

TECHNICAL DOCUMENTATION

Installing and Maintenance Manual

Air Handling Units with Heat Recovery

VEBAR

Models

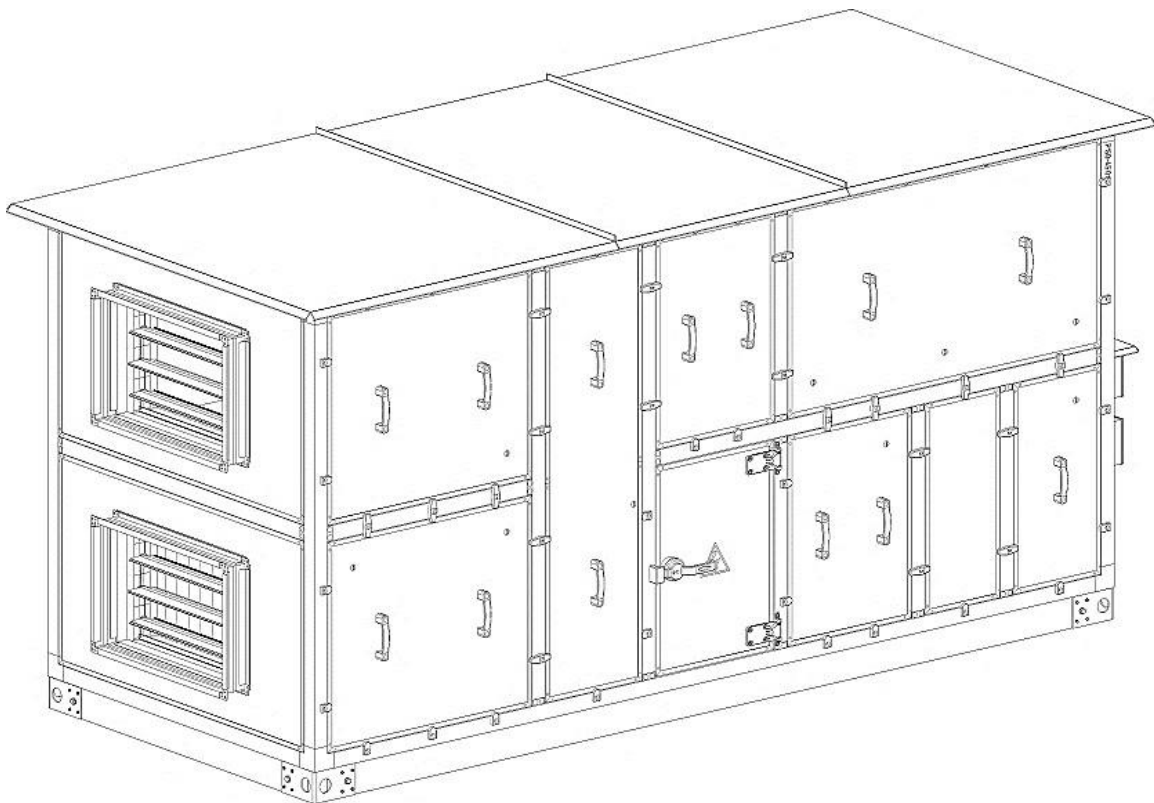
VEBAR-CR

VEBAR-CS

VEBAR-WP

VEBAR-WS

VEBAR-G



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1. GENERAL INFORMATION

Present Instruction Manual enables safe and effective service of the air handling unit.

The Instruction Manual is part of the unit and must be available to the operator at any moment, and is aimed at installation companies, operating personnel, plant installation maintenance personnel or trained persons and electrical and air-conditioning specialists as well. Before starting any work, operators must acquainted with following Instruction Manual.


Main prerequisite for safe work is to comply with all safety and operating instructions contained herein.

In addition, with reference to the scope of device using, accident prevention regulations and general safety regulations are in force.


Beside these present - basic instruction, additional instructions (supplementary instructions) may be issued, containing information on operation of components additionally delivered and/or embedded within the air handling unit - the instructions contained therein, particularly with regard to safety, must be followed strictly at all times!

1.1 Symbols used

In Instruction Manual following graphic symbols are used:





This symbol means useful information and instructions.



This symbol means important information on which damage to property, health or life may depend.

Notice: to make this Instruction Manual easier to read, important information has been marked with symbols. However, this does not exempt the user and installer from observing requirements not marked with the graphic symbols!

Other symbols used in this Instruction Manual:


Symbol	Symbol meaning
	Action to be performed
	Cross-reference to page/item of Instruction Manual

1.2 Manufacturer's limitations and reservations

Manufacturer is not liable for damages due to:

- inappropriate transportation, storage, assembly and/or disassembly;
- product misusing;
- damages resulting from improper handling and operation;
- carrying out modifications, working parameter modifications, carrying out conversions, repair or replacement of parts on your own without knowledge and consent of Manufacturer;
- assembly not carried out in accordance with Instruction Manual and/or by unqualified persons (without involvement of Authorised Service).

Manufacturer reserves the right to make technical modifications without prior notice and related to improving product performance and development.



Drawings and photos presented in this Instruction Manual are of illustrative character only and may differ from the actual version of the unit.

In view of possibility of device multi-variant configuration, Instruction Manual may contain descriptions and functions which are not available in the ordered and supplied variant or which do not appear in device basic variant (available as additional option).

1.3 Copyright protection

Present documentation - including all descriptions, photos, drawings, diagrams, etc. - is protected by copyright and may only be used in conjunction with the air handling unit delivered. Any other documentation using, in particular copying, saving and processing, without consent and knowledge of Bartosz Company, and in violating the copyright law, is not permitted and may constitute grounds for claiming appropriate compensation from part of Bartosz Company.

2 SAFETY REQUIREMENTS

2.1 Unauthorized persons

Persons without necessary qualifications and ability to recognise possible dangers on their own, persons with reduced physical and mental capabilities, including those under influence of drugs, alcohol or medication, and consequently with impaired reaction capabilities, and children, are not allowed to assemble and operate these devices. Unauthorized persons, as incapable to recognise hazards, should not be present in direct zone of equipment operation.

2.2 General safety guidance

Installation, service and maintenance works should only be carried out after being acquainted with Instruction Manual and safety stickers on the air handling unit and only when:

- operating personnel have been provided with personal protective equipment;
- the unit has been shut down correctly - via the control panel;
- power supply has been correctly and permanently disconnected from the device;
- all rotating and moving parts in the air handling unit have stopped and there is no overpressure inside the air handling unit.



Before starting to install and maintenance, make sure whether the air handling unit has been permanently and safely disconnected from power supply installation.



The air handling unit should be connected to power supply should by executed by person having appropriate certificates and qualifications and in accordance with safety regulations.



Do not put into operation not grounded air handling unit – hazard of electrocution.



If the air handling unit is not provided with manufacturer’s automation, company delivering automation is responsible for functionality and reliability of safety features.



Before starting servicing works on the air handling unit, ensure that the unit has been disconnected from power supply and none of the rotating elements thereof is in motion.



Rotating fan impeller, risk of injury. Switch off the unit and wait at least 3 minutes before opening the inspection door.



During the air handling unit operation, all doors and inspection panels must be closed.

2.3 Personal protective equipment

All works must be carried out with using personal protective equipment in form of:



Protective helmet

protection against falling of heavy elements and materials.



Protective gloves

hand protection against abrasions, injuries and burns in contact with hot surfaces.



Protective footwear

protection against falling of heavy elements and materials and slipping on the slippery ground.



Eye protection

protection against eye damage.



Hearing protection

protection against hearing damage.



Protective clothing

with narrow sleeves and without protruding parts to prevent clothing from being caught by machine moving parts.

2.4 WEEE 2012/19/EU Directive

The product purchased has been designed and manufactured with using the highest quality materials and components that are recyclable and can be reused.

The product meets requirements of **Directive 2012/19/EU of European Parliament and Council from 4th of July 2012 on used electrical and electronic equipment (WEEE)**, according to which it is marked with the symbol of a crossed-out wheeled bin (as above) indicating that it is subject to separate collection.

Responsibilities after product end-of-life:

- recycle packaging and product at the end of its life in suitable recycling company.
- do not dispose product with normal waste.
- do not burn product.



By complying with these obligations for controlled disposal of wasted electrical and electronic equipment, you will avoid harmful influence on environment and human health hazard.

Before starting installation/use, you should be acquainted with warning labels on the air handling unit and observe safety instructions.

3. PURPOSE AND CONDITIONS OF USE

3.1 Non-intended use

The VEBAR air handling units in standard execution are intended for general ventilation of single- and multi-family buildings, offices, commercial premises, etc., providing transport, filtration and recuperation and, depending on additional options using, air heating/cooling, humidifying/drying. Any other use shall be deemed to be inappropriate to purpose and user shall be liable for any damage resulting from inappropriate use.

Using the device in standard version under following conditions shall be also considered as misusing:

- explosion hazard;
- in excessively dusty rooms;
- in areas with strong electromagnetic field;
- in aggressive and excessively humid environments (swimming pools).

Above-mentioned conditions require special version of the unit to be used.

3.2 Air handling unit operation conditions

The air handling units in indoor execution and standard version are intended to be installed in rooms which should fulfil following conditions:

- be free from aggressive agents and excessive dust and protected from atmospheric agents;
- maintain ambient temperature within range from +5°C to +40°C;
- air humidity in the air handling unit's surroundings must not lead to water vapour condensation on the enclosure or other elements of the unit;
- fresh air parameters should be within temperature range from -24°C to +40°C (automatic control system has function of supply air temperature protection), and the absolute humidity should not exceed value of 13g/kg;
- exhaust air parameters should be in temperature ranges from +15°C to +40°C.

The air handling units in outdoor execution and standard version are suitable for outdoor operation and corrosion resistance thereof is equal to class C3 (acc. to PN-EN ISO 12944-2).

The requirements for non-standard versions of the air handling units are given in separate documentation.

3.3 Device identification

Each air handling unit, automation and control panel is fitted with nameplates including the unit's identifying serial number [SN]. The plates are located in the following places:

- (1) SN of the air handling unit – the external air filter inspection door
- (2) SN of the automation – inside the automation cabinet
- (3) SN of the controller – front cover of the controller. In addition, it is possible to call out controller in the operating unit from its menu: Panel→Menu→Information→Software version→Factory no.
- (4) SN of the control panel – located on the back of the panel;



Serial number SN of the air handling unit and controller/automation should be given every time when contacting with service department – to order parts and operation materials and to obtain any technical assistance.

Unit designation		VEBAR-WP6-KF-NE-EC	
Technical data			
Flow range (N/W)(m³/h)	3200/2200	Fan section - air supply	Static pressure (Pa)
Max. pressure (N/W) (Pa)	200/200		Total pressure (Pa)
Production version	external		Power input (kW)
Execution variant	right		Nominal power (kW)
Heat exchanger section			
Pressure drop supply (Pa)	187.8		Fan speed (rpm/min)
Pressure drop exhaust (Pa)	186.5		Fan speed max (rpm/min)
Heat recovery - winter (%)	92.2		Rated input (V)
Filter section			
Filter section	nawiew wywiew		Rated current (A)
Filtration class	F7 M5		
Pressure drop (Pa)	128 121		
Type	pocket		
Size/type	827x490x320/1 827x490x360/1		
Electrical heater section			
Power (kW)	6.0		
Pressure drop (Pa)	10		
Rated input (V)	3 x 400		
Current (A)	9.7		
Fan section - air exhaust			
			Static pressure (Pa)
			Total pressure (Pa)
			Power input (kW)
			Nominal power (kW)
			Fan speed (rpm/min)
			Fan speed max (rpm/min)
			Rated input (V)
			Rated current (A)
			Weight (kg) ±5%
			Serial no.
			XXXXXXXXXX
			Year of production
			2024



Fig. 1 Air handling unit nameplate

3.4 Delivery range

The VEBAR air handling units are packed on non-returnable transport pallets and protected from moisture by foil. Additional components are packed in cardboard boxes and placed inside the unit sections. Delivery range and conformity should be determined on the basis of attached shipping documents.



Full listing of optional equipment is available in Bartosz Company's catalogues and price list. Correct operation is only possible with original accessories delivered by Manufacturer.



Due to various unit configuration possibilities, delivery range should be checked on the basis of attached specifications and delivery notes. Their general condition should also be inspected.

3.5 Transport and storage

Unloading and transport to installation site should be carried out with due care and with using the forklift or pallet truck. Proceeding rules during transport and unloading:



UWAGA SZKŁO!
FRAGILE!



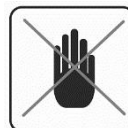
GÓRA!
THIS WAY UP!



ZACHOWAĆ
OSTROŻNOŚĆ!
HANDLE WITH CARE!



PRZEWOZIĆ
POWOLI!
DRIVE CAREFULLY!



NIE DOTYKAĆ!
DO NOT TOUCH!



NIE STAWAĆ!
NIE KOPAĆ!
DO NOT STEP!
DO NOT KICK!



NIE PIĘTROWAĆ!
DO NOT STACK!



NIE OPIERAĆ
SIĘ O TOWAR!
DO NOT LEAN ON THE
PRODUCT!

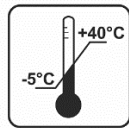
During storage, following conditions should be cared to be met:



CHRONIĆ PRZED
BEZPOŚREDNIM
SŁOŃCEM!
KEEP AWAY FROM
DIRECT SUNLIGHT!



CHRONIĆ PRZED
WILGOCIĄ!
KEEP DRY!



PRZESTRZEGAĆ
ZAKRESU
TEMPERATUR!
OPERATING
TEMPERATURE RANGE!

