

Option Box

Installateurshandleiding

Installers manual

Installations Anleitung

Manuel de l'installateur

Manuale per l'installatore

Instrukcja obsługi dla instalatora

Manual para instaladores

Heating

Cooling

Fresh Air

Clean Air



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¹ Only available in Switzerland
² Not allowed in Belgium

Read this document and the documentation of the ventilation unit carefully before installing this device.

With this document you can install and perform the maintenance of the OptionBox for the ComfoAir Q, Comfort Vent Q and Aeris NEXT in a safe and optimal manner. In this document the OptionBox will be referred to as “device” and the ComfoAir Q Comfort Vent Q and Aeris NEXT will be referred to as “the ventilation unit”. The device is subject to continuous development and improvement. Therefore the device may be slightly different from the given descriptions.

!? **Questions**

Contact your supplier if you have any questions. In the back of this document is a list of the contact details for the main suppliers.

Use of the system

The device is part of a balanced ventilation system and does not work stand alone. Therefore the use, safety and warranty instructions of the ventilation unit also apply for this device. Please read this document and the documentation of the ventilation unit carefully before using this device.

1 Safety

- Always obey the safety regulations, warnings, comments and instructions given in this document. When the safety regulations, warnings, comments and instructions in this document are not obeyed personal injury or damage to the device can occur;
- Always obey the general and locally applicable construction, safety and installation instructions of the local council, electricity and water boards or other agencies;
- After installation all parts that can cause personal injury are secured behind the casing. Tools are required to open the casing;
- The installation, commissioning and maintenance must be carried out by

a certified engineer unless instructed differently. A non-certified engineer can cause personal injury or damage the performance of the ventilation system;

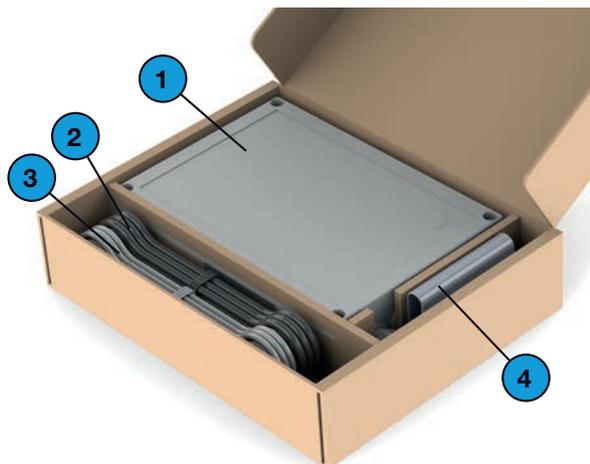
- Do not modify the device or the specifications given in this document. A modification can cause personal injury or damage the performance of the ventilation system;
- Always disconnect all poles of the power supply of the device, optional connected ComfoSplitter and ventilation unit before you start working on the ventilation system. The device or ventilation system can cause personal injury when it is open while running/switched on. Make sure the device and ventilation unit cannot switch back on by accident;
- Only install a post-heater with a SELV (Safety Extra Low Voltage) 0-10V connection and own temperature safety control. The system is not designed to be safe when using post-heater without SELV connection and temperature safety control;
- Always take ESD-inhibiting measures when dealing with electronics, such as wearing an antistatic wristband. The electronics can be damaged by static charges.

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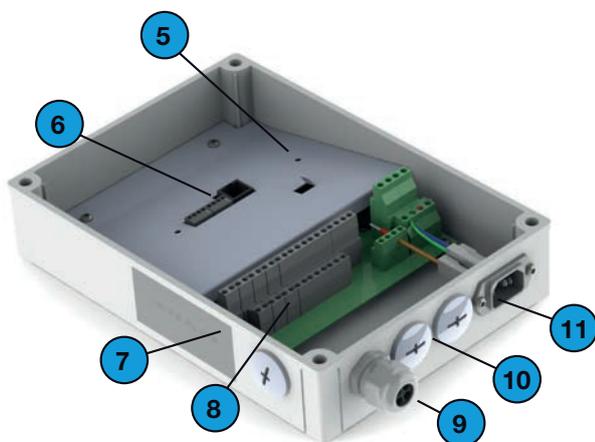
2 Technical specifications

