VHRU-S VENT

Ceiling Type Energy / Heat / High Efficient Heat Recovery Units

VOLTVENT®
VENTILATION SYSTEMS

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VHRU-S/SD 250/500/800/1000/1500/2000
Ceiling Type Energy Recovery Unit

ErP 2018

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VHRU-S

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VHRU-SD (Standard Double Skin)
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Supply and Exhaust Air Fans

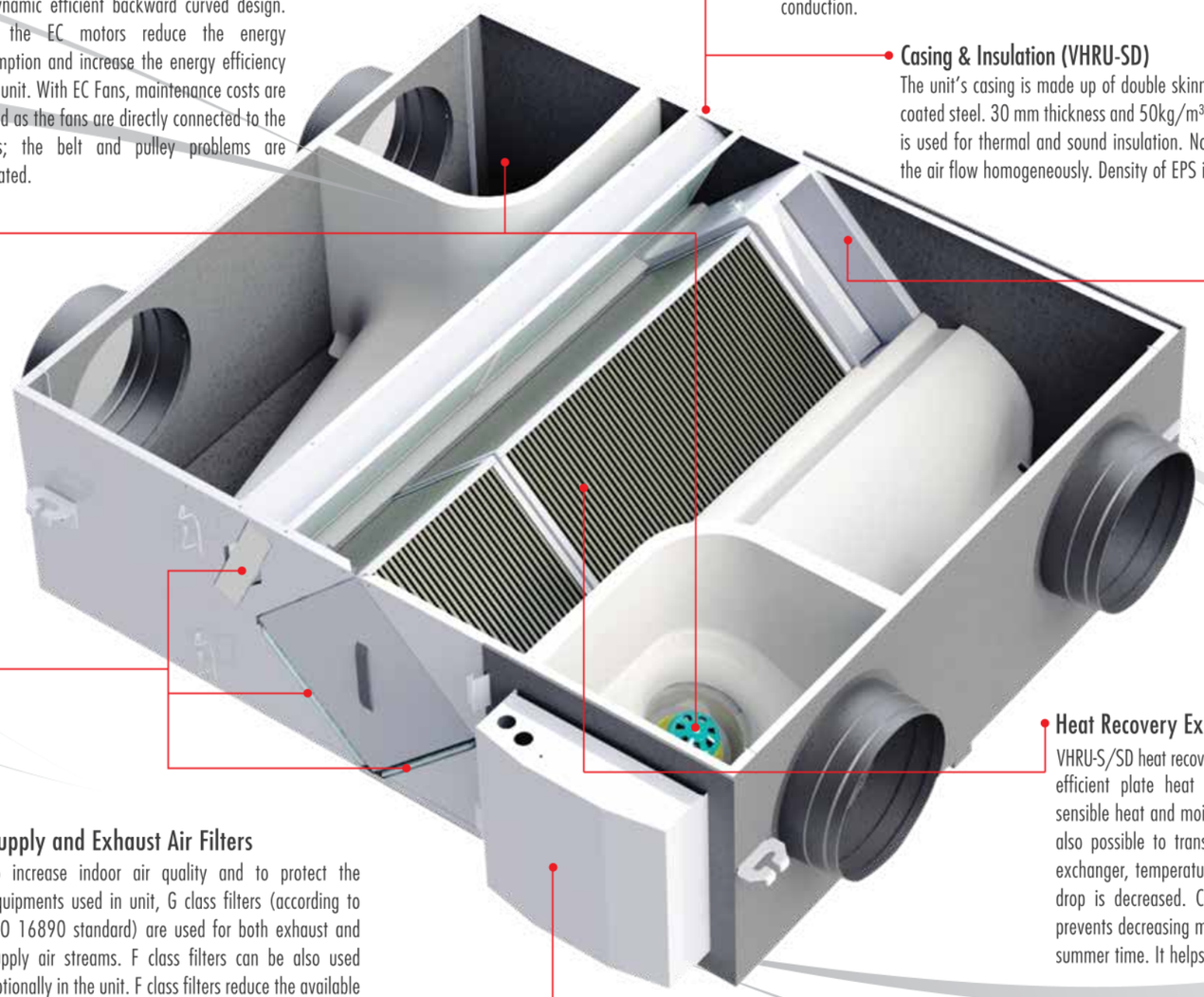
The fans in heat recovery units are equipped with innovative Electronically Commutated **EC motor** technology. EC motors have higher efficiency and simple speed control. Fan blades have high aerodynamic efficient backward curved design. Using the EC motors reduce the energy consumption and increase the energy efficiency of the unit. With EC Fans, maintenance costs are reduced as the fans are directly connected to the motors; the belt and pulley problems are eliminated.

Casing & Insulation (VHRU-S)

High corrosion resistive 200 gr/m² galvanize coated steel is used for the casing. Inside of outdoor air stream is insulated with 10 mm, outside of outdoor air stream is insulated with 5 mm; inside of indoor air stream is insulated with 10 mm non-flammable acoustics foam against sound and thermal conduction.

Casing & Insulation (VHRU-SD)

The unit's casing is made up of double skinned high corrosion resistive 200 gr/m² galvanize coated steel. 30 mm thickness and 50kg/m³ density of Rockwool insulation between the walls is used for thermal and sound insulation. Non-flammable EPS modules are used for directing the air flow homogeneously. Density of EPS is 40 kg/m³.



By-Pass

During by-pass ventilation, no heat transfer occurs between exhaust and fresh air stream. In transition periods and at nights in summer, by-pass module helps to cool down (free-cooling) and heat up (free-heating) the building without any energy expense.

Heat Recovery Exchanger (Cellulosic)

VHRU-S/SD heat recovery ventilation units have cellulosic crossflow, high efficient plate heat recovery exchangers. The exchanger transfers sensible heat and moisture between supply and exhaust air. Thus, it is also possible to transfer latent heat. With the optimization of heat exchanger, temperature and humidity efficiency is increased, pressure drop is decreased. Cellulosic Paper Type Crossflow Heat Exchanger prevents decreasing moisture in winter time and increasing moisture in summer time. It helps indoor air quality to be increased.

Supply and Exhaust Air Filters

To increase indoor air quality and to protect the equipments used in unit, G class filters (according to ISO 16890 standard) are used for both exhaust and supply air streams. F class filters can be also used optionally in the unit. F class filters reduce the available static pressure of the unit for the nominal air flow rate.

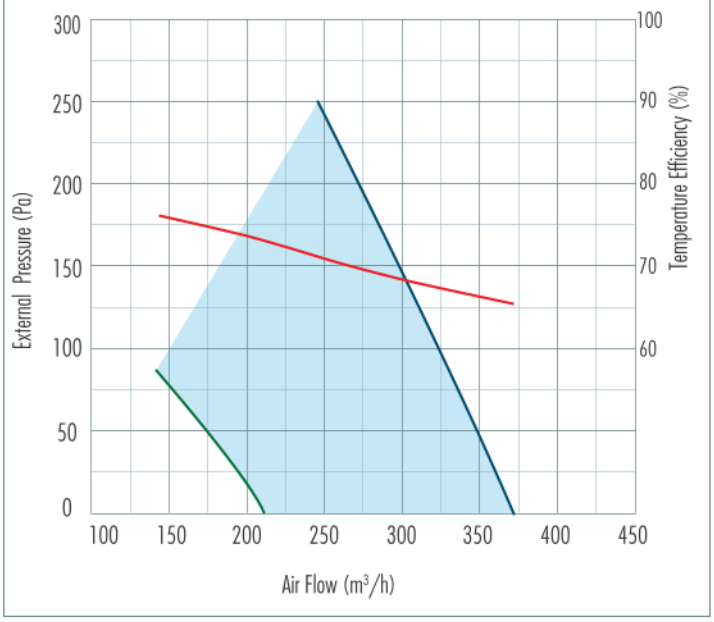
Control System Plug&Play

VOLTVENT PLUS control unit is developed for controlling of heat recovery units' equipments, meeting the demands coming from the customers and is user-friendly designed. VOLTVENT PLUS is capable of commanding the equipments in standard unit and optional accessories. VOLTVENT PLUS Control unit can be performed the basic functions without any control panel, with Standard Panel can be also used more functional. Besides, the control unit can control the all functions via ModBus and switch on/off via BMS as optional. Alternatives different from VOLTVENT PLUS controller are listed in "Control System" part.

