EN7630115-00

10 - 2023

DFU

Instruction manual

CIAT

PLUS

- High efficiency
- Plug&play version
- Advanced Control
- User-friendly maintenance

ORIGINAL INSTRUCTIONS

The technical and dimensional data provided herein may undergo changes in connection with product improvements.
The unit data are reported on the rating label in this page.

The label shows the following data

- Series and size of the unit
- Date of manufacture
- Main technical data
- Manufacturer
- The label is applied on the unit, usually on the enclosing panels.

Never remove the label

- **Serial number of the unit**
- **The serial number permits to identify the technical characteristics and the components installed**
- **Without these data it will be impossible to identify the unit correctly**

CONTENTS

Original document

EC DECLARATION OF CONFORMITY

❶ **DFU**	❸ CIAT	❹ ../../….

English EN	**DECLARATION OF CONFORMITY UE**

We, the manufacturer ❽ , declare under our sole responsibility that the air handling unit described above

❶ Designation ❸ Make

complies with the provisions of the directives,❺

and the European harmonised standards ❻ in the original here above.

2006/42/CE (Machinery)	EN 60204-1:2018
2014/30/UE (EMC)	EN 55014-1:2017
	EN 55014-2:2015
2011/65/UE (RoHS)	EN IEC 63000:2018
2009/125/EC (Eco Design) and regulations 1253/2014/EU	EN 13053:2019

Signed by:

❼

on behalf of: **CARRIER SCS**

❽ Rte de Thil

01120 Montluel - France

Date: ❹ (jj-mm-aaaa)

The signatory is the person authorized to compile the technical files.

English EN	**UK DECLARATION OF CONFORMITY**

We, the manufacturer ❽ , declare under our sole responsibility that the described above

❶ Designation ❸ Manufacturer

complies with the requirements of :

Supply of Machinery (Safety) Regulations 2008,
Electromagnetic Compatibility Regulations 2016,
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment regulations 2012,
The Ecodesign for Energy-Related Products and Energy Information Regulations 2019,
and following amendments,

conforms to the following Designated Standards:

EN 60204-1:2018
EN 55014-1:2017
EN 55014-2:2015
EN IEC 63000:2018
EN 13053:2019

Signed by:

❼

on behalf of : **CARRIER SCS**

❽ Rte de Thil

01120 Montluel - France

Date : ❹ (jj-mm-aaaa)

Person in charge to compile the technical file for UK:
Matthew SHORT - Toshiba Carrier UK Ltd, Porsham Close, Roborough, Plymouth, PL6 7DB

1 - GENERAL DESCRIPTION

The units are intended to provide ventilation with recovery of the energy in the expelled air and with filtration of normal quality air. Depending on the composition it could include air heating and/or cooling with or without control valves, options for defrosting, or different filters including carbon filters.

Designed for spaces where fresh air exchange is required by regulations or simply to improve livability, DFU allows the recovery of up to 95% of the heat present in the expelled air. The DFU range is suitable for installation in service sector spaces such as: Cafes, offices, restaurants, meeting rooms, shops, school buildings, gyms, homes for the elderly, low-energy buildings, and in general facilities where it is important to ensure proper air ventilation and minimize energy consumption. These needs are met by DFU is available in both vertical and horizontal configuration false ceiling or floor mounted. The aluminum plate heat exchanger operates in counterflow mode, making it possible to maintain a nearly constant temperature gradient between the supply and return flows, thus guaranteeing a very high exchange efficiency. The heat exchanger's performance is Eurovent certified.

Proper air ventilation is guaranteed by means of two ventilation sections with BIDc (Brushless Direct Current) type with built-in inverter ("Direct driven" EC type).

1.1 - Constructive features

- Mechanical ventilation heat recovery unit equipped with aluminum counter-flow static heat exchanger, direct-drive BLDC fans ("Direct driven" EC type) with mechanical set-up for internal assembly of following options: heating coil / heater and antifreeze heater
- Horizontal version for ceiling installation, horizontal or vertical for floor installation.
- Double-walled sandwich panels in galvanized steel, pre-painted (RC3 according to ISO-EN 13523-8) on the external surface, completely removable for inspections / maintenance and configuration of different inlet / outlet air position. Extruded aluminum profile 6060 T5 9006/1 with thermal cut and rounded internal shape.
- Internal thermal-acoustic insulation made of 30mm thick uninflammable rockwool (90 kg/m³)
- Medium efficiency filter section on the ambient air intake Class M6 (average efficiency Em: 40% ≤ Em <60% according to EN 779, ePM10 75% according to ISO16890)
- High efficiency filter section on the outside air intake Class F7 (average efficiency Em: 80% ≤ Em < 90% according to EN 779, ePM1 50% according to ISO16890)
- Counter-current flow heat recovery with aluminum frame, aluminum plate with self-spaced fins sealed at the extremities in order to prevent contamination of the fresh air by the exhuast air. Condensate and drainage tray made with AISI 304 stainless steal. Minimum thermal efficiency 79% -, assembled with internal by-pass damper.
- Mechanical set-up for antifreeze electric heater installation, fresh air-side (option).
- Mechanical set-up for water/electric heating coil/heater installation (option).
- Mechanical set-up for water cooling coil installation (option).
- Mechanical set-up for condensing or evaporating coil installation, alternative to water cooling coil (option).
- Fan sections with direct-drive BLDC fans, independently one-to-one managed by factory-programmed electronic controller, with LCD display for remote installation.
- Internal electrical panel, fully wired in the factory.
- Optional carbon filters.
- Optional F9 filters (instead of F7 in the outside air intake).

1.2 - CONFIGURATIONS & ACCESSORIES

1 - APPLICATION
Indoor installation
Outdoor installation
2 - LAYOUT
A orientation
B orientation
3 - AIR IN/OUT-TAKE POSITION
Standard openings (A1/B1/C1/D1)
Extraction opening - upside(1) (B2 in place of B1)
Outside air opening - upside(1) (A2 in place of A1)
Extraction and outside air opening - upside(1) (A2 and B2 in place of A1 and B1)
4 - VENTILATION EC
Standard. EC - constant speed
EC - constant airflow
EC - constant pressure
EC - quality control (only with IAQ probe (CO_2/VOC))
5 - BY-PASS MANAGEMENT
Standard - Absent (only arrangement for servomotor installation)
ON/OFF servomotor (installed, wired and managed)
6 - FILTRATION
Standard - F7 Filter (supply air) / M6 filter (return air)
F9 filter (supply air) / M6 filter (return air)
7 - ANTIFREEZE FUNCTION
Standard – by flow rates unbalance
Antifreeze electric heater - 2 step
8 - HEATING COIL OR ELECTRIC HEATER (INTERNAL)
Standard - No
Water coil - heating
Electric heater - 2 step
Electric heater - modulating (+ NTC fixed point control outlet)
9 - CONTROL PANEL
Standard - Remote display
10 - CONTROLLER LANGUAGE
Italian
English
French

(1) Vertical outdoor version only

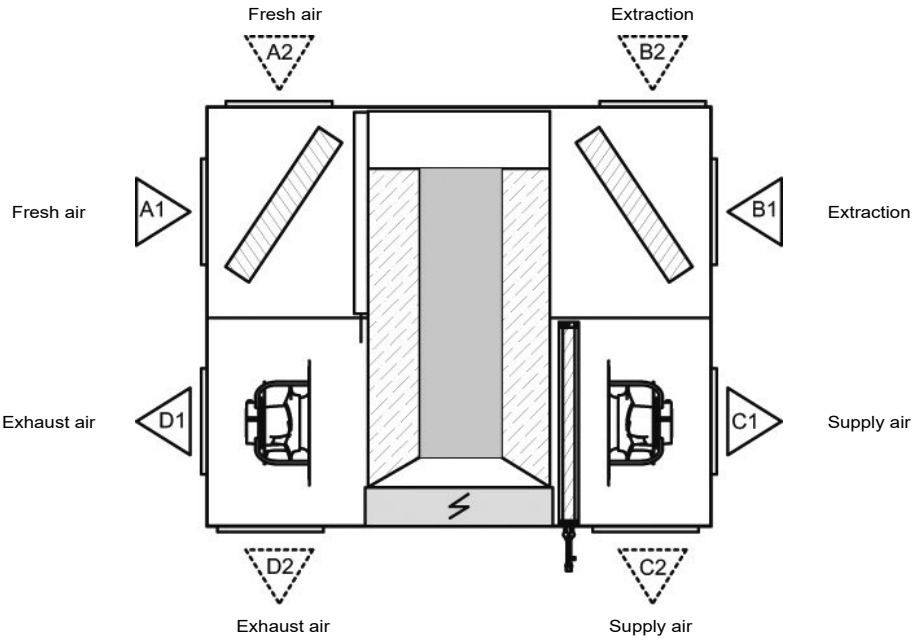
11 - COOLING OR MIXED USE COIL
Standard - No
Water coil - cooling
R410A coil - cooling
Water coil - mixed use
R410A coil - mixed use
12 - WATER COILS CONTROL
Standard - No
2 ways valve 0-10V (+ NTC fixed point supply control)
3 ways valve 0-10V (+ NTC fixed point supply control)
13 - ADDITIONAL PURIFICATION SECTION
Standard - No
Additional active carbon filter - supply air (external module)
14 - STRUCTURAL ACCCESSORIES
Standard - No
Rain caps(2)
Dampers on fresh and exhaust air openings (ON/OFF) with servomotor
Circular connections
Rain caps + Circular connections(2)
Rain caps + dampers on fresh and exhaust air openings(2)

(2) Outdoor version only

Note : For AISI304 panel material, please contact manufacturer

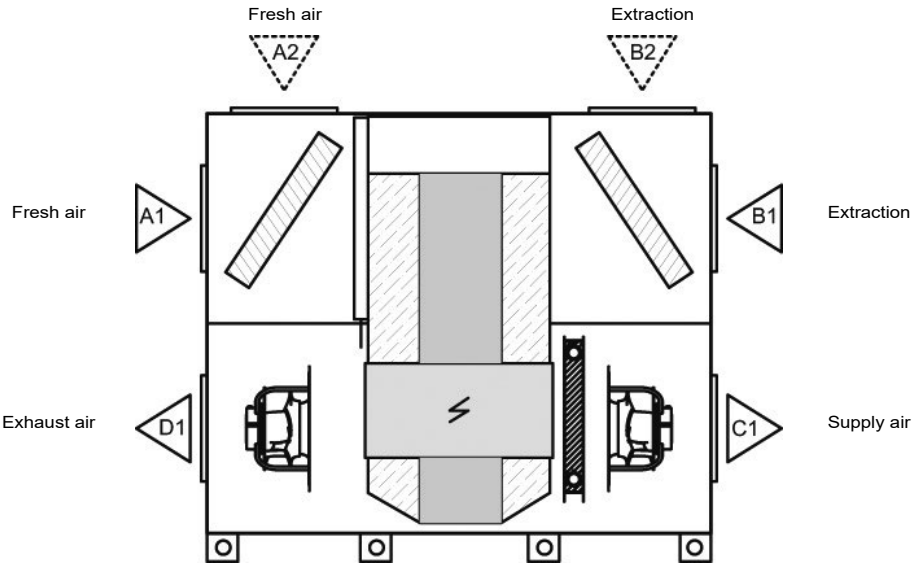
1.3 - Air direction and openings configuration

ORIENTATION A
Horizontal installation : Top view



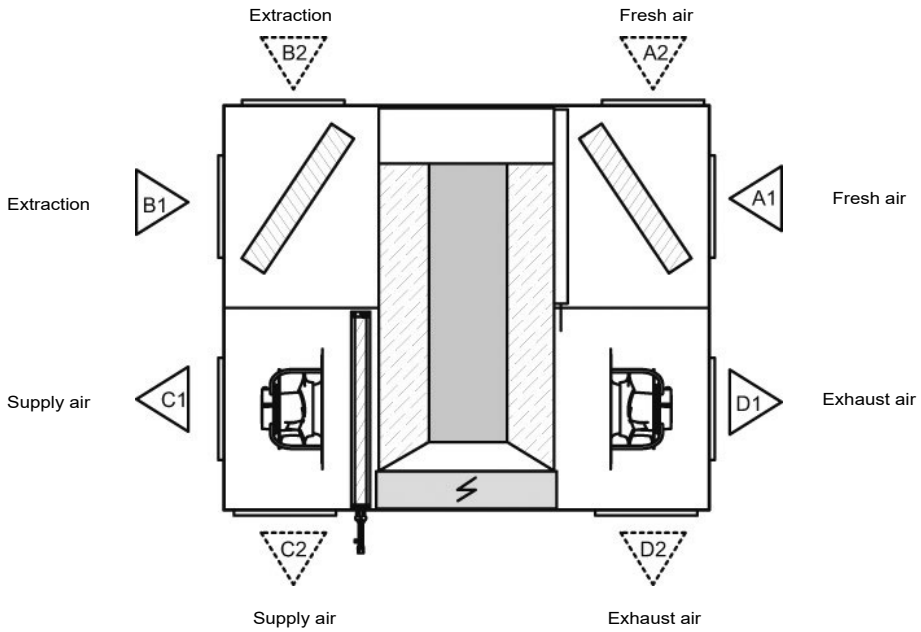
The opening position can be switched on site (e.g. from A1 to A2).

ORIENTATION A
Vertical installation : Front view



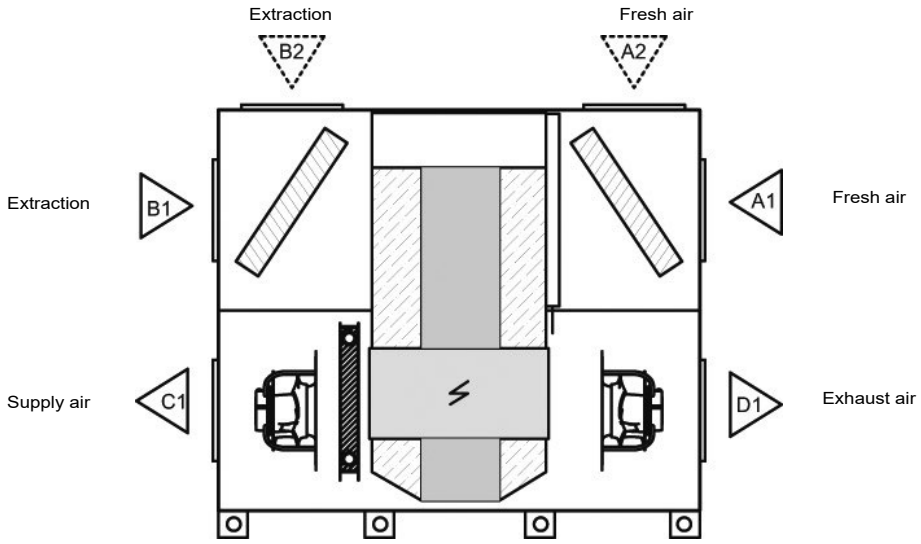
The switching of A2/B2 (instead of A1/B1) are possible on-site, only if the unit is for indoor configuration.
For outdoor configuration A2/B2 have to be requested at the order because it is not possible to switch the position on-site.

ORIENTATION B
Horizontal installation : Top view



The opening position can be switched on site (e.g. from A1 to A2).

ORIENTATION B
Vertical installation : Front view



The switching of A2/B2 (instead of A1/B1) are possible on-site, only if the unit is for indoor configuration.
For outdoor configuration A2/B2 have to be requested at the order because it is not possible to switch the position on-site.

1.4 - Accessories

Coils

Electric heating coil
Water heating coil
Water mixed coil (1)
Water cooling coil (1)
Direct expansion cooling coil (1)
Direct expansion mixed coil (1)

Antifreeze/by-pass

Electric antifreeze coil
ON / OFF by-pass damper with servocontrol

Valves

Two-way valve+ 0-10 Vcc actuator
Three-way valve+ 0-10 Vcc actuator

Structure

Support feet (included for outdoor horizontal version)
Roof (included for outdoor version)
Rain hood with protection grille
Circular collar
Motorized dampers : ODA and EXP

Adjustment/sensors

Advanced control with display
Air quality sensor
Pressure differential transducer (flow rate)
Pressure differential transducer (pressure)

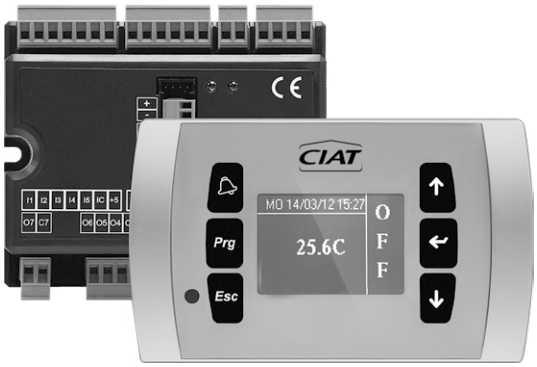
Other

Activated carbon filter external module
ePM1 filter 80 % outlet

(1) These accessories are installed in external module for 175-220 and 255-320 sizes, otherwise they are installed internally.
Consider that units with both carbon filters and external module coils include two external modules

1.5 - Adjustment (depending configuration of the unit)

DFU control



Ventilation
Manual/automatic control (65-100%)
Constant flow rate/pressure controller
Air quality automatic controller
Actuators
Valve 1 – 0/10 Vcc (Supply or room temperature)
Valve 2 – 0/10 Vcc (Supply or room temperature)
By-Pass Damper On / OFF (direct total free-cooling)
Electric heater 2 steps or 0-10 Vcc
Motorized dampers ODA and EXP – ON/OFF actuator
Outdoor call
Outdoor unit

For parameter list and regulation logics for DFU controller please refere to the Software manual.

1.6 - Antifreeze control

The DFU electronic controller is designed for two different antifreeze management systems:

Flow rate imbalance: For expelled air temperatures lower than the allowed limit, the supply air flow rate is reduced, in order to maintain the plate temperature above the allowed limit.

Antifreeze heating element activation (if option has been added) and flow rate imbalance: The antifreeze heating element is activated in case of expelled air temperatures lower than the allowed limit. When the heating element is no longer able to compensate for the lower external temperature, the air flow rate imbalance logic is activated.

2 - GENERAL INFORMATION

- Please keep this manual complete and in good condition for the entire life of the machine.
- Carefully read all the information contained in this manual. Failure to comply with the instructions provided could result in injury to persons or damage to the equipment.
- Should a fault occur, consult this manual and if necessary contact the nearest Carrier service center.
- All installation and maintenance operations must be carried out by qualified personnel, unless otherwise indicated in this manual.
- First start-up may be carried out solely by qualified technicians.
- Before performing any work on the unit, disconnect it from the power supply.
- Failure to comply with the rules provided in this manual will result in the immediate invalidation of the warranty.
- Carrier shall not accept any liability for injury or damage resulting from improper use of the equipment or failure to comply with the directions provided in this manual and on the unit itself.

Carrier will not be held responsible in the event of malfunctioning or damage, if the unit:

1. Is used for purposes other than those for which it is intended;
2. Is not operated and maintained according to the service standards specified in the following manual;
3. Is not periodically and constantly maintained as prescribed, or if non-original spare parts are used;
4. Is modified or some components are replaced without the Manufacturer's written authorization, especially when the effectiveness of the safety systems have been reduced or nullified on purpose;
5. Is used beyond its operating limits.

The materials used and the equipment, as well as the production processes, quality assurance, and quality control meet the most stringent safety and reliability requirements. By using them for the purposes specified in this user manual, handling them with due diligence, and performing precise maintenance and overhauls in a professional and expert manner, it is possible to maintain performance, continuous functionality, and durability of the units. Never postpone repair and maintenance work.

3 - SAFETY INFORMATIONS

The following are some of the measures adopted for this purpose:

- Inspection hatches are installed in conjunction with the sections that have moving parts;
- Elimination of sheet metal with sharp edges both inside and outside;
- Use of self-tapping screws with hidden tip inside sections and panels.

It is advisable to always install an electric switch inside the fan section. The electric switch's function is to prevent the fan drive assembly from starting during maintenance or inspections, thereby placing the operator's safety at risk.

Safety notes posted on the unit

Outside, data plates are attached to the inspection hatches that inform the operator of the danger from the moving parts and the need to disconnect power to the unit before opening the inspection hatches.

Danger symbols


Danger: Hot parts


Danger: Hazardous voltage present


Danger: Cutting hazard in finned coils zone

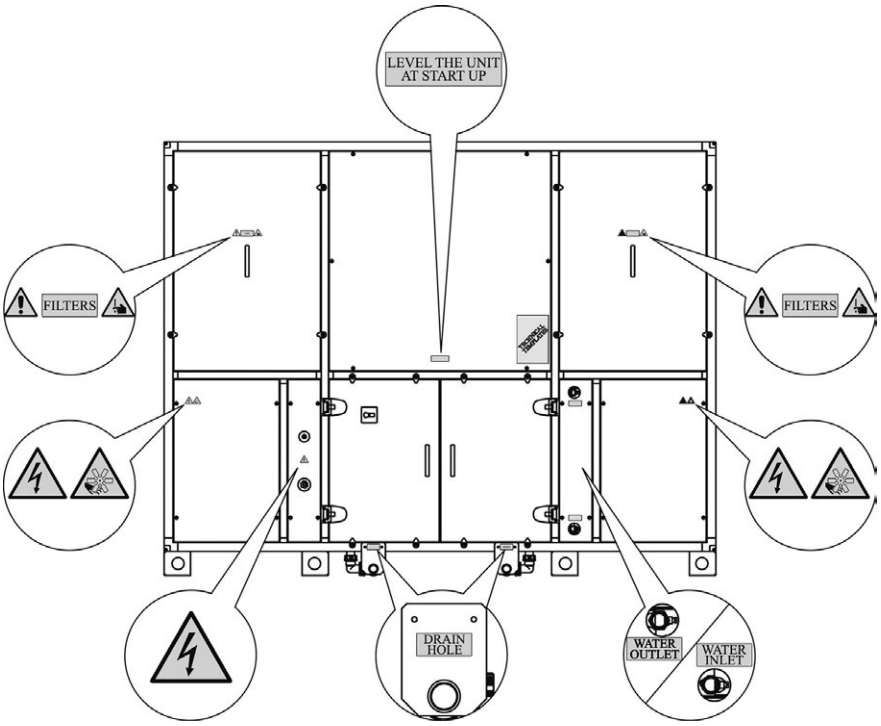

Danger of burns

Practical advice for accident prevention

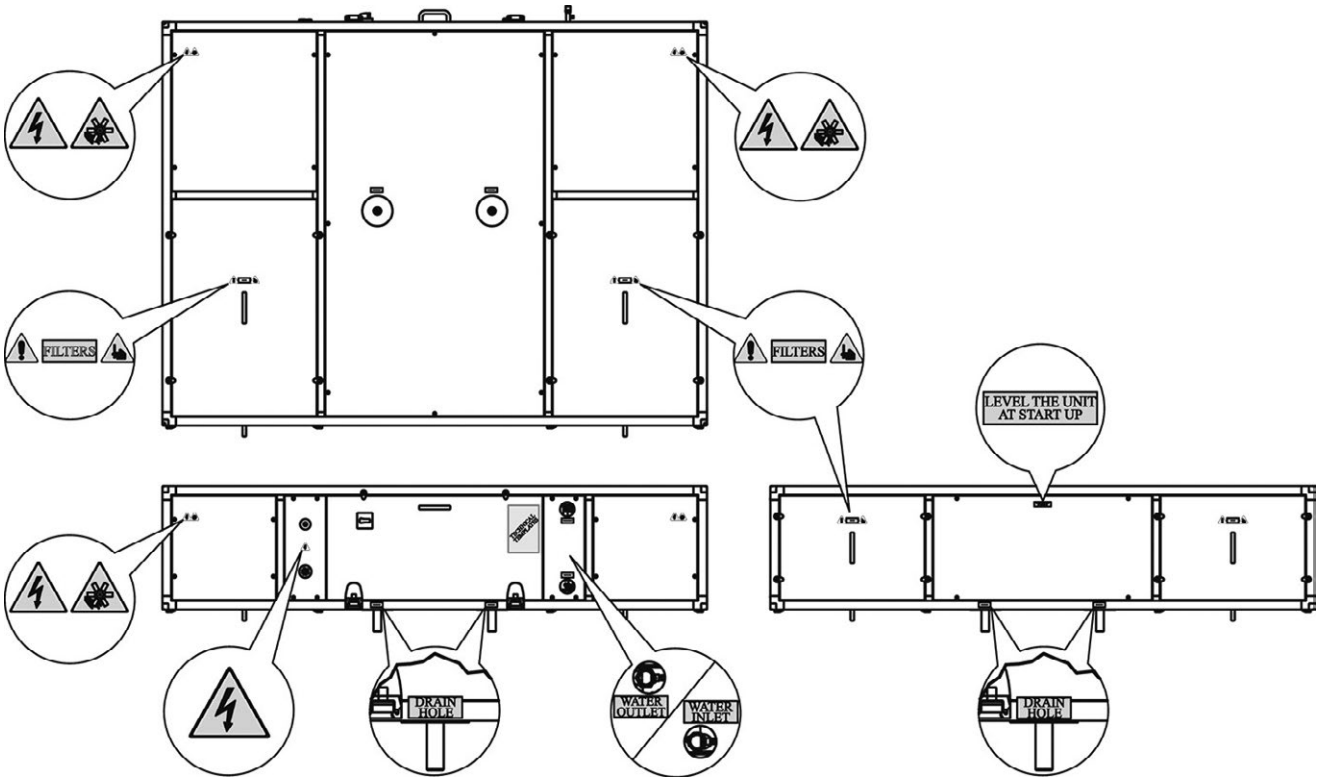
Before starting any maintenance operations on the fan drive assembly, ensure that the motor cannot be started accidentally. Before working on the motor, make sure that it has completely cooled down.

