TÜV Rheinland InterCert Kft.
Termék üzletág

TÜVRheinland®

Vizsgálati jegyzőkönyv sz.: *Test Report No.:*	**28220085 001**	**Oldal 1 / 12** *Page 1 of 12*
Megbízó: *Client:*	AC TRUP Ltd. 6000 Kecskemét, Budai hegy 121/b Hungary	
Gyártó: *Manufacturer:*	AC TRUP Ltd. 6000 Kecskemét, Budai hegy 121/b Hungary	
Vizsgálat tárgya: *Test item:*	BES 35VV Heat pump COP ratio measurement	
Azonosítás: *Identification:*	BES 35VV	**Széria sz.:** *Serial No.:* 16.10.12.
Raktározási szám.: *Receipt No.:*		**Átvételi dátum:** *Date of receipt:*
Vizsgálat helyszíne: *Testing location:*	AC TRUP Ltd. 6000 Kecskemét, Budai hegy 121/b Hungary	
Vizsgálati előírás: *Test specification:*	EN 14511-3:2013	
Vizsgálati eredmény: *Test Result:*	*The test item passed the test specification(s).* *The COP ratio of the test item is 5,5*	
Vizsgáló laboratórium: *Testing Laboratory:*	**TÜV Rheinland InterCert Kft. Termék üzletág Termékvizsgáló laboratórium** H-1132 Budapest, Váci út 48/a-b, Hungary On site test at the manufacturer: AC TRUP Ltd. 6000 Kecskemét, Budai hegy 121/b Hungary	

Vizsgálta/ *tested by:*			**Ellenőrizte/** *reviewed by:*		
2013.10.31.	Mátraházi János	Mátraházi János	2013.10.31.	Zsákai Zoltán	Zsákai Zoltán
Dátum *Date*	**Név** *Name*	**Aláírás** *Signature*	**Dátum** *Date*	**Név** *Name*	**Aláírás** *Signature*

Egyéb szempontok/ *Other Aspects:*

Attachment: Measuring report

SAP: 93339889
Rated data: 3 x 400 V, 50 Hz

Trade mark: BES

Rövidítések:				*Abbreviations:*			
	P(ass)	=	megfelelő		*P(ass)*	=	*passed*
	F(ail)	=	nem megfelelő		*F(ail)*	=	*failed*
	N/A	=	nem vonatkozik		*N/A*	=	*not applicable*
	N/T	=	nem vizsgált		*N/T*	=	*not tested*

General product information:

Heat pump using water to water as heat transfer media, with electrically driven compressors when used for space heating. The source pump is not included in the equipment. The measurements are carry out at manufacturer's labotatory with the manufacturer's instruments taking account of EN 14511-3:2013 standard. The measurement results are made for information purposes.

Technical dates:

Main technical dates				
Types	**Weight (kg)**	**Rated input (kW)**	**Main sizes (mm)**	**Rated voltage**
BES 35VV	65	7,8	650 x 650 x 380	3 x 400V; 50Hz; 25A

EN 14511-3:2013			
Clause	Requirement + Test	Result - Remark	Verdict
1.	SCOPE	Water-water heat pump	P
4.	Rating capacity test		
4.1.	Basic principles		
4.1.1.	Heating capacity	$P = q \times \rho \times c \times \Delta t$	P
4.1.2.	Cooling capacity		N/A
4.1.3.	Heat recovery capacity		N/A
4.1.4.	Power input of fans for units without duct connection		N/A
4.1.5.	Power input of fans with duct connection		N/A
4.1.6.	Power input of liquid pumps		P
4.1.6.1.	Corrections of the power input of liquid pumps		P
4.1.6.2.	Liquid pump is an integral part of the unit	Heating circulation pump is an integral part	P
4.1.6.3.	Absorbed power of pump is an integral part of the unit is calculated	$q \times \Delta p_e / \eta$	P
4.1.6.4.	If no liquid pump is provided with the unit, the proportional power input which is to be included in the effective power absorbed by the unit, shall be calculated using the following formula	$q \times (-\Delta p_i) / \eta$	P
4.1.7.	Units for use with remote condenser		N/A
4.2.	Test apparatus		
4.2.1.	Arrangement of the test apparatus		
4.2.1.1.	General requirements	According to the installation guide	P
4.2.1.2.	Test room for the air side		N/A
4.2.1.3.	Appliances with duct connection		N/A