Performance Data

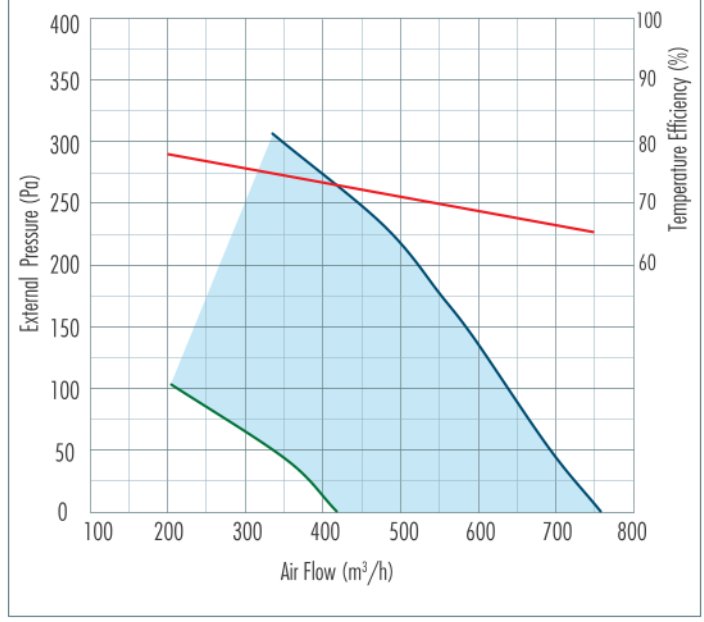
VHRU-S/SD 250

Performance Curve



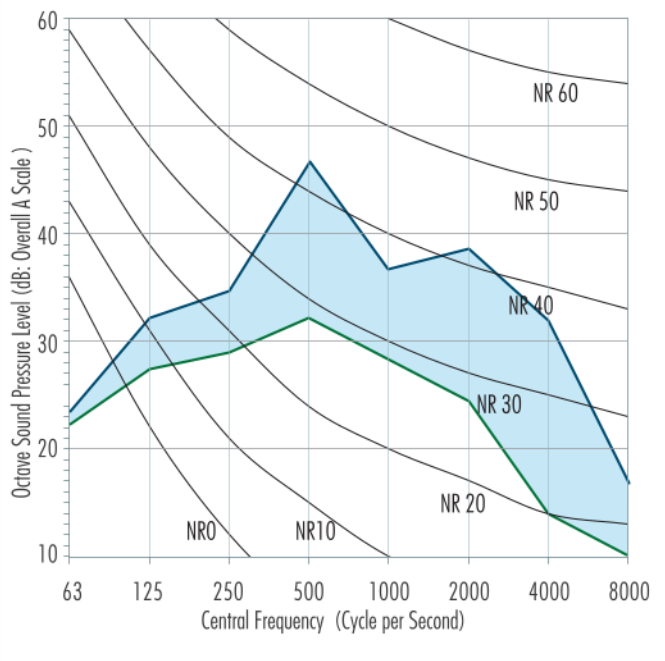
VHRU-S/SD 500

Performance Curve



VHRU-S 250

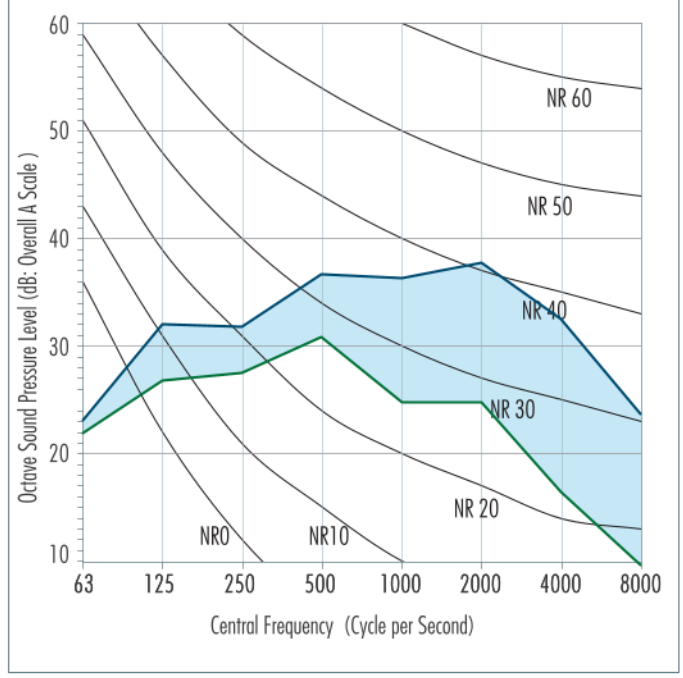
Sound Curve



*Acoustic test is performed 1.5 meter away from the unit.

VHRU-S 500

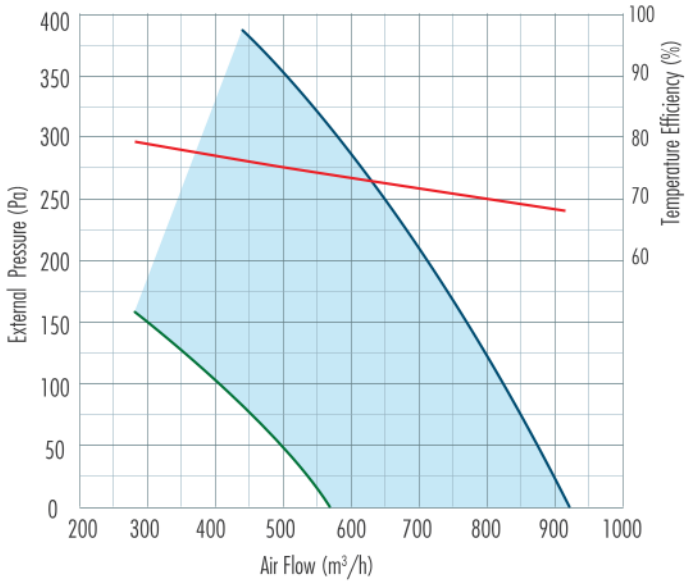
Sound Curve



*Acoustic test is performed 1.5 meter away from the unit.

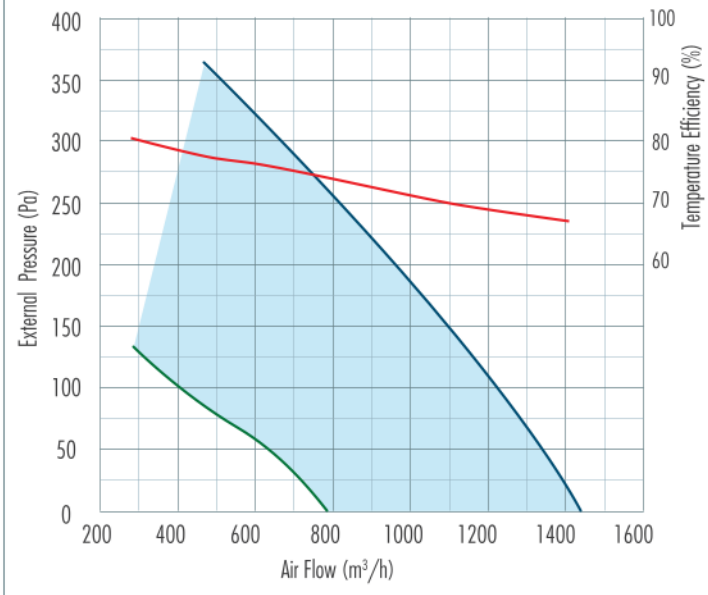
VHRU-S/SD 800

Performance Curve



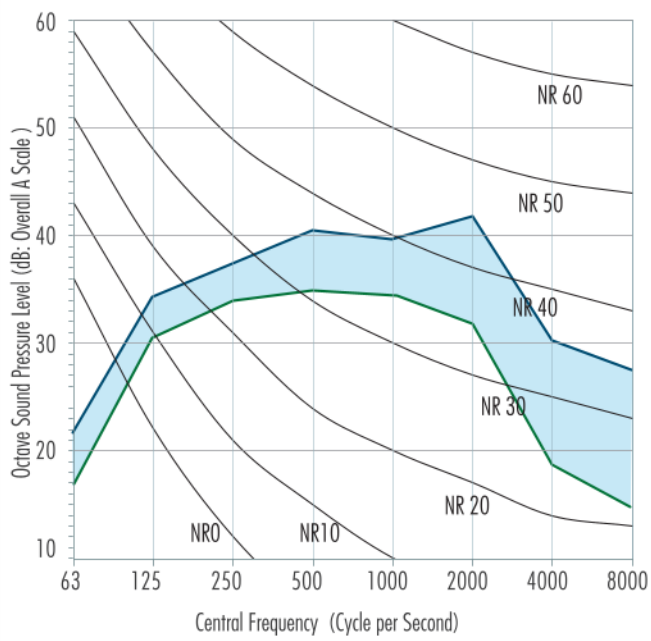
VHRU-S/SD 1000

Performance Curve



VHRU-S 800

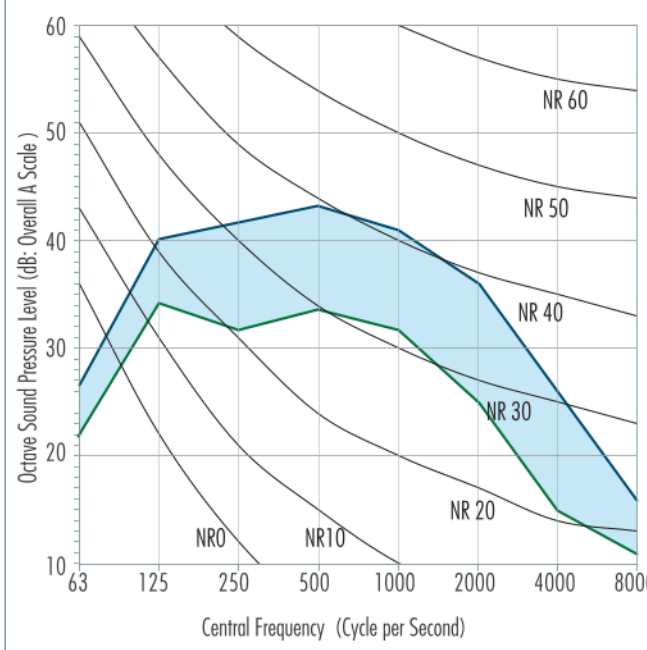
Sound Curve



*Acoustic test is performed 1.5 meter away from the unit.

