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REPORT

WRG 387
EN 308

Test laboratory	TÜV SÜD Industrie Service Center of Competence for Refrigeration and Air Conditioning Air Conditioning and Ventilation
Test object	HRU-MinistAIR-W-450 central ventilation unit with heat recovery from the company Alnor Systemy Wentylacji Sp z o.o. Aleja Krakowska 10, 05-552 Wola Mrokowska Poland
Customer	Alnor Systemy Wentylacji Sp z o.o. Aleja Krakowska 10, 05-552 Wola Mrokowska Poland
Scope of assignment	Tests according to DIN EN 308:1997-06
Date of receipt of test object	26.03.2013
Test period	19.04.2013 – 08.08.2013
Test location	Munich
Test principles	DIN EN 308:1997-06 „Informal translation of the Specific Procedure for fans and ventilation units in the EPB product database in Belgium"

Date: 2014-11-03

Our reference:
IS-TAK03-MUC/mr

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Order-No.: 2269296

This document consists of 7 Pages.and 19 Appendices

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The test results refer exclusively to the units under test.

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1. Purpose of testing

The company Alnor Systemy Wentylacji Sp z o.o, Aleja Krakowska 10 in 05-552 Wola Mrokowska Poland, ordered tests to be conducted on a "HRU-MinistAIR-W-450" central ventilation unit with heat recovery, in accordance with the „Informal translation of the Specific Procedure for fans and ventilation units in the EPB product database in Belgium".

2. Description of ventilation unit of type "HRU-MinstAIR-W-450"

The structure of the "HRU-MinstAIR-W-450" central ventilation unit with heat recovery is pictured in figure 1.

Images of the "HRU-MinstAIR-W-450" central ventilation unit with heat recovery are shown in appendixes A.

Data pertaining to the tested ventilation unit and its built-in components are listed in appendixes B.

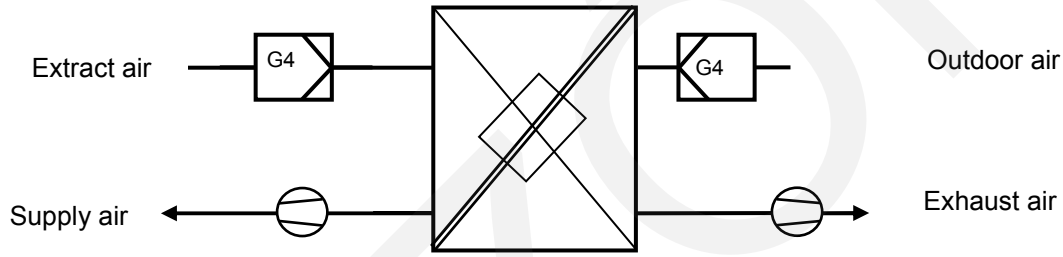

Figure 1: Schematic diagram of the "HRU-MinstAIR-W-450" central ventilation unit with heat recovery, from the company Alnor Systemy Wentylacji Sp z o.o

3. Execution of tests

The tests were conducted on a „HRU-MinstAIR-W-450" ventilation unit in the test facilities at the Center of Competence for Refrigeration and Air Conditioning Technology of the TÜV SÜD Industrie Service GmbH.

The tests included the reception inspection, the tightness tests, the ventilation tests and a the thermodynamic tests.

A list of the used measurement equipment is recorded at the test centre.

3.1 Reception inspection

The relevant technical data of the ventilation unit were recorded during the reception inspection.

3.2 Leakage test

3.2.1 External leakage test

The external leakage was determined by of establishing a pressure difference between the interior of the unit and its environment. The measured air volume flow required to maintain the pressure difference indicates the external leakage.

3.2.2 Internal leakage test

In order to determine the leakage volume flow between the exhaust air / extract air side and the outdoor air / supply air side, the exhaust air / extract air side of the unit were pressurised and a volume flow was supplied to or extracted from the outdoor air / supply air side, to keep the differential pressure between the environment and the outdoor air / supply air side at zero.

As there is no differential pressure between the environment and the outdoor air / supply air side, the leakage volume flow corresponds to the ingoing or outgoing volume flow which exists when the specified differential pressures are established.

3.3 Ventilation test

The ventilation test was conducted with a test chamber in accordance with the standard DIN 24 163.
The pressure-airflow curves on the outdoor air / supply air side and the exhaust air / extract air-side were determined. In the ventilation test, the air volume flow of one line was determined in each instance, while the other air line was throttled.
The recorded real power consumption values relate to the entire unit.

3.4 Thermodynamic test

The thermodynamic test was conducted on a „HRU-MinstAIR-W-450“ central ventilation unit in a double climate chamber.

The data pertaining to the incoming and outgoing airflow (temperature, humidity, air volume flow) and the total real power consumption of the central ventilation unit were recorded at the envelope boundaries of the central ventilation unit.
The exhaust air's entrance into, and the outgoing air's emission out of the central ventilation unit, as well as the outdoor air's entrance into, and the supply air's emission out of, the central ventilation unit, were defined as envelope boundaries.

4. Test results

4.1 Reception inspection

The recorded relevant technical data pertaining to the ventilation unit and its built-in components is listed in appendixes B.

The visual inspection of the central ventilation unit yielded the following results:

- Unit labelling
  - The unit was equipped with a type plate.
  - The unit is marked with a CE sign.
- Electrical safety
  - The electrical parts are not accessible if the cover of the unit was open.
  - Tools are required for opening the unit cover.
- Mechanical safety
  - The unit will not be cut out by opening the unit cover.
  - Tools are required for opening the unit cover.
- Operation and installation
  - The unit is operated by a control panel
  - By the control panel 3 speeds can be choosen.
  - The control voltage of speed low and speed high can be adjusted at the electric of the „HRU-MinstAIR-W-450“. Medium speed is a result of the adjustment of speed low and high.
  - There was no possibility to adjust a disbalance of the fans.
- Maintenance
  - The filters are situated at the outdoor and extract side. They can be removed over the Filter access panels.

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4.2 Tightness test

The nominal air volume flow of the ventilation unit was 500 m³/h.

