek – Test Engineer at the test station of SZU.

III. Methods, results of tests and verifications

The tests were carried out with the use of validly calibrated measuring and test equipment.

No.	Name:	Inventory number:	Calibration is valid to:	Accuracy see Calibration Sheet number:
1.	Electrical energy meter	022370/1	07/2022	082/12/E
2.	Digital watt meter	MaR01/EM01	07/2027	K17071728
3.	Flow meter Krohne Optiflux	022370/5	02/2022	6015-KL-P0077-18
4.	Barometer	022370/7	04/2024	4257/2019
5.	Differential pressure gauge	MaR01_TI	05/2021	KL-P-0056-19
6.	Temperature-humidity meter HC2-IC305	022370/10	10/2024	6036-KL-V0417-19
7.	Temperature-humidity meter HC2-IC305	022370/11	10/2024	6036-KL-V0416-19
8.	Thermometers	022370/13	02/2020	KL-T-0014-19

Accredited test number: **T 037*** Test title: **Tests of leakage, pressure resistance, thermal and technical parameters, combustion efficiency, safety functions**

Testing method	ČSN EN 14825:2019, ČSN EN 14511-2:2019, ČSN EN 14511-3:2019
Sample tested	Heat pump **Rakoczy 20 Monoblok**
Measuring equipment used	See table above

Place of testing:	at the Engineering Test Institute	☒	at the Manufacturer´s premises	☐	at the Customer´s premises	☐	*other:*

a) Rating conditions:

Measurement results: Heat pump **Rakoczy 20 Monoblok**

Test number		1	2	3
Assessment condition		Rating conditions		
Specification of the assessment condition*		A7/W35	A2/W35	A7/W55
Date of testing		2019-12-17	2019-12-20	2019-12-18
Transient test procedure	YES / NO	NO	YES	NO
Average defrost time of 1 cycle	[min]	–	3.9	–
Average time of 1 cycle	[min]	–	68.2	–
Calculation time	[min]	70.0	136.4	70.0
Output heating water – temperature calculation	[°C]	35.01	34.08	55.02
Input heating water – temperature calculation	[°C]	30.00	29.76	47.02
Output heating water temperature	[°C]	35.01	34.99	55.02
Input heating water temperature	[°C]	30.00	30.01	47.02
Air temperature - dry bulb temperature	[°C]	7.00	2.00	7.00
Air temperature - wet bulb temperature	[°C]	6.01	1.02	6.02
Relative humidity	[%]	87.01	84.18	86.93
Barometric pressure	[kPa]	98.120	96.744	99.166
Ambient temperature	[°C]	19.53	20.25	20.80
Secondary circuit pressure difference	[kPa]	11.671	12.910	21.696
Efficiency of the secondary liquid pump	[–]	0.189	0.194	0.185
Volume flow rate of heating water	$[m^3 \cdot h^{-1}]$	1.8889	1.8152	0.9582
Density of heating water	$[kg \cdot m^{-3}]$	993.9	994.2	985.8
Specific heat capacity of heating water	$[kJ \cdot kg^{-1} \cdot K^{-1}]$	4.180	4.180	4.180
Voltage	[V]	399.79	399.83	399.80
Total current	[A]	13.45	14.82	16.77
Overall power input	[kW]	2.188	2.451	2.767
Capacity correction of sec. liquid pump	[W]	26.225	27.051	25.405
Power input correction of sec. liquid pump	[W]	32.35	33.55	31.18
Heating capacity - heating water	[kW]	10.924	9.183	8.771
Corrected heating capacity - heating water	**[kW]**	**10.898**	**9.156**	**8.746**
Uncertainty of corrected heating capacity	[kW]	± 0.156	± 0.149	± 0.079
Effective electric power input	**[kW]**	**2.155**	**2.418**	**2.736**
COP	**[–]**	**5.056**	**3.787**	**3.197**
Uncertainty of COP	[–]	± 0.072	± 0.062	± 0.029
Control settings	**[rpm]**	**2300**	**3600**	**2700**
Circulation pump settings – heating water	[%]	0 (min)	0 (min)	0 (min)
Fan speed	[%]	52	60	49

*Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

b) Seasonal performance tests and SCOP calculation – Low temperature application for reference heating seasons:

„A" = average (reference water temperature 35 °C, reference design conditions for heating Tdesignh = -10 °C)
„W" = warmer (reference water temperature 35 °C, reference design conditions for heating Tdesignh = +2 °C)
„C" = colder (reference water temperature 35 °C, reference design conditions for heating Tdesignh = -22 °C)

Model			Heat pump **Rakoczy 20 Monoblok**			
Design			Air / Water – monobloc			
Conditions specification according to ČSN EN 14825:2019	Temperature application			**Low** (reference water temperature 35 °C)		
	Reference heating season			**A**		
	Outlet water temperature - indoor heat exchanger			Variable		
	Compressor speed control			Variable		
	Water flow rate – primary circuit			–		
	Water flow rate – secondary circuit			Variable		
Seasonal space heating energy efficiency	Heating	Average	η_s / A	**176.3**	%	
		Warmer	η_s / W	–	%	
		Colder	η_s / C	–	%	
Seasonal efficiency according to ČSN EN 14825:2019	Heating	Average	**SCOP / A**	**4.48**	–	
		Warmer	SCOP / W	–	–	
		Colder	SCOP / C	–	–	
Function	Cooling			Yes		
	Heating	Yes	Reference heating season	Average	Yes	
				Warmer (if designated)	–	
				Colder (if designated)	–	
Full heating load	Cooling		$P_{designc}$	–	kW	
	Heating	Average	$P_{designh}$	14.45	kW	
		Warmer	$P_{designh}$	–	kW	
		Colder	$P_{designh}$	–	kW	
Bivalent temperatures	Heating	Average	$T_{bivalent}$	-7	°C	
		Warmer	$T_{bivalent}$	–	°C	
		Colder	$T_{bivalent}$	–	°C	
Operation limit temperatures	Heating	Average	TOL	-10	°C	
		Warmer	TOL	–	°C	
		Colder	TOL	–	°C	
Seasonal power consumption according to ČSN EN 14825:2019	Cooling		Q_{CE}	–	kWh	
	Heating	Average	Q_{HE}/A	6662	kWh	
		Warmer	Q_{HE}/W	–	kWh	
		Colder	Q_{HE}/C	–	kWh	
Modes other than „active mode"	Off mode		P_{OFF}	23.5	W	
	Thermostat off mode		P_{TO}	23.4	W	
	Standby mode		P_{SB}	23.5	W	
	Crankcase heater mode		P_{CK}	9.7	W	

(Not tested): The technical data were declared by the Manufacturer and were not tested by the Testing Laboratory.

