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Revision dated 09.01.2025

VRS

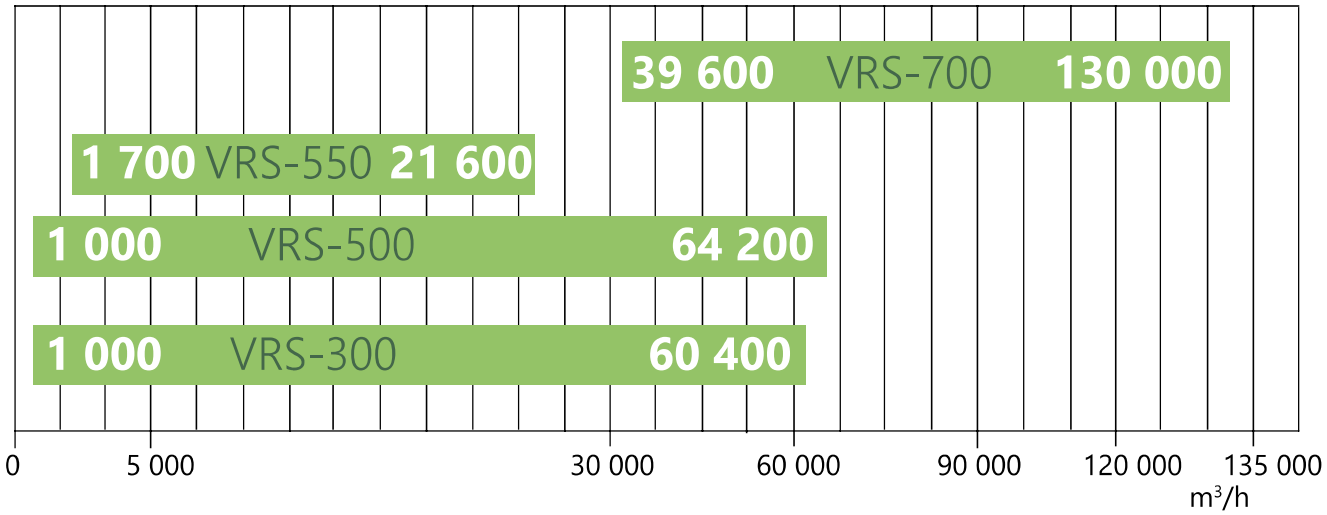
air handling unit series

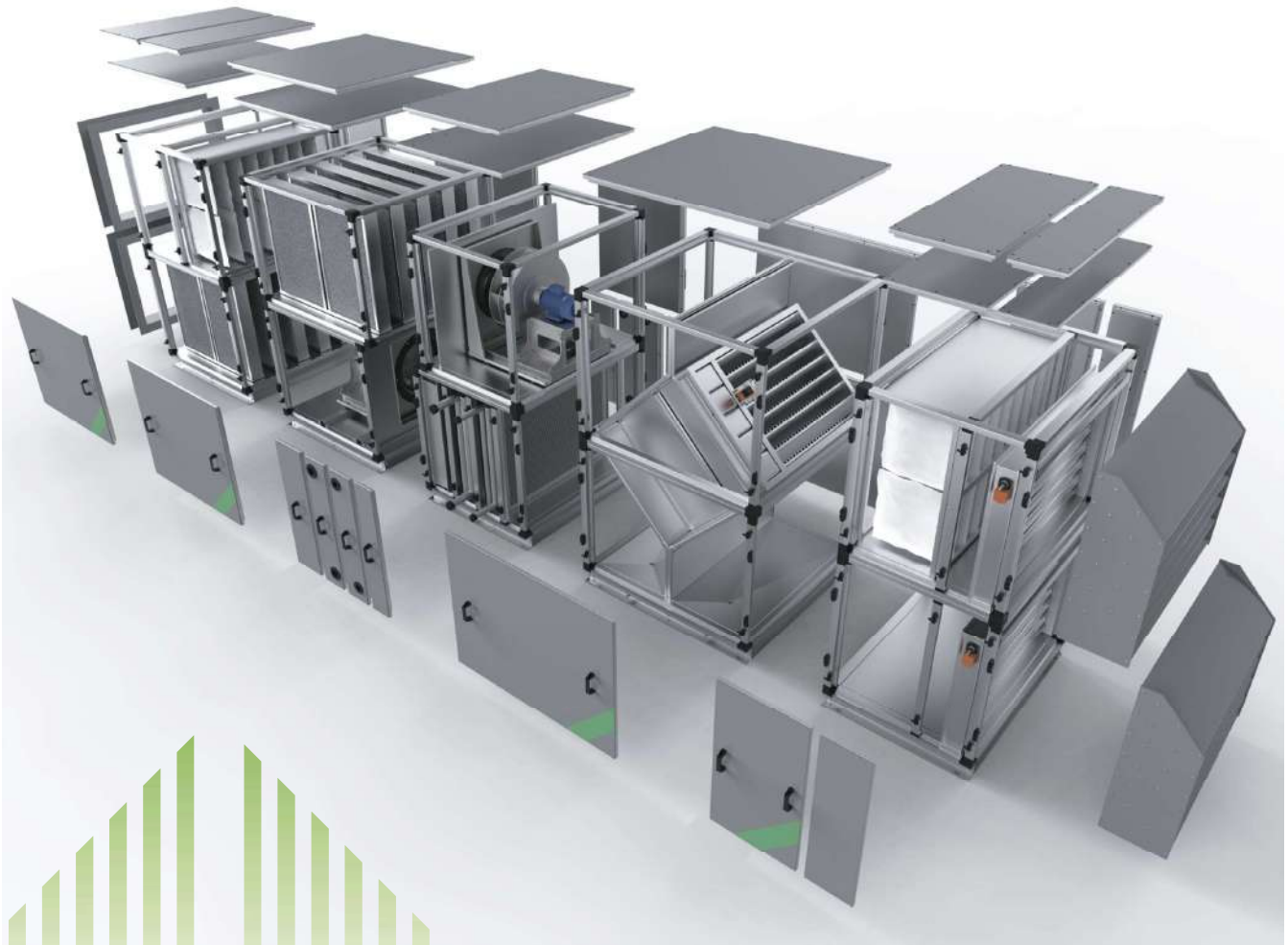
VRS - air handling units of this series are designed for residential, commercial and industrial buildings, hospitals, schools, sports facilities, clean and special industries. The air conditioners of this series purify, heat and supply fresh air, while extracting heat into the outgoing air and transferring it to the incoming one. This allows the air to be environmentally friendly, and also helps to create comfortable conditions in the room and at the same time significantly save electricity.
A wide range of models allows for the completion of units with different configurations.

• **1 000-130 000** m3/h •
• **41** standard sizes • **62** functional modules •

Modern requirements for ventilation and air conditioning systems are determined not only by the functional set of air treatment processes, but also by energy efficiency, environmental friendliness, safety and durability of the equipment. Depending on the specifics of the premises being serviced, their purpose, technologies used, architectural concept and design, an individual solution is required for each object when creating air treatment systems. From compact units, providing air purification and supply, to complex ones, that allow for creating and maintaining artificial microclimate parameters with high accuracy.

AIR FLOW RATES OF VRS UNITS





The VRS series of air handling units is based on a modular system that allows for assembling equipment of any complexity from modules and sections that provide a particular functional air treatment process. Such a system makes it possible to create installations taking into account individual project requirements of any degree of complexity for any field of application.

Air handling units of the VRS series allow performing a full range of air treatment processes: filtration, heating, cooling, dehumidification, humidification, heat and cold recovery and regeneration, noise reduction. To expand the range of application of the units and ensure optimal operating parameters, a number of special designs have been developed.

DESIGNATED NAME	design[1]					unit type[2]								topology[3]			
	00	01	02	03	04	0	1	2	3	4	5	6	7	0	1	2	3
VRS-300	●	–	–	–	–	●	●	●	●	●	●	●	●	●	●	●	●
VRS-500	–	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
VRS-550	–	●	–	●	–	●	●	●	●	●	–	–	–	●	●	–	–
VRS-700	●	●	●	●	●	●	●	●	–	–	●	●	–	●	–	●	●

[1]design

00 - for "standard" residential and industrial buildings;
01 - for "clean rooms" and industries that require high-quality air treatment;
02 - for medical institutions, healthcare facilities, and facilities that have special requirements for the corrosion resistance of equipment;
03 - for "standard" residential and industrial buildings with high requirements for the quality of air treatment and energy saving;
04 - for outdoor installation;

[2]unit type

0 - supply air unit;
1 - extract air unit;
2 - air handling unit with recirculation;
3 - air handling unit with rotary heat recovery unit;
4 - air handling unit with plate heat recovery unit;
5 - air handling unit with a heat recovery unit that operates by using an intermediate heat carrier;
6 - supply air unit with redundancy;
7 - extract air unit with redundancy.

[3]topology

0 - supply or extract air unit;
1 - two-tier combination of supply and extract air units;
2 - side by side combination of supply and extract air units;
3 - end-to-end combination of supply and extract air units.

SIDE BY SIDE COMBINATION OF SUPPLY AND EXTRACT AIR UNITS

TWO-TIER COMBINATION OF SUPPLY AND EXTRACT AIR UNITS

END-TO-END COMBINATION OF SUPPLY AND EXTRACT AIR UNITS

SUPPLY OR EXTRACT AIR UNIT

DESIGN OF VRS UNITS

Air handling units of the VRS series feature a frame structure. The frame elements are made of a special aluminum profile or galvanized steel and are connected to each other by corner elements. Removable or non-removable heat-insulated panels are used as external enclosing elements. The panel cladding is made of galvanized steel sheets, and the space between the claddings is filled with non-flammable mineral wool, which is characterized by high sound insulation properties (noise reduction reaches 30 dBA) and a low thermal conductivity coefficient (0.02 - 0.04 W/m·K). The panels minimize heat losses and ensure the tightness of the casing.

Additionally, the outer surface of the panels can be coated with powder paint. Based on the individual requirements of the project, the material of the frame, panels, their thickness and coating can vary, as well as the set of functional elements.

DESIGN VERSION 00 (VRS-300, VRS-700)	For "standard" residential and industrial buildings.
DESIGN VERSION 01 (VRS-500, VRS-550, VRS-700)	For "clean rooms" and industries that require high-quality air treatment, including food production and electronic industry facilities, healthcare facilities. All built-in elements feature free access for maintenance. The body surfaces are made from a special aluminum omega profile to fit the special shape of the "quarter" panel edge. The profile and panel together provide a smooth inner surface of the modules to avoid the accumulation of dust and dirt. The panels are always fastened from the outside. Special materials and components that are resistant to disinfectants and high humidity are used. All seals used are closed-pore ones. Cooler trays are designed to have slopes on all sides. All built-in elements feature free access for maintenance.
DESIGN VERSION 02 (VRS-500, VRS-700)	For "medical institutions", healthcare facilities and other projects with special requirements - surgery, production of drugs and biological medical products, chemical industry. For the "medical" design, the body surface is made of a special profile with a special panel shape, which provides a smooth inner surface of the modules to avoid the accumulation of dust and dirt. The panels are always fastened from the outside. Special materials and components resistant to disinfectants are used. All seals used are closed-pore ones. Cooler trays are designed to have slopes on all sides. All built-in elements feature free access for maintenance.
DESIGN VERSION 03 (VRS-500, VRS-550, VRS-700)	For "standard" residential and industrial buildings with high requirements for the quality of air treatment and energy saving. All built-in elements feature free access for maintenance. They are made of a special profile with a special panel shape, which provides a smooth inner surface of the modules to avoid the accumulation of dust and dirt. All seals used are closed-pore ones. The casing features increased strength and tightness.

DESIGN VERSION 04 (VRS-500, VRS-700)

Outdoor, "external" design for placement without shelter.

Outdoor air handling unitss are designed for installation on the roof of a building or in open areas. They are made of a special profile with a special panel shape, which ensures a smooth inner surface of the modules.

To protect the air handling units from precipitation, a special roof made of powder-coated galvanized steel is additionally supplied. For easy transport and installation, the roof is delivered separately non-assembled.

Also, for the external version, a special hood is additionally installed on the air intake modules to prevent precipitation from entering the air handling unit. A mesh is provided between the weather protection hood and the air intake module to protect against small objects entering the c air handling unit.

STANDARDS

The characteristics of the supply air unit casing, as well as the classification and technical characteristics of the units, components and sections are regulated by two European standards:

EN 1886-2007 "Air Handling Units – Mechanical Performance"

EN 13053-2011 "Air handling units. Nominal and technical characteristics of units, components and sections".

The characteristics of the casing are established in accordance with EN 1886 based on measurements made on the prototype and on the actual installation. The prototype is a supply air unit without installed components, consisting of two sections. Each section has a door. The dimensions and design must meet the requirements of the standard.

The thermal and acoustic characteristics of the casing are determined only on the basis of measurements made on the prototype. Mechanical strength, air leakage through the casing and leakage bypassing the filter must be determined on the basis of measurements made on a real installation designed for use in ventilation and air conditioning systems. The last three characteristics can also be defined for the prototype. However, for a clear and unambiguous distinction, the documentation should always indicate how the tests were performed: on a prototype (the index "M" is used) or on a real installation (the index "R" is used).

MECHANICAL STRENGTH

Two criteria for determining mechanical strength are:

- relative deflection ($mmxm^{-1}$) of the frame and panels under normal design conditions;
- mechanical resistance (no residual deformation) to the maximum fan pressure.

Where mechanical strength is determined for a prototype, the following pressure data shall be added:

DEFLECTION

±1 000 Pa according to EN 1886

FAN PRESSURE

±2 500 Pa according to EN 1886

MECHANICAL STRENGTH CLASSES ACCORDING TO EN 1886-2007

CASING CLASS	MAXIMUM RELATIVE DEFLECTION	QUALITY
D1	4	+
D2	10	↑
D3	no requirements	–

AIR LEAKAGE THROUGH THE CASING

Depending on the design of the air handling unit and the rated operating pressures, air leaks through the casing are measured under the following conditions:

- all sections of the air conditioner are tested at 400 Pa negative pressure if the air handling unit is only operating at negative pressure;
- sections of the air conditioner operating at positive pressure must be tested separately from other sections if the positive pressure directly behind the fan exceeds 250 Pa. If the positive pressure directly behind the fan does not exceed 250 Pa, it is sufficient to perform one general test for the entire air conditioner at negative pressure. Sections of the air conditioner operating at positive pressure must be tested at the greater of two values: 700 Pa positive pressure or at the maximum operating positive pressure of the air conditioner.

The permissible air leakage is tied to the class of the filter installed in the corresponding section. The table below shows the air leakage values corresponding to the specified filter classes.

AIR LEAKAGE CLASSES ACCORDING TO EN 1886

AIR LEAKAGE CLASS	MAXIMUM AIR LEAKAGE VOLUME AT -400 PA $L \times S^{-1} \times M^{-2}$	MAXIMUM AIR LEAKAGE VOLUME AT +700 PA $L \times S^{-1} \times M^{-2}$	MAXIMUM FILTER CLASS ACCORDING TO EN 779	QUALITY
L1	0,15	0,22	higher than F9	+ ↑ —
L2	0,44	0,63	F8÷F9	
L3	1,32	1,9	G1÷F7	

FILTER BYPASS LEAKS

Filter bypass leaks are added to the total volume of air after the filter section that has not been filtered.

The total volume of air that has not been filtered consists of:

- air that bypasses the filter element;
- air entering through the walls of the air conditioner sections located after the filter.

Leaks bypassing the filter element are measured at a pressure drop of 400 Pa. Sometimes the filter element is replaced by dummy plates with a tightness identical to that of filters.

The table below shows a list of permissible leaks bypassing the filter k as a percentage of rated air capacity.

MAXIMUM ALLOWABLE LEAK VOLUME BYPASSING THE FILTER ACCORDING TO EN1886

FILTER CLASS	G1÷M5	M6	F7	F8	F9
TOTAL LEAK VOLUME K, %	6	4	2	1	0,5

Air leaks, bypassing the filter, lead to a decrease in the efficiency of the filter, especially if the filter is a high-efficiency filter, since the bypass air is not filtered. Air leaks through the casing of the installation sections located after the filter act in the same way.

THERMAL CHARACTERISTICS OF THE CASING

The heat transfer coefficient U ($W \times м^{-2} \times K^{-1}$) is the energy loss per square meter of surface when there is a difference between external and internal temperatures.

Measurements should be made with a heat source installed in the prototype, when the total power supply and the average temperature difference inside and outside are determined in a stable state.

The heat transfer coefficient is defined as the ratio of the total delivered power and the temperature difference outside and inside to the outer surface area of the casing.

The classification of heat transfer coefficients is shown in the table:

HEAT TRANSFER COEFFICIENT ACCORDING TO EN 1886

CLASS	HEAT TRANSFER COEFFICIENT, ($W \times M^{-2} \times K^{-1}$)	QUALITY
T1	$U \leq \leq 0,5$	
T2	$0,5 < U \leq \leq 1,0$	
T3	$1,0 < U \leq \leq 1,4$	+ ↑ —
T4	$1,4 < U \leq \leq 2,0$	
T5	no requirements	

THERMAL BRIDGES

The thermal bridge factor is measured under the same conditions as the thermal conductivity coefficient. In a stable state, the highest temperature of the outer surface of the casing is measured.