The leakage volume flow and the leakage in relation to the average air volume flow in the application range are as follows:

		external leakage		internal leakage	
Measurement	**P_{stat}**	**leakage volume flow**	**leakage**	**leakage volume flow**	**leakage**
Nr.	[Pa]	[m³/h]	%	[m³/h]	%
1	-300	1.8	0.4	2.1	0.4
2	-250	1.6	0.3	1.9	0.4
3	-200	1.3	0.3	1.7	0.3
4	-100	0.7	0.1	1.1	0.2
5	-50	0.4	0.1	0.8	0.2
6	0	0.0	0.0	0.0	0.0
7	50	0.3	0.1	0.8	0.2
8	100	0.6	0.1	1.1	0.2
9	200	1.2	0.2	1.7	0.3
10	250	1.5	0.3	2.0	0.4
11	300	1.7	0.3	2.2	0.4

4.3 Ventilation test

The pressure-airflow curves on the exhaust air / extract airside and the outdoor air / supply air side are shown in appendixes E.

The values measured in the ventilation test are listed in appendixes F.

The electrical power input – airflow curves of maximum speed (10V) of the central ventilation are shown in appendix G.

The maximum electrical power input of the central ventilation unit is 170.5 W.

4.4 Thermodynamic test

The results of the thermodynamic test of the „HRU-MinstAIR-W-450“ central ventilation unit were determined at the following nominal conditions

	Aircondition
extract air	**25 °C db**
	<14 °C wb
out door air	**5 °C db**

The measurements and calculated values from the thermodynamic test of the „HRU-MinstAir-W-450“ central ventilation unit are listed in appendix C.

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5. Summary

5.1 Reception inspection

The „HRU-MinstAIR-W-450“ central ventilation unit was equipped with a type plate a CE mark.

The fans are situated on the exhaust air side and the supply air side.

5.2 Tightness

The leakage volume flow percentage in relation to the nominal air volume flow of 500 m³/h was:

	- 250 Pa	+ 250 Pa
external leakage	0.3 %	0.3 %
internal leakage	0.4 %	0.4 %

5.3 Ventilation test

The air volume flows recorded for the „HRU-MinstAIR-W-450“ central ventilation unit presented graphically, and in table form, in appendices E and F.

The maximum electrical power input of the central ventilation unit is 170.5 W.

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5.4 Thermodynamic test

For the „HRU-MinstAIR-W-450“ central ventilation unit, the following unit-specific temperature ratios was recorded (see also appendix C):

outdoor air volume flow		**m³/h**	71	197	320	378
extract air volume flow		**m³/h**	76	217	344	426
temperature ratio supply side	$eta_{t,sup}$	**%**	94.7	90.3	86.5	86.8
humidity ratio supply side	$eta_{x,sup}$	**%**	-	-	-	-
temperature ratio exhaust side	$eta_{t,eha}$	**%**	80.3	82.1	80.9	77.9
humidity ratio exhaust side	$eta_{x,eha}$	**%**	-	-	-	-
mean temperature ratio	$eta_{t,epb}$	**%**	87.5	86.2	83.7	82.4

Center of Competence for
Refrigeration and Air Conditioning

Andreas Klotz

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Heiko Mirring

Appendices

Appendices A1 to A7	Images of the tested ventilation unit
Appendices B1 to B3	Data pertaining to the tested unit
Appendix C	Measurements and calculated values from the thermodynamic test
Appendices D	Formula for the calculation of the temperature ratio
Appendices E1 and E2	Pressure-airflow curves
Appendices F1 to F4	Measurements from the ventilation test
Appendix G	Elect. Power input - airflow curves

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Images of the tested ventilation unit

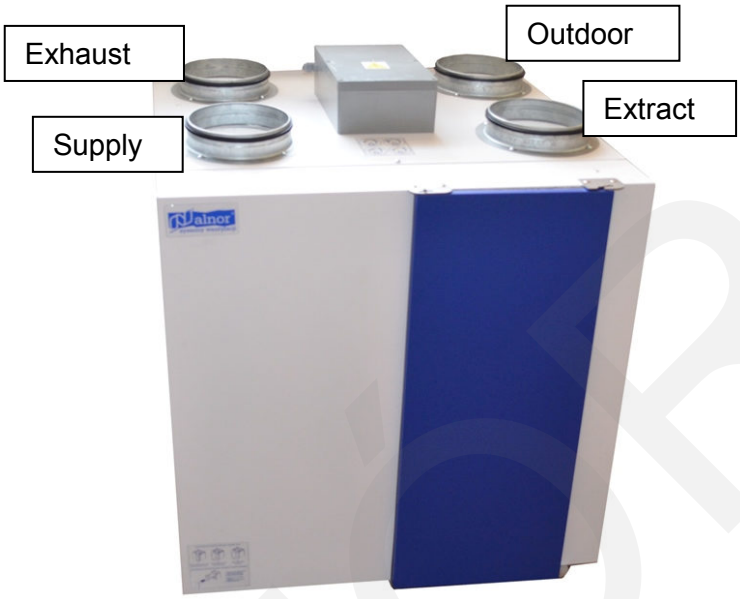

Figure A-1: View of the „ HRU-MinstAIR-W-450” central ventilation unit

Figure A-2: Top View of the „ HRU-MinstAIR-W-450” central ventilation unit

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Images of the tested ventilation unit

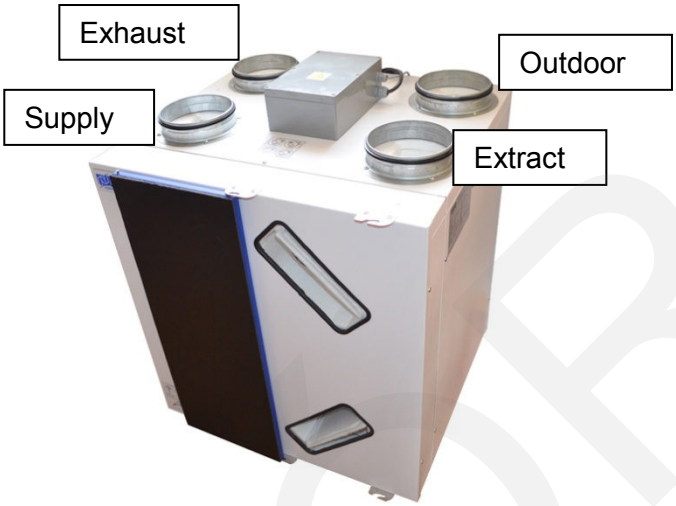

Figure A-3: View of the „HRU-MinstAIR-W-450“ central ventilation unit with opened filter cover

Figure A-4: Filter of the ventilation unit type „HRU-MinstAIR-W-450“

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Images of the tested ventilation unit