Lock the fan impeller before proceeding to perform any maintenance work on it, as the "chimney effect" caused by the ductwork could cause it to rotate, thereby placing the operator's safety at risk.

3.1 - Warning label vertical models



3.2 - Warning label horizontal models



4 - INSTALLATION

Each DFU, before shipment, is subject to all the functional checks indicated on the constructive verification form.

The checks performed concern:

1. The overall dimensions of the unit;
2. The correct assembly of the various assemblies and sections;
3. Compliance with the various pre-established safety conditions;
4. The good condition of all the components of the system;
5. The affixing of the identification, operation, and safety plates.

Once the control cycle has been completed, the person in charge of the test ensures the application of the CE marking proving that the product is in compliance with the Community regulations in force for the units.

Carrier shall not be liable for damage to its products during loading, unloading, and transport operations.

4.1 - Inspection

On receiving the unit, check that the packing is intact: The machine left the factory in perfect conditions and after thorough inspection. Should you detect any signs of damage, immediately report them to the carrier and note them on the delivery slip. Carrier must be notified of the entity of the damage within 8 days of the delivery date.

Check that the following items are present:

- Putting into service report;
- Wiring diagram;
- Warranty certificate;
- Check that this manual is intact.

4.2 - Storage

If the unit is not protected by packing, take the necessary protective measures to prevent it from becoming dirty. The packing must be removed only before installing the unit, and it must be kept in accordance with the limit temperatures listed in this manual (do not stock the recuperator in external ambient).

From discharge to installation: The unit must be protected from accidental impact, dust and atmospheric agents (as an example but not only: Return, supply, electronic control components, etc.).

Any damage due to incorrect storage remains at the customer charge.

Unit must not be exposed to weather condition.

4.3 - Handling

During handling it is compulsory to check dimensions, weights, center of gravity and anchorages. Check as well that lifting and positioning devices conform to the current safety regulations. The unit leaves the factory screwed onto a wooden pallet, which allows it to be easily conveyed with a forklift truck. After removing the unit from the pallet, handle it gently, without applying excessive pressure on the side panels, finned coil and fan grille. You should collect and separate the packing materials (wood, cardboard, nylon etc.) and make them available for recycling in order to minimize their environmental impact. Before lifting, remove the screws fastening the base of the unit to the wood platform. The unit must be lifted using ropes or straps, anchored to the lifting points located on the unit base, that are longer than the height of the unit and bars and spacer boards placed on top of the unit so as not to damage the unit's sides or its upper part.

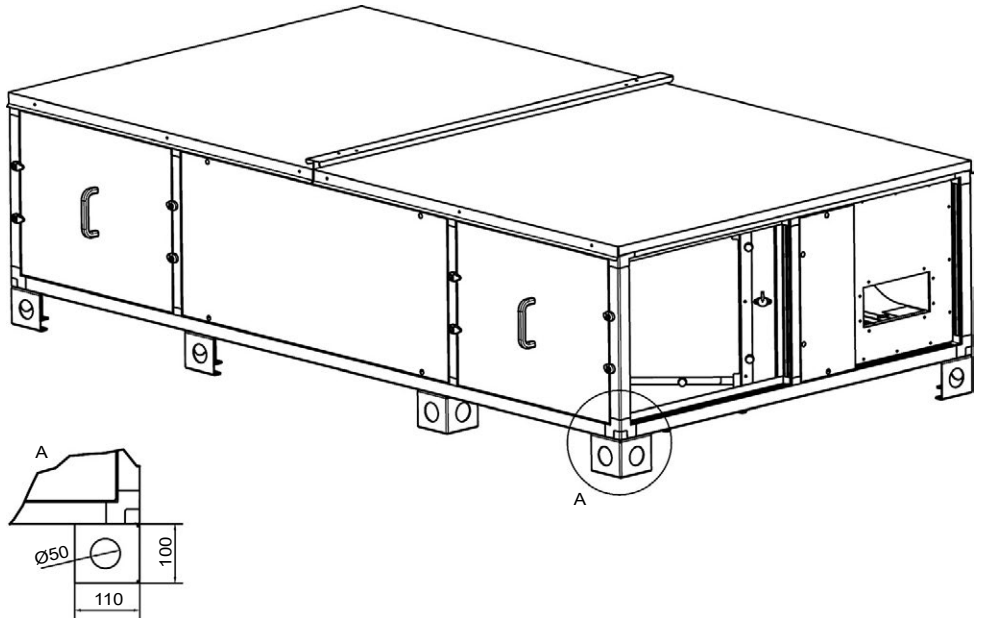
In any lift-up operation ensure that unit is firmly fastened to avoid accidental capsizing or falling.

<u>Unit for floor installation</u> : Use the designed holes present in the support plates. (A)

<u>Unit for ceiling installation</u> : Use the support bars (not included) like recommended in the picture "Ceiling installation", ensuring that all the belts are firmly fastened.

In order to avoid structural damages be sure that lifting belt/ropes are not directly in contact with unit profiles/panels.

Floor installation



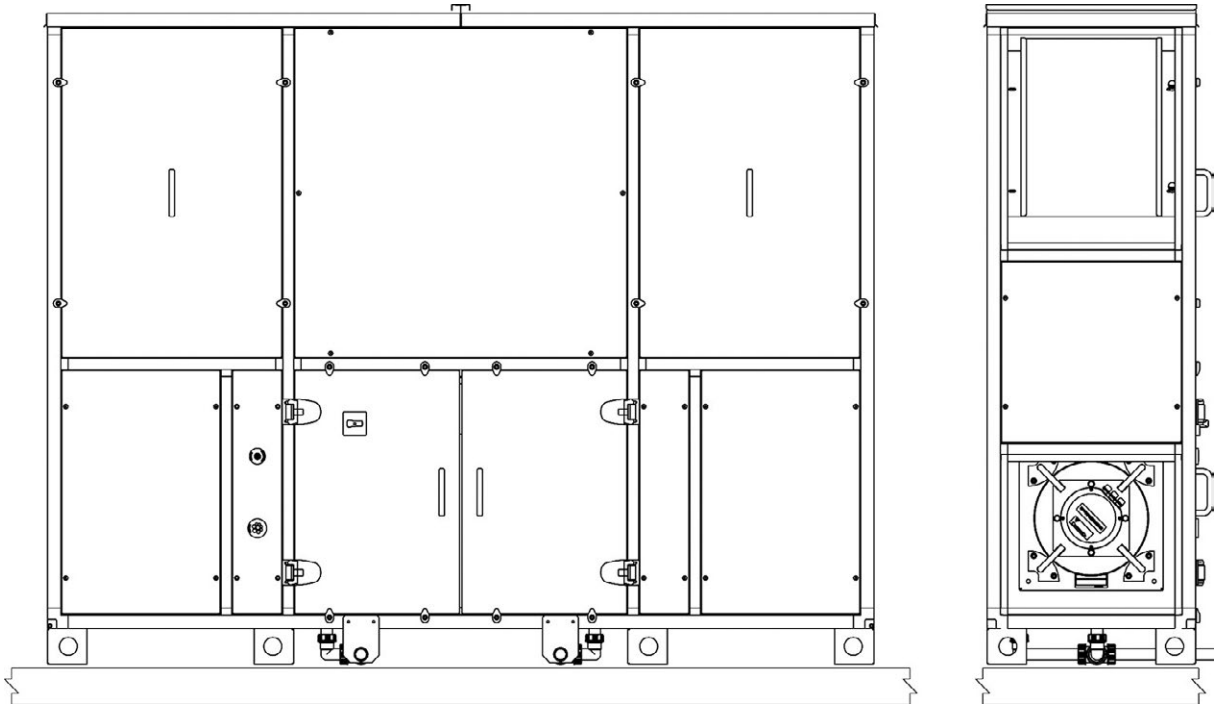
4.4 - Siting

It is essential that the recuperator be positioned on a perfectly horizontal plane (A), in order to avoid:

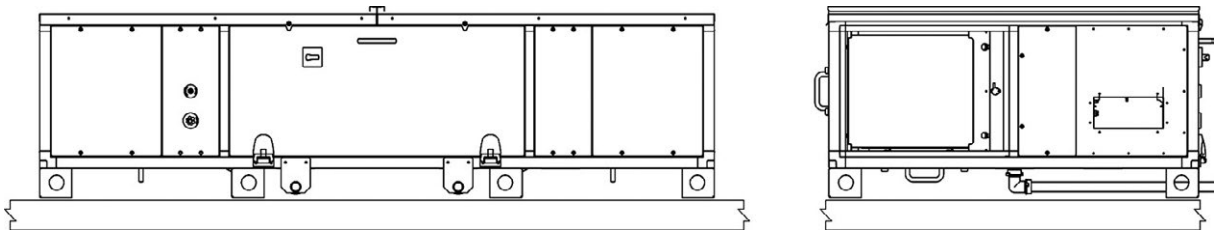
- Damage to the fan drive units due to an imbalance of the masses on the vibration dampers;
- Malfunctioning of the condensate drains;
- Difficulty in opening and closing the inspection hatches.

The horizontality of the support surface should be checked with a spirit level; any corrections can be made using metal shims.

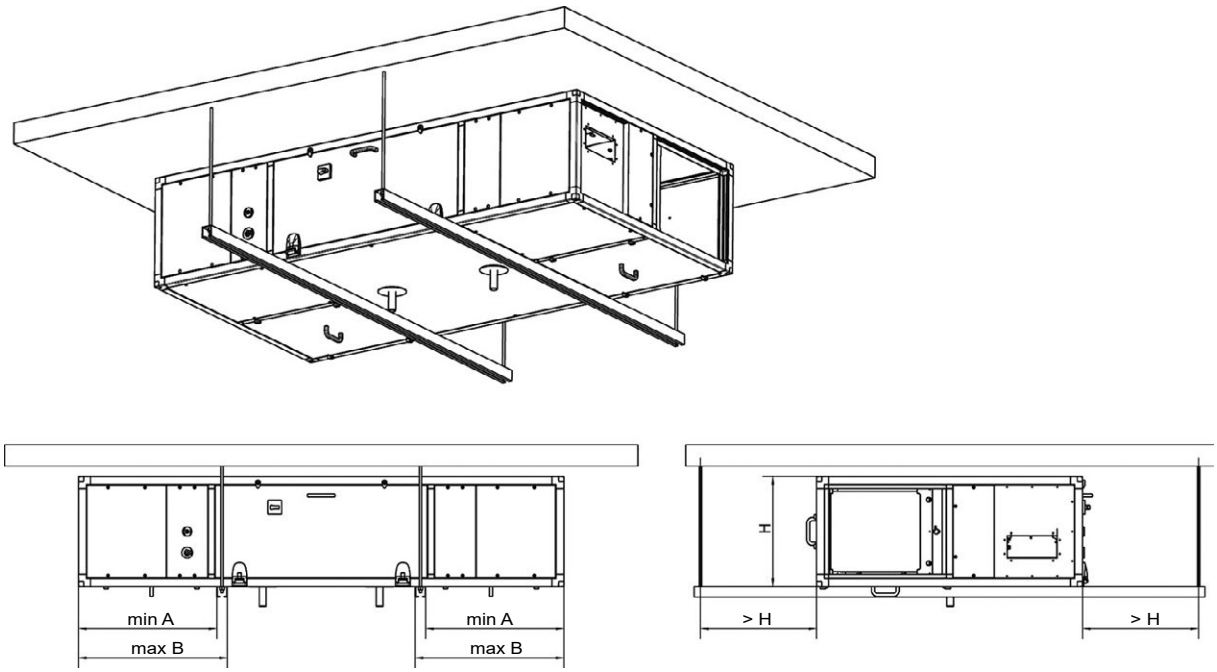
Floor installation - Vertical unit



Floor installation - Horizontal unit



Ceiling installation: Recommended installation



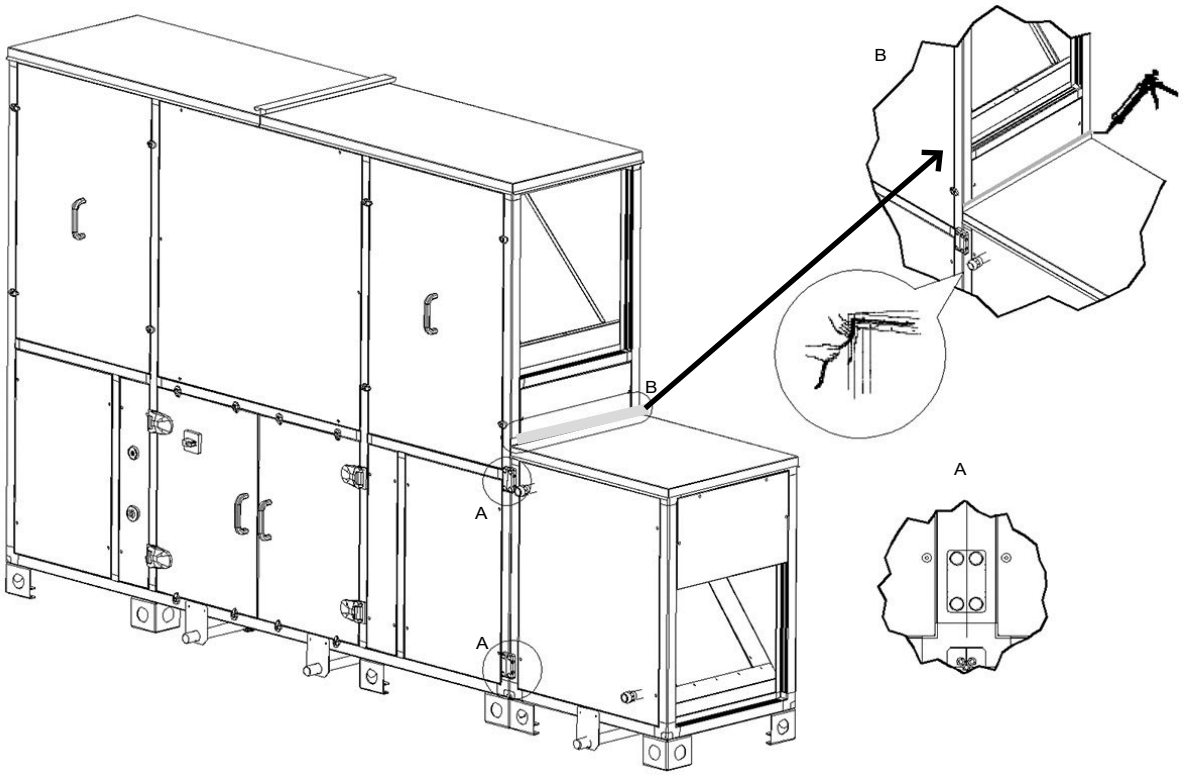
The recuperator support feet are included in horizontal versions for external installation and in all vertical versions (vice versa are excluded on horizontal versions for internal installation). For ceiling installation the bars are not inluded in the package.

Size	Ceiling installation		
	A	B	H
	[mm]	[mm]	[mm]
55	655	800	520
110	655	800	520
175	655	830	520
220	655	830	520
255	780	950	600
320	780	950	600

4.5 - Accessories installation

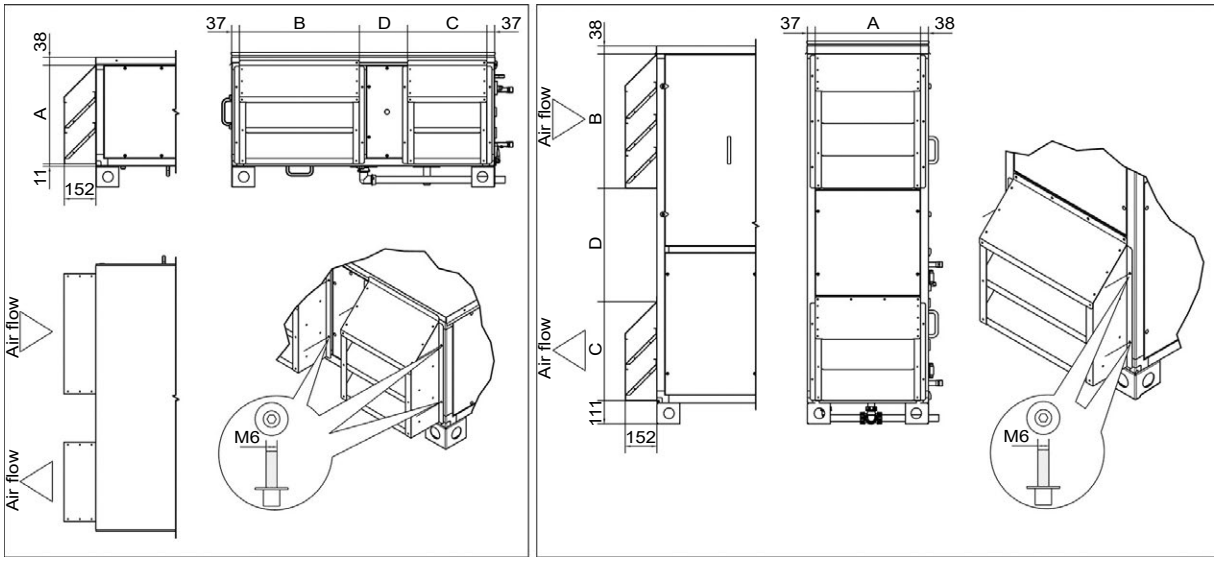
Painted galvanized steel roof protect DFU units installed outdoor. Protection roof is assembled in Carrier: In case the external module or accessories are supplied together with unit the connection between the roofs must be carried out by the installer, by using the assembling kit.

External module

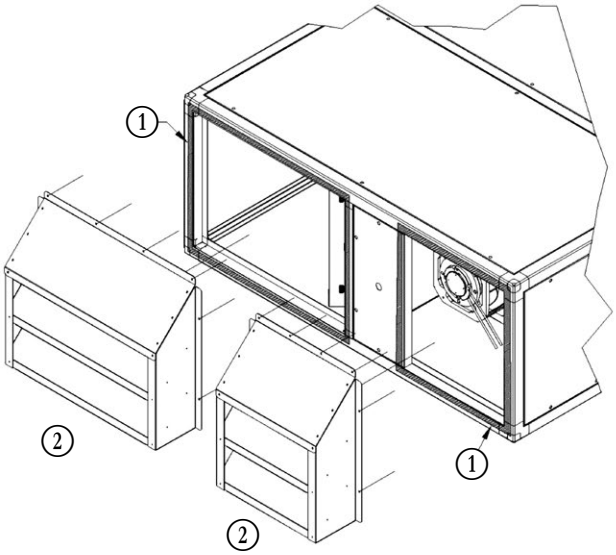


The connection point highlighted in the picture must be sealed.

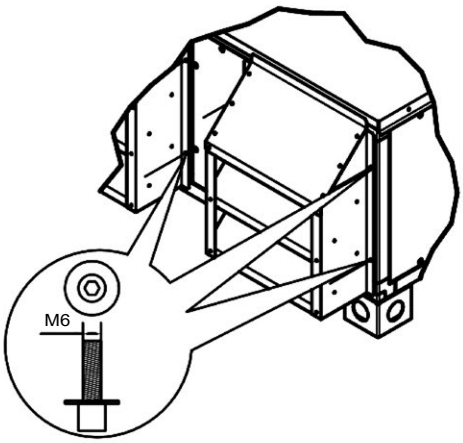
Rain caps



1. **Apply the gasket** (supplied with the assembly kit) **on the external surface of the unit profiles as indicated in the drwing on the left**
2. **Fix the rain cap on the energy recovery unit profiles using m6 screws** (supplied with the assembly kit). **screw them in the inserts already installed on the unit (picture below)**

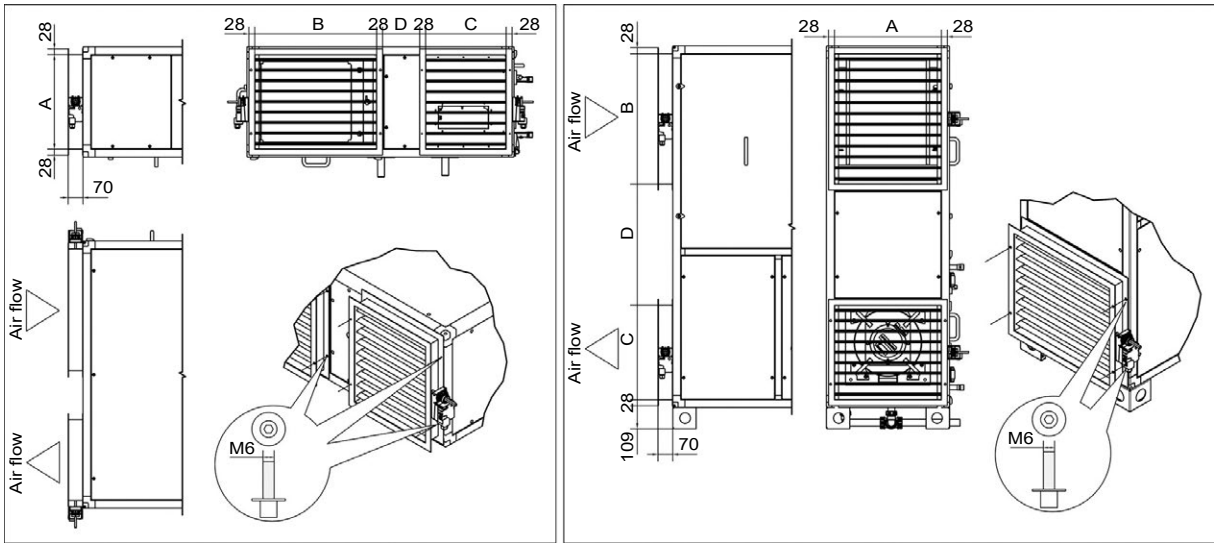


Indicative drawing:

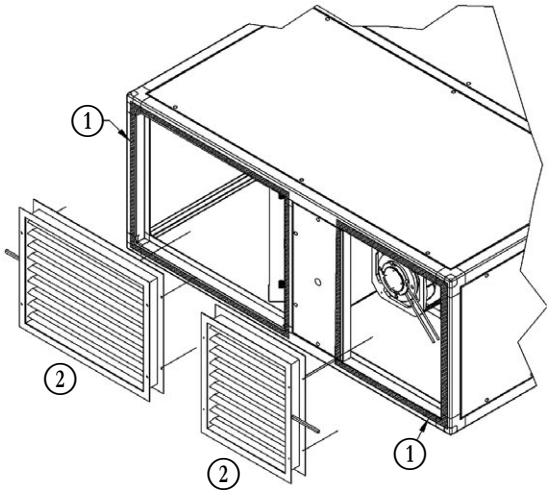


Rain caps dimensions				
Size	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**
055/110	472	578	380	230
175/220 H	472	615	445	570
175/220 V	505	642	472	543
255/320 H	525	748	526	653
255/320 V	525	772	552	625

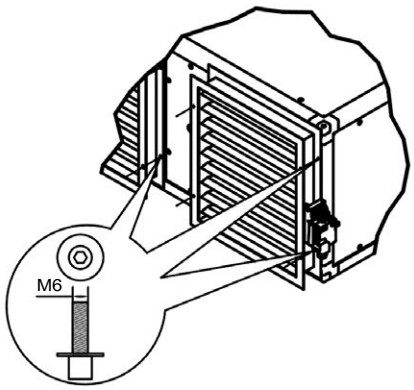
Dampers



1. **Apply the gasket** (supplied with the assembly kit) **on the external surface of the unit profiles as indicated in the drwing on the left**
2. **Fix the damper on the unit profiles using m6 screws** (supplied with the assembly kit). **screw them in the inserts already installed on the unit (picture below)**

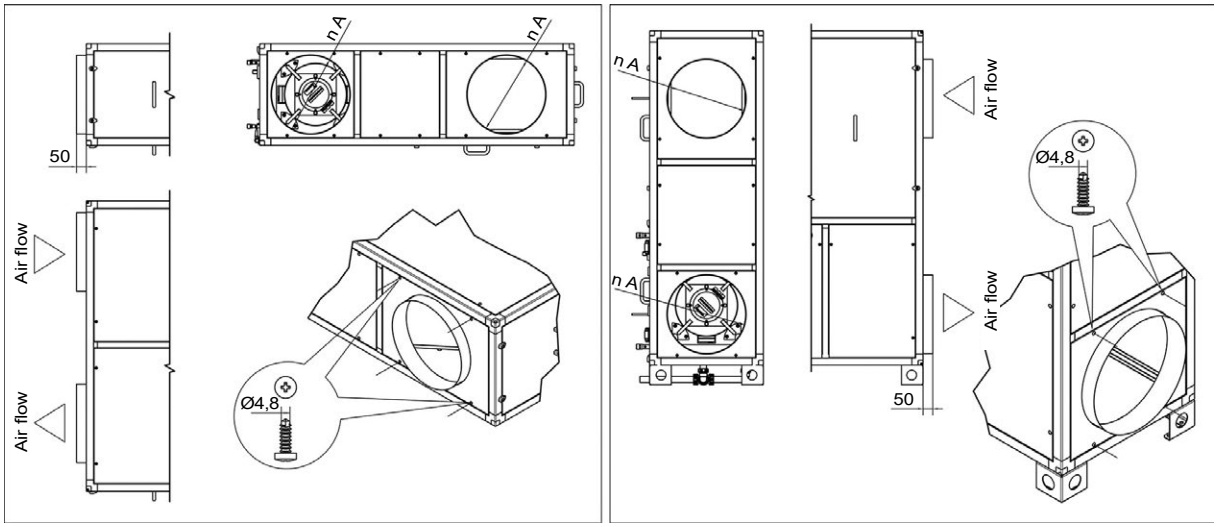


Indicative drawing:

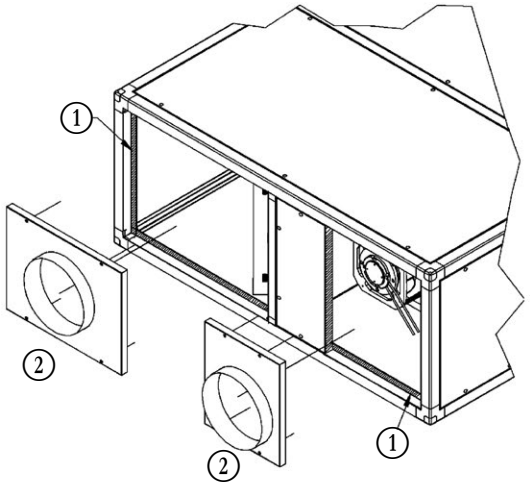


Damper dimensions				
Size	**A (mm)**	**B (mm)**	**C (mm)**	**D (mm)**
055/110	446	578	380	230
175/220 H	446	618	446	570
175/220 V	506	618	446	570
255/320 H	526	748	526	655
255/320 V	526	748	526	655

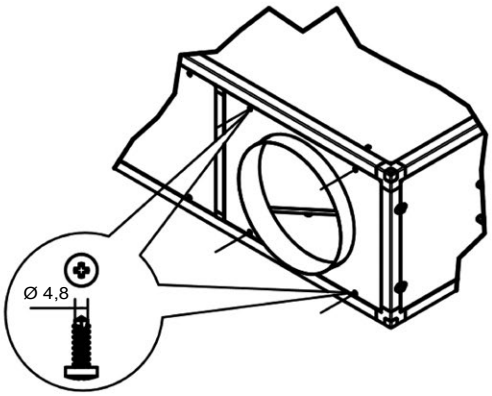
Circular connections



1. **Apply the gasket** (supplied with the assembly kit) **on the external surface of the unit profiles as indicated in the drwing on the left**
2. **Fix the circular connection on the energy recovery unit using self drilling screws** (supplied with the assembly kit)



Indicative drawing:



Circular connection diameters	
Size	**A (mm)**
055/110	300
175/220	400
255/320	450

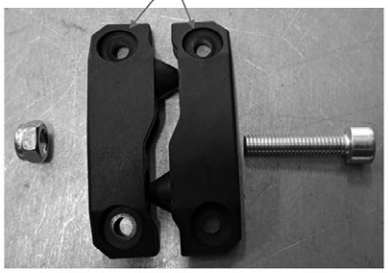
External module fixing by junction blocks

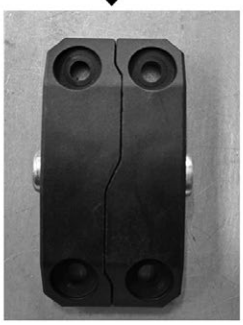
1. **Position** the **external module close to** the **recuperator**;
2. **Fix** the **first part** of the **junction block** to the **energy recovery unit** and **fix** the **second part** of the **junction block** to the **external module using n°4 self drilling screws** (supplied with the assembly kit)

Keep attention to drill aluminum profiles and not the panels

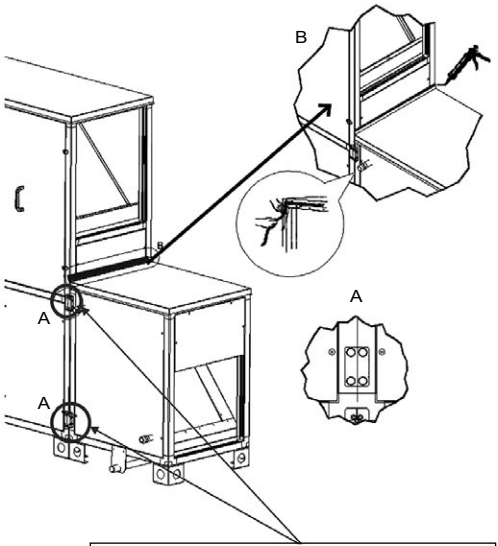
3. **Fix the 2 parts** of the **junction block** using **n°1 m8 screw** and **n°1 m8 self-locking nut**;

N.2 parts of the junction blocks





Indicative schema of the result:

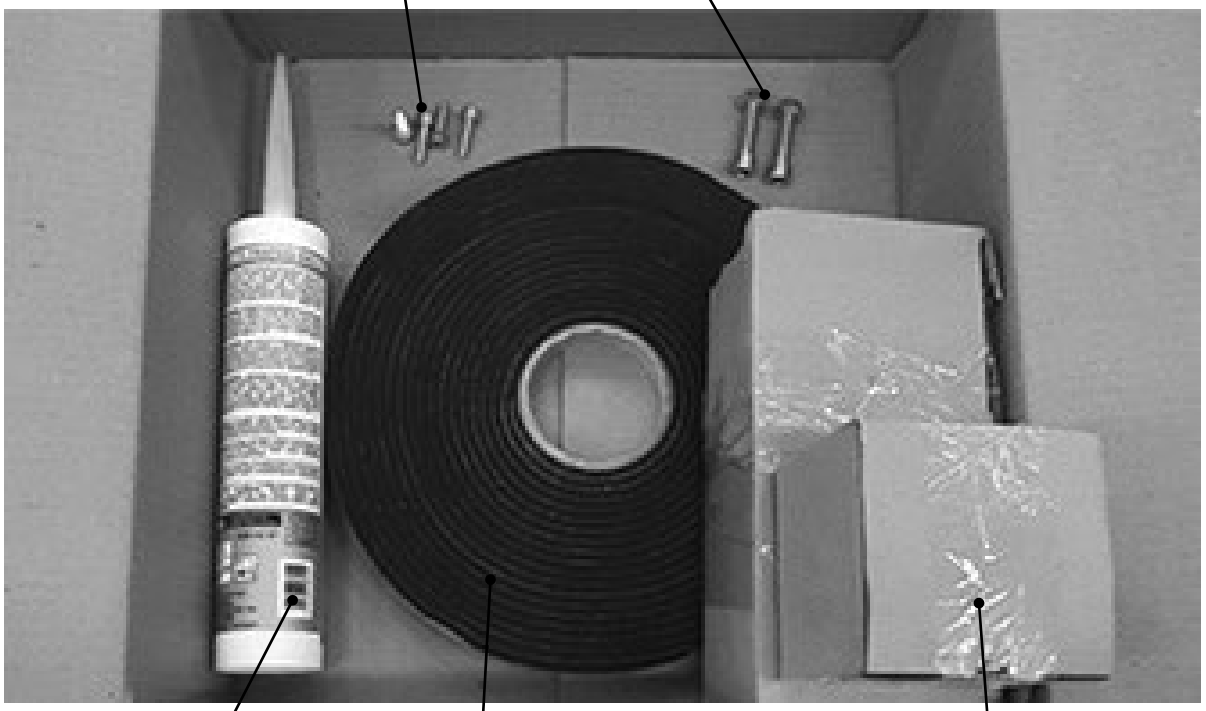


Use 2 junction blocks for **each side** of the **external module** (for a total of n°4);

Assembly kit

Screws to be used with connection systems (see picture below) (in case of presence of the external module)

Different types of screws (in case of presence of the external module, roof, etc..)

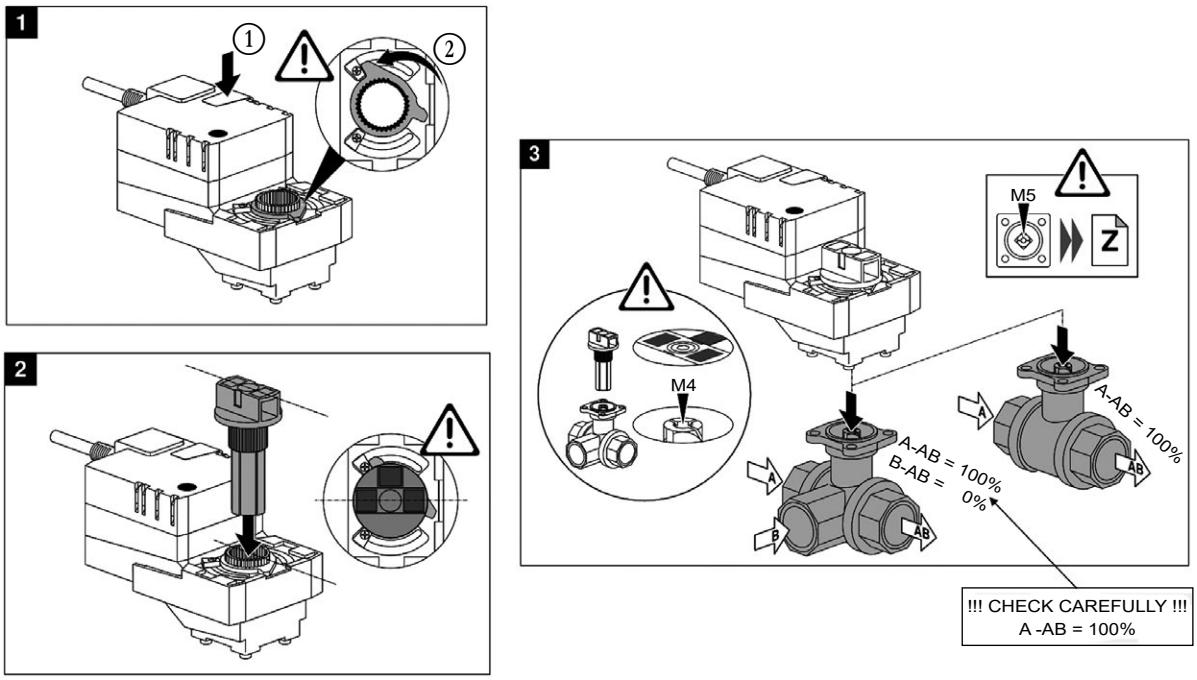


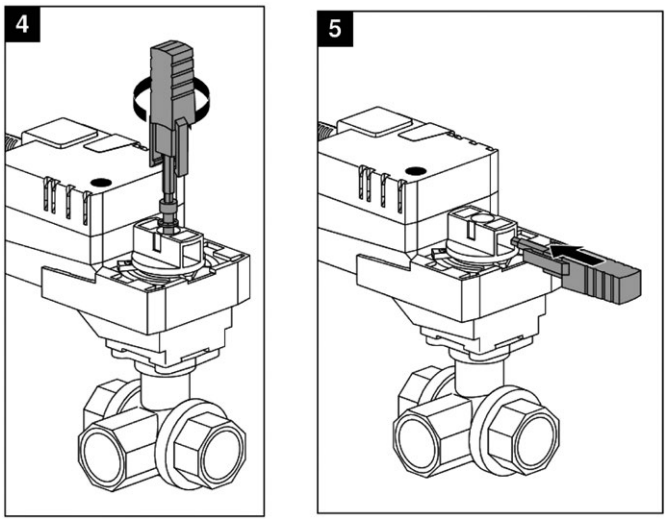
Silicone (in presence of external module and \or accessories)

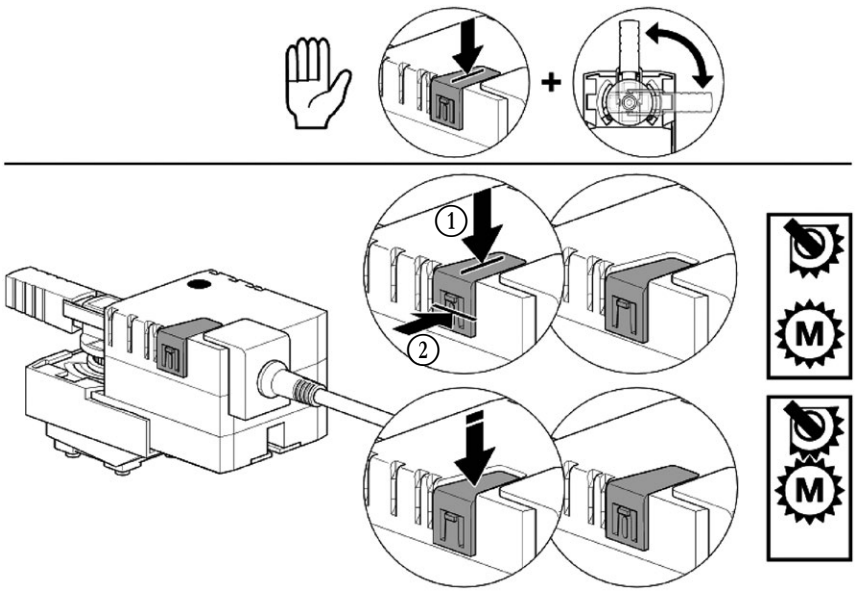
Gasket (if external module is present)

Hot/cold battery valves (in case coils control is requested)

2/3 way valves







4.6 - Service area

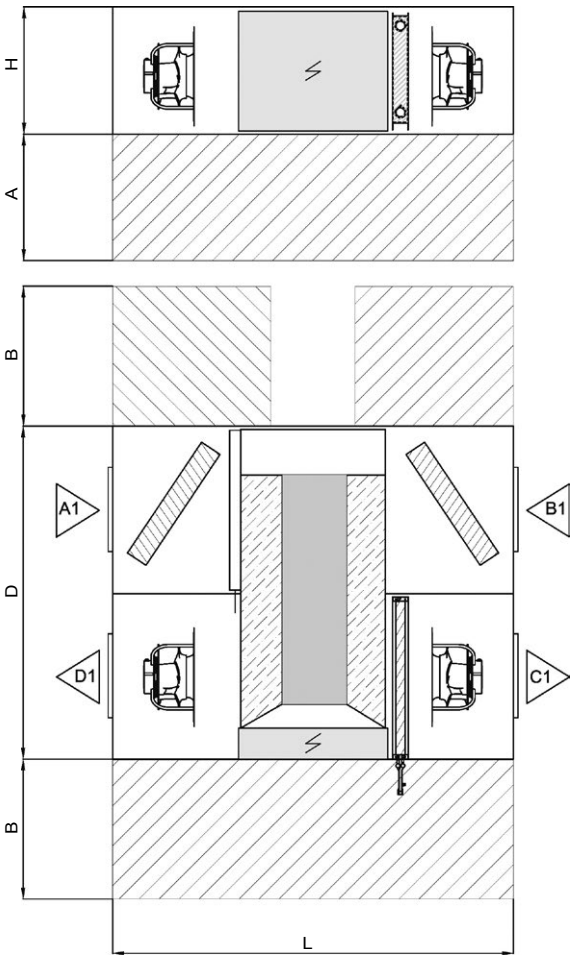
To guarantee the proper functioning of the unit and access for maintenance purposes, it is necessary to comply with the minimum installation clearance requirements shown in figures specified below.

- There must be no obstacles blocking the path of the air flow from the fans.
- Avoid any and all situations of backflow of air between external air intake and air discharge.
- If even only one of the above conditions is not fulfilled, please contact the manufacturer to check for feasibility.
- Whenever the unit is to be sited on unstable ground (various types of soil, gardens, etc.) it is a good idea to provide a supporting base of adequate dimensions.
- In presence of an external module (or two) extend the service area up to the end of the external module itself.

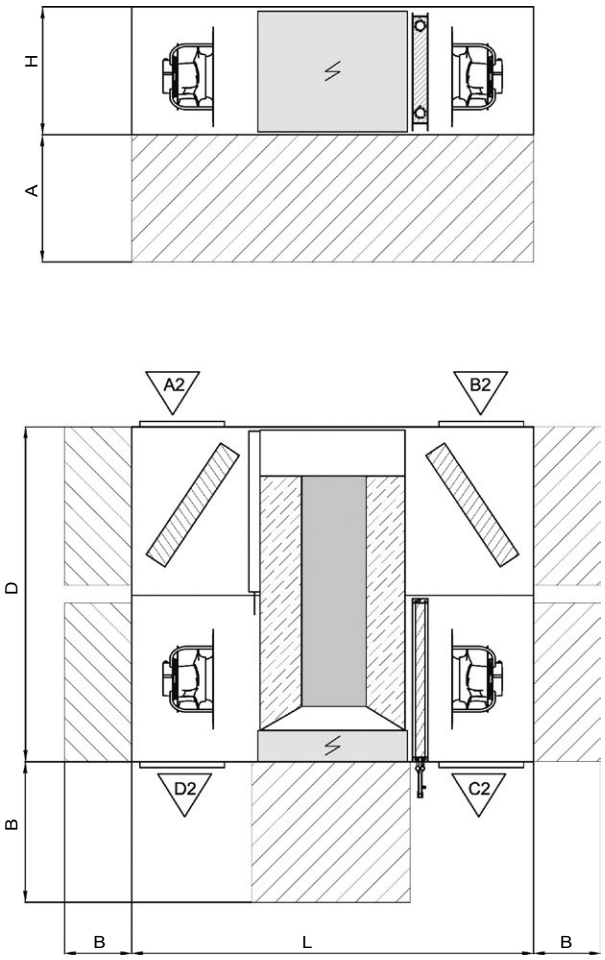
Service area						
Size		L	D	H	A	B
		[mm]	[mm]	[mm]	[mm]	[mm]
Horizontal	55	2300	1260	520	520	630
	110	2300	1260	520	520	630
	175	2300	1705	520	520	855
	220	2300	1705	520	520	855
	255	2300	2000	600	600	1000
	320	2300	2000	600	600	1000
Vertical	175	2300	580	1705	1705	290
	220	2300	580	1705	1705	290
	255	2300	600	2000	2000	300
	320	2300	600	2000	2000	300

4.6.1 - Horizontal version – Ceiling installation

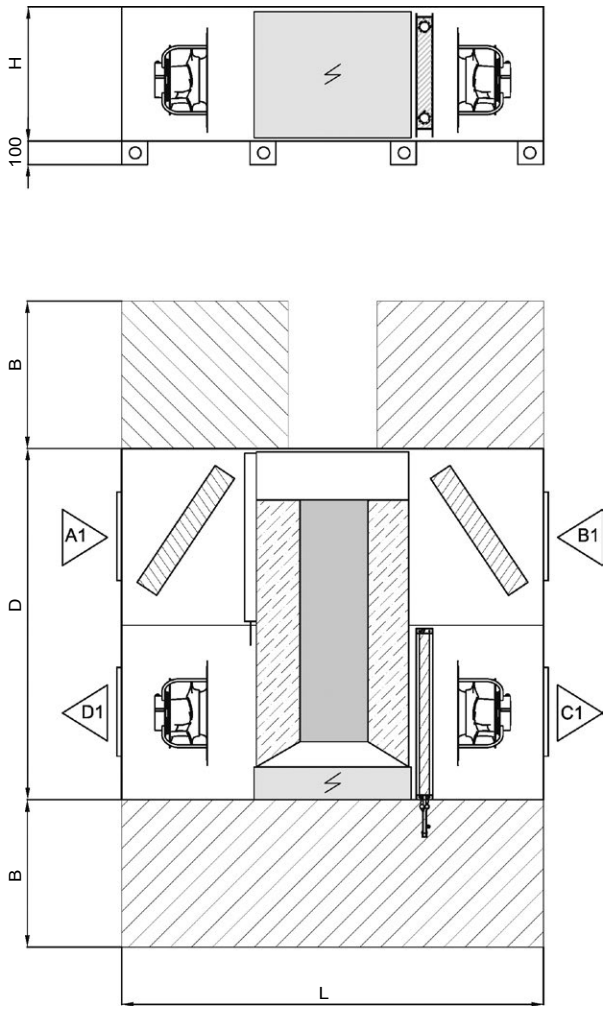
Standard openings - A1/B1/C1/D1



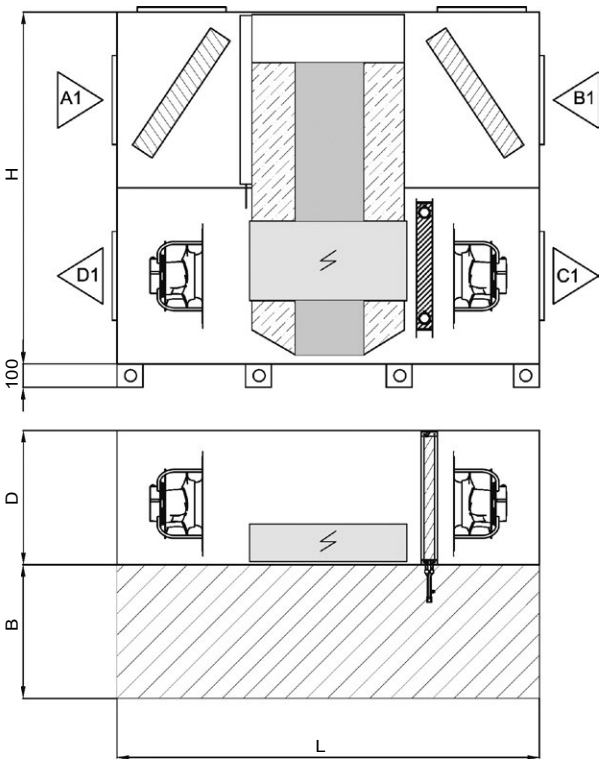
A2/B2/C2/D2 openings



4.6.2 - Horizontal version – Floor installation

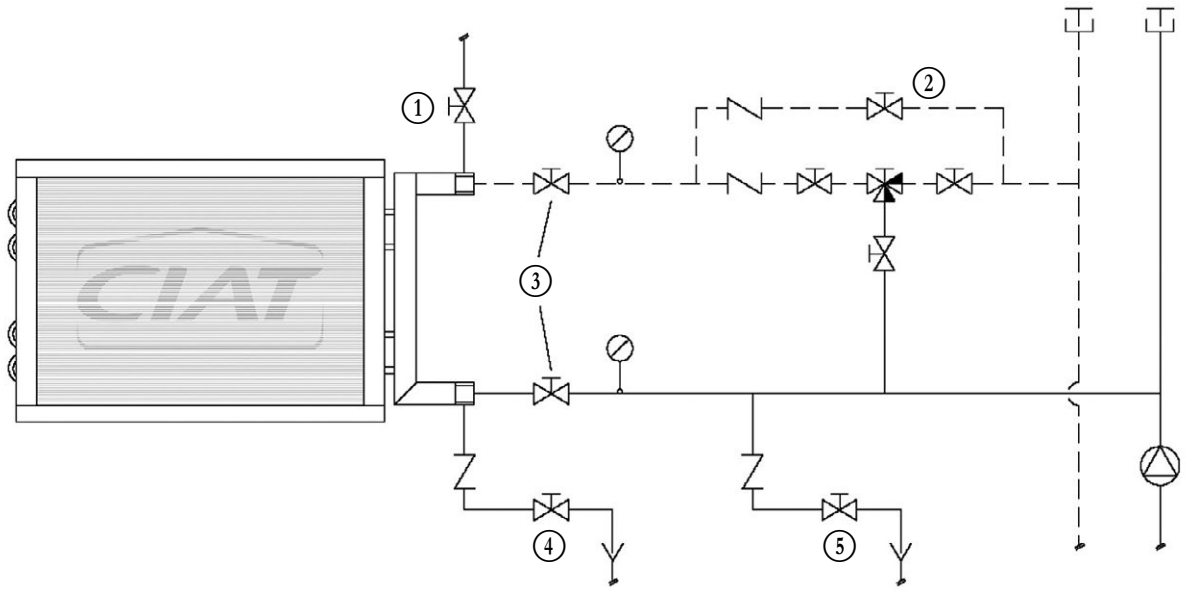


4.6.3 - Vertical version



4.7 - Plumbing connections

Recommended installation diagram for a water coil.



1. Heat exchanger air vent
2. 2By-pass
3. Coil cut-off valves
4. Venting air from the condensing coil
5. Venting air from the pipes

Coil connection

In order to avoid damages between the coupling of the copper collector and steel pipes, during installation care must be taken by ensuring the following procedure:

- Help yourself with two pliers one on the plant side and one on the coil side thread to accomplish the connection screwing. Keep the plier on the coil side steady, while moving the one on the plant side.

The heavy weight of the plant piping must strictly not weight on the coil collector. The installer must envisage appropriate support bracket.

In order to grant the correct heat exchange, it is necessary to :

- Pressure wash the coil pipe from the inside;
- Vent completely the air from the water circuit.