Calculation of SCOP according to ČSN EN 14825:2019:

Number of hours used for calculation of reference SCOP (Annex B – Table B.2, B.3)
- For reversible heat pumps and reference heating season „A“ = average

H_{HE}	2066	[h]
H_{TO}	178	[h]
H_{SB}	0	[h]
H_{CK}	178	[h]
H_{OFF}	0	[h]

Measured data:

P_{TO}	0.0234	[kW]
P_{SB}	0.0235	[kW]
P_{CK}	0.0097	[kW]
P_{OFF}	0.0235	[kW]
$P_{designh}$	14.45	[kW]
$SCOP_{ON}$	4.49	[–]

Coefficient and correction:

F(1)	3	[%]
F(2)	0	[%]
CC	2.5	[–]

Calculation of SCOP:

7.3 Calculation of the reference annual heating demand (Q_H)

$Q_H = P_{designh} \cdot H_{HE}$ [kWh]

$Q_H = 14.45 \cdot 2066 = 29861$ [kWh]

7.4 Calculation of the annual electricity consumption (Q_{HE})

$Q_{HE} = Q_H / SCOP_{on} + H_{TO} \cdot P_{TO} + H_{SB} \cdot P_{SB} + H_{CK} \cdot P_{CK} + H_{OFF} \cdot P_{OFF}$ [kWh]

$Q_{HE} = 29861 / 4.49 + 178 \cdot 0.0234 + 0 \cdot 0.0235 + 178 \cdot 0.0097 + 0 \cdot 0.0235 = 6662$ [kWh]

7.2 General formula for calculation of reference SCOP

$SCOP = Q_H / Q_{HE}$ [–]

$SCOP = 29861 / 6662 = 4.48$ [–]

7.1 Calculation of the seasonal space heating efficiency η_s

$\Sigma F(i) = F(1) + F(2)$ [–]

$\Sigma F = 0.03 + 0 = 0.03$ [–]

$\eta_s = 1 / CC \cdot SCOP - \Sigma F(i)$ [–]

$\eta_s (A) = (1 / 2.5) \cdot 4.48 – 0.03 = 1.763$ [–]

Test results for single part load conditions

Measurement results: Heat pump **Rakoczy 20 Monoblok**

Test number		4	5	6
Temperature level		Low temperature application (reference water temperature 35 °C)		
Reference heating season		„A" = average ($T_{designh}$ = -10 °C)		
Assessment condition		**A, Tbiv(F)**	**B**	**C**
Specification of the assessment condition*		**A-7/W34**	**A2/W30**	**A7/W28.58**
Date of testing		**2019-12-20**	**2019-12-28**	**2019-12-29**
Transient test procedure	YES / NO	YES	YES	NO
Average defrost time of 1 cycle	[min]	4.1	4.1	–
Average time of 1 cycle	[min]	54.7	75.3	–
Calculation time	[min]	164.1	150.6	70.0
Output heating water – temperature calculation	[°C]	33.05	29.17	28.63
Input heating water – temperature calculation	[°C]	28.78	24.78	23.62
Output heating water temperature	[°C]	33.91	30.05	28.63
Input heating water temperature	[°C]	28.99	25.04	23.62
Air temperature - dry bulb temperature	[°C]	-7.01	2.00	7.01
Air temperature - wet bulb temperature	[°C]	-8.02	1.03	6.03
Relative humidity	[%]	75.15	83.97	87.00
Barometric pressure	[kPa]	97.222	100.592	100.637
Ambient temperature	[°C]	19.72	19.03	19.60
Secondary circuit pressure difference	[kPa]	28.842	14.715	18.780
Efficiency of the secondary liquid pump	[–]	0.303	0.196	0.195
Volume flow rate of heating water	$[m^3 \cdot h^{-1}]$	2.5849	1.6445	1.2645
Density of heating water	$[kg \cdot m^{-3}]$	994.6	995.7	995.9
Specific heat capacity of heating water	$[kJ \cdot kg^{-1} \cdot K^{-1}]$	4.180	4.180	4.180
Voltage	[V]	399.39	400.01	400.45
Total current	[A]	26.75	12.38	7.69
Overall power input	[kW]	4.798	1.998	1.178
Capacity correction of sec. liquid pump	[W]	47.601	27.508	27.272
Power input correction of sec. liquid pump	[W]	68.30	34.21	33.87
Heating capacity - heating water	[kW]	12.833	8.474	7.343
Corrected heating capacity - heating water	**[kW]**	**12.786**	**8.446**	**7.315**
Uncertainty of corrected heating capacity	[kW]	± 0.213	± 0.135	± 0.104
Effective electric power input	**[kW]**	**4.730**	**1.963**	**1.144**
COP	**[–]**	**2.703**	**4.302**	**6.392**
Uncertainty of COP	[–]	± 0.045	± 0.069	± 0.092
Control settings	**[rpm]**	**7000**	**3200**	**2000**
Circulation pump settings – heating water	[%]	50	0 (min)	0 (min)
Fan speed	[%]	65	60	45

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Test results for single part load conditions