Checking the delivery

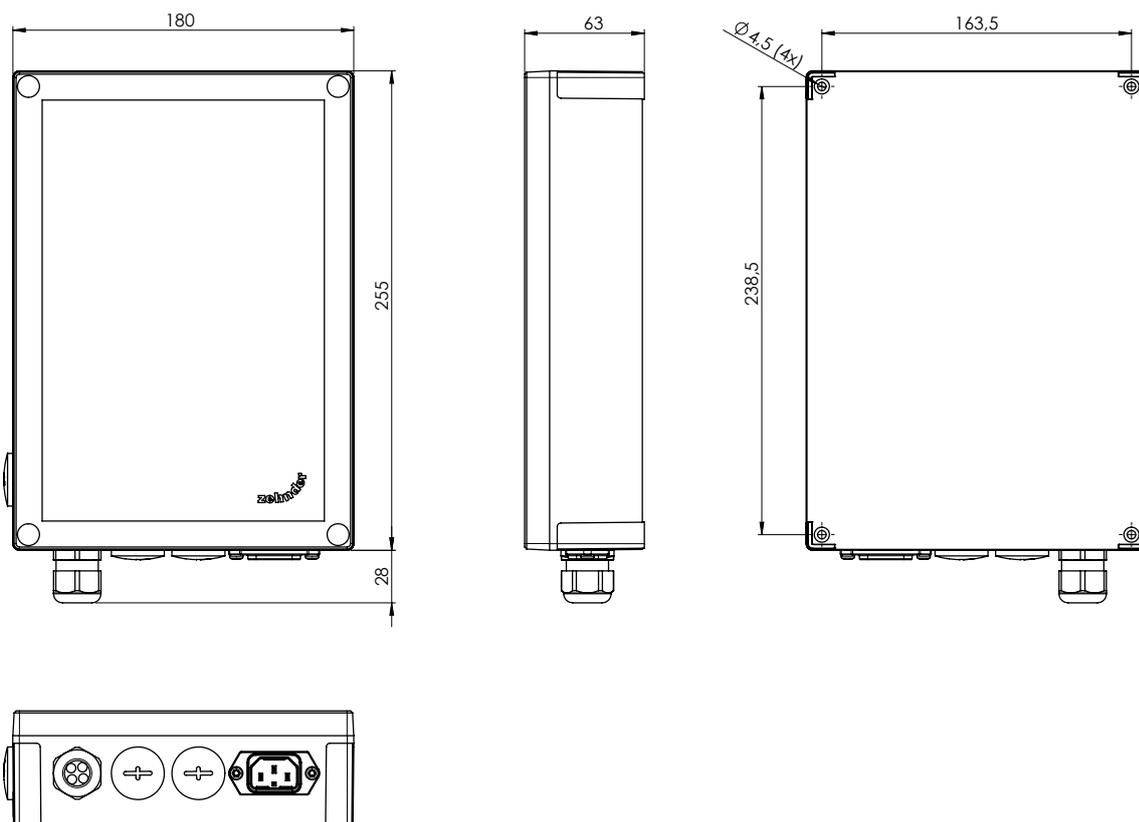


Position	Part
1	Option box
2	Power cable 230V (2.5m)
3	ComfoNet cable (2.5m)
4	Accessories bag
5	Protection cover
6	ComfoNet connectors
7	Identification plate
8	Ancillary connectors (see wiring diagram for more details)
9	Cable gland M20x1.5 4x5 Input for a maximum of 4 low voltage cables or one high voltage cable when interchanged for a gland with one opening.
10	Cable gland cover M20x1.5 Interchangeable for a cable gland to create an input for a maximum of 4 sensor cables or one 230V cable.
11	Power supply 230V