To ease the coil extraction:

- Pipes coupling must be made in order to optimize maintenance;
- Shut-off valve must be envisaged upflow and downflow the coil;
- A drainage valve must be installed on the bottom collector of the coil.

Size	Cooling or mixed coil			
	Horizontal	Vertical	Horizontal dx	Vertical dx
	DN [mm]	DN [mm]	in / out [mm]	in/out [mm]
55	20	-	12 / 18	-
110	20	-	12 / 18	-
175	25	25	18 / 28	18 / 28
220	25	25	18 / 28	18 / 28
255	32	32	18 / 28	18 / 28
320	32	32	18 / 28	18 / 28

Size	Heating coil	
	Horizontal	Vertical
	DN [mm]	DN [mm]
55	15	-
110	15	-
175	20	20
220	20	20
255	20	20
320	20	20

4.8 - Modulating valves

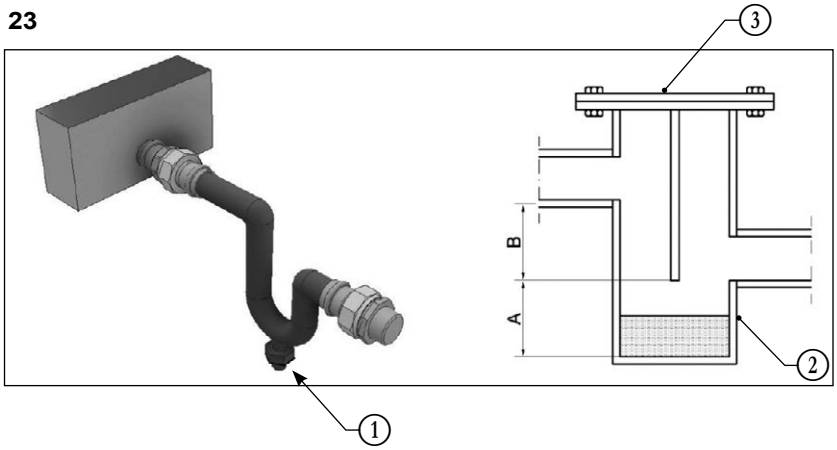
Size	Heating coil	
	Water	
	DN [mm]	DN [mm]
	2ways	3ways
55	10	15
110	10	15
175	15	15
220	15	15
255	15	15
320	15	15

Size	Cooling or mixed use coil	
	Water	
	DN [mm]	DN [mm]
	2ways	3ways
55	15	15
110	15	15
175	20	20
220	20	20
255	25	25
320	25	25

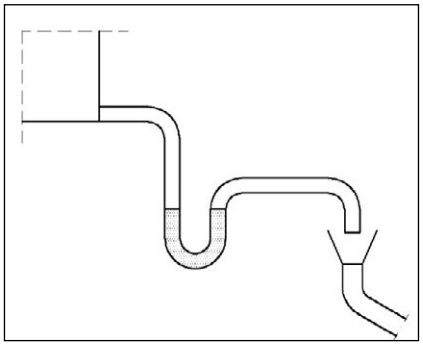
4.9 - Condensate discharge system

In order to avoid drain pan overflow and consequent recuperator and/or technical room flooding, siphon must be equipped with a bleeding valve to remove deposit dirt (Fig.23)

23



24

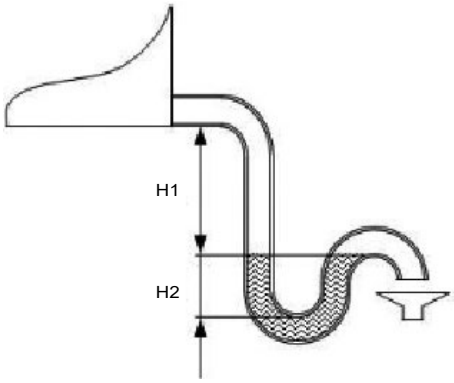


1 Drain
2 Draining pan
3 Opening cover for cleaning

Sewer discharge:

- Must not directly be connected to the siphon, in order to control upflow from the system and check visually water drainage;
- Must have a bigger diameter compared to the drain pipe (Fig.24) and at least have 2% inclination.

4.10 - Siphon CAlculation



Overpressure and underpressure discharge MUST NOT be connected on the same piping line, in order to avoid air short-circuit and drain pan overflow.

Discharge must be connected through a hose clamp and flexible pipes for horizontal units and 3/8" threaded connection for vertical units. Siphon must be dimensioned according to the following:

Size		Heat exchanger under pressure discharge		Cooling or mixed use coil			
				Internal under pressure discharge		On external module over pressure discharge	
		H1 (mm)	H2 min (mm)	H1 (mm)	H2 min (mm)	H1 (mm)	H2 (mm)
Horizontal	**55**	45	25	45	25	40	45
	110	60	30	60	30	40	60
	175	60	30	60	30	40	60
	220	65	35	65	35	40	65
	255	55	30	55	30	40	55
	320	65	35	65	35	40	65
Vertical	**175**	60	30	60	30	40	60
	220	65	35	65	35	40	65
	255	60	30	60	30	40	60
	320	70	35	70	35	40	70

4.11 - Electrical connections

Before making any electrical connections, make sure that the power supply line is disconnected. The electrical connections to the control panels must be carried out by qualified personnel according to the wiring diagrams supplied; make sure the voltage and frequency shown on the rating plate match those of the power line hookup.

Connect the unit and its accessories with cables having a section suitable to the power installed and in compliance with local standards. however, their dimensions must be such to get a voltage drop during starting lower than 3% compared to the rated voltage.

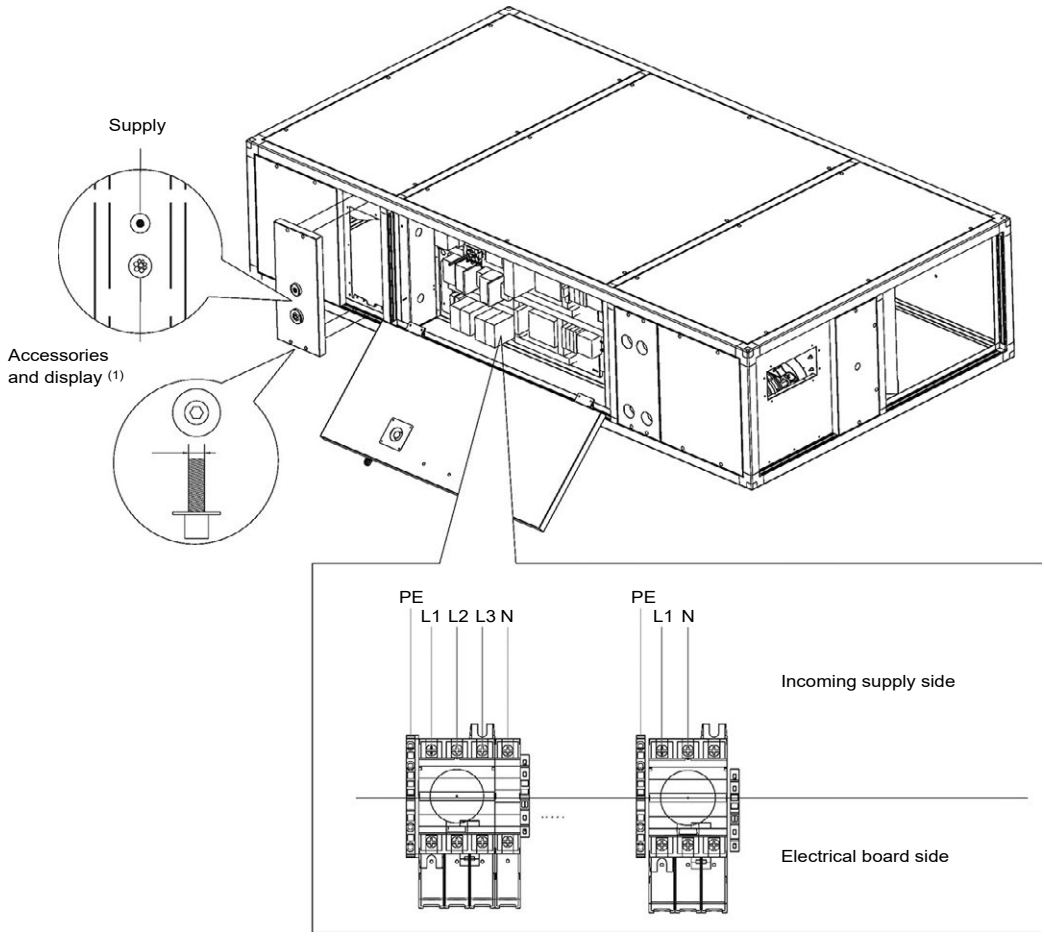
No adapters or multiple jacks and/or extensions are allowed for feeding the unit and its accessories. It is the installer's responsibility to provide for installation as close as possible to the unit of a power disconnecting switch, which must have a contact gap of at least 3 mm, and to furnish everything necessary to protect the electrical parts.

Connect the unit to an appropriate ground system using the screw inserted in the unit. The electrical connections indicated with broken lines must be made by the installer. All lines must be isolated by the installer in advance.

Power consumption							
Size		**55**	**110**	**175**	**220**	**255**	**320**
Fans - EC							
plc and auxiliaries	Power supply	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
	kW	0,1	0,1	0,1	0,1	0,1	0,1
	A	0,4	0,4	0,4	0,4	0,4	0,4
Supply fan (x1)	Power supply	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
	kW	1,07	1,07	1,4	1,4	1,4	1,4
	A	4,6	4,6	5,9	5,9	5,9	5,9
Return fan (x1)	Power supply	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
	kW	1,07	1,07	1,4	1,4	1,4	1,4
	A	4,6	4,6	5,9	5,9	5,9	5,9
Electric antifreeze	Power supply	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50
	kW	2,2	4,5	10	10	15	15
	A	9,6	19,6	14,4	14,4	21,7	21,7
Electric heater	Power supply	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50
	kW	2,2	4,5	10	10	10	10
	A	9,6	19,6	14,4	14,4	14,4	14,4
Fans(2x) + plc	Power supply	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
	Supply tipe	230V / 1Ph + N + PE / 50Hz					
	kW	2,2	2,2	2,9	2,9	2,9	2,9
	A	9,6	9,6	12,6	12,6	12,6	12,6
	Minimum wire section	1,5 mm²	1,5 mm²	1,5 mm²	1,5 mm²	1,5 mm²	1,5 mm²
	Internal main switch size	40A	40A	40A	40A	40A	40A
	Maximum wire section	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²
	Min / max tightening torque for terminals	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm
Fans(2x) + antifreeze+plc	Power supply	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50
	Supply tipe	230V / 1Ph + N + PE / 50Hz		400V / 3Ph + N + PE / 50Hz			
	kW	4,4	6,7	12,9	12,9	17,9	17,9
	A	19,2	29,2	26,6	26,6	33,9	33,9
	Minimum wire section	4 mm²	6 mm²	6 mm²	6 mm²	10 mm²	10 mm²
	Internal main switch size	40A	40A	40A	40A	40A	40A
	Maximum wire section	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²
	Min / max tightening torque for terminals	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm

Power consumption							
Size		**55**	**110**	**175**	**220**	**255**	**320**
Fans - EC							
Fans(2x) + electric heater+plc	Power supply	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50
	Supply tipe	230V / 1Ph + N + PE / 50Hz		400V / 3Ph + N + PE / 50Hz			
	kW	4,4	6,7	12,9	12,9	12,9	12,9
	A	19,2	29,2	26,6	26,6	26,6	26,6
	Minimum wire section	4 mm²	6 mm²	6 mm²	6 mm²	6 mm²	6 mm²
	Internal main switch size	40A	40A	40A	40A	40A	40A
	Maximum wire section	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²
	Min / max tightening torque for terminals	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm	1,8 Nm / 2 Nm
Fans(2x) + antifreeze + electric heater+plc	Power supply	230/1/50	230/1/50	400/3/50	400/3/50	400/3/50	400/3/50
	Supply tipe	230V / 1Ph + N + PE / 50Hz		400V / 3Ph + N + PE / 50Hz			
	kW	6,6	11,2	22,9	22,9	27,9	27,9
	A	28,7	48,7	41,1	41,1	48,3	48,3
	Minimum wire section	6 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²
	Internal main switch size	40A	63A	63A	63A	63A	63A
	Maximum wire section	16 mm²	70 mm²	70 mm²	70 mm²	70 mm²	70 mm²
	Min / max tightening torque for terminals	1,8 Nm / 2 Nm	5 Nm / 6 Nm	5 Nm / 6 Nm	5 Nm / 6 Nm	5 Nm / 6 Nm	5 Nm / 6 Nm

Minimum cable cross-sections are provided as a guide for PVC insulated copper conductors at a temperature of 40 ºC installed in a channel system to hold and protect conductors or single-pole cables (regulatory reference 60204-1:2018). These sections must be calculated taking into account the specifications of each installation (connection type, ambient temperature, cable length, etc.)



(1) For accessories and display refer to wiring diagrams

4.12 - User terminal installation

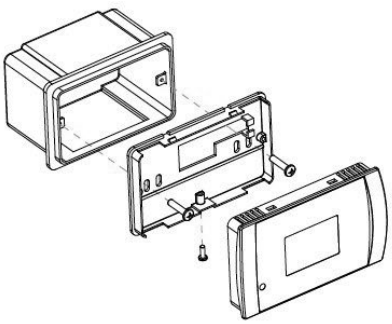
DFU control

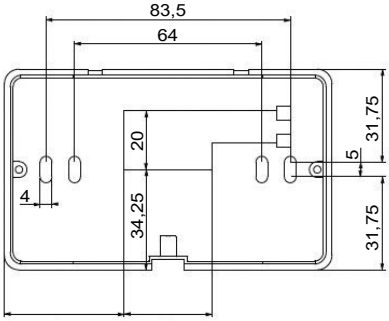
Choose an installation site where you will have easy access to the user interface for setting the functions and may accurately read the room temperature (1.5 m from floor level).

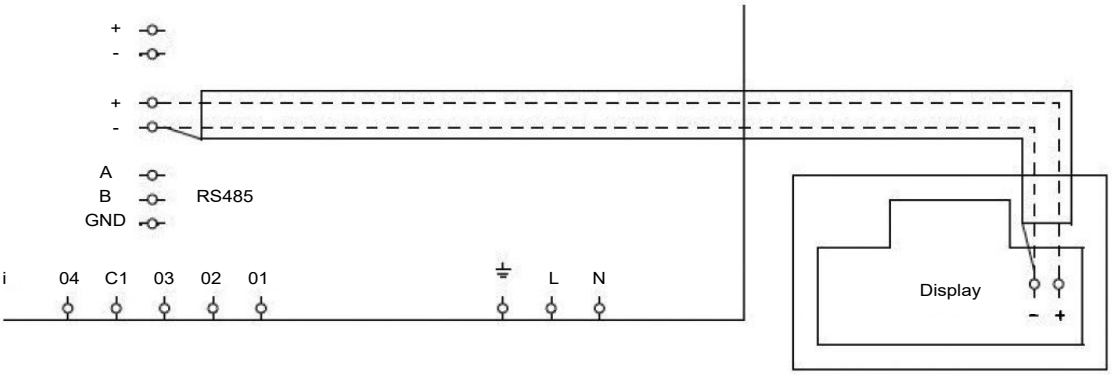
You should avoid:

- Positions directly exposed to sunlight;
- Positions exposed to direct currents of warm or cold air;
- Placing obstacles that impede an accurate temperature reading (drapes or furniture);
- Constant presence of steam (kitchens, etc.)
- Covering the panel or recess mounting it on the wall.

For wall mounting of the user interface it is advisable to use a 503 recess mounting electric box behind the controller to accommodate the cables.







All DFU units are supplied plug&play (about the electrical diagrams see controller user manual or electrical diagrams documentation.

The connection between the user interface and the power board must be performed using the 2-terminal connectors of the power-line communication found on both devices (see wiring diagram). In the case of connection between power boards, there are two connectors: It doesn't matter which connector you connect to.

It is recommended to use a data network cable consisting of a pair of twisted and shielded conductors.

It is also recommended to connect the shielding conductor to the (-) terminal both on the user interface and on the power board.

The installation of power supply wire and signal wire must be done separately.

5 - START UP

The start up must be done by qualified and properly trained personnel about the air treatment techniques. No inspection doors must be opened during the machine operation.

Once the unit has been installed in accordance with the instructions given in the previous paragraphs, it will be possible to proceed with the start-up. Below an indication of the operations that must have already been performed.

- Installation
- Water connections
- Air connections
- Electrical connections
- Installation of the remote display

The unit must not be modified and/or converted in any way. Any change made and unauthorized has the effect of invalidating the guarantee and conformity CE.

All connections must be made only by specialized personnel, equipped with the necessary preparation in the prevention of accidents and safety in the workplace.

Make sure that the unit is grounded before proceeding and that the whole system is connected to the same potential.

All power supplies must be turned off and free of voltage. Ensure that such power supplies are protected against unintended ignition.

The unit is fully wired, programmed according to selected accessories and factory tested.

For the start-up refer to the indications on the characteristic label of the unit.

The dimensioning of the power supply line is at the installer charge, depending on the length and type of cable, the absorption and the physical dislocation of the unit. All electrical connections must comply with the laws in force at the time and in the place of installation.

The unit is equipped with two grommets:

- One for connecting external utilities;
- One for power connection.

Once the electrical panel is opened, the power cable must be connected to the general switch.

Preparatory activities:

- Thoroughly clean the unit and all components by removing dust and other sediments;
- Remove loose parts such as tools etc. and documentation from the unit, they could be sucked into the fan and cause its destruction;
- Check and tighten again all screw and electrical connections;
- Check the connection of the general power supply and if the mains voltage coincides with that indicated on the label, a connection voltage tolerance of ± 5 % is admitted;
- It is necessary to check all cables insulation for possibile damages and eventually replaced them;
- Check the correct installation of the external module (if present);
- Where the by-pass actuator is present, check the correct and complete opening of the damper;
- If external shutters are present, check that they are correctly and completely opening;
- Install all the foreseen filters, check their cleanliness;
- Check that the water coil hydraulic connections are properly sealed;
- Check the operation of the valve actuator; for its wiring, refer to the wiring diagrams;
- Check the presence of the siphon on the condensate drain, its dimensioning and the absence of foreign bodies which could obstruct the drain;
- If direct expansion coils or air-cooled condensers/heat exchangers are fitted, the system must be filled with a refrigerant fluid. In this case, the installation and connections must be carried out by a refrigeration technician in possession of a valid licence.

According to the safety instructions, the supply temperature should be < 40 ºC.

6 - TROUBLESHOOTING AND MAINTENANCE

The maintenance must be done by qualified and properly trained personnel about the air treatment techniques. The unit must be switched OFF during the maintenace operations.

To open the inspection doors an allen key (size 4 mm) is needed (see the pictures below).

Filters

The filters regeneration can not be performed (the clogged, dirty and damaged filters have to be replaced).

Carrier recommends to replace the filters when the alarm is present on DFU controller display.

During maintenance it will be necessary to wear adequate personal protective equipment,checking the indications listed in section“Safety”.

Fans

The presence of fans with a directly coupled motor minimizes maintenance on this component. It is however recommended to clean the motor and the impeller in order to avoid overheating and/or failure, bearing in mind that the motors have an IP54 protection rating. During maintenance it will be necessary to wear adequate personal protective equipment, checking the indications listed in section “Safety”.

Heat recovery section

As there are no moving parts, the maintenance for this type of heat recovery unit is limited to its cleaning, which consists of:

- Removing dust from the coil using compressed air and a wire brush;
- Cleaning the finned block of any grease deposits by means of hot water or steam with the addition of household fat-soluble detergents, if necessary;
- Monthly checking the correct operation of condensate drainage, and removing any deposits.

During maintenance it will be necessary to wear adequate personal protective equipment, checking the indications listed in section “Safety”.

Coils

In order to maintain an optimal water/air exchange, it is necessary to regularly perform, on the coils, the maintenance operations listed below:

- At the beginning of each operating season, use the appropriate relief valve to eliminate any air present in the coil circuit;
- At the beginning of each operating season, remove accumulated dust and any deposits on the finned block. It is possible to clean them by using a jet of compressed air in the opposite direction to that of the air flow during the normal operation of the recuperator, or by washing the finned block with water, suitable non-corrosive cleaning products, and a wire brush;
- Remove any deposits from the condensate collection tank and drain. This operation must be repeated on a monthly basis in order to prevent flooding the unit and the room in which it is located.

  To avoid irreparably damaging the heat exchangers, you must ensure that the primary fluid does not run the risk of freezing in the winter season.

To this end Carrier recommends:

- In the case of extended inactivity of the heat exchange circuits, they should be completely drained;
- Verify, in systems operating with antifreeze liquid, the latter’s efficiency by topping up or replacing it.

Antifreeze liquid must not be placed in circuits not designed for it, as it could compromise the proper operation of the pumps and the coil’s performance. During maintenance it will be necessary to wear adequate personal protective equipment, checking the indications listed in section“Safety”.

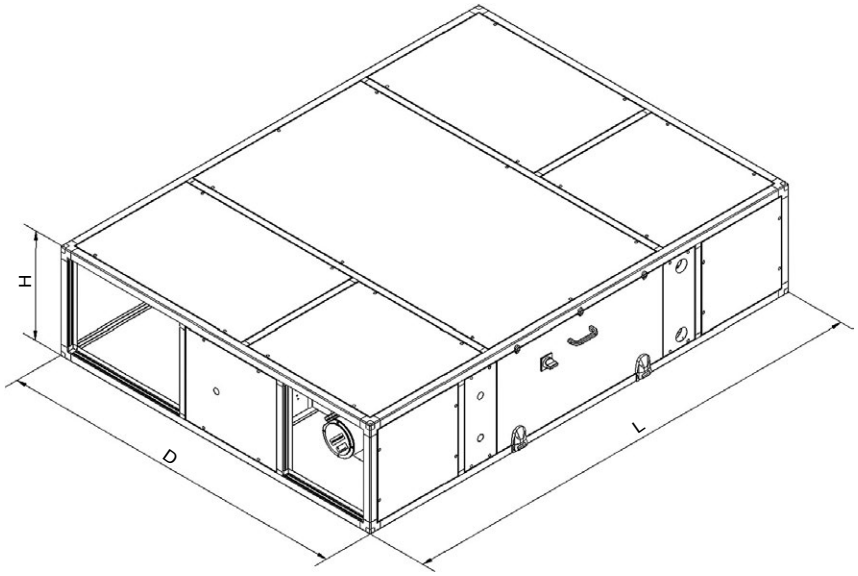
6 - TROUBLESHOOTING AND MAINTENANCE

6.1 - Problem solution

Alarm	Description	Solution
AL01	Outlet fan alarm	Check power supply on fan clamps, if power supply is present replace fan
AL02	Inlet fan alarm	Check power supply on fan clamps, if power supply is present replace fan
AL03	Clogged filter	Check filter and the actual airflow (the fan could work out of design conditions)
AL04	Pre-heating electrical heaters	Low air flow. Safety thermostat of the heater could be open, if the alarm does not reset by pressing the bell wait unit you the temperature get low. If it persists press the manual reset on the electrical heater (inside of the unit)
AL06	Antifreeze electrical heaters	Low air flow. Safety thermostat of the heater could be open, if the alarm does not reset by pressing the bell wait unit you the temperature get low. If it persists press the manual reset on the electrical heater (inside of the unit)
AL08	Room air temperature probe	Room air temperature probe probably damaged, it should have to be replaced
AL09	Delivery air temperature probe	Supply air temperature probe probably damaged, it should have to be replaced
AL010	External air temperature probe	External air temperature probe probably damaged, it should have to be replaced
AL012	Heat recovery temperature probe	Heat recovery temperature probe probably damaged, it should have to be replaced
AL17	High room temperature	Room/Return high temperature. Adjust parameter R22
AL18	Low room temperature	Room/Return low temperature. Adjust parameter R23
AL21	Recovery antifreeze	Heat recovery section outlet temperature lower than 1 degree for 300s. Check if frost is present on the expulsion side of the heat recovery system.
AL23	Expansion board offline	Expansion board Offline. Remove the OC network clamps and bridge the IC and I10 clamps for 5 seconds. Remove the bridge when both LEDs turn green. Redirect the board to expansion again. If the alarm persists, the board should be damaged and it needs to be replaced.