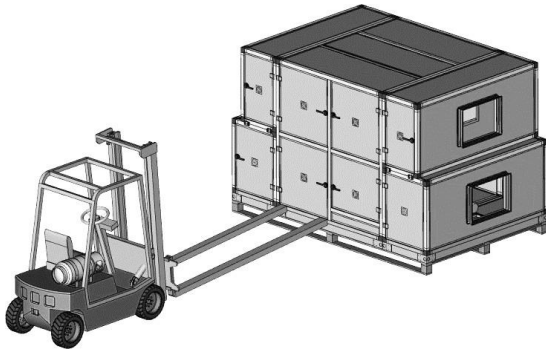


Fig. 2 Transport by forklift truck with appropriately selected length of fork beams



Fig. 3 Correct vertical transport with crane and transport beams and spreading beams



DANGER: Risk of damage
Use fork beams of the correct length



DANGER: Risk of damage!
Use transport elements of adequate strength

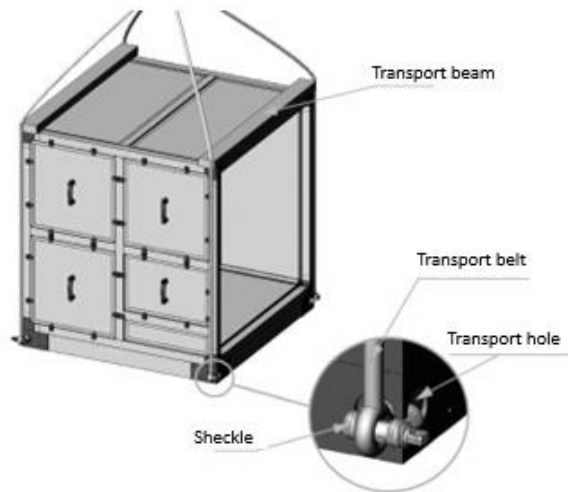


Fig. 4 Vertical transport with using of the shackles and spreading beams



DANGER: Risk of damage!
Take special care during transport – follow transport instructions placed on the packaging.



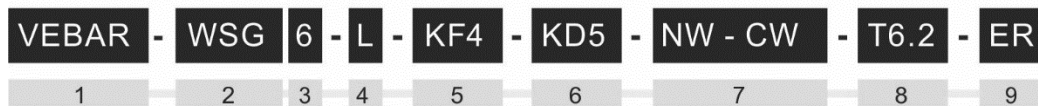
Any damage resulting from incorrect transport, unloading and storage is excluded from Manufacturer's liability.



Delivery items must be stored in their original packaging in dry and sheltered from weather condition influence and protected against possibility of any mechanical damages.

3.6 Air handling unit code designations

AIR HANDLING UNITS WITH HEAT RECOVERY



1. AHU model

2. Exchanger type:

- WSG – spiral heat exchanger WS, vertical position
- WSC – spiral heat exchanger WS, horizontal position
- CR – condensing rotary heat exchanger
- CRE – enthalpy rotary heat exchanger
- CRX – sorption rotary heat exchanger
- WP - counter-flow heat exchanger, vertical blocking AHU
- WPL - counter-flow heat exchanger, horizontal blocking AHU
- WPV - counter-flow heat exchanger, suspended variant
- G - glycol exchanger
- GRV - heat pump

3. AHU size:

- WS – sizes from 6 to 24
- CR – sizes from 3 to 13
- WP – sizes from 3 to 12
- G – sizes from 5 to 14
- GRV – sizes from 5 to 14

4. Execution variants:

- L – left
- P – right

5. Filter type - air supply:

- type and class of filtration:
- KF – pocket filter (G4-F9)
- KD – cartridge filter (G4-F5)
- FAT - fat filter (G1-G2)

6. Filter type - air exhaust:

- type and class of filtration:
- KF – pocket filter (G4-F9)
- KD – cartridge filter (G4-F5)
- FAT - fat filter (G1-G2)

7. Additional options:

- NW – water heater
- CW – water cooler
- CF – freon cooler
- NE – electric heater
- ES 5.3 – empty section:
 - 5 – length (pitch every 100 mm/100 ex., length 800 mm:100 = 8)
 - 3 – location (same as noise silencer: 1-intake, 2-air supply itd.)
- NG – gas heater
- KM – recirculation section
- PC – cooling-heating device
- HF – air humidifier
- OK – dip tray with air intake / exhaust port

8. Noise silencer:

- 6, 9, 12 – damping length (x100)
- 2 – location:
 - 1 – intake
 - 2 – air supply
 - 3 – air ejection
 - 4 – exhaust

9. Fan type:

- ER – alternating current fans AC
- EC – electronically commutated fans EC
- EX – explosion-proof fans

AIR HANDLING UNITS WITHOUT HEAT RECOVERY



1. AHU model

2. AHU type:

- N – air supply unit
- W – air exhaust unit
- CNW – supply and exhaust air, vertical blocking AHU
- CNL – supply and exhaust air, horizontal blocking AHU
- CNV - supply and exhaust air, suspended variant

3. AHU size:

- N – sizes from 3 to 13
- W – sizes from 3 to 13
- CNW – sizes from 3 to 14
- CNL – sizes from 3 to 8
- CNV – sizes from 3 to 7

4. Execution variants:

- L – left
- P – right

5. Filter type - air supply:

- type and class of filtration:
- KF – pocket filter (G4-F9)
- KD – cartridge filter (G4-F5)
- FAT - fat filter (G1-G2)

6. Filter type - air exhaust:

- type and class of filtration:
- KF – pocket filter (G4-F9)
- KD – cartridge filter (G4-F5)
- FAT - fat filter (G1-G2)

7. Additional options:

- NW – water heater
- CW – water cooler
- CF – freon cooler
- NE – electric heater
- ES 5.3 – empty section:
 - 5 – length (pitch every 100 mm/100 ex., length 800 mm:100 = 8)
 - 3 – location (same as noise silencer: 1-intake, 2-air supply itd.)
- NG – gas heater
- KM – recirculation section
- PC – cooling-heating device
- HF – air humidifier
- OK – dip tray with air intake / exhaust port

8. Noise silencer:

- 6, 9, 12 – damping length (x100)
- 2 – location:
 - 1 – intake
 - 2 – air supply
 - 3 – air ejection
 - 4 – exhaust

9. Fan type:

- ER – alternating current fans AC
- EC – electronically commutated fans EC
- EX – explosion-proof fans

3.7 Functional signing of air handling unit sections

























		
WS – spiral heat exchanger	WP – counter-flow heat exchanger	CR – rotatable heat exchanger (rotor)
		
CS – cross-flow heat exchanger	G – glycol exchanger	GRV – heat pipe
		
KM – mixing chamber	PC – cooling-heating device	ER, EC – fan section
		
KD, KF – filtration section	NW – water heater	NE – electric heater
		
NG – gas heater	CW – water cooler	CF – freon cooler
		
PW - throttle	T – noise silencer	OD - condensate collector
		
ES – empty section	OK - dip tray with air intake/ launch pad	STW - automation
		
B – heat exchanger (by-pass)	O – heat exchanger drainage	OA – cabling

Table 1 Unit section graphic designation

4. AIR HANDLING UNIT DESIGN

4.1 General characteristics

The air handling units have mono-block or sectional skeleton design depending on size and design version. The skeleton constitute aluminium profiles filled with sandwich type panels of 40 mm thickness, consisting of polyurethane foam core covered with coated steel sheet cladding with devices embedded therein.

The set enclosure provides both thermal and acoustic insulation.

The enclosure is equipped with inspection flaps allowing service access to the unit's components. The unit is provided with mounting frame enabling quick and easy installation in operating position. Depending on purpose and operating conditions foreseen, following types are available:

Execution variant	Description
Standard execution	<ul style="list-style-type: none"> • Service access through inspection panels equipped with handles and pressure block (basic version); • Inspection doors mounted on hinges with arm lever (sections with overpressure, double stage lever – expandable system) with lock in option; • Inspection panels equipped with measurement nipples (Φ8); • Mutual connections of individual sections by centering fittings; • Aluminium sheet metal condensate trays with slope and drain on service side; • Condensate drain with siphon (ball-type for vacuum sections or flooded for positive pressure sections) on inspection side;
Hygienic execution (fulfils guidelines of VDI 6022 and PZH)	<ul style="list-style-type: none"> • All materials are certified (acc. to VDI 6022 and PZH guidelines); • Sandwich type panel design painted by powder method or stainless steel (in accordance with VDI 6022 requirements); • Enclosure on internal side completely smooth, made of sheet steel painted by powder method or stainless steel; • Contact spots of perpendicular walls are rounded and additionally provided with sealing; • Service access through inspection doors mounted on hinges with arm lever (sections with overpressure, double stage lever – expandable system) with lock; • Inspection possibility behind and past exchangers; • Possibility of independent dip tray replacement; • Resistance of all construction materials to disinfectants and cleaning agents (rails and guides, filter frames, heat exchanger housings, throttles made of powder-coated, epoxy-coated sheet metal or stainless steel); • Drip trays in each section made of stainless steel with nipple to drain the unit on service side, enabling constant and complete discharge of condensate from drip trays; • All components of the air handling unit are easy accessible to be cleaned and corrosion-resistant (additionally, epoxidation of components - exchangers, fans - is possible); • The air handling units have internal lighting and inspection windows enabling cleanliness inspection during device operation; • Full tightness of enclosure and tight doors – tightness class L1 according to PN-EN 1886;

- Sealant compound resistant to chemicals and micro-organism growth with antibacterial additives and non-porous;
- Two stages of filtration, whereby initial filters at least of F5 class (EU5);
- Fans with direct drive (prevention of contamination from belt drive wear);
- Installation of components outside floor contour (suspended components) - easy access and cleaning;

Table 2 Unit execution standards



The air handling units in special execution (for swimming pools, with enhanced chemical resistance, explosion-proof – parameters, configuration, equipment and execution standard according to individual agreements.

4.3 Enclosure execution variants

Indoor and outdoor execution:

Execution variant	Characteristic features
Indoor	<ul style="list-style-type: none"> • Throttles and actuators mounted outside of the air handling unit; • Exchanger fitting nipples outside of the air handling unit;
Outdoor	<ul style="list-style-type: none"> • Additional sealing; • Roof of steel sheet metal of 0.7 mm thickness, coated with polyester of 25 μ m RAL 9006; • Throttles and actuators of air intake and launch pad mounted inside enclosure; • Protective drip trays and shutter-type intake and launcher; • Possibility of connecting hydraulic modules to exchangers inside the air handling unit or their special outdoor installation arrangement;

Table 3 Execution variants

4.4 Arrangement variants

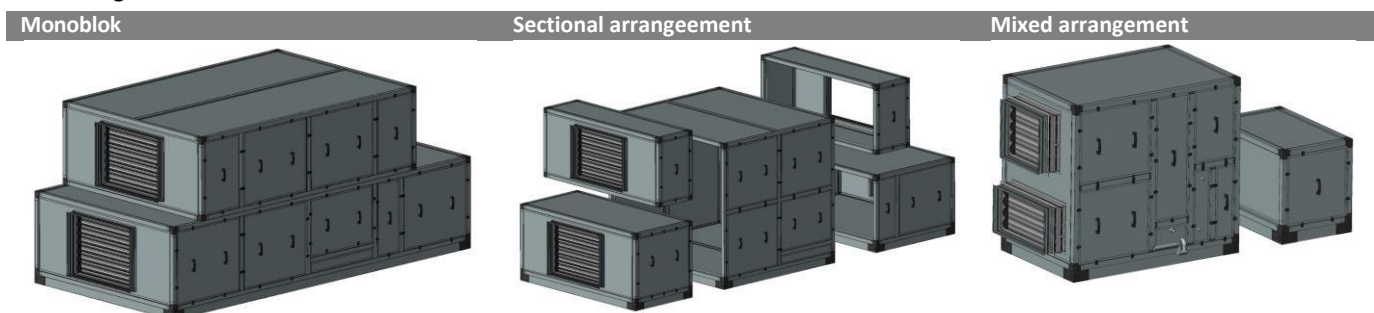


Fig. 5 The VEBAR unit arrangement variants.

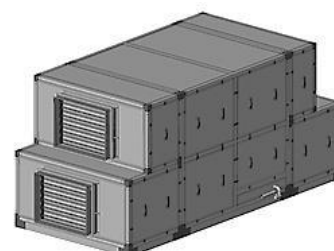
All functional unit elements arranged in single enclosure (or possibly two, most commonly lower and upper enclosure). This solution is characterised by permanent connection (no dividing possibility) and therefore it is possible to apply in certain size of the air handling unit (for logistical reasons).

The individual functional elements of the air handling unit built into individual sections - connection through connectors. In case of cabled version of the air handling units, individual sections have socket-to-plug type electrical connections (quick-connectors).

The air handling units have partial monobloc arrangement - several components in one enclosure and the remaining ones in separate common enclosure (2-section enclosure) or separate individual enclosure for each component.

4.5 Air handling unit configuration

Execution variant	Characteristic features
Standing variant–vertical blocking (section over section)	<ul style="list-style-type: none"> • The air handling unit in standard arrangement is delivered together with mounting base. • Designed for location on foundation or additional support structure. • Inspection side: <ul style="list-style-type: none"> - side access (single-sided: right or left) - double-sided.




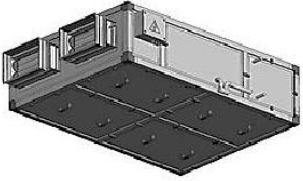
<p>Standing variant – horizontal blocking (sections by sections)</p>	<ul style="list-style-type: none"> • The air handling unit in standard arrangement is delivered together with mounting base. • Designed for location on foundation or additional support structure. • Inspection side: <ul style="list-style-type: none"> - double-sided access (external execution), - double-sided access / upper (internal execution). 	
<p>Suspended variant</p>	<ul style="list-style-type: none"> • The air handling unit designed for mounting in suspension. • Horizontal operation position. • Inspection side: <ul style="list-style-type: none"> - access from bottom, - double-sided access from the side. 	