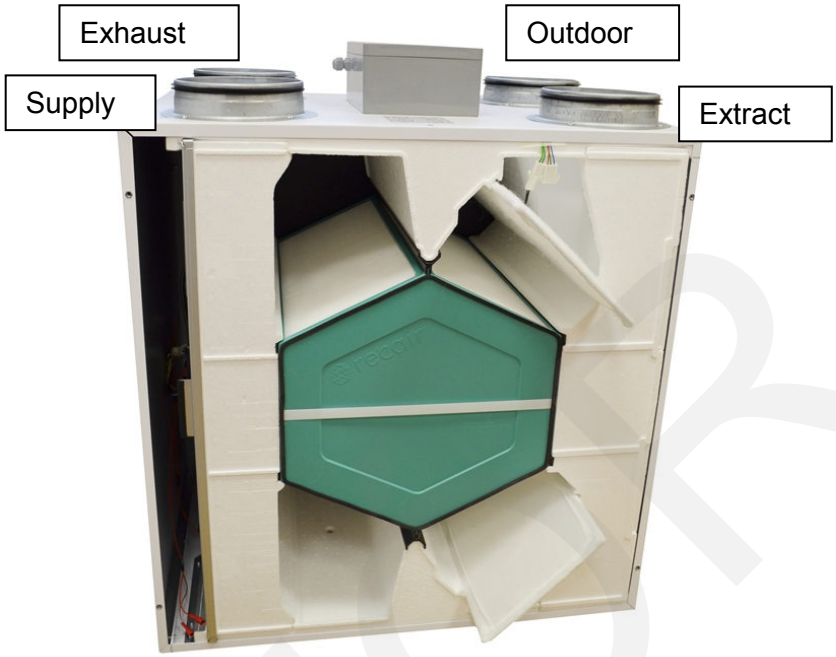

Figure A-5: View of the „HRU-MinstAIR-W-450“ central ventilation unit without front cover

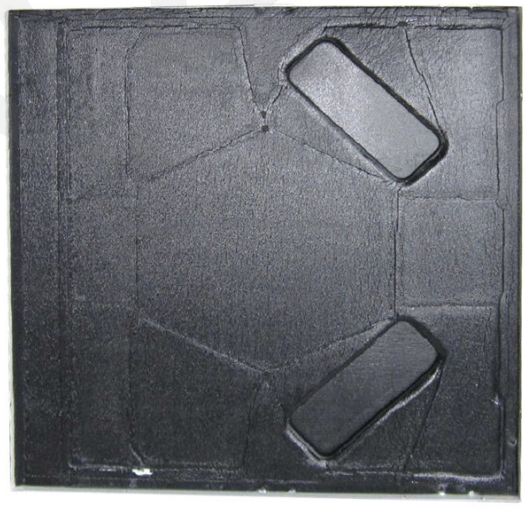

Figure A-6: View of the „HRU-MinstAIR-W-450“ central ventilation unit front cover

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Images of the tested ventilation unit

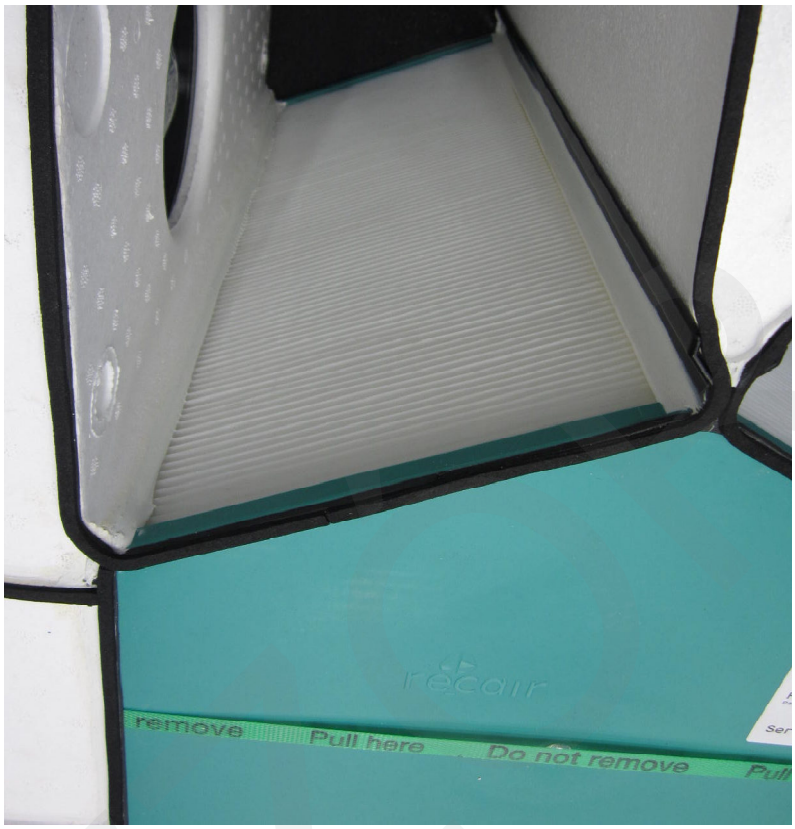

Figure A-7: Heat recovery cell of the „HRU-MinstAIR-W-450“ central ventilation unit

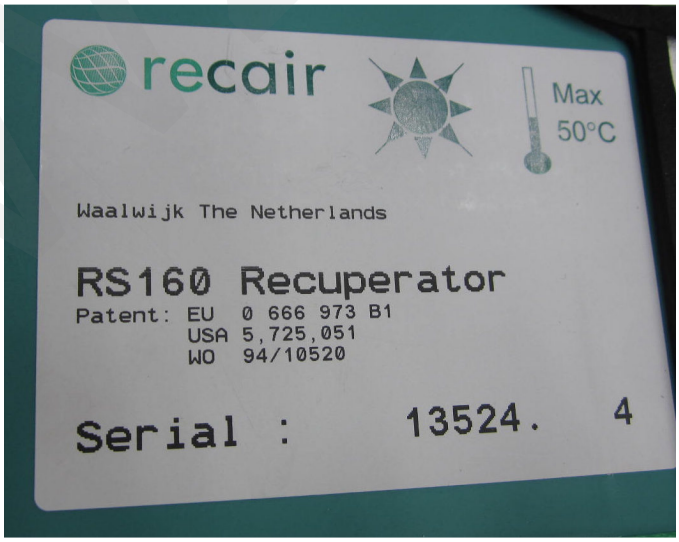

Figure A-8: Heat recovery cell of the „HRU-MinstAIR-W-450“ central ventilation unit

