

Renovent Excellent 300/400 (Plus)



INSTALLATION INSTRUCTIONS (English)

*Air for Life*

**BRINK**

*Air for life*



## Renovent Excellent 300/400 (Plus)



STORE NEAR THE APPLIANCE

This appliance may be used by children as of 8 years of age, persons with reduced physical or mental capacities, and persons with limited knowledge and experience if they are supervised or have received instructions on how to use the appliance safely and are aware of the possible dangers.

Children younger than 3 years of age must be kept away from the appliance, unless they are under constant supervision.

Children between the ages of 3 and 8 may only switch the appliance on or off, but only if supervised or if they have received clear instructions on the safe use of the appliance and understand the possible dangers, on the condition that the appliance has been placed and installed in the normal position for use. Children between the ages of 3 and 8 may not insert the plug into the socket, nor clean or make changes to the settings of the appliance, nor carry out any maintenance on the appliance that would normally be carried out by the user. Children may not play with the appliance.

**If you need a new power cable, always order the replacement from Brink Climate Systems B.V. To prevent dangerous situations, a damaged mains connection must only be replaced by a qualified expert!**

Country: GB



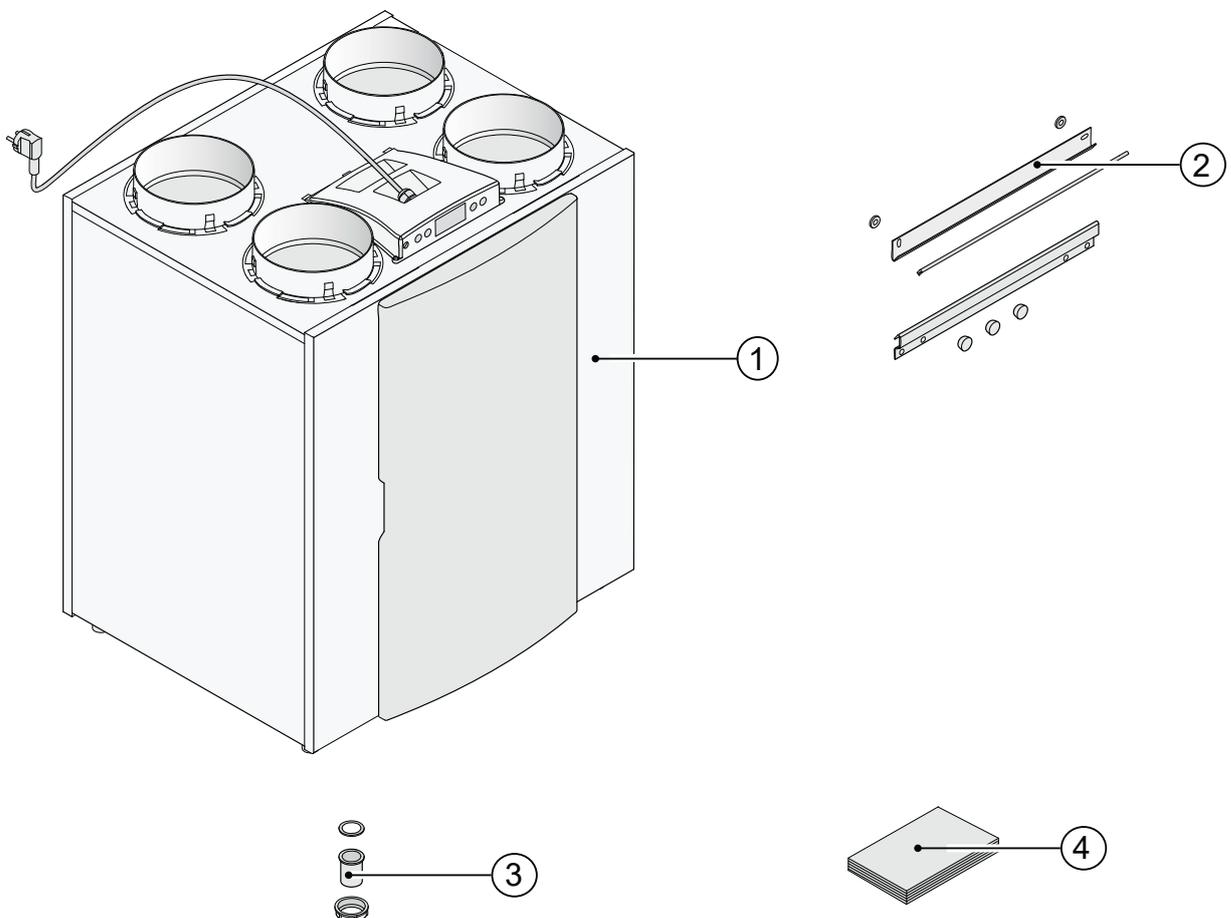
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## 1.1 Scope of delivery

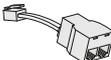
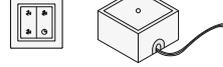
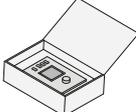
Before starting installation of the heat recovery unit, check that it has been supplied complete and undamaged.

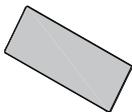
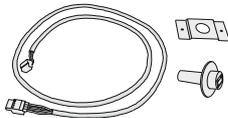
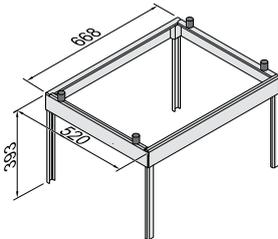
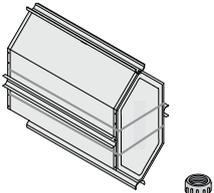
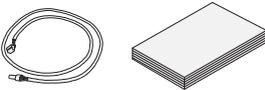
The scope of delivery of the heat recovery unit Renovent Excellent includes the following components:

- ① Heat recovery appliance type Renovent Excellent
- ② Wall mounting bracket kit containing:
  - 2 x suspension strips
  - 3x protective caps
  - 1 x rubber strip
  - 2 x rubber rings
  - 1 x mounting instructions
- ③ PVC condensate discharge connection containing:
  - 1 x synthetic screw gland 1.5"
  - 1 x sealing ring
  - 1 x PVC glued coupling 32 mm
- ④ Documentation set consisting:
  - 1 x installation instructions
  - 1 x occupants instructions



## 1.2 Accessories Renovent Excellent

Article description		Article code
Splitter RJ12		510472
CO <sub>2</sub> sensor eBus surface-mounted (only for Plus version)		532126
Transmitter wireless remote control 2 positions (with. battery)		532170
Transmitter wireless remote control 4 positions (with. battery)		532171
Receiver wireless remote control (for battery version)		532172
Kit wireless remote control 2 positions (1 transmitter & 1 receiver)		532173
Kit wireless remote control 4 positions (1 transmitter & 1 receiver)		532174
3-way switch white flush-mounted (without filter indication) Delivered with insert plate and cover frame		540214
4-way switch with filter indication; flush mounted; modular connection. Delivered with insert plate and cover frame		540262
Control unit		510498
Electric postheater Excellent 300 Ø 160mm Electric postheater Excellent 400 Ø 180mm		310630 310650
Electric (extra) preheater Excellent 300 Ø 160mm Electric (extra) preheater Excellent 400 Ø 180mm		310640 310660

Article description		Article code
Filter kit 1 x ISO ePM 1 50% (F7) filter (1 pcs)		531771
Filter kit 1x ISO Coarse 45% (G3) & 1x ISO ePM 1 50% (F7) (1 pcs/ 1 pcs)		531773
RH-sensor		310657
Mounting support Excellent 300/400		217035
Enthalpie heat exchanger		532059
Servicetool		531961



The Brink Renovent Excellent is a ventilation unit with heat recovery with an high efficiency, a maximum ventilation capacity of 300 or 400 m<sup>3</sup>/h and low-energy fans. Features Renovent Excellent:

- steplessly adjustable air flow rates through a control panel;
- filter indication on the appliance and the possibility for filter indication on the multiple switch;
- a completely new intelligent frost protection system which ensures that also at low outdoor temperatures the appliance's performance remains optimal and that, if necessary, it activates the standard preheater.
- low sound level
- comes as standard with automatic bypass valve
- constant flow control
- low energy consumption
- high efficiency

Renovent Excellent 300/400 is available in two types:

- **Renovent Excellent”**
- **Renovent Excellent Plus”**

Compared to the Renovent Excellent, the Renovent Excellent Plus has a more extensive control board which increases the connection options.

These installation instruction describe both the standard Renovent Excellent and the Renovent Excellent Plus.

The Renovent Excellent (Plus) is available in the left-handed or right-handed version. A left-handed version has the filters on the left behind the filter door; a right-handed version has the filters on the right behind the filtered door. The position of the air ducts differs for these two versions! For the correct position of the connection ducts and dimensions see §3.2.1 or §3.2.2. respectively.

When ordering an appliance always state the correct type; subsequent conversion to a different version is not possible.

The Renovent Excellent comes ready to plug in with a 230 V mains plug and a connection for a low-voltage multiple switch on the outside of the appliance.

**Note:** When replacing a Renovent Large by a Renovent Excellent, do realise that the positions of the ducts “From dwelling” and “From atmosphere” are different! (only for type 4/0 & 3/1) Carefully check the position of these ducts on the basis of the connection drawings §3.2.1 and §3.2.2.

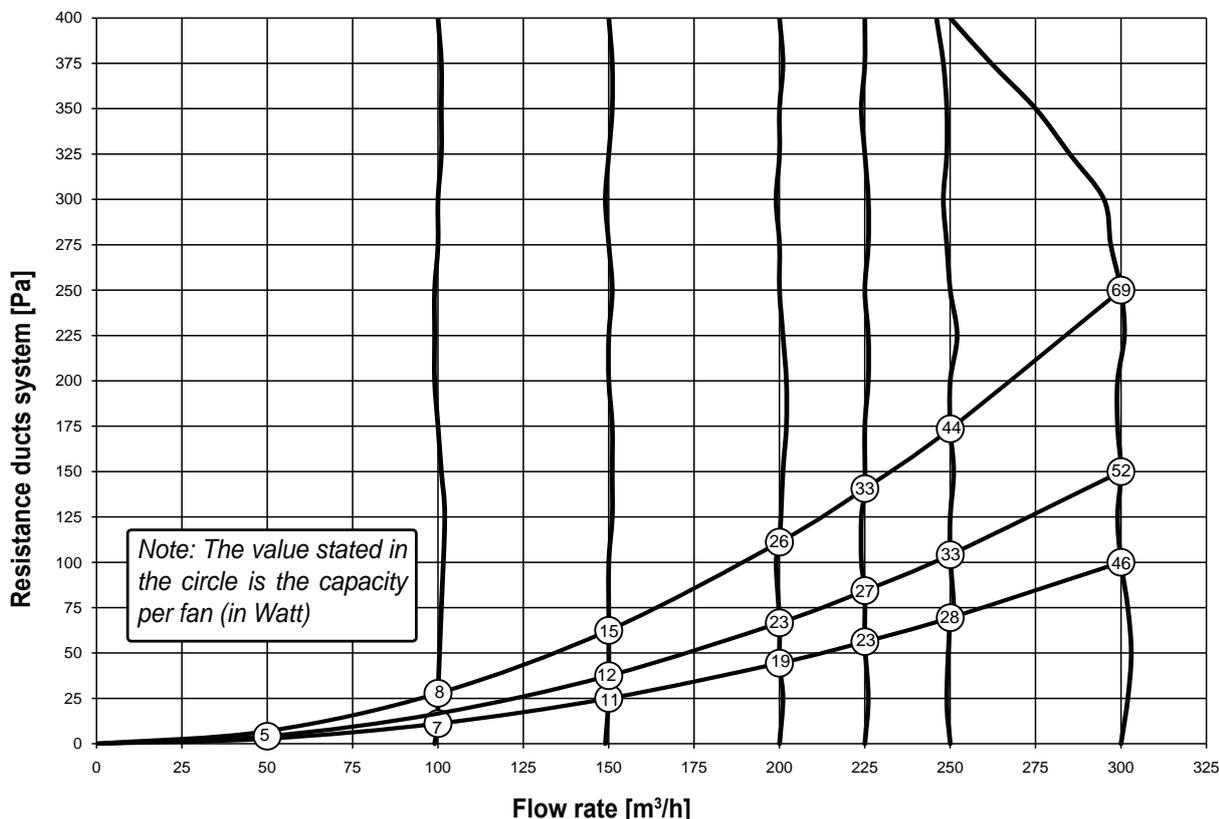
Version types Renovent Excellent 300/400				
Type	Version L of R	Position air ducts	Power supply	Type code
Renovent Excellent	Left-handed version	4 top connections	Power plug	4/0 L
		2 top connections & 2 bottom connections	Power plug	2/2 L
		3 top connections & 1 bottom connection	Power plug	3/1 L
	Right-hand version	4 top connections	Power plug	4/0 R
		2 top connections & 2 bottom connections	Power plug	2/2 R
		3 top connections & 1 bottom connection	Power plug	3/1 R
Renovent Excellent Plus	Left-handed version	4 top connections	Power plug	4/0 L+
		2 top connections & 2 bottom connections	Power plug	2/2 L+
		3 top connections & 1 bottom connection	Power plug	3/1 L+
	Right-hand version	4 top connections	Power plug	4/0 R+
		2 top connections & 2 bottom connections	Power plug	2/2 R+
		3 top connections & 1 bottom connection	Power plug	3/1 R+

3.1 Technical information

Renovent Excellent 300				
Supply voltage [V/Hz]	230/50			
Protection degree	IP20			
Dimensions (w x h x d) [mm]	677 x 765 x 564			
Duct diameter [mm]	Ø160			
External diameter condensate discharge [mm]	Ø32			
Weight [kg]	38			
Filter class	ISO Coarse 45% (G3) {ISO ePM 1 50% (F7) optional for supply}			
Fan setting (factory setting)		1	2	3
Ventilation capacity [m³/h]	50	100	150	225
Permissible resistance ducts system [Pa]	3 - 7	11 - 28	26 - 66	56 - 142
Rated power (excl. preheater)[W]	9,0 - 9,2	13,7 - 15,2	22,0 - 29,2	46,8 - 66,2
Rated current (excl. preheater)[AA]	0,104 - 0,107	0,150 - 0,161	0,214 - 0,274	0,403 - 0,578
Max. rated current (with preheater switched on) [A]	6			
Cos φ	0,368 - 0,374	0,391 - 0,416	0,447 - 0,463	0,505

Sound power Excellent 300									
Ventilation capacity [m³/h]		90		150		210		300	
Sound power level Lw (A)	Static pressure [Pa]	50	100	50	100	50	100	50	100
	Housing emission [dB(A)]	30	33	38	38	44	46	50	52
	Duct "from dwelling" [dB(A)]	33	34	39	42	45	46	54	54
	Duct "to dwelling" [dB(A)]	44	47	52	55	60	60	67	67

In practice, the value may deviate 1 dB(A) as a result of measuring tolerances

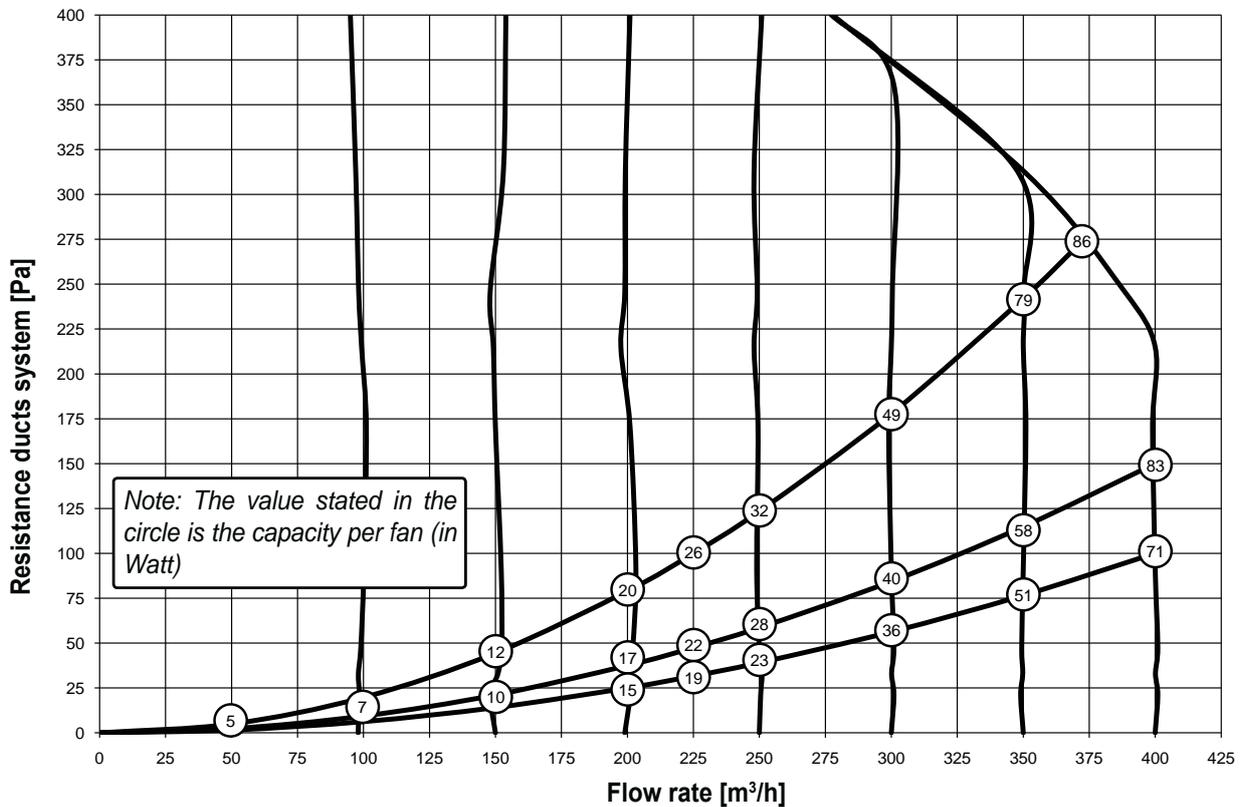


Fan graph Renovent Excellent 300

Renovent Excellent 400				
Supply voltage [V/Hz]	230/50			
Protection degree	IP20			
Dimensions (w x h x d) [mm]	677 x 765 x 564			
Duct diameter [mm]	Ø180			
External diameter condensate discharge [mm]	Ø32			
Weight [kg]	38			
Filter class	ISO Coarse 45% (G3) {ISO ePM 1 50% (F7) optional for supply}			
Fan setting (factory setting))		1	2	3
Ventilation capacity [m³/h]	50	100	200	300
Permissible resistance ducts system [Pa]	3 - 6	6 - 20	25 - 79	56 - 178
Rated power (excl. preheater)[W]	8,6	9,5 - 15	29 - 40	72 - 98
Rated current (excl. preheater)[A]	0,10	0,12 - 0,14	0,24 - 0,31	0,51 - 0,7
Max. rated current (with preheater switched on) [A]	6			
Cos φ	0,38	0,45 - 0,40	0,56 - 0,58	0,60 - 0,61