EN 14511-3:2013			
Clause	Requirement + Test	Result - Remark	Verdict
4.2.1.4.	Appliances with integral pumps For appliances with integral and adjustable water or brine pumps, the external static pressure shall be set at the same time as the temperature difference.		P
4.2.1.5.	Liquid chilling package for use with remote condenser		N/A
4.2.2.	Installation and connection of the test object		
4.2.2.1.	General		P
4.2.2.2.	Installation of unit consisting of several parts		P
4.2.2.3.	Indoor units of multisplit systems		N/A
4.2.2.4.	Measuring points		P
4.3.	Uncertainties of measurement		P
4.4.	Test procedure		
4.4.1.	General		
4.4.1.1.	All units		P
4.4.1.2.	Non ducted units		N/A
4.4.1.3.	Unites ducted on the indoor heat exchanger		N/A
4.4.1.4.	Unites ducted on the outdoor heat exchanger		N/A
4.4.2.	Output measurement for water(brine)-to-water (brine) and water (brine)-to-air units	water-to-water unit	
4.4.2.1.	Steady state conditions	(see Attechment)	P
4.4.2.2.	.Measurement of heating capacity, cooling capacity and heat recovery capacity	(see Attechment)	P
4.4.3.	Output measurement for cooling capacity of air-to-water and air-to-air units		N/A
4.4.3.1.	Steady state conditions		N/A
4.4.3.2.	Measurement of cooling capacity		N/A
4.4.4.	Output measurement for heating capacity of air-to-air units with the air enthalpy method and of air-to-water units		N/A
4.4.4.1.	General		N/A
4.4.4.2.	Preconditioning period		N/A
4.4.4.3.	Equilibrium period		N/A
4.4.4.4.	Data collection period		N/A
4.4.4.5.	Test procedure: When a defrost cycle ends the preconditioning period		N/A
4.4.4.6.	Test procedure: When a defrost cycle does not end the preconditioning period		N/A
4.4.4.7.	Test procedure for transient tests		N/A
4.4.5.	Output measurement for heating capacity of air-to-air units with the calorimeter room		N/A
4.4.5.1.	General		N/A

EN 14511-3:2013			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.5.2.	Equilibrium period		N/A
4.4.5.3.	Data collection period		N/A
4.4.5.4.	General test procedure		N/A
4.4.5.5.	Test procedure for transient tests		N/A
4.5.	Test results		N/A
4.5.1.	Data to be recorded	(see Attechment)	P
4.5.2.	Cooling capacity and heat recovery capacity calculation		N/A
4.5.3.	Heating capacity calculation	(see Attechment)	P
4.5.3.1.	Steady state capacity test		N/A
4.5.3.2.	Transient capacity test		N/A
4.5.4.	Effective power input calculation	(see Attechment)	P
4.5.4.1.	Steady state test		N/A
4.5.4.2.	Transient with defrost cycle		N/A
4.5.4.3.	Transient without defrost cycle		N/A
5.	Electrical consumptions for single duct and double duct units		N/A
5.1.	Determination of power consumption due to standby mode		N/A
5.2.	Determination of power consumption in off-mode		N/A
5.3.	Electricity consumption		N/A
6.	Air flow rate measurement of ducted units		N/A
7.	Heat recovery test for air-cooled multisplit systems		N/A
7.1.	Test installation		N/A
7.1.1.	General		N/A
7.1.2.	Three-room calorimeter method		N/A
7.1.3.	Three-room air-enthalpy method		N/A
7.1.4.	Two-room air-enthalpy method		N/A
7.2.	Test procedure		N/A
7.3.	Test results		N/A
8.	Test report		
8.1	General information	(see Attechment)	P
8.2.	Additional information	(see Attechment)	P
8.3.	Rating test results	COP = 5,5	P
	Annex A (normative) Calorimeter test method		N/A
A.1.	General		N/A
A.2.	Transient heating capacity test		N/A
A.3.	Calibrated room-type calorimeter		N/A