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Images of the tested ventilation unit

Figure A-9: Fan of the „HRU-MinstAIR-W-450“ central ventilation unit

Figure A-10: Fan of the „HRU-MinstAIR-W-450“ central ventilation unit

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Images of the tested ventilation unit

Figure A-11: Electric of the „HRU-MinstAIR-W-450“ central ventilation unit

Figure A-12: Control unit of the „HRU-MinstAIR-W-450“ central ventilation unit

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Images of the tested ventilation unit

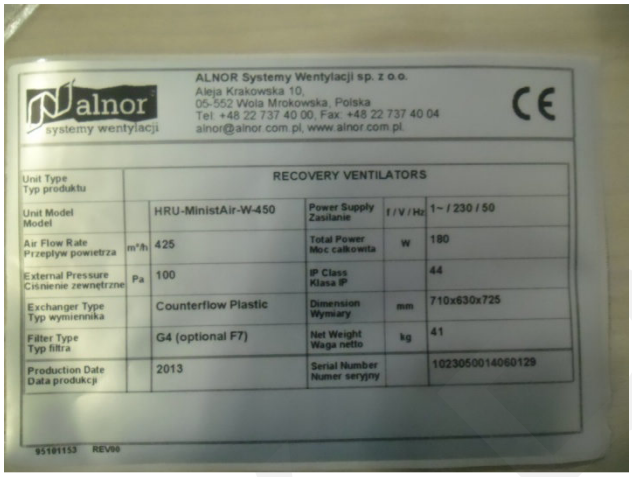

Figure A-13: Type plate of the „ HRU-MinstAIR-W-450 “ central ventilation unit

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Data pertaining to the tested unit

Description of the tested unit

Manufacturer / supplier	Alnor Systemy Wentylacji Sp z o.o. Aleja Krakowska 10, 05-552 Wola Mrokowska Poland
Type	HRU-MinistAIR-W-450

Specifications according to ventilation unit's type plate

Manufacturer:	Alnor Systemy Wentylacji Sp z o.o.
Type:	HRU-MinistAIR-W-450
Voltage:	230 V / 50 Hz
Total Power consumption:	180 W
Air Volume flow:	425 m³/h at 100 Pa
Protection class:	IP 44
Serial number:	1023050014080188
Weight	41 kg

Dimensions of the ventilation unit

	Test laboratory indications
Width	707 mm
Height	720 mm
Depth	515 mm

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Data pertaining to the tested unit

Data pertaining to the unit's components

Filter

Type	Quantity	Filter class	Dimensions
Outdoor air filter	1	G4	515 mm x 220 mm x 10 mm
Extract air filter	1	G4	515 mm x 220 mm x 10 mm

Fans

Exhaust air fan

Quantity	1
Design	radial
Manufacturer	ebm-papst
Type	R3G190-RC05-03
Voltage	200 - 240 V 50/60 Hz
Current input	0.75 A
Real power consumption	83W
Speed	3200 min-1

Supply air fan

Quantity	1
Design	radial
Manufacturer	ebm-papst
Type	R3G190-RC05-03
Voltage	200 - 240 V 50/60 Hz
Current input	0.75 A
Real power consumption	83 W
Speed	3200 min-1

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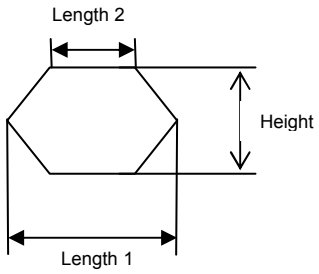
Data pertaining to the tested unit

Heat exchanger

Quantity	1
Design	cross counter flow
Material	synthetical
Manufacturer	recair
Type	RS160
Serial No.	13524.4-
Dimensions	Length 1 365 mm
	Length 2 195 mm
	Height 365 mm
	Depth 500 mm



Plates	21 / 10 cm
Plate spacing	4.8 mm

Air connections

Extract air	∅ 150 mm
Exhaust air	∅ 150 mm
Outdoor	∅ 150 mm
Supply air	∅ 150 mm

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Measurements and calculated values from the thermodynamic test

EPP regulation Belgium

measured values		unit				
temperature outdoor air	t_{21}	°C	***5.2***	***5.1***	***5.0***	***5.0***
temperature supply air	t_{22}	°C	24.3	23.3	22.7	22.9
r.h. outdoor air		%	***67***	***77***	***78***	***77***
r.h. supply air		%	21	24	25	24
outdoor air volume flow		m^3/h	71	197	320	378
temperature extract air	t_{11}	°C	***25.1***	***24.9***	***24.9***	***25.1***
temperature exhaust air	t_{12}	°C	9.4	9.0	9.3	10.0
r.h. extract air		%	***24***	***25***	***25***	***27***
r.h. exhaust air		%	66	69	67	70
extract air volume flow		m^3/h	76	217	344	426
ambient pressure		Pa	95,615	95,637	95,695	95,711
total power input		W	14.2	55.2	116.7	169.8
external stat. pressure (supply - outdoor)		Pa	-45	-108	-102	-104
external stat. pressure (exhaust - extract)		Pa	-39	-109	-127	-96
calculated values						
wet bulb temperature extract air		°C	13.0	13.0	13.0	13.5
saturation pressure (outdoor air)		Pa	930	926	875	873
saturation pressure (supply air)		Pa	3,032	2,863	2,756	2,802
saturation pressure (extract air)		Pa	3,181	3,147	3,151	3,181
saturation pressure (exhaust air)		Pa	1,177	1,151	1,170	1,227
abs. humidity outdoor air		g/kg	4.10	4.69	4.45	4.42
abs. humidity supply air		g/kg	4.08	4.44	4.43	4.38
abs. humidity extract air		g/kg	5.02	5.12	5.08	5.56
abs. humidity exhaust air		g/kg	5.08	5.24	5.17	5.64
delta xzu-xau		g/kg	-0.03	-0.25	-0.02	-0.03
delta xab-xfo		g/kg	-0.06	-0.12	-0.09	-0.08
density outdoor air		kg/m^3	1.19	1.19	1.19	1.19
density extract air		kg/m^3	1.11	1.11	1.11	1.11
correction temperature outdoor air	Δt_{21}	K	0.25	0.35	0.45	0.55
correction temperature supply air	Δt_{22}	K	0.00	0.00	0.00	0.00
correction temperature extract air	Δt_{11}	K	0.25	0.34	0.45	0.53
correction temperature exhaust air	Δt_{12}	K	0.00	0.00	0.00	0.00
massflow extract air/exhaust air		kg/s	0.024	0.065	0.106	0.125
massflow outdoor air/supply air		kg/s	0.024	0.067	0.106	0.132
massflow disbalance extract/outdoor		%	0.0	2.7	0.3	5.2
results						
temperature ratio supply side	$\eta_{t,sup}$	%	94.7	90.3	86.5	86.8
humidity ratio supply side	$\eta_{x,sup}$	%	-	-	-	-
temperature ratio exhaust side	$\eta_{t,eha}$	%	80.3	82.1	80.9	77.9
humidity ratio exhaust side	$\eta_{x,eha}$	%	-	-	-	-
mean temperature ratio	$\eta_{t,epb}$	%	87.5	86.2	83.7	82.4