VHRU-S 1000

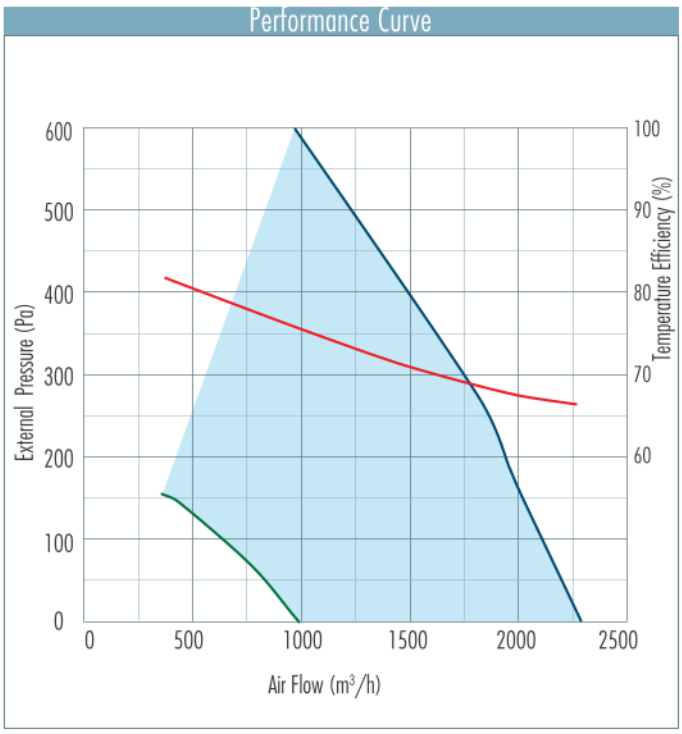
Sound Curve



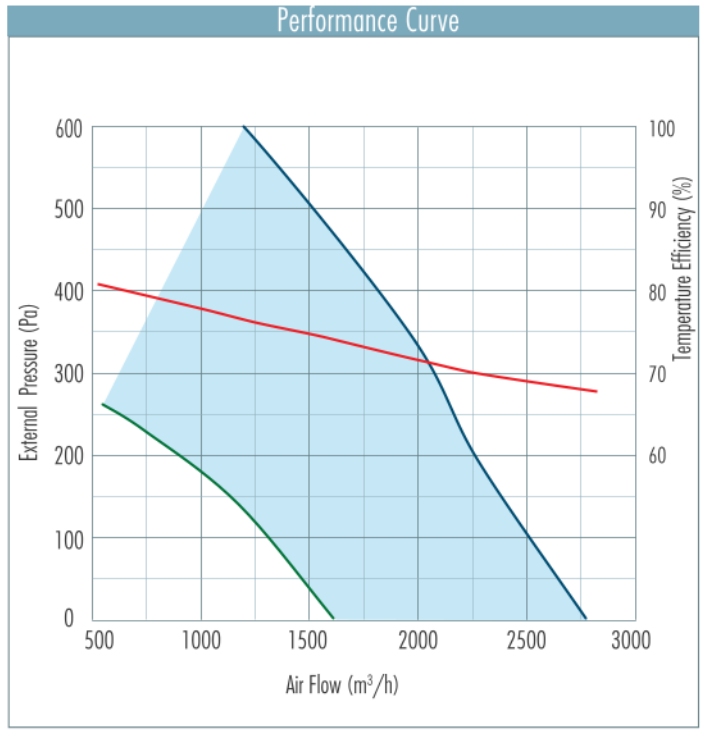
*Acoustic test is performed 1.5 meter away from the unit.

Performance Data

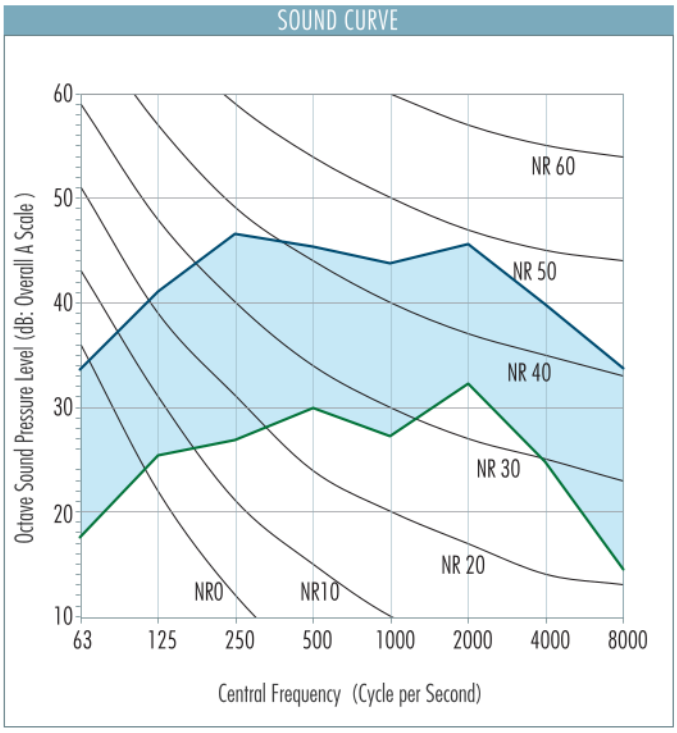
VHRU-S/SD 1500



VHRU-S/SD 2000

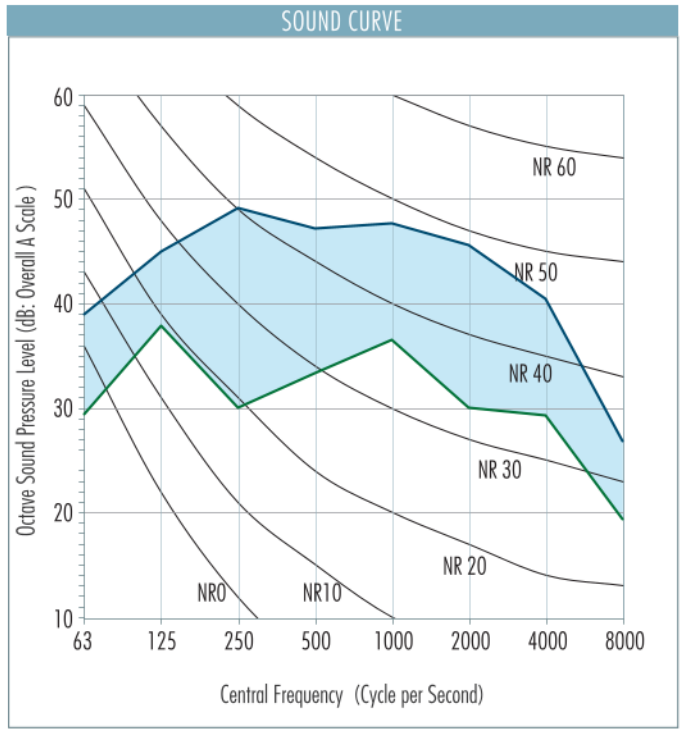


VHRU-S 1500



*Acoustic test is performed 1.5 meter away from the unit.

VHRU-S 2000



*Acoustic test is performed 1.5 meter away from the unit.