Measurement results: Heat pump **Rakoczy 20 Monoblok**

Test number		**7**	**8**
Temperature level		Low temperature application (reference water temperature 35 °C)	
Reference heating season		„A" = average ($T_{designh}$ = -10 °C)	
Assessment condition		**D**	**TOL(E)**
Specification of the assessment condition*		**A12/W27.04**	**A-10/W35**
Date of testing		**2019-12-19**	**2019-12-27**
Transient test procedure	YES / NO	NO	YES
Average defrost time of 1 cycle	[min]	–	3.7
Average time of 1 cycle	[min]	–	80.7
Calculation time	[min]	70.0	161.4
Output heating water – temperature calculation	[°C]	27.08	34.33
Input heating water – temperature calculation	[°C]	22.08	29.78
Output heating water temperature	[°C]	27.08	35.01
Input heating water temperature	[°C]	22.08	30.01
Air temperature - dry bulb temperature	[°C]	12.01	-10.01
Air temperature - wet bulb temperature	[°C]	11.01	-11.01
Relative humidity	[%]	88.97	69.66
Barometric pressure	[kPa]	98.864	99.171
Ambient temperature	[°C]	20.38	19.63
Secondary circuit pressure difference	[kPa]	21.263	4.659
Efficiency of the secondary liquid pump	[–]	0.186	0.151
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	0.9847	2.3287
Density of heating water	[$kg \cdot m^{-3}$]	996.3	994.1
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.180
Voltage	[V]	399.90	399.30
Total current	[A]	5.46	25.93
Overall power input	[kW]	0.815	4.753
Capacity correction of sec. liquid pump	[W]	25.506	16.874
Power input correction of sec. liquid pump	[W]	31.32	19.88
Heating capacity - heating water	[kW]	5.694	12.231
Corrected heating capacity - heating water	**[kW]**	**5.669**	**12.214**
Uncertainty of corrected heating capacity	[kW]	± 0.081	± 0.192
Effective electric power input	**[kW]**	**0.783**	**4.733**
COP	**[–]**	**7.238**	**2.581**
Uncertainty of COP	[–]	± 0.105	± 0.041
Control settings	**[rpm]**	**1400**	**7000**
Circulation pump settings – heating water	[%]	0 (min)	0 (min)
Fan speed	[%]	25	50

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Data for SCOP calculation (Heat pump **Rakoczy 20 Monoblok**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „A“ – average

	Outdoor heat exchanger	Indoor heat exchanger	Part load ratio	Part load	DC Declared capacity	COPd at declared capacity	Cdh degradation coefficient	CR	COPbin (Tj)	Eff. power input of compressor off state
	Outdoor air inlet	Outlet water temperature								
	[°C]	[°C]	[%]	[kW]	[kW]	[–]	[–]	[–]	[–]	[kW]
A	-7	34.00	88.46	12.79	12.786	2.703	0.900	1.00	2.703	–
B	2	30.00	53.85	7.78	8.446	4.302	0.900	1.00	4.302	–
C	7	28.58	34.62	5.00	7.315	6.392	0.979	0.68	6.332	0.0236
D	12	27.04	15.38	2.22	5.669	7.238	0.970	0.39	6.915	0.0236
TOL (E)	-10	35.00	100.00	14.45	12.214	2.581	0.900	1.00	2.581	–
Tbiv (F)	-7	34.00	88.46	12.79	12.786	2.703	0.900	1.00	2.703	–

Adaption of water temperature – according to ČSN EN 14825:2019, Annex F

- Low temperature application (reference water temperature 35 °C)
- Reference season „A“– average
- Condition D
- Variable water flow rate – secondary circuit

General formulas and derivation:

$t_{outlet,\,average} = t_{inlet,\,capacity\,test} + (t_{outlet,\,capacity\,test} - t_{inlet,\,capacity\,test}) \cdot CR$ [°C]

$t_{outlet,\,average} = t_{inlet,\,capacity\,test} + (\Delta t) \cdot CR$ [°C]

$t_{outlet,\,average} = t_{outlet,\,capacity\,test} - \Delta t + \Delta t \cdot CR$ [°C]

$t_{outlet,\,capacity\,test} = t_{outlet,\,average} + \Delta t - \Delta t \cdot CR$ [°C]

For variable flow:

$\Delta t = 5$

$CR \cdot \Delta t$ = Part load / Declared capacity · 5

$t_{outlet,\,capacity\,test,\,variable\,flow} = t_{outlet,\,average} + 5$ - Part load / Declared capacity · 5

Measured data:

$t_{outlet,\,average}$	24.00	[°C]
Declared capacity	5.669	[kW]
Declared capacity standard rating condition A7/W35	–	[kW]
Part load	2.22	[kW]

Calculation of water temperature

$t_{outlet,\,capacity\,test,\,variable\,flow} = 24 + 5 - 2.22 / 5.669 \cdot 5 = 27.04$ [°C]