Sound power Excellent 400												
Ventilation capacity [m³/h]		100		200		225		300		400		
Sound power level Lw (A)	Static pressure [Pa]	9	40	38	80	47	100	84	175	240	150	225
	Housing emission [dB(A)]	29.5	32.5	40.5	40.5	43.5	47.5	51.0	53.0	54.0	54.5	57.0
	Duct "from dwelling" [dB(A)]	31.5	34.5	46.5	48.0	48.5	50.0	56.5	57.0	58.0	59.0	60.0
	Duct "to dwelling" [dB(A)]	42.5	47.5	57.0	59.0	60.5	62.5	66.0	68.5	69.5	70.5	71.5

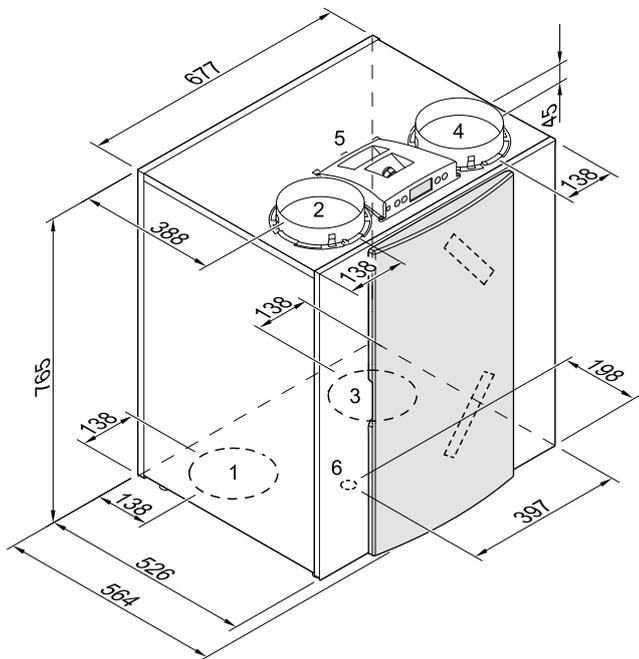
In practice, the value may deviate 1 dB(A) as a result of measuring tolerances



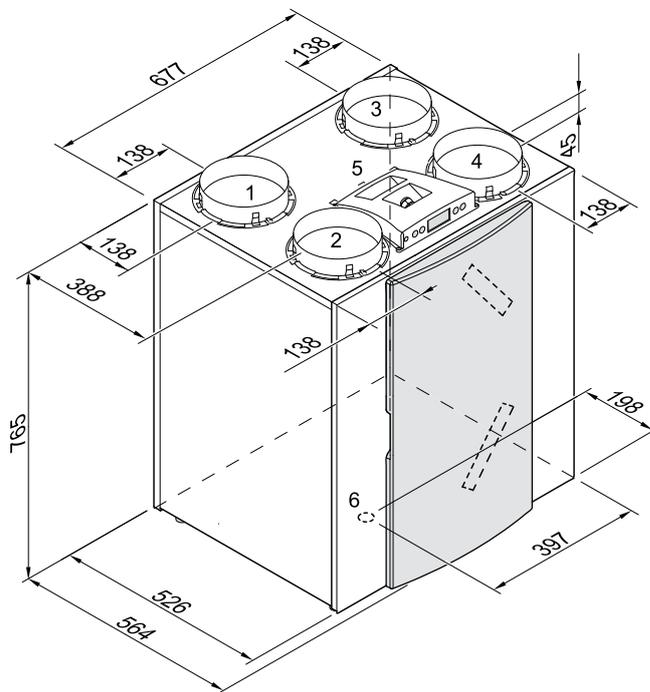
Fan graph Renovent Excellent 400

3.2 Connections and dimensions Renovent Excellent 300/400

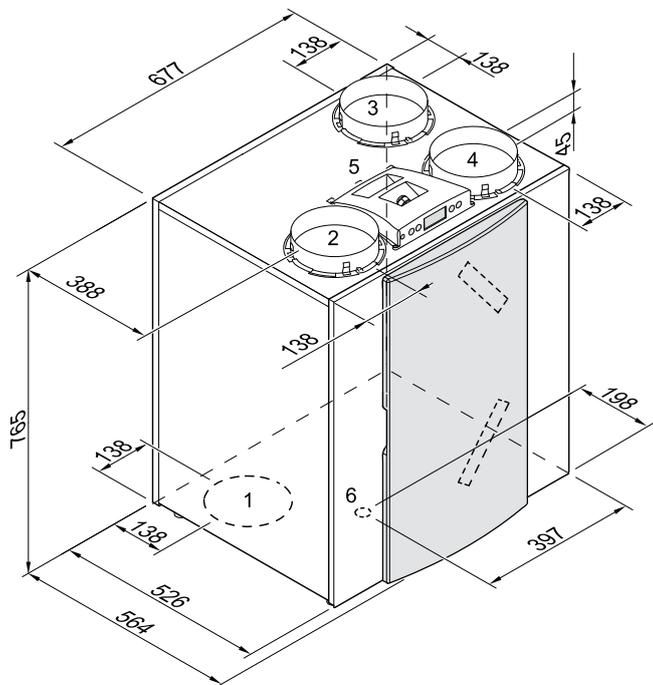
3.2.1 Renovent Excellent right-handed version



Renovent Excellent Right-handed 2/2



Renovent Excellent Right-handed 4/0

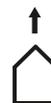


Renovent Excellent Right-handed 3/1

1 = To dwelling



2 = To atmosphere



3 = From dwelling



4 = From atmosphere

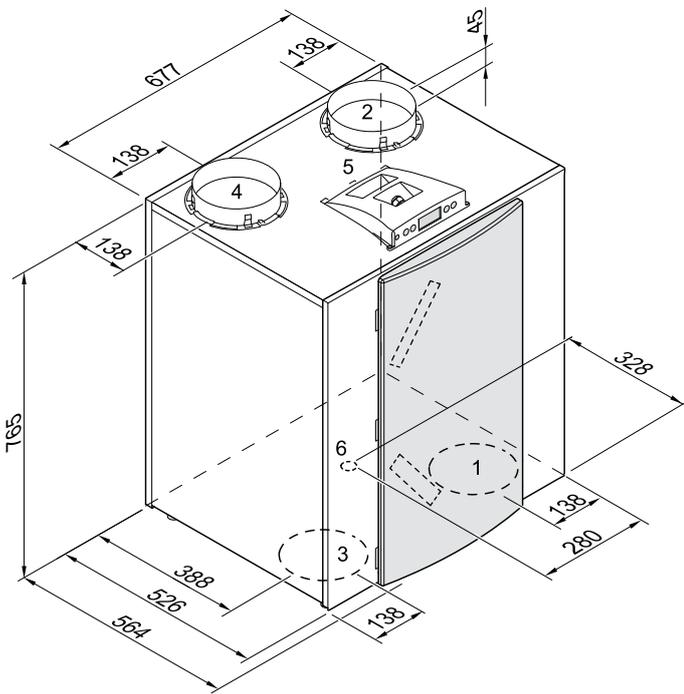


5 = Electric connections

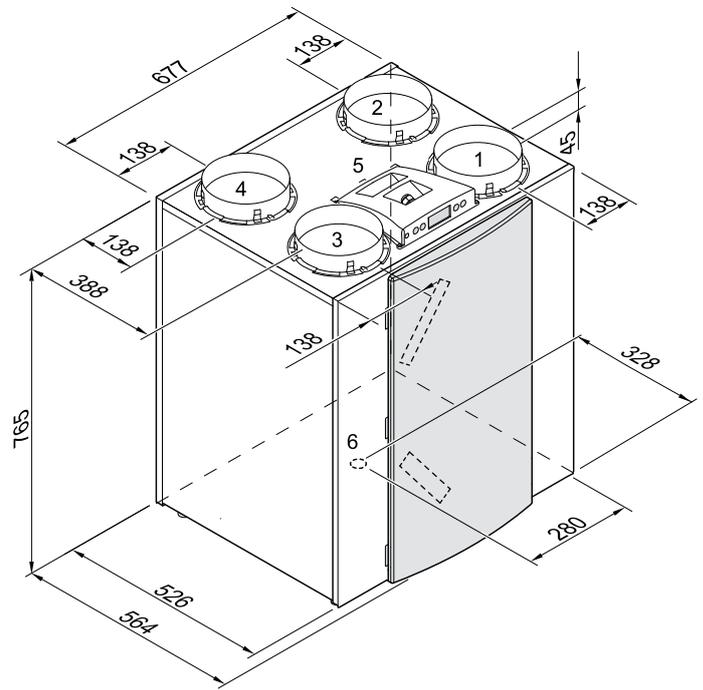
6 = Connection condensate discharge

7 = Wall mounting bracket (note the correct position of the rubber strip, washers and caps)

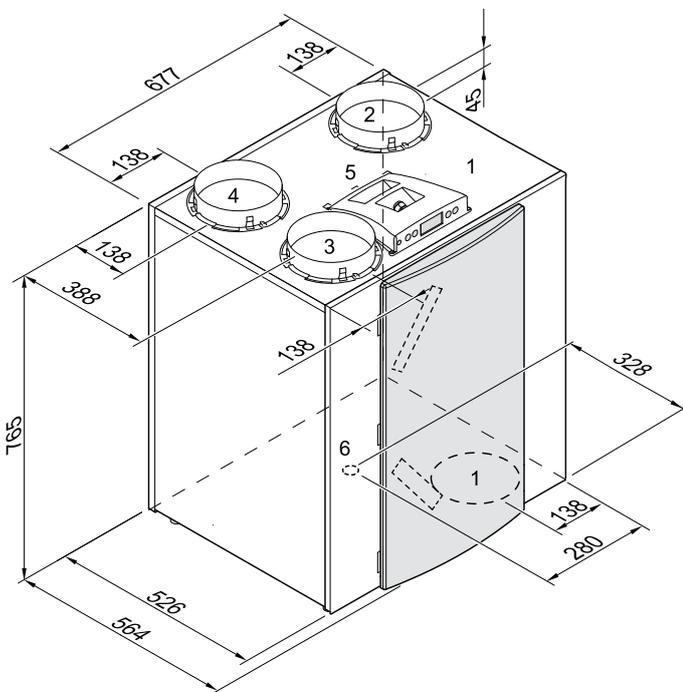
3.2.2 Renovent Excellent left-handed version



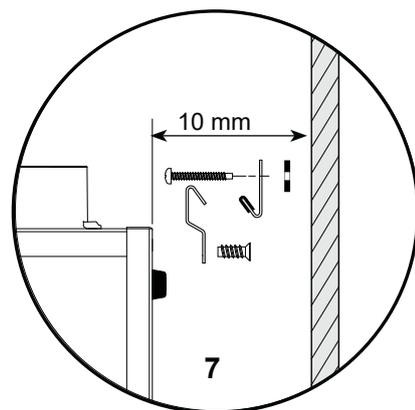
Renovent Excellent left-handed 2/2



Renovent Excellent left-handed 4/0

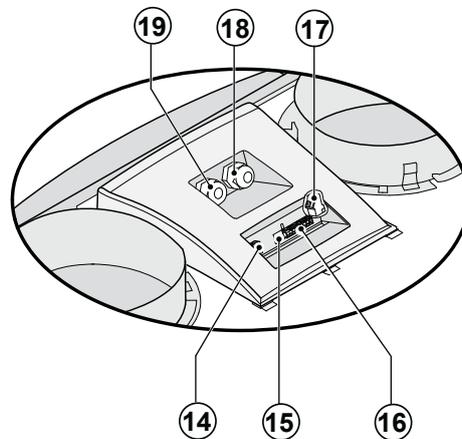
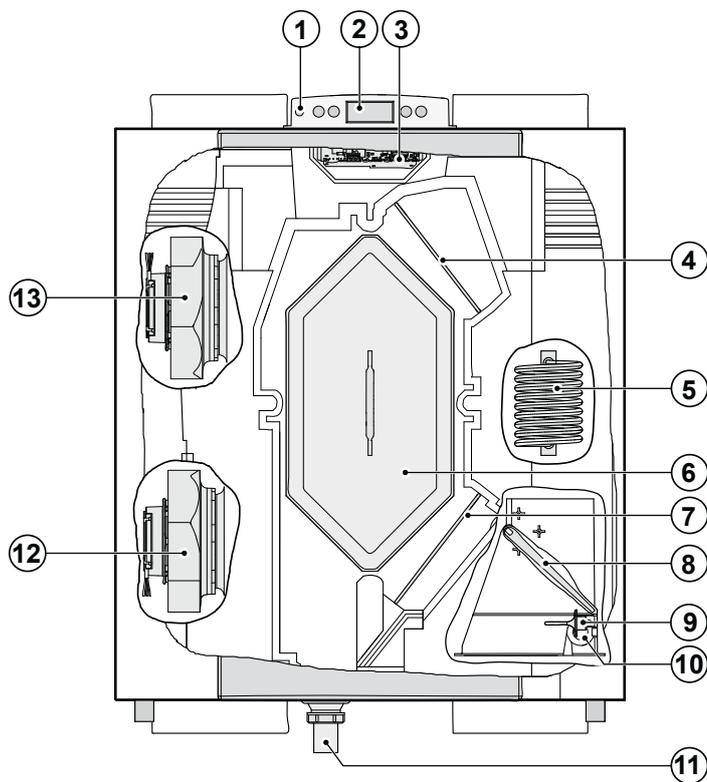


Renovent Excellent left-handed 3/1



Mounting wall suspension kit

3.3 Exploded view appliance



Rear view display cover  
(Plus version)

1	Service connector	Computer connection for service purposes.
2	Display and 4 control buttons	Interface between user and control electronics.
3	Control board	Contains the control electronics for the basic functions.
4	Extract air filter	Filters air flow from dwelling
5	Preheater	Heats up the outdoor air when there is a risk of freezing for the heat exchanger
6	Heat exchanger	Ensures heat transfer between input and output air
7	Supply air filter	Filters outdoor air supplied to the dwelling
8	Bypass valve	Sends the air through or around the heat exchanger (For the 3/1 and 4/0 this valve is in the upper part of the appliance)
9	Outdoor temperature sensor	Measures outside air temperature.
10	Indoor temperature sensor	Measures the dwelling air temperature
11	Condensate discharge	Connection condensate discharge (Kit comes separately with the appliance)
12	Extract fan	Discharges air from the dwelling to the atmosphere.
13	Supply fan	Feeds fresh air into the dwelling.
14	Modular connector multiple switch X2	Connections for cable to multiple switch, if desired with filter indicator.
15	Connector eBus X1	Connection for eBus control
16	Connector X15	Contains the various control inputs and outputs; only for Plus version
17	Connector X14	Connection postheater; only for Plus version (accessible after taking off the display cover)
18	Mains cable 230 V	Gland power cable 230 volt
19	Connection to postheater	Gland 230 V cable to postheater or extra preheater; only for Plus version

#### 4.1 Description

The appliance comes plug and play and operates fully automatically. The extracted indoor air heats up the fresh, clean outdoor air. That saves energy and fresh air is sent to the required rooms.

The control system has three ventilation modes. The air flow rate can be adjusted per ventilation mode. The constant volume control system ensures that the air flow rate of the supply and extract fans is realised independent of the duct pressure.

#### 4.2 Bypass conditions

The standard bypass valve makes it possible to supply fresh outside air that is not heated by the heat exchanger. Particularly during summer nights it is desirable to supply cooler outside air. Then the hot air in the dwelling is replaced by cooler outside air in so far as possible.

The bypass valve opens and closes automatically when a number of conditions are satisfied (refer to the table below for bypass conditions).

The operation of the bypass valve can be adjusted in step number 5, 6 and step number 7 in the settings menu (see chapter 13).

Bypass valve conditions	
<b>Bypass valve open</b>	<ul style="list-style-type: none"> <li>- The outdoor temperature is higher than 7°C <b>and</b></li> <li>- the outdoor temperature is lower than the indoor temperature in the dwelling <b>and</b></li> <li>- the temperature in the dwelling is higher than the temperature set at step no. 5 in the settings menu (set standard at 24°C).</li> </ul>
<b>Bypass valve closed</b>	<ul style="list-style-type: none"> <li>- The outdoor temperature is lower than 7°C <b>or</b></li> <li>- the outdoor temperature is higher than the indoor temperature in the dwelling <b>or</b></li> <li>- the temperature outside the dwelling is lower than the temperature set at step no. 5 in the settings menu minus the set temperature on the hysteresis (step no 6), this temperature is standard set at 22 °C (24.0 °C minus 2.0 °C).</li> </ul>

#### 4.3 Frost protection

To prevent freezing of the heat exchanger at extremely low outdoor temperatures, the Renovent Excellent features intelligent frost control. Temperature sensors measure the temperatures

across the heat exchanger and, if necessary, the preheater is switched on. That guarantees a proper ventilation balance, also at very low outdoor temperatures.

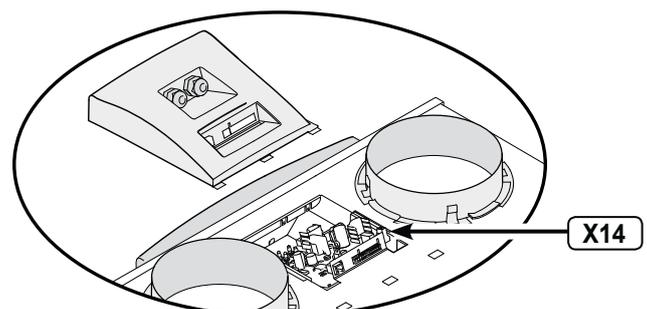
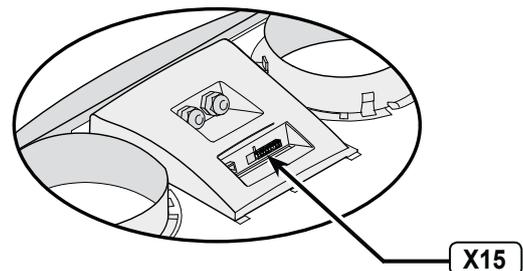
#### 4.4 Renovent Excellent Plus version

The Renovent Excellent is also available as Plus version. This version is equipped with a different control board with 2 additional connectors (X14 & X15) with more connection options for various applications.

The 9-pole connector X15 is accessible at the rear of the Renovent Excellent display cover without having to open the appliance.

The 2-pole connector X14 is accessible after taking off the display cover. The display cover of the "Plus" version has a second gland. That makes it possible to feed a 230 volt cable, which may be connected to connector X14, two outside the appliance.

See § 11.1 for more information on the connection possibilities of connectors X14 and X15.



## 5.1 Installation general

Installing the appliance

1. Placing the appliance (§5.2)
2. Connecting the condensate discharge (§5.3)
3. Connecting the ducts (§5.4)
4. Electric connection
  - Connecting the mains power, multiple switch and, if necessary, the OpenTherm/eBus coupler (§5.5)

Installation must take place under:

- Quality requirements ventilation systems dwellings.
- Quality requirements balanced ventilation in dwellings.
- The regulations for ventilation of dwellings and residential buildings.
- The safety regulations for low-voltage installations.
- The regulations for connection to interior sewers in dwellings and residential buildings.
- Any additional regulations of the local utilities.
- The installation instructions for the Renovent Excellent.

