

# PRODUCT DATA

COMBI S 302 POLAR TOP BY NILAN



## Ventilation with passive & active heat recovery



Domestic



Passive  
heat recovery



Active  
heat recovery



Ventilation  
< 375 m<sup>3</sup>/h



Comfort  
heating



Comfort  
cooling



# COMBI S 302 POLAR TOP

## Product description

Combi S 302 Polar Top is a ventilation unit that combines two heat recovery technologies.

Passive heat recovery takes place via a counterflow heat exchanger that utilises 83% of the energy in the extracted air. Active heat recovery takes place via a heat pump that utilises the residual energy. The heat pump has a COP > 4, which eliminates the need to install a heating coil with an attached mixing circuit. Combi S 302 Polar Top can increase the temperature of the supply air to over 30°C.

The heat pump also makes it possible to cool the supply air in the summer by up to 10°C. Due to the low air exchange, this does not function as an air conditioning system, but cooling the air intake reduces its humidity, giving a more pleasant and comfortable climate inside the home, even when the indoor temperature is high.

Combi S 302 Polar Top is delivered with a built-in pre-heating element, which protect the counterflow heat exchanger against icing. This ensures continuous operation at low outdoor temperatures.



Time-controlled filter change alarm.  
Easy filter access by opening the top front panel with the help of two finger screws.

There is plenty of space to replace filters and to vacuum clean the filter space.

Efficient counterflow heat exchanger providing high temperature efficiency and low pressure loss, resulting in good heat recovery and low energy consumption.

Automatic bypass function that carries the air past the counterflow heat exchanger when heat recovery is not required.



The unit comes with a clear and user-friendly HMI touch panel.

The modern CTS 602 control runs Modbus communication.

The hermetically-sealed heat pump utilizes the residual energy after the counterflow heat exchanger and ensures a high supply air temperature.

Can also cool the supply air.

8 duct connections.  
Combi S 302 Polar Top is supplied as standard with 4 duct connections in the top.

Plates are mounted on the side, which makes it possible to move the ducts from the top to the side as required.

Combi S 302 Polar Top has a frost-protection heating element.

Can be placed in the duct system.

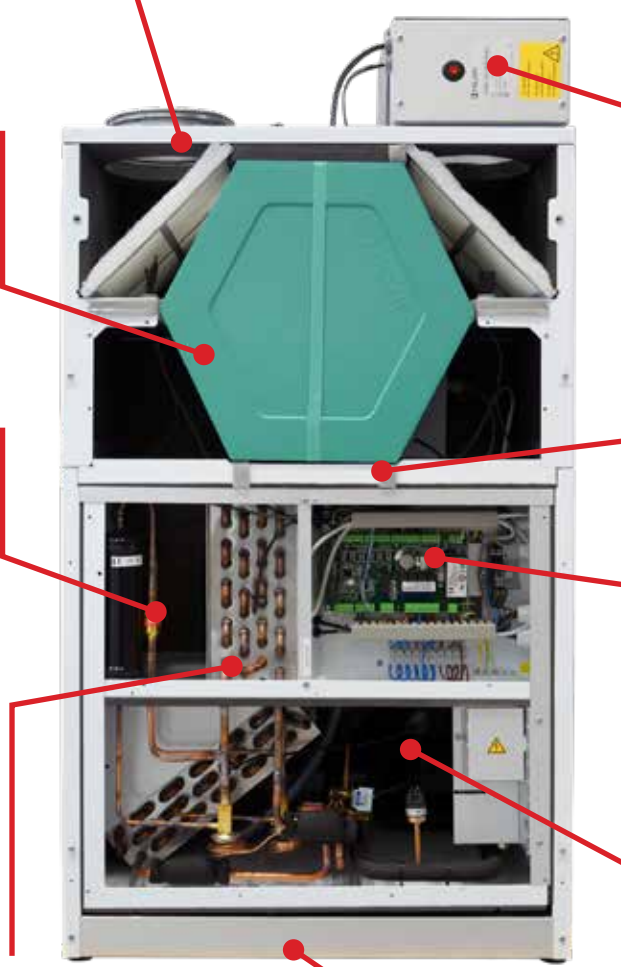
A powder-coated condensation tray prevents the formation of "acid water", leading out the condensation water.