7.1 - Dimensional data

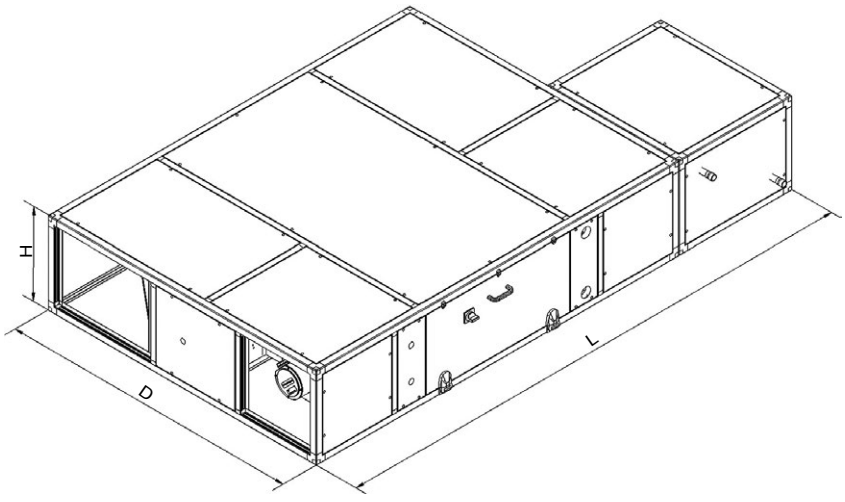
Horizontal version



DFU		Horizontal					
		55	110	175	220	255	320
H	mm	520(1)	520(1)	520(1)	520(1)	600(1)	600(1)
L	mm	2300	2300	2300	2300	2600	2600
D	mm	1260	1260	1705	1705	2000	2000
W	kg	160	180	290	300	430	440

(1) Consider the additional height of feet = 100 mm, for outdoor application

Horizontal version + external module



DFU		Horizontal + External module					
		55	110	175	220	255	320
H	mm	520(1)	520(1)	520(1)	520(1)	600(1)	600(1)
L	mm	2800	2800	3020	3020	3270	3270
D	mm	1260	1260	1705	1705	2000	2000
W	kg	160	180	290	300	430	440
W (external module)	kg	50	50	68	68	82	82

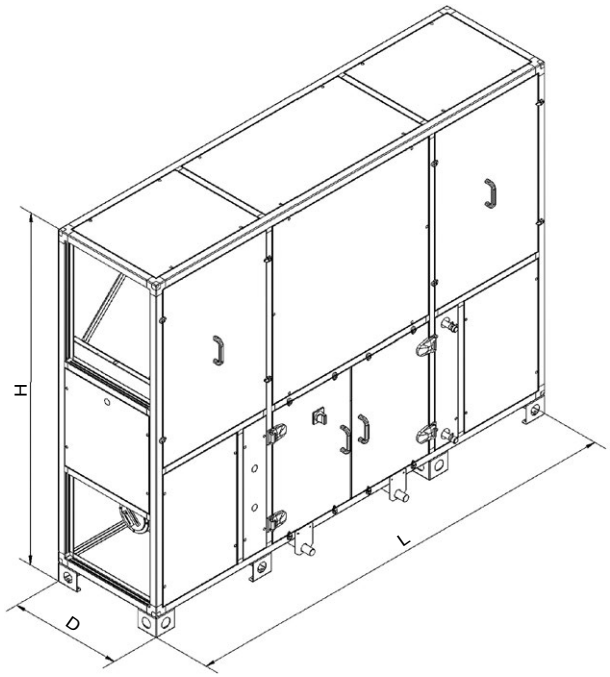
(1) Consider the additional height of feet = 100 mm, for outdoor application

NOTE: External module contains carbon filters or cooling/mixed coil.

Cooling/mixed coil is internal for 55-110 sizes.

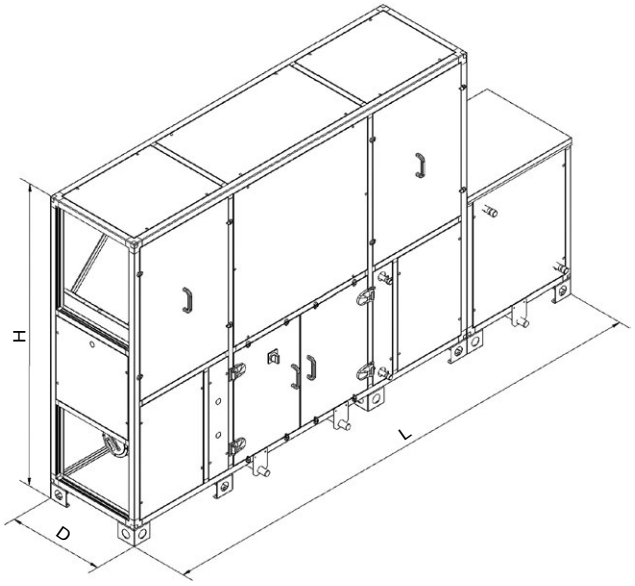
7 - TECHNICAL SPECIFICATION

Vertical version



DFU		Vertical					
		55	110	175	220	255	320
H	mm	-	-	1805	1805	2100	2100
L	mm	-	-	2300	2300	2600	2600
D	mm	-	-	580	580	600	600
W	kg	-	-	290	300	430	440

Vertical version + external module



DFU		Vertical + External module					
		55	110	175	220	255	320
H	mm	-	-	1805	1805	2100	2100
L	mm	-	-	3020	3020	3270	3270
D	mm	-	-	580	580	600	600
W	kg	-	-	290	300	430	440
W (external module)	kg	-	-	70	70	84	84

NOTE: External module contains carbon filters or cooling/mixed coil.

7.2 - Erp compliant

		55	110	175
ERP compliant		ERP 2018 ready	ERP 2018 ready	ERP 2018 ready
Range		Size 55	Size 110	Size 175
Unit type		NRVU	NRVU	NRVU
Fan speed - regulation type		stepless	stepless	stepless
HRS type		Counterflow HRS	Counterflow HRS	Counterflow HRS
HRS dry efficiency (EN 308)	%	75,5	77,9	79,7
Reference airflow	m³/s	0,153	0,306	0,486
Input power (installed)	kW	2,2	2,2	2,9
SFP int	W/(m³/s)	891	1059	806
Air speed filters supply	m/s	0,55	1,09	1,03
Air speed filters return	m/s	0,55	1,09	1,03
Δps,ext supply	Pa	150	250	250
Δps,int supply	Pa	140	201	221
Δps,ext return	Pa	150	250	250
Δps,int return	Pa	154	191	206
ηv,st fan supply	%	32	37	53
ηv,st fan return	%	33	37	53
Internal air leakage	%	0	0	0
External air leakage	%	1	1	1
Filter energy class supply		B	B	B
Filter energy class return		B	B	B
Dirty filter alarm type		Diff. Press. Switch	Diff. Press. Switch	Diff. Press. Switch
Lw irradiated	dB(A)	51,1	58,6	61,5

		220	255	320
ERP compliant		ERP 2018 ready	ERP 2018 ready	ERP 2018 ready
Range		Size 220	Size 255	Size 320
Unit type		NRVU	NRVU	NRVU
Fan speed - regulation type		stepless	stepless	stepless
HRS type		Counterflow HRS	Counterflow HRS	Counterflow HRS
HRS dry efficiency (EN 308)	%	79,6	81,4	80,6
Reference airflow	m³/s	0,611	0,708	0,889
Input power (installed)	kW	2,9	2,9	2,9
SFP int	W/(m³/s)	857	676	925
Air speed filters supply	m/s	1,30	1,51	1,89
Air speed filters return	m/s	1,30	1,51	1,89
Δps,ext supply	Pa	250	250	250
Δps,int supply	Pa	249	194	254
Δps,ext return	Pa	250	250	250
Δps,int return	Pa	231	178	236
ηv,st fan supply	%	56	55	53
ηv,st fan return	%	56	55	53
Internal air leakage	%	0	0	0
External air leakage	%	1	1	1
Filter energy class supply		B	B	B
Filter energy class return		B	B	B
Dirty filter alarm type		Diff. Press. Switch	Diff. Press. Switch	Diff. Press. Switch
Lw irradiated	dB(A)	62,5	62,5	66,5

7.3 - Pressure drops - accessories

Size		Component		Air flow [% rated]					
				20	40	60	80	100	110
Horizontal	55	F9 filter	Pa	3	11	18	25	32	35
		heating coil		1	3	5	8	11	13
		cooling coil - dry/humid		2/5	5/11	9/17	14/24	19/32	22/36
		Carbon filter		11	22	33	43	54	60
	110	F9 filter	Pa	10	25	40	55	70	77
		heating coil		3	8	14	21	29	33
		cooling coil - dry/humid		6/10	14/24	24/40	36/56	51/74	59/83
		Carbon filter		22	43	65	87	109	119
	175	F9 filter	Pa	16	36	56	78	99	110
		heating coil		3	9	15	23	31	36
		cooling coil - dry/humid		3/6	7/14	13/22	19/32	26/42	30/47
		Carbon filter		25	50	76	101	126	139
	220	F9 filter	Pa	21	46	73	100	128	142
		heating coil		5	12	21	31	42	48
		cooling coil - dry/humid		4/8	10/18	17/30	26/42	36/55	42/62
		Carbon filter		32	63	95	127	158	174
	255	F9 filter	Pa	16	36	56	77	99	110
		heating coil		3	8	14	20	27	31
		cooling coil - dry/humid		4/8	10/17	17/29	25/40	34/53	39/59
		Carbon filter		31	61	92	123	153	168
	320	F9 filter	Pa	21	46	72	99	127	141
		heating coil		4	11	19	27	37	42
		cooling coil - dry/humid		5/10	13/23	23/38	34/53	47/70	54/78
		Carbon filter		38	77	115	154	192	211

Size		Component		Air flow [% rated]					
				20	40	60	80	100	110
Vertical	175	F9 filter	Pa	16	36	56	78	99	110
		heating coil		3	9	15	22	30	34
		cooling coil - dry/humid		4/8	10/19	18/31	27/43	37/57	43/64
		Carbon filter		25	50	76	101	126	139
	220	F9 filter	Pa	21	46	73	100	128	142
		heating coil		5	12	20	30	41	47
		cooling coil - dry/humid		5/11	14/25	25/40	38/57	52/75	60/84
		Carbon filter		32	63	95	127	158	174
	255	F9 filter	Pa	16	36	56	77	99	110
		heating coil		3	9	16	23	31	35
		cooling coil - dry/humid		4/10	12/22	22/36	33/51	45/67	52/75
		Carbon filter		31	61	92	123	153	168
	320	F9 filter	Pa	21	46	72	99	127	141
		heating coil		6	13	21	31	42	48
		cooling coil - dry/humid		6/13	17/29	30/47	45/67	62/88	71/99
		carbon filter		38	77	115	154	192	211

7.4 - Heat exchangers / internal heating elements technical data

Water heating coil

Size		Air flow rate	Rows	Fins pitch	Power	Air outlet	Air pressure drop	Water pressure drop
		[m³/h]	[N°]	[mm]	[kW]	[°C]	[Pa]	[kPa]
Air inlet = 17 °C // Water inlet = 45 °C / Water outlet = 40°C								
Horizontal	**55**	550	2	2,5	3,27	34,7	11	17,95
	110	1000	2	2,5	5,12	32,28	25	40,54
	175	1750	2	2,5	8,37	31,26	31	12,03
	220	2200	2	2,5	9,86	30,35	42	16,15
	255	2550	2	2,5	12,59	31,72	27	17,57
	320	3200	2	2,5	14,82	30,81	37	23,6
Vertical	**175**	1750	2	2,5	8,43	31,36	30	13,31
	220	2200	2	2,5	9,93	30,46	41	17,94
	255	2550	2	2,3	12,19	31,25	31	14,68
	320	3200	2	2,3	14,34	30,36	42	19,73
Air inlet = 17 °C // Water inlet = 70 °C / Water outlet = 60°C								
Horizontal	**55**	550	2	2,5	6,19	50,57	11	15,35
	110	1000	2	2,5	9,73	46,01	25	34,89
	175	1750	2	2,5	15,94	44,15	31	10,36
	220	2200	2	2,5	18,78	42,44	42	13,95
	255	2550	2	2,5	23,95	44,99	27	15,1
	320	3200	2	2,5	28,21	43,27	37	20,32
Vertical	**175**	1750	2	2,5	16,06	44,35	30	11,53
	220	2200	2	2,5	18,92	42,63	41	15,55
	255	2550	2	2,3	23,21	44,13	31	12,7
	320	3200	2	2,3	27,3	42,43	42	17,09

7.5 - Antifreeze heating element

Size		HRS ice temperature -7 °C					
		Air flow rate	Freezing point	Air inlet limit	Power	Control	Power supply
		[m³/h]	[°C]	[°C]	[kW]		V-ph-Hz
Horizontal	**55**	550	-7	-20	2,2	2 steps	230/1/50
	110	1100	-7	-20	4,5	2 steps	230/1/50
	175	1750	-7	-20	10	2 steps	400/3+N/50
	220	2200	-7	-20	10	2 steps	400/3+N/50
	255	2550	-7	-20	15	2 steps	400/3+N/50
	320	3200	-7	-20	15	2 steps	400/3+N/50
Vertical	**175**	1750	-7	-20	10	2 steps	400/3+N/50
	220	2200	-7	-20	10	2 steps	400/3+N/50
	255	2550	-7	-20	15	2 steps	400/3+N/50
	320	3200	-7	-20	15	2 steps	400/3+N/50

7.6 - Re-heating element power

Size		Air inlet = temperature 18°C; relative humidity 70 %						
		[m³/h]	Temperature [°C]	Rel. Humidity [%]	Temperature [°C]	[kW]	Power supply	
Horizontal	**55**	550	18	70	29,9	2,2	2 steps or 0-10V	230/1/50
	110	1100	18	70	30,2	4,5	2 steps or 0-10V	230/1/51
	175	1750	18	70	35,1	10	2 steps or 0-10V	400/3/50
	220	2200	18	70	31,6	10	2 steps or 0-10V	400/3/50
	255	2550	18	70	29,7	10	2 steps or 0-10V	400/3/50
	320	3200	18	70	27,3	10	2 steps or 0-10V	400/3/50
Vertical	**175**	1750	18	70	35,1	10	2 steps or 0-10V	400/3/50
	220	2200	18	70	31,6	10	2 steps or 0-10V	400/3/50
	255	2550	18	70	29,7	10	2 steps or 0-10V	400/3/50
	320	3200	18	70	27,3	10	2 steps or 0-10V	400/3/50

7.7 - Water cooling or mixed use coil

Size		Air flow rate	Rows	Fins pitch	Total power	Sensitive power	Air outlet	Water flow rate	Air pressure drop	Water pressure drop
		[m³/h]	[N°]	[mm]	[kW]	[kW]	[°C]	[l/h]	[Pa]	[kPa]
COOLING MODE: Air inlet = T 28°C; RH 75% // Water inlet = 7 °C / Water outlet = 12°C										
Horizontal	**55**	550	3	1,8	5,86	2,4	15,06	1008	19	5,95
	110	1100	3	1,8	9,62	4,04	17,27	1656	51	11,15
	175	1750	3	2,1	18,32	7,51	15,3	3132	26	15,82
	220	2200	3	2,1	21,55	8,84	16,09	3708	36	21,24
	255	2550	3	2,1	24,58	10,08	16,26	4212	34	13,73
	320	3200	3	2,1	28,79	12,09	17	4932	47	14,54
Vertical	**175**	1750	3	2,1	16,33	6,86	16,6	2808	37	9,47
	220	2200	3	2,1	19,12	8,03	17,34	3276	52	12,42
	255	2550	3	2,1	22,18	9,32	17,31	3816	45	9,41
	320	3200	3	2,1	25,83	10,85	18,02	4428	62	9,06
COOLING MODE: Air inlet: T 28°C; RH 75% // Water inlet = 5 °C / Water outlet = 10°C										
Horizontal	**55**	550	3	1,8	6,55	2,69	13,64	1116	19	6,74
	110	1100	3	1,8	10,83	4,44	16,07	1872	51	13,92
	175	1750	3	2,1	20,39	8,36	13,93	3492	26	19,36
	220	2200	3	2,1	24,1	9,88	14,77	4140	36	26,11
	255	2550	3	2,1	27,54	11,29	14,95	4716	34	13,58
	320	3200	3	2,1	32,32	13,25	15,77	5544	47	18,09
Vertical	**175**	1750	3	2,1	18,34	7,52	15,32	3132	37	11,63
	220	2200	3	2,1	21,5	8,81	16,15	3672	52	15,51
	255	2550	3	2,1	25,01	10,25	16,09	4284	45	11,64
	320	3200	3	2,1	29,19	11,97	16,89	5004	62	11,07

7 - TECHNICAL SPECIFICATION

Size		Air flow rate	Rows	Fins pitch	Total power	Sensitive power	Air outlet	Water flow rate	Air pressure drop	Water pressure drop
		[m³/h]	[N°]	[mm]	[kW]	[kW]	[°C]	[l/h]	[Pa]	[kPa]
HEATING MODE: Air inlet: 17 °C // Water inlet = 45 °C / Water outlet = 40°C										
Horizontal	**55**	550	3	1,8	4,2	4,2	39,75	720	19	4,16
	110	1100	3	1,8	7,33	7,33	36,85	1260	51	6,95
	175	1750	3	2,1	13,06	13,06	39,25	2268	26	9,78
	220	2200	3	2,1	15,71	15,71	38,28	1736	36	10,39
	255	2550	3	2,1	18,1	18,1	38,15	3132	34	7,69
	320	3200	3	2,1	21,68	21,68	37,2	3780	47	9,7
Vertical	**175**	1750	3	2,1	12,21	12,21	37,79	2124	37	7,88
	220	2200	3	2,1	14,61	14,61	36,79	2556	52	10,03
	255	2550	3	2,1	17,07	17,07	36,95	2952	45	6,36
	320	3200	3	2,1	20,35	20,35	35,95	3528	62	7,83
HEATING MODE: Air inlet: 17 °C // Water inlet = 70 °C / Water outlet = 60°C										
Horizontal	**55**	550	3	1,8	8,01	8,01	60,42	720	19	3,94
	110	1100	3	1,8	13,99	13,99	54,89	1224	51	6,36
	175	1750	3	2,1	24,87	24,87	59,36	2196	26	8,82
	220	2200	3	2,1	29,94	29,94	57,55	2628	36	11,91
	255	2550	3	2,1	34,54	34,54	57,37	3024	34	7,02
	320	3200	3	2,1	41,35	41,35	55,51	3636	47	8,77
Vertical	**175**	1750	3	2,1	23,3	23,3	56,67	2052	37	7,23
	220	2200	3	2,1	27,91	27,91	54,8	2448	52	9,1
	255	2550	3	2,1	32,64	32,64	55,14	2880	45	5,91
	320	3200	3	2,1	38,94	38,94	53,72	3420	62	7,21

Size		Air inlet = temperature 18°C; relative humidity 70 %							
		Air flow rate	Rows	Fins pitch	Total power	Sensitive power	Air outlet	Flow rate	Air pressure drop
		[m³/h]	[N°]	[mm]	[kW]	[kW]	[°C]	[kg/h]	[Pa]
COOLING MODE: Air inlet = T 28°C; RH 75% // Evaporating temperature R410A = 7°C									
Horizontal	**55**	550	3	2,1	5,49	2,25	15,93	108	19
	110	1100	3	2,1	8,99	3,78	18,04	180	49
	175	1750	3	2,1	16,55	6,79	16,53	324	24
	220	2200	3	2,1	19,42	7,96	17,24	360	33
	255	2550	3	2,1	22,41	9,19	17,29	432	32
	320	3200	3	2,1	26,14	10,98	17,99	504	44
Vertical	**175**	1750	3	2,1	14,81	6,22	17,64	288	35
	220	2200	3	2,1	17,26	7,25	18,35	324	48
	255	2550	3	2,1	21,22	8,91	17,85	396	45
	320	3200	3	2,1	24,61	10,34	18,58	468	61
HEATING MODE: Air inlet: T 17°C // Condensing temperature R410A = 38°C									
Horizontal	**55**	550	3	2,1	2,79	2,79	31,76	40	19
	110	1100	3	2,1	4,66	4,66	29,31	64	49
	175	1750	3	2,1	7,83	7,83	30,02	110	24
	220	2200	3	2,1	9,19	9,19	29,15	128	33
	255	2550	3	2,1	10,09	10,09	28,57	137	32
	320	3200	3	2,1	11,72	11,72	27,65	158	44
Vertical	**175**	1750	3	2,1	6,42	6,42	27,67	100	35
	220	2200	3	2,1	7,42	7,42	26,8	116	48
	255	2550	3	2,1	10,48	10,48	28,95	155	45
	320	3200	3	2,1	12,24	12,24	28,18	180	61

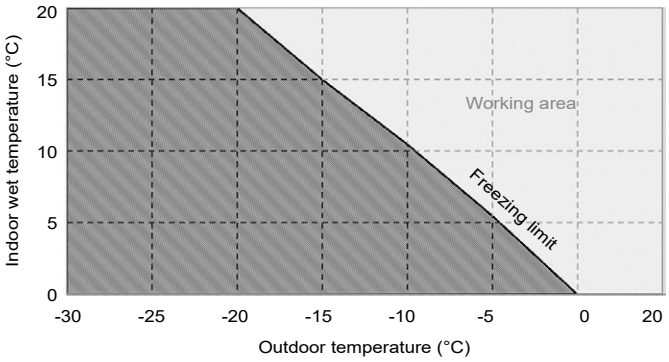
7.8 - Operating limits

The correct operation of the unit is guaranteed within the operating and installation limits of the unit. The unit must not exceed the specified temperature limits. Correct operation is not guaranteed in case of fire or natural phenomena of exceptional intensity. In case of installation and/or operation of the unit in environments with an aggressive or explosive atmosphere, contact the manufacturer. The following are the operating limit curves:

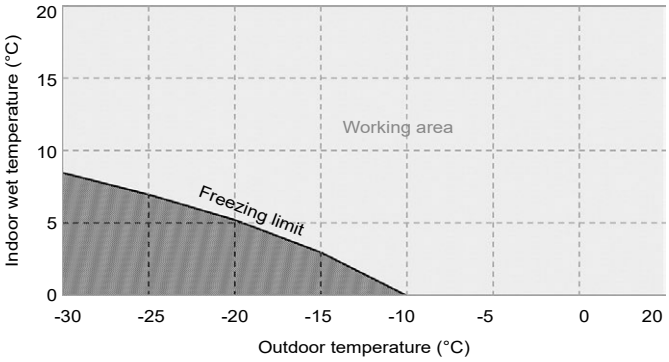
The freezing limit is calculated considering a recuperator air exhaust temperature of 2 °C.

The temperatures on the vertical axis in the graphs below are wet bulb temperature

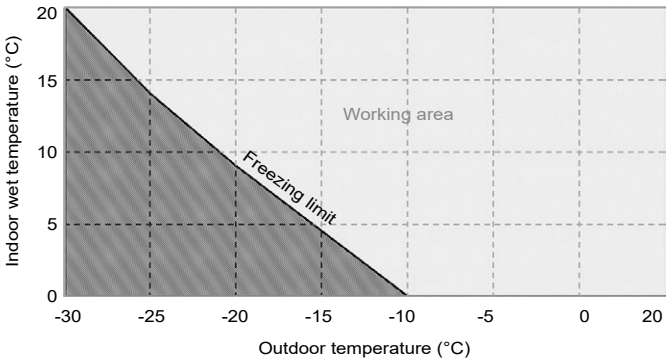
Without antifreeze function intervention



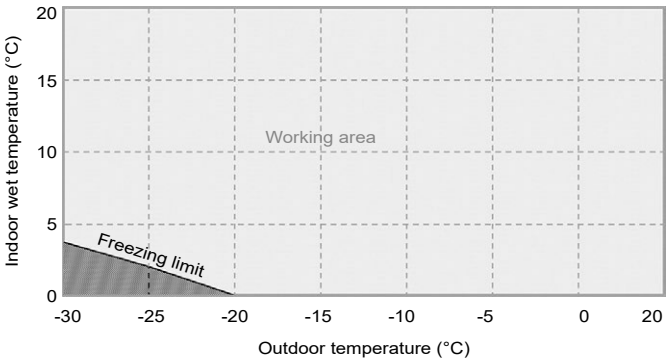
With standard antifreeze function (unbalanced flow rates)



With antifreeze resistance intervention only



With both standard function and antifreeze resistance intervention



Operating limit diagram reading:

- Vertical axis: The wet bulb temperature of the indoor (ambient) air is indicated.
- Horizontal axis : The dry bulb temperature of the outdoor air is indicated.
- Dashed-line area: Conditions of heat exchanger icing up.

As the wet bulb temperature decreases (i.e., as the enthalpy available in the extracted air decreases), the outdoor operating limit temperature decreases. For example, ambient air at 20 °C and 50 % humidity corresponds to a wet bulb temperature of 13.85 °C.

Provide an antifreeze system that is suitable for the ambient conditions present.

7.9 - Ratings

Configuration		Horizontal		Horizontal + Vertical			
Size		**55**	**110**	**175**	**220**	**255**	**320**
Rated air flow	m³/h	550	1100	1750	2200	2550	3200
Fans - EC							
Max external pressure	Pa	190	960	950	860	820	560
Rated external pressure	Pa	150	250	250	250	250	250
Heat recovery units							
Winter operation (-10 °C, 90% / 20 °C, 50%)							
Wet Efficiency	%	87,7	88,3	90,3	90,3	92,7	92,0
Heat recovery	kW	4,85	9,77	15,93	20,03	23,78	29,65
Efficiency (EN 308)	%	75,5	77,9	79,7	79,6	81,4	80,6
Supply temperature	°C	16,3	16,5	17,1	17,1	17,8	17,6
Summer operation (35 °C, 50 % / 26 °C, 60 %)							
Heat recovery	kW	1,25	2,59	4,21	5,29	6,26	7,77
Supply temperature	°C	28,2	28	27,9	27,9	27,7	27,8

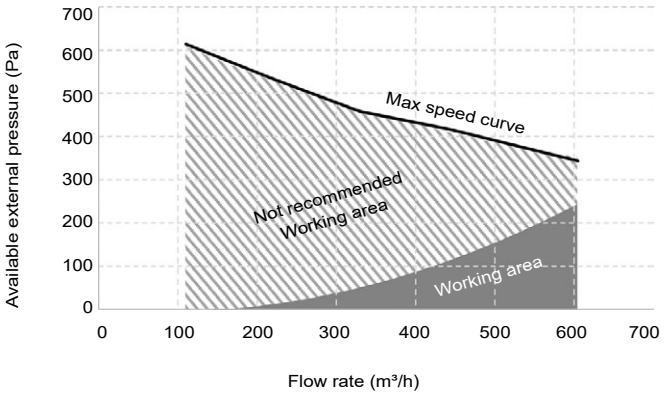
7.10 - Ventilation curves

Data from minimum airflow without constant airflow control is 30% to 110% of the nominal flow rate.