## 5.2 Placing the appliance

The Renovent Excellent can directly be mounted to the wall using the suspension brackets supplied for that purpose. For a vibration-free result the appliance must be mounted to a solid wall with a minimum mass of 200 kg/m<sup>2</sup>. A gypsum block or metal stud wall does not suffice! Additional measures such as double panelling or extra studs are required in that case. On request, a mounting support for floor mounting is available. In addition, the following aspects must be taken into account.

- The appliance must be placed level.
- Dwellings with construction moisture must be ventilated naturally during a certain period!
- The installation room must be frost-free.

- The installation room must be such that a good condensate discharge with air trap and pitch for condensate can be made.
- Make sure there is a free space of at least 70 cm at the front of the appliance and a free headroom of 1.8 m for cleaning the filters and carrying out maintenance.
- Make sure there is a free space of at least 20 cm above the display cover so it can always be removed.
- We recommend not to install the heat recovery unit in spaces with an average high RH (for instance bathroom). That will prevent condensation on the outside of the heat recovery unit.

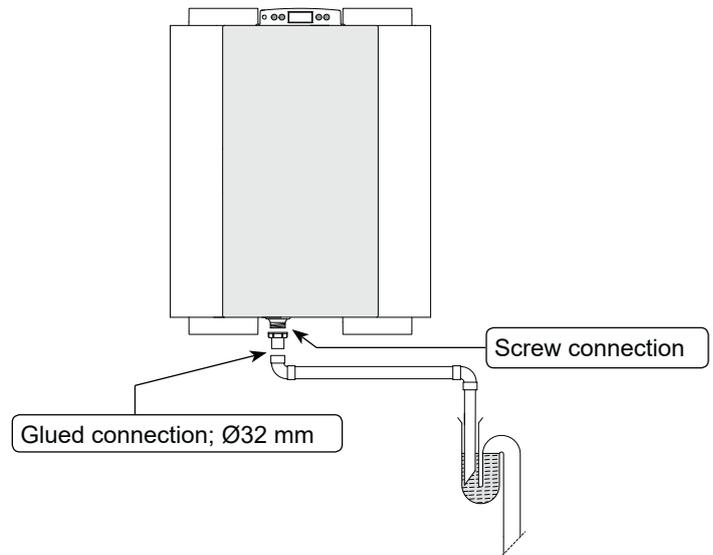
## 5.3 Connecting the condensate discharge

The condensate discharge line for the Brink Renovent HR is fed through the lower panel. The condensate must be discharged through a drainpipe.

The condensate discharge comes separately with the appliance and the installer must screw it into the underside of the appliance. This condensate discharge connection has an external connecting diameter of 32 mm.

The condensate discharge line can be glued to it, if necessary using a square bend. The installer can glue the condensate discharge in the desired position in the lower part of the appliance. The drain must discharge under the water level in the U-trap

Before connecting the condensate discharge to the appliance, pour water into the U-trap to create an air trap.



## 5.4 Connecting ducts

The air extract duct does not have to be fitted with a control valve. The appliance itself controls the air flow rates.

To prevent condensation on the outside of the outdoor air supply duct and the air exhaust duct downstream of the Renovent Excellent, these ducts must be provided with an external vapour barrier as far as the appliance. If thermally insulated piping is used here, additional insulation is not necessary.

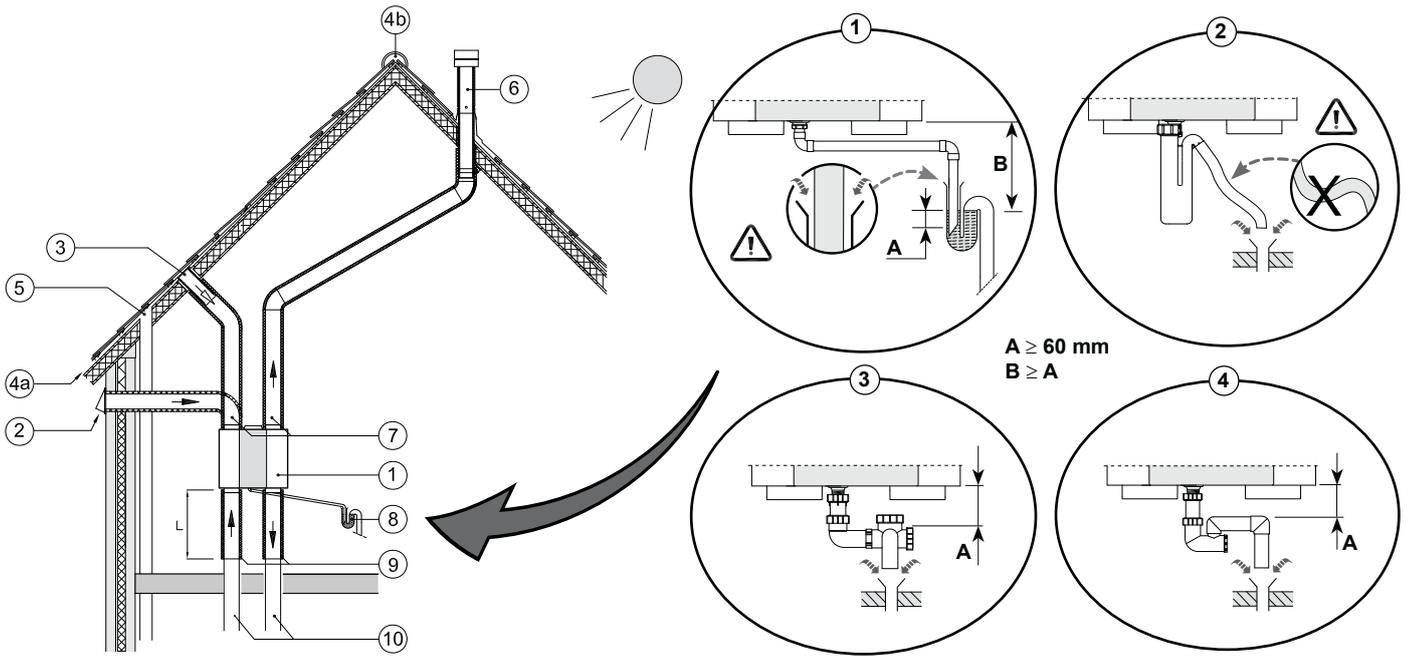
**For compliance with the maximum installation noise level of 30 dB, it will have to be assessed for every installation specifically what measures will be required to limit the noise. At least a muffler with a length of not less than 1.5 m is required, but additional measures may be necessary.**

**Please contact the Brink Consultancy Department if you have any questions on this subject.**

Pay attention to crosstalk and installation noise, also for incorporated ducts. Design the duct with separate branches to the valves to prevent crosstalk. If necessary, the supply ducts must be insulated, for instance when they are installed outside the insulated envelope.

Preferably use Brink incorporated ducts. These ducts have been developed with a view to a low duct resistance.

A duct diameter of 180 mm is required for the Renovent Excellent 400, for the Renovent Excellent 300 can suffice with a duct diameter of 160 mm.



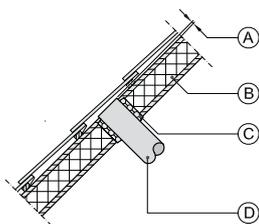
- 1 = Renovent Excellent left-handed 2/2 (place level)
- 2 = Preferred ventilation air supply
- 3 = Ventilation air supply under the tiles
- 4a = Free suction bottom roof area
- 4b = Free suction top roof area
- 5 = Sewer vent

- 6 = Preferred location extract ventilation air; use Brink insulated ventilation roof sleeve.
- 7 = Thermally isolated pipe
- 8 = Condensate discharge
- 9 = Muffler
- 10 = Ducts from and to dwelling

A ≥ 60 mm  
B ≥ A

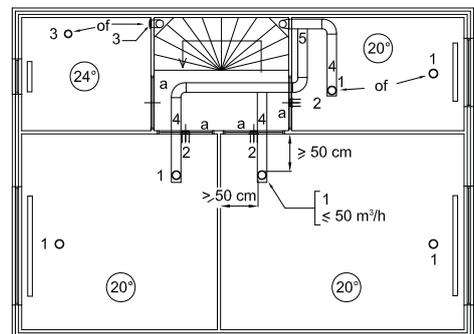
- Arrange the exterior air supply from the shadowed side of the dwelling, preferably from the wall or overhang. If the outdoor air is sucked in from under the tiles, it must be ensured that no condensation develops in the roof boarding and no water can run in. Ventilation air can be sucked in from under the tiles if air can access freely at the top and the bottom of the roof area and the sewage vent stack does not end under the tiles.

- The maximum permissible resistance in the duct system is 150 Pa at the maximum ventilation capacity. If the resistance of the duct system is higher, the maximum ventilation capacity will be lower.
- The location of the mechanical ventilation output and the sewer stack vent relative must be chosen to prevent nuisance.
- Choose the location of the supply valves to prevent fouling and draught. We recommend to use the Brink supply valves.
- When mounting flexible ducts, bear in mind that it must be possible to replace them in due course.



- A = Spacing 10 mm above roof deck
- B = Roof insulation
- C = Seal with foam
- D = Pipe for make-up air to be carefully insulated and provided with vapour barrier

- Feed the extract duct through the roof boarding in such a manner that no condensation develops in the roof boarding.
- Install the extract duct between the Renovent Excellent and the roof sleeve in such a manner that surface condensation is prevented.
- Always use an insulated ventilation roof sleeve.
- Avoid the use of petroleum-based adhesives in air plant systems.



- 1 = Brink supply valves
- 2 = Supply from wall
- 3 = Suction valve in ceiling or high in wall
- 4 = Prevent crosstalk
- 5 = Preferably Brink incorporated ducts

a = Gap under the door 2 cm.

Install sufficient overflow openings, door gap 2 cm.

## 5.5 Electric connections

### 5.5.1 Connecting the power plug

The appliance can be connected to an easily accessible, earthed wall socket with the plug that is mounted to the appliance. The electric installation must comply with the requirements of your power company.

**Make allowance for the 1000 W preheater.**



#### Warning

The fans and control board carry a high voltage. Always take the voltage from the appliance by pulling the power plug when working on the appliance.

### 5.5.2 Connecting the multiple switch

The multiple switch (not supplied with the appliance) is connected to the modular connector type RJ12 (connector X2) that is placed at the rear of the appliance's display cover.

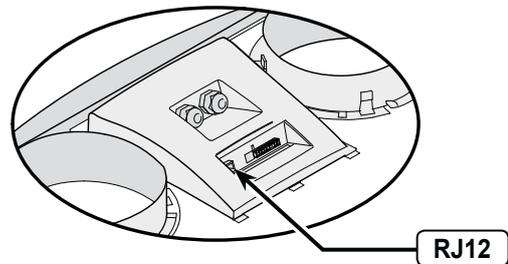
Dependent on the type of multiple switch that is used, a plug RJ11 or RJ12 can be connected to it.

- Application of a 4-way switch with filter indication in all cases requires an RJ12 plug in combination with a 6-core modular cable.
- Application of a 3-way switch without filter indication in all cases requires an RJ11 plug in combination with a 4-core modular cable.

Refer to diagrams §11.2.1 to §11.2.4 for connection examples multiple switch.

Other options include wireless remote control or a combination of multiple switches.

*The 4-way switch can also be used to activate a 30-minutes boost mode by putting the switch to setting 3 for less than 2 seconds and directly turning it back to setting 1 or 2. The boost mode can be reset by putting the switch to setting 3 for longer than 2 seconds or by switching it to absence mode (☼).*

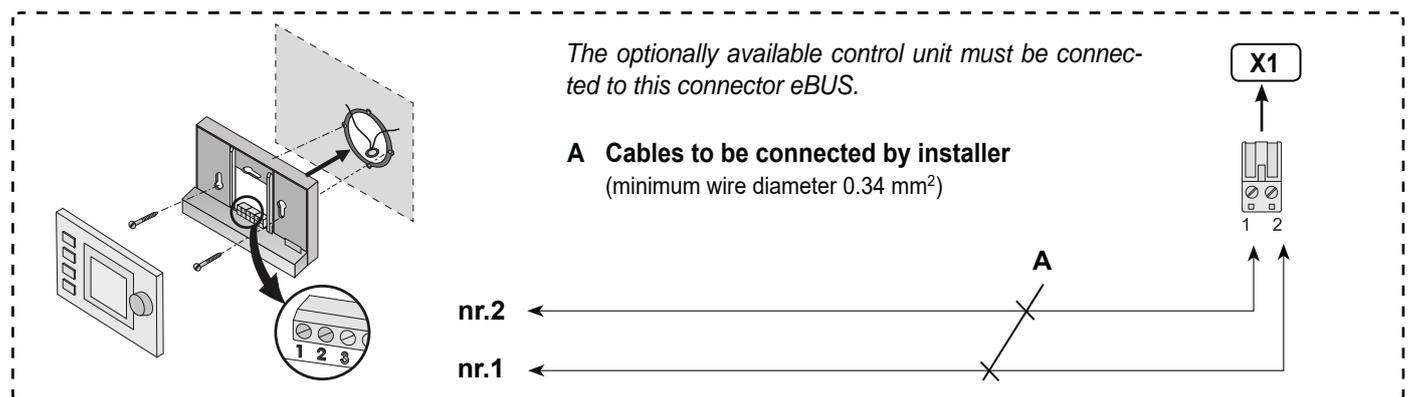
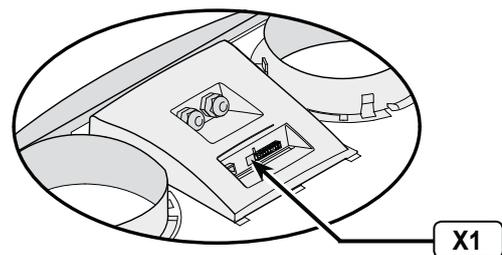


### 5.5.3 Connecting eBus or OpenTherm connector

The Renovent Excellent can operate with OpenTherm as well as with eBus protocol. The setting of parameter 08 in the settings menu (see chapter 13) lets you choose between eBus and OpenTherm.

An eBus or OpenTherm connection can be made with the 2-pole connector X1 at the rear of the display cover.

The eBus protocol can for instance be used for coupling (cascade control) appliances (see §11.3). Because of polarity sensitivity, always connect contacts X1-1 to X1-1 and contacts X1-2 to X1-2; the appliance will not work when these contacts are interchanged!



### 6.1 General explanation control panel

The LCD display shows what the operating situation of the appliance is. Four control keys can be used to call up and modify settings in the control unit program.

When the mains power to the Renovent Excellent is switched on, all display symbols will appear during 2 seconds; at the same time the blue backlight is switched on for 60 seconds..

When one of the control keys is operated, the display will light up during 30 seconds.

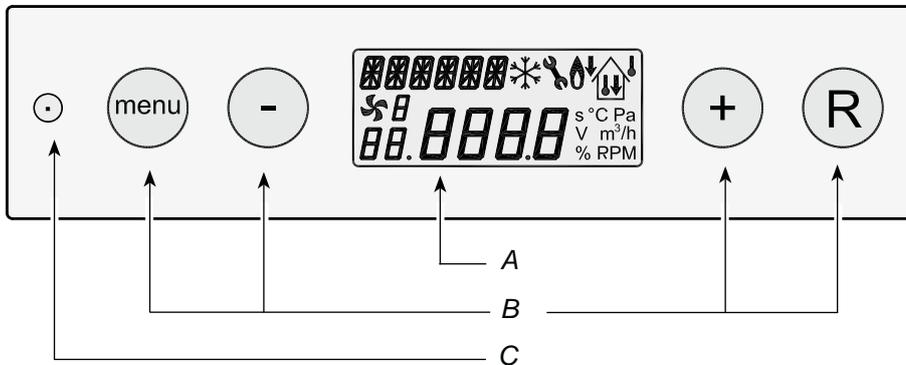
When no keys are operated or when no deviating situation has developed (such as a blocking fault) the display will show the **operating mode** (see § 6.2).

After operating the key 'Menu', the keys "+" or "-" can be used to select from three different menus, including:

- **Settings menu** (SET); see § 6.3
- **Readout menu** (READ), see § 6.4
- **Service menu** (SERV), see § 6.5

Press the R key to leave any menu and return to operating mode.

Briefly press the R key (shorter than 5 seconds) to switch on the display backlight without changing anything in the menu.



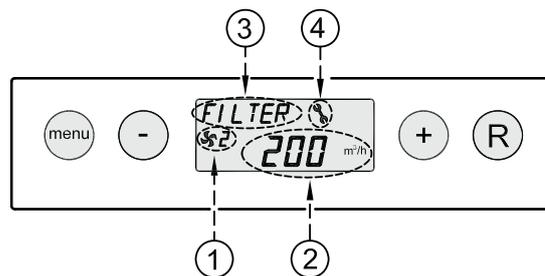
A = LCD  
B = 4 control keys  
C = service connector

Key	Function key
Menu	Activate the settings menu; to the next step in the submenu; confirm value change
-	Scroll; modify value; Switching on or off the Renovent Excellent from operating mode (the press for 5 seconds)
+	Scroll; modify value
R	One step back in menu; cancel value modification; filter reset (the press for 5 seconds), delete fault history

### 6.2 Operating mode

In operating mode the display may simultaneously show 4 different situations/values.

- 1 = **Status fan situation**, image coupled appliances (see § 6.2.1)
- 2 = **Air flow rate** (see § 6.2.2)
- 3 = **Message text** e.g. text filter situation, activation external switch contact etc. (see § 6.2.3)
- 4 = **Fault symbol** (see § 8.1 and § 8.2)

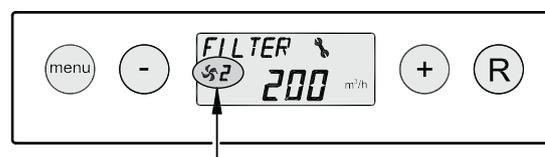


#### 6.2.1 Status system fan

This part of the display shows a fan together with a number.

When the supply and extract fans are running, the fan symbol is displayed. When the fans are stopped, the fan symbol is not visible.

The number behind the fan symbol indicates the fan situation. Refer to the table below for an explanation of the numbers.



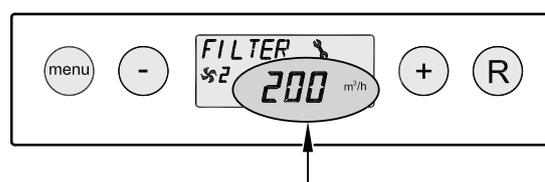
Status fan situation on display	Description
	The supply and extract fans are running at 50 m³/h or are inactive. <sup>1)</sup> This situation depends on setting parameter 1 (see Chapter 13)
1	The supply and extract fans are running under mode 1 of the multiple switch. Air flow rate depends on setting parameter 2 (see chapter 13).
2	The supply and extract fans are running under mode 2 of the multiple switch. Air flow rate depends on setting parameter 3 (see chapter 13).
3	The supply and extract fans are running under mode 3 of the multiple switch. Air flow rate depends on setting parameter 4 (see chapter 13).
□	This Renovent Excellent is coupled with the aid of eBus. The supply and extract fans of the Renovent Excellent are running under switched mode of the ventilation mode “master” Renovent; in addition, (only for cascade connection) the display shows the “slave” number of the relevant Renovent. Air flow rate depends on the set parameters “master” Renovent.