The thermal bridge factor is defined as the ratio of the internal temperature minus the highest surface temperature of the casing and the temperature difference inside and outside.

The classification of the thermal bridge factor is shown in the table:

THERMAL BRIDGE FACTOR ACCORDING TO EN 1886

CLASS	THERMAL BRIDGE FACTOR (KB) EN 1886	QUALITY
TB1	$0,75 < kb \leq \leq 1,0$	
TB2	$0,6 < kb \leq \leq 0,75$	
TB3	$0,45 < kb \leq \leq 0,6$	+ ↑ —
TB4	$0,3 < kb \leq \leq 0,45$	
TB5	no requirements	

The value of the thermal bridge factor indicates whether there is condensation on the casing or not. Simultaneously with the increase in the value of the thermal bridge factor, the probability of condensation decreases.

For TB3 and TB4 classes, one percent of the outer surface may have a higher temperature than the maximum allowable temperature value for the class. This is not acceptable for TB1 and TB2 classes.

ACOUSTIC INSULATION OF THE CASING

EN 1886 defines the degree of sound absorption as the amount by which the noise of a source placed in a prototype is reduced. To do this, first the sound pressure level of a noise source placed on the floor in an imaginary enclosed space is measured. Further, the measurements are repeated in the same enclosed space, but the noise source is placed in the prototype. The difference in the measured sound pressure levels, spread over the octave frequency band from 125 Hz to 8,000 Hz, is the degree of sound absorption of the casing, including the door and frame.

VRS DESIGN OPTIONS

DESIGN	AIR CONDITIONER SERIES			
	VRS-300	**VRS-500**	**VRS-550**	**VRS-700**
00	●	–	–	●
02	–	●	–	●
04	–	●	–	●
01, 03	–	●	●	●

VRS-300

The VRS-300 air handling unit casing consists of closed aluminum profiles connected by strong corner fasteners made of aluminum alloy or high-strength fiberglass-reinforced special plastic and three-layer panels with an internal filler of dense mineral wool. The panel thickness is 25 mm. For the manufacture of panel walls, a galvanized sheet with a thickness of 0.7 mm is used. On request, the exterior walls of the panels can be powder-coated, the default coating color is RAL 7004.

The panels are attached to the frame profile by fasteners from the inside of the installation. A special seal is glued between the panels and the frame to prevent leakage through the casing.

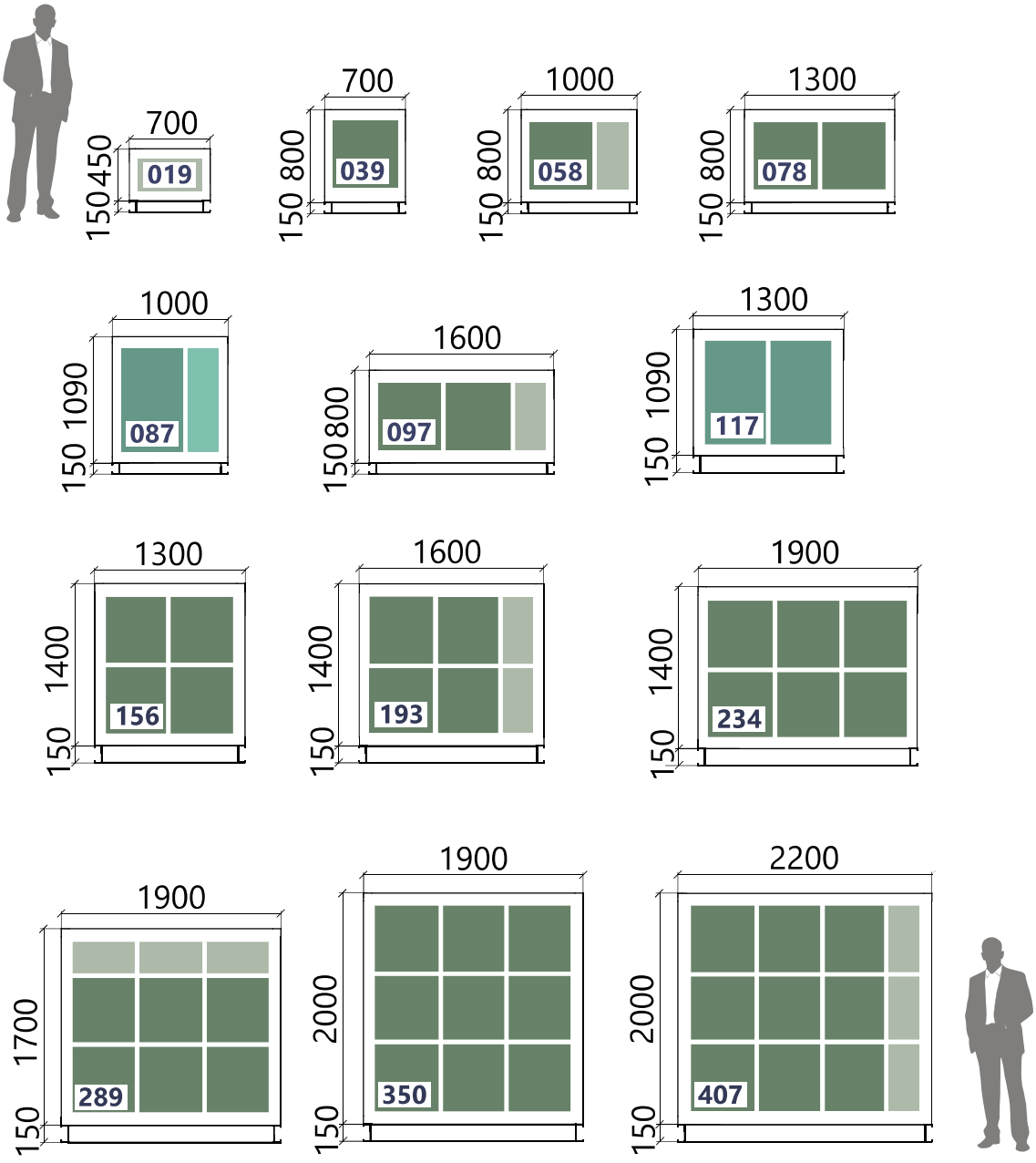
VRS-300 air handling unit modules are installed on 150 mm high galvanized steel support frames. It's also possible to order support frames of different height - 350 mm.

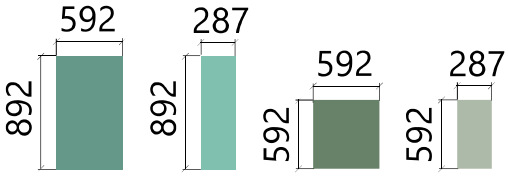
CASING CHARACTERISTICS	
Thermal conductivity coefficient	**T4**
Thermal bridges	**TB4**
Class of air leakage through the casing	**L3**
Casing strength class	**D2**

SOUND ABSORPTION OF THE CASING

Octave frequency band, Hz	63	125	250	500	1000	2000	4000	8000
Sound absorption	10	12	18	25	25	27	30	32

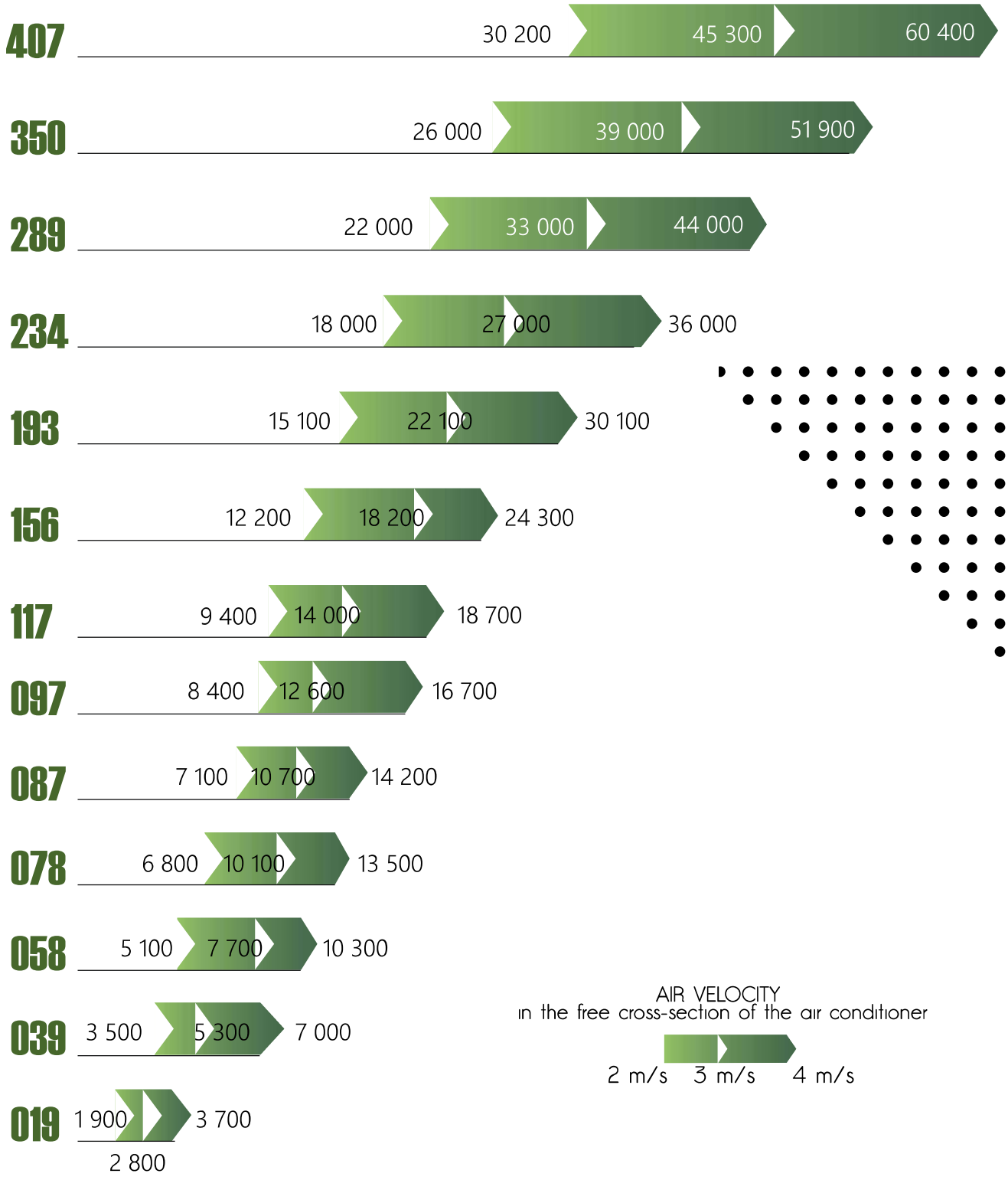
MODULE OVERALL DIMENSIONS



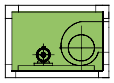
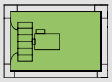
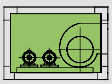
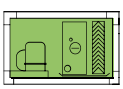


DIMENSIONS OF THE FILTER CASSETTES USED

PERFORMANCE INTERVALS

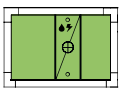
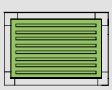


MODULE SIZES

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX												
			019	**039**	**058**	**078**	**087**	**097**	**117**	**156**	**193**	**234**	**289**	**350**	**407**
centrifugal fan		length L* width B height H	802 700 450	990 700 800	1200 1000 800	1200 1300 800	1460 1000 1090	200 1600 800	1500 1300 1090	1780 1300 1400	890 1600 1400	2010 1900 1400	2240 1900 1700	2240 1900 2000	2650 2200 2000
VSK fan		length L* width B height H	750 700 450	900 700 800	950 1000 800	1000 1300 800	1100 1000 1090	1000 1600 800	1150 1300 1090	1400 1300 1400	1500 1600 1400	1550 1900 1400	1850 1900 1700	2050 1900 2000	2050 2200 2000
EC fan		length L* width B height H	700 700 450	800 700 800	850 1000 800	950 1300 800	1000 1000 1090	1100 1600 800	1100 1300 1090	— — —	— — —	— — —	— — —	— — —	— — —
centrifugal fan (with reserve motor)		довжина L* ширина B висота H	1054 700 450	1300 700 800	1500 1000 800	1500 1300 800	1890 1000 1090	1500 1600 800	1930 1300 1090	2250 1300 1400	2370 1600 1400	2470 1900 1400	2750 1900 1700	2750 1900 2000	3270 2200 2000
panel filter G3-F5		length L width B height H	260 700 450	260 700 800	260 1000 800	260 1300 800	260 1000 1090	260 1600 800	300 1300 1090	300 1300 1400	300 1600 1400	300 1900 1400	300 1900 1700	300 1900 2000	300 2200 2000
compact bag filter F5-F9 (L bag = 292 mm)		length L width B height H	500 700 450	500 700 800	— — —	550 1300 800	— — —	— — —	— — —	530 1300 1400	— — —	530 1900 1400	530 1900 1700	530 1900 2000	— — —
bag filter G4-F6 (L bag = 360 mm)		length L width B height H	550 700 450	550 700 800	550 1000 800	550 1300 800	550 1000 1090	550 1600 800	590 1300 1090	590 1300 1400	590 1600 1400	590 1900 1400	590 1900 1700	590 1900 2000	590 2200 2000
bag filter F7-F9 (L bag = 600 mm)		length L width B height H	740 700 450	740 700 800	740 1000 800	740 1300 800	740 1000 1090	740 1600 800	780 1300 1090	780 1300 1400	780 1600 1400	780 1900 1400	780 1900 1700	780 1900 2000	780 2200 2000
liquid air heater		length L* width B height H	540 700 450	540 700 800	540 1000 800	540 1300 800	540 1000 1090	540 1600 800	580 1300 1090	580 1300 1400	580 1600 1400	580 1900 1400	580 1900 1700	580 1900 2000	580 2200 2000
electric air heater		length L width B height H	660 700 450	660 700 800	660 1000 800	660 1300 800	660 1000 1090	660 1600 800	700 1300 1090	700 1300 1400	700 1600 1400	700 1900 1400	700 1900 1700	700 1900 2000	700 2200 2000
electric explosion-proof air heater		length L width B height H	950 700 450	950 700 800	950 1000 800	950 1300 800	950 1000 1090	950 1600 800	1150 1300 1090	1150 1300 1400	1150 1600 1400	1150 1900 1400	1150 1900 1700	1150 1900 2000	1150 2200 2000
steam air heater		length L width B height H	— — —	320 700 800	320 1000 800	320 1300 800	320 1000 1090	320 1600 800	360 1300 1090	360 1300 1400	360 1600 1400	360 1900 1400	360 1900 1700	360 1900 2000	360 2200 2000
liquid air cooler		length L* width B height H	860 700 450	860 700 800	860 1000 800	860 1300 800	860 1000 1090	860 1600 800	900 1300 1090	900 1300 1400	900 1600 1400	900 1900 1400	900 1900 1700	900 1900 2000	900 2200 2000
direct evaporation cooler		length L width B height H	840 700 450	840 700 800	840 1000 800	840 1300 800	840 1000 1090	840 1600 800	880 1300 1090	880 1300 1400	880 1600 1400	880 1900 1400	880 1900 1700	880 1900 2000	880 2200 2000
evaporative air cooler with compressor		length L* width B height H	— — —	1200 700 800	1200 1000 800	1200 1300 800	1500 1000 1090	1500 1300 1090	1955 1420 1177	1955 1540 1264	1500 1660 1351	1500 1780 1438	2000 1900 1525	2000 2020 1612	2000 2200 2000
compressor-receiver module		length L* width B height H	— — —	900 700 800	900 1000 800	900 1300 800	1010 1000 1090	1010 1300 1090	1010 1420 1177	1010 1540 1264	1010 1660 1351	1610* 1900 1525	1610* 1900 1525	1610* 2020 1612	1610* 2200 2000

* maximum size (may be reduced).