Intelligent humidity control.  
Adapts ventilation to the home's current humidity level.

CO<sub>2</sub>-sensor can be purchased, for further demand management.

The efficient fans are powered by energy-saving EC motors.

Aluzinc steel plate, white powder coating (RAL9016)



User APP solution via gateway  
LAN/WiFi is available as an accessory

# TECHNICAL SPECIFICATIONS

## Combi S 302 Polar Top

Dimensions (W x D x H)	600 x 600 x 1015 mm
Weight	87 kg
Plate type casing	Aluzinc steel plate, white powder coating RAL9016
Heat loss casing (*1)	32 W / -32 W
Heat exchanger type	Polyethylenerephthalat counterflow heat exchanger
Fan type	EC, constant volume
Filter class	ISO Coarse >90% (G4)
Duct connections	Ø 160 mm
Condensate drain	PVC, Ø 20x1,5 mm
Refrigerant	R134a
Refrigerant filling	0.65 kg

External leakage (*2)	< 0.79%
Internal leakage (*3)	< 1.47%
Supply voltage	230 V (±10 %), 50/60 HZ
Max. input/power	1,2 kW/5,2 A
Tightness class	IP31
Standby power	3 W
Power consumption build-in preheating element	0,6 kW
Ambient temperature	-20 / +40 °C

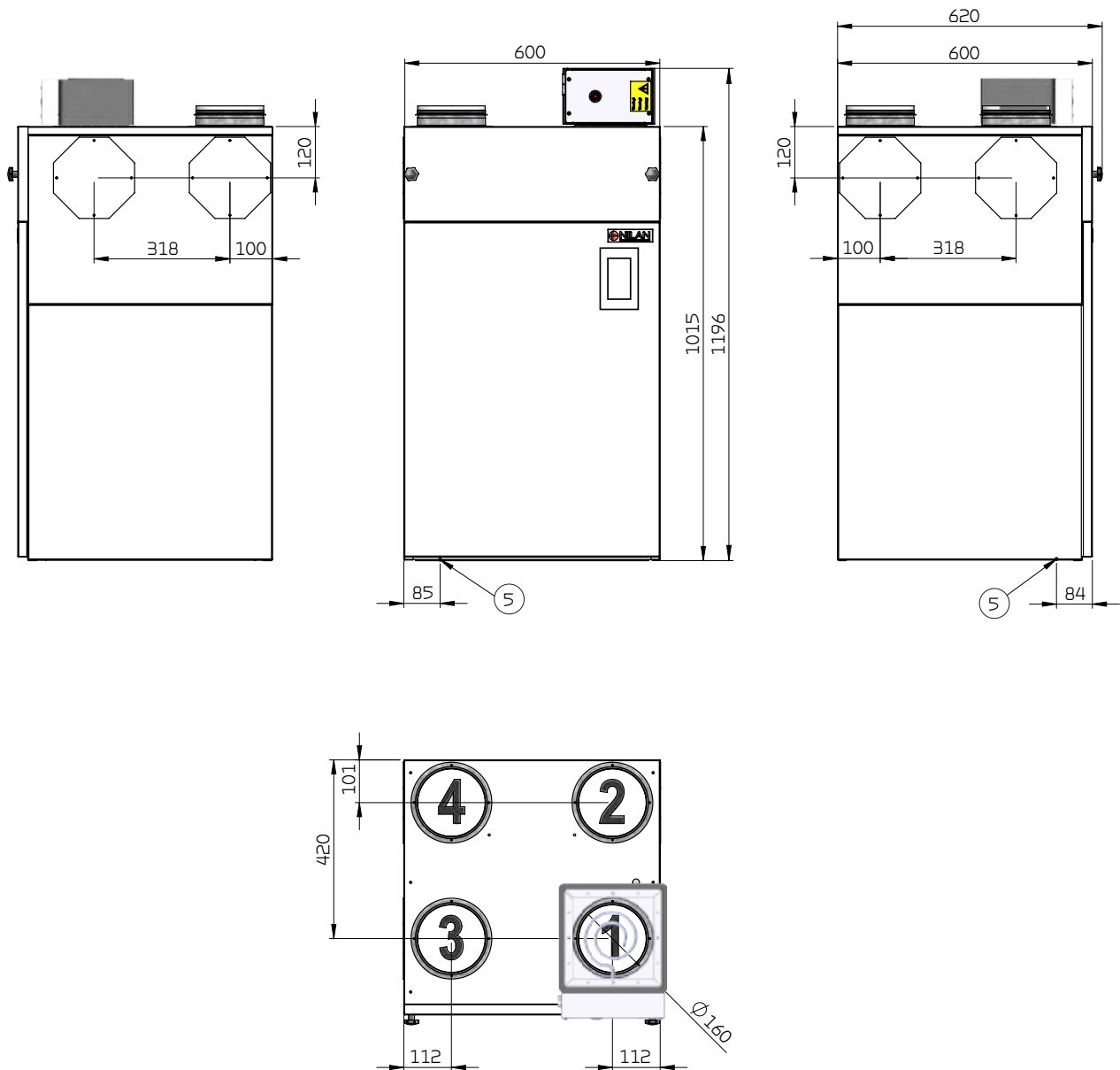
\*1 32 W: Outdoor air temperature -12 °C. Fitting location -12 °C.  
Extract air temperature 20 °C (room).