Device configuration

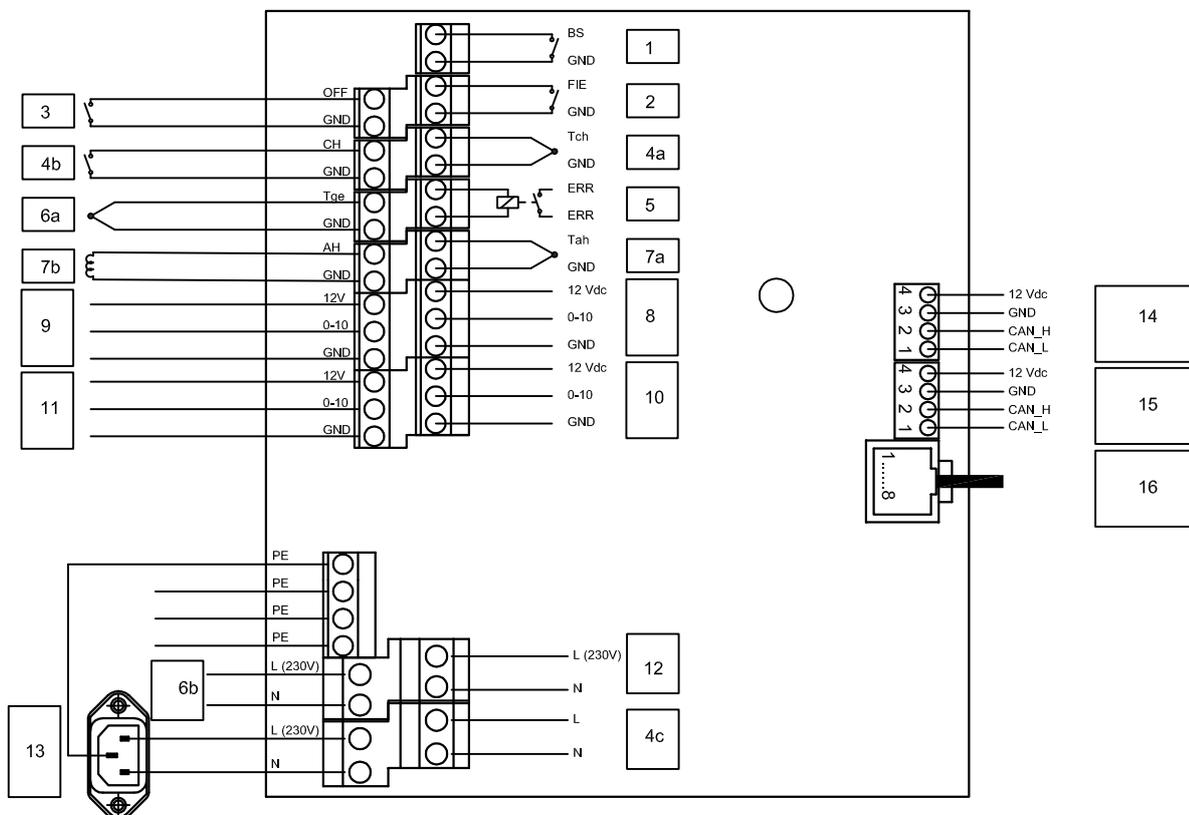


Dimension sketch



Wiring diagram

		Technical specifications			
Code	Meaning	Interface	U _{max}	I _{max}	L _{max-wiring}
1	Bathroom switch	Digital	Vdc	1mA	30m
2	External filter error input	Digital	Vdc	1mA	30m
3	Standby switch ²	Digital	Vdc	1mA	30m
4a	ComfoHood ¹ temperature sensor	Analog	Vdc	1mA	30m
4b	ComfoHood ¹ switch	Digital	Vdc	1mA	30m
4c	ComfoHood ¹ valve	230Vac switched	230Vac	4A	30m
5	Error contact	Potential free contact	230Vac	1A	30m
6a	ComfoFond-L Q temperature sensor / Sub-soil heat exchanger valve sensor (10kΩ @ 25°C)	Analog	Vdc	1mA	30m
6b	ComfoFond-L Q pump	230Vac switched	230Vac	<4A	30m
7a	Post-heater temperature sensor (10kΩ @ 25°C)	Analog	Vdc	1mA	30m
7b	Post-heater control	0 - 10Vdc output	10Vdc	10mA	30m
8	0-10V input 3	0 - 10Vdc input	12Vdc	37,5mA	30m
9	0-10V input 1	0 - 10Vdc input	12Vdc	37,5mA	30m
10	0-10V input 4	0 - 10Vdc input	12Vdc	37,5mA	30m
11	0-10V input 2	0 - 10Vdc input	12Vdc	37,5mA	30m
12	Sub-soil heat exchanger valve	230Vac constant	230Vac	4A	30m
13	Mains power connector	±10%, single phase, 50Hz	230Vac	10A	2.5m
<p> The mains power is needed to power the 230V functions (code 4c, 6b and 12). All other functions are powered through the ComfoNet. I_{max} of the ComfoNet powered tconnectors together: <150mA I_{max} of code 4c, 6b and 12 together: 10A</p>					
14	ComfoNet connector	plug-in	12Vdc	37,5mA	30m
15	ComfoNet connector	plug-in	12Vdc	37,5mA	30m
16	ComfoNet connector ⁴	RJ45	12Vdc	37,5mA	30m

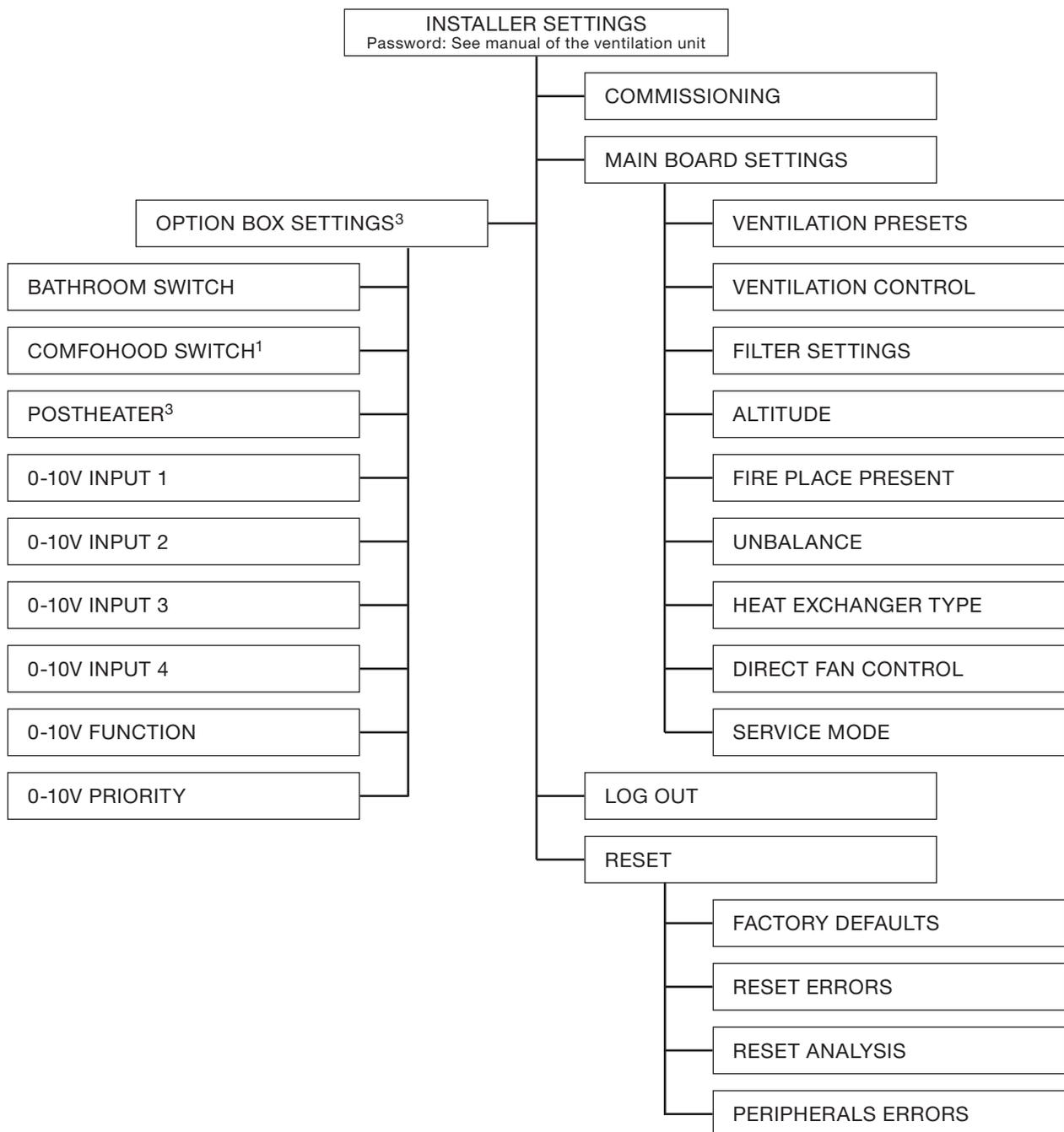


¹ Only available in Switzerland

² Not allowed in Belgium

⁴ For service applications

Menu structure ventilation unit installer menus



General

Material housing	ABS
IP classification	IP40
ISO classification	B
Weight	1.3kg
Temperature range installation area	0°C to 45°C
Relative air humidity installation area	<90%; non-condensing

¹ Only available in Switzerland

³ This menu is only visible when the accessory is connected to the device.