<sup>1)</sup> When using a 3-way switch, the position can not be used.

#### 6.2.2 Display air flow rate

This shows the set air flow rate of the supply of extract fan. When when the air flow rates of the supply and extract fans differ, for instance when using an external switch contact, in all cases the highest air flow rate is shown.

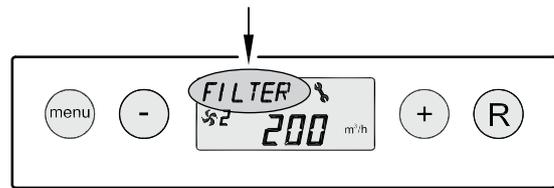
When the appliance is switched off through software, the text “OFF” appears here.



### 6.2.3 Message text for operating mode

This part of the display may show a message text. The message text “Filter” always takes precedence over the other message texts.

The following message text may appear during operating mode.



Message text on display	Description	
FILTER	When the text “FILTER” appears on the display, the filter must be cleaned or replaced; for detailed information, see § 9.1	
Slave 1, Slave 2 etc.	For coupled appliances the message text shelves which appliances “Slave 1” - “Slave 9”; for detailed information, see §11.3. The “Master” appliance displays the regular image regarding ventilation mode.	 <i>Master - appliance</i>  <i>Slave - appliance</i>
EWT (only for Plus version)	When the text “EWT” appears on the display, the geo heat exchanger is active. For extensive information, also see §11.6.	
CN1 or CN2 (only for Plus version)	When the text “CN1 or CN2” appears on the display, one of the external switch inputs is active, also see §11.7.	
V1 or V2 (only for Plus version)	When the text “CN1 or CN2” appears on the display, one of the external 0 - 10 V. inputs is active, also see §11.8.	

### 6.3 Settings menu

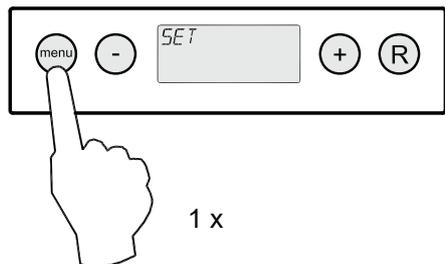
For optimum performance of the appliance, set values can be modified in the settings menu to adjust the appliance to the installation situation; refer to chapter 13 for a list of the set values. A number of set values, such as the air flow rates, are laid down in the design data.

**Warning:**

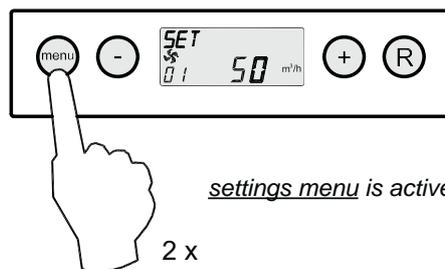
Because changes may affect the proper performance of the appliance, changes of settings not described here require consultation with Brink. Incorrect settings may seriously affect the proper performance of the appliance!

Modifying the set value in the settings menu:

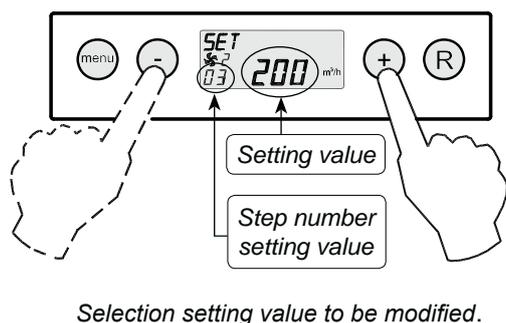
1. In operating mode, press the 'MENU' key.



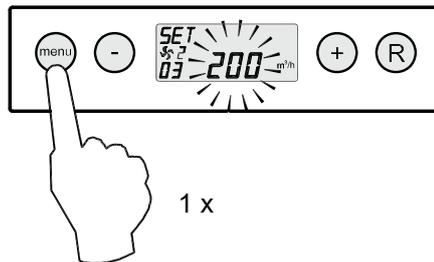
2. Press the 'Menu' key to activate the "settings menu".



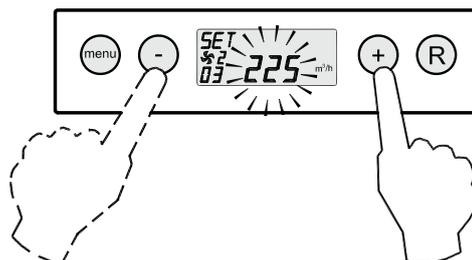
3. Select the set value to be modified with the '+' or '-' key.



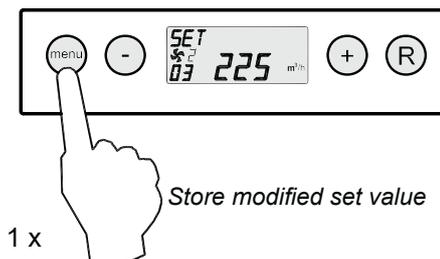
4. Press the 'Menu' key to select the required set value.



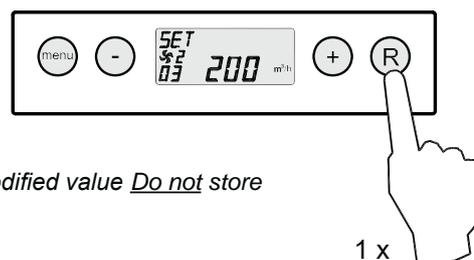
5. Use keys '-' and '+' key to modify selected set value.



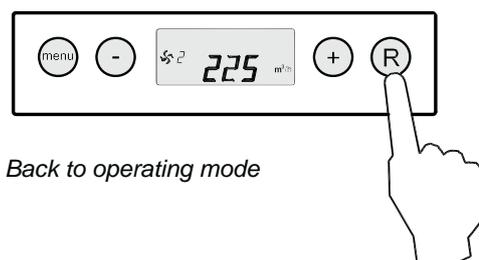
6. Store modified set value



- Do not store modified set value



7. To modify other set values, repeat step 3 - 6. When you do not want to modify any more set values and return to operating situation, then press the 'R' key.



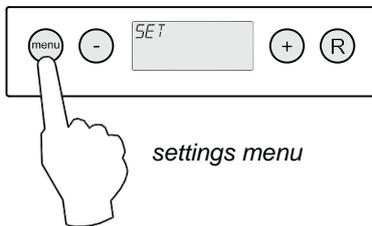
### 6.4 Readout menu

The readout menu can be used to call up a number of current sensor values to obtain more information on the appliance's performance. Modifying values of settings is **not** possible in the readout menu. The **readout menu** can be displayed as follows.

1. In operating mode, press the 'MENU' key. Now the display shows the **settings menu**.

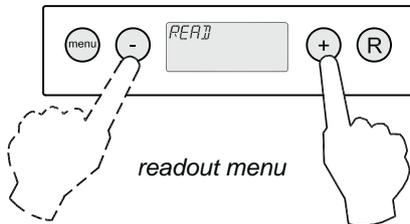


operating mode



settings menu

2. Use the '+' and the '-' key to go to the **readout menu**.



readout menu

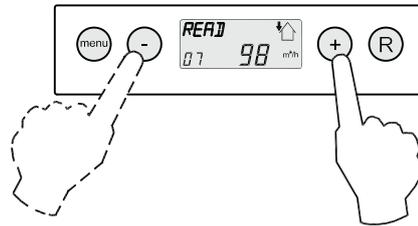
3. Activate the **readout menu**.



readout value

Step no. readout value; refer to the table below for an explanation

- 4 Use the '+' and the '-' key to scroll through the rear menu.



- 5 Press the 'R' key twice to go back to operating mode. If no key is operated during 5 minutes, the appliance automatically returns to operating mode.



operating mode

2 x

Step no. readout value	Description readout value	Unit
01	Current temperature from dwelling	°C
02	Current temperature outdoors sensor	°C
03	Bypass status (ON = bypass valve open, OFF = bypass valve closed)	
04	Status frost protection (ON = frost protection active, OFF = frost protection not active)	
05	Current channel pressure supply	Pa
06	Current duct pressure extract	Pa
07	Current air flow rate supply fan	m³/h
08	Current air flow rate extract fan	m³/h
09	Actual relative humidity (option)	%
10	Readout CO <sub>2</sub> sensor 1 (CO <sub>2</sub> sensor only as an option for Plus version)	PPM
11	Readout CO <sub>2</sub> sensor 2 (CO <sub>2</sub> sensor only as an option for Plus version)	PPM
12	Readout CO <sub>2</sub> sensor 3 (CO <sub>2</sub> sensor only as an option for Plus version)	PPM
13	Readout CO <sub>2</sub> sensor 4 (CO <sub>2</sub> sensor only as an option for Plus version)	PPM

### 6.5 Service menu

The service menu shows the most recent 10 fault messages.

In the event of a locking fault, the settings menu and the readout menu are blocked and only the service menu can be opened; Pressing the 'menu' key directly opens the service menu.

The **service menu** can be displayed as follows.

1. In operating mode, press the 'MENU'- key. The display now shows the settings menu.

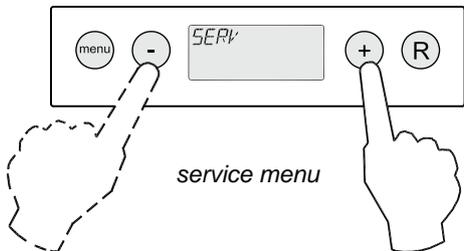


operating mode



settings menu

2. Use the '+' and the '-' key to go to the **service menu**.



service menu

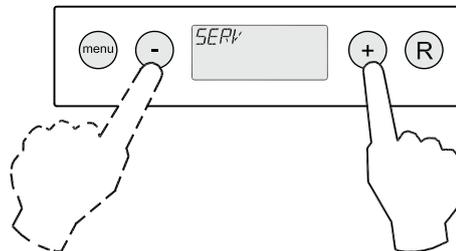
3. Activate the **service menu**.



Fault code; refer to § 8.1 and § 8.2 for explanation fault code

No. fault message

4. Use the '+' and the '-' key to scroll through the messages in the service menu.



- Display not any fault message.



- Current fault message (spanner on display).



- Unsolved fault message (no spanner on display).



5. Press the 'R' key twice to go back to operating mode. If no key is operated during 5 minutes, the appliance automatically returns to operating mode.



operating mode

2 x

All fault messages can be deleted by pressing the "R" key in the service menu during 5 seconds; This is only possible when there is no active fault!

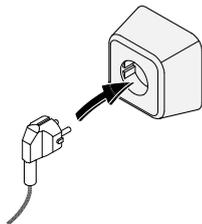
### 7.1 Switching the appliance on and off

There are two methods to switch the appliance on or off.

- Switching on and off by inserting or pulling the power plug.
- Switching on and off through software on the appliance display.

#### Switching on

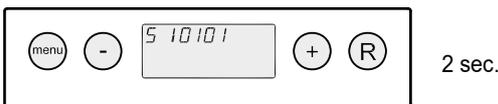
- Switching on the mains power.  
Connect the 230 V power plug to the electric system.



All display symbols appear during 2 seconds.



The software version appears during 2 seconds.



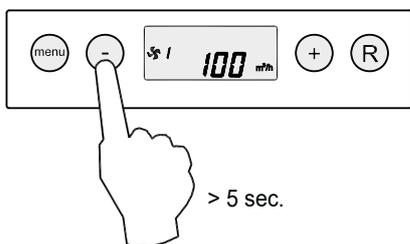
Directly after that the Renovent Excellent will be running in the mode is set on the multiple switch. If no multiple switch is connected, the appliance will always run in mode 1.



- Switching on through software  
When the Renovent Excellent switched off through software, the display will show the text "OFF".

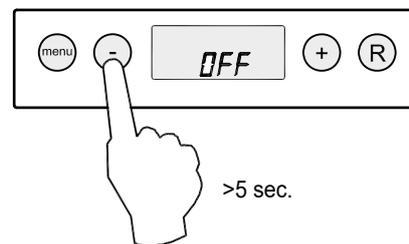


The appliance can be switched on by pressing the key '-' during 5 seconds.

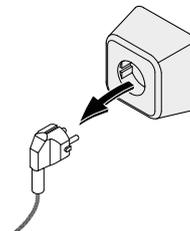


#### Switching off:

- Switching off through software  
Press the "-" key for 5 sec. to switch off the appliance through software. The text 'OFF' appears on the display.



- Switching off the mains power ;  
Pull the 230 V mains plug from the mains to take the voltage from the appliance.  
Nothing is shown on the display now.



**Warning**  
When working on the appliance, always take the voltage from the appliance by first switching it off through software and subsequently pulling the power plug.

### 7.2 Setting the air flow rate

The factory supplies the Renovent Excellent for the Renovent Excellent 300 flow rates set to 50, 100, 150 en 225 m<sup>3</sup>/h and for the Renovent Excellent 400 set to 50, 100, 200 and 300 m<sup>3</sup>/h respectively. The performance and the energy consumption of the Renovent Excellent depend on the pressure drop in the duct system as well as on the filter resistance.

**Important:**

Mode 5: is 0 or 50 m<sup>3</sup>/h (not in combination with a 3-way switch).

Mode 1: must always be lower than mode 2.

Mode 2: must always be lower than mode 3;

Mode 3: Renovent 300 - adjustable between 50 and 300 m<sup>3</sup>/h; Renovent 400 - adjustable between 50 and 400 m<sup>3</sup>/h;

If these conditions are not complied with, the air flow rate of the higher mode will automatically be adjusted.

See the settings menu, §6.3, for changing the flow rates.

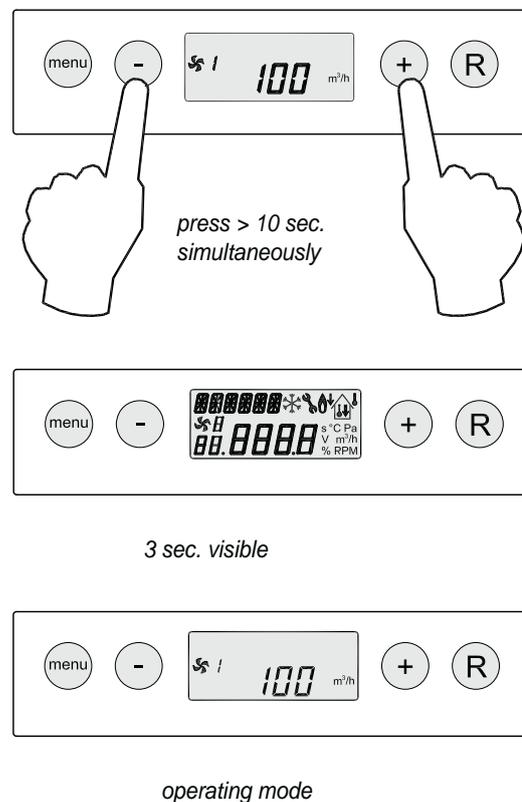
### 7.3 Other settings installer

Various other settings of the Renovent Excellent can also be modified. How to modify these is explained in §6.3.

### 7.4 Factory setting

It is possible to reset all modified settings back to factory setting in one go.

All modified settings will be at the values they had when the Renovent Excellent was supplied from the factory; all message codes / fault codes will be erased from the service menu as well. The filter notification process will not reset.



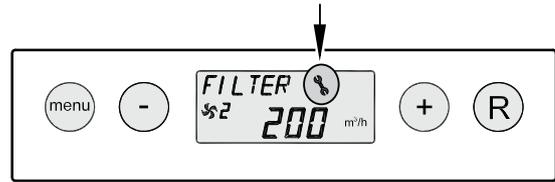
### 8.1 Trouble shooting

When the appliance control system detects a fault, it is indicated on the display with a spanner symbol, possibly together with a fault code.

The appliance makes a distinction between a fault at which the appliance keeps running (limitedly) and a serious (locking) fault at which both fans are switched off.

In case of locking fault, the settings and readings menu is switched off as well and only the service menu is available.

The appliance remains in this fault mode until the problem in question has been solved. Then the appliance will reset itself (auto reset) and the display will once more show the operational mode.



The fans are controlled on the basis of the value of the pressure sensors mounted on the control board. For each fan 2 pressure hoses run to the control board. If these hoses are not connected as prescribed, or if they are leaking or blocked, a wrong pressure will be measured so the fans can no longer be controlled correctly. In case of doubt on the correct performance of the appliance, check the pressure hose connections.

#### Fault E999

If, when the appliance is powered up directly to message **E999** appears on the display, the mounted control board is not suitable for this appliance or the dip switches on the control board are set incorrectly.

For the location of the dip switches see § 10.1.

In that case, check whether the dip switches on the control board are set as shown in the drawing of the dip switches settings; if they are, and the message E999 still appears, then replace the control board by a board of the correct type.



Renovent Excellent 300 typ 4/0		Renovent Excellent 300 Plus typ 4/0	
Renovent Excellent 300 typ 2/2 & 3/1		Renovent Excellent 300 Plus typ 2/2 & 3/1	
Renovent Excellent 400 typ 4/0		Renovent Excellent 400 Plus typ 4/0	
Renovent Excellent 400 typ 2/2 & 3/1		Renovent Excellent 400 Plus typ 2/2 & 3/1	

### 8.2 Display codes

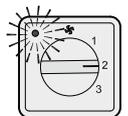
#### Non-locking fault

When the appliance detects a non-locking fault, it will still keep running (limitedly). The display does show the fault symbol (spanner).



#### Locking fault

When the appliance detects a locking fault, it will no longer work. The (permanently lighted) display shows the fault symbol (spanner) together with fault code. The red LED on the multiple switch (if applicable) will be blinking. Contact the installer to remedy this fault. A locking fault cannot be remedied by taking the voltage from the appliance; first the fault must be solved.



#### Warning

When working on the appliance, always take the voltage from the appliance by pulling the power plug.