Table 4 The VEBAR unit central blocking configuration

4.6 Service side of the unit

BARTOSZ units of VEBAR types occur in two execution variants:

- left execution;
- right execution.

Execution side is determined based on airflow relation (viewing from intake side) and unit service side.

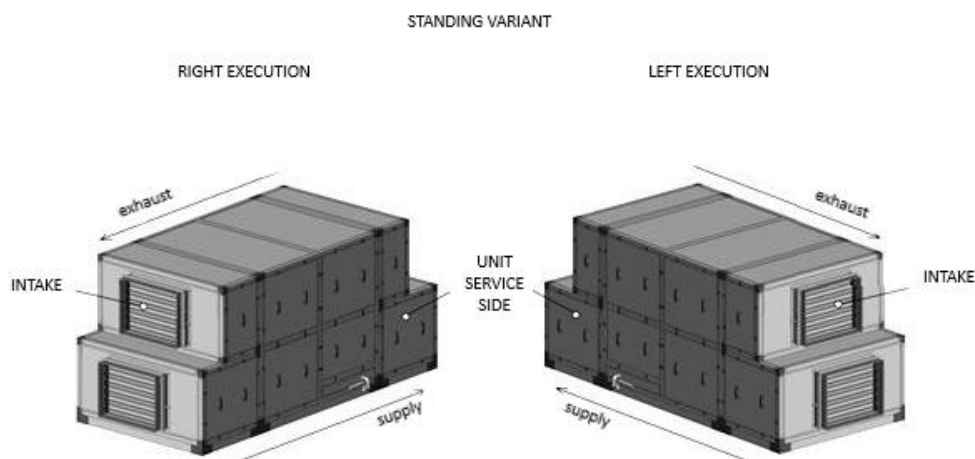


Fig. 6 Execution side of standing units (R-right, L-left)

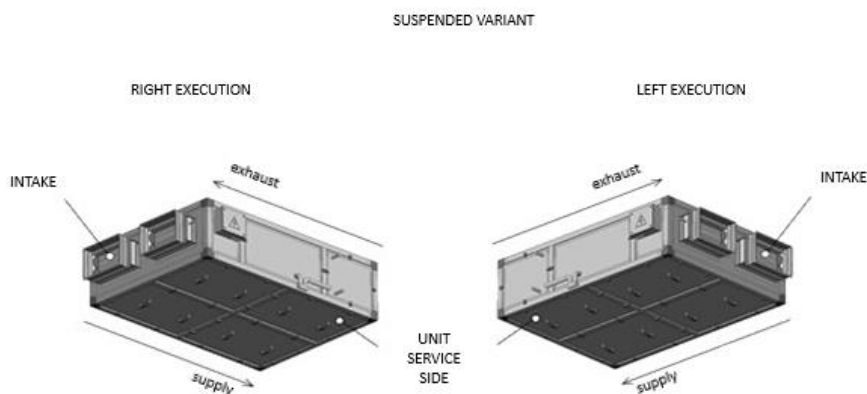
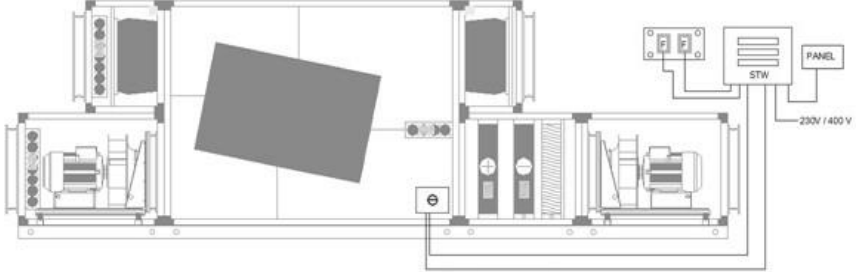
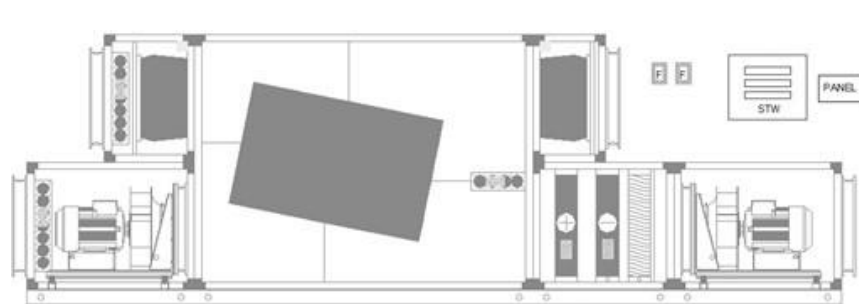
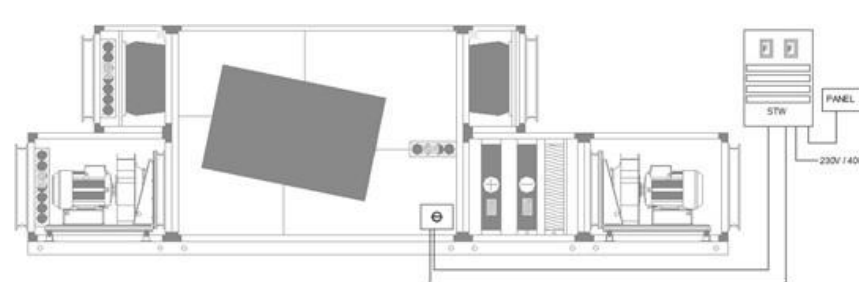
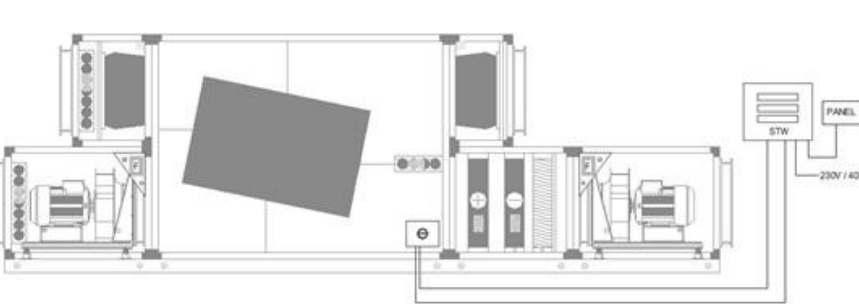
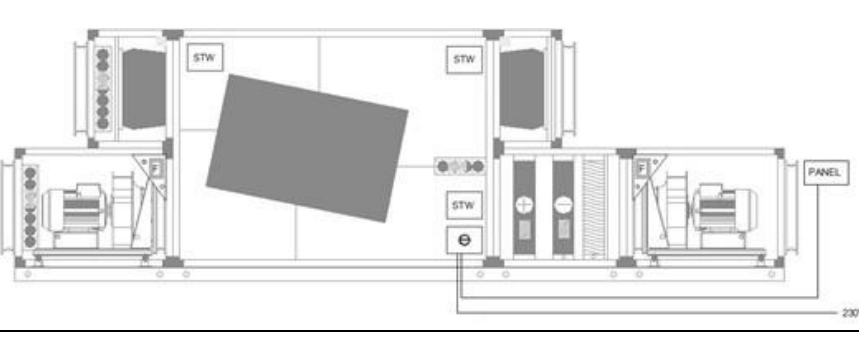


Fig. 7 Execution side of suspended units (R-right, L-left)

4.7 Automation and cabling

The air handling units of VEBAR series may be provided with automation including necessary measuring and control components and factory cabling or can be manufactured and delivered without automation. Possible standard configuration variants within automation and cabling range are presented below.

Variant	Configuration
<p>ZP3 Cabinet (made of plastic IP21) outside the unit, inverters IP21 on unbuilt board, variant for indoor use,</p>	
<p>ZP3.1 Cabinet (made of plastic IP21) outside the unit, inverters IP21 and remaining executive elements not installed,</p>	
<p>ZP4 Cabinet (made of metal IP54, with air conditioning) with inverters IP21 outside the unit, indoor and outdoor variant,</p>	
<p>ZP4.1 Cabinet (made of metal IP54) outside the unit, inverters IP55 within the unit, indoor and outdoor variant,</p>	
<p>ZR1 Plug&Play system No cabinet – element located as dispersed within the unit, inverters IP55, indoor and outdoor variant,</p>	

<p>ZR3 Plug&Play system Cabinet with air-conditioning with inverters IP21 integrated within the unit, indoor and outdoor variant,</p>													
<p>ZR3.1 Plug&Play system Cabinet integrated within the unit, inverters IP55 within the unit, indoor and outdoor variant,</p>													
<p>Designations</p>	<table border="0"> <tr> <td></td> <td>Automation executive element</td> <td></td> <td>Service panel</td> </tr> <tr> <td></td> <td>Frequency inverter</td> <td></td> <td>Automation cabinet</td> </tr> <tr> <td></td> <td>Power supply cabinet with service circuit breaker</td> <td></td> <td></td> </tr> </table>		Automation executive element		Service panel		Frequency inverter		Automation cabinet		Power supply cabinet with service circuit breaker		
	Automation executive element		Service panel										
	Frequency inverter		Automation cabinet										
	Power supply cabinet with service circuit breaker												

Table 5 Configuration variants of automation and cabling

4.8 Programming and initial putting into operation

Depending on selected automation configuration variant, the VEBAR air-handling units are delivered within range of programming and putting into operation in accordance with Table 6 below.

Configuration variant	Cabling	Programming ¹	Initial putting into operation
ZP3	factory-made (internal)	yes	yes
ZP3.1	no	no	no
ZP4	factory-made (internal)	yes	yes
ZP4.1	factory-made (internal)	yes	yes
ZR1	factory-made (internal)	yes	yes
ZR3	factory-made (internal)	yes	yes
ZR3.1	factory-made (internal)	yes	yes

Table 6

5. INSTALLING AND CONNECTION



DANGER: Risk to health and life due to insecure fixing!

Before installation, check load-bearing capacity of the structural elements to which the air handling unit will be attached and make correct selection of all fixing elements.

5.1 Standing unit foundation

The indoor air handling unit may be located in any room of the building (in basement, technical room, boiler room, etc.), provided that ambient temperature does not exceed the permissible operating range, i.e. +5 ÷ +40°C. The room should be located such that it is possible to easily lead out the supply and exhaust ventilation ducts, external air intake and discharge the exhaust air out of the building, as well as meet the following conditions:

- it must be capable to discharge condensate from the heat exchangers to the sewer system with pipe of at least 32 mm of diameter with the pipe arranged with slope towards the sewer system,

¹ Input of settings and operation items determined by Purchaser

- it has electric power to supply the air handling unit with required parameters, including adequate protection (fuses and differential-current leakage breaker),
- it has possibility for exiting the control cable connecting the air handling unit to operator's panel,
- it has entrance doors with dimensions enabling the air handling unit transportation on mounting position,
- the room and location thereof should allow free access to carry out repairs or standard service activity,
- the room should be ventilated and humidity in the air handling unit's surroundings should not lead to condensation on the enclosure or other unit elements.

Both indoor and outdoor air handling units are delivered with standard mounting base which must be placed directly on the floor, the additional foundation or the special support structure.

The foundation method must meet the conditions:

- ensure support for panel frame at required points;
- foundation surface should be planar, stable and ensure required load capacity;
- ensure possibility of adjusting to level the air handling unit;
- foundation height or the support structure should take into account possibility of connecting siphon draining condensate from the drip trays of the air handling unit (detailed information about the required dimension ⇔ point 5.6);
- enable firm unit anchoring in the ground or connection to the support structure in manner protecting against displacement (e.g., due to wind gust).

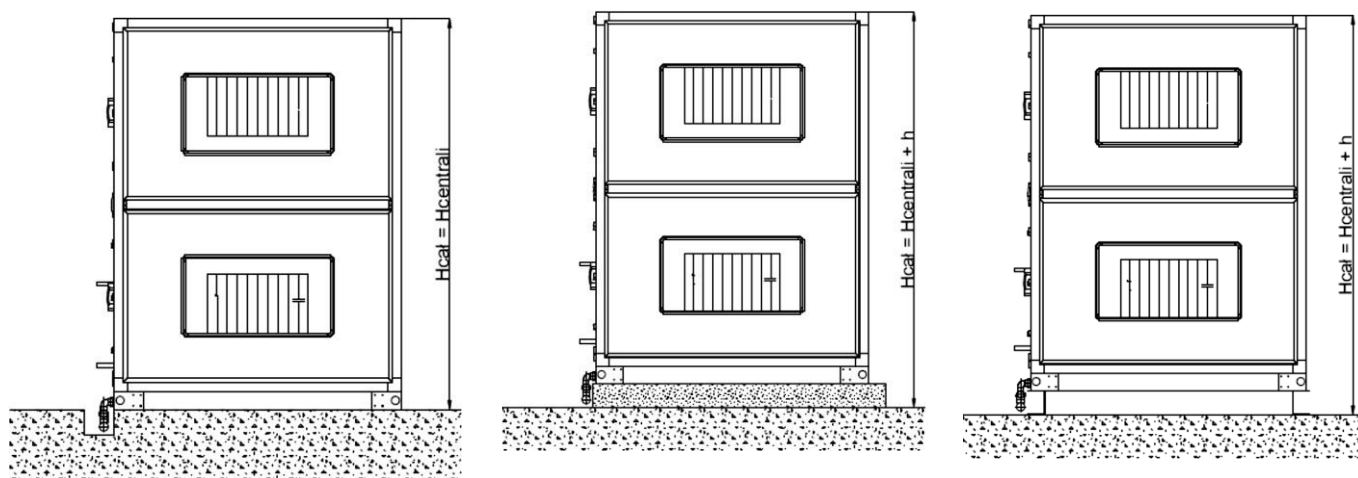


Fig. 8 Unit foundation variant

a) without building additional structure / pedestal – recess for siphon in the floor

b) with building additional pedestal

c) with building additional support structure

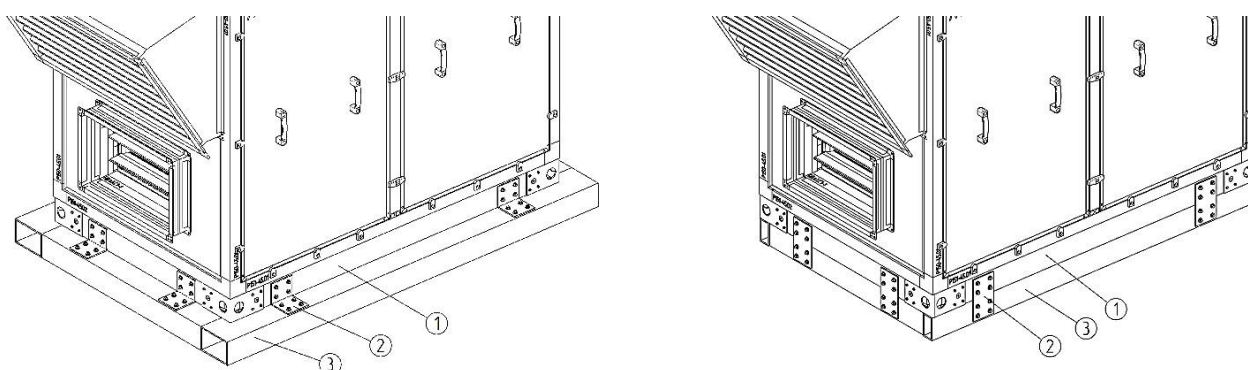


Fig. 9 Proposed variant of unit fixing to the support structure



DANGER: Danger to life and health due to insecure fixing!