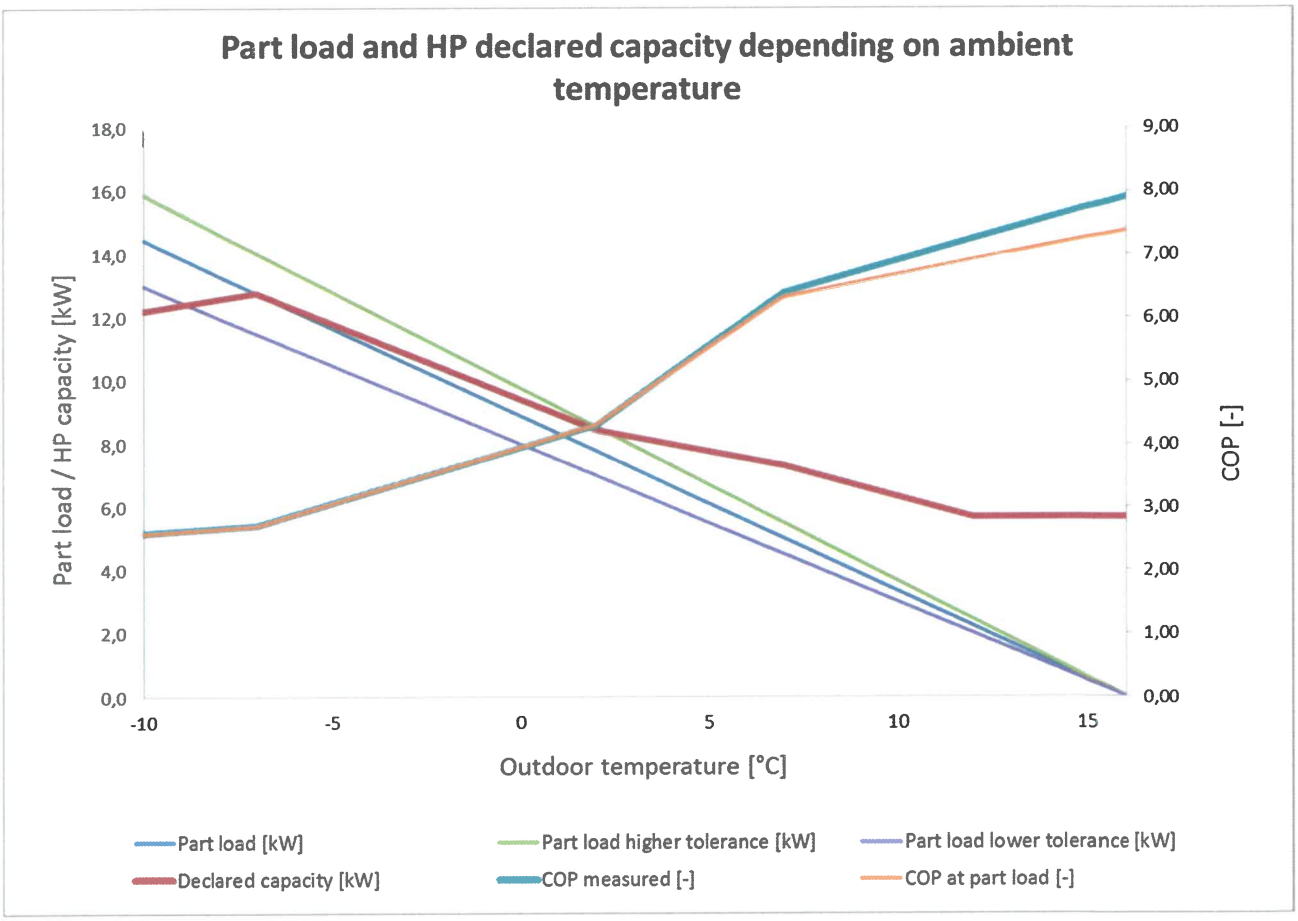
Calculation SCOP, $SCOP_{on}$, $SCOP_{net}$ (Heat pump **Rakoczy 20 Monoblok**)

- Low temperature application (reference water temperature 35 °C)
- Reference heating season „A" – average

	Bin j [–]	Outdoor temp. (dry bulb) T_j [°C]	Hours h_j [h]	Part load ratio [%]	Heat load $P_{h(Tj)}$ [kW]	Capacity of HP [kW]	Heat load covered by heat pump [kW]	Resistive heat elbu (Tj) $elbu_{(Tj)}$ [kW]	Annual resistive heat h_j x $elbu_{(Tj)}$ [kWh]	COPbin (Tj) COPbin (Tj) [–]	Annual heating demand h_j x $P_{h(Tj)}$ [kWh]	Annual power input including electric back up heating [kWh]	Net annual heating capacity h_j × ($P_{h(Tj)}$ - $elbu_{(Tj)}$) [kWh]	Net annual power input without electric back up heating [kWh]
TOL(E)	**21**	**-10**	**1**	**100.00**	**14.45**	**12.21**	**12.21**	**2.24**	**2.24**	**2.58**	**14**	**7**	**12**	**5**
	22	-9	25	96.15	13.90	12.40	12.40	1.49	37.32	2.62	347	156	310	118
	23	-8	23	92.31	13.34	12.60	12.60	0.75	17.17	2.66	307	126	290	109
A, Tbiv(F)	**24**	**-7**	**24**	**88.46**	**12.79**	**12.79**	**12.79**	**0.00**	**0.00**	**2.70**	**307**	**114**	**307**	**114**
	25	-6	27	84.62	12.23	12.30	12.23	0.00	0.00	2.88	330	115	330	115
	26	-5	68	80.77	11.67	11.82	11.67	0.00	0.00	3.06	794	260	794	260
	27	-4	91	76.92	11.12	11.34	11.12	0.00	0.00	3.24	1012	313	1012	313
	28	-3	89	73.08	10.56	10.86	10.56	0.00	0.00	3.41	940	275	940	275
	29	-2	165	69.23	10.01	10.37	10.01	0.00	0.00	3.59	1651	460	1651	460
	30	-1	173	65.38	9.45	9.89	9.45	0.00	0.00	3.77	1635	434	1635	434
	31	0	240	61.54	8.89	9.41	8.89	0.00	0.00	3.95	2135	541	2135	541
	32	1	280	57.69	8.34	8.93	8.34	0.00	0.00	4.12	2335	566	2335	566
B	**33**	**2**	**320**	**53.85**	**7.78**	**8.45**	**7.78**	**0.00**	**0.00**	**4.30**	**2490**	**579**	**2490**	**579**
	34	3	357	50.00	7.23	8.22	7.23	0.00	0.00	4.71	2580	548	2580	548
	35	4	356	46.15	6.67	7.99	6.67	0.00	0.00	5.11	2375	464	2375	464
	36	5	303	42.31	6.11	7.77	6.11	0.00	0.00	5.52	1853	336	1853	336
	37	6	330	38.46	5.56	7.54	5.56	0.00	0.00	5.93	1834	310	1834	310
C	**38**	**7**	**326**	**34.62**	**5.00**	**7.32**	**5.00**	**0.00**	**0.00**	**6.33**	**1631**	**258**	**1631**	**258**
	39	8	348	30.77	4.45	6.99	4.45	0.00	0.00	6.45	1548	240	1548	240
	40	9	335	26.92	3.89	6.66	3.89	0.00	0.00	6.57	1304	199	1304	199
	41	10	315	23.08	3.34	6.33	3.34	0.00	0.00	6.68	1051	157	1051	157
	42	11	215	19.23	2.78	6.00	2.78	0.00	0.00	6.80	598	88	598	88
D	**43**	**12**	**169**	**15.38**	**2.22**	**5.67**	**2.22**	**0.00**	**0.00**	**6.92**	**376**	**54**	**376**	**54**
	44	13	151	11.54	1.67	5.34	1.67	0.00	0.00	7.03	252	36	252	36
	45	14	105	7.69	1.11	5.01	1.11	0.00	0.00	7.15	117	16	117	16
	46	15	74	3.85	0.56	4.68	0.56	0.00	0.00	7.26	41	6	41	6
		Σ	4910							Σ	29855	6655	29798	6598