Installation procedure

Be aware of electromagnetic interference (EMC) during installation.

- For the low voltage cables use a cable with the following requirements:
 - Maximum length: 30m
 - Recommended Ø: 0,60mm²
 - Minimum Ø: 0,25mm²
 - Maximum Ø: 1,00mm²
- Make sure there is a barrier (e.g. separate channel or compartment) or minimum distance of 150 mm between power cables (e.g. 230V) and cables susceptible to interference (e.g. control, low voltage, interface, LAN, digital or analogue signal);
- If interfering power cables and cables susceptible to interference need to intersect each other, make sure that this occurs perpendicularly;
- Install one cable per gland opening;
- Use the glands with one opening for high voltage cables;
- Use the glands with four openings for low voltage cables.

These measures will minimise the EMC disturbance as much as possible and will provide the best communication.

Low voltage cable

Bathroom switch
 External filter error input
 Standby switch
 ComfoHood¹ temperature sensor
 ComfoHood¹ switch
 Error contact
 ComfoFond-L Q temperature sensor
 Post-heater temperature sensor
 Post-heater control
 0-10V input
 ComfoNet cable

High voltage cable

ComfoHood¹ valve
 ComfoFond-L Q pump
 Sub-soil heat exchanger valve

<p>1</p> 	<p>2</p> 	<p>3</p> 
<p>Install the ventilation unit as described in its own documentation.</p> <p>When the ventilation unit is already installed: disconnect the power to the ventilation unit and access the ComfoNet connectors.</p>	<p>Connect the data cable to a non-connected ComfoNet plug-in connection on the ventilation unit and device:</p> <p>a. 12 Vdc: Red b. GND: Black c. CAN_H: Yellow d. CAN_L: White</p>	<p>Mount the device to the wall, with the 4 delivered screws, next to the ventilation unit.</p>
<p>1</p> <p>Example ancillaries</p> 	<p>2</p> 	<p>3</p> 
<p>Install the necessary ancillaries as instructed in their associated manuals.</p>	<p>Install the power cable if one of the following ancillaries are connected:</p> <ul style="list-style-type: none"> ■ ComfoHood¹ valve; ■ ComfoFond-L pump; ■ Sub-soil heat exchanger valve. 	<p>Close the device and commission the connected ancillaries as instructed in their associated manuals or in the next chapters.</p>

¹ Only available in Switzerland

3 Bathroom switch



The device is equipped with an optional time control to quickly decrease the moisture in your bathroom. This is done by setting the airflow temporarily to PRESET 3 (BOOST mode) with a switch in the bathroom.

Installation

Install a (bathroom) switch to connector 1 (see the wiring diagram).

Commissioning

After installation, commission the switch in the ventilation unit OPTION BOX SETTINGS menu. The following menus must be set:

Menu item	Function
<p>DELAY-ON TIMER</p> <p>(Not possible if a pulse-switch is installed. Keep this setting on "0 min." when using a pulse-switch.)</p> <p>(Default = 0 min.)</p>	<p>The exact time before the ventilation unit will start running at PRESET 3 after turning on the bathroom switch.</p> <p>If the bathroom switch is stopped within the set time the ventilation unit will act like the bathroom switch has never been switched on.</p>
<p>OVER-RUN TIMER</p> <p>(First set time and then choose mode)</p> <p>(Default = 30 min. Default = FIXED)</p>	<ul style="list-style-type: none"> ■ FIXED: The exact time the ventilation unit will stay running at PRESET 3 after turning off the bathroom switch. (Use if a pulse-switch is installed) ■ MIRROR: The maximum time the ventilation unit will stay running at PRESET 3 after turning off the bathroom switch. The unit will stay at PRESET 3 for the same duration as the time the bathroom switch had been switched on. If the bathroom switch has been switched on longer than the set MIRROR time, the air volume will switch to the normal airflow when the timer runs out.

Operation

See paragraph commissioning.

4 External filter



The device is equipped with an optional external filter error contact on which a filter error switch can be connected to alert the end user when the external filter must be replaced.

Installation

Install the error switch of an external filter to connector 2 (see the wiring diagram). Read the manual of the external filter for the rest of the installation procedure.

Commissioning

After installation there is no need to commission the switch on the ventilation unit.

Operation

The ventilation unit will display an error when the switch is closed.

5 Standby switch²



The device is equipped with an optional standby contact on which a standby switch can be connected to remotely activate the service mode on the ventilation unit.

Installation

Install a standby switch to connector 3 (see the wiring diagram).

Commissioning

After installation there is no need to commission the switch on the ventilation unit.

Operation

The ventilation unit will go into service mode when the switch is closed.



The ventilation is turned off during service mode.

Do not forget to turn the switch off again to restart ventilation.

² Not allowed in Belgium

6 ComfoHood¹



The device is equipped with an optional control to quickly and safely extract cooking smells and moisture from the kitchen. This is done by setting the airflow to PRESET 3 and opening the valve of the ComfoHood¹ cooker hood.

Installation

1. Install the ComfoHood¹ temperature sensor to connector 4a (see the wiring diagram).
2. Install the ComfoHood¹ switch to connector 4b (see the wiring diagram).
3. Install the ComfoHood¹ valve to connector 4c (see the wiring diagram).
4. Install the mains power cable of the device.