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Formula for the calculation of the temperature ratio

Temperature ratio

On exhaust side:

$$\eta_{t,eha} = \frac{t_{11} + \Delta t_{11} - t_{12} + \Delta t_{12}}{t_{11} + \Delta t_{11} - t_{21} - \Delta t_{21}}$$

On supply side:

$$\eta_{t,\mathrm{sup}} = \frac{t_{22} - \Delta t_{22} - t_{21} - \Delta t_{21}}{t_{11} + \Delta t_{11} - t_{21} - \Delta t_{21}}$$

Mean temperature ratio:

$$\eta_{t,epb} = \frac{\left(\eta_{t,\mathrm{sup}} + \eta_{t,eha}\right)}{2}$$

Correction of the temperature based on fan position:

		extract fan	
		In position extract air (11)	In position exhaust air (12)
supply fan	in position outdoor air (21)	$\Delta t_{11} = \frac{0.5 \cdot P_{elec,ahu,test}}{0.34 \cdot q_{v11}}$ $\Delta t_{21} = \frac{0.5 \cdot P_{elec,ahu,test}}{0.34 \cdot q_{v22}}$ $\Delta t_{22} = \Delta t_{12} = 0$	$\Delta t_{12} = \frac{0.5 \cdot P_{elec,ahu,test}}{0.34 \cdot q_{v11}}$ $\Delta t_{21} = \frac{0.5 \cdot P_{elec,ahu,test}}{0.34 \cdot q_{v22}}$ $\Delta t_{22} = \Delta t_{11} = 0$
	in position supply air (22)	$\Delta t_{11} = \frac{0.5 \cdot P_{elec,ahu,test}}{0.34 \cdot q_{v11}}$ $\Delta t_{22} = \frac{0.5 \cdot P_{elec,ahu,test}}{0.34 \cdot q_{v22}}$ $\Delta t_{21} = \Delta t_{12} = 0$	$\Delta t_{12} = \frac{0.5 \cdot P_{elec,ahu,test}}{0.34 \cdot q_{v11}}$ $\Delta t_{22} = \frac{0.5 \cdot P_{elec,ahu,test}}{0.34 \cdot q_{v22}}$ $\Delta t_{21} = \Delta t_{11} = 0$

Key:

t temperature
Pel total power input of the unit

Index 11 extract air
Index 12 exhaust air
Index 21 outdoor air
Index 22 supply air

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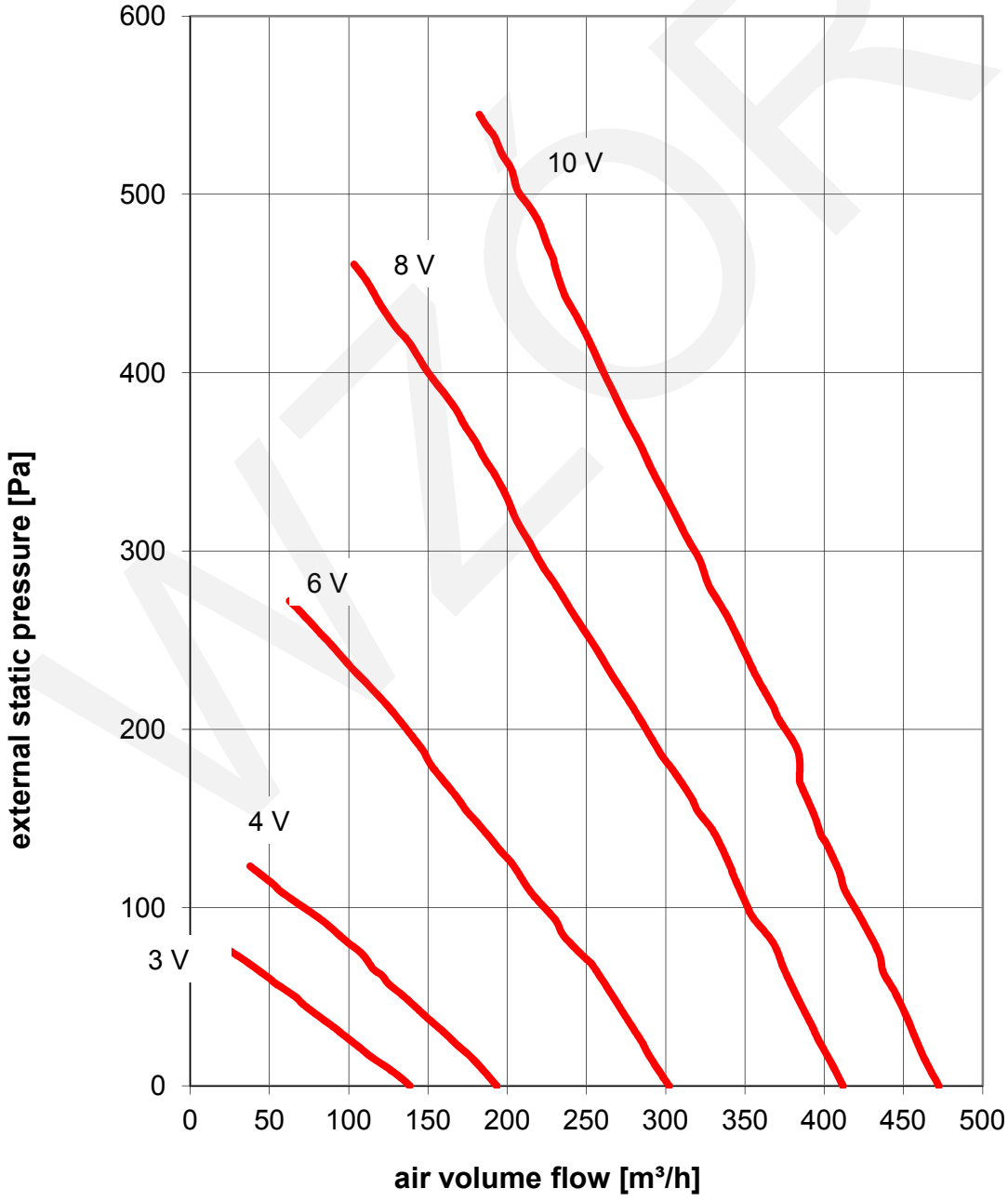
Pressure-airflow curves (extract air) for the „ HRU-MinistAIR-W-450 “ central ventilation unit from the company Alnor Systemy Wentylacji Sp z o.o. Aleja Krakowska 10, 05-552 Wola Mrokowska Poland