AIR HANDLING UNITS

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX												
			019	039	058	078	087	097	117	156	193	234	289	350	407
plate heat recovery unit		length L width B height H	900 700 900	1400 700 1600	1400 1000 1600	1400 1300 1600	2000 1000 2180	1400 1600 1600	2000 1300 2180	2300 1300 2800	2300 1600 2800	2300 1900 2800	2600 1900 3400	3100 1900 4000	3100 2200 4000
rotary heat recovery unit		length L width B height H	330 700 900	330 700 1600	330 1050 1600	330 1300 1600	330 1200 2180	330 1600 1600	330 1500 2180	400 1700 2800	400 1800 2800	400 1900 2800	440 2300 3400	440 2500 4000	440 2700 4000
heating regenerative heat exchanger with intermediate heat carrier		length L* width B height H	540 700 450	540 700 800	540 1000 800	540 1300 800	540 1000 1090	540 1600 800	580 1300 1090	580 1300 1400	580 1600 1400	580 1900 1400	580 1900 1700	580 1900 2000	580 2200 2000
cooling regenerative heat exchanger with intermediate heat carrier		length L* width B height H	860 700 450	860 700 800	860 1000 800	860 1300 800	860 1000 1090	860 1600 800	900 1300 1090	900 1300 1400	900 1600 1400	900 1900 1400	900 1900 1700	900 1900 2000	900 2200 2000
intermediate compartment		length L width B height H	425 700 450	425 700 800	425 1000 800	425 1300 800	525 1000 1090	425 1600 800	565 1300 1090	665 1300 1400	665 1600 1400	665 1900 1400	765 1900 1700	865 1900 2000	865 2200 2000
sound absorber L1plate = 500 mm; L2plate = 1000 mm; L3plate = 1500 mm; L4plate = 2000 mm		length L1 length L2 length L3 length L4 width B height H	605 1105 1605 2105 700 450	605 1105 1605 2105 700 800	605 1105 1605 2105 1000 800	605 1105 1605 2105 1300 800	605 1105 1605 2105 1000 1090	605 1105 1605 2105 1600 800	645 1145 1645 2145 1300 1090	645 1145 1645 2145 1300 1400	645 1145 1645 2145 1600 1400	645 1145 1645 2145 1900 1400	645 1145 1645 2145 1900 1700	645 1145 1645 2145 1900 2000	645 1145 1645 2145 2200 2000
honeycomb humidification chamber		length L width B height H	— — —	1060 700 800	1060 1000 800	1060 1300 800	1060 1000 1090	1060 1600 800	1100 1300 1090	1100 1300 1400	1100 1600 1400	1100 1900 1400	1100 1900 1700	1100 1900 2000	1100 2200 2000
spray humidification chamber		length L width B height H	— — —	— — —	— — —	— — —	— — —	— — —	600 1300 1090	1600 1300 1400	1600 1600 1400	1600 1900 1400	1600 1900 1700	1800 1900 2000	1800 2200 2000
steam humidification chamber		length L width B height H	1000 700 450	1000 700 800	1000 1000 800	1000 1300 800	1000 1000 1090	1000 1600 800	1000 1300 1090	1000 1300 1400	1000 1600 1400	1000 1900 1400	1000 1900 1700	1000 1900 2000	1000 2200 2000
air intake module with vertical valve		length L width B height H	450 700 450	450 700 800	450 1000 800	450 1300 800	600 1000 1090	450 1600 800	640 1300 1090	790 1300 1400	790 1600 1400	790 1900 1400	765 1900 1700	865 1900 2000	865 2200 2000
air intake module with horizontal valve		length L width B height H	450 700 450	460 700 800	460 1000 800	460 1300 800	610 1000 1090	460 1600 800	650 1300 1090	800 1300 1400	800 1600 1400	800 1900 1400	935 1900 1700	1085 1900 2000	1085 2200 2000
air intake module (two valves)		length L width B height H	450 700 450	460 700 800	460 1000 800	460 1300 800	610 1000 1090	460 1600 800	650 1300 1090	800 1300 1400	800 1600 1400	800 1900 1400	935 1900 1700	1085 1900 2000	1085 2200 2000
special air intake module*		length L width B height H	1000 700 450	1000 700 800	1000 1000 800	1000 1300 800	1000 1000 1090	1000 1600 800	1040 1300 1090	1040 1300 1400	1040 1600 1400	1040 1900 1400	1040 1900 1700	1040 1900 2000	1040 2200 2000
air disinfection module		length L width B height H	1500 700 540	1500 700 800	1500 1000 800	1500 1300 800	1500 1000 1090	1500 1600 800	1540 1300 1090	1540 1300 1400	1540 1600 1400	1540 1900 1400	1540 1900 1700	1540 1900 2000	1540 2200 2000
gas heating module		length L width B height H	— — —	1000 700 1540	1150 1000 1540	1150 1300 1540	1150 1000 1540	1150 1600 1540	1350** 1300 1540	1350* 1300 1540	1700** 1600 1540	1390** 1900 1540	1950** 1900 1540	1950** 1900 1540	1950** 2200 1540

* for outdoor temperature below -40°C

** maximum size (may be reduced).

ORDERING DATA

VRS-300-019-00-1-1

- air handling units
- frontal area index

(019, 039, 058, 078, 087, 097, 117, 156, 193, 234, 289, 350, 407)

- design

(00 - for "standard" residential and industrial buildings)

- unit type

(0 - supply, 1 - extract, 2 - two recirculation units
3 - rotary heat recovery unit, 4 - plate heat recovery unit
5 - heat recovery unit with intermediate heat carrier,
6 - supply air unit with redundancy, 7 - extract air unit with redundancy)

- unit topology

(0 - supply or extract air unit, 1 - two-tier combination of supply and extract air units,
2 - side by side combination of supply and extract air units, 3 - end-to-end combination of supply and extract air units)

OUR OBJECTS

SHOPPING AND ENTERTAINMENT CENTER "FORUM", LVIV

RESIDENTIAL COMPLEX "PARK LAKES", KYIV

WALNUT PROCESSING SHOP OF WALNUT GLOBAL LLC, KYIV REGION

VRS-500

The air handling unit casing consists of closed aluminum profiles connected by strong corner fasteners made of aluminum alloy or high-strength fiberglass-reinforced special plastic and three-layer panels with an internal filler of dense mineral wool. The panel thickness is 50 mm. For the manufacture of panel walls, a galvanized sheet with a thickness of 0.7 mm is used. Design version 01 comes with powder coating on external and internal panels as standard. In design version 02, the exterior panels are powder-coated, the interior panels are made of stainless steel. In design version 03, external and internal panels manufactured without additional coating. In design version 04, the internal panels are without additional painting, and the external ones are powder-coated.

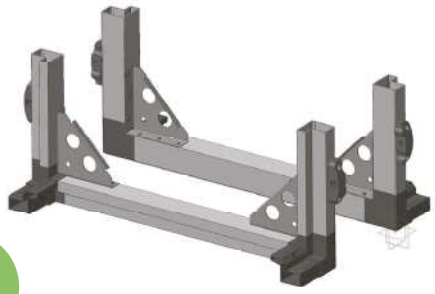
The panels are attached to the frame profile with self-tapping screws fastened from the outside. Thus, preventing the protrusion of fasteners on the inner surface of the installation. A special seal is glued between the panels and the frame to prevent leakage through the casing. Holes in the panels are closed from the outside with special plugs.

The special frame and shape of the panels allow for a smooth inner surface of the sections, which significantly reduces the accumulation of dust and other contaminants.

When joining two modules in the frame, a specially shaped profile and corners plates are used, which allow for a flat inner surface between the sections of the air handling units.

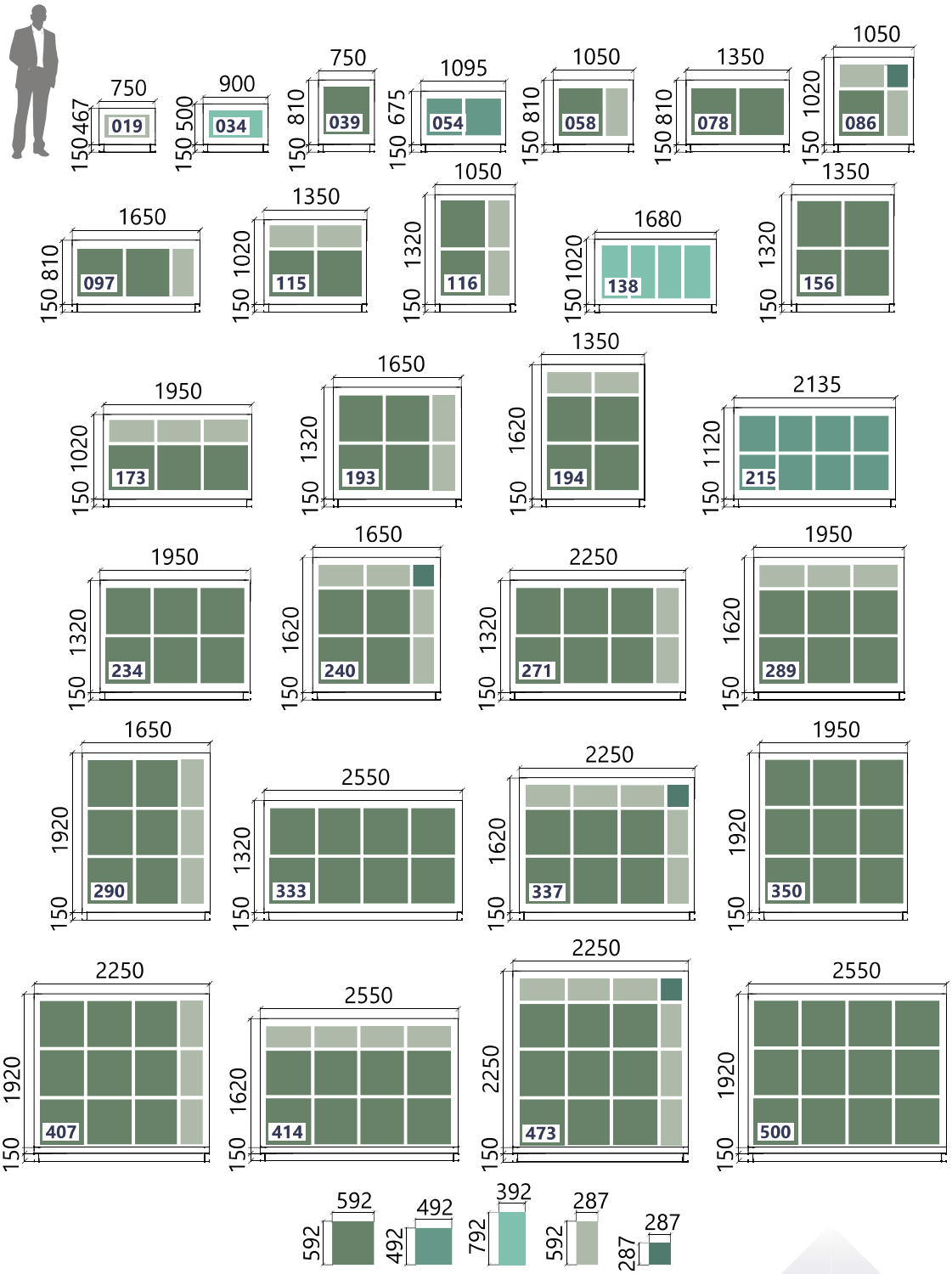
VRS-500 air handling unit modules are installed on 150 mm high galvanized steel support frames. It's also possible to order support frames of different height - up to 350 mm in increments of 50 mm.

CASING CHARACTERISTICS	
Thermal conductivity coefficient	**T3**
Thermal bridges	**TB3**
Class of air leakage through the casing	**L1**
Casing strength class	**D1**



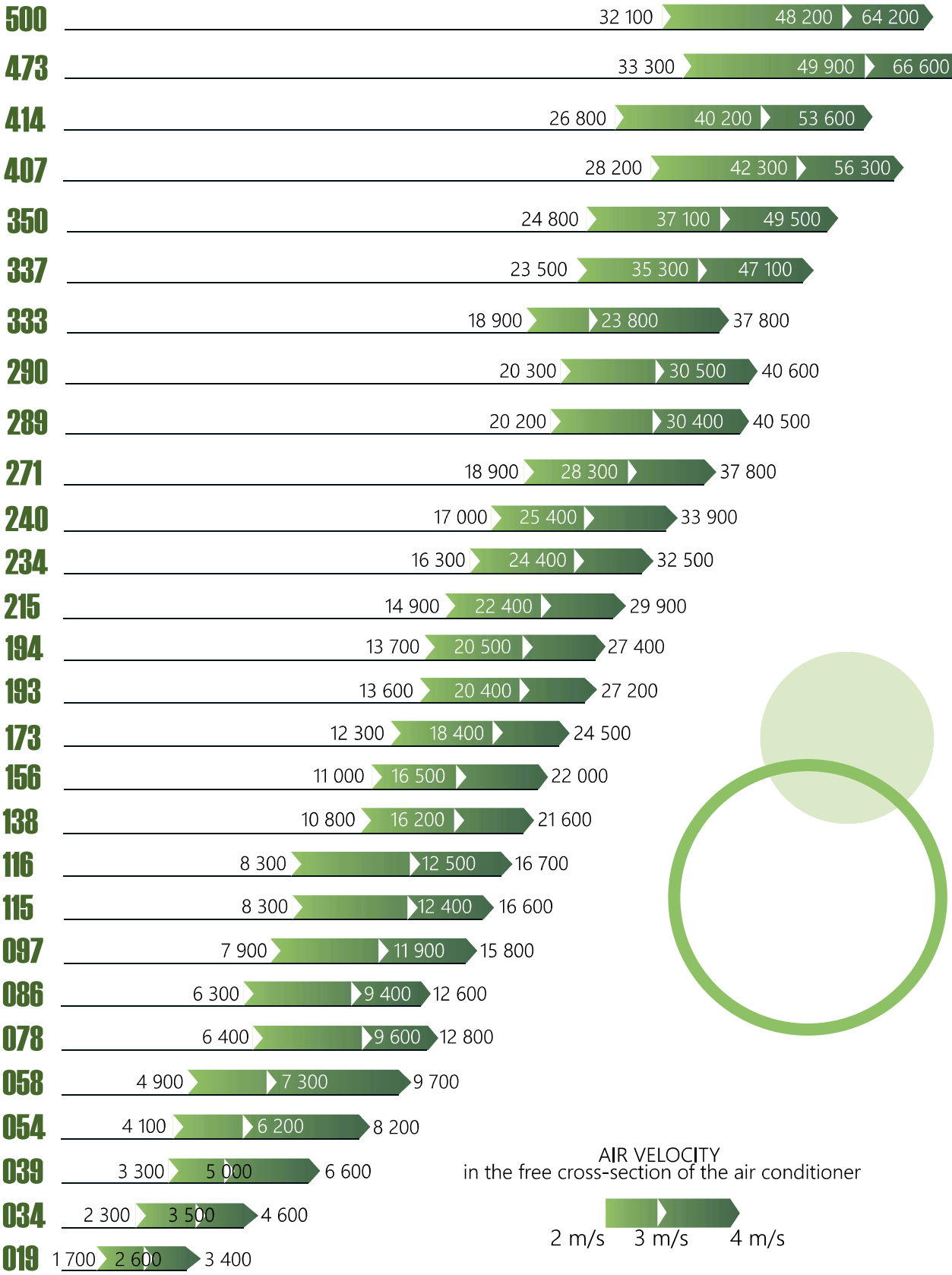
SOUND ABSORPTION OF THE CASING								
Octave frequency band, Hz	63	125	250	500	1000	2000	4000	8000
Sound absorption	16	18	23	32	33	34	35	34

MODULE OVERALL DIMENSIONS



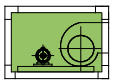
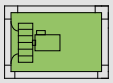
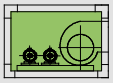
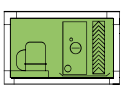
DIMENSIONS OF THE FILTER CASSETTES USED

PERFORMANCE INTERVALS

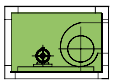
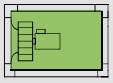
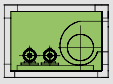
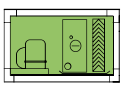


AIR VELOCITY
in the free cross-section of the air conditioner

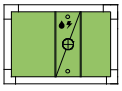
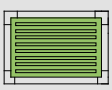
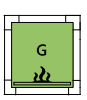
MODULE SIZES