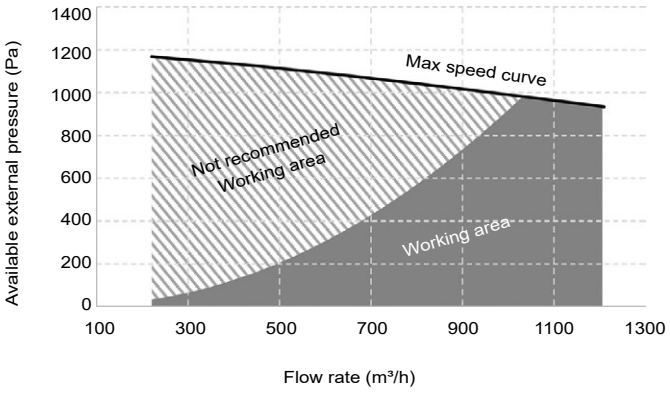
Fan operating area considering the base unit pressure drop:

- Filters pressure drops are calculated as initial pressure drops;
- Recuperator pressure drops are calculated for the supply flow in winter conditions.

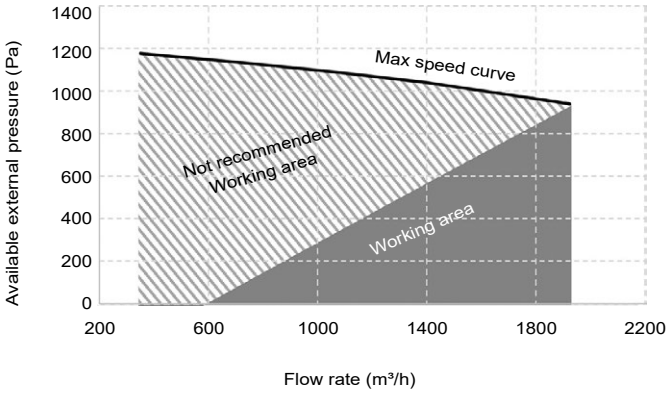
55



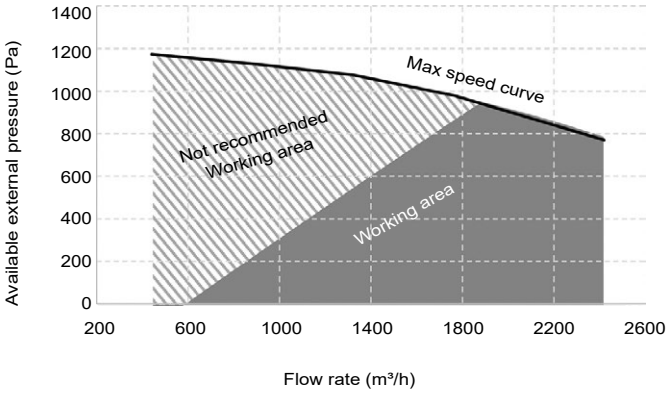
110

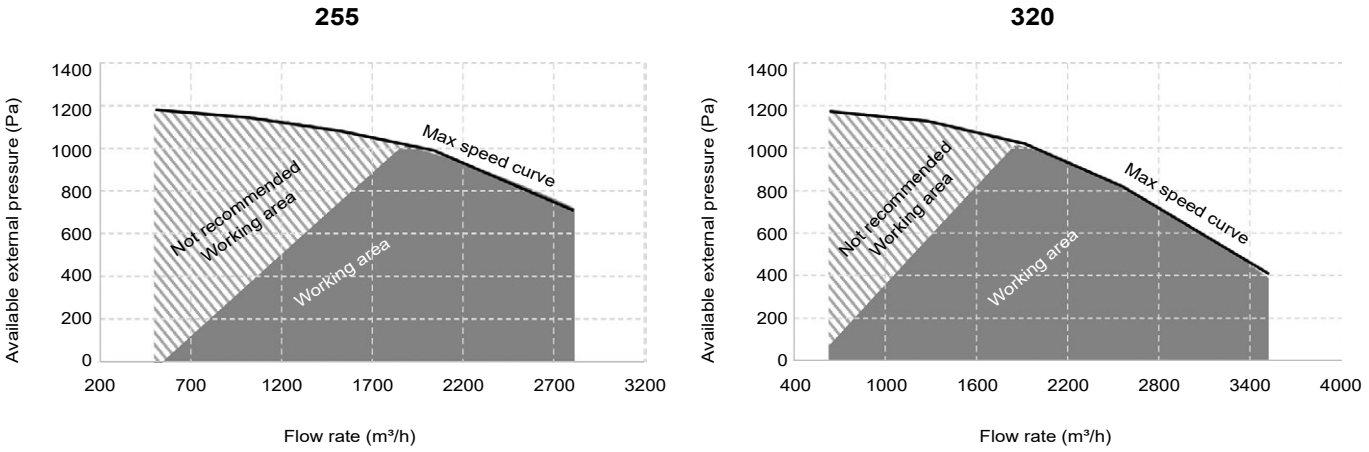


175



220





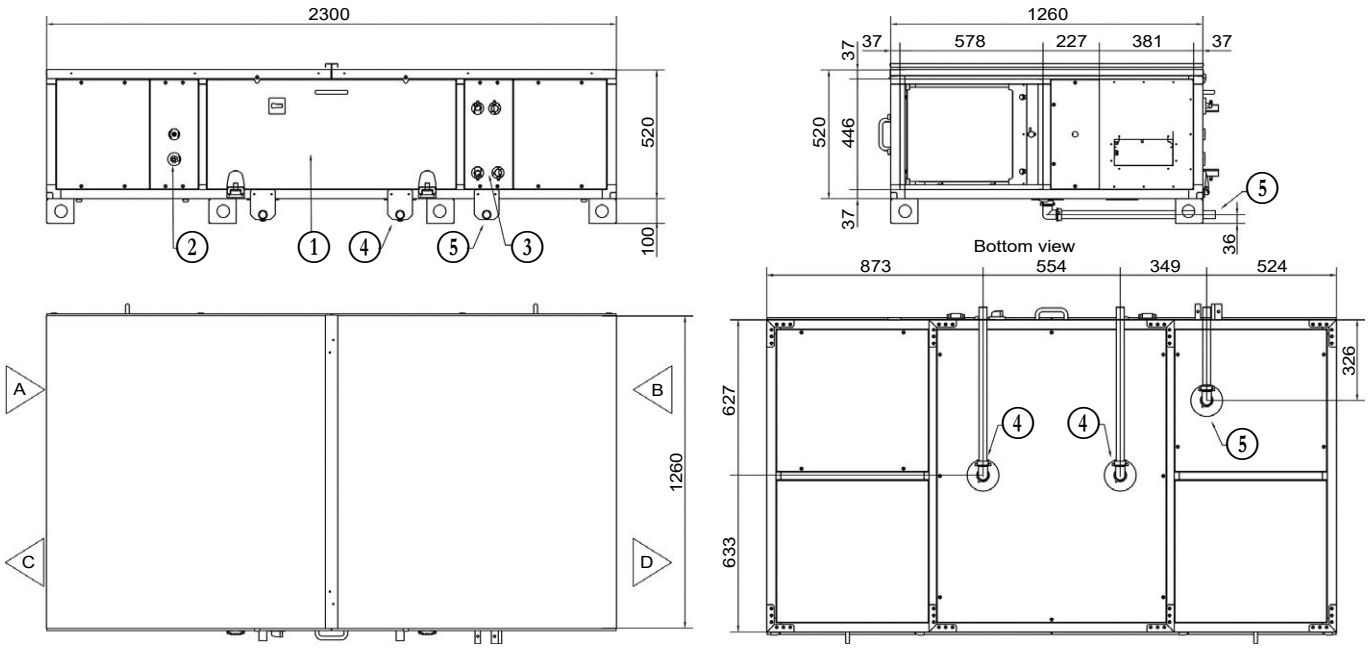
7.11 - Rated acoustic data

Sound power level calculated at nominal conditions - i.e. nominal flow rate and 150 Pa external pressure.

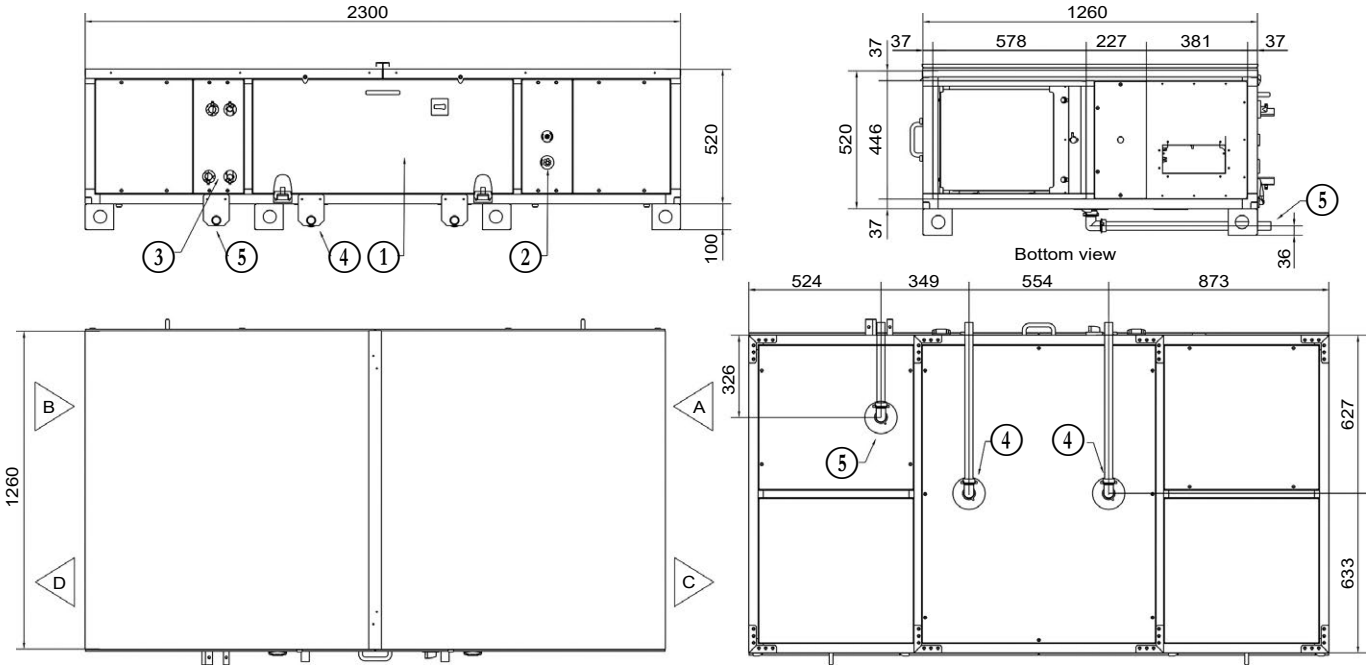
Frequency		Hz	63	125	250	500	1000	2000	4000	8000	Sum [dB(A)]
55	Air intake	dB	61,0	58,0	65,0	57,0	51,0	47,0	42,0	29,0	59,6
	Outlet	dB	61,0	62,0	66,0	62,0	62,0	61,0	54,0	47,0	66,9
	Structure	dB	50,1	51,1	49,8	47,6	46,5	44,6	32,6	18,8	51,1
110	Air intake	dB	55,0	62,0	70,0	62,0	57,0	53,0	49,0	38,0	64,8
	Outlet	dB	55,0	66,0	71,0	67,0	68,0	67,0	61,0	56,0	72,8
	Structure	dB	44,1	55,1	54,8	52,6	52,5	50,6	39,6	27,8	56,8
175	Air intake	dB	60,0	58,0	69,0	61,0	52,0	47,0	45,0	33,0	63,0
	Outlet	dB	62,0	63,0	71,0	68,0	70,0	69,0	66,0	59,0	74,9
	Structure	dB	51,1	52,1	54,8	53,6	54,5	52,6	44,6	30,8	58,5
220	Air intake	dB	62,0	60,0	71,0	63,0	54,0	49,0	47,0	35,0	65,0
	Outlet	dB	64,0	65,0	73,0	70,0	72,0	71,0	68,0	61,0	76,9
	Structure	dB	53,1	54,1	56,8	55,6	56,5	54,6	46,6	32,8	60,5
255	Air intake	dB	63,0	61,0	72,0	64,0	55,0	50,0	48,0	36,0	66,0
	Outlet	dB	65,0	66,0	74,0	71,0	73,0	72,0	69,0	62,0	77,9
	Structure	dB	54,1	55,1	57,8	56,6	57,5	55,6	47,6	33,8	61,5
320	Air intake	dB	67,0	65,0	76,0	68,0	59,0	54,0	52,0	40,0	70,0
	Outlet	dB	69,0	70,0	78,0	75,0	77,0	76,0	73,0	66,0	81,9
	Structure	dB	58,1	59,1	61,8	60,6	61,5	59,6	51,6	37,8	65,5

7.12 - Dimensional drawings

DFU 55-110 – Horizontal – Outdoor configuration A



DFU 55-110 – Horizontal – Outdoor configuration B

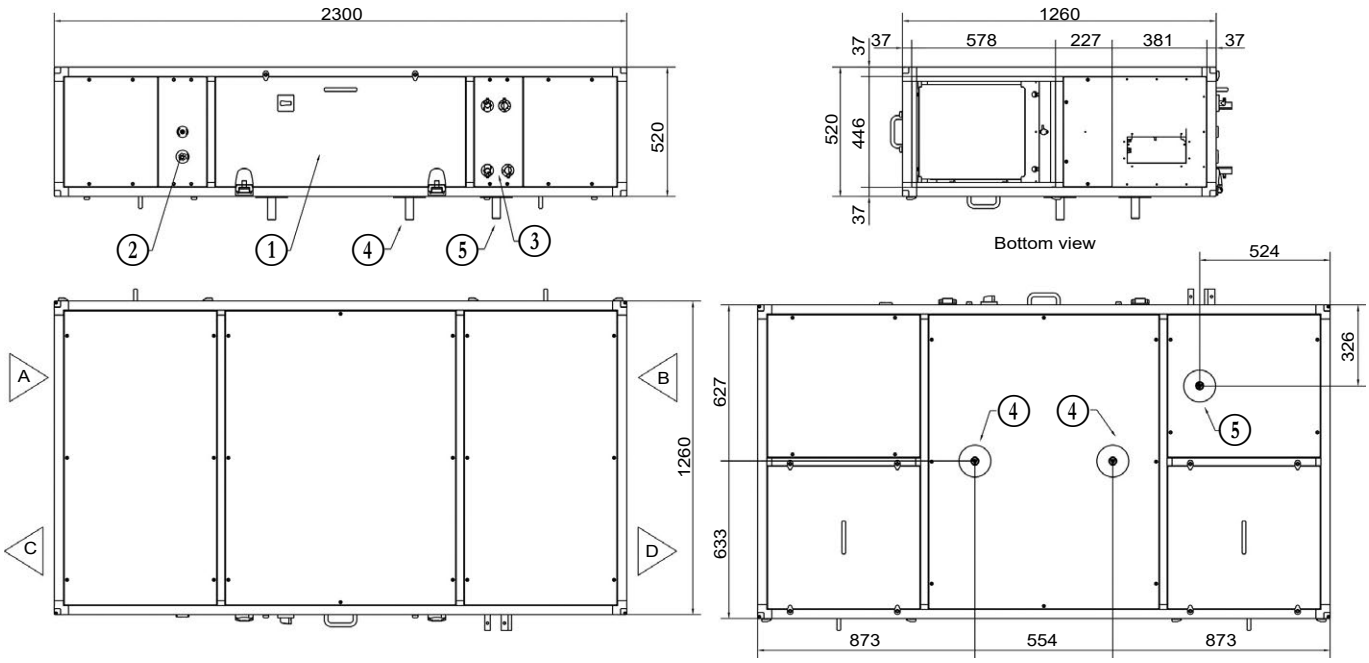


Key

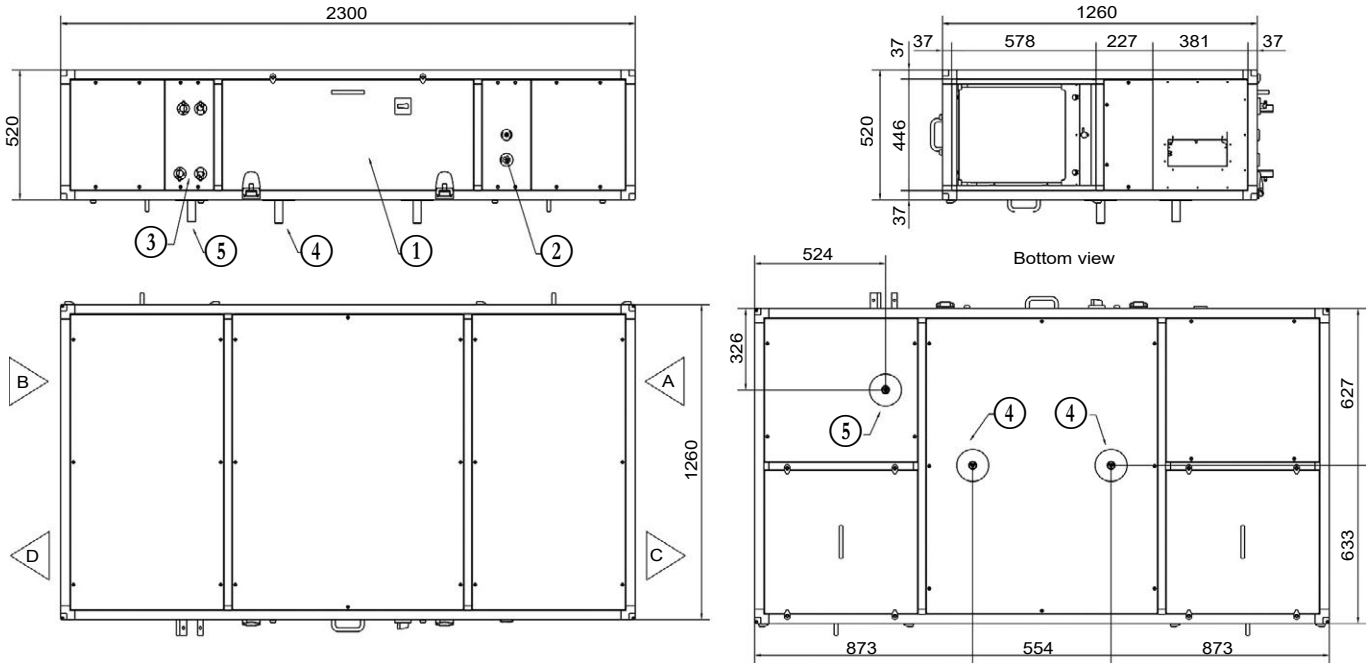
A Fresh air
B Extraction
C Supply Air
D Exhaust Air

(1) Electric panel
(2) Electrical connection
(3) Coil Connection
(4) Drain Hole (1"PP)
(5) Coil Drain Hole (1"PP) optional

DFU 55-110 – Horizontal – Indoor configuration A



DFU 55-110 – Horizontal – Indoor configuration B

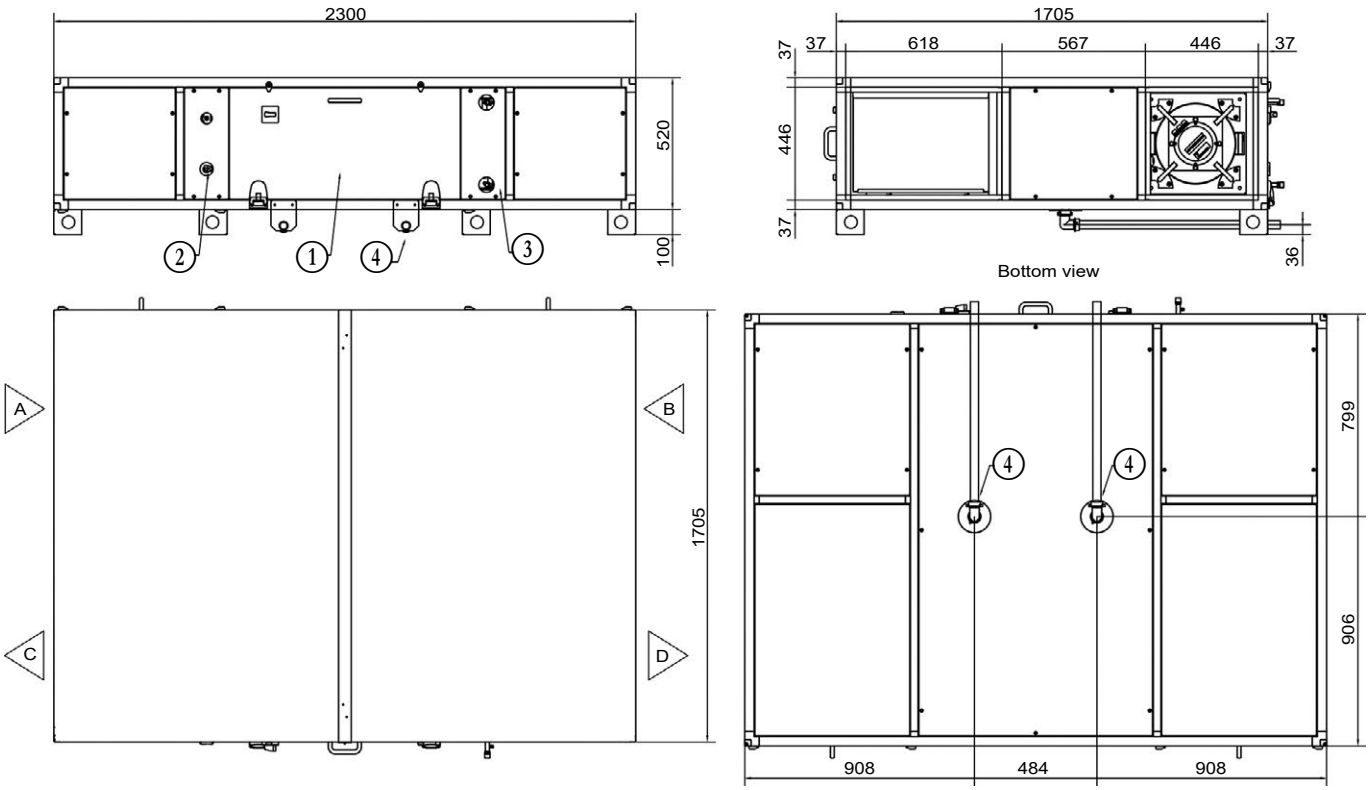


Key

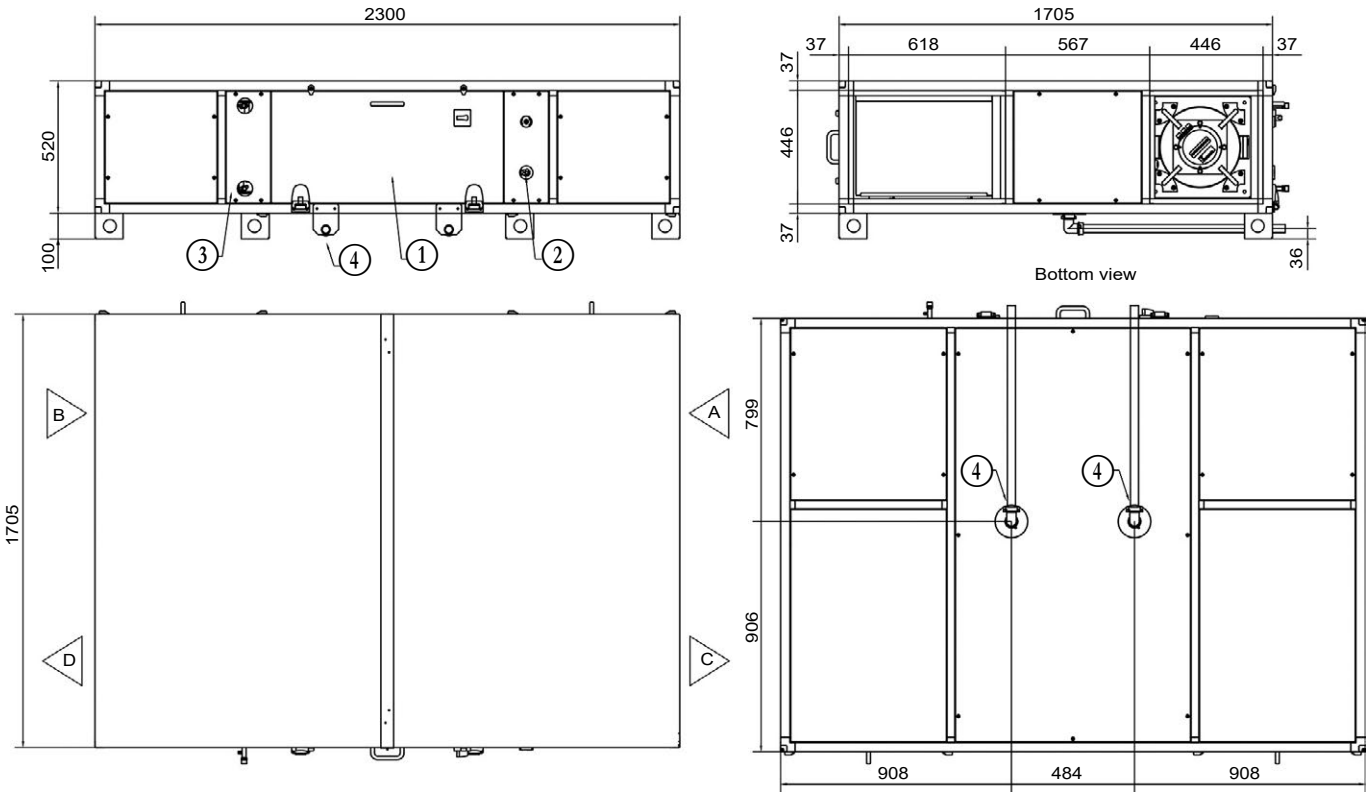
A Fresh air
B Extraction
C Supply Air
D Exhaust Air