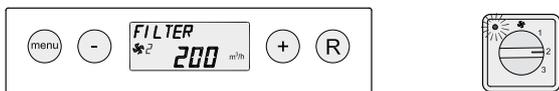
Fault code	Cause	Action appliance	Action installer
<b>E100</b> (non-locking fault)	Pressure sensor supply fan defective. Red pressure hoses blocked or "kinked".	<ul style="list-style-type: none"> <li>- Switches to constant rpm control.</li> <li>- The preheater switches on at outdoor temperatures below 0°C.</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Check the red pressure hoses (and pressure tubes) for fouling, kinking and damage.</li> </ul>
<b>E101</b> (non-locking fault)	Pressure sensor extract fan defective. Blue pressure hoses blocked or "kinked".	<ul style="list-style-type: none"> <li>- Switches to constant rpm control.</li> <li>- The preheater switches on at outdoor temperatures below 0°C.</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Check blue pressure hoses (and pressure tubes) for fouling, kinking and damage.</li> </ul>
<b>E103</b> (non-locking fault)	Bypass fault .	<ul style="list-style-type: none"> <li>- None. (Current too low → stepper motor not correctly connected or effective; Current too high → short-circuit in wiring or stepper motor).</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Check connection stepper motor; replace wiring or stepper motor.</li> </ul>
<b>E104</b> (locking fault)	Extract fan defective.	<ul style="list-style-type: none"> <li>- Both fans are switched off.</li> <li>- Preheater(s) is switched off.</li> <li>- If applicable: Postheater(s) is switched off.</li> <li>- Restart every 5 minutes.</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Replace extract fan.</li> <li>• But voltage back on appliance; Fault will automatically be reset.</li> <li>• Check cabling.</li> </ul>
<b>E105</b> (locking fault)	Supply fan defective.	<ul style="list-style-type: none"> <li>- Both fans are switched off.</li> <li>- Preheater(s) is switched off.</li> <li>- If applicable: Postheater(s) is switched off.</li> <li>- Restart every 5 minutes.</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Replace.</li> <li>• Put voltage back on appliance; Fault will automatically be reset.</li> <li>• Check cabling.</li> </ul>
<b>E106</b> (locking fault)	The temperature sensor that measures the outdoor temperature is defective.	<ul style="list-style-type: none"> <li>- Both fans are switched off.</li> <li>- Preheater(s) is switched off.</li> <li>- Bypass closes and is blocked.</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Replace temperature sensor.</li> <li>• Put voltage back on appliance; fault will automatically be reset.</li> </ul>
<b>E107</b> (non-locking fault)	The temperature sensor that measures the temperature of the extract air is defective.	<ul style="list-style-type: none"> <li>- Bypass closes and is blocked.</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Replace indoor temperature sensor.</li> </ul>
<b>E108</b> (non-locking fault)	If present: The temperature sensor that measures the external temperature is defective.	<ul style="list-style-type: none"> <li>- Postheater is switched off.</li> <li>- If applicable: Geo heat exchanger is switched off.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace external temperature sensor.</li> </ul>
<b>E109</b> (non-locking fault)	Fault on connected CO <sub>2</sub> sensor	<ul style="list-style-type: none"> <li>- Appliance keeps running</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Replace CO<sub>2</sub>-sensor; Correct setting dipperswitches of new CO<sub>2</sub> sensor</li> <li>• Put voltage back on appliance; fault is automatically reset.</li> </ul>
<b>E111</b> (non-locking fault)	If present: The RH-sensor that measures the humidity is defective.	<ul style="list-style-type: none"> <li>- Appliance continues to operate</li> </ul>	<ul style="list-style-type: none"> <li>• Take the voltage from the appliance.</li> <li>• Replace RH-sensor.</li> </ul>
<b>E999</b> (locking fault)	Dip switches on control board not set correctly.	<ul style="list-style-type: none"> <li>- Appliance does nothing; red fault LED on multiple switch is not activated either.</li> </ul>	<ul style="list-style-type: none"> <li>• Put dip switches incorrect position. (see § 8.1).</li> </ul>

**Note!**

If mode 2 of a multiple switch does not work, the modular connector of the multiple switch has been connected the wrong way round. Cut off one of the RJ connectors to the multiple switch and mount a new connector the other way round.

### 9.1 Filter cleaning

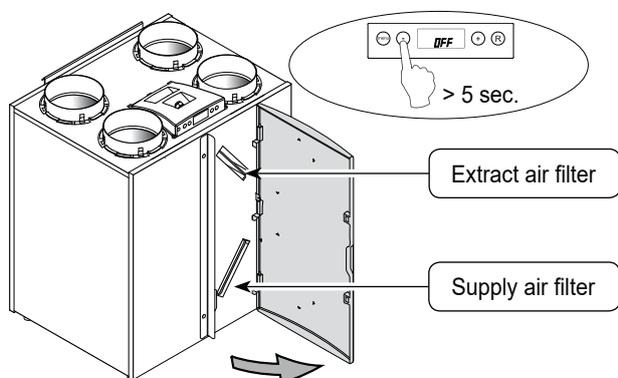
User maintenance is limited to periodically cleaning or replacing the filters. The filter only has to be cleaned when that is indicated on the display (it shows the text "FILTER") or, if a multiple switch with filter indication is mounted, when the red LED at the switch lights up.



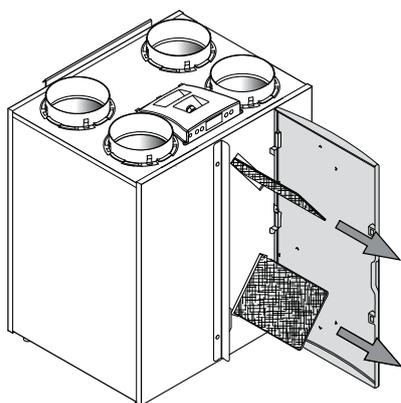
The filters must be replaced every year. It is not permitted to use the appliance without filters.

#### Cleaning or replacing the filters:

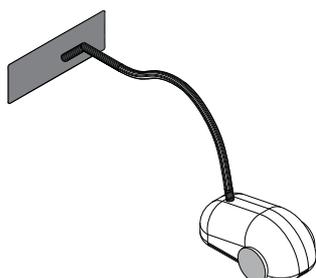
- 1 - Press the '-' key for 5 seconds.  
- Open the filter door.



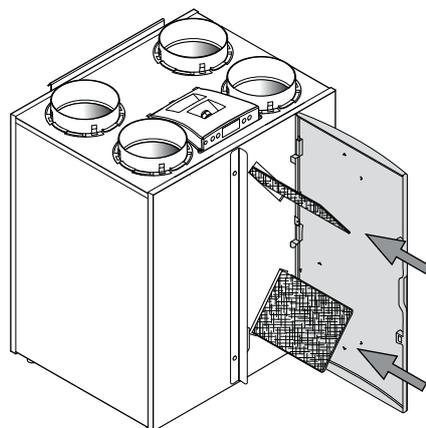
- 2 Remove the filters. Remember in what way the filters are taken out.



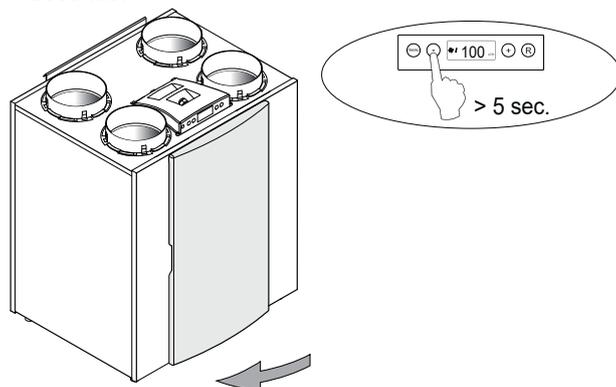
- 3 Clean the filters.



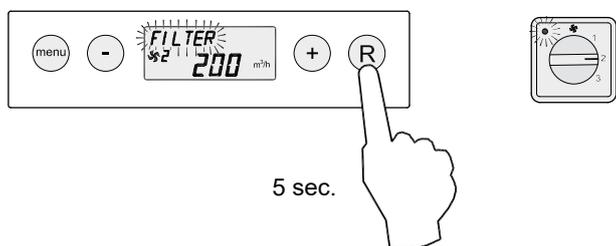
- 4 Place the filters back the same way as they were taken out.



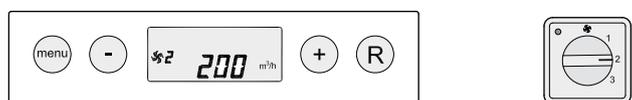
- 5 - Close the filter door.  
- Switch on the appliance by pressing the key '-' during 5 seconds.



- 6 After the filters have been cleaned or replaced, press the "R" key for 5 seconds to reset the filter indication. The text "FILTER" will blink briefly to confirm that the filters have been reset. Also when the message "FILTER" has not yet appeared on the display, a filter reset can be carried out; the "counter" will be reset to zero.



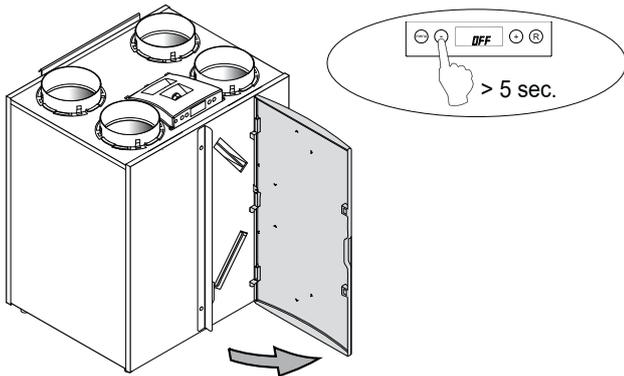
After the filter reset, the text "FILTER"; disappears, the light at the multiple switch is off and the display is back to operating mode.



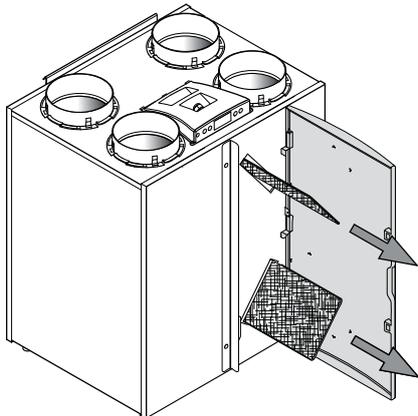
### 9.2 Maintenance

Installer maintenance includes cleaning the heat exchanger and fans. Dependent on the conditions, this must be done about once every three years.

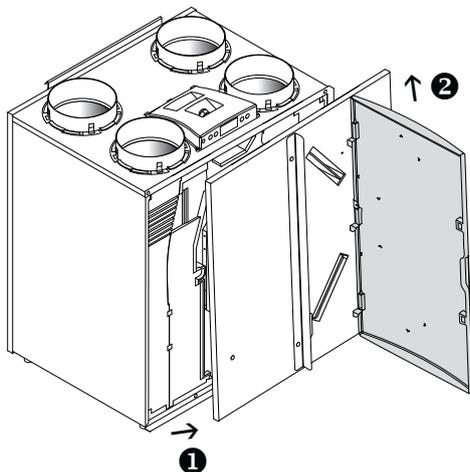
- 1 Switch off the appliance on the control panel (Press the 'OFF' key for 5 seconds; the appliance will be switched off through software) and switch off the power. Open the filter door.



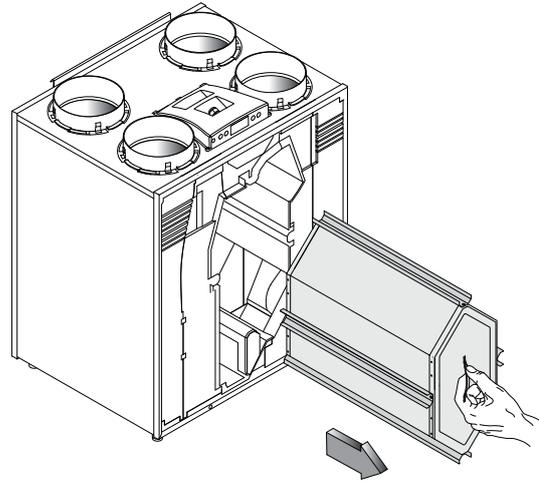
- 2 Remove the filters.



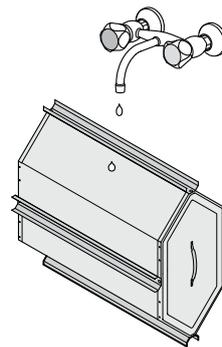
- 3 Remove the front cover.



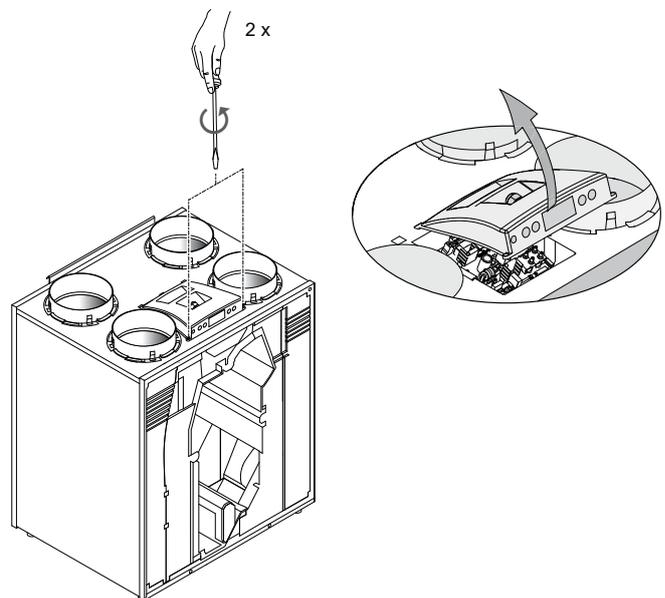
- 4 Remove the heat exchanger. Be careful not to damage the foam parts in the appliance.



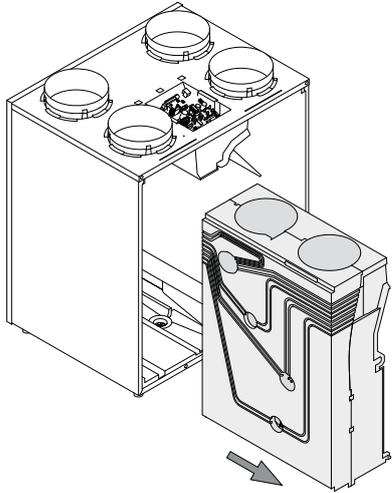
- 5 Rinse the exchanger with hot water (max. 45 °C) and a regular detergent. Rinse the exchanger with hot water.



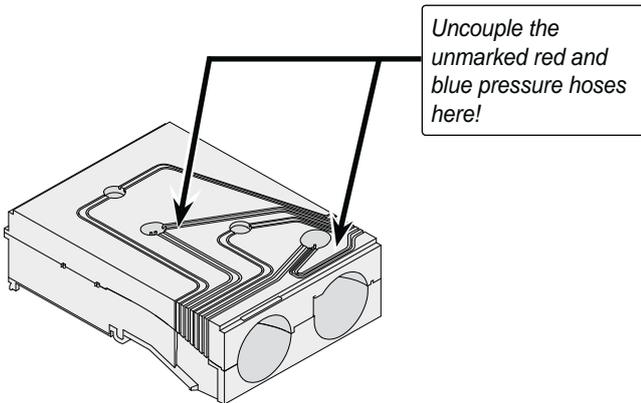
- 6 Take off the display cover.  
Note! First disconnect the connectors on the rear of the display cover.



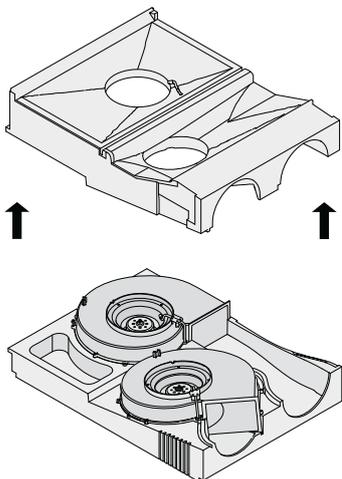
- 7 Remove 4 pressure hoses and 3 connectors from the board.
- 8 Slide the fan assembly out of the appliance.



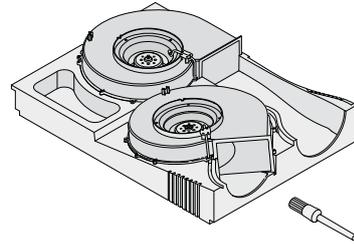
- 9 Place the fan assembly on a flat surface with the pressure hoses facing up. Remove the red and blue pressure hose without black mark from the pressure tubes mounted in the fan assembly. Turn over the foam assembly so the section with the pressure hoses is facing down.



- 10 Now the fan assembly can carefully be split so the two fans are accessible. Make sure the fans remain in the lower fan section!

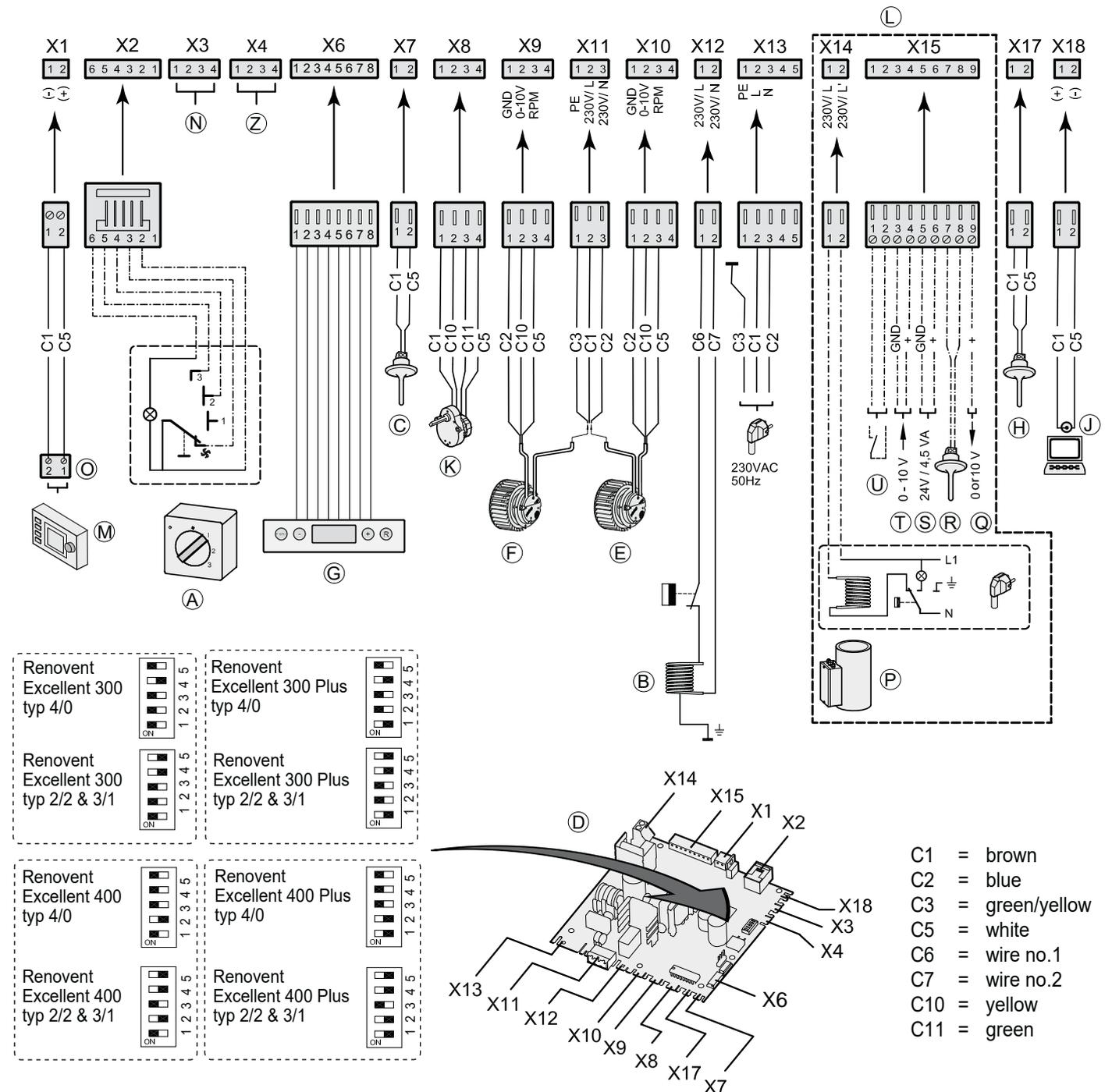


- 11 Clean the fans with a soft brush. **Make sure the balancing weights do not shift!**



- 12 Replace the separated part of the fan assembly and reconnect the loose pressure hoses to the pressure tubes. **Make sure no dirt enters the pressure tubes!**
- 13 Place the complete fan assembly back into the appliance.
- 14 Reconnect the pressure hoses and the fan cables to the board.  
Note the marking sticker on the pressure sensor for the correct position of the pressure hoses. Refer to the sticker in the appliance for the correct position of the connectors.
- 15 Remount the display cover and reconnect the loose connectors on the rear of the display cover.
- 16 Place the heat exchanger back into the appliance.
- 17 Place the front cover.
- 18 Place the filters back into the appliance with the clean side facing the exchanger.
- 19 Close the filter door.
- 20 Switch on the power supply.
- 21 Switch on the appliance on the control panel (pres key “-” for 5 seconds).
- 22 After cleaning the filter or placing a new filter, reset the filter indication by pressing the key “R” for 5 seconds.