Technical Specifications

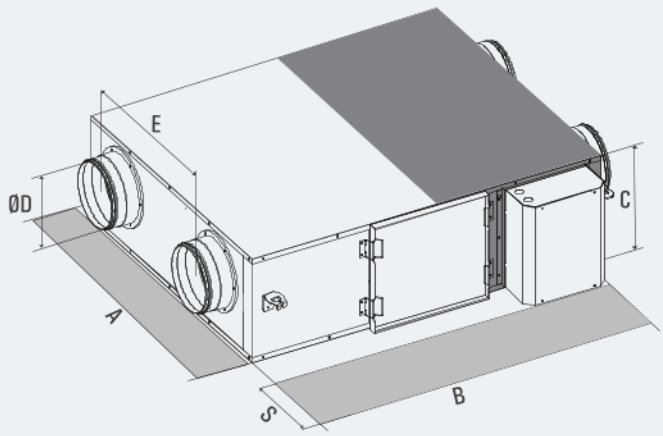
VOLTVENT® VENTILATION SYSTEMS

Product Model Identifier		VHRU-S/SD 250	VHRU-S/SD 500	VHRU-S/SD 800 V	HRU-S/SD 1000 V	HRU-S/SD 1500	VHRU-S/SD 2000
Manufacturer		VOLTVENT					
Erp		Erp 2018					
Declared typology		NRVU/BVU					
Type of drive		Variable speed drive (VSD)					
Type of HRS	%	Other					
Thermal efficiency of HRS[1]	%	73.0	73.0	73.0	73.0	75.0	74.6
Nominal flow rate	m^3/s	0.054	0.107	0.174	0.231	0.306	0.425
Effective electric power input	W	53	107	177	233	361	468
SFP_{int}	$W(m^3/s)$	321	451	577	586	771	732
Face velocity at design flow rate	m/s	0.58	0.72	0.86	0.86	0.99	1.04
Nominal external pressure ($\Delta P_{s,ext}$)	Pa	100	100	100	100	100	100
Internal pressure drop of ventilation components($\Delta P_{s,int}$)	Pa	62	95	144	149	202	210
Internal pressure drop of non-ventilation components($\Delta P_{s,add}$)	Pa	N/A					
Static efficiency of fans used in accordance with Regulation (EU) No. 327/2001		39	42	50	51	52	57
Declared maximum external leakage rate	%	< 3					
Declared maximum internal leakage rate	%	< 5					
Energy classification of the filters (Energy performance)		Coarse > 40% (According to ISO 16890)					
Description of visual filter warning for NRVUs intented for use with filters		Timer					
Casing sound power level (L_{WA})		51/48	52/49	63/59	58/55	59/57	65/62
Internet adress for pre-/dis-assembly instructions		www.voltvent.com					

[1] EN 308 condition (OA = 5°C & 72%, RA = 25°C & 28%).

Unit Dimensions

VHRU-S/SD Unit Dimensions



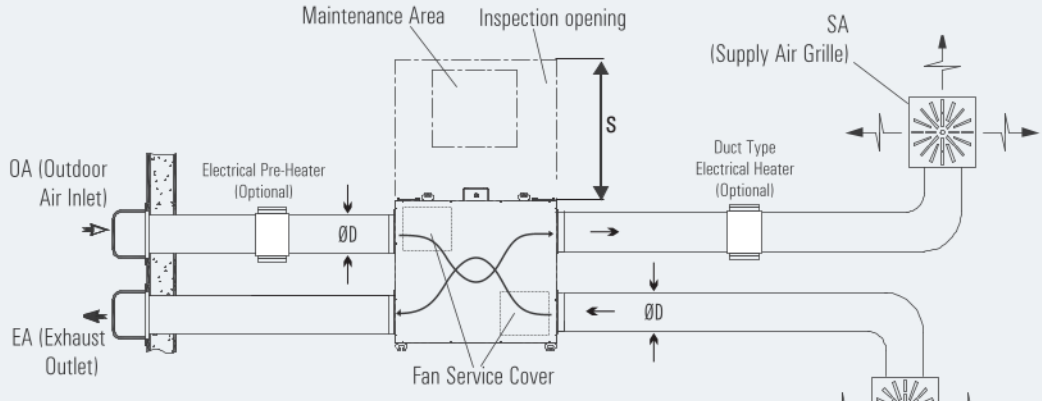
	VHRU-S 250	VHRU-S 500	VHRU-S 800	VHRU-S 1000	VHRU-S 1500	VHRU-S 2000
A	750	922	1014	1294	1128	1428
B	907	1130	1214	1606	1807	1807
C	296	344	410	410	552	552
ØD	Ø160	Ø200	Ø250	Ø300	Ø355	Ø355
E	404	499	589	719	623	921
Unit Weight	34	46	51	79	97	106

*All measurement values are mm.
**Unit weight is kg.

	VHRU-SD 250	VHRU-SD 500	VHRU-SD 800	VHRU-SD 1000	VHRU-SD 1500	VHRU-SD 2000
A	808	981	1071	1351	1185	1485
B	956	1186	1264	1657	1856	1856
C	358	416	472	472	614	614
ØD	160	200	250	300	355	355
E	404	505	590	720	623	921
Unit Weight	52	83	97	135	164	179

*All measurement values are mm.
**Unit weight is kg.

Service Space & Installation

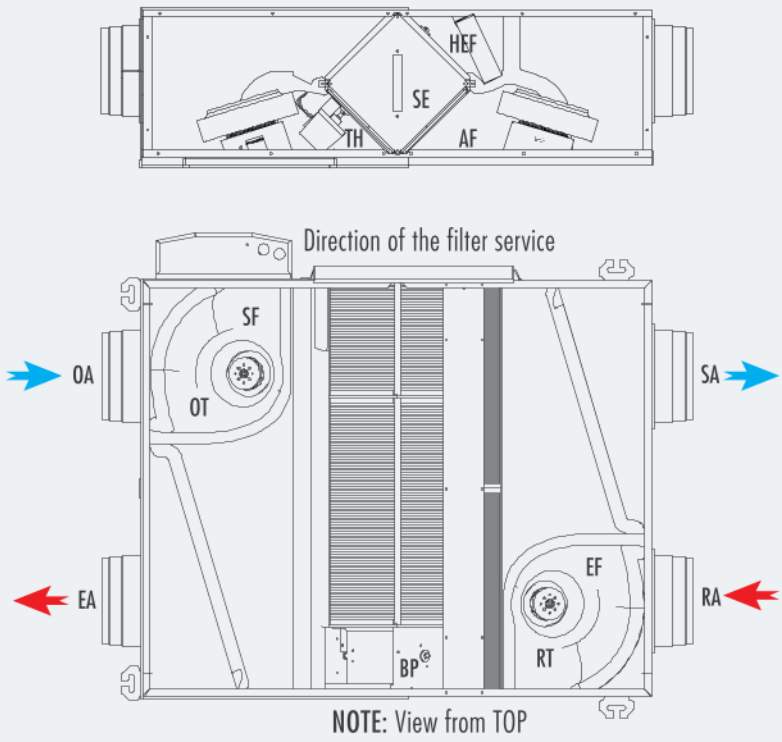


	VHRU-S/SD 250	VHRU-S/SD 500	VHRU-S/SD 800	VHRU-S/SD 1000	VHRU-S/SD 1500	VHRU-S/SD 2000
S	700	700	760	760	800	800

All measurement values are mm.

"S" values indicate the size of the service area.
A service space of "C" must be left under the unit for fan service.
Drain pipe must be installed.

NOTE: View from TOP



Descriptions:

SA - Supply Air

RA - Return Air

EA - Exhaust Air

OA - Outdoor Air

BP - By-Pass Damper

SF - Supply Air Fan

OT - Outdoor Air Temperature Sensor

EF - Exhaust Air Fan

RT - Return Air Temperature Sensor

AF - Exhaust Air Filter

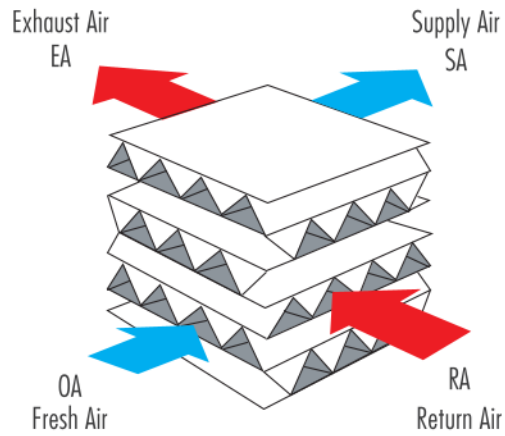
SE - Cellulosic Exchanger

TH - Fresh Air Filter

HEF - High efficient F class filter (Optional)

Cellulosic Exchanger

- High Efficiency Sensible & Latent Enthalpy Transfer
- Humidity Transfer
- Up to 20% Reduction in cooling load
- Sound absorbing material