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX													
			019	034	039	054	058	078	086	097	115	116	138	156	173	193
centrifugal fan		length L* width B height H	812 750 467	— — —	1030 750 810	970 1095 675	1240 1050 810	1240 1350 810	1500 1050 1020	1240 1650 810	1500 1350 1020	1500 1050 1320	1500 1680 1020	1780 1350 1320	1500 1950 1020	1890 1650 1320
VSK fan		length L* width B height H	800 750 467	800 900 500	800 750 810	800 1095 675	1000 1050 810	1050 1350 810	1050 1050 1020	1050 1650 810	1150 1350 1020	1150 1050 1320	1150 1680 1020	1300 1350 1320	1200 1950 1020	1550 1650 1320
EC fan		length L* width B height H	750 750 467	850 900 500	850 750 810	900 1095 675	900 1050 810	1000 1350 810	1050 1050 1020	1050 1650 810	1150 1350 1020	1150 1050 1320	1150 1680 1020	— — —	— — —	— — —
centrifugal fan (with reserve motor)		length L* width B height H	1094 750 467	— — —	1340 750 810	1240 1095 675	1540 1050 810	1540 1350 810	1930 1050 1020	1540 1650 810	1930 1350 1020	1930 1050 1320	1930 1680 1020	2250 1350 1320	1930 1950 1020	2370 1650 1320
panel filter G3-F5		length L width B height H	310 750 467	310 900 500	310 750 810	310 1095 675	310 1050 810	310 1350 810	310 1050 1020	310 1650 810	310 1350 1020	310 1050 1320	310 1680 1020	310 1350 1320	310 1950 1020	310 1650 1320
bag filter G4-F6 (L bag = 360 mm)		length L width B height H	510 750 467	510 900 500	510 750 810	510 1095 675	510 1050 810	510 1350 810	510 1050 1020	510 1650 810	510 1350 1020	510 1050 1320	510 1680 1020	510 1350 1320	510 1950 1020	510 1650 1320
bag filter F7-F9 (L bag = 600 mm)		length L width B height H	750 750 467	750 900 500	750 750 810	750 1095 675	750 1050 810	750 1350 810	750 1050 1020	750 1650 810	750 1350 1020	750 1050 1320	750 1680 1020	750 1350 1320	750 1950 1020	750 1650 1320
high-purity filter block		length L width B height H	1050 750 467	1050 900 500	1050 750 810	— — —	1050 1050 810	1050 1350 810	1050 1050 1020	1050 1650 810	1050 1350 1020	1050 1050 1320	1050 1680 1020	1050 1350 1320	1050 1950 1020	1050 1650 1320
liquid air heater		length L* width B height H	580 750 467	580 900 500	580 750 810	580 1095 675	580 1050 810	580 1350 810	580 1050 1020	580 1650 810	580 1350 1020	580 1050 1320	580 1680 1020	580 1350 1320	580 1950 1020	580 1650 1320
electric air heater		length L width B height H	770 750 467	770 900 500	770 750 810	770 1095 675	770 1050 810	770 1350 810	770 1050 1020	770 1650 810	770 1350 1020	770 1050 1320	770 1680 1020	770 1350 1320	770 1950 1020	770 1650 1320
electric explosion-proof air heater		length L* width B height H	1150 750 467	1150 900 500	1150 750 810	1150 1095 675	1150 1050 810	1150 1350 810	1150 1050 1020	1150 1650 810	1150 1350 1020	1150 1050 1320	1150 1680 1020	1150 1350 1320	1150 1950 1020	1150 1650 1320
steam air heater		length L width B height H	— — —	— — —	360 750 810	360 1095 675	360 1050 810	360 1350 810	360 1050 1020	360 1650 810	360 1350 1020	360 1050 1320	360 1680 1020	360 1350 1320	360 1950 1020	360 1650 1320
liquid air cooler		length L* width B height H	800 750 467	800 900 500	800 750 810	800 1095 675	800 1050 810	800 1350 810	800 1050 1020	800 1650 810	800 1350 1020	800 1050 1320	800 1680 1020	800 1350 1320	800 1950 1020	800 1650 1320
direct evaporation cooler		length L* width B height H	800 750 467	800 900 500	800 750 810	800 1095 675	800 1050 810	800 1350 810	800 1050 1020	800 1650 810	800 1350 1020	800 1050 1320	800 1680 1020	800 1350 1320	800 1925 1020	800 1650 1320
evaporative air cooler with compressor		length L* width B height H	— — —	— — —	1250 750 810	1250 1095 675	1250 1050 810	1250 1350 810	1550 1050 1020	1550 1650 810	2000 1050 1320	2000 1050 1320	2000 1680 1020	2000 1350 1320	2000 1950 1020	1550 1650 1320
compressor-receiver module		length L width B height H	— — —	— — —	940 750 810	940 1095 675	940 1050 810	940 1350 810	1050 1050 1020	1050 1650 810	1050 1350 1020	1050 1050 1320	1050 1680 1020	1050 1350 1320	1050 1950 1020	1050 1650 1320

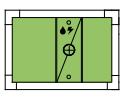
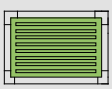
* maximum size (may be reduced)

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX													
			194	**215**	**234**	**240**	**271**	**289**	**290**	**333**	**337**	**350**	**407**	**414**	**473**	**500**
centrifugal fan		length L* width B height H	1780 1350 1620	1780 2135 1120	1890 1950 1320	2010 1650 1620	1890 2250 1320	2240 1950 1620	2240 1650 1920	1890 2550 1320	2010 2250 1620	2240 1950 1920	2400 2250 1920	2010 2550 1620	2650 2250 2250	2400 2550 1920
VSK fan		length L* width B height H	1400 1350 1620	1300 2135 1120	1400 1950 1320	1550 1650 1620	1400 2250 1320	1750 1950 1620	1550 1650 1920	1400 2550 1320	1550 2250 1620	1900 1950 1920	2050 2250 1920	1750 2550 1620	2050 2250 2250	1750 2550 1920
EC fan		length L* width B height H	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —
centrifugal fan (with reserve motor)		length L* width B height H	2250 1350 1620	2250 2135 1120	2370 1950 1320	2470 1650 1620	2370 2250 1320	2750 1950 1620	2750 1650 1920	2370 2550 1320	2470 2250 1620	2750 1950 1920	3070 2250 1920	2470 2550 1620	3270 2250 2250	3070 2550 1920
panel filter G3-F5		length L width B height H	310 1350 1620	310 2135 1120	310 1950 1320	310 1650 1620	310 2250 1320	310 1950 1620	310 1650 1920	310 2550 1320	310 2250 1620	310 1950 1920	310 2250 1920	310 2550 1620	310 2250 2250	310 2550 1920
bag filter G4-F6 (L bag = 360 mm)		length L width B height H	510 1350 1620	510 2135 1120	510 1950 1320	510 1650 1620	510 2250 1320	510 1950 1620	510 1650 1920	510 2550 1320	510 2250 1620	510 1950 1920	510 2250 1920	510 2550 1620	510 2250 2250	510 2550 1920
bag filter F7-F9 (L bag = 600 mm)		length L width B height H	750 1350 1620	750 2135 1120	750 1950 1320	750 1650 1620	750 2250 1320	750 1950 1620	750 1650 1920	750 2550 1320	750 2250 1620	750 1950 1920	750 2250 1920	750 2550 1620	750 2250 2250	750 2550 1920
high-purity filter block		length L width B height H	— — —	1050 2135 1120	1050 1950 1320	— — —	1050 2250 1320	— — —	1050 1650 1920	1050 2550 1320	— — —	1050 1950 1920	1050 2250 1920	— — —	1050 2250 2250	1050 2550 1920
liquid air heater		length L* width B height H	580 1350 1620	580 2135 1120	580 1950 1320	580 1650 1620	580 2250 1320	580 1950 1620	580 1650 1920	580 2550 1320	580 2250 1620	580 1950 1920	580 2250 1920	580 2550 1620	580 2250 2250	580 2550 1920
electric air heater		length L width B height H	770 1350 1620	770 2135 1120	770 1950 1320	770 1650 1620	770 2250 1320	770 1950 1620	770 1650 1920	770 2550 1320	770 2250 1620	770 1950 1920	770 2250 1920	770 2550 1620	770 2268 2250	770 2550 1920
electric explosion-proof air heater		length L* width B height H	1150 1350 1620	1150 2135 1120	1150 1950 1320	1150 1650 1620	1150 2250 1320	1150 1950 1620	1150 1650 1920	1150 2550 1320	1150 2250 1620	1150 1950 1920	1150 2250 1920	1150 2550 1620	1150 2250 2250	1150 2550 1920
steam air heater		length L width B height H	360 1350 1620	360 2135 1120	360 1950 1320	360 1650 1620	360 2250 1320	360 1950 1620	360 1650 1920	360 2550 1320	360 2250 1620	360 1950 1920	360 2250 1920	360 2550 1620	360 2250 2250	360 2550 1920
liquid air cooler		length L* width B height H	710 1350 1620	710 2135 1120	710 1950 1320	710 1650 1620	710 2250 1320	710 1950 1620	710 1650 1920	710 2550 1320	710 2250 1620	710 1950 1920	710 2250 1920	710 2550 1620	710 2250 2250	710 2550 1920
direct evaporation cooler		length L* width B height H	800 1350 1620	800 2135 1120	800 1950 1320	800 1650 1620	800 2250 1320	800 1950 1620	800 1650 1920	800 2550 1320	800 2250 1620	800 1950 1920	800 2250 1920	800 2550 1620	800 2250 2250	800 2550 1920
evaporative air cooler with compressor		length L* width B height H	2000 1350 1620	2000 2135 1120	2000 1950 1320	2000 1650 1620	2000 2250 1320	2000 1950 1620	2000 1650 1920	2000 2550 1320	2000 2250 1620	2000 1950 1920	2000 2250 1920	2000 2550 1620	2000 2250 2250	2000 2550 1920
compressor-receiver module		length L width B height H	1050 1350 1620	1050 2135 1120	1050 1950 1320	1650 1650 1620	1650 2250 1320	1650 1950 1620	1650 1650 1920	1650 2505 1320	1650 2250 1620	1650 1950 1920	1650 2250 1920	1650 2550 1620	1650 2250 2250	1650 2550 1920

* maximum size (may be reduced)

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX													
			019	034	039	054	058	078	086	097	115	116	138	156	173	193
plate heat recovery unit		length L	910	1100	1410	1100	1410	1410	2010	1400	2010	—	2100	2310	2100	2310
		width B	750	900	750	1095	1050	1350	1050	1650	1350	—	1680	1350	1950	1650
		height H	930	1000	1620	1350	1620	1620	2040	1620	2040	—	2040	2640	2040	2640
rotary heat recovery unit		length L	530	530	530	530	530	530	530	570	570	—	570	570	570	570
		width B	750	900	1100	1095	1380	1350	1540	1650	1750	—	1680	2050	1950	2250
		height H	930	1000	1620	1350	1620	1620	2040	1620	2040	—	2040	2640	2040	2640
heating regenerative heat exchanger with intermediate heat carrier		length L*	580	580	580	580	580	580	580	580	580	580	580	580	580	580
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
cooling regenerative heat exchanger with intermediate heat carrier		length L*	800	800	800	800	800	800	800	800	800	800	800	800	800	800
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
intermediate compartment		length L	480	480	480	480	480	480	580	580	580	580	680	680	680	680
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
sound absorber L1plate = 500 mm; L2plate = 1000 mm; L3plate = 1500 mm; L4plate = 2000 mm		length L1	660	660	660	660	660	660	660	660	660	660	660	660	660	660
		length L2	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160	1160
		length L3	1660	1660	1660	1660	1660	1660	1660	1660	1660	1660	1660	1660	1660	1660
		length L4	2160	2160	2160	2160	2160	2160	2160	2160	2160	2160	2160	2160	2160	2160
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
honeycomb humidification chamber		length L	—	1010	1010	1010	1010	1010	1110	1110	1110	1110	1110	1110	1110	1110
		width B	—	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	—	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
spray humidification chamber		length L	—	—	—	—	—	—	—	—	1610	1610	1610	1610	1610	1610
		width B	—	—	—	—	—	—	—	—	1350	1050	1680	1350	1950	1650
		height H	—	—	—	—	—	—	—	—	1020	1320	1020	1320	1020	1320
steam humidification chamber		length L	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
air intake module with vertical valve		length L	470	470	470	470	470	470	570	570	570	570	670	670	670	670
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
air intake module with horizontal valve		length L	505	540	485	485	485	485	485	485	485	635	485	635	485	635
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
air intake module (two valves)		length L	505	540	485	485	485	485	585	485	485	635	485	635	485	635
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
special air intake module**		length L	1010	1010	1010	1010	1010	1010	1010	1010	1050	1050	1050	1050	1050	1050
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
air disinfection module		length L	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550
		width B	750	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	467	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1320
gas heating module		length L	—	1000	1000	1150	1150	1150	1150	1150	1350	1350	1350	1350	1700	1700
		width B	—	900	750	1095	1050	1350	1050	1650	1350	1050	1680	1350	1950	1650
		height H	—	500	810	675	810	810	1020	810	1020	1320	1020	1320	1020	1220

** for outdoor temperatures below -40°C * maximum size (may be reduced).

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX												
			194	215	234	240	271	289	290	333	337	350	407	414	473	500
plate heat recovery unit		length L width B height H	— — —	2000 2135 2240	2700 1950 2640	2610 1650 3240	2700 2250 2640	2610 1950 3240	— — —	2700 2550 2640	— — —	3160 1950 3840	— — —	— — —	3160 2250 4500	— — —
rotary heat recovery unit		length L width B height H	— — —	570 2135 2240	570 2450 2640	— — —	570 2250 2640	570 2700 3240	— — —	570 2550 2640	680 2925 3240	570 2605 3840	— — —	680 3215 3240	680 2810 4500	790 3585 3840
heating regenerative heat exchanger with intermediate heat carrier		length L* width B height H	580 1350 1620	580 2135 1120	580 1950 1320	580 1650 1620	580 2250 1320	580 1950 1620	580 1650 1920	580 2550 1320	580 2250 1620	580 1950 1920	580 2250 1920	580 2550 1620	580 2250 2250	580 2550 1920
cooling regenerative heat exchanger with intermediate heat carrier		length L* width B height H	800 1350 1620	800 2135 1120	800 1950 1320	800 1650 1620	800 2250 1320	800 1950 1620	800 1650 1920	800 2550 1320	800 2250 1620	800 1950 1920	800 2250 1920	800 2550 1620	800 2250 2250	800 2550 1920
intermediate compartment		length L width B height H	680 1350 1620	680 2135 1120	680 1950 1320	680 1650 1620	680 2250 1320	780 1950 1620	780 1650 1920	780 2550 1320	880 2250 1620	880 1950 1920	880 2250 1920	880 2550 1620	880 2250 2250	880 2550 1920
sound absorber L1plate = 500 mm; L2plate = 1000 mm; L3plate = 1500 mm; L4plate = 2000 mm		length L1 length L2 length L3 length L4 width B height H	660 1160 1660 2160 1350 1620	660 1160 1660 2160 2135 1120	660 1160 1660 2160 1950 1320	660 1160 1660 2160 1650 1620	660 1160 1660 2160 2250 1320	660 1160 1660 2160 1950 1620	660 1160 1660 2160 1650 1920	660 1160 1660 2160 2550 1320	660 1160 1660 2160 2250 1620	660 1160 1660 2160 1950 1920	660 1160 1660 2160 2250 1920	660 1160 1660 2160 2550 1620	660 1160 1660 2160 2250 2250	660 1160 1660 2160 2550 1920
honeycomb humidification chamber		length L width B height H	1110 1350 1620	1110 2135 1120	1110 1925 1320	1110 1650 1620	1110 2250 1320	1110 1950 1620	1110 1650 1920	1110 2550 1320	1110 2250 1620	1110 1950 1920	1110 2250 1920	1110 2550 1620	1110 2250 2250	1110 2550 1920
spray humidification chamber		length L width B height H	— — —	— — —	— — —	1610 1650 1620	— — —	1610 1950 1620	— — —	— — —	— — —	1810 1950 1920	1810 2250 1920	— — —	1810 2250 2250	— — —
steam humidification chamber		length L width B height H	1110 1350 1620	1110 2135 1120	1110 1950 1320	1110 1650 1620	1110 2250 1320	1110 1950 1620	1110 1650 1920	1110 2550 1320	1110 2250 1620	1110 1950 1920	1110 2250 1920	1110 2550 1620	1110 2250 2250	1110 2550 1920
air intake module with vertical valve		length L width B height H	670 1350 1620	670 2135 1120	670 1950 1320	670 1650 1620	670 2250 1320	770 1950 1620	770 1650 1920	770 2550 1320	870 2250 1620	870 1950 1920	870 2250 1920	870 2550 1620	870 2250 2250	870 2550 1920
air intake module with horizontal valve		length L width B height H	785 1350 1620	635 2135 1120	635 1950 1320	785 1650 1620	635 2250 1320	785 1950 1620	935 1650 1920	635 2550 1320	785 2250 1620	935 1950 1920	935 2250 1920	785 2550 1620	1235 2250 2250	935 2550 1920
air intake module (two valves)		length L width B height H	785 1350 1620	635 2135 1120	635 1950 1320	785 1650 1620	635 2250 1320	785 1950 1620	935 1650 1920	635 2550 1320	785 2250 1620	935 1950 1920	935 2250 1920	785 2550 1620	1235 2250 2250	935 2550 1920
special air intake module**		length L width B height H	1050 1350 1620	1050 2135 1120	1050 1950 1320	1050 1650 1620	1050 2250 1320	1050 1950 1620	1050 1650 1920	1050 2550 1320	1050 2250 1620	1050 1950 1920	1050 2250 1920	1050 2550 1620	1050 2250 2250	1050 2550 1920
air disinfection module		length L width B height H	1550 1350 1620	1550 2135 1120	1550 1950 1320	1550 1650 1620	1550 2250 1320	1550 1950 1620	1550 1650 1920	1550 2550 1320	1550 2250 1620	1550 1950 1920	1550 2250 1920	1550 2550 1620	1550 2250 2250	1550 2550 1920
gas heating module		length L width B height H	1700** 1350 1620	1700** 2135 1120	1700** 1950 1320	1700** 1650 1620	1950** 2250 1320	1950** 1950 1620	1950** 1650 1920	1950** 2550 1320	1950** 2250 1620	1950** 1950 1920	1950** 2250 1920	1950** 2550 1620	1950** 2250 2250	1950** 2550 1920

** for outdoor temperatures below -40°C * maximum size (may be reduced).

ORDERING DATA

VRS-500-019-00-1-1

- air handling unit
- frontal area index

(019, 034, 039, 054, 058, 078, 086, 097, 115, 116, 138, 151, 156, 173, 193, 194, 234, 240, 271, 289, 290, 333, 337, 350, 407, 414, 473, 500)

- design

(01 - for "clean rooms" and industries that require high-quality air treatment,
02 - for medical institutions, healthcare facilities, and facilities that have special requirements for the corrosion resistance of equipment,
03 - for "standard" residential and industrial buildings with high requirements for the quality of air treatment and energy saving,
04 - for outdoor installation)

- unit type

(0 - supply, 1 - extract, 2 - two recirculation units
3 - rotary heat recovery unit, 4 - plate heat recovery unit
5 - heat recovery unit with intermediate heat carrier,
6 - supply air unit with redundancy, 7 - extract air unit with redundancy)

- unit topology

(0 - supply or extract air unit, 1 - two-tier combination of supply and extract air units,
2 - side by side combination of supply and extract air units, 3 - end-to-end combination of supply and extract air units)

OUR OBJECTS

"DANONE UKRAINE", KREMENCHUK


RESIDENTIAL COMPLEX "HORUS PARADISE", CHISINAU

PHARMACEUTICAL COMPANY "ZDOROVIA", KHARKIV

VRS-550

The air handling unit casing consists of closed aluminum profiles connected by strong corner fasteners made of aluminum alloy or high-strength fiberglass-reinforced special plastic and three-layer panels with an internal filler of dense mineral wool. The panel thickness is 50 mm. For the manufacture of panel walls, a galvanized sheet with a thickness of 0.7 mm is used. Design version 01 comes with powder coating on external and internal panels as standard. In design version 03, external and internal panels manufactured without additional coating.