Commissioning

After installation there is no need to commission the ComfoHood1 on the ventilation unit. However it is possible to set an overrun timer in the ventilation unit OPTION BOX SETTINGS menu.

Operation

The ventilation unit will go to PRESET 3 and open the ComfoHood1 valve when the switch is closed. If the preset is adjusted manually while the switch is closed the ComfoHood¹ valve will remain open and the ventilation unit will go to the selected preset. When a time is set in the ventilation unit OPTION BOX SETTINGS menu, the ComfoHood¹ valve will remain open and the ventilation unit will stay in PRESET 3 for the set time after opening the switch.

Safety function

If the sensor of the ComfoHood¹ detects a temperature higher than 60°C the ventilation unit will close the ComfoHood1 valve within 10 seconds, return to the normal ventilation PRESET and give the error HOOD_TEMP ERROR on the display of the ventilation unit.

If the connection with the sensor of the ComfoHood¹ is lost, the ventilation unit will close the ComfoHood¹ valve within 10 seconds, return to the normal ventilation PRESET and give the error HOOD_CONNECT ERROR on the display of the ventilation unit.

7 Error message contact



The device is equipped with an optional potential-free error message output contact to remotely indicate the presence of an error on the ventilation unit.

Installation

Install an error indicator (e.g. LED) and its power supply to connector 5 (see the wiring diagram).

If desired you can use one of the power supplies for the 0-10V inputs to power the error indicator. (GND to ERR 1 – ERR 2 to indicator – indicator to 12V)

Commissioning

After installation there is no need to commission the error indicator on the ventilation unit.

Operation

The ventilation unit will close connector 5 when the ventilation unit has an error.

8 ComfoFond-L Q



The device is equipped with an optional control of a sub-soil heat exchanger to preheat or precool the outdoor air.

The ComfoFond-L Q is an air to liquid closed circuit ground heat exchanger especially designed for the ventilation unit.

Installation

1. Install the ComfoFond-L Q pump to connector 6b (see the wiring diagram).
2. Install the ComfoFond-L Q outdoor temperature sensor to connector 6a (see the wiring diagram).
3. Install the mains power cable of the device.

Commissioning

After installation there is no need to commission the ComfoFond-L on the ventilation unit.

Operation

The ventilation unit will control the 6b (pump) connector with the information received from the 6a (temperature sensor) connector.

The first two minutes after powerup of the ventilation unit the sensor has not send enough information yet to know if the ComfoFond-L needs to be turned on. Therefore the ComfoFond-L will remain off for at least the first two minutes after powerup of the ventilation unit.

When the ventilation unit is able to reach the requested supply air without the assistance of the ComfoFond-L the ComfoFond-L will remain off. If the ComfoFond-L gives a poor result on the outdoor air temperature at the ventilation unit, the ventilation unit will turn the ComfoFond-L off.

¹ Only available in Switzerland

If the connection with the sensor of the ComfoFond-L is lost the ventilation unit will turn the ComfoFond-L off and give the error GROUND_HEAT_CONNECT_ERROR on the display of the ventilation unit.

9 Post-heater



The device is equipped with an optional control for a post-heater to (pre)heat the supply air.

If the house has very limited thermal losses (e.g. passive house), the post-heater may be the only active source to heat the house.⁵ Otherwise a post-heater can be used to prevent for sense of draught.

Installation

The device supports electrically controlled post-heaters with 0-10V input. PWM (Pulse Width Modulation) input is not supported.

The device is only for the control of a post-heater and does not deliver the needed 230V power supply for the post-heater.

⚠ Only a post-heater with SELV 0-10V may be used. This means the power supply of the post-heater must be double insulated from the sensor and 0-10V control. The device also does not provide any safety controls such as a high temperature thermal cutoff.

1. Install a NTC temperature sensor (10kΩ @ 25°C) after the post-heater in the supply air to connector 7a (see the wiring diagram).
2. Install the 0-10V control of a post-heater to connector 7b (see the wiring diagram).
3. Make sure the post-heater is equipped with a high temperature thermal cutoff.
4. Install the power supply of the post-heater to a different group in the fuse box than the ventilation unit.

Commissioning

After installation, commission the post-heater in the ventilation unit OPTION BOX SETTINGS menu.

The following menus must be set:

Menu item	Function
PROPORTIONAL BAND (Default = 10°C)	The proportional band value, which the ventilation unit must use in its calculations for the output signal.
INTEGRAL TIME (Default = 180s)	The integral time value, which the ventilation unit must use in its calculations for the output signal.

The default settings have been optimized for electrical postheaters of (CV-MPX 200) 2.4kW and should be acceptable for electrical post-heater between 0.5kW and 3.6kW.

The higher the value of the proportional band, the less immediate response to an error. The lower the value, the less stable the response to measurement errors. If instabilities occur at stable setpoints (no changes), the proportional band should be doubled.

The higher the value of the integral time, the slower the response to errors in time. If instabilities occur to setpoint changes, the integral time should be doubled. In chapter "Proportional Integral Differential (PID) controller" you can find more information on the proportional band and integral timer.

Operation

The ventilation unit will control the 7b (control signal) connector from the information received with the 7a (temperature sensor) connector and the setpoint.

The first two minutes after powerup of the ventilation unit the temperature sensor has not reached the actual temperature yet to know if the post-heater needs to be turned on. Therefore the post-heater will remain off for at least the first two minutes after powerup of the ventilation unit.

The end user can influence the behaviour of the post-heater by means of setting a control mode, a timer and/ or a comfort profile. You can find information on the possibilities in the user manual of the ventilation unit.

If the connection with the sensor of the post-heater is lost, the ventilation unit will turn the post-heater off and give the error POSTHEAT_CONNECT_ERROR on the display of the ventilation unit.