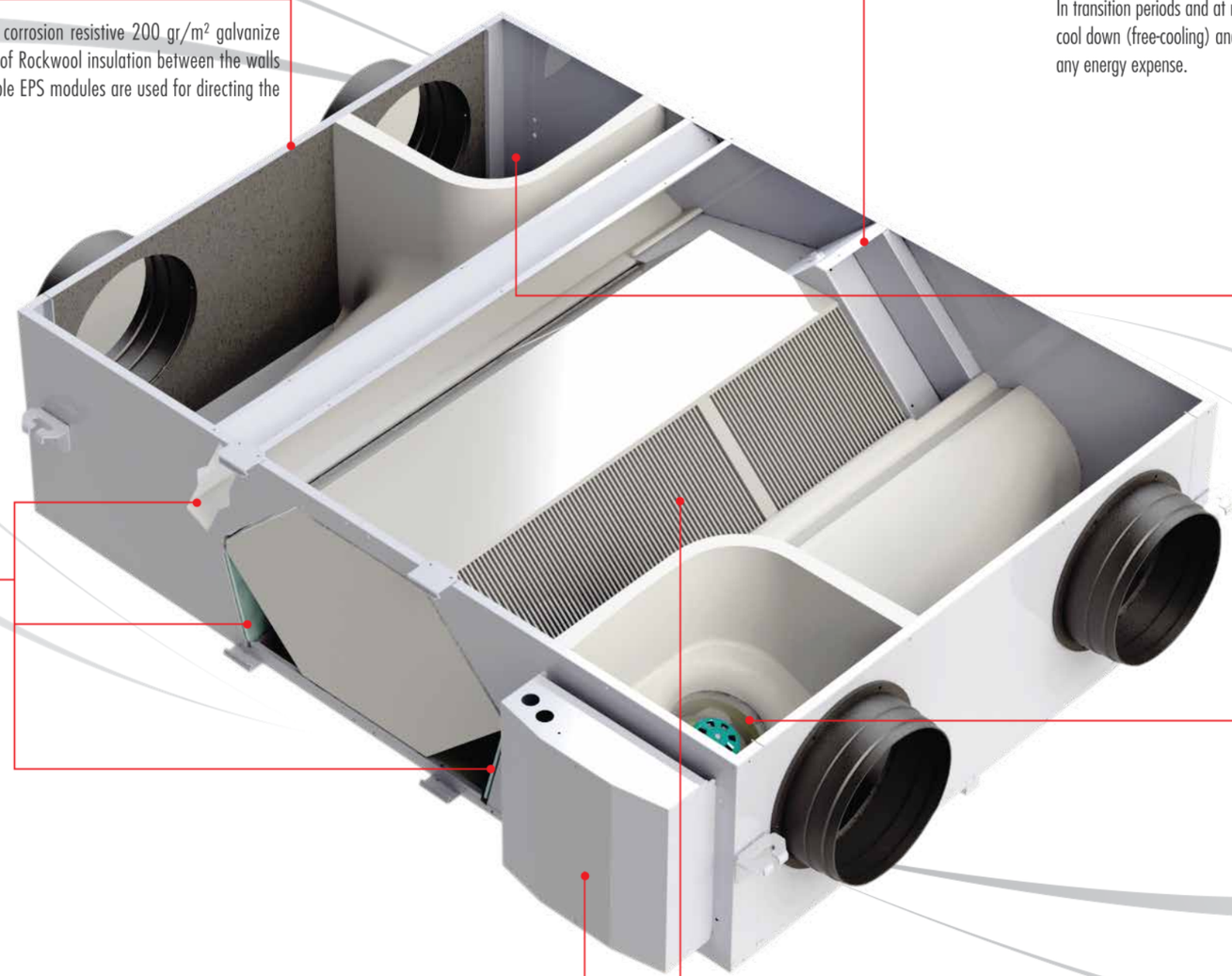
ErP 2018

Casing & Insulation (VHRU-P)

High corrosion resistive 200 gr/m² galvanize coated steel is used for the casing. Inside of outdoor air stream is insulated with 10 mm, outside of outdoor air stream is insulated with 5 mm; inside of indoor air stream is insulated with 10 mm non-flammable acoustics foam against sound and thermal conduction.

Casing & Insulation (VHRU-PD)

The unit's casing is made up of double skinned high corrosion resistive 200 gr/m² galvanize coated steel. 30 mm thickness and 50kg/m³ density of Rockwool insulation between the walls is used for thermal and sound insulation. Non-flammable EPS modules are used for directing the air flow homogeneously. Density of EPS is 40 kg/m³.



By-Pass

VHRU-P/PD units have by-pass ventilation as standard. During by-pass ventilation, no heat transfer occurs between exhaust and fresh air stream. In transition periods and at nights in summer, by-pass module helps to cool down (free-cooling) and heat up (free-heating) the building without any energy expense.

Supply and Exhaust Air Fans

The fans in heat recovery units are equipped with innovative Electronically Commutated **EC motor** technology. EC motors have higher efficiency and simple speed control. Fan blades have high aerodynamic efficient backward curved design. Using the EC motors reduce the energy consumption and increase the energy efficiency of the unit. With EC Fans, maintenance costs are reduced as the fans are directly connected to the motors; the belt and pulley problems are eliminated.

Supply and Exhaust Air Filters

To increase indoor air quality and to protect the equipments used in unit, G class filters (according to ISO 16890 standard) are used for both exhaust and supply air streams. F class filters can be also used optionally in the unit. F class filters reduce the available static pressure of the unit for the nominal air flow rate.

Control System

Plug&Play

VOLTVENT PLUS control unit is developed for controlling of heat recovery units' equipments, meeting the demands coming from the customers and is user-friendly designed. VOLTVENT PLUS is capable of commanding the equipments in standard unit and optional accessories. VOLTVENT PLUS Control unit can be performed the basic functions without any control panel, with Standard Panel can be also used more functional. Besides, the control unit can control the all functions via ModBus and switch on/off via BMS as optional. Alternatives different from ENECON PLUS controller are listed in "Control System" part.

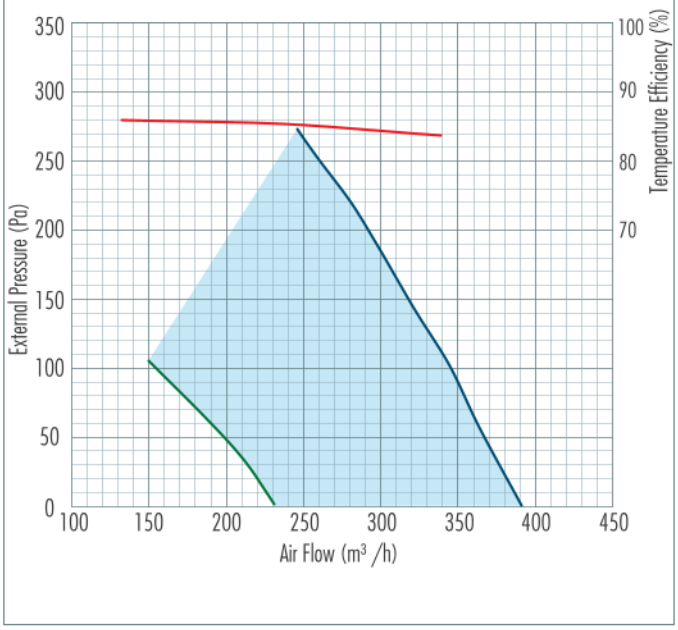
Heat Recovery Exchanger (Aluminum)

VHRU-P-PD heat recovery ventilation units have aluminum counterflow, high efficient plate heat recovery exchangers. Plate heat recovery exchangers have plates that are produced improved surface areas to provide high efficient and leakage free design. With the optimization of exchanger heat transfer is increased and pressure drop is decreased. Heat recovery exchanger has Eurovent certification.