EN 14511-3:2013			
Clause	Requirement + Test	Result - Remark	Verdict
A.4.	Balanced ambient room-type calorimeter		N/A
A.5.	Calorimeter and auxiliary equipment for water-cooled condenser tests		N/A
A.6.	Calculations-cooling capacities		N/A
A.6.1.	General		N/A
A.6.2.	The total cooling capacity on the indoor-side, as tested in either the calibrated or balanced-ambient, room-type calorimeter (see Figures A.1 and A.2), is calculated		N/A
A.6.3	The total cooling capacity of liquid (water)-cooled equipment deducted from the condenser side is calculated		N/A
A.6.4.	The latent cooling capacity (room dehumidifying capacity) is calculated		N/A
A.6.5.	The sensible cooling capacity is calculated		N/A
A.6.6.	Sensible heat ratio is calculated		N/A
A.7.	Calculation-heating capacities		N/A
A.7.1.	General		N/A
A.7.2.	Determination of the heating capacity by measurement in the indoor-side room		N/A
A.7.3.	Determination of the heating capacity by measurement of the heat absorbing side		N/A
A.7.4.	Total heating capacity of liquid (water)-to-air unit deducted from the evaporator side		N/A
	Annex B (normative) Indoor air enthalpy test method		N/A
B.1.	General		N/A
B.2.	Determination of the air flow rate		N/A
B.3.	Calculations-cooling capacities		N/A
B.4.	Calculations-heating capacities		N/A
	Annex C (informative) Heating capacity tests - Flow chart and examples of different test sequences		N/A
	Annex D (informative) Conformance criteria		N/A
D.1.	Liquid chilling packages		N/A
D.2.	Calorimeter room method		N/A
D.3.	Heat recovery of multisplit systems		N/A
	Annex E (informative) Symbols used in annexes		
	Annex F (informative) Test at system reduced capacity		
F.1.	Test at system reduced capacity for multisplit system and modular heat recovery multisplit system		N/A
F.2.	Selection of units		N/A
F.3.	Temperature conditions		N/A
F.4.	Test results		N/A
	Annex G (informative) Individual unit tests		

EN 14511-3:2013			
Clause	Requirement + Test	Result - Remark	Verdict
G.1.	General		N/A
G.1.1.	Methods		N/A
G.1.2.	G.1.2 Calorimeter method		N/A
G.1.3.	G.1.3 Air-enthalpy method		N/A
G.2.	G.2 Temperatures conditions		N/A
G.3.	G.3 Other test conditions		N/A
G.4.	G.4 Test results		N/A
G.5.	G.5 Published results		N/A
	Annex H (normative) Determination of the liquid pump efficiency		
H.1.	H.1 General		P
H.2.	H.2 Hydraulic power of the liquid pump		
H.2.1.	H.2.1 The liquid pump is an integral part of the unit	(see Attechment)	P
H.2.2.	H.2.2 The liquid pump is not an integral part of the unit	(see Attechment)	P
H.3.	H.3 Efficiency of the liquid pump	(see Attechment)	P
	Annex I (informative) Rating of indoor and outdoor units of multisplit and modular heat recovery multisplit system		N/A
I.1.	I.1 General		N/A
I.2.	I.2 Definitions		N/A
I.2.1.	I.2.1 Outdoor cooling capacity		N/A
I.2.2.	I.2.2 Outdoor heating capacity		N/A
I.2.3.	I.2.3 Outdoor power input		N/A
I.2.4.	I.2.4 Indoor power input		N/A
I.2.5.	I.2.5 Outdoor energy efficiency ratio		N/A
I.2.6.	I.2.6 Outdoor energy efficiency ratio		N/A
I.3.	I.3 Rating of indoor units		N/A
I.3.1.	I.3.1 General		N/A
I.3.2.	I.3.2 Air flow rate measurement		N/A
I.3.3.	I.3.3 Measurement of the power input of indoor units		N/A
I.4.	I.4 Rating of outdoor units		N/A
I.4.1.	I.4.1 General		N/A
I.4.2.	I.4.2 Test conditions		N/A
I.4.3.	I.4.3 Test procedure		N/A
	Annex J (normative) Air flow rate measurement		N/A
J.1.	General		N/A
J.2.	Test installation		N/A