The number, type and strength of the elements for permanent connection of the unit to the ground/structure must be made based on local wind and snow load conditions and location/foundation method

Location and foundation of the air handling unit should be carried out such that it is possible to execute connections of all associated installations (ventilation ducts, process heat installations, electrical installation) and that connection of these installations does not cause collision with removable inspection panels.

5.2 Suspended unit foundation

The rooms intended for suspended unit installation should correspond to the same conditions as for standing units. Suspended units may only be installed in horizontal position. Moreover, it is also required to level units in all planes.

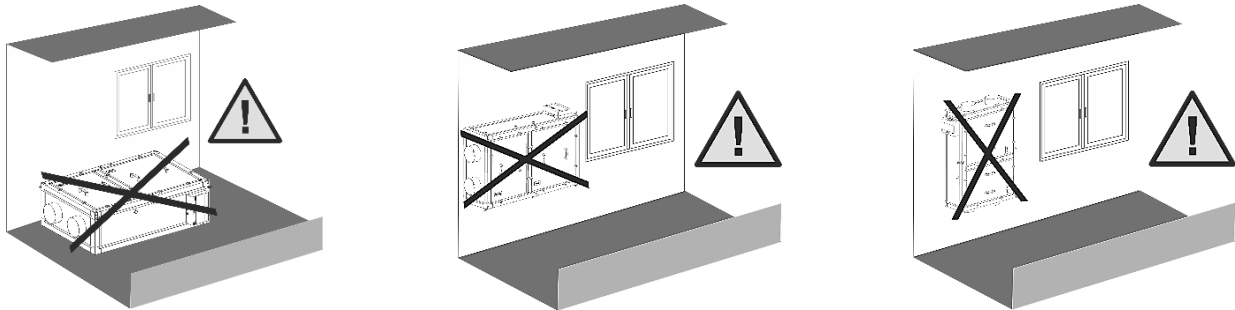
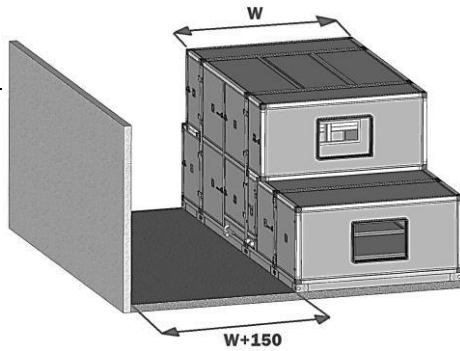


Fig. 1 Inadmissible operating positions of the suspended units

5.3 Space for service

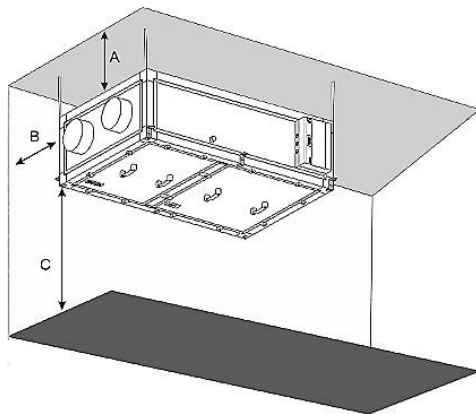
To avoid problems associated with installation and subsequent service, it is recommended to leave free space between the inspection panels of the air handling unit and existing building partitions in accordance with Tables 7 and 8.



Required space for service	
Minimum	0.75W
Reccomeded	W+150cm

Table 7

Fig. 11 Recommended service-mounting space for the standing units






	A	B	C
Minimum distance [mm]	100	100	2000

Table 8

Fig. 12 Recommended service-mounting space for the suspended units

5.4 Section connecting

Assembly of the control panel sections should be carried out as follows:

-  Position individual sections as shown in the drawing corresponding to the ordered unit version, remove packaging;
-  Clean (degrease) and apply the gasket/sealant provided on the profiles at the contact points of the individual sections;
-  Move modules/sections close to each other in accordance with connecting unit diagram (attached in form of additional documentation);

- Mutually connected modules should be screwed together by means of special section connectors;
- Contact connections should be sealed additionally with sealing compound.

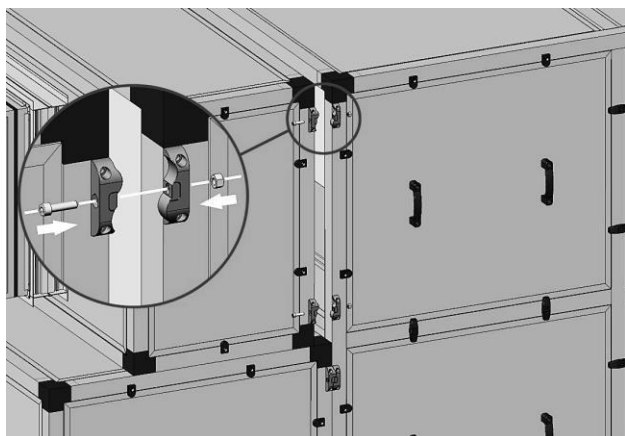
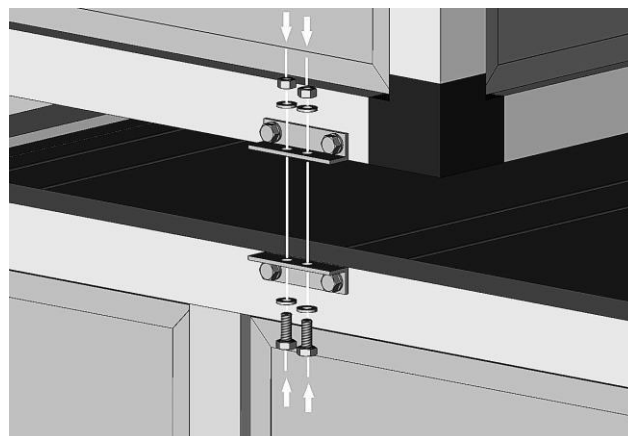


Fig. 13 Method of vertical connecting of the modules



Rys. 14 Method of horizontal connecting of the modules



DANGER: Damage to the air handling unit!
Individual connectors serve to combine firmly the sections and they can not be used as tensioning elements during assembling.

5.5 Installing in suspended position

Suspension of the air handling unit is carried out using the installed suspension slings for suspension of the air handling unit (this applies to the suspended air handling unit variant only). Fixing should be carried out with using M8 threaded rods or suitable anchors (fastening elements are not included in delivery). Special attention must be paid to level the air handling unit during installation works.

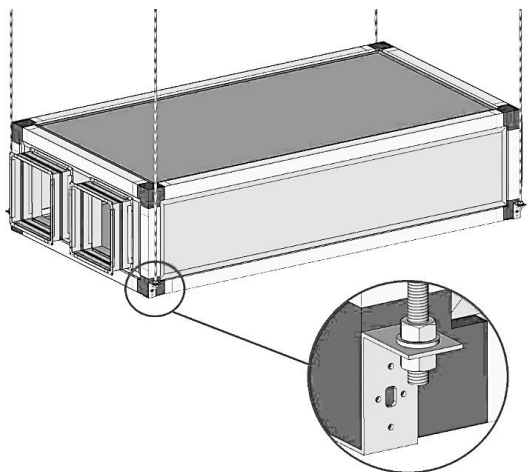


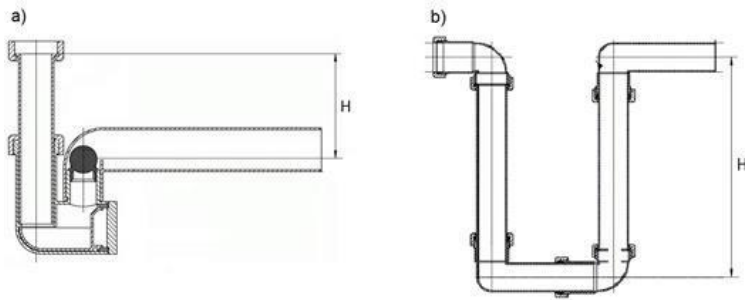
Fig. 15 Installing the unit in suspended version



- The units may only be installed using the factory-made hooks – it is inadmissible to install using hooks, brackets and rails attached to the front, side, rear or top panels.
- Installing suspension elements in places not intended for this purpose may lead to damage unit panel elements or prevent the inspection panels to be removed.

5.6 Draining system connection

The heat exchanger, water and freon cooler and glycol heat exchanger sections are equipped with drip trays terminated with $\phi 32$ aluminium drain discharging nipples which remove condensate outside the air handling unit. The siphons for effective condensate removing during unit operation should be connected to the drain discharging nipples, i.e. when there occurs overpressure or underpressure inside the unit. In case of the indoor units, condensate draining through siphon which guarantees the required water column of height H depending on prevailing pressure inside the drained section to be maintained (Fig.16; Table 9) should be connected to the sewer system with slope (min. 1%), thus enabling the free - gravity condensate draining or the condensate pump should be used.



No.	Total fan pressure [Pa]	Height H [mm]
1	<600	60
2	600-1000	100
3	1000-1400	140
4	1400-1800	180
5	1800-2200	220
6	2200-2600	240

Table 9 Siphon effective height "H"

Fig. 16 Overflow siphons
a) ball siphon (sections with underpressure); b) U-shaped siphon (sections with overpressure)

Heat exchanger condensate draining should be protected in winter by using suitable thermal insulation and/or suitable heating system (e.g. by self-regulating heating cable). The pipe draining condensate should always be installed with slope. Should never connect the drain pipe directly vertically to the drain grating.

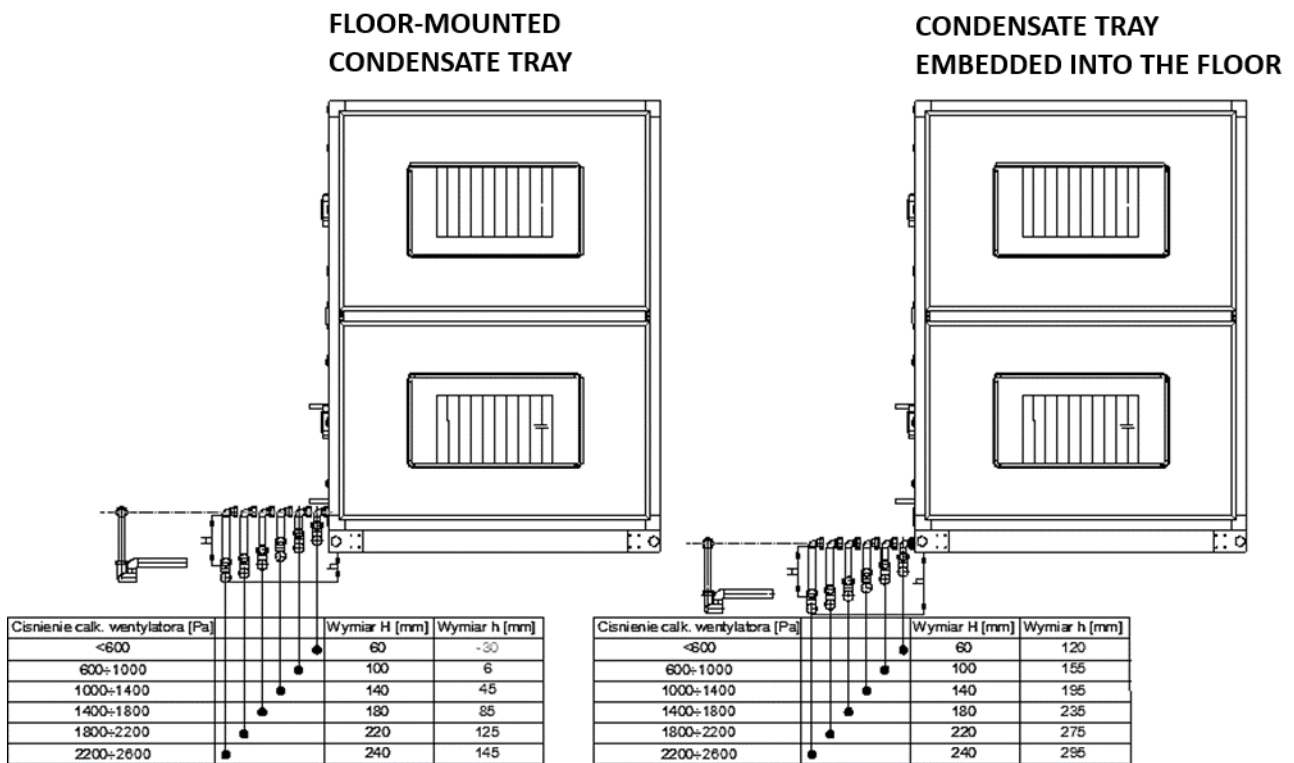


Fig. 17 Required space dimensions for correct siphon installing



DANGER: Unit malfunction!