Performance Data

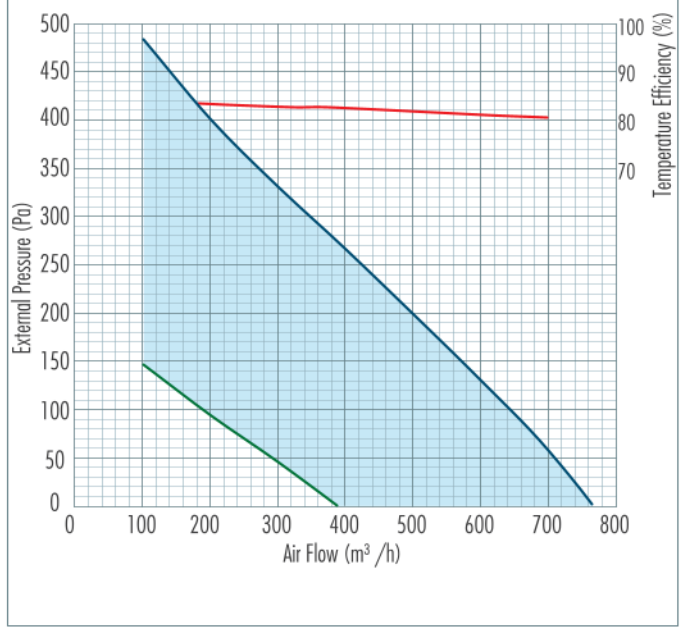
VHRU-P/PD 250

PERFORMANCE & ENERGY



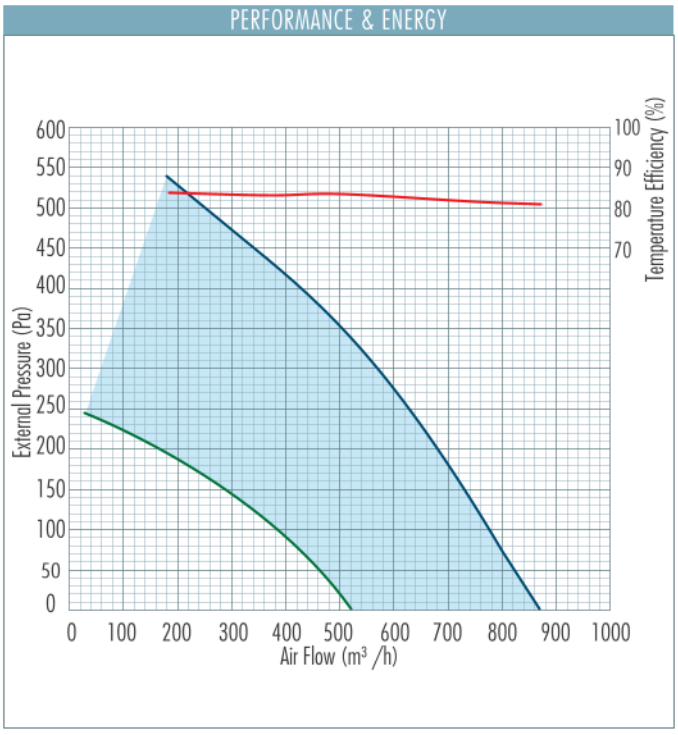
VHRU-P/PD 500

PERFORMANCE & ENERGY



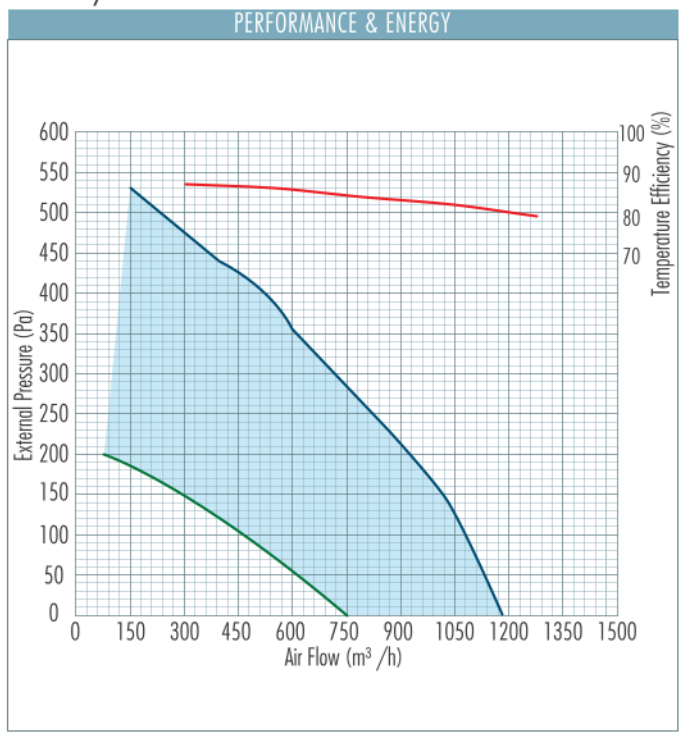
VHRU-P/PD 800

PERFORMANCE & ENERGY



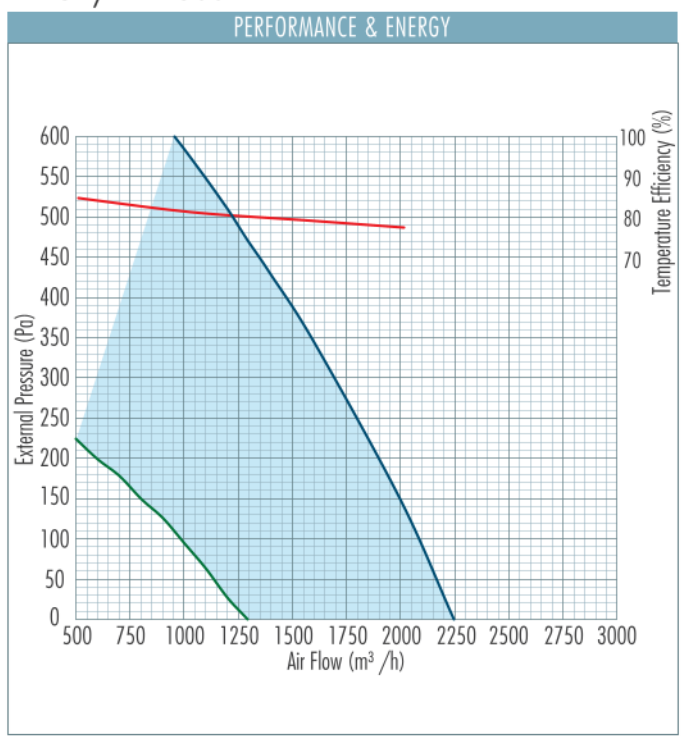
VHRU-P/PD 1000

PERFORMANCE & ENERGY

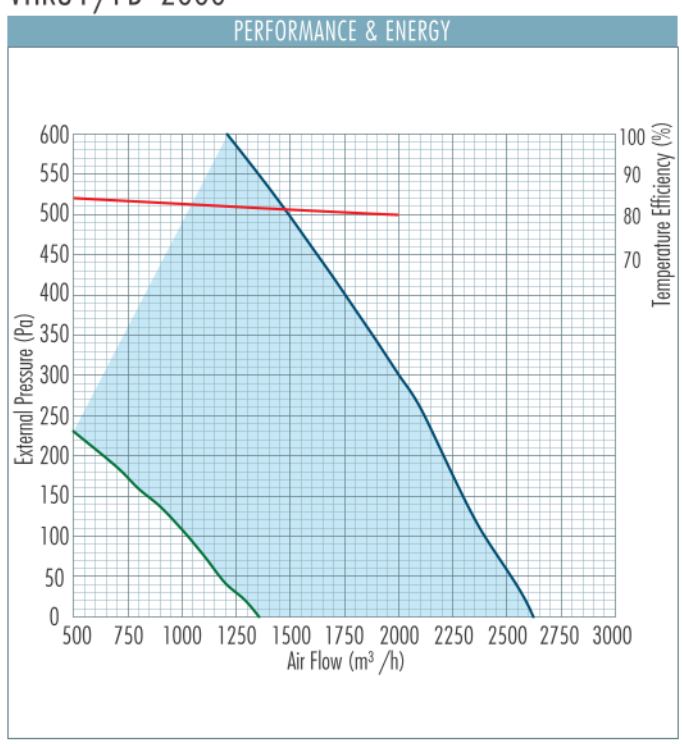


Note: Efficiency values are calculated according to EN 308 standard.

VHRU-P/PD 1500



VHRU-P/PD 2000



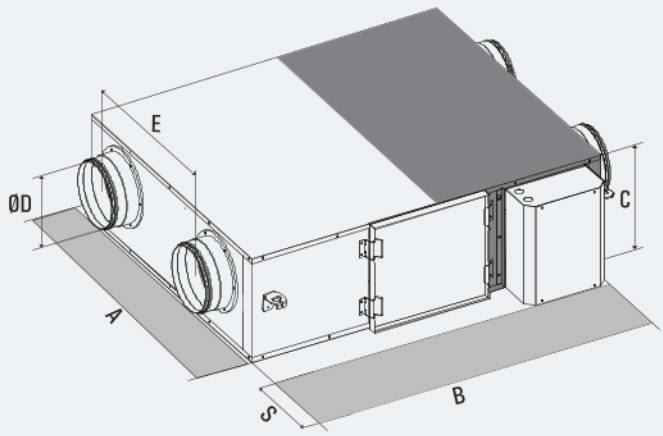
Note: Efficiency values are calculated according to EN 308 standard.

Technical Specifications

Product Model Identifier		VHRU-P/PD 250	VHRU-P/PD 500	VHRU-P/PD 800	VHRU-P/PD 1000	VHRU-P/PD 1500	VHRU-P/PD 2000
Manufacturer		VOLTVENT					
Erp		Erp 2018					
Declared typology		NRVU/BVU					
Type of drive		Variable speed drive (VSD)					
Type of HRS	%	Other					
Thermal efficiency of HRS[1]	%	83.8	82.2	81.2	81.6	80.0	79.9
Nominal flow rate	m^3/s	0.069	0.139	0.222	0.278	0.389	0.528
Effective electric power input	W	71	151	278	270	496	648
SFP_{int}	$W(m^3/s)$	405	584	819	573	900	875
Face velocity at design flow rate	m/s	1.03	1.30	1.54	1.45	1.75	1.79
Nominal external pressure ($\Delta P_{s,ext}$)	Pa	100	100	100	100	100	100
Internal pressure drop of ventilation components($\Delta P_{s,int}$)	Pa	80	132	206	155	252	258
Internal pressure drop of non-ventilation components($\Delta P_{s,add}$)	Pa	N/A					
Static efficiency of fans used in accordance with Regulation (EU) No. 327/2001		40	45	50	54	56	59
Declared maximum external leakage rate	%	< 3					
Declared maximum internal leakage rate	%	< 5					
Energy classification of the filters (Energy performance)		Coarse > 40% (According to ISO 16890)					
Description of visual filter warning for NRVUs intented for use with filters		Timer					
Casing sound power level (L_{WA})		51/48	52/49	63/59	58/55	59/57	65/62
Internet adress for pre-/dis-assembly instructions		www.voltvent.com					

[1] EN 308 condition (OA = 5°C & 72%, RA = 25°C & 28%).