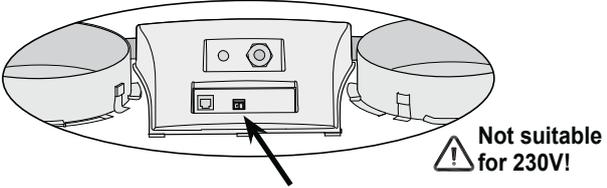
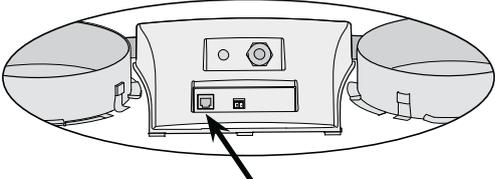
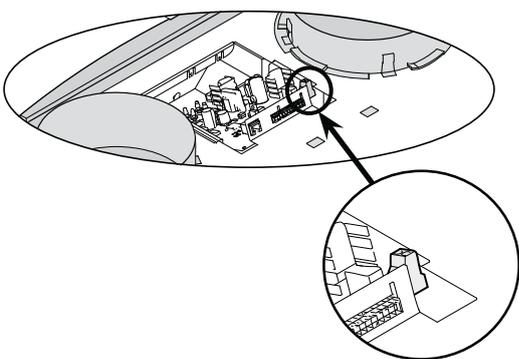
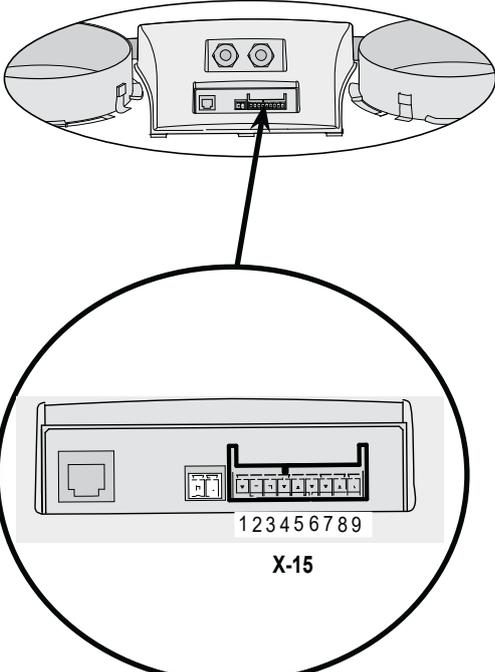
10.1 Basic diagram



- A = Multiple switch
- B = Preheater
- C = Outdoor temperature sensor
- D = Control board
- E = Supply fan
- F = Extract fan
- G = Control panel
- H = Indoor temperature sensor
- J = Service connector
- K = Valve motor bypass
- L = Renovent Plus version
- M = Brink Air Control

- N = Not applicable
- O = E bus connector (polarity sensitive) or OpenTherm, application depending on parameter setting 8
- P = Postheater (Plus version)
- Q = Output 0 or 10 V(Plus version)
- R = Sensor postheater or outdoor sensor geo heat exchanger (Plus version)
- S = 24 volt connector (Plus version)
- T = Input 0-10 V (or make contact) (Plus version)
- U = Make contact or input 0-10 V(Plus version)
- Z = RH-sensor (option)

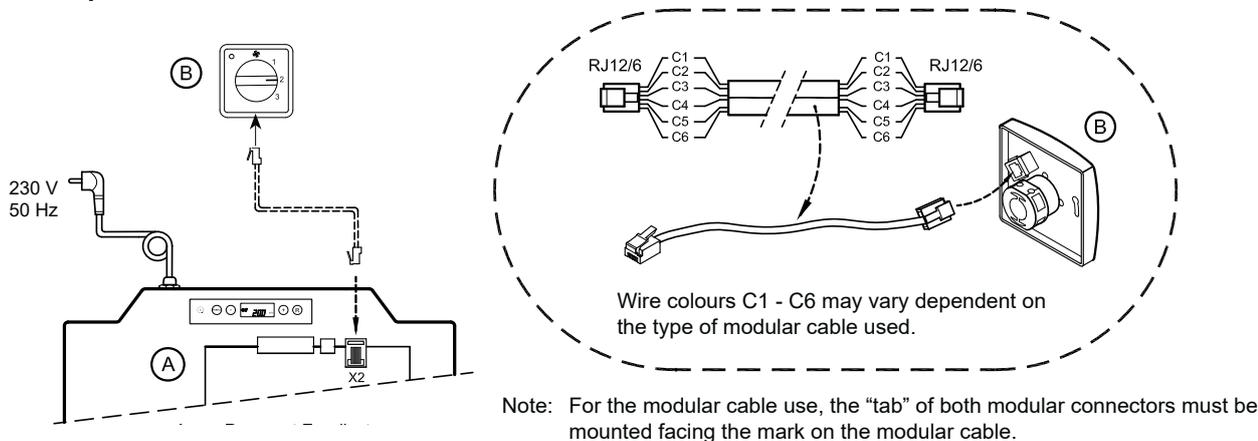
11.1 Connections connectors

<p><b>Connector X1</b></p> 	<p><b>EBus or. OpenTherm connector X1</b>                  Two-pole screw connector.                  Set ex factory as eBus connector; after modifying parameter 8 in the Settings menu, also suitable as OpenTherm connector (see §11.3).                  Only suitable for low voltage.                  Note: For the eBus Application, this connector is polarity-specific.</p>												
<p><b>Connector X2</b></p> 	<p><b>Modular connector X2 for rpm control</b>                  Modular connector type RJ-12.                  Only suitable for low voltage</p>												
<p><b>Connector X14 (only for Plus version)</b></p> 	<p><b>Connector X14 for connecting postheater</b>                  Two-pole screw connector (accessible after taking off display cover).                  Ex factory this connector is not activated; after changing parameter 13 in the settings menu of "0" to "1" (preheater) or "2" (postheater), this connector can be used for connecting the postheater or preheater                  Maximum rated power is 1000W.                  Note: The postheater temperature sensor must also be connected to X15-7 and X15-8.</p> <p>For the Plus version, use the additionally mounted pull relief in the display cover to feed the 230 V cable to the postheater.</p>												
<p><b>Connector X15 (only for Plus version)</b></p> 	<p><b>Connector X15 (9-pole) for connecting special versions</b></p> <table border="1"> <thead> <tr> <th>Connection</th> <th>Application</th> </tr> </thead> <tbody> <tr> <td>1 &amp; 2 (input 1)</td> <td> <p><b>Stepnr. 15 = 0: normally open contact</b>                      (= factory setting) §11.7)</p> <p>Stepnr. 15 = 1: 0 - 10V input 1; X15-1=GND &amp; 15 - 2 = 0 - 10V (see §11.8)</p> <p>Stepnr. 15 = 2: normally closed contact</p> <p>Stepnr. 15 = 3: input 1/ bypas open →12V; bypass closed →0V</p> <p>Stepnr. 15 = 4: input 1/ bypas open →0V; bypass closed →12V</p> </td> </tr> <tr> <td>3 &amp; 4 (input 2)</td> <td> <p>Stepnr. 21 = 0: normally open contact</p> <p><b>Stepnr. 21 = 1: 0 - 10V input</b> (= factory setting) (see §11.8).</p> <p>Stepnr. 21 = 2: normally closed contact</p> <p>Stepnr. 21 = 3: input 2/ bypas open →12V; bypass closed →0V</p> <p>Stepnr. 21 = 4: input 2/ bypas open →0V; bypass closed →12V</p> </td> </tr> <tr> <td>5 &amp; 6</td> <td><b>Conn. 24 volt</b> , 4.5 VA maximum (5 = ground , 6 = +)</td> </tr> <tr> <td>7 &amp; 8</td> <td><b>Connection postheater sensor or and outdoor geo heat exchanger</b></td> </tr> <tr> <td>9</td> <td><b>Control signal valve 0 or 10 V</b> ( 9 = + , 5 = ground)</td> </tr> </tbody> </table>	Connection	Application	1 & 2 (input 1)	<p><b>Stepnr. 15 = 0: normally open contact</b>                      (= factory setting) §11.7)</p> <p>Stepnr. 15 = 1: 0 - 10V input 1; X15-1=GND &amp; 15 - 2 = 0 - 10V (see §11.8)</p> <p>Stepnr. 15 = 2: normally closed contact</p> <p>Stepnr. 15 = 3: input 1/ bypas open →12V; bypass closed →0V</p> <p>Stepnr. 15 = 4: input 1/ bypas open →0V; bypass closed →12V</p>	3 & 4 (input 2)	<p>Stepnr. 21 = 0: normally open contact</p> <p><b>Stepnr. 21 = 1: 0 - 10V input</b> (= factory setting) (see §11.8).</p> <p>Stepnr. 21 = 2: normally closed contact</p> <p>Stepnr. 21 = 3: input 2/ bypas open →12V; bypass closed →0V</p> <p>Stepnr. 21 = 4: input 2/ bypas open →0V; bypass closed →12V</p>	5 & 6	<b>Conn. 24 volt</b> , 4.5 VA maximum (5 = ground , 6 = +)	7 & 8	<b>Connection postheater sensor or and outdoor geo heat exchanger</b>	9	<b>Control signal valve 0 or 10 V</b> ( 9 = + , 5 = ground)
Connection	Application												
1 & 2 (input 1)	<p><b>Stepnr. 15 = 0: normally open contact</b>                      (= factory setting) §11.7)</p> <p>Stepnr. 15 = 1: 0 - 10V input 1; X15-1=GND &amp; 15 - 2 = 0 - 10V (see §11.8)</p> <p>Stepnr. 15 = 2: normally closed contact</p> <p>Stepnr. 15 = 3: input 1/ bypas open →12V; bypass closed →0V</p> <p>Stepnr. 15 = 4: input 1/ bypas open →0V; bypass closed →12V</p>												
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5 & 6	<b>Conn. 24 volt</b> , 4.5 VA maximum (5 = ground , 6 = +)												
7 & 8	<b>Connection postheater sensor or and outdoor geo heat exchanger</b>												
9	<b>Control signal valve 0 or 10 V</b> ( 9 = + , 5 = ground)												

### 11.2 Connection examples multiple switch

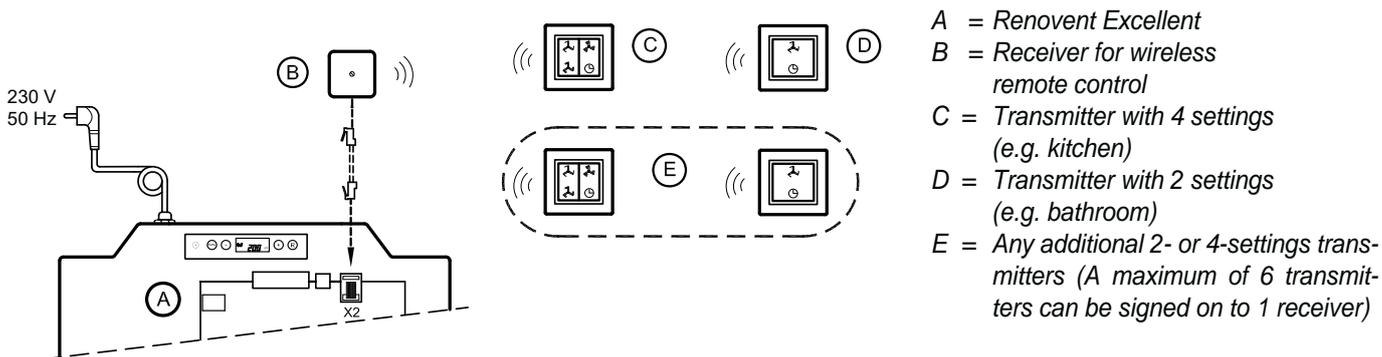
A multiple switch can be connected to the modular connector X2 of the Renovent Excellent. This modular connector X2 is directly accessible at the rear of the display cover (see §11.1) without having to take it off.

#### 11.2.1 Multiple switch with filter indication

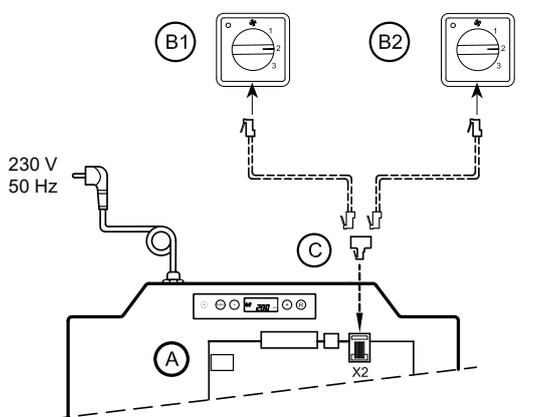


A = Renovent Excellent  
B = Multiple switch with filter indication

#### 11.2.2 Wireless remote control (without filter indication)

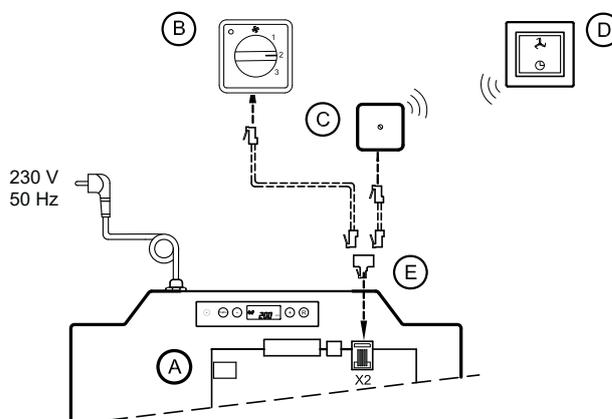


#### 11.2.3 Additional multiple switch with filter indication



A = Renovent Excellent  
B1 = Multiple switch with filter indication  
B2 = Additional multiple switch with filter indication  
C = Splitter

#### 11.2.4 Additional multiple switch with wireless remote control

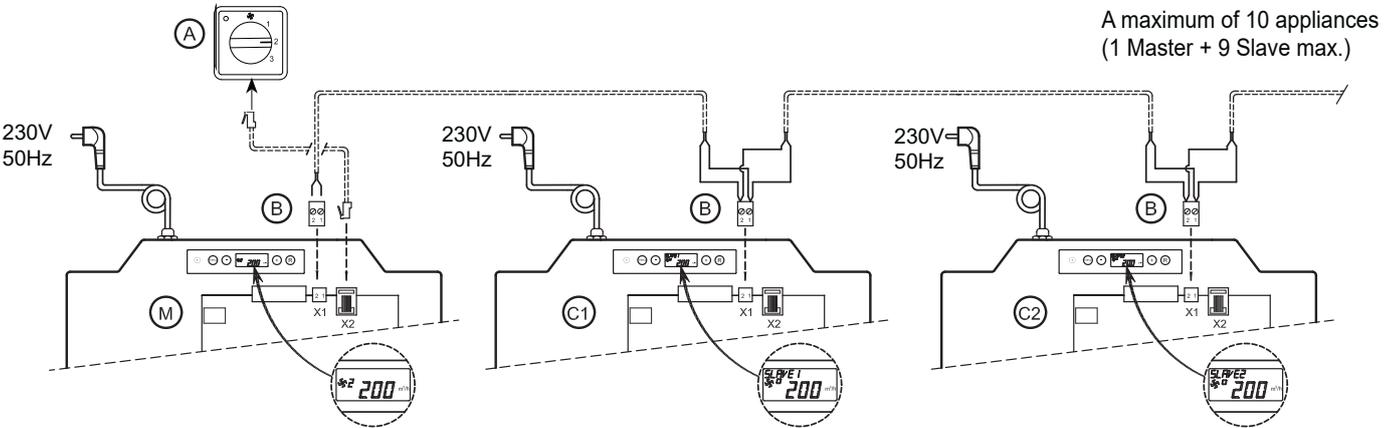


A = Renovent Excellent  
B = Multiple switch with filter indication  
C = Receiver for wireless remote control  
D = Transmitter with 2 settings  
E = Splitter

11.3 Couple through eBus contact; all appliances equal air flow rate

**Important:**

Because of polarity sensitivity, always connect contacts X1-1 to X1-1 and contacts X1-2 to X1-2. Never connect X1-1 and X1-2.



A maximum of 10 appliances (1 Master + 9 Slave max.)

For M (Master):  
Set parameter 9 to 0 (= factory setting).  
Display shows ventilation mode 1, 2 or 3.

For C1 (Slave1):  
set parameter 9 to 1 (= Slave 1).  
Display always shows ventilation mode □.

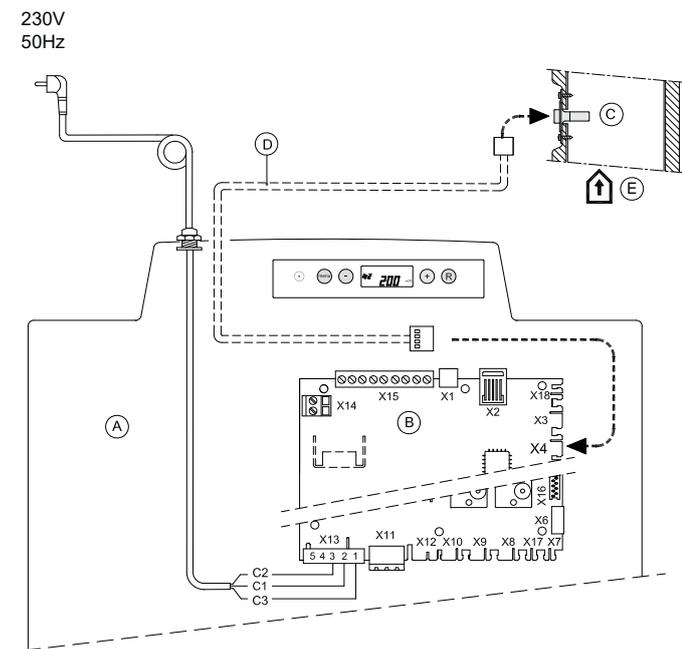
For C2 (Slave2):  
Set parameter 9 to 2 (= Slave 2).  
Display always shows ventilation mode □.