It is not permissible to operate the air handling unit without fitting suitable siphons preventing free airflow through the condensate drainage system.



DANGER: Risk of condensate leaking outside!

Check for correctness in the condensate drain.

5.7 Duct connection

The ventilation air ducts are connected to the air handling unit by flexible socket joints eliminating vibration. The socket joints are made of flexible material with sheet steel or stainless steel edges, terminated with DW20 flange frame (for frame sizes <1000 mm) or DW30 (for frame sizes >1000 mm). The connection should be fitted with the gasket and then bolted at the corners (Fig.15). In case of significant connection dimensions and in order to achieve completely tight connection, it is recommended to use additional clamping elements arranged symmetrically on the flange frame (typical ventilation air duct clamps). It is also necessary to connect PE protective conductors connecting the air handling unit enclosure with the ventilation air duct.

General guidelines for installation:

- installation should be carried out in accordance with keeping designed diameters;
- installation of the external air of indoor units should be made with slope towards air intake or drainage system thereof;
- installation should be made as tight - systems with gaskets should be used, and additionally seal the connections with self-adhesive ventilation tapes;
- installation elements should be secured against possibility of slipping out thereof;
- fix the installation by clamps with rubber inserts;
- thermally insulate (by double jacket system) with properly selected insulation layer;
- secure the thermal insulation against slipping out and unsealing.



DANGER: The air handling unit and system malfunction!

Results of incorrectly executed installation:

- condensating of moisture outside or inside installation;
- heat transmission losses;
- reduced heat recovery/frost in the recuperator;
- noise and vibration transmission;
- mechanical damages and material losses;
- increase in system operating costs.

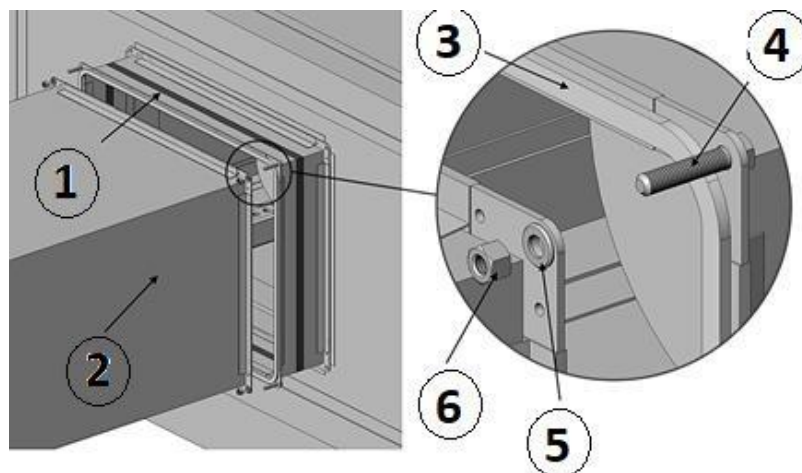


Fig. 18 Ventilation air duct connection

1- elastic nipple; 2- ventilation air duct; 3- gasket; 4- bolt; 5- washer; 6- nut



DANGER: The air handling unit failure!

The air handling unit is not designed to bear the load of connected ventilation system which should be independently fixed with using clamps with rubber dampers.

5.8 Electric drive installing on air throttles

To protect the air handling unit and due to need to regulate amount of air supply, multi-planar throttles are used which are mounted directly in the air handling unit or on its nipple. The air throttles of the air handling units are controlled by means of electric drive. The drive should be mounted on a stem (Fig.19).

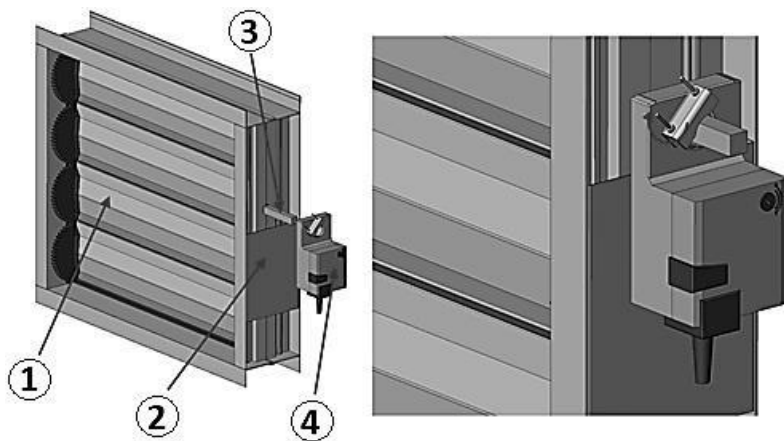


Fig. 19 Actuator mounting on the throttle stem:
1- throttle; 2- actuator bracket; 3- throttle stem;
4- electrical actuator

5.9 Connection of water/glycol heater/cooler



DANGER: Hazard to life and health!
Avoid direct skin contact when filling, venting or emptying. Danger of poisoning and burning from caustic agents!



DANGER: The air handling unit damage!
Admissible agent pressure level should not be exceeded.

The supplying and returning nipples of the exchangers should be connected in such that the exchanger operates in the counter-flow configuration (according to designations indicated on the nipples). In the case of the co-current flow arrangement, the exchanger capacity will be significantly reduced (heaters – capacity drop up to 10%; coolers – drop up even to 25%). Connection of heaters and coolers should be made in manner that would exclude occurrence of stresses (pipeline weight and thermal stresses) that may cause mechanical damage or leaks. Therefore, compensators should be used in supply and return piping system which would exclude or compensate longitudinal pipe expansion.

When connecting and tightening the installation to the exchanger, its nipples must be fixed and counteracted with additional spanner so as damage of the exchanger internal installation components were impossible to be allowed. In addition, the following recommendations should be followed:

- despite the exchangers being equipped with their own vent and drain nipples, the upper nipple should be additionally equipped with automatic vent and the lower nipple with component enabling draining medium to be released,
- connection of the installation to the heater should be made by means of connectable-disconnectable elements enabling easy disassembly in case of service operations to be conducted,
- installing should be carried out such that to allow free access to all components of the unit,
- the pipelines routed outside, inside the air handling unit or in rooms with temperatures below 5°C must be thermally insulated. This should be done to avoid water freezing and undesired water condensation outside the pipeline,
- the exchangers operating in conditions creating risk of water freezing must be equipped with anti-freeze protection (most frequently in form of capillary sensor mounted on the heater cross-section at air discharge side or contact sensor located at the returning nipple).

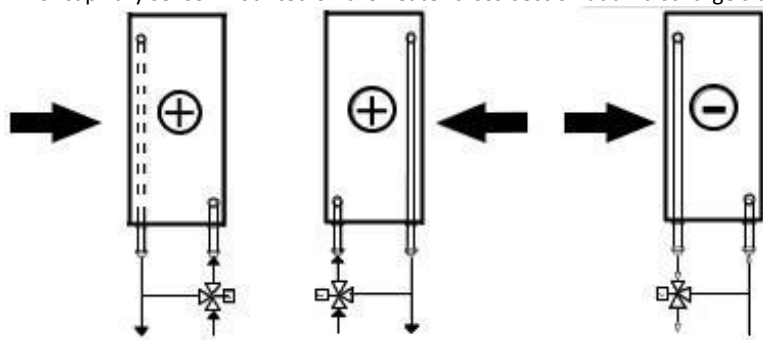


Fig. 20 Example of counter-current flow connection of water heaters and coolers

5.10 Connection of freon cooler



DANGER: Hazard to health and life!

Connection of the freon cooler to the cooling unit should be carried out by qualified cooling fitter in accordance with rules applicable to freon cooling equipment.

This type of cooler is suitable for horizontal airflow only. The cooler should be supplied in counter-current flow arrangement. Particular attention should be paid to ensure whether the type of freon used corresponds to that indicated on the nameplate.

5.11 Connection to electric installation – the unit with automation



DANGER: Hazard to health and life due to electrocution!

- Works may only be carried out by properly qualified and certified persons.
- Before starting works, disconnect the device and optional equipment from power supply.
- Follow instructions.



In variant of the air handling unit without cabling, the person carrying out the electrical installation distribution in the air handling unit should carry out equalising connections and check continuity in the electrical circuits.

The air handling unit is supplied with current from the electrical cabinet usually positioned at or inside the air handling unit. The cross-section and type of power and control cables and all devices should be selected according to the rated current. In addition, specific conditions for the location of the air handling unit should be taken into account (e.g. ambient temperature, cable routing manner, distances from the electrical cabinet). Before starting connecting the power supply, the compatibility of the power supply mains parameters (i.e. voltage and frequency) with data on the equipment nameplates must be checked (permissible deviations are ±5%). If there are inconsistencies or if there is no protection against effects of short circuits and overloads, the equipment should not be put into operation. The network to which the controller is connected should meet the following conditions:

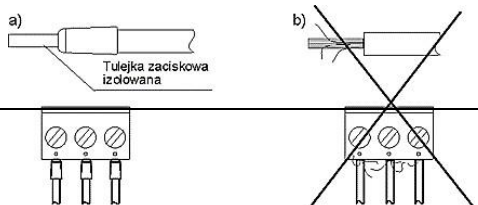
Network type:	TN-S
Supply voltage for single-phase cabinet:	230V±10%
Supply voltage for three-phase cabinet:	3x380-415V and phase asymmetry till 3%
Maximum short-circuit current:	Icu<6 kA
Surge protectors:	class D

The cable ends, especially at mains voltage, must be protected against delamination, e.g. with insulated clamping sleeves. Cable cross sections specified in technical data (⇒Tab. 11) and tightening torques of the screw terminals (⇒Tab. 10) should be used.



DANGER: Hazard to health and life due to electrocution!

- Works may only be carried out by suitably qualified and certified persons.
- Before starting works, disconnect the device and optional equipment from power supply.
- Follow instructions.



Type of cable	Tightening torque	Insulating
Supplying	0.4 Nm	6 mm
Controlling	0.3 Nm	6 mm

Table 10

Fig. 21. Securing of cable ends:
a) correct b) - incorrect



DANGER: Hazard to health and life due to electrocution!

It is not allowed to use damaged power supply cord, power supply cord plug or loose electrical socket. Failure to do so endangers to cause electrocution or fire.



DANGER: Hazard to health and life due to electrocution!

Power supply from mains should be adequately protected in accordance with regulations in force within range of surge, overloading and electric shock protections (fuses, overcurrent circuit breakers).

Required surge, overloading and electric shock protections should be selected for given values of individual parameters.

Parameter	Power supply	Controlling
Air handling unit	YDY 3x1.5	x
Operator's panel	x	LiYCY 4x0.5
Temperature sensors	x	LiYCY 2x0.5
Air sensors (CO ₂ , RH, VOC)	x	LiYCY 3x0.5
Electric heaters	According to loading ²	LiYCY 2x0.5 / 1x0.5
Frost (water exchanger)	x	2x0.5
3-way valve actuator	x	3x0.5
Freon exchangers (only cooling)	x	LiYCY 2x0.5 / 2x0.5
Freon exchangers (heating / cooling)	x	LiYCY 2x0.5 / 4x0.5
Intake/launcher actuator (without spring)	x	5x0.5
Intake/launcher actuator (with spring)	x	4x0.5

Table 11. Listing of connection cables³:

6. DESIGN OF THE AIR HANDLING UNITS

6.1 Fan section

Fans used in the air handling units are mounted directly in the unit - in the fan section. The mounting of the fans ensures a flexible, airtight connection between fan pressure side and the enclosure of the unit. There are three types of fans used in the VEBAR air handling units:

ER Fan:	<p>Compact, optimised design made of zink-plated sheet steel; Integrated inlet ring designed for optimum airflow; made of zink-plated sheet steel with measuring nipple for flow rate determination; Impeller balanced with hub; permissible vibration intensity less than 2.8 mm/s in accordance with ISO 14694 The entire unit is mounted on C-profiles; High-performance radial impeller wheel, of single-suction, without housing, with back-curved and welded sheet steel blade system, with surface protection achieved by powder coating, directly mounted onto the motor shaft driven by Taper-Lock collet system and statically and dynamically balanced. IEC motor 400 V / 50 Hz, three phases; IP 55 construction, IMB3, IE2 *; Motor protection by PTC thermistor, thermal class 155 (previous: insulation class F) Motor suitable for frequency converter operation; Overload protection; Standard version for temperatures -20°C / +40°C;</p>
ECR Fan:	<p>Compact, optimised design made of zink-plated sheet steel; Integrated inlet ring designed for optimum airflow; made of zink-plated sheet steel with measuring nipple for flow rate determination;</p>

² ⇔ Controlling Automation STW-6 Assembly Instruction Manual – Attachment 1

³ It relates to standard devices – it does not relate to individual selection

	<p>Impeller balanced with hub; permissible vibration intensity less than 2.8 mm/s in accordance with ISO 14694 The entire unit is mounted on C-profiles; High-performance RH impeller made in ZAmid technology Standard version for temperatures -20°C / +40°C;</p>
EC Fan:	<p>Impeller with back-curved blades made as composite monolith; Highly-efficient motors of 70-90%; Compliance with ErP2015 Directive; Controlling by signal 0-10V or PWM; From 250 mm size there is possibility to control through RS-485 interface with utilizing of MODBUS RTU protocol; Motor 230/50 Hz or 400 V / 50 Hz, single- or three-phase; IP 54; Motor protection by PTC; Overloading protection; Standard version for temperatures -25°C/+60°C;</p>

6.2 Filter section



To change the filter cartridge easily and quickly, it is important to keep distance between sectional revision system and other installation elements or building partitions.