ρ = 1.2 kg/m³



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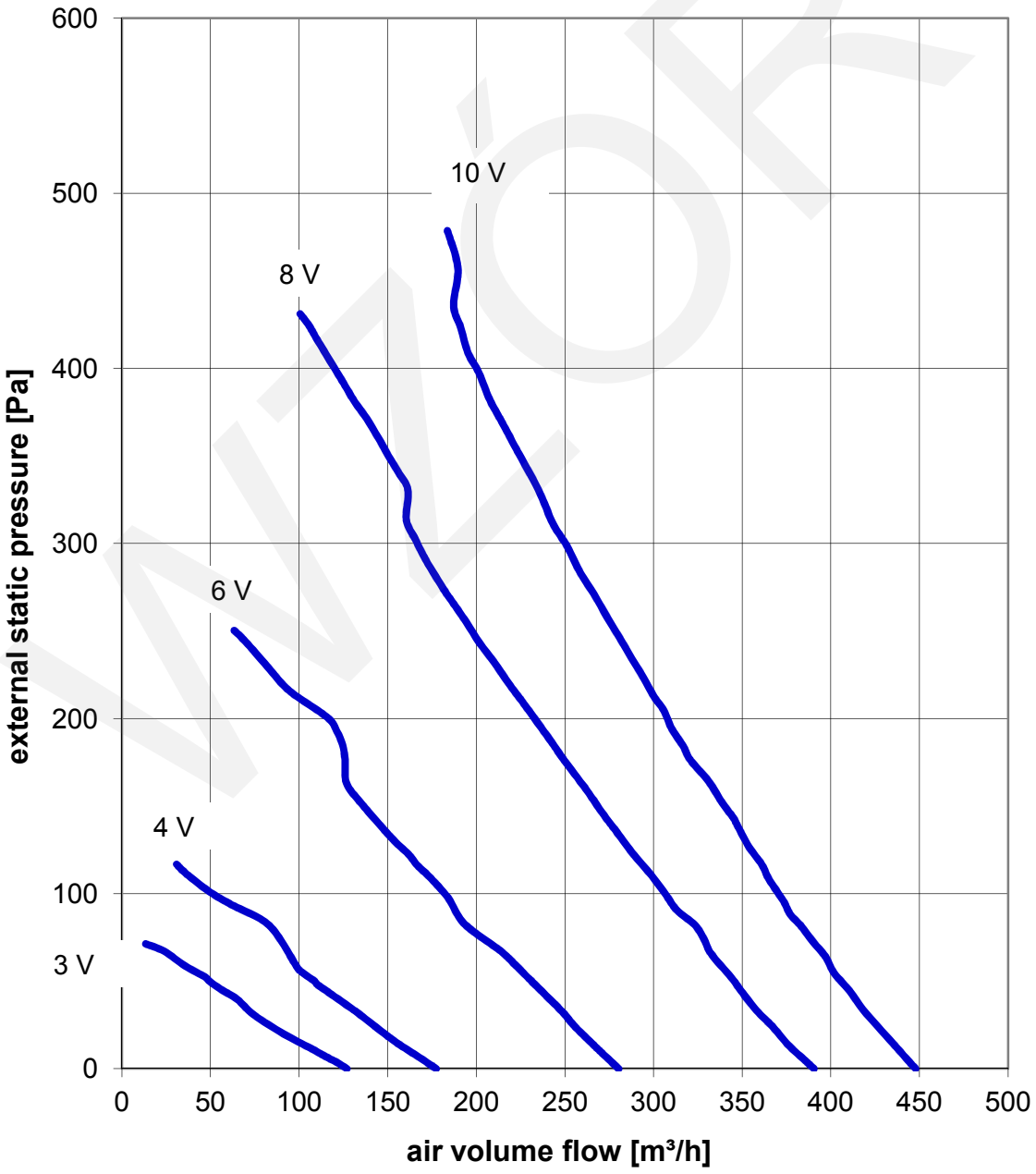
Pressure-airflow curves (outdoor air) for the „ HRU-MinistAIR-W-450“ central ventilation unit from the company Alnor Systemy Wentylacji Sp z o.o. Aleja Krakowska 10, 05-552 Wola Mrokowska Poland

ρ = 1.2 kg/m³



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Measurements from the ventilation test

Extract air

	3 V			4 V		
	p_{stat}	$\dot{V}$	P_{el}	p_{stat}	$\dot{V}$	P_{el}
	[Pa]	[m³/h]	[W]	[Pa]	[m³/h]	[W]
1	0.0	138.6	14.7	0.0	193.5	23.4
2	0.8	137.7	14.7	4.6	189.0	23.4
3	4.2	133.5	14.7	11.8	181.9	22.8
4	9.8	125.2	14.4	18.0	175.0	23.1
5	13.0	119.7	14.3	23.6	167.7	22.2
6	17.1	112.9	14.5	30.2	159.9	22.5
7	22.2	106.1	14.4	38.3	149.5	22.1
8	29.9	94.8	14.1	42.7	144.1	22.9
9	32.6	91.1	14.1	50.3	134.8	22.0
10	42.3	76.3	14.2	56.9	125.5	22.6
11	46.5	70.3	13.5	62.1	120.8	22.0
12	50.0	66.4	13.9	65.4	115.7	21.6
13	58.2	52.7	13.5	74.1	108.4	21.5
14	60.4	50.1	13.6	81.5	97.9	21.5
15	73.7	28.9	13.0	92.9	83.1	21.4
16	81.5	13.3	12.5	108.3	58.2	20.5
17				113.1	52.4	20.4
18				123.2	37.9	19.1

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Measurements from the ventilation test