⁵ Must be determined by the installer of the heating system.

10 0-10V inputs



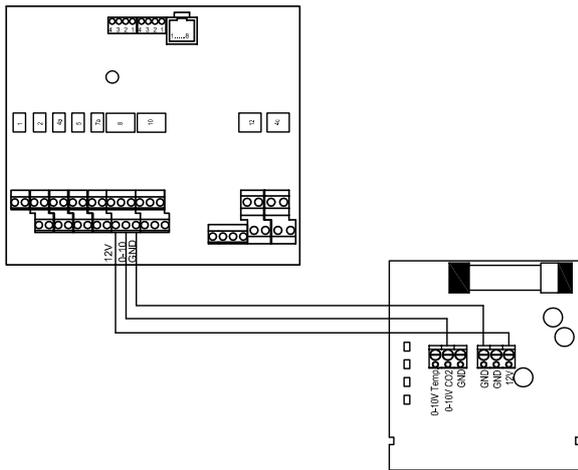
The device is equipped with four optional 0-10V inputs to control the airflow of the ventilation unit. Any sensor or switch within the 0-10V range can be connected to one of the inputs.

Installation

The complete ComfoNet system is limited to deliver a maximum of 150mA. If all connected devices need more the 150mA you need to install a powered ComfoSplitter.

1. Install the first desired sensor or switch to connector 9 (see the wiring diagram).
2. Install the second desired sensor or switch to connector 11 (see the wiring diagram).
3. Install the third desired sensor or switch to connector 8 (see the wiring diagram).
4. Install the fourth desired sensor or switch to connector 10 (see the wiring diagram).
5. If mentioned in the sensor/switch manual: Install the separate power supply of the sensor/switch.

Example Wiring diagram CO₂ sensor



Commissioning

After installation, commission the connected sensor(s) and/or switch(es) in the ventilation unit OPTION BOX SETTINGS menu. Enable the connected input.

You can set the response to the input and the method of interaction for each 0-10V input independently. This way you can combine different types of sensors in one system.

You can set the 0-10V function and the priority for all 0-10V inputs.

It should be considered, that the range of interaction is always between the selected preset and the maximum allowable volume. For optimal control, therefore preset 1 should always be selected. Basic ventilation is guaranteed; request for more is delivered by the 0-10V inputs.

The following menus must be set for each connected 0-10V input:

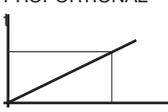
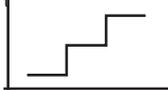
Menu item	Function
INPUT AT 0%	The required input signal to get 0% output signal from the ventilation unit. If the connected ancillaries need negative control, set this value higher than the value at INPUT at 100%.
INPUT AT 100%	The required input signal to get 100% output signal from the ventilation unit. If the connected ancillaries need positive control, set this value higher than the value at INPUT at 0%.
METHOD	<ul style="list-style-type: none"> ■ STEER: the input signal will result in a rectilinear proportional output signal; ■ CONTROL: the ventilation unit will control the output signal to a setpoint. (When the input signal is different from the setpoint the output signal will be adjusted to try to reach the setpoint.)
CONTROL SETTINGS <small>(Only relevant if METHOD CONTROL is selected)</small>	<ul style="list-style-type: none"> ■ SETPOINT: the setpoint, which the ventilation unit must try to maintain; ■ PROPORTIONAL BAND: the proportional band value, which the ventilation unit must use in its calculations for the output signal; ■ INTEGRAL TIME: the integral time value, which the ventilation unit must use in its calculations for the output signal.

In chapter “Control method” you can find more information on the difference between steer and control.

In chapter “Proportional Integral Differential (PID) controller” you can find more information on the proportional band and integral timer.

The following menus must be set for all connected 0-10V input:

■ 0-10V FUNCTION

Menu item	Function
FLOW-PROPORTIONAL	the ventilation unit will translate the incoming signal from a 0-10V sensor into a corresponding airflow request between the minimal and maximal set airflow. 
FLOW_PRESET	the ventilation unit will translate the incoming signal from a 0-10V sensor into one of the airflow presets 

■ 0-10V PRIORITY

Menu item	Function
ON	The ventilation unit will respond to the 0-10V signal in AUTO and MANUAL mode.
AUTO ONLY	The ventilation unit will only respond to the 0-10V signal in AUTO mode.
OFF	The ventilation unit will ignore the 0-10V signal.

Settings advice⁶

CO2 sensor (0-2000 ppm)

Menu item	Setting
INPUT AT 0%	10.0V (2000 ppm)
INPUT AT 100%	2.0V (400 ppm)
METHOD	CONTROL
SETPOINT	5.0V (1000 ppm)
PROPORTIONAL BAND	50% (800 ppm)
INTEGRAL TIME	300s
0-10V FUNCTION	FLOW-PROPORTIONAL
0-10V PRIORITY	AUTO ONLY

Hygro sensor

Menu item	Setting
INPUT AT 0%	10.0V (100% RH)
INPUT AT 100%	2.0V (20% RH)
METHOD	CONTROL
SETPOINT	7.0V (70% RH)
PROPORTIONAL BAND	50% (40% RH)
INTEGRAL TIME	30s
0-10V FUNCTION	FLOW-PROPORTIONAL
0-10V PRIORITY	AUTO ONLY

Pressure sensor

Menu item	Setting
INPUT AT 0%	0.0V
INPUT AT 100%	[2* setpoint] V
METHOD	CONTROL
SETPOINT	[setpoint] V
PROPORTIONAL BAND	50-150% (see reach sensor)
INTEGRAL TIME	30s
0-10V FUNCTION	FLOW-PROPORTIONAL
0-10V PRIORITY	AUTO ONLY