- A = Multiple switch
- B = 2-pole connector
- M = Renovent Excellent (Master)
- C1 t/m C\* = Renovent Excellent (Slave); couple not more than 10 appliances through Ebus

All Renovents have the same air flow rates as the Renovent set as "Master".

Step nr.	Description	Factory setting	Range
8	Communication type	eBus	0t (= Opentherm) eBus
9	eBus address	0	0 = master 1- 9 = slave 1 - 9

11.4 Connection RH (humidity) - sensor



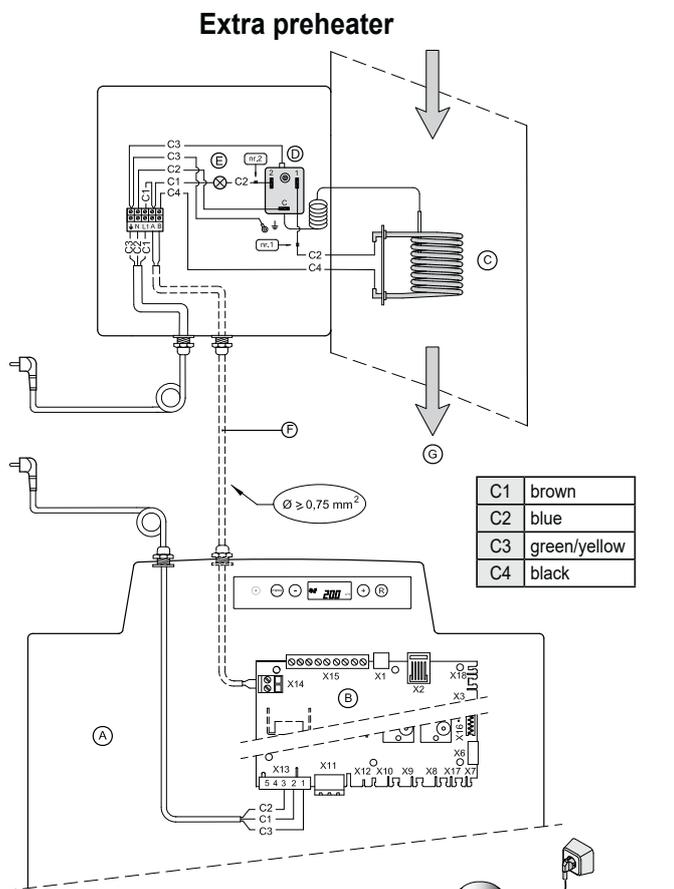
- A = Renovent Excellent
- B = Control board
- C = RH (humidity) - sensor
- D = Cable supplied with RH sensor
- E = Duct from dwelling ↑

- C1 = brown
- C2 = blue
- C3 = green/yellow

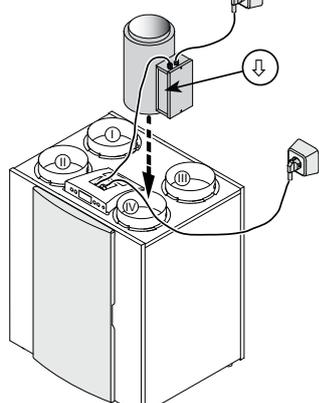
Step nr.	Description	Factory setting	Range
30	Activating RH-sensor	OFF	OFF = not active ON = active
31	Sensitivity	0	+2 most sensitive +1 ↑ 0 default setting RH-sensor -1 ↓ -2 least sensitive

### 11.5 Wiring diagram postheater connection (only possible for Renovent Excellent Plus)

The electrical connections of the postheater and the extra preheater are the same; the only difference is that the postheater has an additional temperature sensor that must be wired to connector X15. Please refer to the mounting instructions that came with the heater for more extensive information regarding installation of the postheater or the extra preheater.

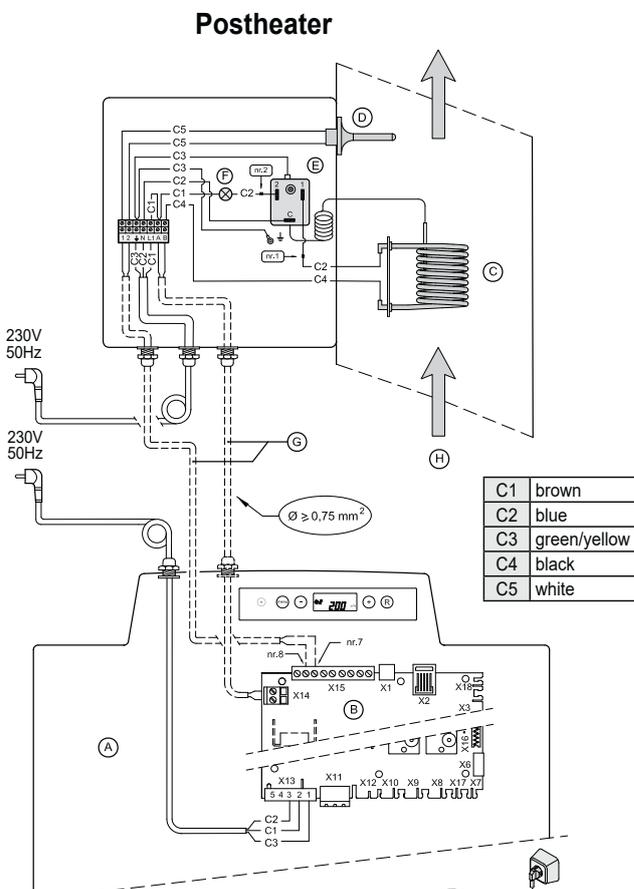


A	Renovent Excellent Plus
B	Control board Plus version
C	Heating coil max. 1000 W
D	Maximum safety with manual reset
E	LED maximum safety; lights up when activated
F	Cables to be connected by installer
G	Flow direction through the heater

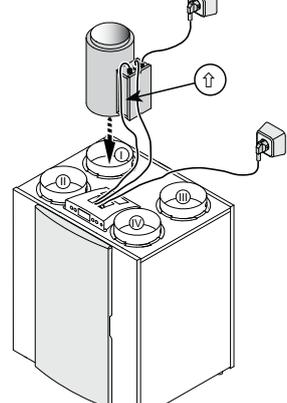


I =		To dwelling
II =		To atmosphere
III =		From dwelling
IV =		From atmosphere

Step nr.	Description	Factory setting	Range
13	Heater	0	0 = Off <b>1 = Preheater</b> 2 = Postheater



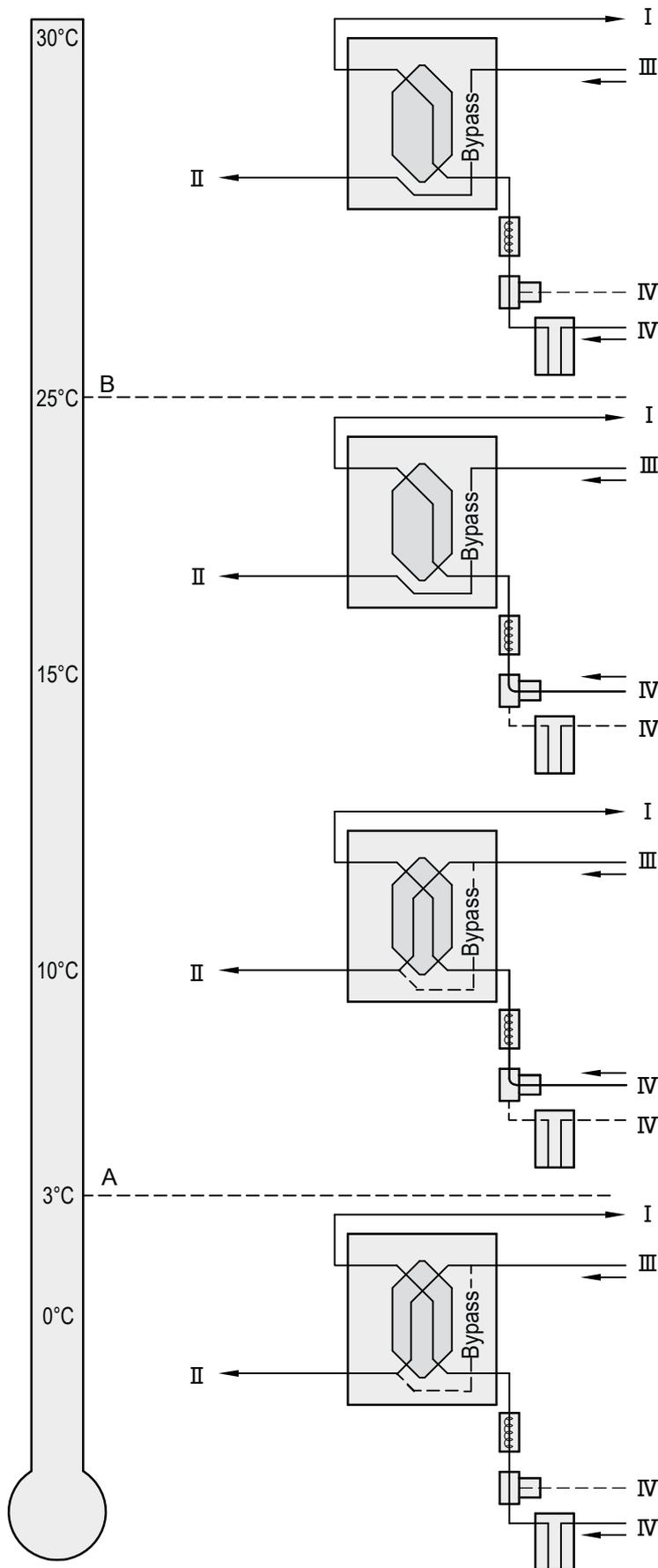
A	Renovent Excellent Plus
B	Control board Plus version
C	Heating coil max. 1000 W
D	Temperatursensor
E	Maximum safety with manual reset
F	LED maximum safety; lights up when activated
G	Cables to be connected by installer
H	Flow direction through the heater



I =		To dwelling
II =		To atmosphere
III =		From dwelling
IV =		From atmosphere

Stepnr.	Description	Factory setting	Range
13	Heater	0	0 = Off 1 = Preheater <b>2 = Postheater</b>
14	Temp. postheater	21°C	15°C - 30°C

11.6 Connection example geo heat exchanger (only possible for the Renovent Excellent Plus)



A geo heat exchanger can be connected to the Renovent Excellent Plus.

A geo heat exchanger can be connected to connection no. 5 (GND) and no. 9 (+) of 9-pole connector X15; this 9-pole connector is directly accessible at the rear of the top without having to dismount the display cover. Connect the outdoor temperature sensor to No. 7 and 8 of the 9-pole connector.

When the geo heat exchanger is connected, it is not possible any more to connect a postheater to the Renovent!

A = Min. temperature

B = Max. temperature

I = To dwelling 

II = To atmosphere 

III = From dwelling 

IV = From atmosphere 

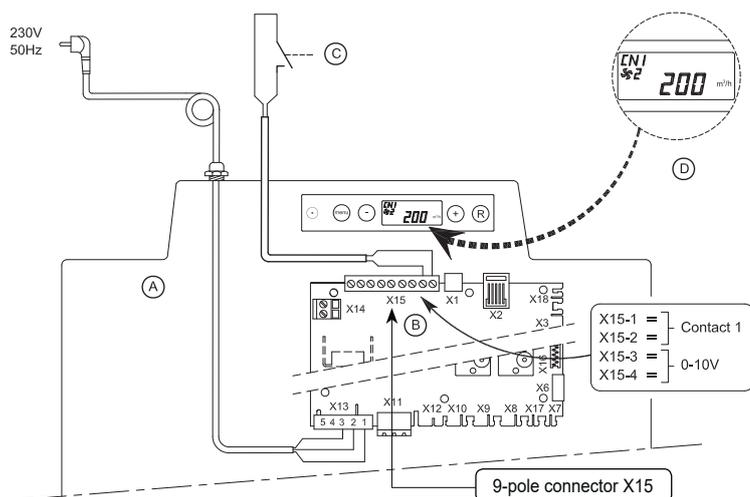
When using a geo heat exchanger, parameter 27 must be changed from "OFF" to "ON". When the air is routed through the geo heat exchanger, the Renovent Excellent Plus display shows the text "EWT".

Step no.	Description	Factory setting	Range
27	Switching on geo heat exchanger	OFF	ON = Switched on OFF = Switched off
28	Minimum temperature geo heat exchanger	5°C	0 - 10°C
29	Maximum temperature geo heat exchanger	25°C	15 - 40°C

### 11.7 Connecting external switch contact (only possible for Renovent Excellent Plus)

An external switch contact (e.g. switch or relay contact) can be connected to the Renovent Excellent Plus. This external switch contact can be connected to connections no. 1 and no. 2 of 9-pole connector X15; this 9-pole connector is directly accessible at the rear of the top without having to dismount the display cover (see also §11.1).

If a second input is required as external switch contact, if necessary connections no. 3 and no. 4 of the 9-pole connector X15, which as standard are preprogrammed as 0-10 volt input, can be reprogrammed as second input switch contact. Changing parameter 21 from "0" to "1" will turn this 0-10 V input into an input make contact. When using two switch inputs, switch contact 1 (X15-1 & X15-2) always takes priority over switch contact 2 (X15-3 & X15-4).



- A = Renovent Excellent Plus
- B = Plus version control board
- C = Contact connected to switch input 1; for instance a switch or a relay contact
- D = Display Renovent Excellent Plus (text "CN1" appears when contact C is closed.)

Modifying parameter 18 enables, when closing the input external switch contact 1 X15-1 and X15-2, five different situations for the extract fan to be set; dependent on the setting of parameters 19 and 20, the supply and extract fans can run at various flow rates (highest flow rate is shown on the display).

Setting Parameter 18	Function conditions	Situation supply fan extract fan	Setting parameters 19 and 20	Action supply or extract fan when closing contact inputs X15-1 & X15-2
0 (factory setting)	Contact input 1 15-1 & X15-2 closed	No action possible because contact input 1 has not been activated yet (parameter 18 is still at 0)		
1	Contact input 1 15-1 & X15-2 closed	Action dependent on setting supply fan (parameter 19) and extract fan (parameter 20)	0	Fan switches off
2	Contact input 1 15-1 & X15-2 closed Satisfies bypass conditions for valve open <sup>1</sup>		1	Fan minimum flow rate (50m³/h)
3	Contact input 1 15-1 & X15-2 closed	The bypass valve opens; automatic bypass control in Renovent Excellent is overruled; action fans dependent on parameters 19 & 20.	2	Fan to flow rate mode 1
			3	Fan to flow rate mode 2
			4	Fan to flow rate mode 3
4	Contact input 1 15-1 & X15-2 closed	The bedroom valves opens. Bedroom valve 24 volt is connected to X15-5 (24V GND) X15-6 (24V +) and X15-9 (0-10 V control); action fans dependent on parameters 19 & 20.	5	Fan to flow rate multiple switch
			6	Fan to maximum flow rate
			7	No fan activation

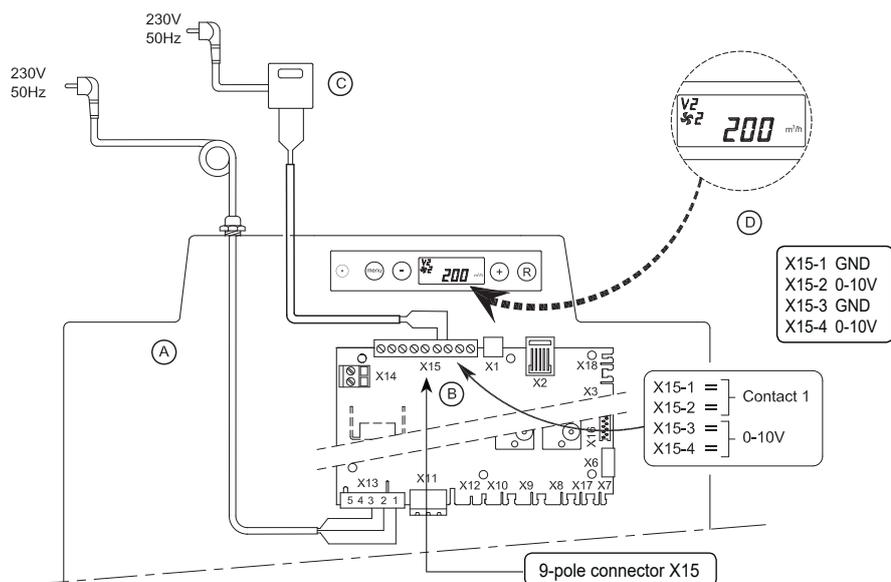
1) Bypass conditions opening valve: - outdoor temperature is higher than 10°C.  
 - temperature from atmosphere is at least lower than temperature from dwelling.  
 - temperature from dwelling is higher than the preset bypass temperature (parameter 5).

When connections X15-3 and X15-4 are programmed as switch input 2, parameters 24, 25 and 26 can be used to set the various situations the same as for contact input 1. When closing contact input 2, the display shows the text "CN2".

### 11.8 Connection to 0-10 V input (only possible for Renovent Excellent Plus)

The Renovent Excellent Plus can be equipped with an external provision with 0-10 volt control (e.g. humidity sensor or CO<sub>2</sub> sensor). This external provision can be connected to pins no. 3 and no. 4 of 9-pole connector X15; this 9-pole connector is directly accessible at the rear of the top without having to dismount the display cover (see also §11.1).

Connections X15-3 and X15-4 are set as standard as 0 - 10 V input; it is activated as standard. Parameter 21 is set "1" ex factory. When the connected provision is active, the display shows the message V2. The minimum and maximum voltage for connected provisions can be set between 0 and 10 volt with parameter 22 (minimum voltage) and 23 (maximum voltage). The minimum voltage for parameter 22 cannot be set higher than the voltage set for parameter 23; the maximum voltage for parameter 23 cannot be set lower than the voltage set for parameter 22.



- A = Renovent Excellent Plus
- B = Plus version control board
- C = Provision connected to 0-10 V input; for instance a humidity sensor or a CO<sub>2</sub> sensor. Connected provision has its own power supply.
- D = Display Renovent Excellent Plus (text "V2" appears when the provision is active on input 2.)

If a second 0-10 V input is required, if necessary connections no. 1 and no. 2 of the 9-pole connector X15, standard preprogrammed as switch contact, can be reprogrammed to a second input 0-10 V. Modifying parameter 15 from "0" to "1" makes this input into a proportional 0-10 V input. When using two 0 - 10 V inputs, the 0 - 10 V input with the highest flow rate always takes precedence.