(1) Electric panel
(2) Electrical connection
(3) Coil Connection
(4) Drain Hole (1"PP)
(5) Coil Drain Hole (1"PP) optional

DFU 175/220 – Horizontal – Outdoor configuration A



DFU 175/220 – Horizontal – Outdoor configuration B

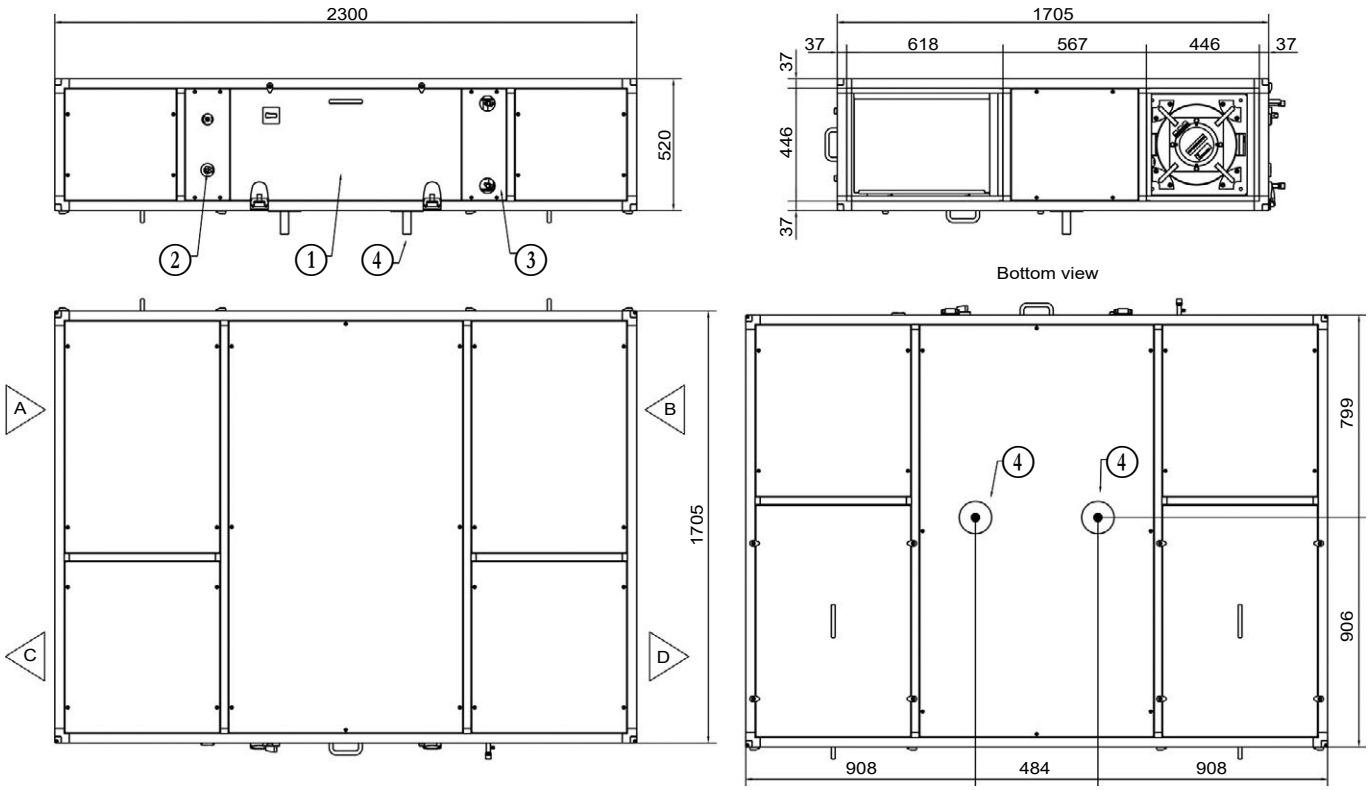


Key

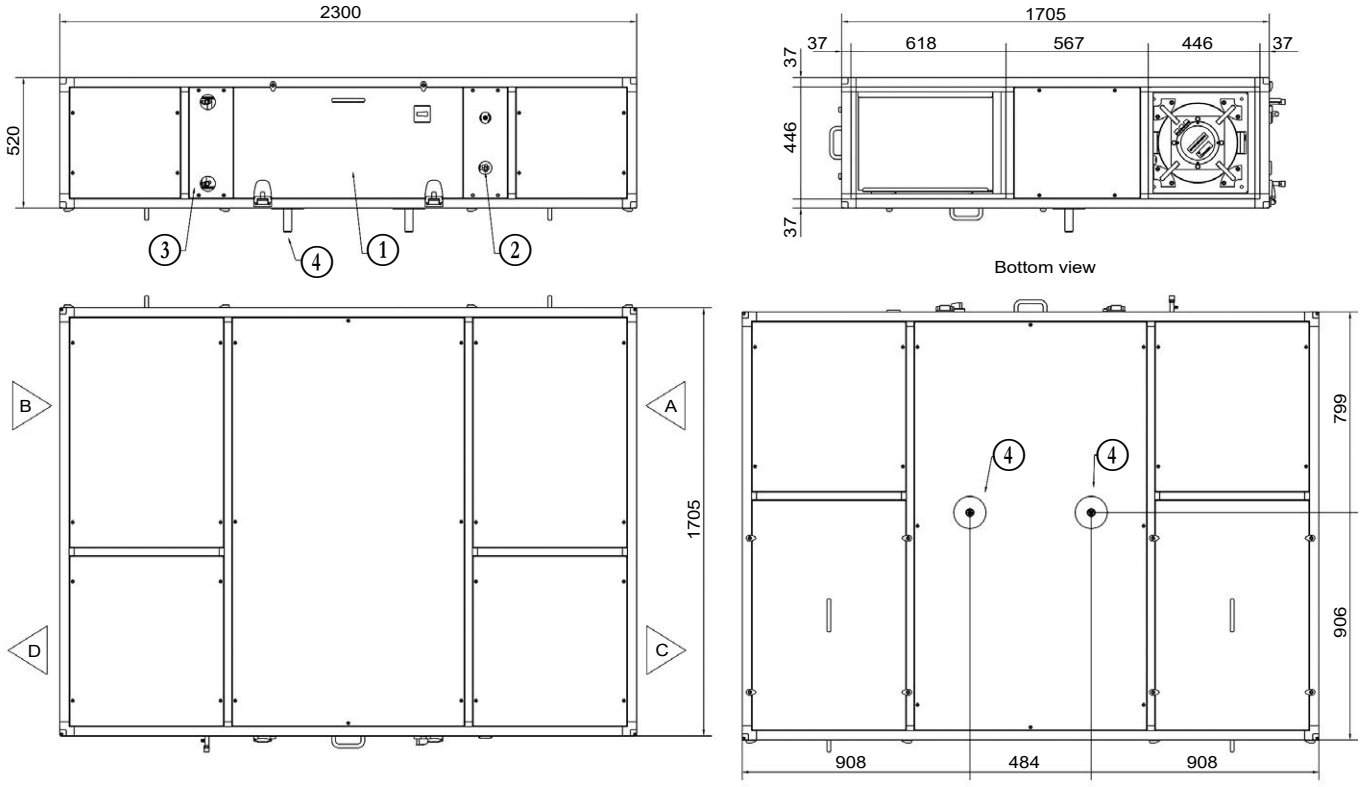
A Fresh air
B Extraction
C Supply Air
D Exhaust Air

① Electric panel
② Electrical connection
③ Coil Connection
④ Drain Hole (1"PP)

DFU 175/220 – Horizontal – Indoor configuration A



DFU 175/220 – Horizontal – Indoor configuration B

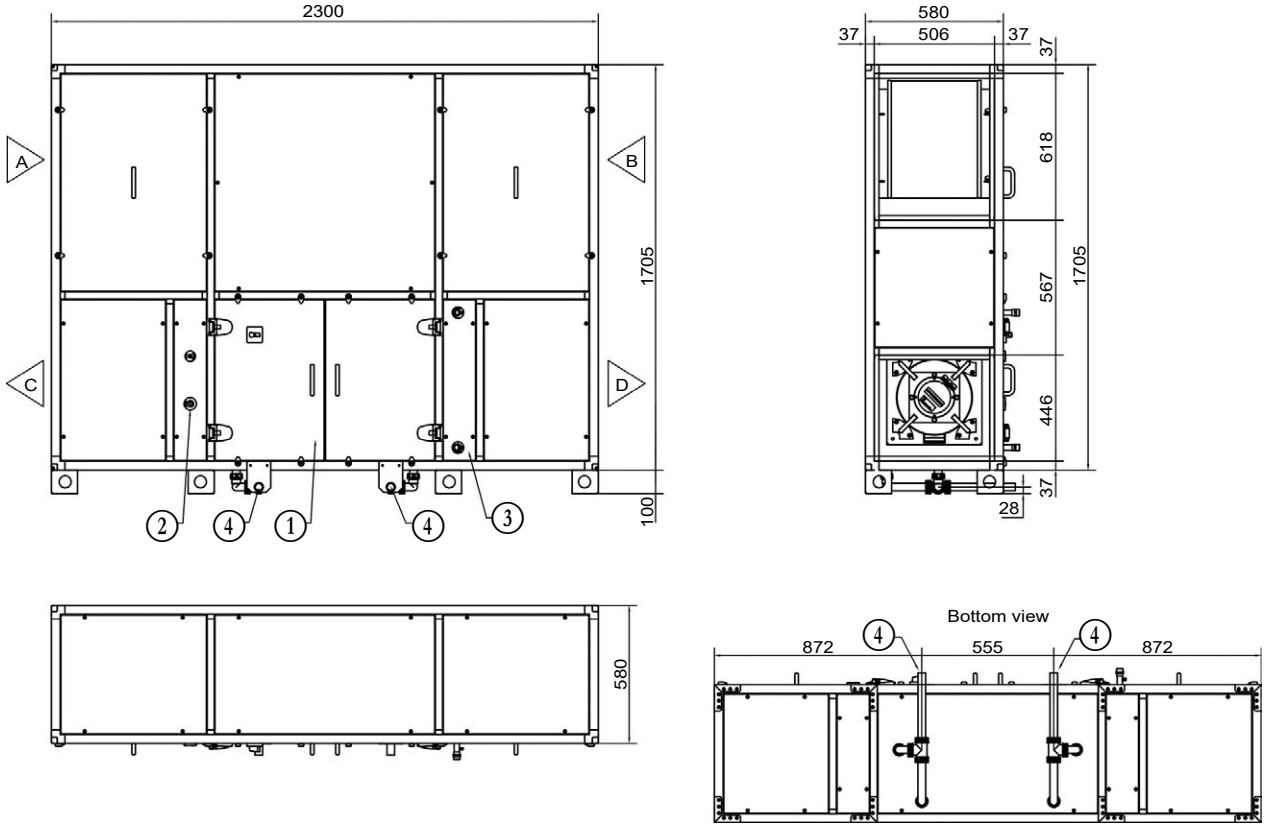


Key

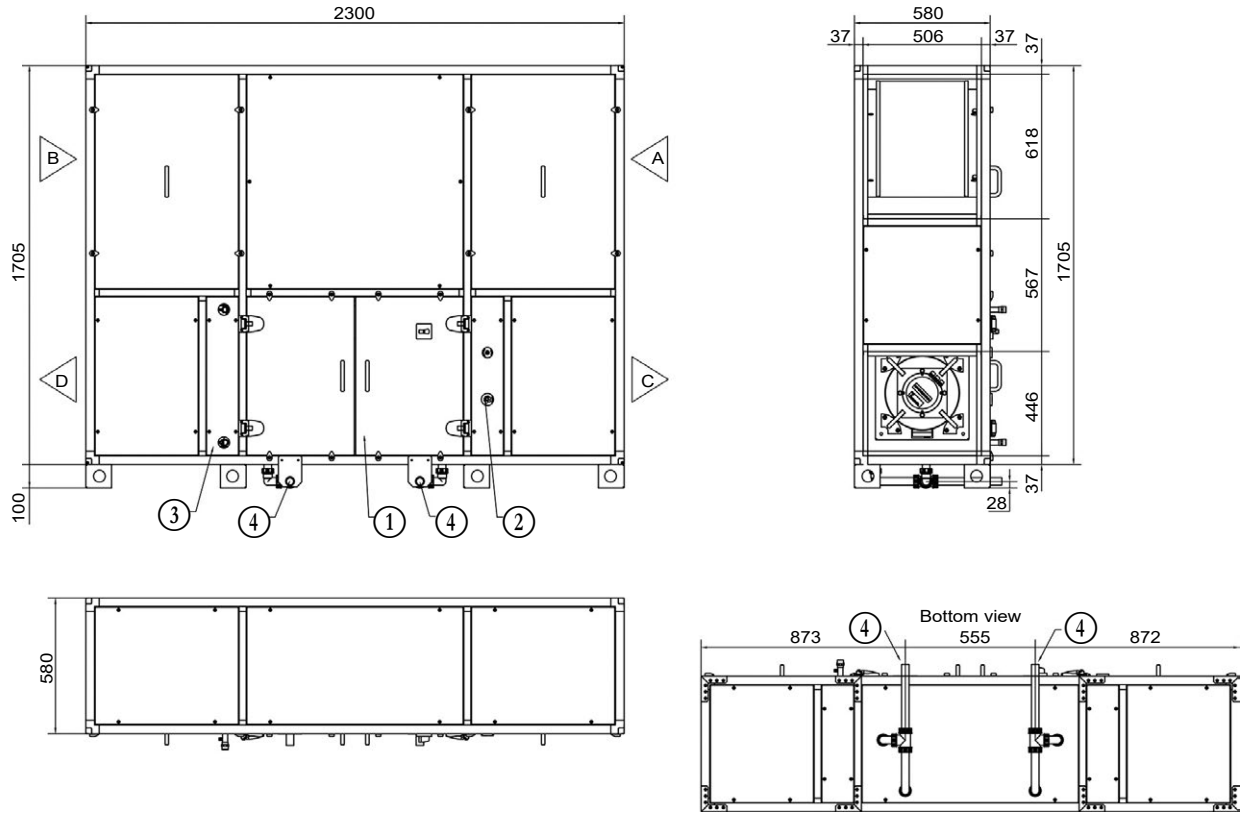
A Fresh air
B Extraction
C Supply Air
D Exhaust Air

① Electric panel
② Electrical connection
③ Coil Connection
④ Drain Hole (1"PP)

DFU 175/220 – Vertical – Configuration A



DFU 175/220 – Vertical – Configuration B

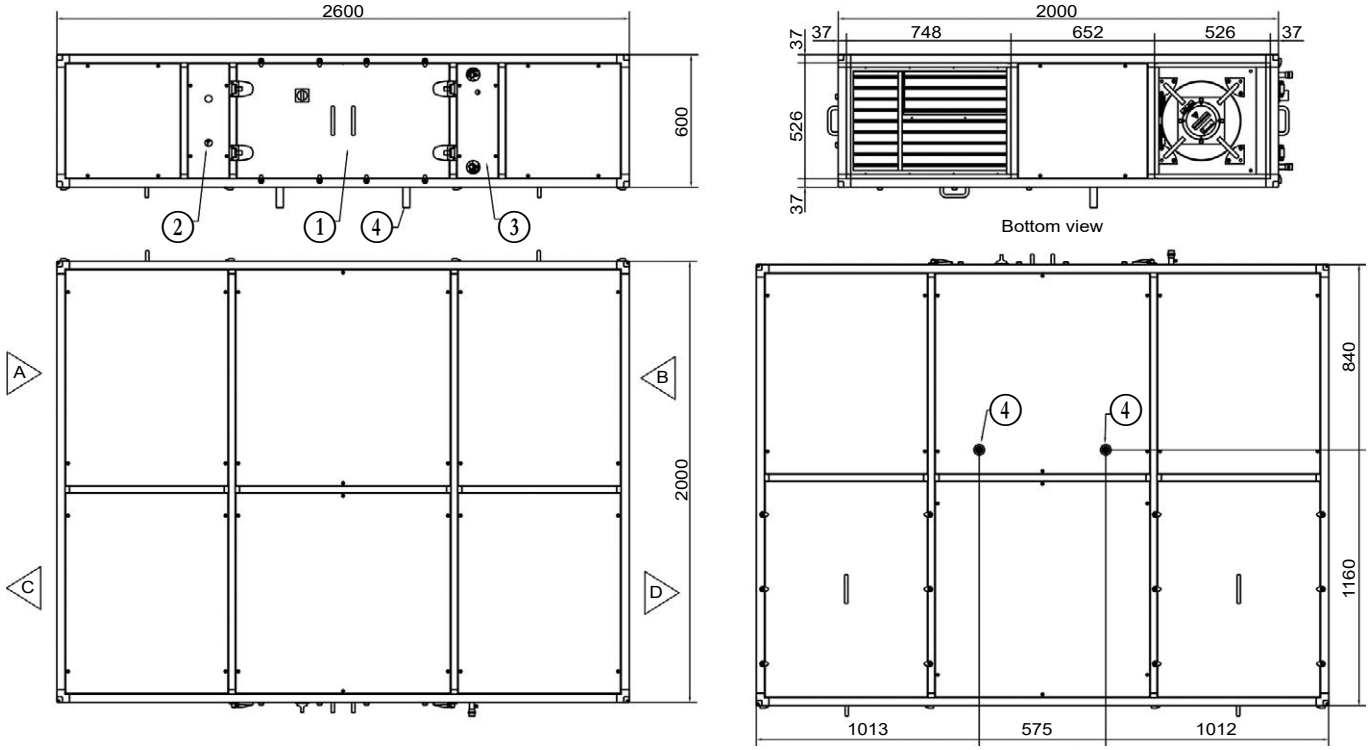


Key

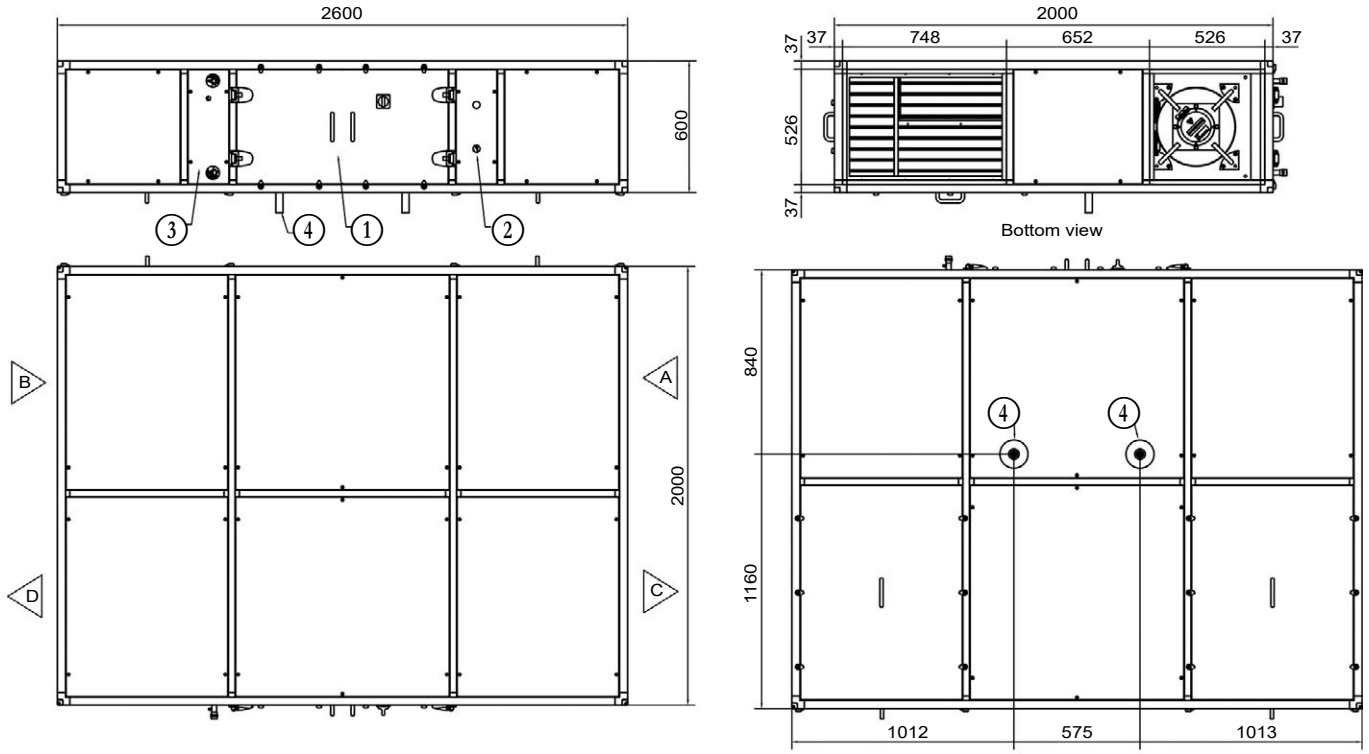
A Fresh air
B Extraction
C Supply Air
D Exhaust Air

(1) Electric panel
(2) Electrical connection
(3) Coil Connection
(4) Drain Hole (1"PP)