SCOPon	4.49	SCOPnet	4.52
		SCOP	**4.48**

Power diagram (Heat pump **Rakoczy 20 Monoblok**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „A“ – average



c) Seasonal performance tests and SCOP calculation – Medium temperature application for reference heating seasons:

„A" = average (reference water temperature 55 °C, reference design conditions for heating Tdesignh = -10 °C)
„W" = warmer (reference water temperature 55 °C, reference design conditions for heating Tdesignh = +2 °C)
„C" = colder (reference water temperature 55 °C, reference design conditions for heating Tdesignh = -22 °C)

Model			Heat pump **Rakoczy 20 Monoblok**			
Design			Air / Water – monobloc			
Conditions specification according to ČSN EN 14825:2019	Temperature application			**Medium** (reference water temperature 55 °C)		
	Reference heating season			**A**		
	Outlet water temperature - indoor heat exchanger			Variable		
	Compressor speed control			Variable		
	Water flow rate – primary circuit			–		
	Water flow rate – secondary circuit			Variable		
Seasonal space heating energy efficiency	Heating	Average	**η_s / A**	**137.6**	%	
		Warmer	η_s / W	–	%	
		Colder	η_s / C	–	%	
Seasonal efficiency according to ČSN EN 14825:2019	Heating	Average	**SCOP / A**	**3.52**	–	
		Warmer	SCOP / W	–	–	
		Colder	SCOP / C	–	–	
Function	Cooling			Yes		
	Heating	Yes	Reference heating season: Average	Yes		
			Warmer (if designated)	–		
			Colder (if designated)	–		
Full heating load	Cooling		$P_{designc}$	–	kW	
	Heating	Average	$P_{designh}$	14.39	kW	
		Warmer	$P_{designh}$	–	kW	
		Colder	$P_{designh}$	–	kW	
Bivalent temperatures	Heating	Average	$T_{bivalent}$	-7	°C	
		Warmer	$T_{bivalent}$	–	°C	
		Colder	$T_{bivalent}$	–	°C	
Operation limit temperatures	Heating	Average	TOL	-10	°C	
		Warmer	TOL	–	°C	
		Colder	TOL	–	°C	
Seasonal power consumption according to ČSN EN 14825:2019	Cooling		Q_{CE}	–	kWh	
	Heating	Average	Q_{HE}/A	8459	kWh	
		Warmer	Q_{HE}/W	–	kWh	
		Colder	Q_{HE}/C	–	kWh	
Modes other than „active mode"	Off mode		P_{OFF}	23.5	W	
	Thermostat off mode		P_{TO}	23.4	W	
	Standby mode		P_{SB}	23.5	W	
	Crankcase heater mode		P_{CK}	9.7	W	

(Not tested): The technical data were declared by the Manufacturer and were not tested by the Testing Laboratory.

Calculation of SCOP according to ČSN EN 14825:2019:

Number of hours used for calculation of reference SCOP (Annex B – Table B.2, B.3)
- For reversible heat pumps and reference heating season „A“ = average

H_{HE}	2066	[h]
H_{TO}	178	[h]
H_{SB}	0	[h]
H_{CK}	178	[h]
H_{OFF}	0	[h]

Measured data:

P_{TO}	0.0234	[kW]
P_{SB}	0.0235	[kW]
P_{CK}	0.0097	[kW]
P_{OFF}	0.0235	[kW]
$P_{designh}$	14.39	[kW]
$SCOP_{ON}$	3.52	[–]

Coefficient and correction:

F(1)	3	[%]
F(2)	0	[%]
CC	2.5	[–]

Calculation of SCOP:

7.3 Calculation of the reference annual heating demand (Q_H)

$Q_H = P_{designh} \cdot H_{HE}$ [kWh]

$Q_H = 14.39 \cdot 2066 = 29738$ [kWh]

7.4 Calculation of the annual electricity consumption (Q_{HE})

$Q_{HE} = Q_H / SCOP_{on} + H_{TO} \cdot P_{TO} + H_{SB} \cdot P_{SB} + H_{CK} \cdot P_{CK} + H_{OFF} \cdot P_{OFF}$ [kWh]

$Q_{HE} = 29738 / 3.52 + 178 \cdot 0.0234 + 0 \cdot 0.0235 + 178 \cdot 0.0097 + 0 \cdot 0.0235 = 8459$ [kWh]

7.2 General formula for calculation of reference SCOP

$SCOP = Q_H / Q_{HE}$ [–]

$SCOP = 29738 / 8459 = 3.52$ [–]

7.1 Calculation of the seasonal space heating efficiency η_s

$\Sigma F(i) = F(1) + F(2)$ [–]

$\Sigma F = 0.03 + 0 = 0.03$ [–]

$\eta_s = 1 / CC \cdot SCOP - \Sigma F(i)$ [–]

$\eta_s (A) = (1 / 2.5) \cdot 3.52 – 0.03 = 1.376$ [–]