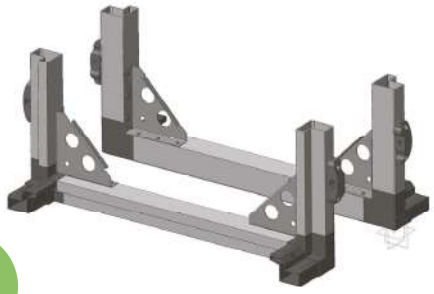
When designing VRS-550 air conditioners with a built-in automatic control system, the possibility of a traditional approach and an individual order development procedure based on block-modular construction of air conditioners from an arbitrary set of functional modules is preserved.

The block-modular design of VRS-550 air conditioners, combined with the block-modular standardized design of the automatic control system, provides high design flexibility with minimal labor and time investment.

The ability to freely combine modules into monoblocks made it possible to minimize the number of wires and electrical connections between the modules. Electrical connections between monoblocks of the air conditioner supplied for installation by separate transport units are made on site by simply connecting factory-installed connectors.

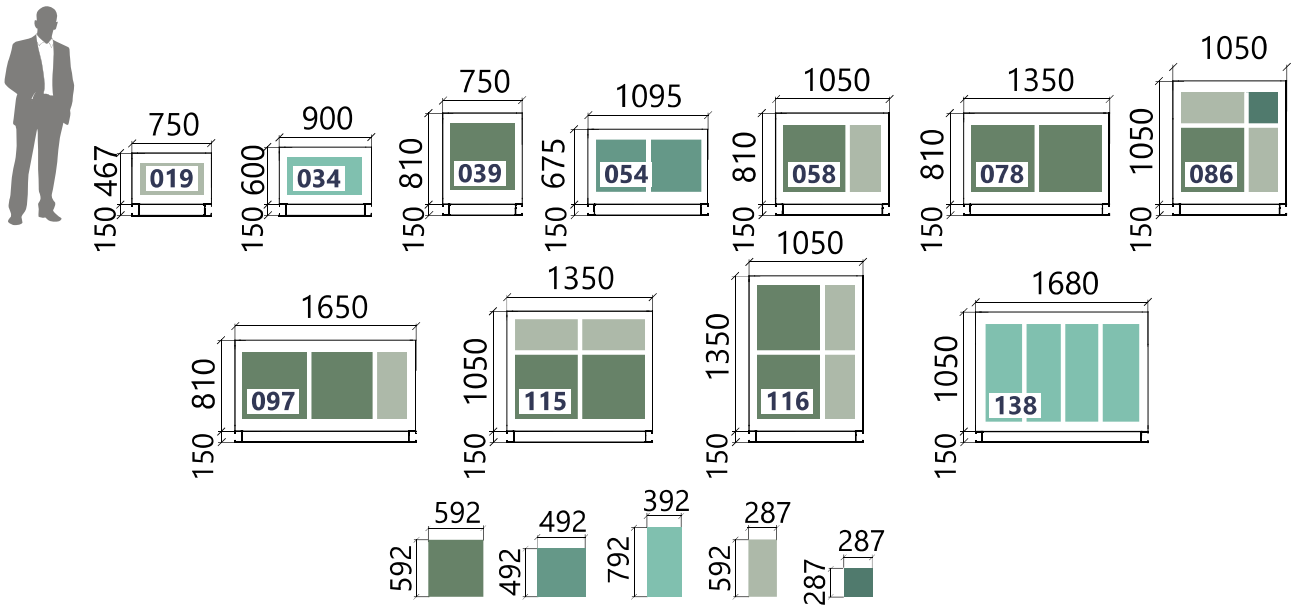
VRS-550 air handling unit modules are installed on 150 mm high galvanized steel support frames. It's also possible to order support frames of different height - up to 350 mm in increments of 50 mm.

CASING CHARACTERISTICS	
Thermal conductivity coefficient	**T3**
Thermal bridges	**TB3**
Class of air leakage through the casing	**L1**
Casing strength class	**D1**



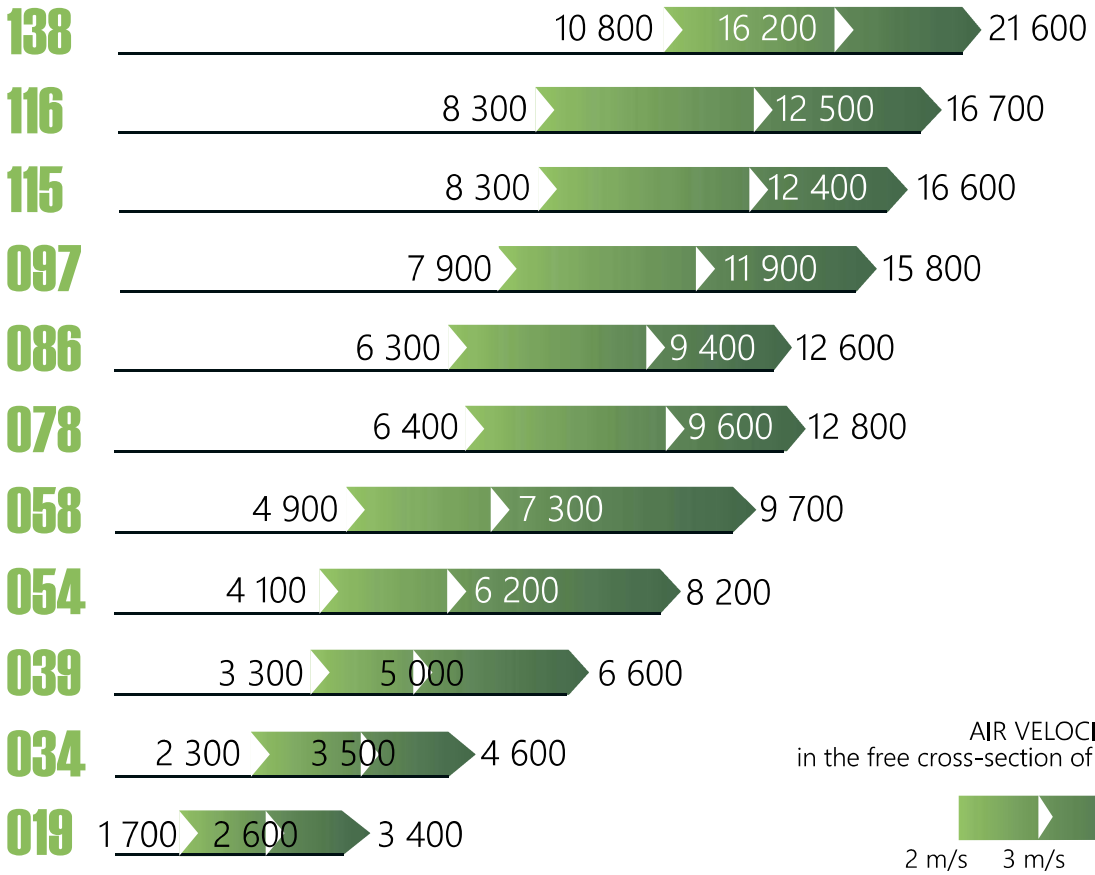
SOUND ABSORPTION OF THE CASING								
Octave frequency band, Hz	63	125	250	500	1000	2000	4000	8000
Sound absorption	16	18	23	32	33	34	35	34

MODULE OVERALL DIMENSIONS



DIMENSIONS OF THE FILTER CASSETTES USED

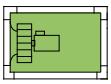
PERFORMANCE INTERVALS



AIR VELOCITY
in the free cross-section of the air conditioner

2 m/s 3 m/s 4 m/s

MODULE SIZES

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX										
			019	034	039	054	058	078	086	097	115	116	138
VSK fan		length L* width B height H	800 750 467	800 900 600	800 750 810	1000 1095 675	1000 1050 810	1050 1350 810	1050 1050 1050	1050 1650 810	1150 1350 1050	1150 1050 1350	1150 1680 1050
panel filter G4-M5		length L width B height H	350 750 467	350 900 600	350 750 810	350 1095 675	350 1050 810	350 1350 810	350 1050 1050	350 1650 810	350 1350 1050	350 1050 1350	350 1680 1050
bag filter G4/M5/M6 (L bag = 360 mm)		length L width B height H	550 750 467	550 900 600	550 750 810	550 1095 675	550 1050 810	550 1350 810	550 1050 1050	550 1650 810	550 1350 1050	550 1050 1350	550 1680 1050
bag filter F7-F9 (L bag = 600 mm)		length L width B height H	790 750 467	790 900 600	790 750 810	790 1095 675	790 1050 810	790 1350 810	790 1050 1050	790 1650 810	790 1350 1050	790 1050 1350	790 1680 1050
liquid air heater		length L* width B height H	750 750 467	750 900 600	750 750 810	750 1095 675	750 1050 810	750 1350 810	750 1050 1050	750 1650 810	750 1350 1050	750 1050 1350	750 1680 1050
electric air heater		length L width B height H	770 750 467	770 900 600	770 750 810	770 1095 675	770 1050 810	820 1350 810	790 1050 1050	935 1650 810	895 1350 1050	895 1050 1350	1120 1680 1050
liquid air cooler		length L* width B height H	800 750 467	800 900 600	800 750 810	800 1095 675	800 1050 810	800 1350 810	800 1050 1050	800 1650 810	800 1350 1050	800 1050 1350	800 1680 1050
direct evaporation cooler		length L* width B height H	800 750 467	800 900 600	800 750 810	800 1095 675	800 1050 810	800 1350 810	800 1050 1050	800 1650 810	800 1350 1050	800 1050 1350	800 1680 1050
plate heat recovery unit		length L* width B height H	910 750 467	1100 900 600	1410 750 810	1100 1095 675	1410 1050 810	1410 1350 810	2010 1050 1050	1400 1650 810	2010 1350 1050	— — —	2100 1680 1050
rotary heat recovery unit		length L* width B height H	530 750 467	530 900 600	530 750 810	530 1095 675	530 1050 810	530 1350 810	530 1050 1050	570 1650 810	570 1350 1050	570 1050 1350	570 1680 1050
honeycomb humidification chamber		length L* width B height H	— — —	1010 900 600	1010 750 810	1010 1095 675	1010 1050 810	1010 1350 810	1100 1050 1050	1100 1650 810	1100 1350 1050	1100 1050 1350	1100 1680 1050
steam humidification chamber		length L* width B height H	1110 750 467	1110 900 600	1110 750 810	1110 1095 675	1110 1050 810	1110 1350 810	1110 1050 1050	1110 1650 810	1110 1350 1050	1110 1050 1350	1110 1680 1050
air intake module with vertical valve		length L* width B height H	470 750 467	470 900 600	470 750 810	470 1095 675	470 1050 810	470 1350 810	570 1050 1050	570 1650 810	570 1350 1050	570 1050 1350	570 1680 1050
air intake module with horizontal valve		length L* width B height H	505 750 467	540 900 600	485 750 810	485 1095 675	485 1050 810	485 1350 810	585 1050 1050	485 1650 810	485 1350 1050	635 1050 1350	485 1680 1050
air intake module (two valves)		length L* width B height H	505 750 467	540 900 600	485 750 810	485 1095 675	485 1050 810	485 1350 810	585 1050 1050	485 1650 810	485 1350 1050	635 1050 1350	485 1680 1050

* approximate size (can be changed depending on the selected equipment).

ORDERING DATA

VRS-550-054-03-2-1

- air handling unit
- frontal area index

(019, 034, 039, 054, 058, 078, 086, 097, 115, 116, 138)

- design

(01 - for "clean rooms" and industries that require high-quality air treatment,
03 - for "standard" residential and industrial buildings with high requirements for the quality of air treatment and energy saving)

- unit type

(0 - supply, 1 - extract, 2 - two recirculation units
3 - rotary heat recovery unit, 4 - plate heat recovery unit)

- unit topology

(0 - supply or extract air unit, 1 - two-tier combination of supply and extract air units)

The air temperature in the room where the VRS-550 is installed must be in the range from -10° to +45° C during operation (with a temperature limit during storage and transportation from -40° to +70° C).

QUESTIONNAIRE

Organization: _____ Contact person: _____

City (Region): _____ Object: _____

E-mail: _____ Tel: _____

Frontal area index: _____

Type: ☐ supply ☐ extract ☐ air handling unit with rotary heat exchanger
☐ air handling unit with recuperation ☐ air handling unit with plate heat recovery unit

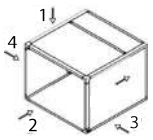
Topology: ☐ supply or extract air unit ☐ two-tier combination of supply and extract air units

SERVICEABLE SIDE IN THE DIRECTION OF AIR FLOW

SUPPLY ☐ right-hand ☐ left-hand EXTRACT ☐ right-hand ☐ left-hand

AIR INLET AND OUTLET

Air intake:



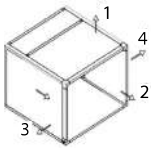
☐ At the top (1)
☐ Axially (2)
☐ Right-side (3)
☐ Left-side (4)

☐ flexible connector
☐ rigid connector

Recycling ____%

T_{sup}=____°C T_{ext} =____°C
φ_{sup}=____% φ_{ext}=____%
t_{mix}=____°C φ_{mix}=____%

Air outlet:



☐ At the top (1)
☐ Axially (2)
☐ Right-side (3)
☐ Left-side (4)

☐ flexible connector
☐ rigid connector

FAN UNIT

SUPPLY air-flow rate _____ m^3/h external static pressure _____ Pa
☐ flexible connector on the fan exhaust ☐ EC (rotor motor)
☐ with direct drive

EXTRACT air-flow rate _____ m^3/h external static pressure _____ Pa
☐ flexible connector on the fan exhaust ☐ EC (rotor motor)
☐ with direct drive

FILTER BLOCK

Panel: ☐ G4 ☐ M5

Bag: ☐ G4 ☐ M5 ☐ M6 ☐ F7 ☐ F8 ☐ F9

Spare filter block: ☐

HEATER

Air temperature:

$t_{вх}$ =_____°C

$t_{вих}$ =_____°C

Q =_____кВт

(не обов'язково)

☐ Liquid

Температура теплоносія

$t_{вх}$ =_____°C

$t_{вих}$ =_____°C

☐ пропіленгліколь

☐ етиленгліколь

концентрація _____%

☐ вузол обв'язки UWS

☐ Electric

Управління: плавне

$t_{вх}$ =_____°C

$t_{вих}$ =_____°C

LIQUID COOLER

Air parameters:

t_{inp} =_____°C,

φ_{init} =_____%,

t_{out} =_____°C

Refrigerant type:

☐ water

☐ ethylene glycol

☐ propylene glycol

concentration _____%

FREON COOLER

Air parameters: t_{inp} =_____°C, φ_{init} =_____%, t_{out} =_____°C **Refrigerant type:** R_____

RECUPERATIVE HEAT EXCHANGER

Plate:

Air parameters:

t_{out} =_____°C, φ_{outd}=_____%, t_{ext} =_____°C, φ_{ext} =_____%

Rotary:

Air parameters:

t_{out} =_____°C, φ_{outd}=_____%, t_{extr}=_____°C, φ_{extr}=_____%

HUMIDIFIER

Honeycomb:

t_{init} =_____°C φ_{init} =_____%

t_{end} =_____°C d_{end}=_____g/kg or φ_{end} =_____%

Steam:

t_{init} =_____°C φ_{init} =_____%

t_{end} =_____°C d_{end} =_____g/kg or φ_{end} =_____% G_{steam}=_____kg/h (optional)

Include the steam generator in the delivery package ☐ yes ☐ no

NOISE PROOFING MODULE

Supply: ☐ inlet ☐ outlet ☐ 500 mm ☐ 1000 mm ☐ 1500 mm ☐ 2000 mm or max. dB____

Extrac: ☐ inlet ☐ outlet ☐ 500 mm ☐ 1000 mm ☐ 1500 mm ☐ 2000 mm or max. dB____

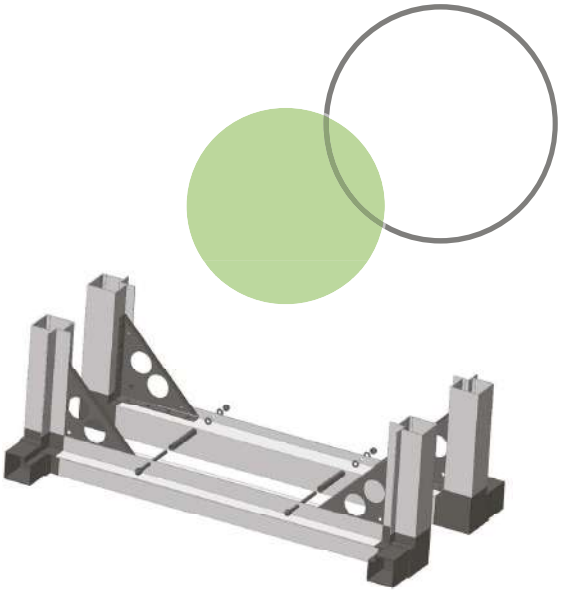
THE CUSTOMER IS RESPONSIBLE FOR FILLING OUT THE QUESTIONNAIRE

VRS-700

The casing of the air handling unit of the VRS-700 series consists of closed aluminum profiles connected to each other by strong corner fasteners made of aluminum alloy, three-layer panels with an internal filler made of dense mineral wool. The panel thickness is 50 mm. For the manufacture of panel walls, a galvanized sheet with a thickness of 0.7 mm is used. On request, the exterior walls of the panels can be powder-coated, the default coating color is RAL 7004.