DFU 255/320 – Horizontal – Configuration A



DFU 255/320 – Horizontal – Configuration B

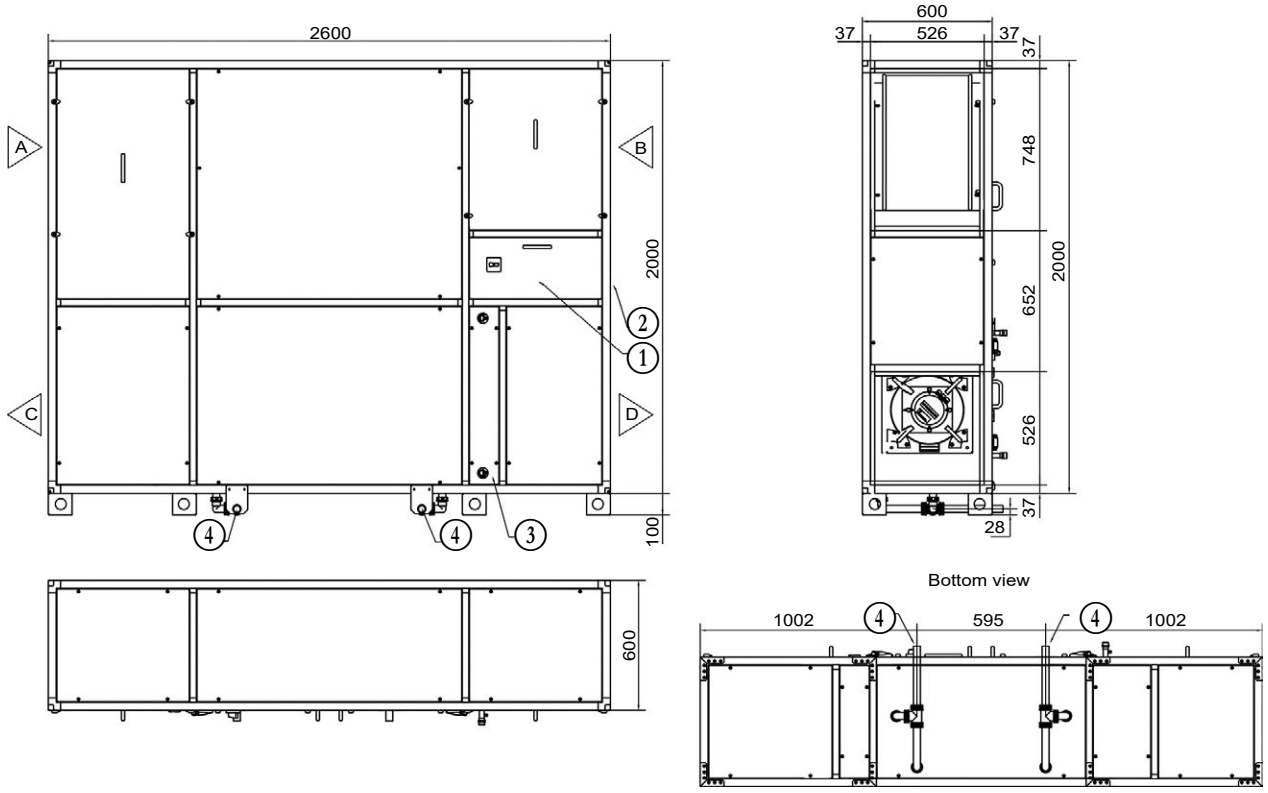


Key

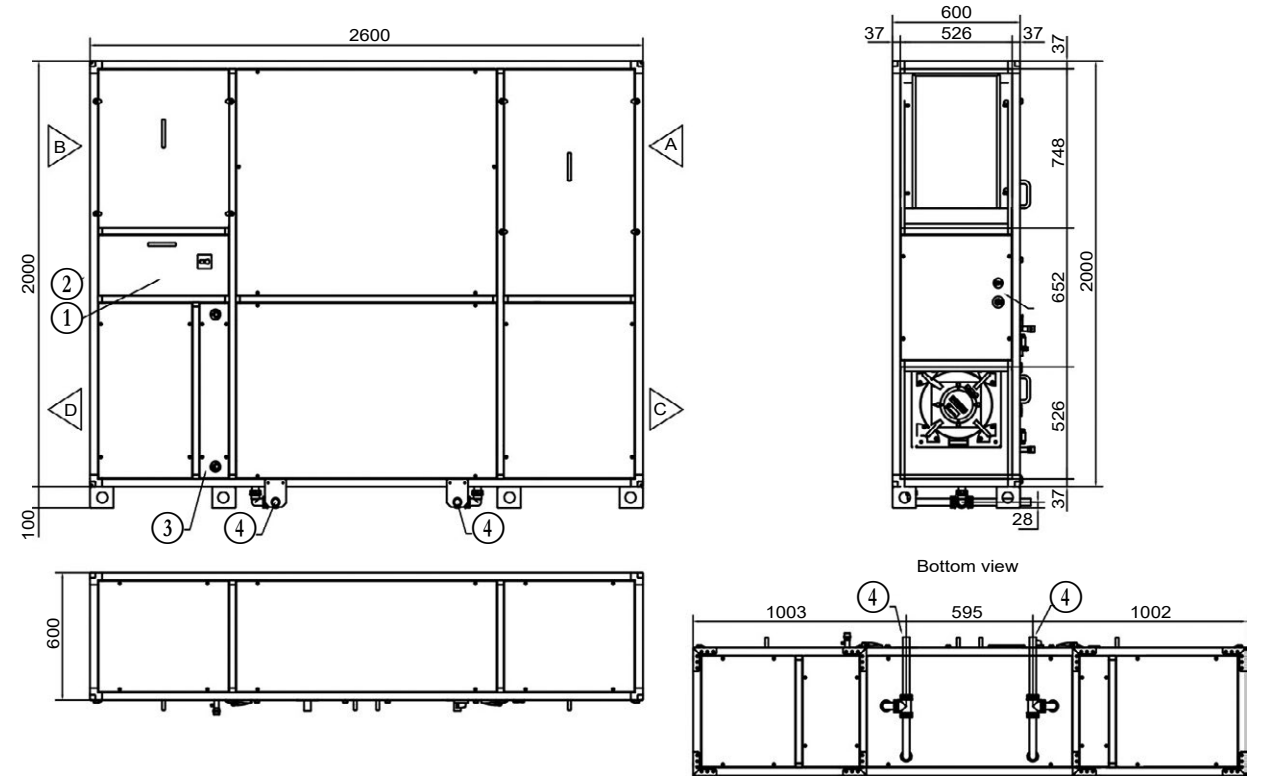
A Fresh air
B Extraction
C Supply Air
D Exhaust Air

(1) Electric panel
(2) Electrical connection
(3) Coil Connection
(4) Drain Hole (1"PP)

DFU 255/320 – Vertical – Configuration A



DFU 255/320 – Vertical – Configuration B



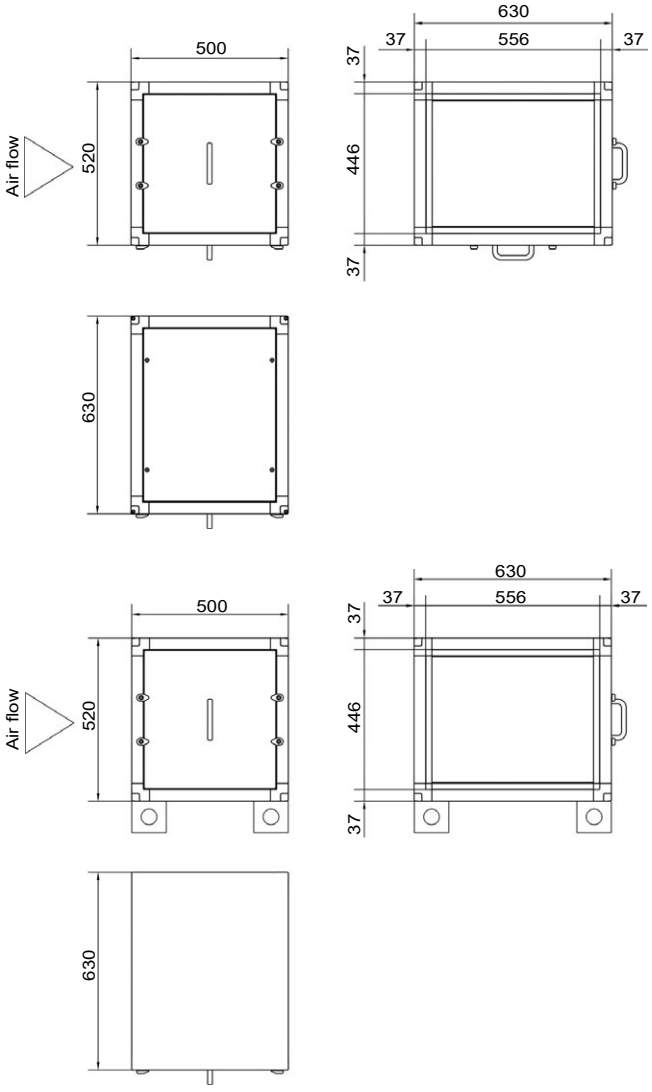
Key

A Fresh air
B Extraction
C Supply Air
D Exhaust Air

(1) Electric panel
(2) Electrical connection
(3) Coil Connection
(4) Drain Hole (1"PP)

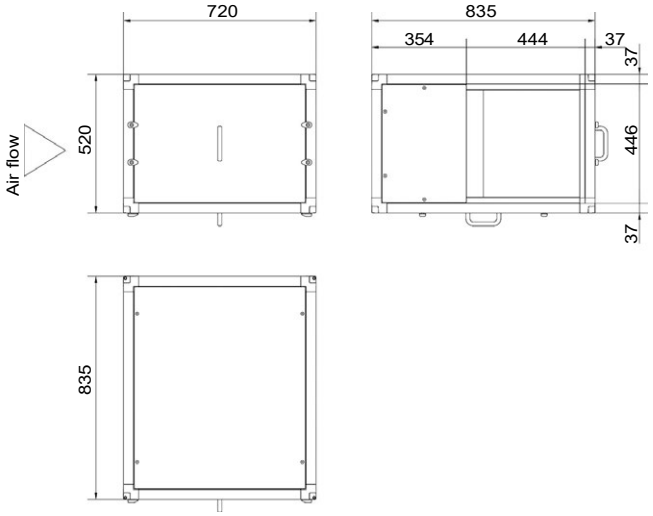
7.13 - Dimentional drawings - Accessories

Size 55/110 - Carbon filters external module

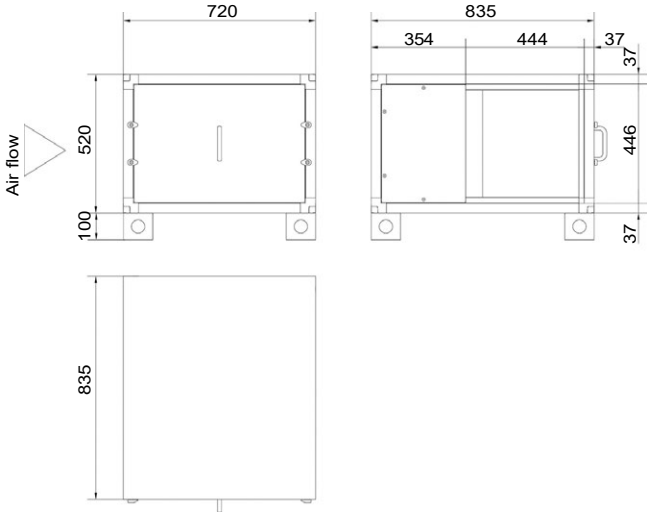


Size 175/220

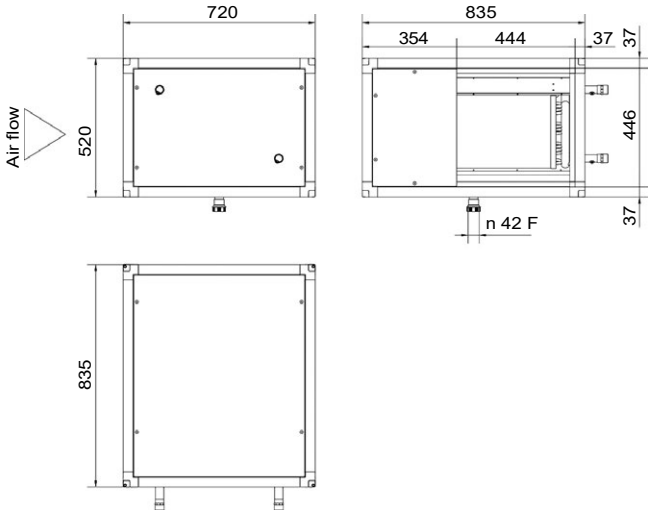
Carbon filter external module - Horizontal indoor version



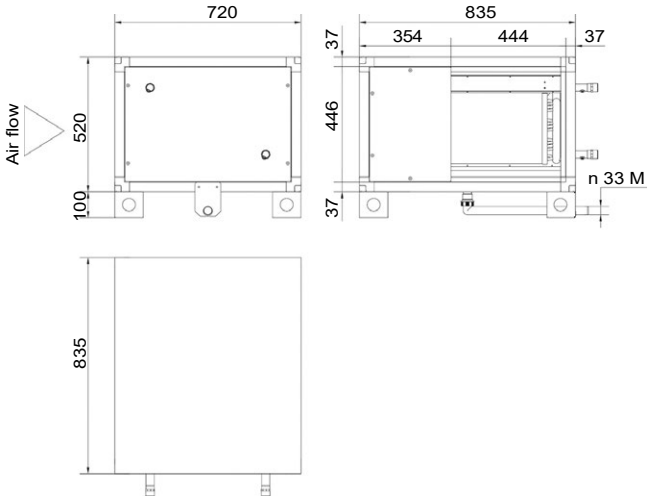
Carbon filter external module - Horizontal outdoor version



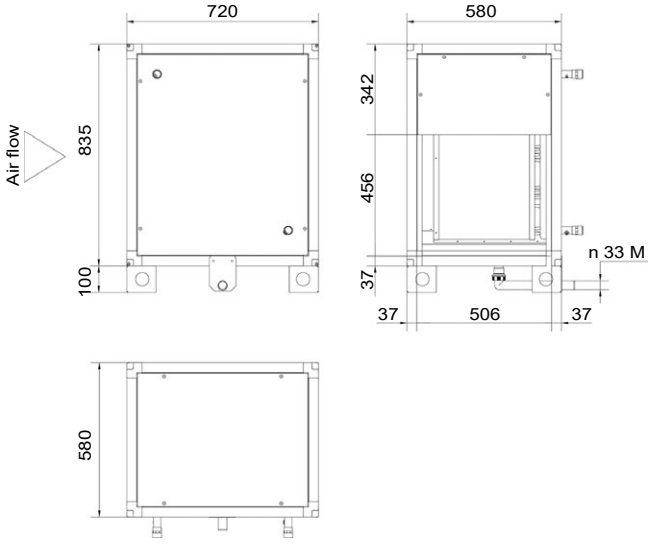
Coil external module - Horizontal indoor version



Coil external module - Horizontal outdoor version

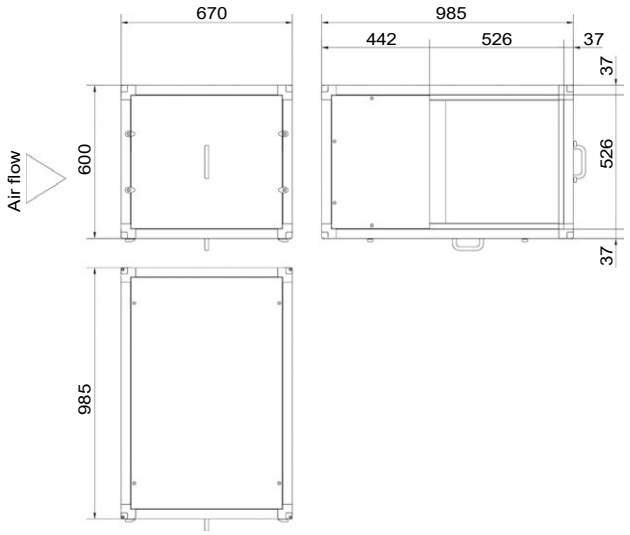


Coil external module - Vertical indoor/outdoor version

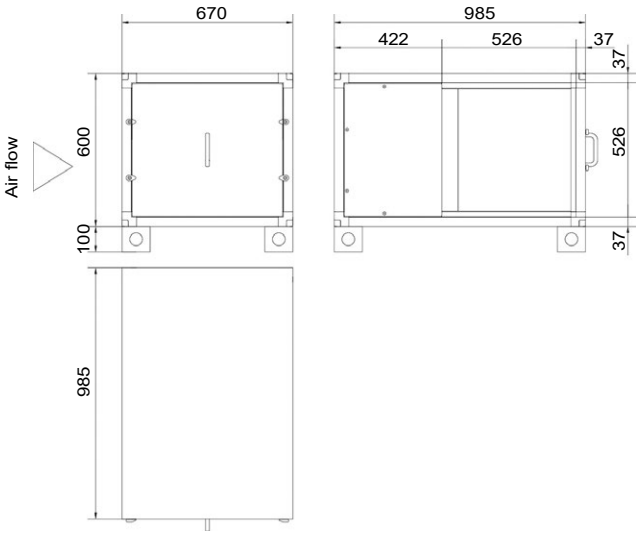


Size 220/320

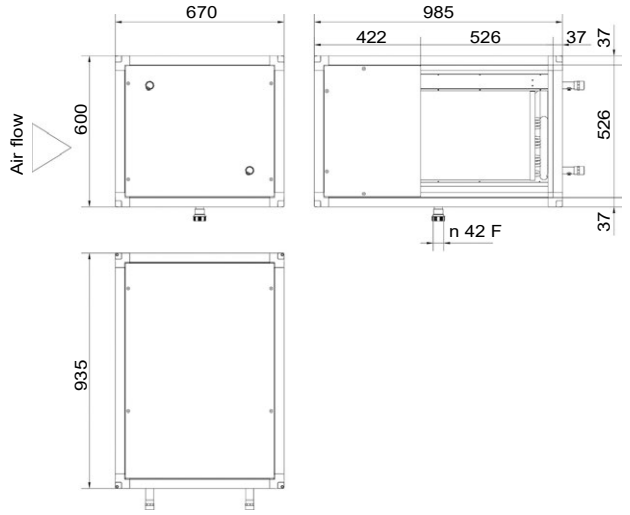
Carbon filter external module - Horizontal indoor version



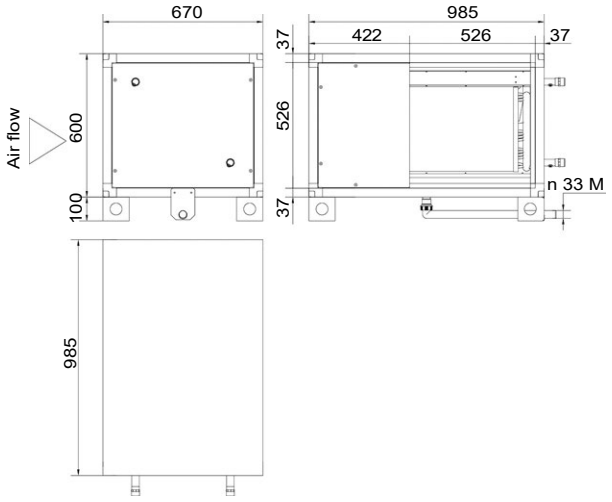
Carbon filter external module - Horizontal outdoor version



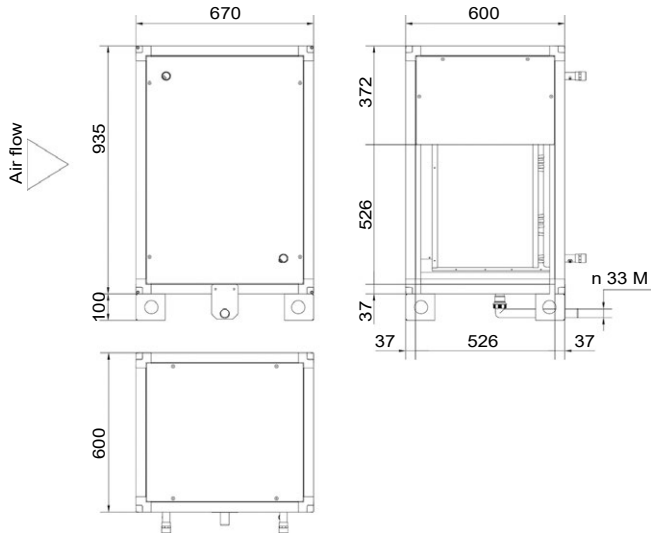
Coil external module - Horizontal indoor version



Coil external module - Horizontal outdoor version



Coil external module - Vertical indoor/outdoor version



8 - GENERAL INFORMATION ABOUT RS485 SERIAL NETWORK

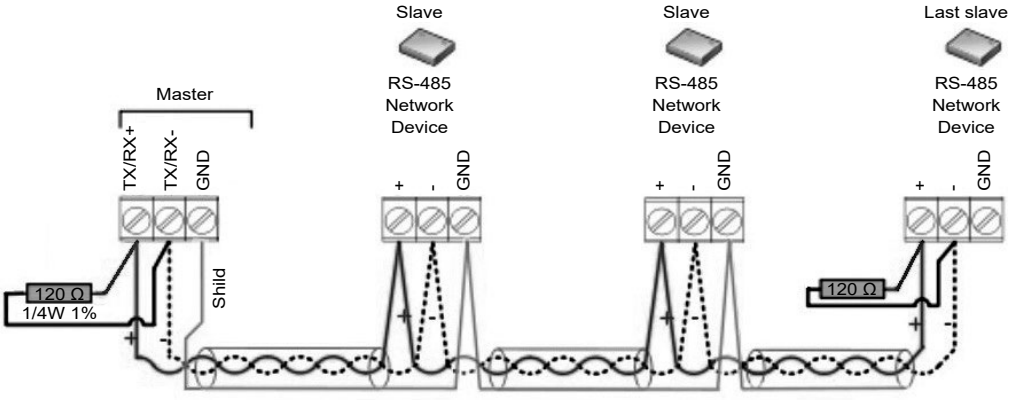
8.1 - Cable selection

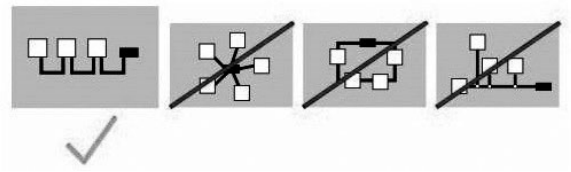
It is recommended a data cable that conforms to EIA RS-485 standard is used, twisted pair and shielded (shielding braid + insulation) with the following characteristics:

- Section AWG24 / AWG 22
- Characteristic impedance of 120 Ω (100 kHz)
- Capacity between the conductors ≤ 50 pF / ft

8.2 - Cabling diagrams

The figure below shows the most used connection diagram.

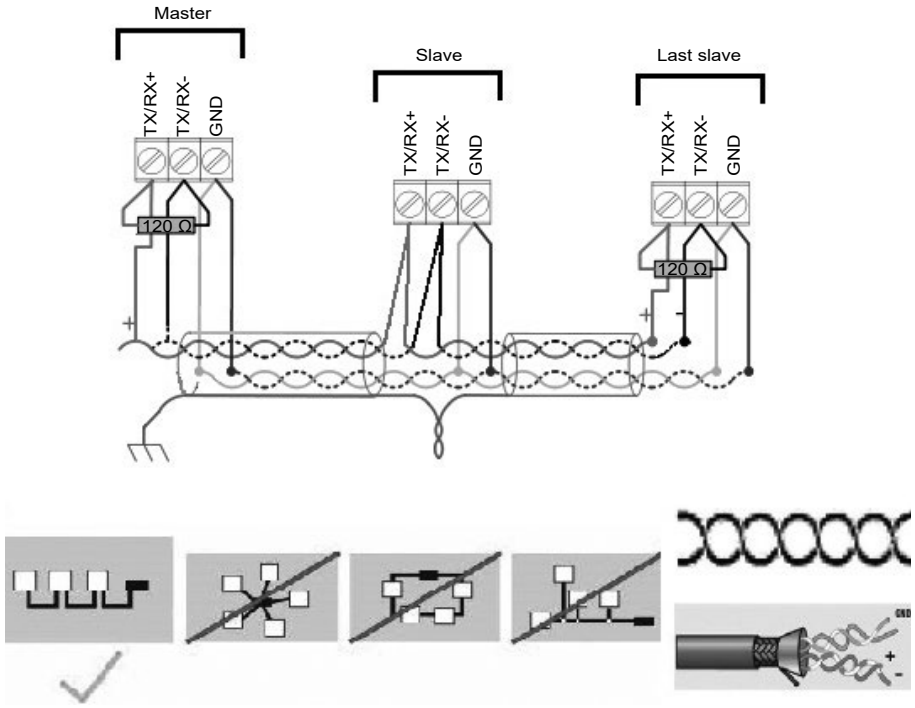




Shield must be used for GND connection between controls and NOT for earth grounding.

If the cable path is parallel to power cables or near electromagnetic noise sources (in particular large motors, switch panels, inverters, neon reactors, all kinds of antennas) the most suitable serial cable for RS-485 network construction is a 24 AWG wire, composed of two twisted pairs wires with TC braid shield, 120 Ω impedance and a capacity between the conductors less than 50 pF/m (see image). One of the two pairs is used to connect RS-485 (+ and -), one of the remaining two (or both) for signal GND connection, while the sock can be used for earth grounding.

The figure below shows the connection made with this kind of wire.



8.3 - Correct wiring rules

- DO NOT use different types of cable to achieve the same network, but always use the same type of cable;
- Network cables must not be wired into channels designed to dangerous voltage cables (eg 230Vac) and those carrying high currents, especially if AC. Must also avoid parallel paths to these power cables;
- Wire the cable as relaxed as possible while avoiding tight bends with turns and wrapping it in unnecessary hanks;
- Do not twist the cable around power conductors and, if it is to cross them, provide an intersection of 90 ° between the cable and such conductors;
- Keep away from electromagnetic field sources, in particular large motors, switch panels, inverters, neon reactors, all kinds of antennas;
- It is not necessary to insert the cable in wireway but it is good to avoid all sources of wear or mechanical damage;
- Avoid the cable voltage range exceeds 110 N (11.3 kg) to prevent ironing;
- Prior assessment of the route to shorten it as much as possible and take note of the instruments addresses connected, with particular reference to its location in the ordered sequence;
- Do not reverse the polarity “+” and “-” of terminal connection;
- Avoid short lengths of cable in connection terminations to instruments to allow maintenance without any rip or draft of the cable itself;
- Identify beginning and ending terminations to avoid “open” pieces;
- 100-120Ω ending resistances should be placed only at the ends of the network and not on each device.
- Maximum BUS length (before installing signal repeater/ amplifier) depends on several factors such as communication speed, input impedance, number of controls linked to bus, cable electric features, installation interferences ; therefore cross-referring specific literature for a correct assessment. In the most part of industrial data networks, controls number, type and connection speed tipically used (assuming employing appropriate cable and no interference) allows BUS to reach trouble-free 1 km length.

The quality management system of this product's assembly site has been certified in accordance with the requirements of the ISO 9001 standard (latest current version) after an assessment conducted by an authorized independent third party.
Please contact your sales representative for more information.

Carrier, Rte de Thil - 01120 Montluel, France.
Manufacturer reserves the right to change any product specifications without notice.

Printed in the European Union.