Ex factory activated 0 - 10 V input (when active, the display shows the text "V2")				
Connection	Parameter	Description	Adjusting range	Factory setting
X15-3 & X15-4	21	do/ do not activate 0 - 10 V input	1 = Switched on 0 = Switched off	1
	22	minimum voltage 0 - 10 volt	0.0 volt - 10.0 volt	0.0 volt
	23	maximum voltage 0 - 10 volt	0.0 volt - 10.0 volt	10.0 volt

If connection X15-1 and X15-2 are programmed as second 0-10 V input, parameters 15, 16 and 17 can be used to modify the various situations the same as for the standard 0-10 V input. When the provision is active on the optional second 0-10 V input, the display shows the text "V1".

### 12.1 Exploded view

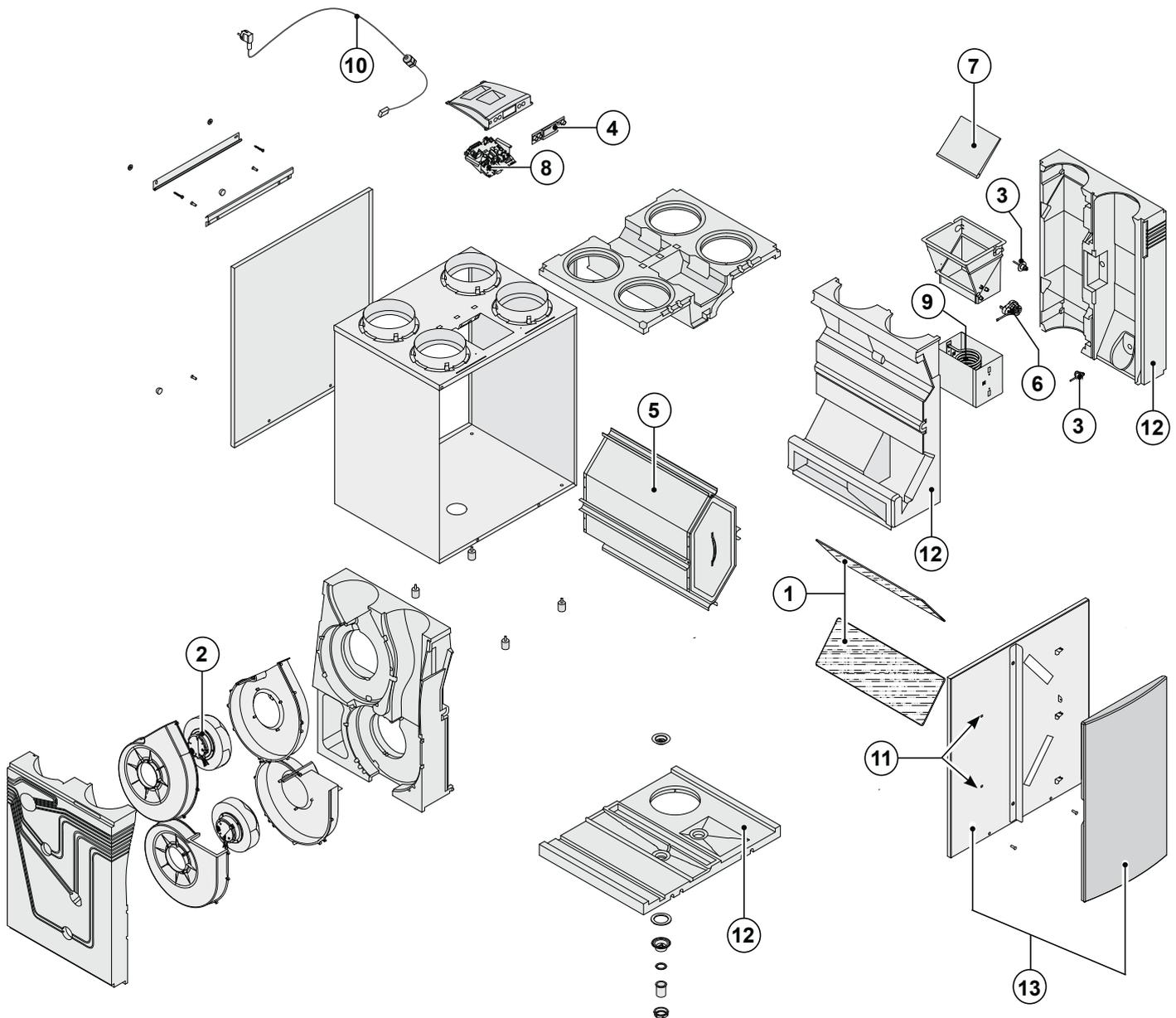
When ordering parts, in addition to the article code number (see exploded view), please state the type of the heat recovery appliance, the serial number, the year of production and the name of the part:

**N. B.:**

Appliance type, serial number and year of production are stated on the identification plate on the top of the appliance.

Example	
Appliance type	: Renovent Excellent 4/0 R
Serial number	: 420020222501
Year of production	: 2022
Part	: Fan
Article code	: 531774
Qty	: 1

### 12.2 Service parts



No.	Article description	Article code
1	Filter kit 2x ISO Coarse 45% (G3) filter (standard version)	531770
2	Fan Excellent 300/400 (1 pcs)	531774
3	Temperature sensor NTC 10K(1 pcs)	531775
4	Control panel UBP-01	531776
5	Heat exchanger Excellent 300	532179
	Heat exchanger Excellent 400	532180
6	Motor bypass valve	531778
7	Bypass valve	531779
8	Control board (Plus version) When replacing, note the correct dip switch settings; see §8.1	531780
9	Heating coil 1000 W preheater	531781
10	Cable with power plug 230 volt*	531782
11	Door closing (2 pcs)	531297
12	EPS set (3 pieces) incl. condensate outlet connection	531798
13	Filter door left	531934
	Filter door right	531935

- \* The mains cable has a print connector.  
When replacing it, always order a replacement mains cable Brink  
**To avoid dangerous situations, a damaged mains should only be replaced by a qualified person!**

#### Modifications reserved

Brink Climate Systems B. V. continuously strives after improvement of products and reserves the right to change the specifications without prior notice.

STEP NO.	DESCRIPTION	FACTORY SETTING	ADJUSTING RANGE	STEP	DISPLAY TEXT + SYMBOLS
01	Air flow rate mode Exc. 300 : mode	50 m <sup>3</sup> /h	0 m <sup>3</sup> /h or 50 m <sup>3</sup> /h		
	Air flow rate mode Exc. 400 : mode	50 m <sup>3</sup> /h	0 m <sup>3</sup> /h or 50 m <sup>3</sup> /h		
02	Air flow rate mode Exc. 300 : mode 1	100 m <sup>3</sup> /h	50 m <sup>3</sup> /h - 300 m <sup>3</sup> /h	5 m <sup>3</sup> /h	
	Air flow rate mode Exc. 400 : mode 1	100 m <sup>3</sup> /h	50 m <sup>3</sup> /h - 400 m <sup>3</sup> /h		
03	Air flow rate mode Exc. 300 : mode 2	150 m <sup>3</sup> /h	50 m <sup>3</sup> /h - 300 m <sup>3</sup> /h	5 m <sup>3</sup> /h	
	Air flow rate mode Exc. 400 : mode 2	200 m <sup>3</sup> /h	50 m <sup>3</sup> /h - 400 m <sup>3</sup> /h		
04	Air flow rate mode Exc. 300 : mode 3	225 m <sup>3</sup> /h	50 m <sup>3</sup> /h - 300 m <sup>3</sup> /h	5 m <sup>3</sup> /h	
	Air flow rate mode Exc. 400 : mode 3	300 m <sup>3</sup> /h	50 m <sup>3</sup> /h - 400 m <sup>3</sup> /h		
05	Bypass temperature	24,0 °C	15,0 °C - 35,0 °C	0,5 °C	BYPASS
06	Bypass hysteresis	2,0 °C	0,0 °C - 5,0 °C	0,5 °C	BY HYS
07	Operation bypass valve	0	0 (= Automatic) 1 (= Bypass valve closed) 2 (= Bypass valve open)		BYPASS
08	Communication	eBUS	Ot (= Opentherm) eBUS		OT/BUS
09	Bus address	0	0 - 9 (0 = Master)		BUSADR
10	Central heating + heat recover	OFF	OFF (= Central heating+heat rec. off) ON (= Central heating+heat rec. on)		CV+WTW
11	Imbalance permissible	ON	OFF (= flow rate sup. equals extract) ON (= imbalance permissible)		
12	Fixed imbalance	0 m <sup>3</sup> /h	-100 m <sup>3</sup> /h t/m 100 m <sup>3</sup> /h	1 m <sup>3</sup> /h	
STEP NO.	DESCRIPTION	FACT. SETTINGS REN. EXC. PLUS	ADJUSTING RANGE	STEP	DISPLAY TEXT + SYMBOLS
13	Heater	0	0 (= off) 1 (= preheater) 2 (= postheater)		HEATER
14	Temperature postheater	21,0 °C	15,0 °C - 30,0 °C	0,5 °C	HEATER
15	Selection input 1	0	0 (= normally open contact) 1 (= 0 - 10V input) 2 (= normally closed contact) 3 (= input 1/ bypas open → 12V; bypass closed → 0V) 4 (= input 1/ bypas open → 0V; bypass closed → 12V)		V1
16	Minimum voltage input 1	0,0 V	0 Volt - 10 Volt	0,5 V	V1 MIN
17	Maximum voltage input 1	10,0 V	0 Volt - 10 Volt	0,5 V	V1 MAX
18	Conditions switching input 1	0	0 (off) 1 (on) 2 (= On if conditions bypass open satisfied) 3 (= Bypass control) 4 (= Bedroom valve)		CN1
19	Supply fan mode switching input 1	5	0 (= Input fan off) 1 (= Absolute min. flow rate 50m <sup>3</sup> /h) 2 (= Flow rate mode 1) 3 (= Flow rate mode 2) 4 (= Flow rate mode 3) 5 (= Multiple switch) 6 (= Maximum flow rate) 7 (= no fan activation)		CN1

STEP NO.	DESCRIPTION	FACTORY SETTINGS REN. EXC. PLUS	ADJUSTING RANGE	STEP	DISPLAY TEXT + SYMBOLS
20	Extract fan mode switching input 1	5	0 (= Extract fan off) 1 (= Absolute min. flow rate 50m <sup>3</sup> /h) 2 (= Flow rate mode 1) 3 (= Flow rate mode 2) 4 (= Flow rate mode 3) 5 (= Multiple switch) 6 (= Maximum flow rate) 7 (= no fan activation)		CN1  
21	Selection input 2	1	0 (= normally open contact) 1 (= 0 - 10V input) 2 (= normally closed contact) 3 (= input 2/ bypas open →12V; bypass closed →0V) 4 (= input 2/ bypas open →0V; bypass closed →12V)		V2
22	Minimum voltage input 2	0,0 V	0,0 Volt - 10,0 Volt	0,5 V	V2 MIN
23	Maximum voltage input 2	10,0 V	0,0 Volt- 10,0 Volt	0,5 V	V2 MAX
24	Conditions switching input 2	0	0 (off) 1 (on) 2 (= On if conditions bypass open satisfied) 3 (= Bypass control) 4 (= Bedroom valve)		CN2
25	Supply fan mode switching input 2	5	0 (= Input fan off) 1 (= Absolute min. flow rate 50m <sup>3</sup> /h) 2 (= Flow rate mode 1) 3 (= Flow rate mode 2) 4 (= Flow rate mode 3) 5 (= Multiple switch) 6 (= Maximum flow rate) 7 (= No input fan activation)		CN2  
26	Extract fan mode switching input 2	5	0 (= Extract fan off) 1 (= Absolute min. flow rate 50m <sup>3</sup> /h) 2 (= Flow rate mode 1) 3 (= Flow rate mode 2) 4 (= Flow rate mode 3) 5 (= Multiple switch) 6 (= Maximum flow rate) 7 (= No extract fan activation)		CN2  
27	Geo heat exchanger	OFF	OFF (= Valve control geo heat exchanger off) ON (= Valve control geo heat exchanger on)		EWT
28	Minimum temperature geo heat exchanger (Below this temperature the valve opens.)	5,0 °C	0,0 °C - 10,0 °C	0,5 °C	EWT T- 
29	Maximum temperature geo heat exchanger (Above this temperature the valve opens.)	25,0 °C	15,0 °C - 40,0 °C	0,5 °C	EWT T+ 
STEP NO.	DESCRIPTION	FACTORY SETTING	ADJUSTING RANGE	STEP	DISPLAY TEXT + SYMBOLS
30	RH-sensor	OFF	OFF (= RH-sensor not active) ON (= RH-sensor active)		
31	Sensitivity RH-sensor	0	+2 most sensitive +1 ↑ 0 default setting RH-sensor -1 ↓ -2 least sensitive		

STEP NO.	DESCRIPTION	FACTORY SETTING RENOVENT SKY PLUS	ADJUSTING RANGE	STEP
35	Switching on and off eBus CO <sub>2</sub> sensor	OFF	ON - OFF	-
36	Min. PPM eBus CO <sub>2</sub> -sensor 1	400	400-2000	25
37	Max. PPM eBus CO <sub>2</sub> -sensor 1	1200		
38	Min. PPM eBus CO <sub>2</sub> -sensor 2	400		
39	Max. PPM eBus CO <sub>2</sub> -sensor 2	1200		
40	Min. PPM eBus CO <sub>2</sub> -sensor 3	400		
41	Max. PPM eBus CO <sub>2</sub> -sensor 3	1200		
42	Min. PPM eBus CO <sub>2</sub> -sensor 4	400		
43	Max. PPM eBus CO <sub>2</sub> -sensor 4	1200		
44	Flow correction	100%	90% - 110%	%
45	Default position switch	1	0 - 1	-

STEP NO.	DESCRIPTION	FACTORY SETTING	ADJUSTING RANGE	STEP
46	Brink Connect	1	1 Brink Connect function (extern, Brink Connect no RHT sensor) 3 Brink Connect (intern )	



Productdatasheet conform Ecodesign (EU), nr. 1254/2014 (Annex IV)					
Supplier:		Brink Climate Systems B.V.			
Model:		Renovent Excellent 300 (Plus)			
Climate zone	Type of control	SEC-Value in kWh/m <sup>2</sup> /a	Energyclass (SEC)	The annual electricity consumption (AEC) in kWh	The annual heating saved (AHS) in kWh
Average	Manual	-37,52	A	308	4454
	Clock	-38,38	A	282	4477
	Central demand control	-40,01	A	235	4521
	Local demand control	-42,88	A+	156	4611
Cold	Manual	-74,75	A+	845	8714
	Clock	-75,82	A+	819	8758
	Central demand control	-77,88	A+	772	8845
	Local demand control	-81,60	A+	693	9019
Warm	Manual	-13,57	F	263	2014
	Clock	-14,31	E	237	2024
	Central demand control	-15,69	E	190	2045
	Local demand control	-18,07	E	111	2085
Type of ventilation unit:		Ventilation unit with heat recovery			
Fan:		Variable speed EC fan			
Type of heat exchanger:		Recuperative plastic cross-counterflow heatexchanger			
Thermal efficiency:		86%			
Maximum flow rate:		300 m <sup>3</sup> /h			
Electric power input:		92 W			
Sound power level Lwa:		44 dB(A)			
Reference flow rate :		210 m <sup>3</sup> /h			
Reference pressure difference:		50 Pa			
Specific Power Input (SEL):		0,21 Wh/m <sup>3</sup>			
Control factor:		1,0 in combination with manual switch			
		0,95 in combination with clock			
		0,85 in combination with central demand control with 1 sensor			
		0,65 in combination with local demand control with at least two or more sensors and with at least a two-zone control			
Leakage*:	Internal	0,8%			
	External	2,1%			
Filterwarning:		On the display of the ventilation unit / Manual switch / clock control. <b>Attention!</b> For optimal energy efficiency and a proper operation a regular filter inspection, cleaning or replacement is necessary.			
Internet address for Assembly instructions:		<a href="https://www.brinkclimatesystems.nl/support/downloads">https://www.brinkclimatesystems.nl/support/downloads</a>			
Bypass:		Yes; 100% Bypass			

\* Measurements executed by TNO according to the EN 13141-7 standard (TNO-report TNO 2013 M10230, Februari 2013)

Classification from 1 January 2016	
SEC Class („Average climate“)	SEC in kWh/m <sup>2</sup> /a
A+ (Most efficient)	SEC < -42
A	-42 ≤ SEC < -34
B	-34 ≤ SEC < -26
C	-26 ≤ SEC < -23
D	-23 ≤ SEC < -20
E (Least efficient)	-20 ≤ SEC < -10

Productdatasheet conform Ecodesign (EU), nr. 1254/2014 (Annex IV)					
Supplier:		Brink Climate Systems B.V.			
Model:		Renovent Excellent 400 (Plus)			
Climate zone	Type of control	SEC-Value in kWh/m <sup>2</sup> /a	Energyclass (SEC)	The annual electricity consumption (AEC) in kWh	The annual heating saved (AHS) in kWh
Average	Manual	-36,26	A	346	4423
	Clock	-37,23	A	316	4447
	Central demand control	-39,06	A	262	4494
	Local demand control	-42,27	A+	172	4590
Cold	Manual	-73,18	A+	883	8652
	Clock	-74,38	A+	853	8699
	Central demand control	-76,67	A+	799	8792
	Local demand control	-80,79	A+	709	8979
Warm	Manual	-12,48	F	301	2000
	Clock	-13,32	E	271	2011
	Central demand control	-14,89	E	217	2032
	Local demand control	-17,58	E	127	2075
Type of ventilation unit:		Ventilation unit with heat recovery			
Fan:		Variable speed EC fan			
Type of heat exchanger:		Recuperative plastic cross-counterflow heatexchanger			
Thermal efficiency:		85%			
Maximum flow rate::		400 m <sup>3</sup> /h			
Electric power input:		142 W			
Sound power level Lwa:		48 dB(A)			
Reference flow rate :		280 m <sup>3</sup> /h			
Reference pressure difference:		50 Pa			
Specific Power Input (SEL):		0,24 Wh/m <sup>3</sup>			
Control factor:		1,0 in combination with manual switch			
		0,95 in combination with clock			
		0,85 in combination with central demand control with 1 sensor			
		0,65 in combination with local demand control with at least two or more sensors and with at least a two-zone control			
Leakage*:	Internal	0,4%			
	External	1,3%			
Filterwarning:		On the display of the ventilation unit / Manual switch / clock control. <b>Attention!</b> For optimal energy efficiency and a proper operation a regular filter inspection, cleaning or replacement is necessary.			
Internet address for Assembly instructions:		<a href="https://www.brinkclimatesystems.nl/support/downloads">https://www.brinkclimatesystems.nl/support/downloads</a>			
Bypass:		Yes; 100% Bypass			

\* Measurements executed by TNO according to the EN 13141-7 standard (TNO-report TNO - 060 - DTM - 2013 - 01161, May 2013)

Classification from 1 January 2016	
SEC Class („Average climate“)	SEC in kWh/m <sup>2</sup> /a
A+ (Most efficient)	SEC < -42
A	-42 ≤ SEC < -34
B	-34 ≤ SEC < -26
C	-26 ≤ SEC < -23
D	-23 ≤ SEC < -20
E (Least efficient)	-20 ≤ SEC < -10



*Air for life*

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