Extract air

	6 V			8 V			10 V		
	p_{stat}	$\dot{V}$	P_{el}	p_{stat}	$\dot{V}$	P_{el}	p_{stat}	$\dot{V}$	P_{el}
	[Pa]	[m³/h]	[W]	[Pa]	[m³/h]	[W]	[Pa]	[m³/h]	[W]
1	0.0	302.2	58.5	0.0	411.9	117.3	0.0	472.4	169.3
2	3.2	299.7	58.0	12.5	404.8	117.3	13.3	464.4	169.1
3	17.3	289.3	56.7	25.8	396.5	116.8	24.9	458.5	169.0
4	24.1	285.4	57.1	34.3	392.0	117.4	38.9	452.0	169.1
5	31.5	280.0	58.8	45.8	385.3	116.5	52.9	444.5	168.9
6	43.8	271.3	56.2	56.5	379.4	116.5	63.8	437.3	169.3
7	51.8	265.6	56.4	66.5	374.2	116.9	74.7	434.5	168.3
8	67.5	254.0	56.1	80.2	367.9	116.3	95.0	422.6	168.7
9	72.2	248.7	56.3	94.1	355.3	115.8	109.8	413.0	169.4
10	84.1	235.7	54.9	102.1	350.8	115.8	120.1	409.6	167.9
11	93.0	230.5	55.5	119.1	342.3	115.8	135.8	401.5	168.7
12	103.6	219.8	54.3	121.7	341.4	115.3	141.0	397.9	168.1
13	111.2	212.9	55.2	136.3	333.9	117.0	151.4	394.0	165.8
14	123.9	203.7	53.9	144.5	328.8	113.6	168.6	385.5	169.3
15	132.3	195.4	53.4	154.3	320.1	113.1	171.4	384.5	169.7
16	140.5	188.0	54.2	161.4	316.3	113.5	187.8	383.6	168.7
17	149.2	179.5	52.8	176.4	305.2	113.1	206.0	371.2	168.9
18	154.3	174.2	52.5	184.1	298.5	112.5	212.4	368.2	169.6
19	162.2	168.0	53.3	192.9	292.4	115.9	220.8	362.8	169.7
20	179.4	152.4	52.2	211.6	279.9	111.7	230.6	356.7	169.1
21	187.6	147.3	51.3	221.7	272.5	110.5	260.9	340.4	168.4
22	194.7	141.3	51.8	232.9	264.4	115.1	270.3	334.2	167.1
23	210.7	126.9	49.8	244.0	257.0	110.7	281.2	327.0	167.6
24	223.1	114.2	49.7	256.3	248.0	109.0	294.8	321.6	168.6
25	234.7	101.6	48.5	268.1	239.4	108.7	306.9	313.8	168.7
26	247.5	88.9	48.2	280.6	230.8	108.8	319.0	306.9	169.7
27	254.1	81.9	47.2	291.5	222.4	108.3	332.6	299.0	168.9
28	266.1	69.4	45.3	304.3	214.4	107.8	345.6	291.2	169.1
29	272.1	62.6	45.1	317.0	206.0	107.0	360.2	283.6	168.9
30				331.0	199.4	106.4	374.2	275.1	169.5
31				343.1	192.1	105.6	388.8	267.1	169.1
32				352.3	185.4	106.2	403.1	259.3	169.0
33				361.9	179.7	106.9	417.9	251.8	168.8
34				370.4	173.2	103.5	431.7	243.7	167.9
35				381.3	166.3	101.0	443.7	236.2	168.9
36				399.3	150.7	100.5	458.7	230.5	165.0
37				408.0	144.4	98.8	464.0	229.1	166.6
38				417.3	137.8	98.2	472.0	225.1	164.1
39				425.0	130.1	99.7	483.6	220.4	165.3
40				433.2	123.6	101.4	493.4	213.7	165.7
41				440.1	118.7	98.0	502.3	206.5	162.2
42				451.3	111.5	96.1	513.9	202.8	163.6
43				460.8	103.4	97.7	522.8	196.6	162.3
44							532.2	192.1	159.8
45							538.0	187.2	158.0
46							544.7	182.4	159.3

Industrie Service

Measurements from the ventilation test

Outdoor air

	3 V			4 V		
	p_{stat}	$\dot{V}$	P_{el}	p_{stat}	$\dot{V}$	P_{el}
	[Pa]	[m³/h]	[W]	[Pa]	[m³/h]	[W]
1	0.0	127.1	14.3	0.0	177.4	22.5
2	3.7	121.3	14.2	2.9	173.2	22.7
3	6.1	116.6	14.5	7.9	165.8	22.4
4	11.7	106.6	14.7	14.0	156.3	22.9
5	19.9	91.3	14.5	18.9	149.8	23.2
6	30.8	74.5	14.5	24.7	142.2	22.7
7	39.7	65.1	14.2	33.0	131.6	22.5
8	45.5	55.7	13.6	43.5	116.9	23.0
9	49.9	49.5	13.8	48.4	110.1	21.8
10	52.4	47.0	13.9	50.0	108.8	21.9
11	58.7	35.7	13.6	56.5	100.0	22.7
12	67.0	24.0	13.3	60.0	97.7	22.1
13	71.3	13.5	13.0	81.9	83.2	21.9
14				93.8	61.8	21.0
15				100.8	49.9	21.1
16				111.2	36.5	19.8
17				116.8	30.9	19.8