Test results for single part load conditions

Measurement results: Heat pump **Rakoczy 20 Monoblok**

Test number		9	10	11
Temperature level		Medium temperature application (reference water temperature 55 °C)		
Reference heating season		„A" = average ($T_{designh}$ = -10 °C)		
Assessment condition		**A, Tbiv(F)**	**B**	**C**
Specification of the assessment condition*		**A-7/W52**	**A2/W42**	**A7/W38.34**
Date of testing		**2019-12-19**	**2019-12-28**	**2019-12-29**
Transient test procedure	YES / NO	YES	YES	NO
Average defrost time of 1 cycle	[min]	4.1	4.3	–
Average time of 1 cycle	[min]	67.8	83.5	–
Calculation time	[min]	135.7	166.9	70.0
Output heating water – temperature calculation	[°C]	50.56	40.66	38.40
Input heating water – temperature calculation	[°C]	43.69	33.84	30.30
Output heating water temperature	[°C]	52.01	42.05	38.40
Input heating water temperature	[°C]	44.01	34.06	30.30
Air temperature - dry bulb temperature	[°C]	-7.01	2.00	7.00
Air temperature - wet bulb temperature	[°C]	-8.01	1.02	6.03
Relative humidity	[%]	74.99	83.93	87.02
Barometric pressure	[kPa]	98.638	100.352	100.615
Ambient temperature	[°C]	19.71	19.31	19.21
Secondary circuit pressure difference	[kPa]	75.170	21.346	23.222
Efficiency of the secondary liquid pump	[–]	0.344	0.187	0.175
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	1.5641	0.9972	0.7585
Density of heating water	[$kg \cdot m^{-3}$]	987.8	991.8	992.8
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.174	4.180
Voltage	[V]	399.18	399.73	399.77
Total current	[A]	32.38	14.65	9.30
Overall power input	[kW]	6.144	2.440	1.463
Capacity correction of sec. liquid pump	[W]	62.191	25.669	23.130
Power input correction of sec. liquid pump	[W]	94.76	31.56	28.02
Heating capacity - heating water	[kW]	12.795	8.170	7.065
Corrected heating capacity - heating water	**[kW]**	**12.733**	**8.144**	**7.042**
Uncertainty of corrected heating capacity	[kW]	± 0.129	± 0.082	± 0.063
Effective electric power input	**[kW]**	**6.050**	**2.409**	**1.435**
COP	**[–]**	**2.105**	**3.381**	**4.908**
Uncertainty of COP	[–]	± 0.021	± 0.034	± 0.044
Control settings	**[rpm]**	**7000**	**3200**	**2000**
Circulation pump settings – heating water	[%]	100 (max)	0 (min)	0 (min)
Fan speed	[%]	65	60	45

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Test results for single part load conditions

Measurement results: Heat pump **Rakoczy 20 Monoblok**

Test number		**12**	**13**
Temperature level		Medium temperature application (reference water temperature 55 °C)	
Reference heating season		„A“ = average ($T_{designh}$ = -10 °C)	
Assessment condition		**D**	**TOL(E)**
Specification of the assessment condition*		**A12/W35.07**	**A-10/W55**
Date of testing		**2019-12-29**	**2019-12-27**
Transient test procedure	YES / NO	NE	ANO
Average defrost time of 1 cycle	[min]	–	4.3
Average time of 1 cycle	[min]	–	106.1
Calculation time	[min]	70.0	106.1
Output heating water – temperature calculation	[°C]	35.17	54.07
Input heating water – temperature calculation	[°C]	27.13	46.82
Output heating water temperature	[°C]	35.17	55.01
Input heating water temperature	[°C]	27.13	47.02
Air temperature - dry bulb temperature	[°C]	12.00	-10.01
Air temperature - wet bulb temperature	[°C]	11.01	-11.01
Relative humidity	[%]	89.02	69.57
Barometric pressure	[kPa]	100.646	99.458
Ambient temperature	[°C]	19.43	19.44
Secondary circuit pressure difference	[kPa]	23.762	17.408
Efficiency of the secondary liquid pump	[–]	0.168	0.199
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	0.6556	1.4354
Density of heating water	[$kg \cdot m^{-3}$]	993.9	986.2
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.180
Voltage	[V]	400.01	398.74
Total current	[A]	6.98	32.46
Overall power input	[kW]	1.040	6.334
Capacity correction of sec. liquid pump	[W]	21.490	27.954
Power input correction of sec. liquid pump	[W]	25.82	34.87
Heating capacity - heating water	[kW]	6.071	12.043
Corrected heating capacity - heating water	**[kW]**	**6.050**	**12.015**
Uncertainty of corrected heating capacity	[kW]	± 0.055	± 0.118
Effective electric power input	**[kW]**	**1.015**	**6.299**
COP	**[–]**	**5.963**	**1.907**
Uncertainty of COP	[–]	± 0.054	± 0.019
Control settings	**[rpm]**	**1500**	**7000**
Circulation pump settings – heating water	[%]	0 (min)	0 (min)
Fan speed	[%]	30	65

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Data for SCOP calculation (Heat pump **Rakoczy 20 Monoblok**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „A" – average

	Outdoor heat exchanger Outdoor air inlet	Indoor heat exchanger Outlet water temperature	Part load ratio	Part load	DC Declared capacity	COPd at declared capacity	Cdh degradation coefficient	CR	COPbin (Tj)	Eff. power input of compressor off state
	[°C]	[°C]	[%]	[kW]	[kW]	[–]	[–]	[–]	[–]	[kW]
A	-7	52.00	88.46	12.73	12.733	2.105	0.900	1.00	2.105	–
B	2	42.00	53.85	7.75	8.144	3.381	0.900	1.00	3.381	–
C	7	38.34	34.62	4.98	7.042	4.908	0.984	0.71	4.874	0.0236
D	12	35.07	15.38	2.21	6.050	5.963	0.977	0.37	5.732	0.0236
TOL (E)	-10	55.00	100.00	14.39	12.015	1.907	0.900	1.00	1.907	–
Tbiv (F)	-7	52.00	88.46	12.73	12.733	2.105	0.900	1.00	2.105	–

Adaption of water temperature – according to ČSN EN 14825:2019, Annex F

- Medium temperature application (reference water temperature 55 °C)
- Reference season „A"– average
- Condition D
- Variable water flow rate – secondary circuit

General formulas and derivation:

$t_{outlet,\,average} = t_{inlet,\,capacity\,test} + (t_{outlet,\,capacity\,test} - t_{inlet,\,capacity\,test}) \cdot CR$ [°C]

$t_{outlet,\,average} = t_{inlet,\,capacity\,test} + (\Delta t) \cdot CR$ [°C]

$t_{outlet,\,average} = t_{outlet,\,capacity\,test} - \Delta t + \Delta t \cdot CR$ [°C]

$t_{outlet,\,capacity\,test} = t_{outlet,\,average} + \Delta t - \Delta t \cdot CR$ [°C]

For variable flow:

$\Delta t = 8$

$CR \cdot \Delta t$ = Part load / Declared capacity · 8

$t_{outlet,\,capacity\,test,\,variable\,flow} = t_{outlet,\,average} + 8$ - Part load / Declared capacity · 8

Measured data:

$t_{outlet,\,average}$	30.00	[°C]
Declared capacity	6.050	[kW]
Declared capacity $_{standard\,rating\,condition\,A7/W55}$	–	[kW]
Part load	2.21	[kW]

Calculation of water temperature

$t_{outlet,\,capacity\,test,\,variable\,flow} = 30 + 8 - 2.21 / 6.05 \cdot 8 = 35.07$ [°C]

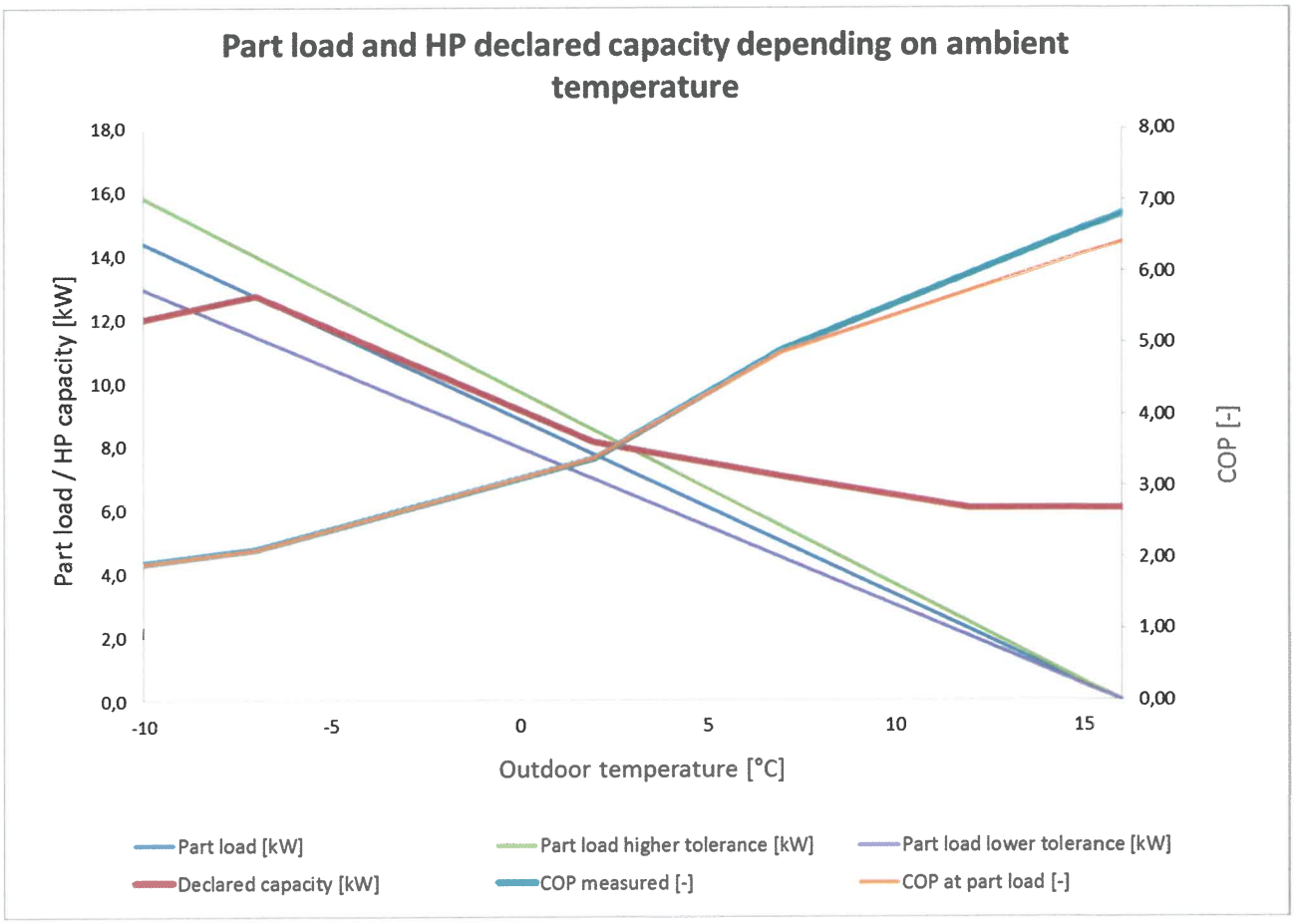
Calculation SCOP, $SCOP_{on}$, $SCOP_{net}$ (Heat pump **Rakoczy 20 Monoblok**)

- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „A" – average

	Bin j [–]	Outdoor temp. (dry bulb) T_j [°C]	Hours h_j [h]	Part load ratio [%]	Heat load $P_{h(Tj)}$ [kW]	Capacity of HP [kW]	Heat load covered by heat pump [kW]	Resistive heat elbu (Tj) $elbu_{(Tj)}$ [kW]	Annual resistive heat h_j x $elbu_{(Tj)}$ [kWh]	COPbin (Tj) COPbin (Tj) [–]	Annual heating demand h_j x $P_{h(Tj)}$ [kWh]	Annual power input including electric back up heating [kWh]	Net annual heating capacity h_j × ($P_{h(Tj)}$ - $elbu_{(Tj)}$) [kWh]	Net annual power input without electric back up heating [kWh]
TOL(E)	**21**	**-10**	**1**	**100.00**	**14.39**	**12.02**	**12.02**	**2.38**	**2.38**	**1.91**	**14**	**9**	**12**	**6**
	22	-9	25	96.15	13.84	12.25	12.25	1.59	39.64	1.97	346	195	306	155
	23	-8	23	92.31	13.29	12.49	12.49	0.79	18.24	2.04	306	159	287	141
A, Tbiv(F)	**24**	**-7**	**24**	**88.46**	**12.73**	**12.73**	**12.73**	**0.00**	**0.00**	**2.11**	**306**	**145**	**306**	**145**
	25	-6	27	84.62	12.18	12.22	12.18	0.00	0.00	2.25	329	146	329	146
	26	-5	68	80.77	11.63	11.71	11.63	0.00	0.00	2.39	791	331	791	331
	27	-4	91	76.92	11.07	11.20	11.07	0.00	0.00	2.53	1008	398	1008	398
	28	-3	89	73.08	10.52	10.69	10.52	0.00	0.00	2.67	936	350	936	350
	29	-2	165	69.23	9.97	10.18	9.97	0.00	0.00	2.81	1644	584	1644	584
	30	-1	173	65.38	9.41	9.67	9.41	0.00	0.00	2.96	1628	551	1628	551
	31	0	240	61.54	8.86	9.16	8.86	0.00	0.00	3.10	2126	686	2126	686
	32	1	280	57.69	8.30	8.65	8.30	0.00	0.00	3.24	2325	718	2325	718
B	**33**	**2**	**320**	**53.85**	**7.75**	**8.14**	**7.75**	**0.00**	**0.00**	**3.38**	**2480**	**733**	**2480**	**733**
	34	3	357	50.00	7.20	7.92	7.20	0.00	0.00	3.68	2569	698	2569	698
	35	4	356	46.15	6.64	7.70	6.64	0.00	0.00	3.98	2365	594	2365	594
	36	5	303	42.31	6.09	7.48	6.09	0.00	0.00	4.28	1845	431	1845	431
	37	6	330	38.46	5.54	7.26	5.54	0.00	0.00	4.58	1827	399	1827	399
C	**38**	**7**	**326**	**34.62**	**4.98**	**7.04**	**4.98**	**0.00**	**0.00**	**4.87**	**1624**	**333**	**1624**	**333**
	39	8	348	30.77	4.43	6.84	4.43	0.00	0.00	5.05	1541	305	1541	305
	40	9	335	26.92	3.88	6.64	3.88	0.00	0.00	5.22	1298	249	1298	249
	41	10	315	23.08	3.32	6.45	3.32	0.00	0.00	5.39	1046	194	1046	194
	42	11	215	19.23	2.77	6.25	2.77	0.00	0.00	5.56	595	107	595	107
D	**43**	**12**	**169**	**15.38**	**2.21**	**6.05**	**2.21**	**0.00**	**0.00**	**5.73**	**374**	**65**	**374**	**65**
	44	13	151	11.54	1.66	5.85	1.66	0.00	0.00	5.90	251	42	251	42
	45	14	105	7.69	1.11	5.65	1.11	0.00	0.00	6.07	116	19	116	19
	46	15	74	3.85	0.55	5.45	0.55	0.00	0.00	6.25	41	7	41	7
		Σ	4910							Σ	29733	8452	29672	8391

SCOPon	3.52	SCOPnet	3.54
		SCOP	**3.52**

Power diagram (Heat pump **Rakoczy 20 Monoblok**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „A“ – average



Tested by:	Ing. Michal Faltýnek	Date:	2024-07-19	Signed:	
Reviewed and approved by:	Ing. Dominik Šedivý, Ph.D.	Date:	2024-07-19	Signed:	

IV. A list of referenced documents

- Order of 2024-06-20 (Order reg. no. B-82503, received on 2024-06-24)
- Contract B-82503/39
- ČSN EN 14825:2019 - Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling - Testing and rating at part load conditions and calculation of seasonal performance
- ČSN EN 14511-2:2019 - Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 2: Test conditions
- ČSN EN 14511-3:2019 - Air conditioners, liquid chilling packages and heat pumps for space heating and cooling a process chillers with electrically driven compressors - Part 3: Test methods
- Background 39-17844
- Record measurement file: 39-17844 Novitera (AW-monoblok, eco-design).zip
- Test report 39-14429/2/T of 2020-02-07

Test Report compiled by: Ing. Michal Faltýnek

Accredited Testing Laboratory No. 1045.1 * STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, s.p. * 1

Test Report approved by: Ing. Mario Jankola
Heating Equipment and Construction Products Manager

– End of Test Report –

OŚWIADCZENIE

Producent **Rakoczy Stal Sp. z o.o.** oświadcza, iż pompy ciepła:

1) Rakoczy 16 Monoblok
Oznaczenie/typ/identyfikator modelu

2) Rakoczy 18 Monoblok
Oznaczenie/typ/identyfikator modelu

3) Rakoczy 20 Monoblok
Oznaczenie/typ/identyfikator modelu

Należą do jednego podtypu w danym typoszeregu i spełniają łącznie następujące warunki:

- identyczna konstrukcja obiegu chłodniczego, ten sam czynnik chłodniczy/roboczy;
- ten sam producent, typ i liczba sprężarek;
- ten sam typ elementu rozprężnego;
- ten sam typ skraplacza;
- ten sam typ parownika;
- ten sam typ procesu odszraniania;
- ten sam sterownik i zasada sterowania wydajnością;
- ten sam producent, typ i liczba wentylatorów parownika (w przypadku powietrznych pomp ciepła) i zasada sterowania wydajnością (stała, zmienna lub stopniowana regulacja prędkości obrotowej);
- urządzenia z i bez zaworu czterodrogowego nie mogą być zaliczone do tego samego typoszeregu.

2024.09.27
Miejscowość, data

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PREZES ZARZĄDU
Patrik Kowalczyk

Podpis osoby upoważnionej