The panels are attached to the frame profile with self-tapping screws from the inside of the installation. A special seal is glued between the panels and the frame to prevent leakage through the casing.

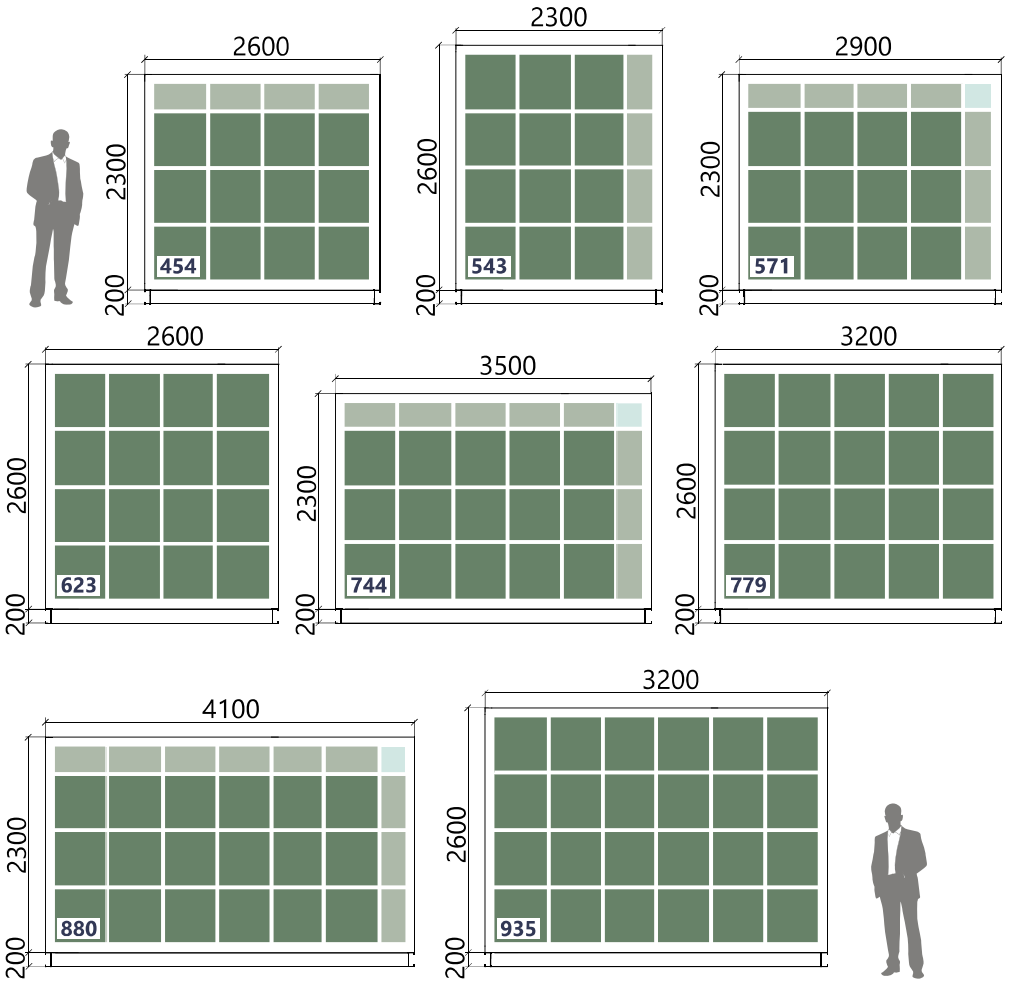
VRS-700 air handling unit modules are installed on 200 mm high galvanized steel support frames.

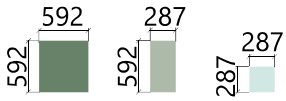


CASING CHARACTERISTICS	
Thermal conductivity coefficient	**T2**
Thermal bridges	**TB3**
Class of air leakage through the casing	**L2**
Casing strength class	**D1**

SOUND ABSORPTION OF THE CASING								
Octave frequency band, Hz	63	125	250	500	1000	2000	4000	8000
Sound absorption	16	18	23	32	33	34	35	34

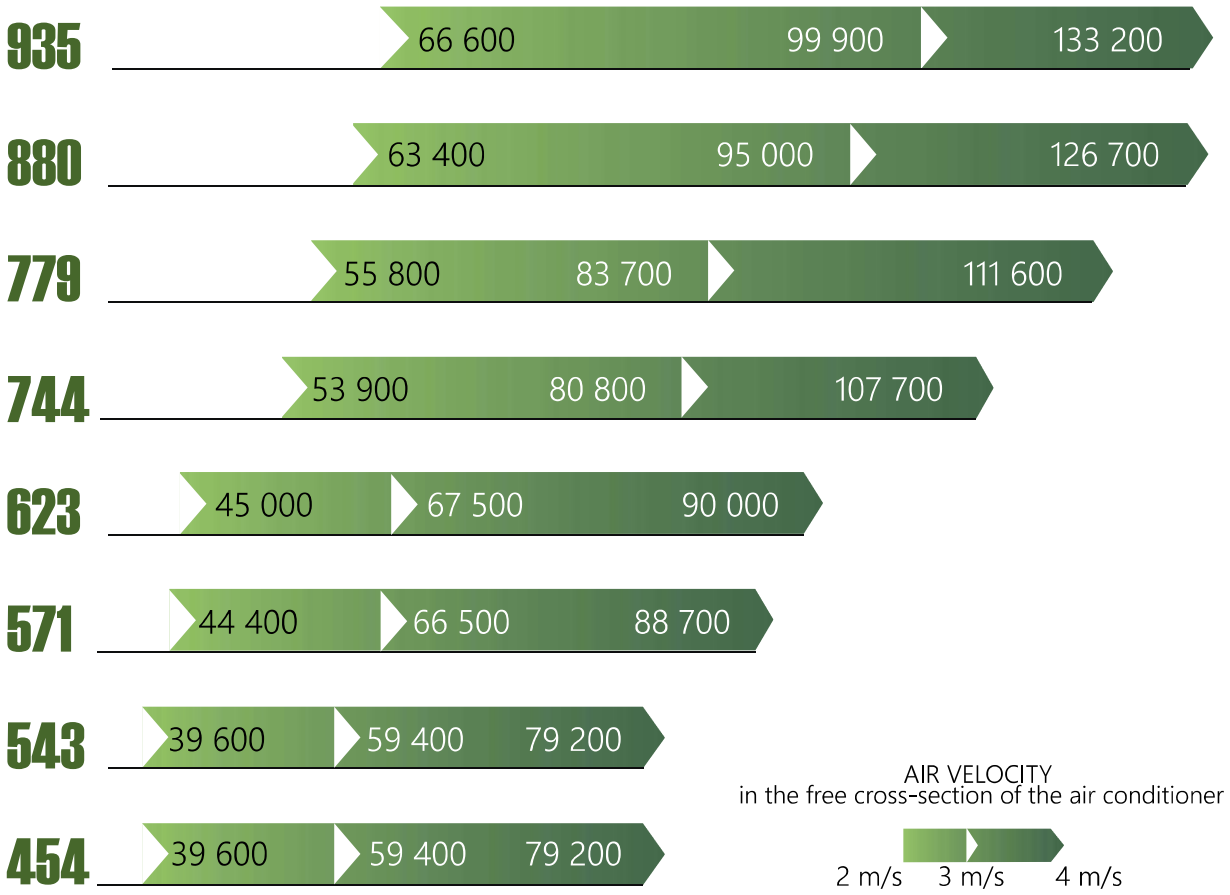
MODULE OVERALL DIMENSIONS



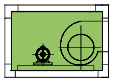
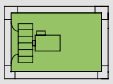


DIMENSIONS OF THE FILTER CASSETTES USED

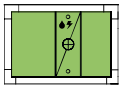
PERFORMANCE INTERVALS



MODULE SIZES

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX							
			454	**543**	**571**	**623**	**744**	**779**	**880**	**935**
centrifugal fan		length L* width B height H	2690 2600 2300	2690 2300 2600	3000 2900 2300	3000 2600 2600	3000 3500 2300	3210 3200 2600	3000 4100 2300	3480 3800 2600
VSK fan		length L* width B height H	2200 2600 2300	2200 2300 2600	2200 2900 2300	2200 2600 2600	2200 3500 2300	2050 3200 2600	2200 4100 2300	2200 3800 2600
panel filter G3-F5		length L* width B height H	1105 2600 2300	1105 2300 2600	1105 2900 2300	1105 2600 2600	1105 3500 2300	1105 3200 2600	1105 4100 2300	1105 3800 2600
bag filter G4-F9		length L* width B height H	1105 2600 2300	1105 2300 2600	1105 2900 2300	1105 2600 2600	1105 3500 2300	1105 3200 2600	1105 4100 2300	1105 3800 2600
liquid air heater		length L width B height H	620 2600 2300	620 2300 2600	620 2900 2300	620 2600 2600	620 3500 2300	620 3200 2600	620 4100 2300	620 3800 2600
electric air heater		length L width B height H	1105 2600 2300	1105 2300 2600	1105 2900 2300	1105 2600 2600	1105 3500 2300	1105 3200 2600	1105 4100 2300	1105 3800 2600
steam air heater		length L width B height H	400 2600 2300	400 2300 2600	400 2900 2300	400 2600 2600	400 3500 2300	400 3200 2600	400 4100 2300	400 3800 2600
liquid air cooler		length L width B height H	800 2600 2300	800 2300 2600	800 2900 2300	800 2600 2600	800 3500 2300	800 3200 2600	800 4100 2300	800 3800 2600
direct evaporation cooler		length L width B height H	800 2600 2300	800 2300 2600	800 2900 2300	800 2600 2600	800 3500 2300	800 3200 2600	800 4100 2300	800 3800 2600
heating regenerative heat exchanger with intermediate heat carrier		length L width B height H	620 2600 2300	620 2300 2600	620 2900 2300	620 2600 2600	620 3500 2300	620 3200 2600	620 4100 2300	620 3800 2600
cooling regenerative heat exchanger with intermediate heat carrier		length L* width B height H	740 2600 2300	740 2300 2600	740 2900 2300	740 2600 2600	740 3500 2300	740 3200 2600	740 4100 2300	740 3800 2600
intermediate compartment		length L width B height H	1105 2600 2300	1105 2300 2600	1105 2900 2300	1105 2600 2600	1105 3500 2300	1105 3200 2600	1105 4100 2300	1105 3800 2600
sound absorber L1plate = 500 mm; L2plate = 1000 mm; L3plate = 1500 mm; L4plate = 2000 mm		length L1 length L2 length L3 length L4 width B height H	685 1185 1685 2185 2600 2300	685 1185 1685 2185 2300 2600	685 1185 1685 2185 2900 2300	685 1185 1685 2185 2600 2600	685 1185 1685 2185 3500 2300	685 1185 1685 2185 3200 2600	685 1185 1685 2185 4100 2300	685 1185 1685 2185 3800 2600
honeycomb humidification chamber		length L* width B height H	1340 2600 2300	1340 2300 2600	1340 2900 2300	1340 2600 2600	1340 3500 2300	1340 3200 2600	1340 4100 2300	1340 3800 2600
spray humidification chamber		length L* width B height H	— — —	2000 2300 2600	— — —	2000 2600 2600	— — —	2000 3200 2600	— — —	2000 3800 2600

* maximum size (may be reduced).

MODULE TYPE		OVERALL DIMENSIONS	FRONTAL AREA INDEX							
			454	**543**	**571**	**623**	**744**	**779**	**880**	**935**
steam humidification chamber		length L width B height H	1000 2600 2300	1000 2300 2600	1000 2900 2300	1000 2600 2600	1000 3500 2300	1000 3200 2600	1000 4100 2300	1000 3800 2600
air intake module with vertical valve		length L width B height H	1105 2600 2300	1105 2300 2600	1105 2900 2300	1105 2600 2600	1105 3500 2300	1105 3200 2600	1105 4100 2300	1105 3800 2600
air intake module with horizontal valve		length L width B height H	1125 2600 2300	1125 2300 2600	1125 2900 2300	1125 2600 2600	1125 3500 2300	1125 3200 2600	1125 4100 2300	1125 3800 2600
air intake module (two valves)		length L width B height H	1125 2600 2300	1125 2300 2600	1125 2900 2300	1125 2600 2600	1125 3500 2300	1125 3200 2600	1125 4100 2300	1125 3800 2600
special air intake module*		length L width B height H	1150 2600 2300	1150 2300 2600	1150 2900 2300	1150 2600 2600	1150 3500 2300	1150 3200 2600	1150 4100 2300	1150 3800 2600
gas heating module		length L width B height H	2550 2600 2300	2550 2300 2600	3200 2900 2300	3200 2600 2600	— — —	— — —	— — —	— — —

* for outdoor temperature below -40° C

ORDERING DATA

VRS-700-454-00-1-0

- air handling unit
- frontal area index

(454, 543, 571, 623, 744, 779, 880, 935)

- design

(00 - for "standard" residential and industrial buildings,
01 - for "clean rooms" and industries that require high-quality air treatment,
02 - for medical institutions, healthcare facilities, and facilities that have special requirements for the corrosion resistance of equipment,
03 - for "standard" residential and industrial buildings with high requirements for the quality of air treatment and energy saving,
04 - for outdoor installation)

- unit type

(0 - supply, 1 - extract, 2 - two recirculation units
5 - heat recovery unit with intermediate heat carrier)

- unit topology

(0 - supply or extract air unit, 2 - side by side combination of supply and extract air units,
3 - end-to-end combination of supply and extract air units)

OUR OBJECTS


"KULINICHI", KHARKIV

"INTERPIPE", DNIPRO


RESIDENTIAL COMPLEX "HOFFMAN HAUS", KYIV


RESIDENTIAL COMPLEX "KOZATSKY", KYIV

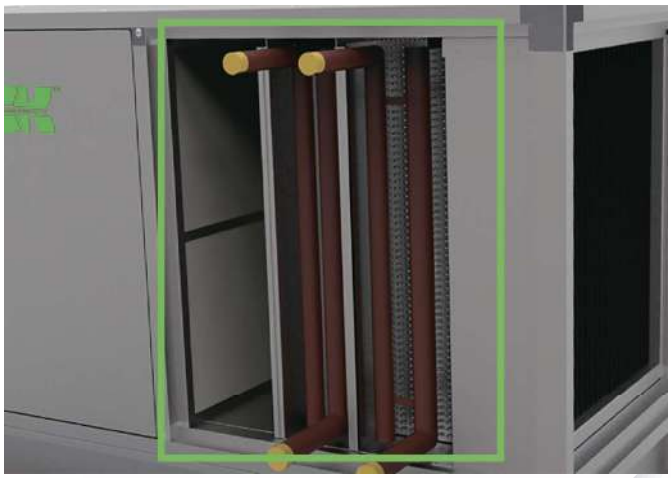

RESIDENTIAL COMPLEX "ELYSIUM", KYIV

SPORTS CLUB, CHISINAU

CAR WASH, POLTAVA

MODULE DESCRIPTION

HEAT EXCHANGERS



Fin heat exchangers are used for heating and cooling the air in VRS air handling units. The heat exchange surface of fin heat exchangers consists of tubes with plates pressed onto them. Depending on the modification of the heat exchanger, the tubes and fins can be made of different materials. According to the type of heat exchanger bundle configuration, the following designs are used in VRS air handling unit:

- 50x25 mm bundle configuration with a 12 mm diameter tube - standard heat exchanger used in air heating and cooling modules. This heat exchanger can be manufactured in the following combinations:
  - copper tubes with aluminum fins;
  - copper tubes with aluminum fins with epoxy coating;
  - copper tubes with copper fins;
  - copper tubes with copper fins with coating.

Depending on the purpose, the heat exchanger housing can be made of galvanized steel, powder-coated galvanized steel, or stainless steel.

Water or low-freezing liquids are used as a heat carrier or refrigerant.

Manifolds can be made of steel or copper.