Industrie Service

Measurements from the ventilation test

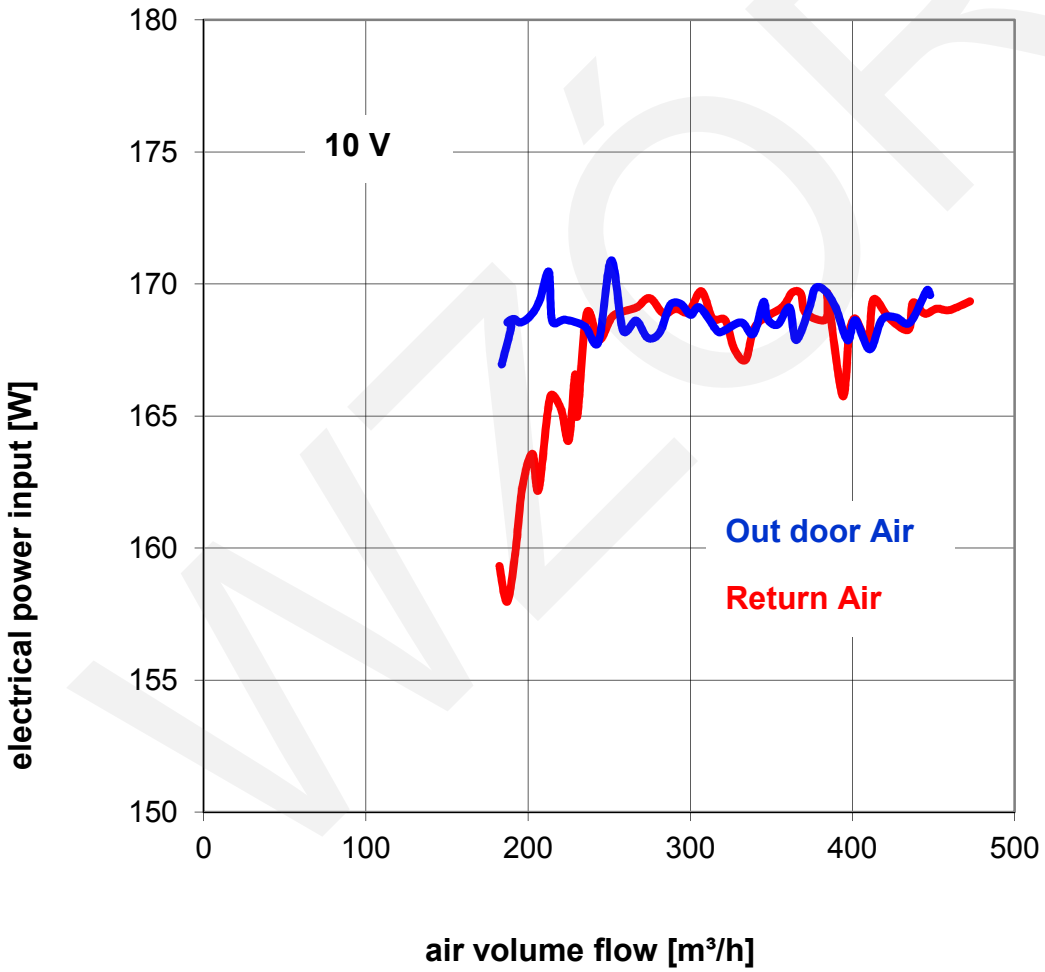
Outdoor air

	6 V			8 V			10 V		
	p_{stat}	$\dot{V}$	P_{el}	p_{stat}	$\dot{V}$	P_{el}	p_{stat}	$\dot{V}$	P_{el}
	[Pa]	[m³/h]	[W]	[Pa]	[m³/h]	[W]	[Pa]	[m³/h]	[W]
1	0.0	280.4	56.6	0.0	390.6	116.9	0.0	447.9	169.6
2	0.2	280.1	56.6	4.6	385.7	116.9	2.2	445.8	169.8
3	8.8	271.2	56.3	13.3	376.3	116.7	14.1	435.4	168.5
4	11.8	268.1	56.7	24.3	367.0	116.9	24.1	426.5	168.7
5	23.9	255.8	57.2	32.1	359.2	116.5	33.9	418.1	168.6
6	33.0	248.0	59.4	42.0	351.3	116.0	44.5	410.6	167.5
7	50.7	230.5	56.0	52.1	343.9	116.2	54.8	401.8	168.6
8	59.8	221.6	56.2	65.7	332.5	116.7	64.2	396.9	167.9
9	67.7	213.2	56.1	73.4	328.8	116.7	72.7	389.8	169.1
10	82.8	193.3	55.0	82.0	323.4	116.2	81.7	383.1	169.7
11	97.7	184.1	55.5	90.7	313.1	116.0	88.3	377.0	169.8
12	109.7	173.5	55.7	99.2	307.2	114.9	95.7	373.3	169.1
13	116.1	166.8	53.9	110.3	298.9	115.7	108.1	365.2	167.9
14	122.5	161.7	54.2	123.5	287.9	115.4	116.4	361.2	169.1
15	132.4	151.7	55.3	136.3	278.4	114.1	126.7	353.8	168.5
16	151.5	135.2	53.3	143.0	273.4	114.0	138.4	347.6	168.7
17	163.0	126.8	53.1	150.6	268.1	113.9	143.2	345.1	169.3
18	176.4	126.0	53.8	160.2	261.5	113.5	151.8	338.8	168.1
19	184.9	124.6	51.4	177.0	249.0	113.2	163.7	331.4	168.6
20	192.7	121.3	52.1	186.9	242.2	112.4	176.6	320.6	168.2
21	200.3	116.4	51.0	208.8	226.6	112.3	184.2	316.8	168.2
22	215.7	94.7	50.1	220.2	218.2	111.8	194.1	310.4	173.8
23	229.6	82.2	48.4	232.2	210.0	110.8	204.6	305.8	169.1
24	243.9	69.9	47.7	243.1	201.9	111.0	212.6	300.2	168.8
25	250.2	63.5	46.6	255.2	194.2	109.3	223.4	294.3	169.2
26				266.7	186.5	109.1	234.3	287.8	169.2
27				272.4	182.5	109.8	245.5	281.2	168.2
28				281.4	177.0	108.2	257.9	273.8	168.0
29				290.9	171.3	108.3	270.9	266.5	168.6
30				302.8	165.4	107.8	283.6	258.5	168.2
31				313.4	160.5	106.4	298.4	251.3	170.9
32				330.5	161.4	106.5	311.1	243.4	167.8
33				340.4	156.2	105.7	330.8	234.9	168.4
34				350.4	150.1	104.3	353.8	222.7	168.6
35				360.5	144.6	103.7	368.5	214.9	168.6
36				371.4	138.1	105.0	372.4	212.8	170.5
37				380.9	131.4	102.7	383.5	206.9	169.4
38				390.3	125.8	100.8	397.4	201.5	168.8
39				417.7	109.5	98.8	408.9	195.3	168.5
40				424.4	105.7	100.5	422.7	191.4	168.7
41				431.1	100.6	98.7	435.9	187.3	168.6
42							457.2	189.7	168.4
43							478.6	183.8	167.0

Industrie Service

Electrical power input - airflow curves for the „HRU-MinstAIR-W-450“ central ventilation unit from the company Alnor Systemy Wentylacji Sp z o.o. Aleja Krakowska 10, 05-552 Wola Mrokowska Poland

(determination of the maximum power input)



The maximum electrical power input of the central ventilation unit is 170.9 W.