VHRU-P/PD Unit Dimensions



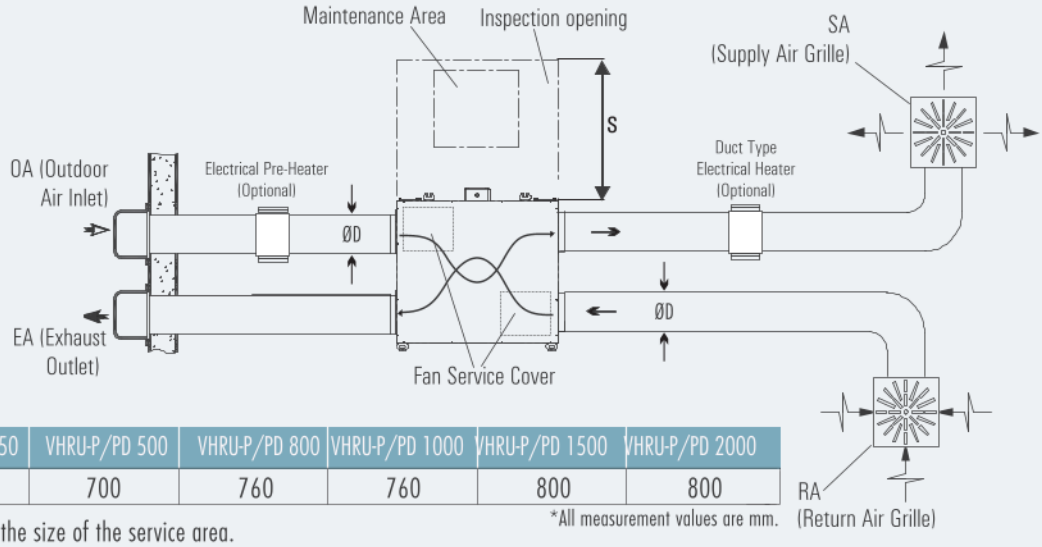
	VHRU-P 250	VHRU-P 500	VHRU-P 800	VHRU-P 1000	VHRU-P 1500	VHRU-P 2000
A	760	934	1024	1304	1138	1438
B	1110	1325	1387	1780	1920	1920
C	296	355	400	410	552	552
ØD	160	200	250	300	355	355
E	404	499	589	719	623	921
Unit Weight	45	64	71	113	117	140

*All measurement values are mm.
**Unit weight is kg.

	VHRU-PD 250	VHRU-PD 500	VHRU-PD 800	VHRU-PD 1000	VHRU-PD 1500	VHRU-PD 2000
A	808	981	1071	1351	1185	1485
B	1163	1378	1440	1833	1973	1973
C	355	412	469	469	610	610
ØD	160	200	250	300	355	355
E	404	500	590	720	625	920
Unit Weight	59	84	95	145	156	184

*All measurement values are mm.
**Unit weight is kg.

Service Space & Installation



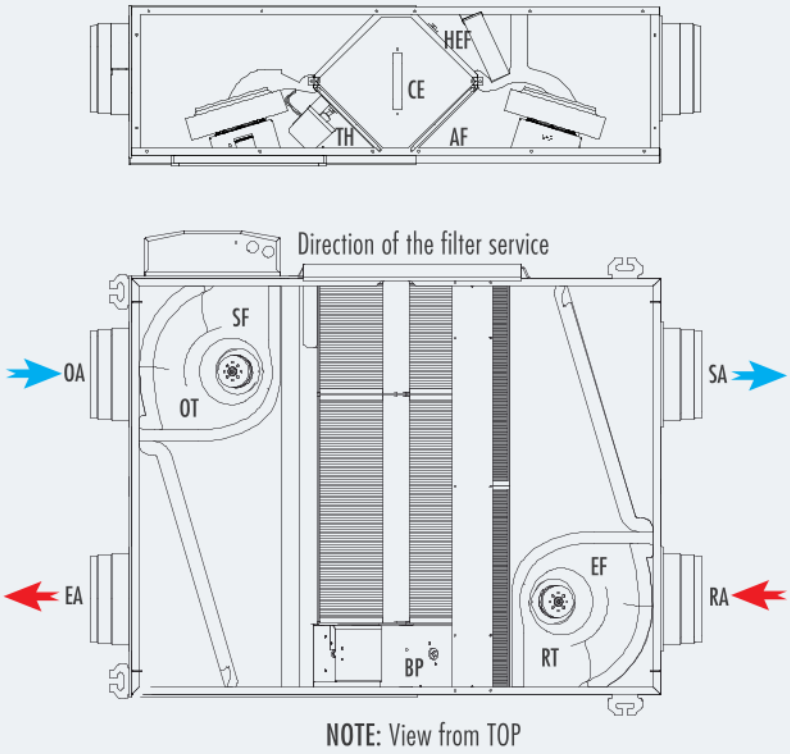
	VHRU-P/PD 250	VHRU-P/PD 500	VHRU-P/PD 800	VHRU-P/PD 1000	VHRU-P/PD 1500	VHRU-P/PD 2000
S	700	700	760	760	800	800

*All measurement values are mm.

"S" values indicate the size of the service area.
A service space of "C" must be left under the unit for fan service.
Drain pipe must be installed.

NOTE: View from TOP

Working Principle of Unit



Descriptions:

SA - Supply Air

RA - Return Air

EA - Exhaust Air

OA - Outdoor Air

BP - By-Pass Damper

SF - Supply Air Fan

OT - Outdoor Air Temperature Sensor

EF - Exhaust Air Fan

RT - Return Air Temperature Sensor

AF - Exhaust Air Filter

CE - Aluminium Exchanger (Counter-Flow)

TH - Fresh Air Filter

HEF - High efficient F class filter (Optional)

Automation Options		Control Cards				
Standard	Optional	Standard	Alternative 1		Alternative 2	
			Type 1	Type 2	Type 1	Type 2
OA Temperature Sensor		✓	✓	✓	✓	✓
RA Temperature Sensor		✓	✓	✓	✓	✓
SA Fan Control		✓	✓	✓	✓	✓
RA Fan Control		✓	✓	✓	✓	✓
ByPass Damper		✓	✓	✓	✓	✓
Filter Contamination Info (Time)		✓	✓	✓	✓	✓
Modbus RTU		✓	✓	✓	✓	✓
Weekly Timer		✓	✓	✓	✓	✓
	On/Off Damper Control	✓	✓	✓	✓	✓
	Proportional Damper Control	⊗	✓	✓	✓	✓
	Airflow Control	⊗	≡	≡	≡	≡
	Humidity Control	≡				
	CO2 Control					
	SA Temperature Sensor	✓	✓	✓	✓	✓
	On/Off Heating Coil	✓	✓	✓	✓	✓
	Proportional Heating Coil	✓	✓	✓	✓	✓
	On/Off Cooling Coil	✓	✓	✓	✓	✓
	Proportional Cooling Coil	✓	✓	✓	✓	✓
	Electrical Pre-Heater	✓	✓	✓	✓	✓
	Electrical After-Heater	✓	✓	✓	✓	✓
	BacNET	⊗	✓	✓	✓	✓
	Web Browser (TCP/IP)	⊗	✓	✓	✓	✓
	Filter Contamination Info (DPS)	⊗	✓	✓	✓	✓

≡ Only one of them the defined functions is selectable for this control card.

⚠ The optional features in the table vary according to the product.

Control Panel			Control Cards				
Panel Type		Panel Descriptions	Standard	Alternative 1		Alternative 2	
				Type 1	Type 2	Type 1	Type 2
	Standard	Wall-mounted type Max:30 m communication ability	✓	⊗	⊗	⊗	⊗
	Alternative-1.1	Wall-mounted type hand panel, IP 30 protection class, Max:100 m communication ability	⊗	✓	⊗	⊗	⊗
	Alternative-1.2	Wall-mounted type hand panel, IP 30 protection class, Max:100 m communication ability	⊗	⊗	✓	⊗	⊗
	Alternative-2.1	Magnet type, IP 31 protection class, Max:700 m communication ability	⊗	⊗	⊗	✓	✓
	Alternative-2.2	**Hand Panel 1:** Wall-mounted type, IP 65 protection class for only front side of panel, Max:50 m communication ability **Hand Panel 2 :** Magnet type, IP 65 protection class for whole panel, Max:50 m communication ability	⊗	⊗	⊗	✓	✓

Selection of Electrical Cable Cross-Section

Unit Model VHRU-S/SD/P/PD	Unit Voltage (V)	Unit Power Input (kW)	Current (A)	Fuse (A)	Cable Cross-Section(mm^2) for 50M and PF=0.8
250	230	0.138	0.94	1.00	1.5
500	230	0.248	1.78	2.00	1.5
800	230	0.330	2.58	3.15	1.5
1000	230	0.360	2.98	4.00	1.5
1500	230	1.040	4.58	5.00	2.5
2000	230	1.040	4.58	5.00	2.5

The data in the table shows the maximum power/current values. Please check unit label for updated values.