EN 14511-3:2013			
Clause	Requirement + Test	Result - Remark	Verdict
J.3.	Test conditions		N/A
J.4.	Air flow measurement		N/A
	Annex ZA (informative) Relationship between this European Standard and the requirements of commission regulation (EC) No 206/2012		N/A

Attachment

MEASURING REPORT

concerning to the instrument measuring of the COP ratio of the BES 35VV type heat pump unit at the site of manufacturer laboratory. (6000 Kecskemét, Budai hegy 121/b.)

János Mátraházi
test engineer

Budapest
Oct. 10th, 2013

1. Measuring laboratory

TÜV Rheinland InterCert Kft. Termék üzletág Termékvizsgáló laboratórium
H-1132 Budapest, Váci út 48/a-b, Hungary
On site test at manufacturer's laboratory.

Manufacturer laboratory.
AC TRUP Ltd. 6000 Kecskemét, Budai hegy 121/b.

2. Duty persons

Mátraházi János, test engineer

3. The report made by

Mátraházi János, test engineer

4. Client

AC TRUP Ltd. 6000 Kecskemét, Budai hegy 121/b.
Exponent of client: Bálint Árpád

5. Measuring items

BES 35VV Heat pump COP ratio measurement.

6. Location, date and circumstance of measuring

AC TRUP Ltd. 6000 Kecskemét, Budai hegy 121/b. Workshop and laboratory

Dates of the testings:
10.10.2013. between 10 and 14 hours.

Outside environmental parameters: t = 10,4 ^{0}C
rf= 58 %
p_{bar}= 1000,2 hPa

7. Measuring instruments

Device	Manufacturer	Type	Inventory / Serial No.	Next calibration
Power analyser	NORMA	D 5255 S	22327	2014.09.
Data logger	FLUKE	2680A	023325	2014.01.
Thermocouple	K-type		016 – 020	2014.10.
Flow meter	Glenbroeks	TDS-100H	60010-0244	Not valid calibration
Refrigerant pressure gauge	Testo	Testo 550		Not valid calibration
Heating system pressure gauge			Built-in instrument	Not valid calibration
Source pump pressure gauge			Built-in instrument	Not valid calibration

8. Measuring procedure

During the measurements we attend to the next standard

MSZ EN 14511-3:2013 Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling.
Part 3: Test methods

Measured parameters:

1. Time, T(min)
2. inside temperatures, t(^{0}C)
3. heating warm water temperatures, t_i(^{0}C)
4. heating back water temperatures, t_b (^{0}C)
5. heating water flow rate, q_h (m3/s)
6. static pressure differenca in t he heating system, Δp_{hc} (Pa)
7. source water inlet temperature, t_{sci} (^{0}C)
8. source water outlet temperature, t_{sco} (^{0}C)
9. static preassure difference at the source pump, Δp_{sc} (Pa)
10. source water flow rate, qsc (m3/s)
11. refrigerant discharge pressure, p_{dch} (bar)
12. Electric voltage, U(V)
13. Electric current, I(A)
14. Electric power, P_e (kW)
15. Power factor, cosφ