Filters serve for supply and extract air filtering. Separation of airborne contaminant particles extends service life of equipment downstream of the filter - fans, heat exchangers, heaters, etc. The filters used in the units are pocket or cartridge filters of appropriate filtration class.

Cartridge filters [KD]				
Filtration class acc. to PN EN 779	G4		F5	
Type of filtration	initial		initial	
Filtration degree Am [%]	~91.5		~96.6	
Length [mm]	50		100	
Initial/end resistance	50 / 105		60 / 200	
Pocket filters [KF]				
Filtration class acc. to PN EN 779	G4	F5	F7	F9
Type of filtration	initial	initial	II degree	II degree
Filtration degree Am [%]	~91.6	~96.5	~99.3	~99.5
Length [mm]	300 / 4	300 / 4	500 / 8	500 / 8
Initial/end resistance	40 / 150	50 / 200	100 / 300	165 / 400

Table 12 Detailed characteristics of filtration inserts



It is important to remember to install pocket filters in the air handling unit in accordance with indicated airflow direction.

There are two execution variants of filter fixing:

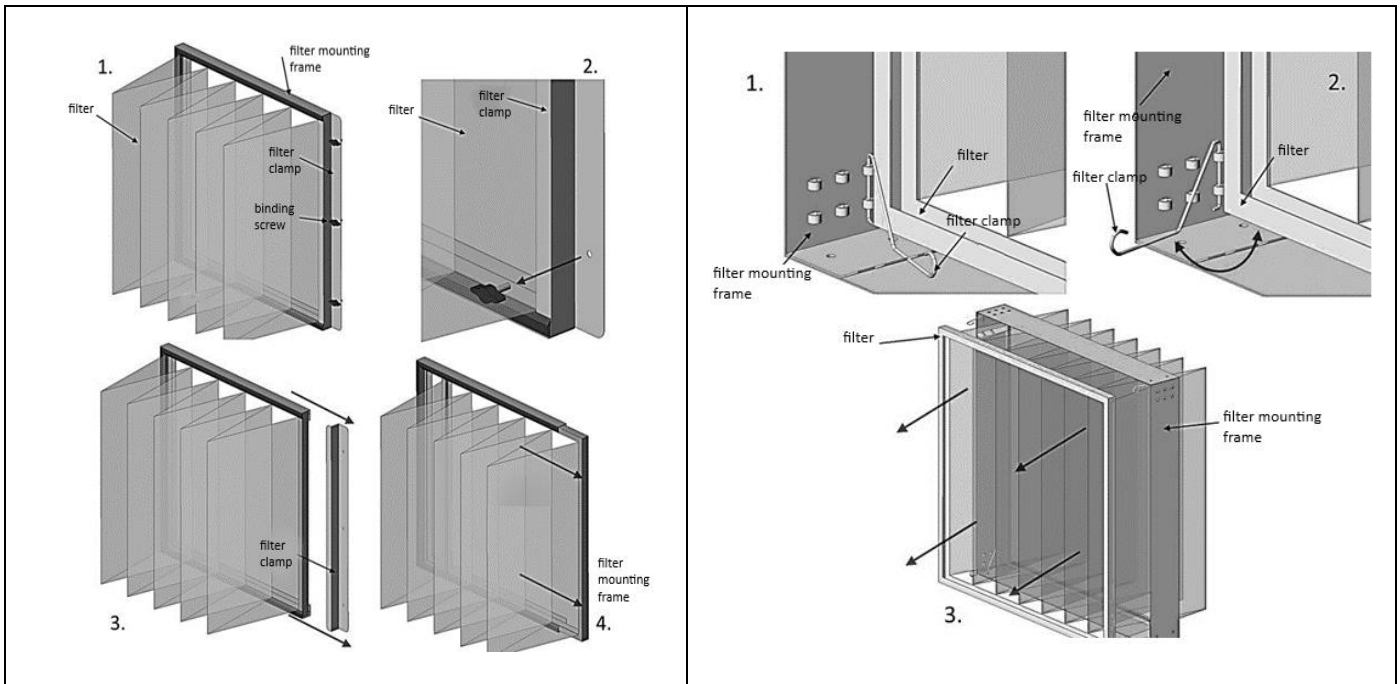


Fig. 22 Filter mounting in the guides.

Filter mounted on inspection side, in aluminium guides with gasket and filter press fixed to the filter section baffle.

Fig. 23 Mounting with yoke pressure clamps.

Filter mounted on „soiled” side (from side of inflow air) in the frame. Filter is pressed to the mounting frame by four resilient elements.

6.3 Heat recovery section

6.3.1 Spiral-counter-flow exchanger [WS]

- Exchanger material: aluminium foil folded spirally, casing and shell of zink-plated sheet metal and shell made of sheet aluminium or stainless sheet metal.
- Heat recovery class [acc. to EN 13053]: A
- Exchanger tightness: 99.9%
- Exchanger working length: 1350 mm
- Exchanger maximum working temperature: till +60°C
- Possibility of exchanger cold recovery (temperature efficiency till 65%)
- Possibility of exchanger operation in lying position WS-C and standing position WS-G (Fig.17)
- **Integrated double by-pass independent for exhaust and supply air without cutting off the airflow through the exchanger (Fig.25)**
- Condensate trays made of sheet aluminium with slope and outflow on service side

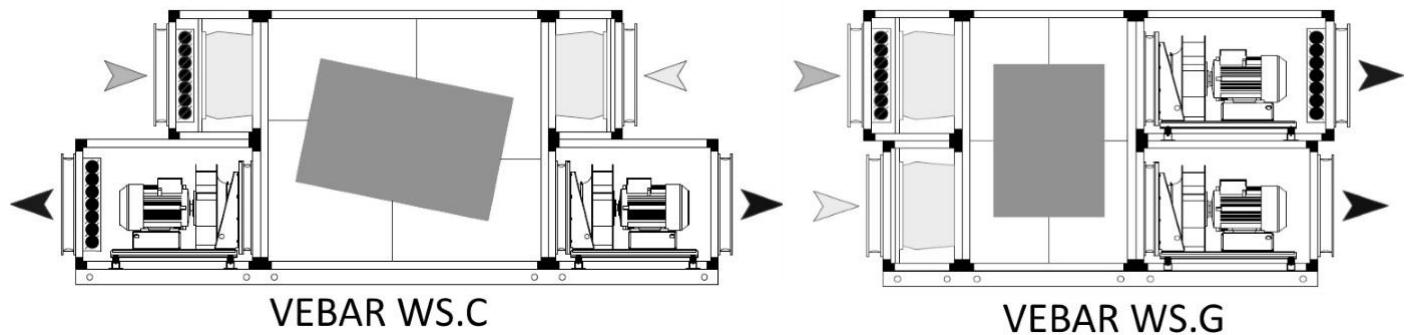


Fig. 24 The basic unit VEBAR WS possible configurations

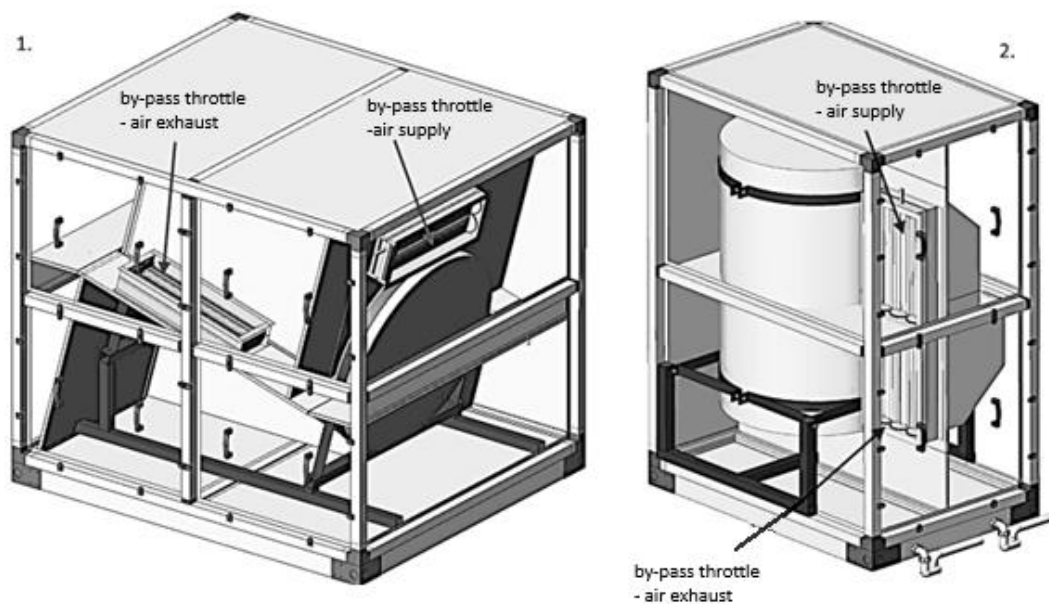


Fig. 25 The by-pass throttle arrangement (1-variant WS-C; 2-variant WS-G)

6.3.2 Rotary exchanger [CR]

- Exchanger material: filling in form of alternately wound coil made of two layers of flat and corrugated aluminium tape of 0.07 ÷ 0.12 mm thickness, forming channels with hydraulic diameter of D=1.6 mm (standard execution).
- Heat recovery class [acc. to EN 13053]: A
- Exchanger tightness: ≤95%
- Temperature efficiency: ≤80%
- Exchanger maximum working temperature: till +60°C
- Types of casing :
 - RRU – bolted structure of zink-plated sheet metal (till size of 2500 mm) [CR]
 - RRS – welded structure of cold-bended zink-plated profiles (till size of 4250 mm) [CRs]
 - RRT – welded structure of closed aluminium profiles (till size of 8000 mm) [CRt]
- Types of accumulation mass:
 - Condensation impeller for sensible heat relative energy recovery; latent heat only in case of condensation [CR]
 - Impeller for enthalpy recovery for sensible and latent heat with using impeller filling with hygroscopic coating [CRE]
 - Sorption impeller for sensible and latent heat relative energy recovery all over the year due to impeller filling with hygroscopic coating [designation CRX]
- By-pass realized through impeller stopping
- CR exchangers equipped with built-in drive - geared motor for infinitely variable speed control combined with control unit - frequency converter and V-belt and rotation control in form of induction rotation speed sensor.

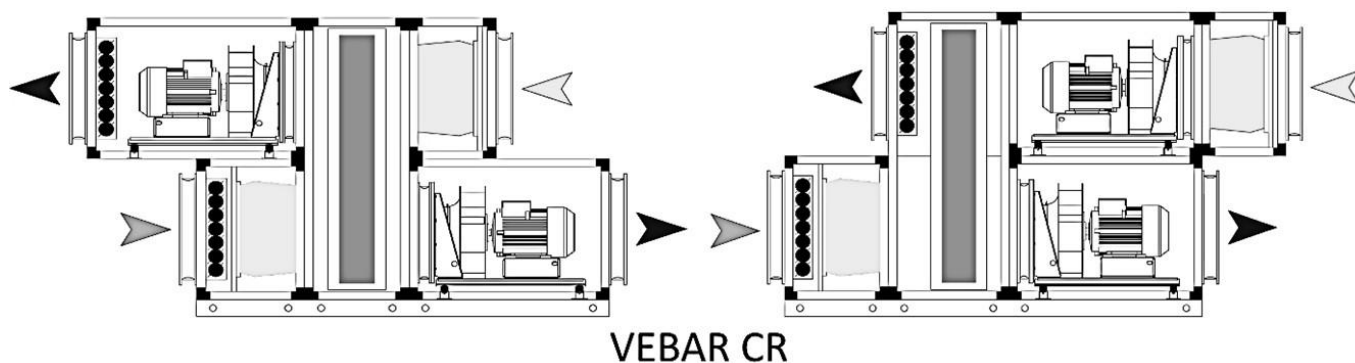


Fig. 26 The basic unit VEBAR-CR possible configurations

6.3.3 Plate exchanger [CS]

- Exchanger material: packet of aluminium plates of 0.12 ÷ 0.2 mm thickness, pressed single-sided, double-sided or with using of corrugated inserts, between which the supply and extract air streams flow
- Heat recovery class [acc. to EN 13053]: B
- Temperature efficiency: ≤70%
- Spacing between plates: 1.8 - 14 mm

- Exchanger tightness: 99.9%
- Length of the side: 400 - 1200 mm
- Maximum working temperature: till +60°C
- Integrated by-pass – on supply air with full airflow cut off through exchanger (Fig. 28)