- 48x42 mm bundle configuration with a 16 mm diameter tube - standard heat exchanger used in steam- and water- air heating modules. This heat exchanger can be manufactured in the following combinations:
  - copper tubes with aluminum fins;
  - stainless pipes with aluminum fins;
  - copper tubes with copper fins;
  - stainless pipes with copper fins.

Water, solutions, and steam are used as heat carriers.

- 35x30 mm bundle configuration with a 12 mm diameter tube - heat exchanger used in water- or Freon- air cooling modules. Depending on the materials used, this heat exchanger can be manufactured in the following combinations:
  - copper tubes with aluminum fins;
  - copper tubes with aluminum fins with coating;
  - copper tubes with copper fins.
- 25x22 mm bundle configuration with a 10 mm diameter tube - heat exchanger used in water- or Freon- air cooling modules. This heat exchanger can be manufactured in the following combinations based on the materials used:
  - copper tubes with aluminum fins;
  - copper tubes with aluminum fins with coating;
  - copper tubes with copper fins.

Cooling modules are additionally equipped with a condensate collection tray and a drip catcher. The drip catcher can be extended for cleaning.

VRS series	BUNDLE GEOMETRY	PIPE MATERIAL	FIN MATERIAL	MANIFOLD MATERIAL	HEAT EXCHANGER FRAME MATERIAL
VRS-300	• 5012 • 3512 • 4816	• copper • stainless steel	• aluminum • copper • coated aluminum	• steel • stainless steel • copper	determined by the VRS design
VRS-500 VRS-550	• 5012 • 3512 • 4816 • 2510	• copper • stainless steel	• aluminum • coated aluminum • copper	• steel • copper • stainless steel	
VRS-700	• 5012 • 3512 • 4816	• copper • stainless steel	• aluminum • coated aluminum • copper	• steel • copper • stainless steel	

HEAT RECOVERY UNITS

Depletion of energy resources, rising electricity prices, and climate change make the issue of saving energy particularly relevant. This, in turn, forces consumers to increasingly use heat recovery systems. The use of a heat recovery unit in a supply air system allows for significant energy savings, as the heat or cold of the exhaust air is transferred to the supply air using the heat recovery unit. Thus, the power of the air heater and air cooler in the supply unit is significantly reduced. This means that operating costs are also reduced.

Depending on the application conditions, required air quality, and efficiency, different types of heat exchangers are used.

The design of VRS air conditioners provides for three types of heat recovery modules: based on heat exchangers with pump circulation of intermediate heat carrier-antifreeze, a module with a plate cross-flow recuperative air-to-air heat exchanger, a module with a regenerative rotary heat exchanger.

MODULE WITH CROSS-FLOW RECUPERATIVE HEAT EXCHANGER

The plate heat recovery unit is made of aluminum plates that create a system of channels for the flow of two air flows. In the heat exchanger, heat transfer occurs between these flows at different temperatures. The exhaust air removed from the room flows in every second channel between the heat exchanger plates, heating them. The supply conditioned air flows through other channels of the heat exchanger and absorbs the heat of the heated plates. At the same time, the supply and exhaust air are almost completely separated (flows due to structural leaks amount to up to 0.1%). Thus, plate heat recovery units can be used in cases where mixing of supply and exhaust air is not allowed. The special design of the aluminum plates creates a turbulent air flow in the heat exchanger channels, which allows for high heat recovery efficiency with relatively low hydraulic resistance. The efficiency of such a heat exchanger can reach 70%.

Due to the fact that moisture from the exhaust air may appear during the heat recovery process, the plate heat recovery units are equipped as standard with a tray for collecting condensate and removing condensate through a siphon.

To prevent condensate from freezing in the unit, a bypass channel with a valve is provided. When there is a risk of freezing, some of the cold air flow bypasses the heat exchanger.

MODULE WITH REGENERATIVE ROTARY HEAT EXCHANGER

The rotary heat exchanger is a rotating heat wheel with an adjustable speed. The exhaust air that is removed and has a high temperature passes through the heat wheel, heating it. Rotating, the heat wheel is in a flow of cold supply air. Heat is transferred from the heat wheel to the supply air. The use of rotary heat recovery units is the most efficient means of heat recovery in ventilation systems. This is the best way to achieve high efficiency in a compact size. The heat recovery efficiency reaches 80%. When choosing a module with a rotary heat exchanger, it should be taken into account that the design of the module allows some mixing of supply and exhaust air. This limits the scope of their application to ventilation systems where complete separation of supply and exhaust air is not required. By correctly positioning the supply and extract fans in the installation and providing a certain pressure drop, the air flow stream can be directed from the supply air flow to the exhaust air flow.

Depending on the type of accumulating mass, there are several types of heat exchangers: condensing, enthalpy and sorption. The condensation wheel is designed for sensible heat recovery. Moisture transfer occurs only in winter, when the exhaust air is cooled below the dew point. Thus, in winter, it's possible to humidify the air without using humidifiers.

Enthalpy wheels feature a hygroscopic foil coating that promotes moisture transfer. Thus, total heat is recovered (sensible heat plus latent heat). In winter, the air is humidified, and in summer, it is dehumidified, which means that in winter it's possible to avoid using humidifiers, and in summer it's possible to spend less cold for further cooling the air.

Sorption wheels feature a highly hygroscopic surface, which ensures even greater efficiency when transferring temperature and moisture. Wheels of this type are used for dehumidification in air conditioning systems.

The recovery efficiency is regulated by changing the wheel speed using a frequency converter.

MODULE WITH INTERMEDIATE HEAT CARRIER

The system with an intermediate heat carrier consists of two heat exchangers combined in a closed circuit, in which the intermediate heat carrier circulates. Liquid (aqueous solutions of glycol of various concentrations) is used as an intermediate heat carrier. The heat exchanger installed in the exhaust air flow is an air cooler equipped with a drip catcher, a tray and condensate drainage through a siphon. The heat exchanger installed in the supply air flow is an air heater. The heat carrier, having heated up in the heat exchanger blown by warm exhaust air, transfers heat to the heat exchanger located in the flow of supply air. The heat recovery efficiency reaches 55%. The heat recovery capacity is controlled by a three-way control valve.

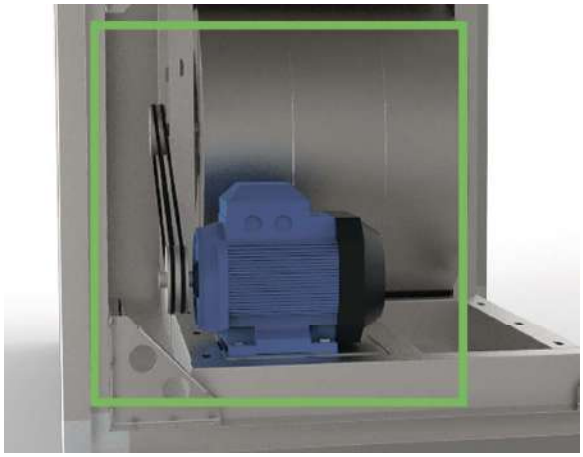
The advantage of this system is that the supply and exhaust air flows are completely separated. The system with an intermediate heat carrier can be used in the case of a large distance between the supply and exhaust units. The heat recovery unit of this type is indispensable in cases where high requirements for air purity are put forward, explosive media are moved, and in other cases where mixing of supply and exhaust air is unacceptable.

PARAMETER	TYPE OF HEAT RECOVERY UNIT		
	plate heat recovery unit	rotary heat recovery unit	heat recovery unit with intermediate heat carrier
MAXIMUM EFFICIENCY	70%	80%	55%
ABILITY TO TRANSFER MOISTURE	no	minor (condensation wheel) higher (enthalpy wheel) maximum (sorption wheel)	no
SUPPLY AND EXTRACT PARTS MUST BE COMBINED	yes	yes	no
RATIO OF MODULE LENGTHS	maximum	minimum	average
POSSIBILITY OF AIR FLOW THROUGH LEAKS IN THE STRUCTURE	minor (up to 0.1%)	number and direction depend on the location of the fans	no
NEED FOR FROST PROTECTION	yes	yes	yes
NEED FOR CONDENSATE DRAINAGE	yes (in the supply and extract parts)	no	yes (in the extract part)
POSSIBILITY OF MANUFACTURING IN A HYGIENIC DESIGN	yes	yes (for enthalpy and sorption wheels, provided that the supply air flows into the exhaust air)	yes

PARAMETER	TYPE OF HEAT RECOVERY UNIT		
	plate heat recovery unit	rotary heat recovery unit	heat recovery unit with intermediate heat carrier
POSSIBILITY OF USE IN THE PRESENCE OF SUBSTANCES WITH A STRONG SMELL IN THE EXHAUST AIR	yes	no	yes
AVAILABILITY OF MOVING PARTS THAT REQUIRE MAINTENANCE	no	yes	yes
POSSIBILITY OF MANUFACTURING IN EXPLOSION-PROOF DESIGN	yes	no	yes
NEED FOR PERIODIC CLEANING	yes	no (self-cleaning option)	yes

FANS

V-BELT DRIVEN AIR HANDLING UNITS



They are usually used with a large air flow resistance of the ductwork, when high static pressure is required.

They are a design in which the double suction fan and motor are mounted on a single vibration-proof frame. The motor is mounted on a special skid for easy belt tensioning. The pulleys on the motor and fan shaft are fitted with special quick-release clamping conical sleeves. The fan exhaust is connected to the module body by means of a sealed flexible connector.

Ventilation modules of VRS air handling units can be equipped with fans with impellers with forward or backward curved blades. For smooth adjustment of fan performance, ventilation modules can be equipped with frequency converters upon additional request.

AIR HANDLING UNITS WITH A FREE-WHEEL FAN

They are used when it is necessary to obtain a compact and inexpensive design of the air handling unit. They are characterized by a simple design and do not require maintenance of the belt drive. Easy to clean. Thanks to the direct drive, there are no power losses that are present with V-belt transmission.

They are a structure in which the impeller with backward-curved blades and the motor are mounted on a single vibration-proof frame. The impeller is placed on the shaft of the electric motor and fixed with a special quick-release clamping conical sleeve.

For smooth adjustment of fan performance, ventilation modules can be equipped with frequency converters upon additional request.

Additionally, these ventilation modules can be equipped with service switches upon request.

AIR HANDLING UNITS THAT ARE EQUIPPED WITH A FREE-WHEEL FAN WITH EC MOTOR

They are used in cases where a highly efficient, energy-saving and compact solution for the ventilation system is needed.

They are a structure in which the impeller with backward-curved blades and the motor are mounted on a single special vibration-proof frame. The fans are driven by a special high-performance electronically commutated motor (EC motor), which provides record low energy consumption, as well as the most compact installation.

Since EC motors already have a built-in speed controller, these fans do not require an additional frequency converter to regulate performance.

Ventilation modules of large-sized air handling units are manufactured as FANWALL type. They consist of a set of several fans. The advantages of such sets are that when a single fan fails, only this part of the air flow is lost, unlike systems with a single fan, where the entire system is turned off. The loss of air flow from one fan can be compensated by increasing the speed of other fans.

When assembling large systems, all components can pass through a standard door opening.

HEATERS

ELECTRIC HEATER

In the standard version, they are designed to heat dust-free air. Heating elements - tubular heating elements - are made of stainless steel as standard and feature a low surface heating temperature. In sections of electric heaters, finned tubular heating elements are used, connected to each other in a "star" connection pattern, which can be switched on in stages from three to six, depending on the power of the electric heater and the standard size of the air handling unit.

Triac-controlled sections of electric heaters are designed for smooth control of air temperature over the entire power range of the electric heater and are a functionally complete power device for controlling the electric heater. The main advantages compared to step (discrete) control:

- higher accuracy of maintaining the set temperature (±1° C);
- consumed electrical power always corresponds to the required one;
- increasing the service life of contactors.

To protect against overheating, all electric heaters are equipped as standard with overheat protection thermostats. The thermostat is activated when the temperature of the electric heater body reaches 60° C.

GAS HEATER

VRS air handling units can also be equipped with gas heating sections. A special heat exchange module consisting of a combustion chamber and a heat exchanger is installed inside the section. Outdoor installations can be ordered with an insulated protective burner casing with an electric heater, which protects the gas fittings from freezing when the burner is not in operation. The combustion products are completely separated from the heated air. The heat transfer efficiency of combustion products ranges from 91% to 93%. The standard gas heating section is equipped with a bypass (except for the standard size 234), which prevents the formation of condensation of combustion products by maintaining the optimal temperature in the heat exchanger.

The heat output of the heat exchanger can be adjusted by modulating the burner or switching the power levels of two-stage burners. All sections are equipped as standard with a special thermostat (controlled by flue gas temperature) and an emergency thermostat with manual reset. The smoke pipe outlet is located on the unattended side of the unit. A removable panel on the service side makes it possible to control and clean the gas heater heat exchanger.

Depending on the method of use, the heat exchange module can be made of different types of steel:

- plain steel for simple tasks;
- stainless steel;
- special stainless heat-resistant steel for heating air from -40° C to +30° C with one heating stage.

AIR DISINFECTION MODULE

The air disinfection module is designed to purify the air from living organisms and viruses using special UV radiation. The structure of the module consists of a supporting frame and an internal retractable block (with special 75 W lamps). Depending on the VRS size, the lamps are placed along the flow or vertically across it. The power control unit with high-voltage cables is mounted on the side panel. The lamps are delivered separately in a cardboard box and mounted in the VRS air conditioner section on site.

NOTE – when processing a larger amount of air, the specific dose transferred to the flow decreases and, accordingly, the room category provided by the module must be reduced. Thus, it is impossible, selecting a module of a certain type, to claim that a given category will always be provided.

This property of the module in the air handling unit results from different air speeds. It is recommended not to exceed the speed of 3.0-3.5 m/sec. The use of air disinfection units is permissible not only as part of the VRS air handling unit on the supply or extract, but also separately. In this case, it is used as an independent air terminal unit and additional installation of the filter is advisable.

According to P 3.5.1904-04, rooms of categories I-V indicated in the table should be equipped with bactericidal installations for air disinfection.

Levels of bactericidal efficiency of J in and volume bactericidal dose (exposure) of Hv for S. aureus depending on the categories of premises to be equipped with bactericidal installations for air disinfection.

CATEGORY	TYPES OF PREMISES	Microbial contamination CFU*, 1 m³		Bactericidal efficiency, %, not less	Volumetric bactericidal dose, J/m³ (reference values)
		general microflora	S. aureus		
I	Operating, preoperative, maternity, sterile areas of the CSSD**, children's wards of maternity hospitals, wards for premature and injured children	no more than 500	none	99,9	385
II	Dressing rooms for sterilization and pasteurization of breast milk, wards and departments for immunocompromised patients, wards of intensive care units, premises of non-sterile zones of the CSSD, bacteriological and virological laboratories, blood transfusion stations, pharmaceutical workshops	no more than 1000	no more than 4	99	256
III	Wards, offices and other premises of medical preventive institutions (Not included in categories I and II)	not defined/rated	not defined/ rated	95	167
IV	Children's playrooms, school classrooms, utility premises of industrial and public buildings with large crowds of people during long stays	—	—	90	130
V	Public toilets and stairwells of medical preventive institutions	—	—	85	105

* CFU - colony-forming units
** CSSD - Central Sterile Supply Departments

COMPRESSOR-EVAPORATIVE MODULE OF THE AIR COOLER

The compressor-evaporative modules of the air cooler are a refrigeration machine built into the body of the VRS air conditioner with an evaporator, a drip tray for collecting condensate. The refrigeration machine is fully equipped: it includes the necessary refrigeration automation, a temperature control valve, and a control system. Thus, during installation, it is only necessary to connect an external vapor condenser and supply power to the control cabinet. The external vapor condenser fans are powered and controlled from the control cabinet; no additional control cabinet is required for the vapor condenser.

Switching on and off is performed by a signal from an external "dry contact". Depending on how the control of the air conditioning system is designed, this can be either a signal from the supply air unit control system, or a signal from an external temperature sensor (for example, from a room thermostat).

A wide range of standard sizes allows selecting the required unit for almost any low- and medium-power air conditioning system. At the same time, there is no need to select the evaporator and compressor separately, and then look for a place to install it.

The units use ozone-safe Freon R407C.

BLOCK-TYPE COMPRESSOR-RECEIVER MODULE

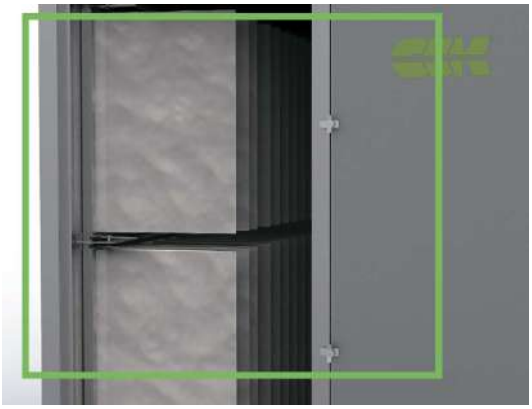
Compressor-receiver units are used as a permanent cold source for VRS air conditioner, duct cooler, etc. They can be used with both air- and water-cooled condensers. This is a compressor-receiver module mounted in the housing of the VRS air handling unit. The following are installed on a single frame: a compressor, a refrigerant receiver, refrigeration automation elements, and a control cabinet.