Cable Cross-Section Formulas

1

$$I_{current} = \frac{P}{U.CosQ}$$

$$I_{cable} > I_{current}$$

2

$$\%e = \frac{100.P.L}{k.S.U^2}, \quad S = \frac{100.P.L}{k.\%e.U^2}$$

$$\%e = \%3$$

3

$$I_{cable} > I_{fuse} \geq I_{current}$$

Cable Cross-Section S = Max (S1, S2, S3, 1.5mm^2)

P : Power
I : Current
U : Voltage
S : Conductor cross section
k : Conductor coefficient
L : Conductor length
%e : The voltage drop

Example of Cable Cross-Section Calculation

P : 1 kW **L** : 50m
U : 230V **%e** : %3
PF: CosQ : 0.8 **k** : 56m / Ω

1

$$I_{current} = \frac{1000\ W}{230.0,8} = 5.43\ A$$

The cable will be used, is selected from the cable cross-section table so that the equivalent ampere value in the table should be higher than calculated "$I_{current}$" value.

S1 = 1.5 mm^2

2

%e = %3

$$S = \frac{100.1000.50}{56.3.230^2} = 0.56\ mm^2$$

S2 ≥ 0.56 mm^2 ≥ 0.75 mm^2

S2 = 0.75 mm^2

3

$I_{cable} > I_{fuse} \geq I_{current}$

I_{cable} > 10A ≥ 5.43A

"I_{fuse}"which will be higher than "$I_{current}$", is selected.

The cable will be used, is selected from the cable cross-section table so that the equivalent ampere value in the table should be higher than selected "I_{fuse}" value.

I_{cable} = 24A

S3 = 1.5 mm^2

Cable cross-section S = Max (S1, S2, S3, 1.5 mm^2)

S = Max (1.5, 0.75, 1.5, 1.5)

S = 1.5 mm^2

Electric Heaters

Electric heaters are optionally supplied in cold climates for supply air and in extreme climates for both supply and outdoor air sides against freezing. Electric heaters are manufactured according to circular or rectangular duct systems.
Standard types are produced of stainless steel heating elements and galvanized metal casing. Stainless steel casing is also avaliable. Electric heaters are equipped with two circuit cutting thermostats. Factory setting for the automatically operating one is 70 °C and for the manual operating 110 °C.
Electric heaters capacity can be controlled up to 3 steps with control panel according to the set temperature from the room control panel and room (or supply air) temperature. Speed controls shall not be used with Electric heater installations. Voltvent electric heaters are connected in VREH connection in standard models.

Heating Capacity Calculation

$Q = 0,33x\ V\ x\ (T_2 - T_1)$

Q : Heating Capacity (W)
V : Air Flow through electric heater (m^3/h)
T_1 : Air temperature before the heater (°C)
T_2 : Air temperature after the heater (°C)

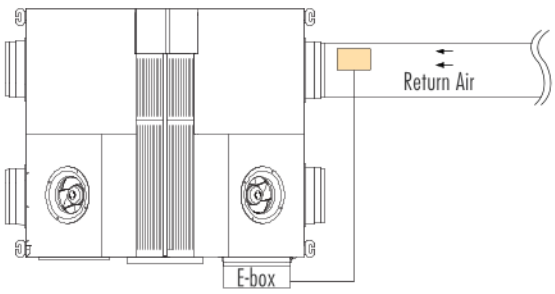
Electrical Heater Capacity

Unit Model		Heater Diameter (mm)	Capacity (Pre-Heater) (kW) (Outdoor air between 0°C and -5°C)	Capacity (Pre-Heater) (kW) (Outdoor air between -5°C and -15°C)	Capacity (After-Heater) (kW) (Heating the supply air to 25°C)
VHRU-S/SD	250	160	1	1.5	-
	500	200	1	3	-
	800	250	1.5	4.5	-
	1000	300	2	6	-
	1500	355	4	10	-
	2000	355	4	10	-
VHRU-P/PD	250	160	1	1.5	1
	500	200	1	3	2
	800	250	1.5	4.5	3
	1000	300	2	6	4
	1500	355	4	10	6
	2000	355	4	12	8

*Except this application about electic heaters, please contact us.

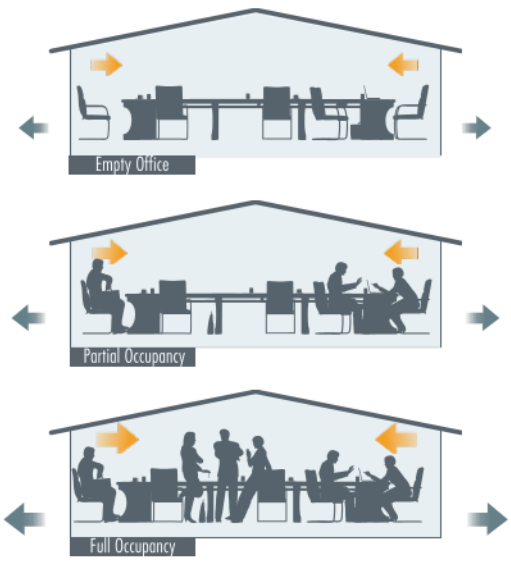
Ventilation on Demand

Air Quality Sensor (CO_2 / Humidity) is mounted to the return air duct and is connected to control system of unit. The set point for the desired indoor air quality is set during the installation. According to the demand indoors, VHRUVENT units are modulated automatically by the sensor. Annual energyenergy consumption of the unit is reduced as a result of the modulation, ending in reduction in energy costs.



Fresh air demand in a space is calculated according to human occupancy and/or physical properties of the conditioned space. The calculation is based on the maximum indoor occupancy. In practice maximum occupany is observed for only a small period of time annually where lower air flow rates will be sufficient for most of the year. By reducing the air flow rate according to the fresh air demand; it is possible to reduce units electrical consumption and reduce also energy consumption used to condition the space. It should be noted that by increasing fresh air rate, indoors heating/cooling demand will also be increased.

With the help of control panel, it is possible to regulate fresh air rate according to the demand indoors. Voltvent Indoor air quality sensor (CO2/Humidity) sensor is mounted to the return duct or the conditioned space and the demanded condition is set. A 0-10 V signal will be created and VHRU-S VENT unit's air flow will be regulated according to the signal.



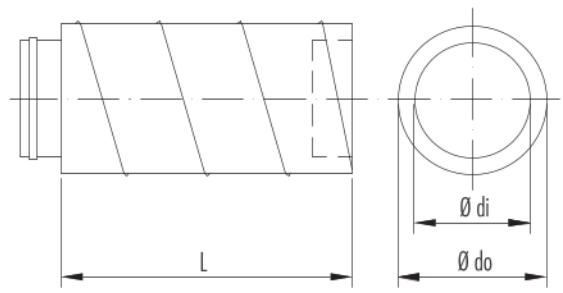
Sound Attenuator For Circular Ducts

Sound attenuators are designed for standard duct dimensions. Various lenghts are avaliable accoring to attenuation demand. Sound attenuation capacities are given in the table.For better performance sound attenautors can be used in series. For the best result the sound attenuators shall be installed just after the unit.

Notation

SLT ---- ----

- Sound Attenuator
- Diameter (mm)
- Lenght(mm)



Sound Attenuator Capacity [dB]

SLT	63	125	250	500	1k	2k	4k	8k
200-300	1	2	3	6	10	14	12	14
200-600	2	3	6	7	13	17	18	20
200-900	3	4	7	10	16	18	21	22
250-300	1	2	6	6	13	16	14	15
250-600	2	3	7	7	18	21	20	22
250-900	3	4	9	8	21	24	21	23
300-300	1	2	4	4	10	12	12	15
300-600	1	3	6	7	13	15	17	19
300-900	2	4	7	8	15	17	18	21
355-600	1	3	8	8	9	6	5	7
355-900	4	4	13	13	11	7	6	8

Sound Attenuator Dimensions [mm]

SLT	length (L)	Ø di	Ø do
200-300	300	200	260
200-600	600	200	260
200-900	900	200	260
250-300	300	250	310
250-600	600	250	310
250-900	900	250	310
300-300	300	300	360
300-600	600	300	360
300-900	900	300	360
355-600	600	355	415
355-900	900	355	415

Final Filter (F Class - Optional)

F class filters are optionally available for VHRU-S units. Additional pressure drop due to final filters are indicated on the diagrams. To reduce initial and operational pressure drop innovative pleated type filters are used to increase filtration surface. Units' maximum air flow is reduced due to filter pressure drop.

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Notes