Calculated results:

1. Time (min)
2. Heating circulation pump efficiency, η_{ph}
3. Heating circulation pump correction, P_{hcorr} (kW)
4. Source pump efficiency, η_{psc}
5. Source pump correction, P_{sccorr} (kW)
6. Heating power in the measuring interval , P_{hint} (kW)
7. COP in the measuring interval , COP_{int}
8. Integral COP in the measuring cycle,

$P_h=q_h \times \rho_{tb} \times c_p \times (t_i - t_b)$ c_p=4,18 kJ / kg, K

$P_{hcorr}=q_h \times \Delta p_{hc} / \eta_{ph}$ η_{ph}=0,28 Δp_{hc}=30 kPa

$P_{sccorr}= q_{sc} \times \Delta p_{sc} / \eta_{sc}$ η_{sc}=0,55 Δp_{sc}= 45 kPa

$P_{out}= P_h + P_{hcorr}$

$P_{in}= P_e + P_{sccorr}$

$COP_{int}= P_{out} / P_{in}$

$COP = COP_{int} \times T / \Sigma T$ ΣT= 50 min

9. Results of measurings

Measured parameters														
1 T (min)	2 t (^{0}C)	3 t_i (^{0}C)	4 t_b (^{0}C)	5 q_h (m^3/s)	6 Δp_{ha} (kPa)	7 t_{sci} (^{0}C)	8 t_{sco} (^{0}C)	9 Δp_{ha} (kPa)	10 q_h (m^3/s)	11 p_{dch} (bar)	12 U (V)	13 I (A)	14 P_e (kW)	15 cos φ
11:030	18,3	34,9	26,8	0,00073	30	17,2	12,9	45	0,00206	4,5	400,0	14,5	6,65	0,67
2	18,5	39,6	27,1	0,00074	30	17,2	12,8	45	0.00210	4,5	400,5	14,3	6,73	0,68
4	18,9	40,6	28,3	0,00077	30	17,2	12,7	45	0,00212	4,5	400,5	14,3	6,84	0,69
6	19,1	41,6	29,5	0.00079	30	17,2	12,7	45	0,00214	4,5	400,3	14,3	6,92	0,69
8	19,3	43,4	31,4	0,00080	30	17,2	12,7	45	0,00223	4,5	400,4	14,4	6,99	0,70
10	19,5	45,4	33,5	0,00084	30	17,2	12,6	45	0,00216	4,5	400,5	15,0	7,27	0,70
10-14									STOP					
16	19,5	45,6	33,4	0,00089	30	17,2	12,6	45	0,00224	4,5	400,5	15,5	7,47	0,72
18	19,6	45,7	34,3	0,00088	30	17,2	12,6	45	0,00228	4,5	400,6	15,3	7,73	0,73
20	19,7	45,7	34,3	0,00088	30	17,3	12,5	45	0,00220	4,5	400,7	15,3	7,76	0,73
22	19,8	45,8	34,3	0,00089	30	17,3	12,5	45	0,00220	4,5	400,8	15,3	7,74	0,73
24	19,9	45,8	34,2	0,00088	30	17,3	12,5	45	0,00220	4,5	400,8	15,2	7,71	0,73
24-28									STOP					
30	19,8	44,5	33,1	0,00087	30	17,3	12,4	45	0,00221	4,5	401,4	14,7	7,67	0,74
32	19,8	43,9	32,7	0,00084	30	17,2	12,4	45	0,00221	4,5	401,2	14,7	7,67	0,75
34	19,9	43,5	32,4	0,00085	30	17,3	12,4	45	0,00221	4,5	401,0	14,7	7,65	0,75
36	20,0	43,5	32,4	0,00085	30	17,3	12,3	45	0,00222	4,5	400,8	14,7	7,65	0,75
36-44									STOP					
46	19,9	43,9	32,5	0,00086	30	17,2	12,4	45	0,00222	4,5	399,7	14,9	7,63	0,74
48	19,9	43,9	32,4	0,00088	30	17,2	12,4	45	0,00223	4,5	399,7	14,9	7,63	0,74
50	19,9	43,9	32,3	0,00089	30	17,2	12,4	45	0,02223	4,5	399,5	14,9	7,60	0,74
52	20,0	44,1	32,5	0,00086	30	17,2	12,5	45	0,00222	4,5	399,5	14,8	7,58	0,74
52-60									STOP					
62	20,0	44,4	32,6	0,00084	30	17,2	12,5	45	0,00222	4,5	399,2	14,9	7,53	0,73
64	20,1	44,1	32,7	0,00087	30	17,2	12,5	45	0,00221	4,5	399,4	14,9	7,55	0,73
66	20,2	43,8	32,5	0,00085	30	17,2	12,5	45	0,00221	4,5	399,7	15,0	7,55	0,73
68	20,2	43,7	32,4	0,00089	30	17,2	12,6	45	0,00220	4,5	400,4	14,9	7,56	0,73
70	20,3	43,9	32,4	0,00088	30	17,2	12,6	45	0,00220	4,5	400,8	14,9	7,55	0,73
70-80									STOP					
82	20,1	43,8	32,5	0,00088	30	17,2	12,7	45	0,00224	4,5	401,9	14,9	7,54	0,73
84	20,3	43,7	32,5	0,00089	30	17,2	12,7	45	0,00221	4,5	401,7	14,9	7,54	0,73