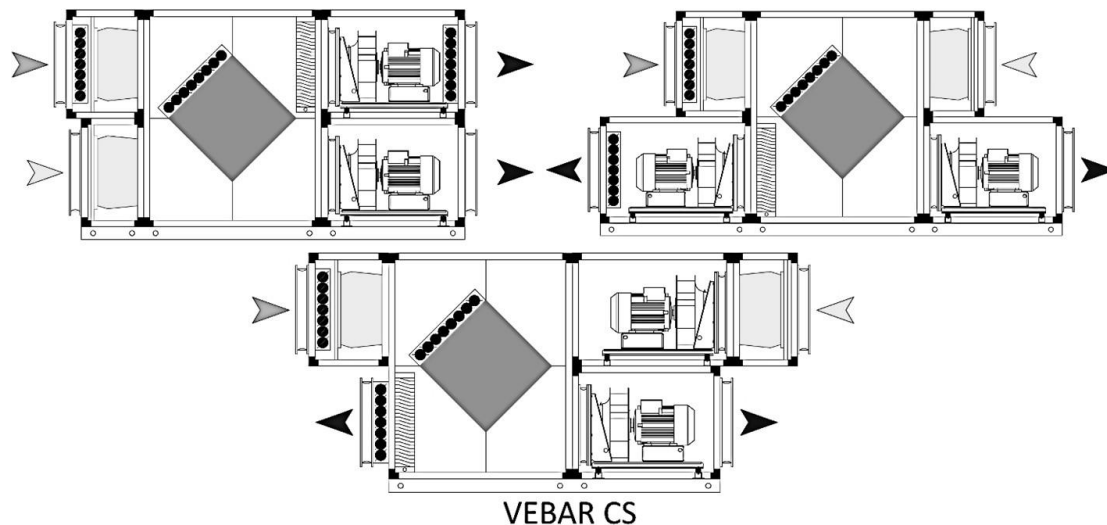


Fig. 27 The basic VEBAR CS unit possible configuration

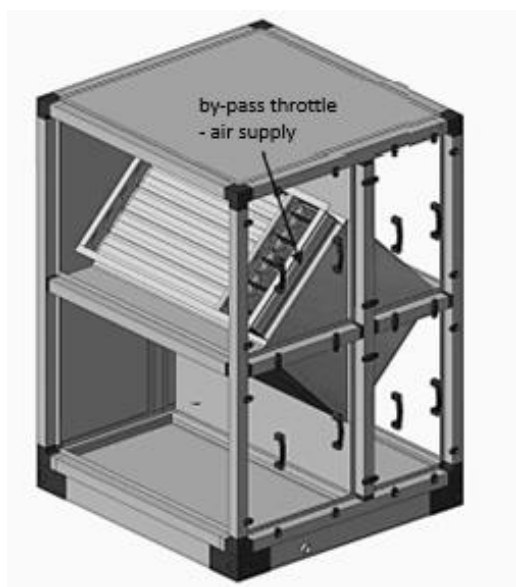


Fig. 28 VEBAR-CS throttle by-pass location

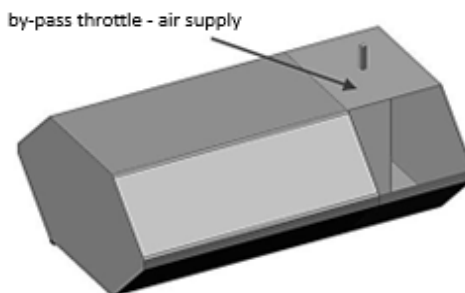


Fig. 29 VEBAR-WP throttle by-pass location

6.3.4 Counter-flow exchanger [WP]

- Exchanger material: air streams flow in counter-current arrangement along folded in-parallel thin corrugated aluminium plates
- Heat recovery class [acc. to EN 13053]: A
- Temperature efficiency: ≤90%
- Exchanger tightness: 99.9%
- Maximum operating temperature: till +60°C
- Integrated by-pass – on supply air without airflow cut off through exchanger (Fig. 29)

6.3.5 Exchanger with intermediate medium – glycol recovery [G]

- Set of two exchangers located independently in exhaust air stream (cooler) which recovers and transfers heat by means of glycol intermediary medium solution to the exchanger located in the supply air stream (heater).
- Heat recovery class [acc. to EN 13053]: C
- Temperature efficiency: ≤55%

- Spacing between lamells: standard execution – 2.5 mm; conditions of enhanced cleanliness (hygienic) – 3.0-3.5 mm
- Tightness: 100%
- By-pass realized through circulation pump stopping
- Heat exchangers have separate nipples for venting and emptying
- Heat exchanger is located on guiding rails
- Connecting nipples sealed in region of casing wall from inside and from outside by rubber rosettes, and passage through casing insulated
- Heat exchangers oversized by minimum 10% - power reserve
- External pipeline connection
- Condensate trays made of sheet aluminium with slope and outflow on service side
- At airflow velocity ≤ 2.5 m/s – integrated drop separator

6.4 Water/glycol heater section

In the air handling units, the heaters with rectangular cross-section of ribbed seamless copper pipe with firmly inserted high-efficiency aluminium lamells and zink-plated steel sheet frame are used.

- Heating medium: water, mixture of water with glycol till 120°C and PN 16, steam (as option).
- Maximum heating medium resistance: till 15 kPa.
- Spacing between lamells: standard execution - 2.0 mm, enhanced cleanliness conditions (hygienic) – 2.5-3.0 mm.
- Heat exchangers have separate nipples for venting and emptying
- Heat exchanger is located on the guiding rails
- Connecting nipples sealed in region of casing wall from inside and from outside by rubber rosettes, and passage through casing insulated

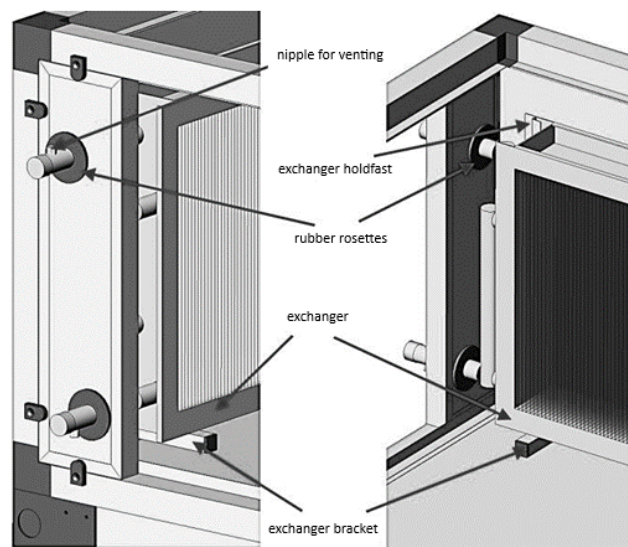


Fig. 30 The heater section

6.5 Cooler section

In the air handling units, the heaters with rectangular cross-section of ribbed seamless copper pipe with firmly inserted high-efficiency aluminium lamells and zink-plated steel sheet frame are used.

- Cooling medium: water exchangers [CW]: water, water/glycol; freon exchangers [CF]: R404A, R407C, R410A.
- Cooling medium maximum resistance: till 40 kPa
- Spacing between lamells: standard execution - 2.5 mm; enhanced cleanliness conditions (hygienic) – 3.0-3.5 mm.
- Heat exchangers have separate nipples for venting and emptying (CW)
- Heat exchanger is located on the guiding rails
- Connecting nipples sealed in region of casing wall from inside and from outside by rubber rosettes, and passage through casing insulated
- External pipeline connections
- Condensate trays made of sheet aluminium with slope and outflow on service side
- At airflow velocity ≤ 2.5 m/s – integrated drop separator

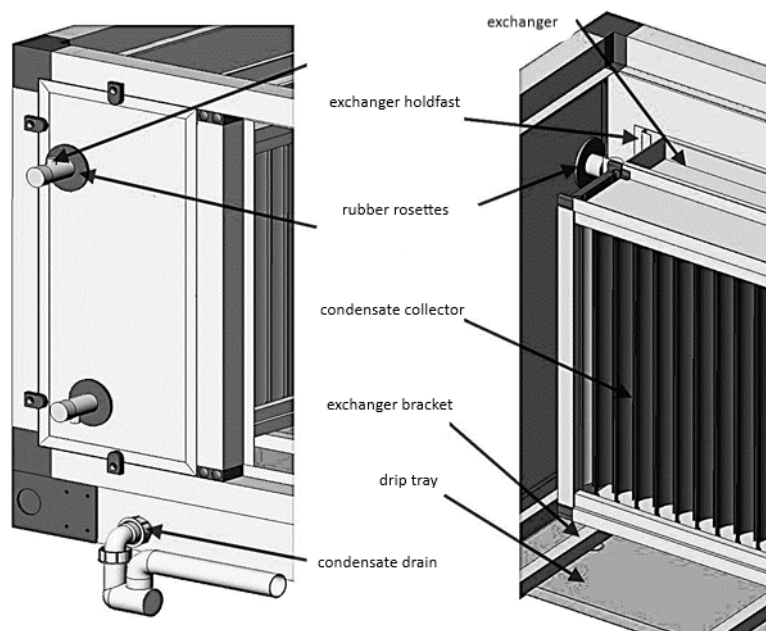


Fig. 31 The cooler section

6.6 Electric heater section

In the air handling units, the electric heaters with rectangular cross-section with casing of zink-plated sheet steel and flanged connections are used.

- Heating elements: pipes of stainless steel or ribbed pipes.
- Connection box: contains terminal block for power supply and control system connecting, temperature limiter and thermal breaker, breaking contactors of heating elements.
- Power supply: 230V / 3 x 400V
- As option: signalling system „L” and remote reset system „R”.

6.7 Noise suppression section

In the noise suppression section, silencers consisting of profiled zink-plated sheet steel frames with inflow profiles and mineral wool filling are used.

- Silencer thickness: standard – 200 mm, option – 100 mm
- Silencer standard lengths: 600 mm, 900 mm, 1200 mm
- Number of silencers: 3-18 pcs.
- Type of silencers: as standard – absorption type [T], as option – absorption-resonator type [Tr]
- Silencer surface is covered with woven fabric of glass rayon

Unit type	Unit size													
	5	6	7	8	9	10	11	12	13	14	21	22	23	24
WS.C	-	4	4	5	5	6	6	7	7	8	8	8	9	9
WS.G	-	4	4	5	5	6	6	7	7	8	8	8	9	9
CR														
WP														
CS	3	4	4	5	6	7	8	10	12	18	-	-	-	-
G, GRV														

Table 13 Number of silencers used depending on unit size

7. OPERATION AND MAINTENANCE

All necessary technical and operational parameters of the air handling unit (such as type and dimensions of heat exchangers, filters, fans) are contained in the unit's technical sheets. The basis for the correct and failure-free operation of the air handling unit are regular and carefully carried out surveys and maintenance of the unit individual components. Such actions will also cause early detection of possible irregularities connected with work of the air handling unit and their eliminating before occurrence of serious and expensive damages.



Any damage to the air handling unit or integral equipment thereof caused by failure to follow the guidelines contained in documentation will not be subject to warranty repairs.

7.1 Maintenance conducted by User

Maintenance conducted by User is reduced to check messages and alarms reported by control system, and to check general condition of individual system elements, the air handling unit and additional options used as well.



DANGER:

- Hazard to health and life due to electrocution!
- Hazard to health and life due to injuries by rotating elements of the air handling unit!

All maintenance works should be carried out after the air handling unit has been switched off, disconnected from power supply and having stopped the rotating elements of the air handling unit.

7.2 Grates of external inlets/outlets

Contamination evaluation of the air intake and air launch pad components can be done by visual inspection (necessity to use inspection revisions) or by comparing the resistance of fresh air intake and air discharge systems at the moment of starting (record in the commissioning protocol) with current measurement values obtained. If increases in resistance are found to be caused by soiling, the lamells of the grilles and insect screen should be cleaned.



Air inlets/outlets obstructed due to contamination prevent the air handling unit and the system to be operated properly and are major source of increased energy consumption by ventilation system.

7.3 Alarms and messages reported

Log of emergency calls and warnings should be checked periodically and appropriate action should be taken to eliminate them.

7.4 Inspection panel dismantling

To carry out maintenance works, the inspection panels should be removed to gain thereby access to the inside of the unit. To do this:

- Air handling unit operation should be stopped (by means of the service panel / mobile application / website stw6.bartosz.com.pl) and power supply should be disconnected;
- Wait 3 minutes to be assured that fans are completely stopped;

With using the Allen wrench (●4mm), blockings should be loosen and then rotated by 90°, and the inspection panel should be dismantled thereafter;

7.5 Air filter replacement

The air handling units are equipped with indication system of assumed filter contamination level achieving. Status monitoring is independent for supply and exhaust filters. Replacement of filters should be performed each time when automation system notifies about such necessity. Replacement notification relates to the specific filter - message content should be acquainted.



DANGER: Air handling unit damage!

Air handling unit operation without filters mounted is forbidden.

Filter replacement procedure:

- Air handling unit operation should be stopped (by means of the service panel / mobile application / website stw6.bartosz.com.pl);
- The air handling unit should be disconnected from power supply;
- Wait 3 minutes to be assured that fans are completely stopped;
- Inspection panel should be dismantled;
- Pull out the supply air filtration insert and/or exhaust air filtration insert;
- Slide new filter into according to airflow direction designation and in accordance with filtration class placed on the insert;
- Install inspection panels;
- Switch power supply on and put the unit into operation.

Message concerning soiled filters will be removed after performing Dirty Filter Test. The filter soiling test can be started manually according to the instructions ⇔ "Control automation STW-6" or it will be started automatically according to controller's settings.



DANGER: False indications!
The air handling unit should not be switched off during the filter soiling test!



Each time the filtration class of particular filter is changed into different one, the system has to be readjusted and the settings of automation system adjusted.

7.6 Temperature sensors

To ascertain sensor reading correctness, the sensor resistance should be measured and results compared with reference parameters shown in Table 14.

T(°C)	Resistance kΩ		T(°C)	Resistance kΩ
-40	1135		10	1772
-30	1247		20	1922
-20	1367		30	2000
-10	1495		40	2080
-5	1563		50	2245
0	1630		60	2417

Table 14 Temperature sensor resistance values⁴

7.7 Heat exchanger

Exchanger condition checking relies on every-quarter checking of general technical condition thereof and the soiling degree of the aluminium plates.

In case of such exchanger soiling, it should be cleaned by:

- purging with compressed air in direction opposite to normal airflow,
- cleaning by vacuum cleaner with soft suction nozzle,
- flushing with water or warm water stream with the addition of cleaning agents not causing aluminium corrosion.