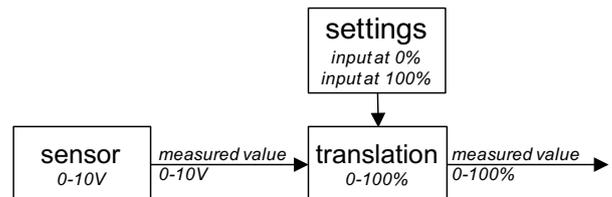
SAG 0-3 / SAG 0-5 / SAG 0-M

Menu item	Setting
INPUT AT 0%	0.0V
INPUT AT 100%	10.0V
METHOD	STEER
CONTROL SETTINGS	n/a
0-10V FUNCTION	FLOW-PRESET
0-10V PRIORITY	ON

Operation

The input of the connected sensor or switch is translated to a neutral 0-100% signal. This translated signal is sent to the ventilation unit as requested airflow. The ventilation unit will compare this request with any other incoming requests and determine the needed airflow.

By translating the signal to a neutral 0-100% signal a 0-600Pa 0-10V pressure sensor can be easily replaced by for example a 0-500Pa 0.5-4.5V pressure sensor. The input voltage settings need to be changed only. Also, in case of control, the setpoint needs to be adjusted.



The input voltage at 0% output and the input voltage at 100% output is set in the option box menu for each specific 0-10V input, after enabling the input. By default, 0% output is given at 0V input, whereas 100% output is given at 10V. If a 0.5-4.5V pressure sensor would be connected to steer the ventilation, the input for 0% output would be 0.5V and the input for 100% output would be 4.5V.

11 Regulated sub-soil heat exchanger valve



The device is equipped with an optional control for a sub-soil heat exchanger to preheat or precool the outdoor air.

The device can control a 230V valve from an air through ground heat exchanger.

Installation

1. Install the permanent 230V power of a sub-soil heat exchanger valve to connector 12 (see the wiring diagram).
2. Install the switched 230V power of a sub-soil heat exchanger valve to connector 6b (see the wiring diagram).
3. Install the outdoor temperature sensor of a sub-soil heat exchange to connector 6a (see the wiring diagram).
4. Install the mains power cable of the device

Commissioning

After installation there is no need to commission the sub-soil heat exchanger on the ventilation unit.

⁶ Not in accordance with Belgian freduc legislation

Operation

The ventilation unit will control the 6b (power) connector with the information received from the 6a (temperature sensor) connector.

The first two minutes after powerup of the ventilation unit the sensor has not reached the actual temperature yet to know if the sub-soil heat exchanger valve needs to be opened. Therefore the sub-soil heat exchanger valve will remain closed for at least the first two minutes after powerup of the ventilation unit.

When the ventilation unit is able to reach the requested supply air without the assistance of the sub-soil heat exchanger valve the sub-soil heat exchanger valve will remain closed. If the sub-soil heat exchanger valve gives a poor result on the outdoor air temperature at the ventilation unit, the ventilation unit will close the sub-soil heat exchanger valve.

If the connection with the sensor of the sub-soil heat exchanger valve is lost the ventilation unit will close the sub-soil heat exchanger valve and give the error GROUND_HEAT_CONNECT_ERROR on the display of the ventilation unit.

12 Main power connector



You can always install the power cable of the device but it is only needed if a 230V ancillary is powered by the device.

The following 230V ancillaries are

powered by the device:

- ComfoHood¹ valve;
- ComfoFond-L pump;
- Sub-soil heat exchanger valve.

All other functions are powered through the ComfoNet of the ventilation unit with a maximum of 150mA. The device is limited to deliver a maximum of 10A to the powered 230V ancillaries connections. Ensure all the connected devices do not exceed these maximums.

13 ComfoNet connector



Each ComfoNet connector can be connected to any ComfoNet device. When you would like to connect more ComfoNet devices then there are available ComfoNet connectors, install a ComfoSplitter.

The complete ComfoNet system is limited to deliver a maximum of 150mA. If all connected devices need more the 150mA you need to install a powered ComfoSplitter.

Wiring diagram ComfoNet



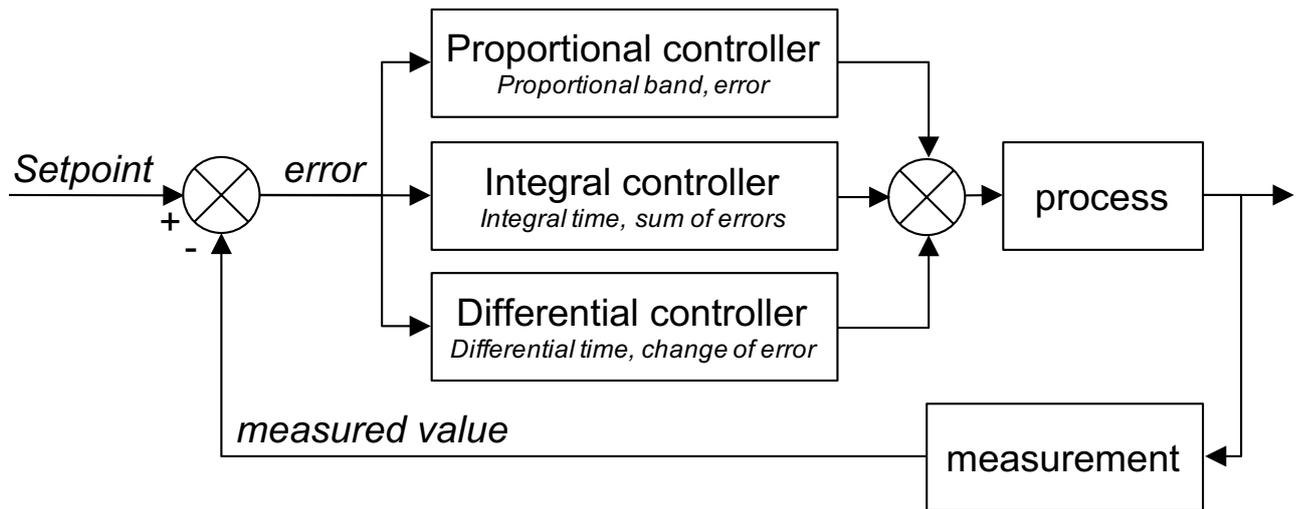
14 Malfunction procedures

The device does not have a digital control system that indicates malfunction codes.