CALCULATED RESULTS							
1 T (min)	2 P_h (kW)	3 P_{hcorr} (kW)	4 P_{out} (kW)	5 P_{sccorr} (kW)	6 P_{in} (kW)	7 COP_{int}	8 COP
11:03 0	38,43	0,07	38,50	0,172	6,72	5,73	
2	38,69	0,07	38,76	0,172	6,80	5,71	
4	39,83	0,07	39,90	0,172	7,01	5,70	
6	40,20	0,07	40,27	0,172	7,09	5,68	
8	40,10	0,07	40,17	0,172	7,16	5,61	
10	41,51	0,07	41,58	0,172	7,44	5,59	
10- 14		STOP					
16	42,25	0,07	42,32	0,172	7,64	5,54	
18	43,70	0,07	43,77	0,172	7,90	5,54	
20	43,78	0,07	43,85	0,172	7,93	5,53	
22	43,66	0,07	43,74	0,172	7,91	5,53	
24	43,35	0,07	43,40	0,172	7,88	5,51	
24- 28		STOP					
30	42,97	0,07	43,04	0,172	7,84	5,49	
32	42,97	0,07	43,04	0,172	7,84	5,49	
34	42,71	0,07	42,78	0,172	7,82	5,47	**5,5**
36	42,71	0,07	42,78	0,172	7,82	5,47	
36- 44		STOP					
46	42,36	0,07	42,43	0,172	7,80	5,44	
48	42,36	0,07	42,43	0,172	7,80	5,44	
50	41,97	0,07	42,04	0,172	7,77	5,41	
52	41,62	0,07	41,69	0,172	7,75	5,38	
52- 60		STOP					
62	41,28	0,07	41,35	0,172	7,70	5,37	
64	41,43	0,07	41,50	0,172	7,70	5,39	
66	41,46	0,07	41,53	0,172	7,72	5,38	
68	41,59	0,07	41,66	0,172	7,73	5,39	
70	41,54	0,07	41,61	0,172	7,72	5,39	
70- 80		STOP					
82	41,41	0,07	41,48	0,172	7,71	5,38	
84	41,49	0,07	41,56	0,172	7,71	5,39	