The main distinguishing feature of these units is that they are installed in the air flow (supply or exhaust) and can be used not only as part of air handling units, but also for retrofitting existing ventilation systems with coolers, and as independent air-cooling devices.

This feature provides the units with greater flexibility of application and allows them to be used not only in standard air conditioning systems, but also in special systems, such as dehumidifiers for swimming pools, installations with a heat pump, or in conditions where there is limited space for installing refrigeration equipment.

The units use ozone-safe Freon R407C.

FILTERS



VRS installations use panel, bag, compact filters, metal mesh filters, carbon filters and fine HEPA filters.

FILTER TYPES AND MATERIALS USED

PANEL FILTERS

The panel filter cassette housing is made of a special galvanized steel profile.

The material is polyester. The material is fixed in the frame by pouring polyurethane. The filter is not suitable for regeneration.

BAG FILTERS

The filter material is made of 100% high-quality polyester by thermal bonding of synthetic bicomponent fibers at temperatures above 100°C. Despite its small thickness (8 mm), the material has a fairly high dust capacity (290 g/cm).

CARBON FILTERS

Designed to purify the air from dust, unpleasant odors and gases of external recirculating air. The filter material can only consist of carbon adsorption material without a pre-filter. If it is necessary to protect the adsorption layer from dust, a dust filter material is placed in front of the carbon material.

HEPA FILTERS

The filter material is a corrugated filter paper based on ultra- and micro-glass fiber.

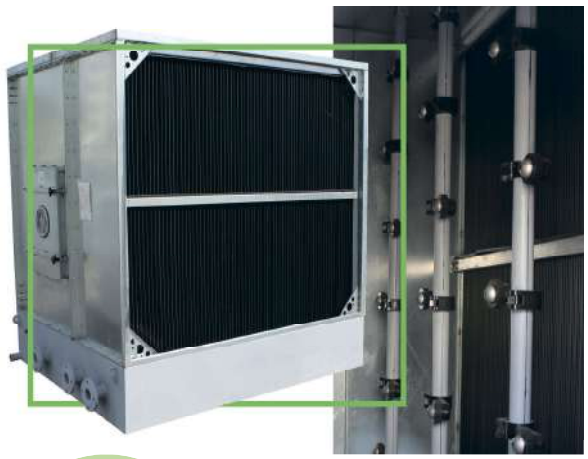
FILTER GROUP	EFFICIENCY, %	Filter class according to GOST R 51251 (EN779, EN1822)	RECOMMENDATIONS FOR USE
COARSE FILTERS	80	G2	◤ for filtering large-sized particles (dust, fluff) contained in outdoor air; ◤ as a pre-filter in multi-stage filtration systems; ◤ in ventilation and air conditioning systems of business centers, warehouses and office premises, industrial enterprises and compressor stations.
	80	G3	◤ as first-stage filters in multi-stage filtration systems or as the main filter in single-stage systems; ◤ in ventilation and air conditioning systems of business centers, warehouses and office premises, industrial enterprises and compressor stations.
	90≤	G4	◤ for cleaning external and recirculated air from dust in supply ventilation systems; ◤ as first-stage filters in multi-stage filtration systems or as the main filter in single-stage systems; ◤ in severe operating conditions: variable and turbulent flows, frequent switching on and off of fans; ◤ in ventilation and air conditioning systems of business centers, warehouses and office premises, industrial enterprises and compressor stations.
FINE FILTERS	40≤Em<60	M5	◤ it is used for cleaning outside and recirculating air from dust in supply ventilation systems as second-stage cleaning filters; ◤ in multi-stage filtration systems or as the main filter in single-stage systems.
	60≤Em<80	M6	◤ it is used for cleaning outside and recirculating air from dust in supply ventilation systems as second-stage cleaning filters; ◤ in multi-stage filtration systems or as the main filter in single-stage systems; ◤ in ventilation and air conditioning systems of the pharmaceutical and food industries, ◤ in foundries and nuclear power plants, in gas turbine and compressor installations.
	80≤Em<90	F7	
	90≤Em<95	F8	
	95≤Em	F9	
HIGH EFFICIENCY FILTERS	85	E10	◤ as a final stage filter in multi-stage supply ventilation cleaning systems; ◤ for final air purification in supply ventilation systems to the level of "sterility" in clean areas of the microelectronic, microbiological, and food industries; ◤ for cleaning the air in exhaust ventilation systems from dangerous microorganisms and radioactive aerosols in medical institutions, the pharmaceutical industry, nuclear production and bacteriological laboratories.
	95	E11	
	99,5	E12	
	99,95	H13	
	99,995	H14	

STANDARD SIZE	DIMENSIONS, MM		Filter cell sizes, mm				
			592	592	287	792	492
			592	287	287	392	492
	b	h	number of the front-facing cells				
VRS-500-019	750	465	—	1	—	—	—
VRS-500-034	900	500	—	—	—	1	—
VRS-500-039	750	810	1	—	—	—	—
VRS-500-054	1095	675	—	—	—	—	2
VRS-500-058	1050	810	1	1	—	—	—
VRS-500-078	1350	810	2	—	—	—	—
VRS-500-086	1050	1020	1	2	1	—	—
VRS-500-115	1350	1020	2	2	—	—	—
VRS-500-116	1015	1320	2	2	—	—	—
VRS-500-138	1680	1020	—	—	—	4	—
VRS-500-156	1350	1320	4	—	—	—	—
VRS-500-173	1950	1020	3	3	—	—	—
VRS-500-193	1650	1320	4	2	—	—	—
VRS-500-194	1350	1620	4	2	—	—	—
VRS-500-151	2135	1120	—	—	—	—	8
VRS-500-234	1950	1320	6	—	—	—	—
VRS-500-240	1650	1620	4	4	1	—	—
VRS-500-271	2250	1320	6	2	—	—	—
VRS-500-289	1950	1620	6	3	—	—	—
VRS-500-290	1650	1920	6	3	—	—	—
VRS-500-333	2550	1320	8	—	—	—	—
VRS-500-337	2250	1620	6	5	1	—	—
VRS-500-350	1950	1920	9	—	—	—	—
VRS-500-414	2550	1620	8	4	—	—	—
VRS-500-407	2250	1920	9	3	—	—	—
VRS-500-500	2550	1920	12	—	—	—	—
VRS-500-473	2250	2250	9	6	1	—	—

HUMIDIFIERS

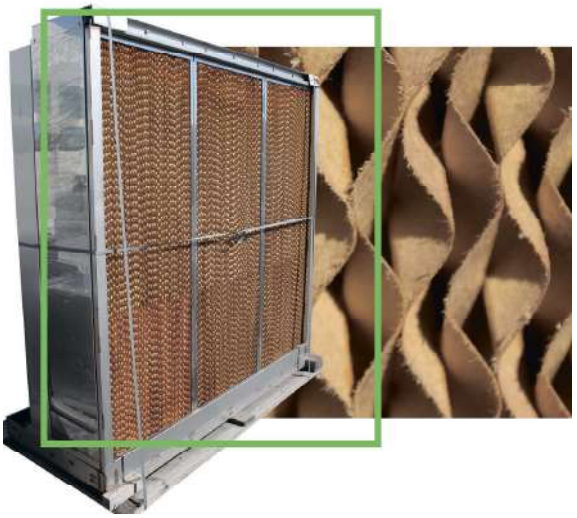
VRS air handling units can be equipped with various types of humidifiers: spray humidification chambers, honeycomb humidifiers, steam humidifiers.

Spray humidification chambers are a heat moisture exchanger in which air comes into contact with water sprayed by nozzles. Water droplets that have not evaporated are collected in a special pan, from where water is pumped through pipes to the nozzles and sprayed again into the air flow. In the spray humidification chamber, an adiabatic process of air humidification occurs – the air is humidified and cooled. The use of a spray humidification chamber allows not only to humidify the air, but also to purify the air from harmful substances and unpleasant odors.

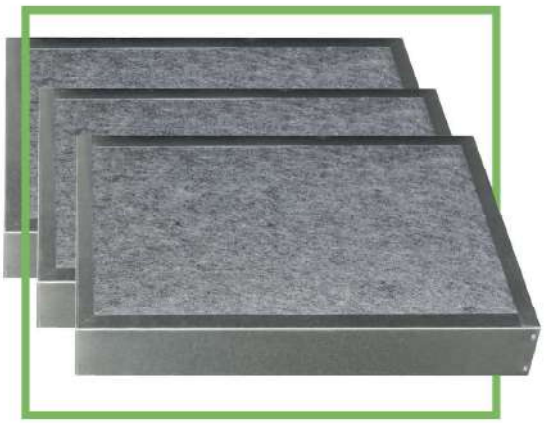


Honeycomb humidifiers are a special water-humidified element in the form of a honeycomb structure made of hygroscopic material, to which water is supplied through a water distributor. Passing through the water-humidified element, the air evaporates the water. In honeycomb humidifiers, an adiabatic humidification process occurs - the air is humidified and cooled. Water that has not evaporated flows into the pan, from where it is again fed to the water-humidified element from above by a special pump. The water level in the pan is maintained constant by a make-up system that compensates for water evaporation. To ensure long-term operation of the device, water treatment systems should be used that are capable of removing hardness salts from the make-up water. The advantage of this type of humidification is low water and electricity costs.

Steam humidifiers use dry steam to humidify the air, which is supplied through special steam distributors directly into the air flow. This type of humidification occurs during an isothermal process - the air temperature remains constant. The advantage of this type of humidification is the small dimensions of the steam humidifier and the ability to ensure hygienic conditions.



NOISE PROOFING MODULE



Noise proofing modules are used to reduce the noise generated by the fan and other elements of the air handling unit. Noise proofing modules can be installed both at the inlet and outlet of the air handling unit. Special noise-absorbing plates are installed inside the noise proofing module, the size and quantity of which determines the degree of noise reduction in the air handling unit. In VRS version 02 air handling units, the noise-absorbing plates can be removed if necessary.

VALVES

Air valves in the air handling unit serve as shut-off and control devices for changing the air flow rate. For outdoor VRS air handling units, vertical intake valves can be installed inside the intake section to insulate the valve body and protect the valve actuator from precipitation. For air handling units of design version 00, the valves are installed outside the section.

THE TABLE SHOWS THE AIR VALVES THAT ARE USED IN VARIOUS SERIES OF VRS AIR HANDLING UNITS

IDENTIFICATION	GMK-P	GMK	GMK-R	RLN	REG
VRS-300	•	•	•	—	•
VRS-500	•	•	•	•	—
VRS-700	•	•	•	—	—

Currently, automation systems for supply and exhaust systems developed and manufactured by CCK TM are successfully operated at many large industrial and social facilities, where modern and reliable management of life support systems is required. The automatic ventilation and air conditioning control system manufactured by CCK TM solves the problem of optimizing energy costs and maintaining high accuracy of parameter control in air conditioning systems. The schematic solutions presented in the catalog are developed without the use of programmable controllers and do not require special skills, the purchase of software or the creation of a special control room. For facilities with less than 10 supply air systems, this choice is reasonable. By special order, it is possible to manufacture automation and control systems with centralized dispatching, programmable controllers and other individual modifications.

IDENTIFICATION	Blade material	Casing material	Leakage class according to EN 1751	Lever mechanism
GMK-P	aluminum	Galvanized steel for general purpose industrial design Galvanized coated steel for VRS-series - ...- 01 Stainless steel for VRS-500-02 series	2	lever system outside the valve
GMK	aluminum	Galvanized steel for general purpose industrial applications Galvanized coated steel for VRS-series - ...- 01 Stainless steel for VRS-500-02 series	2	lever system outside the valve
GMK-R	aluminum	Galvanized steel for general purpose industrial applications Galvanized coated steel for VRS-series - ...- 01 Stainless steel for VRS-500-02 series	2	lever system outside the valve
RLN	aluminum	aluminum	1	gears inside the valve
REG	galvanized steel	galvanized steel	2	lever system outside the valve

AUTOMATIC CONTROL SYSTEM

At the request of the customer, in addition to the cabinet, the delivery package includes automation and control devices that ensure the operation of air conditioners according to the specified cycles and parameters.

The automatic control system provides the following features:

- providing air intake (atmospheric or mixed recirculating air). It is carried out by controlling the corresponding valves using electric drives;
- control of air intake valve heating (for valves with electric heating) – preheating the valve before it opens;
- control and regulation of the supply air temperature by controlling the valves of the water/air-heater and water/air-cooler. The temperature is controlled by a sensor that is usually installed in the air duct at the outlet of the air conditioner or in the serviced room;
- protection of the water/air-heater from freezing. It is carried out using a relay sensor of the return water temperature and an air temperature sensor behind the air heater;
- control of a multi-stage electric heater by switching on and off its stages. The temperature is controlled by a sensor that is usually installed in the air duct;
- protection of the electric heater from overheating. Protection is provided by means of an emergency overheating thermal relay. To ensure electrical and fire safety, protection against overload (short circuit), overheating and blocking when the fan motor stops is provided;
- multistage regulation of the supply air temperature (displacement of temperature control settings by room and/or external temperature sensor);
- air filter clogging indication. When the air filter clogging increases, the differential pressure on the filter changes, as a result of which the filter differential pressure switch sensor is triggered, and the "Filter" indicator lights up, usually without stopping the system operation;
- control of fan start-up with preheating of the water/air-heater and air intake valve in winter;
- control of fan stop or malfunction. When the fan stops or malfunctions (belt breaks, etc.), the pressure difference changes, causing the fan pressure relay sensor to be triggered and the air conditioner to be turned off;
- control of systems with backup fan (emergency fan);
- protection against short circuits and overloads in electrical circuits. Protection is implemented in a standard way using circuit breakers and thermal relays of magnetic starters.

VRS-550 AUTOMATIC CONTROL SYSTEM

- Fan and electric heater modules are always equipped with built-in electrical cabinets that have a separate power input according to the design. Electrical cabinets feature the necessary protection equipment and local disconnectors that ensure disconnection of the electrical power supply.

- Electric heater modules are always equipped with a heating power control system.

- External connections of the VRS-550 are standardized, determined by the presence and composition of the air conditioner functional modules, and are practically independent of their combinations.

- Modbus RTU and Modbus TCP/IP protocols are provided as standard

- Functions for calculating and maintaining air flow. Heat and power parameters and air consumption are maintained regardless of the degree of clogging of air filters and changes in the parameters of the air ductwork, ensuring stable operation.

Power consumption is optimized for changes in air flow resistance and changes in air filter clogging. Preventing the pumping of "excess" cubic meters of air saves both electrical and thermal energy.

- Frequency converters with high performance characteristics. The frequency converters used in the VRS-550 feature an ingress protection rating IP54 of the enclosure and are installed inside the air conditioner housing in proximity to the fan motor, and remain operational in the temperature range from -10° to +50° C.

The frequency converters used have a high power factor and a low harmonic factor, which makes their current consumption up to 20...60% lower than "budget" analogues. The load on electrical wires and switchgears is reduced, and electricity losses are reduced as well.

- Changes in air production and the presence of a "night" mode. Setting up variable air flow, switching on and off on a schedule. Standby night mode with automatic activation of the unit based on the air temperature in the room. The ability to adjust air production and operation with air quality sensor. Ability to maintain pressure or vacuum in the serviced room.

- Constant monitoring of the degree of air filters clogging, including during variable air production. The ability to plan the replacement of air filters without waiting for a degradation in air quality and an increase in energy consumption, regardless of the operating mode of the air conditioner.

- Efficient operational control of recuperative heat exchangers. Calculation and continuous monitoring of the efficiency of recuperation, together with control of the temperature of the exhaust air cooled by the recuperative heat exchanger, allow the stable operation of the unit to be set up and the "freezing-thawing" cycles to be prevented at low outside air temperatures.

TYPICAL DIAGRAMS OF EXTERNAL CONNECTIONS

External electrical connections of VRS-550 air handling units are determined by the presence of functional air handling modules and are practically independent of their total number and combinations. There are two types of electrical connections:

- power supply input;
- connection and interlocking with external equipment.

Fan and electric heater modules are always equipped with electrical cabinets that require separate power supply input according to the design.

Only four types of functional modules require execution of electrical power inputs, external electrical connections and interlocks on the installation site. The need to perform these connections depending on the type of functional module is shown in Table*.

TYPE OF FUNCTIONAL MODULE	SEPARATE POWER INPUT	AVAILABILITY OF EXTERNAL CONNECTIONS	NOTE
Modules with air valves	—	—	—
Panel filter module G4/M5	—	—	—
Bag filter module G4/M5/M6/F7/F8/F9	—	—	—
Electric heater module with smooth adjustment	available**	—	—
Liquid air heater module	only for heaters with 3-phase circulation pumps	available*	—
Evaporative air cooler module	—	—	necessary interlocks are provided in the fan unit cabinet
Liquid/air-cooler	—	—	control valve can be connected in the cabinet on the fan unit
Honeycomb humidification module	—	—	—
Steam humidification chamber	—	available*	—
Fan unit	available**	available*	external connections and interlocks must be done only in the cabinet on the supply fan
Plate heat exchanger	—	—	—
Rotary heat exchanger	—	—	—

* Typical electrical connection diagrams are given below.

** Power input parameters are specified in the VRS-550 air conditioner order form.