The ventilation unit has a display that indicates malfunction codes. The service manual of the ventilation unit states what the malfunction codes mean and how to rectify these malfunctions.

¹ Only available in Switzerland

15 Proportional Integral Differential (PID) controller



Most controllers of the ventilation unit are of the PID type (Proportional Integral Differential). Controllers are trying to reduce an error to zero. Controller circuits – unlike steering circuits - are closed loop, meaning there is a feedback of the result of the control to the process. Steering circuits are unable to reduce an error to zero, simply because there is no error, since there is no setpoint. There is a direct relation between the steering input and the steering output.

The output of the proportional controller is depending on the error divided by proportional band. Proportional band is a setting, determining the sensitivity of the output to the error. Proportional control is not depending on time. By itself, it is not capable of reducing the error to zero. It leaves a steady state error.

The output of the integral controller is depending on the sum of errors in time, and the integral time. The integral time is the time required for full output, at an error the size of the proportional band. The longer the integral time, the longer it takes to reduce the steady state error to zero. If the integral time is too low however, the process will not be able to keep up with the control, and instability will occur.

The output of the differential action is depending on the rate of change, which is the difference between the current error and the previous error. The differential output is the differential time times the rate of change. The longer the differential time, the more aggressive the differential action. If response to the rate of change is not required, the differential time is set to zero and the controller is called PI-controller (Proportional Integral controller). Differential action is required only, if the rate of change of a process matters, for example for humidity control. Anticipating on fast humidity change reduces the problem of high humidity.

16 Control method

Steer

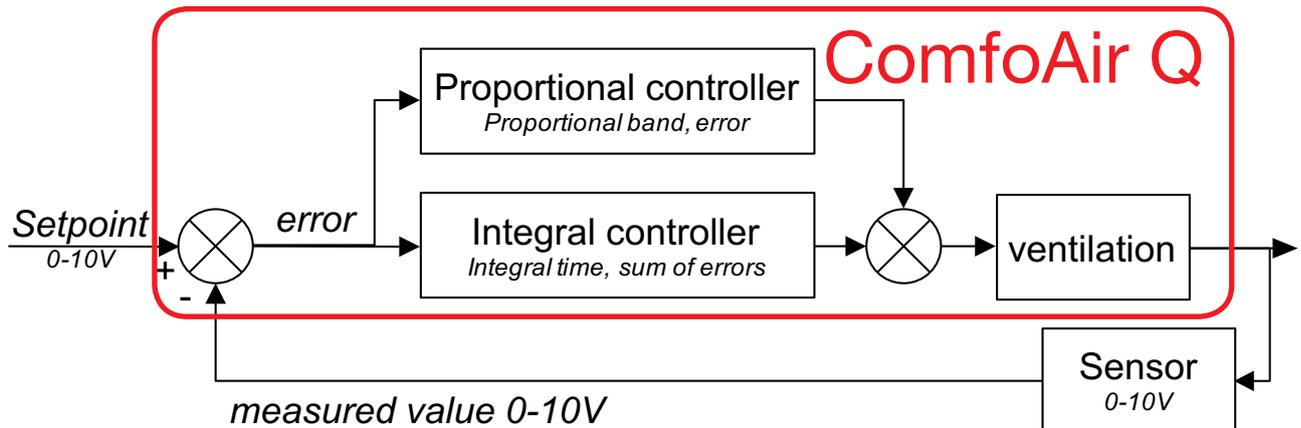


To steer means, the output of the connected device directly influences the volume. Typically, this should be used for steering devices, such as SAG 0-3, SAG 0-5 or SAG 0-M.

Sensors with steering add-ons, such as 0-10V CO₂-sensors with presets, cannot be used for control. The method of interaction must be to steer, since the presets are fixed sensor outputs, which must directly influence the volume.

In case a sensor would be connected, this would mean that a high sensor level corresponds with a high volume. If a 0-2000ppm CO₂-sensor, with 0V@0ppm and 10V@2000ppm would be connected, this would mean, that at 1000ppm, 50% would be the output of the steering. The volume would be 50% on the scale of the volume at which the sensor started (preset 1 typically) and the maximum allowable volume (preset 3 typically). To steer means, there is no control, so the air quality is not guaranteed. If the requirement would be for the ventilation to guarantee a maximum of – for example - 800ppm, control should be selected as a method.

Control



In case of control with a CO₂-sensor or a humidity sensor, the input at 0% is the maximum output of the sensor and the input at 100% is the minimum input of the sensor. The reason for this is, that a control tries to remove an error, which is defined as the setpoint minus the measured value. If the measured value is too high, the error is negative, whereas a positive action (increased volume) is required. This means, the input for the control needs to be inverted.

The CO₂ sensor controlling the ventilation means the CO₂ is kept at a constant level. The control tries to get rid of the error. The steady state CO₂ level for any number of persons will be the same, unless the ventilation system cannot deliver enough air. In case of control with a third-party pressure sensor, too high pressure (negative error) requires reduced volume. Therefore, there is no need to invert the input.