All operations should be carried out with the exchanger installed. It is not recommended to disassemble the exchanger by oneself due to complexity of this operation. Exchanger disassembling carries the risk of damaging or improper component reassembling - therefore it may be performed only by Authorised Manufacturer's Service.



DANGER: Damage to the equipment!

- Exchanger lamell damage possibility.
- During disassembling, seals and sealings of device may not be damaged.
- During cleaning, the air handling unit electrical components should be protected properly.

When performing above-mentioned operations, special care and attention must be paid to avoid damage or obstruction of the exchanger's aperture passageways. Furthermore, inspection and checking should also be carried out on:

- tightness and condensate drain system patency,
- siphon and its degree of flooding with water.

7.8 Condensate draining

Condensate draining from device patency and required level of siphon filling with water should be checked. In addition (especially in cold areas), thermal insulation and water draining system heating installation should be inspected (attachment correctness thereof) - if applied.



In summer seasons, the siphon water filling level can be decreased (the air handling unit operation without condensation of moisture and increased evaporation process thereof) - the losses can be replenished by controlled water flooding of the air handling unit's drip tray.

⁴ +/- 2%

7.9 Fans



Any servicing operations for the air handling unit should be performed only at not-operating device.

The fans are designed for ventilation of rooms with low dusting degree. It is unacceptable to operate them in contact with gases (in particular aggressive ones), steam or air containing solid particle impurities. Failure to follow above recommendations may result in fan damage or significant deterioration of the fan's technical parameters (rotating velocity, capacity, total backflow).

To avoid accumulation of dust and dirt within the fan, it should be cleaned at least once a year (do not use strong detergents, cleaning with damp, not wet, cloth is recommended).

Housing interior and the motor itself soiling should also be checked, as intensive soiling and settling dust hinders motor cooling which can consequently lead to damage of windings. Therefore, if necessary, they should be cleaned (by means of vacuum cleaner or cloth).

In case of performing further checking-servicing operations on the fan, among others, it should be checked whether:

- Impeller is balanced and is rotating smoothly,
- All bolted fixings of construction elements are tightened correctly,
- Vibrating elements and elastic joints are not loosened.

If it is found that the impeller is imbalanced and that so-called "run-out" occurs, it is necessary to check whether dust and other solid particle impurities are deposited on the impeller blades in significant amounts, whether there is no mechanical damage to the fan blades or whether the balancing weights have become detached.

The small fans have maintenance-free bearings, but they must be checked by-the way of maintenance operations. By turning manually the fan impeller, auditory test of the bearings should be performed. If you can hear:

- not very loud sound accompanying the rotation in form of quiet, soft, steady murmur - correct bearing operation,
- hard, frequently irregular noises, scrubbing or metallic, frequently repeated sound - defective bearing. The bearing should be replaced.

7.10 Throttles

Basically, throttles do not require servicing, however, when excessive soiling and heavy operation is found, the throttle should be cleaned by one of the following methods:

- purging with compressed air,
- cleaning by vacuum cleaner with soft suction nozzle,
- flushing with water or warm water stream with the addition of cleaning agents not causing aluminium corrosion. Particular attention should be paid to the tightness of the throttle when it is closed.

7.11 Water/glycol heater and cooler

State of heater or cooler lamell soiling should be checked at least quarterly (dust accumulation causes reduction in the equipment output and increase in pressure drop). When excessive soiling is detected, cleaning can be carried out using the following methods:

- by means of vacuum cleaner with soft suction nozzle from air intake side,
- purging with compressed air stream in direction opposite to that of normal airflow with addition of cleaning agents directing water stream in parallel to lamell arrangement,
- flushing with warm water with addition of cleaning agents not causing corrosion of aluminium and copper,

In case of downtime possibility in winter season (temperature below +5°C), water from the heater should be emptied. For this purpose, the following should be done:

- isolate the heater from heating installation through closing the supply and exhaust valves of heating medium,
- unscrew the drain plug and venting plug from connection nipples,
- the heater should be purged with compressed air delivered to the air vent (purging should be repeated in small intervals several times, until only air is coming out of the drain plug with no visible water droplets),
- screw on the drain plug and venting plug.

To achieve full thermal efficiency, the heater must be well vented. Venting plugs located in the heater connection nipples are used for this purpose.

During device downtime, flow of heating medium should be limited to minimum such that temperature inside device not exceed + 60°C. Temperature increase above this value may cause damage of some components or subassemblies (motor, bearings, plastic parts, etc.) installed in adjacent sections of the heater.

7.12 Electric heater



DANGER: Hazard to health and life!
Cleaning live or wet electric heaters is not admissible.

The electric heater section consists of unshielded heating coils. During unit operation, when the heater is not running, on the heating coils dust may be accumulated. When the heater is put back into operation, heavy soiling may cause certain smell of burning dust and may even cause fire hazard occurrence. At regular intervals (every 4 months), and especially before start of heating season, the electrical connections should be checked, technical condition of the heating elements - whether they are not deformed and the degree of soiling. Possible soiling should be removed with vacuum cleaner with soft suction nozzle, soft brush or compressed air. Activation of protection against temperature increase in the event of airflow disappearance should also be checked.

7.13 Periodical inspections

It is recommended to carry out inspection and periodic maintenance at least every 12 months (before heating season). If the system is equipped with optional air cooling elements (water/freon), these elements should also be inspected before summer period.

7.14 Service and spare parts

Unsuitable or defective spare parts can influence negatively on safety and can cause damages, malfunction or device failure as well. Only original spare parts from Bartosz Company may be used to ensure the correct operation of the appliance.

In matters relating to technical support, periodic inspections (warranty and post-warranty), ordering of spare parts, please contact directly with Bartosz Company Service Centre:



Fig. 32 Information plate including Service data located on the device

8. FAULT REASONS

8.1 Messages and alarms reported by control system

Detailed descriptions of messages and alarms reported by system is contained in instruction manual „Control automation STW-6”.

8.2 Reasons for unit malfunctioning

Emergency states and possible reasons and solution methods thereof are given in Table 16.



DANGER: Recuperator failure!
Emergency operation is only allowed under user supervision until service arrival and failure removing. If user supervision is not possible, the unit should be switched off and disconnected from power supply.

Fault	Possible reason	Solution method
Device may not be put into operation	No power supply or device is not connected to power supply	<ul style="list-style-type: none"> ➤ Put plug into the socket. ➤ Check voltage in mains. ➤ Check fuses and mains differential current leakage circuit-breaker. ➤ Check controller’s fuse.
No airflow	The unit in mode Downtime / false settings/ emergency mode	<ul style="list-style-type: none"> ➤ Switch the unit on. ➤ Check setting correctness in programs and operation scheduling.

Fault	Possible reason	Solution method
		<ul style="list-style-type: none"> ➤ Check protection against excessive/too low air supply temperature. ➤ Replace the filter (emergency mode).
	Incorrect connection	➤ Check correctness of installation connection to the unit.
	Failure of flow transducers	<ul style="list-style-type: none"> ➤ Check impulse tube patency. ➤ Replace damaged transducer.
Low flow rate	Low level of set unit efficiency	<ul style="list-style-type: none"> ➤ Check capacity settings, time program settings. ➤ Correct capacity settings.
	Low level of flow control parameters (CO ₂ , RH, VOC sensors)	<ul style="list-style-type: none"> ➤ Check settings and thresholds for sensors. ➤ Correct sensor threshold settings. ➤ Check parameter „Maximum fan control” in controller’s settings.
	Dirty filters	<ul style="list-style-type: none"> ➤ Check information on filter soiling. ➤ Check pressure switch settings and alternatively, correct settings. ➤ Replace filters.
	Soiled inlet/outlet	➤ Inspect patency and clean intake/launch pad.
	Internal installation soiling	<ul style="list-style-type: none"> ➤ Inspect patency and setup of anemostats. ➤ Inspect anemostat filters (if occur) and if necessary replace them.
	Fan out of order	<ul style="list-style-type: none"> ➤ Check messages and alarms. ➤ Check fan, if damaged, replace it. ➤ Check control voltage and supply voltage of fan. ➤ Check controller – control voltage, power supply relay.
	Leaks on installation	<ul style="list-style-type: none"> ➤ Check installation connection tightness. ➤ Check installation of condensate draining and filling the siphon with water.
	Malfunction or lack of system adjustment	<ul style="list-style-type: none"> ➤ Check blockage before changing setting on throttles. ➤ Perform system adjustment.
Noisy operation of the unit and installation	Incorrect fan velocity	<ul style="list-style-type: none"> ➤ Inspect set unit capacity. ➤ Check parameter „Maximum fan control” in controller’s settings. ➤ Check impulse tube patency of differential transducers and fan measurement orifice. ➤ Check fan control voltage.
	Damaged fan	➤ Replace fan.
	Malfunction or lack of installation adjustment	<ul style="list-style-type: none"> ➤ Check blockage before setting change on the throttles. ➤ Perform system adjustment.
	Leaks	<ul style="list-style-type: none"> ➤ Check installation connection tightness. ➤ Check correct closing of the unit.
	Incorrectly sized ventilation duct cross-sections	<ul style="list-style-type: none"> ➤ Check flow rate in installation and on anemostats. ➤ Decrease capacity of the unit.
	No noise silencer	➤ Install noise silencers.
Water leaking from the unit	Obstruction of condensate draining installation	➤ Check patency of draining installation.
	Incorrect levelling, verticalisation of the unit	➤ Check levelling and verticalisation, make correction, if necessary.
	Water inflow through external installation	<ul style="list-style-type: none"> ➤ Check correctness of intake selection within range of air supply inlet velocity (entrainment of raindrops). ➤ Inspect installation sloping in direction of the unit. ➤ Perform installation draining.
Water appearance on enclosure of the unit	Incorrect thermal insulation	➤ Check thermal insulation, connections of the unit with ventilation ducts of external installation.
	Leaks	<ul style="list-style-type: none"> ➤ Check connection tightness of the unit with ventilation ducts. ➤ Check correct closing of the unit.
	Water inflow through external installation	See fault: Water is flowing out of the unit – water inflow through external installation.
Low temperature of air supply in winter	By-pass is opened	<ul style="list-style-type: none"> ➤ Check by-pass mode – change Auto into Closed. ➤ Check by-pass throttle position and actuator operation. ➤ Check by-pass opening settings.

Fault	Possible reason	Solution method
		➤ Check setting parameter Summer/Winter.
	Secondary heater failure	See fault: The secondary heater is not in operation.
	Soiled filters	See fault: Low flow rate – soiled filters.
	Low heat recovery	See fault: Low recovery in winter.
	Incorrect thermal insulation	➤ Check installation thermal insulation, to insulate additionally. ➤ Enhance unit capacity.
	Installation leak	➤ Check tightness of installation connections.
	Incorrect installation adjustment or lack thereof	➤ Check blockage before setting change on the throttles. ➤ Perform system adjustment.
	Incorrect settings	➤ Check parameter settings Summer/Winter.
Air supply high temperature in winter	False settings	➤ Check air supply temperature settings and controlling the heaters.
	Temperature sensor failure	➤ Check temperature sensor indications, and replace it, if necessary.
Low heat recovery in winter	Soiled filters	See fault: Low flow rate – soiled filters.
	Heat losses and leaks in installation	➤ Check installation thermal insulation, insulate additionally. ➤ Check tightness of installation connections. ➤ Enhance capacity of the unit.
	Incorrect installation adjustment or lack thereof	➤ Check blockage before setting change on throttles. ➤ Perform system adjustment.
	Exchanger frosting	➤ Check control automation settings.
	False settings	➤ Check automation settings within range of heat exchanger.
	Controller failure	➤ Replace the controller.
	Damaged/soiled exchanger	➤ Check exchanger condition – exchanger’s lamells. ➤ Clean/replace exchanger.
The unit does not response for panel parameter change	Communication error	➤ Check communication cables. ➤ Check bolted connections of connection blocks and working life of electrical connections.
	Exceeded maximum admissible control cable length	➤ Decrease cable distance between panel and the unit. ➤ Replace the wire for one with greater conductor cross-section. ➤ Install additional power supply appliance.
The unit does not response for parameter change in web module	No power supply	➤ Check power supply and fuse, differential-current leakage breaker
	False connection / no communication	➤ Check connection compliance with documentation. ➤ Check communication cables. ➤ Check bolted joints of connection blocks and working life of electrical connections.
	No internet access	➤ Check Internet operation. ➤ Check wire or Wi-Fi coverage.
	Modem power supply failure	➤ Check modem AC adapter operation.
Secondary electric heater is not in operation	No power supply	➤ Check power supply and fuse, differential-current leakage breaker.
	Thermal fuse	➤ Reset manually the heater.
	Emergency presostat	➤ Check emergency presostat – correct settings or replace element.
	Temperature sensor damage	➤ Check temperature sensor indications and replace it, if necessary.
	False settings	➤ Check Summer/Winter settings and heater parameters.
Water exchanger (heater/cooler is not in operation)	Lack of / incorrect parameters of agent	➤ Check inflow and supplying agent parameters.
	Automation element failure	➤ Check circulation pump, actuator, and valve operation. ➤ Check control cables.
	Temperature sensor damage	➤ Check indication correctness of temperature sensor.
	False settings	➤ Check settings Summer/Winter and exchanger parameters.
Freon cooler/heater does not function	No power supply	➤ Check control cables. ➤ Check power supply of external unit.
	Temperature sensor damage	➤ Check indication correctness of temperature sensor.
	False settings	➤ Check settings Summer/Winter and heater parameters.
	Freon installation damage	➤ Check installation tightness. ➤ Check/top up amount of refrigerating agent.

Fault	Possible reason	Solution method
The unit is blocked	Auhtorization code	➤ Enter authorization code obtained from Seller.
	Soiled filters	➤ Start procedure of Filter Replacement and Filter Soiling Tests.

Table 15