-32 W: Outdoor air temperature -12 °C. Fitting location 20 °C.  
Extract air temperature 20 °C (room).

\*2 At ± 250 Pa and 265 m<sup>3</sup>/h according to EN 13141-7.

\*3 At ± 100 Pa and 265 m<sup>3</sup>/h according to EN 13141-7.

## Dimensional drawing



All dimensions are in mm.

## Connections

- 1: Fresh air
- 2: Supply air
- 3: Extract air
- 4: Discharge air
- 5: Condensate drain

# PLANNING DATA

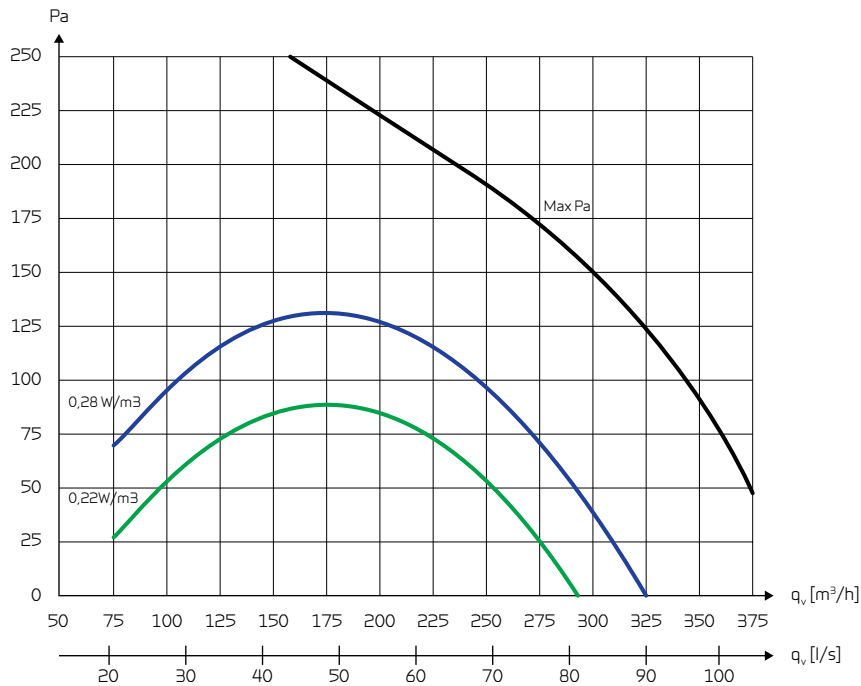
## Capacity

Capacity of standard unit as a function of  $q_v$  and  $P_{t,ext}$ .

SEL values according to EN 13141-7 are for standard units with ISO Coarse >90% (G4) filters and without heating element. SEL values comprise the unit's total power consumption incl. control.

Conversion factor:  $\frac{J/m^3}{3600} = W/m^3/h$

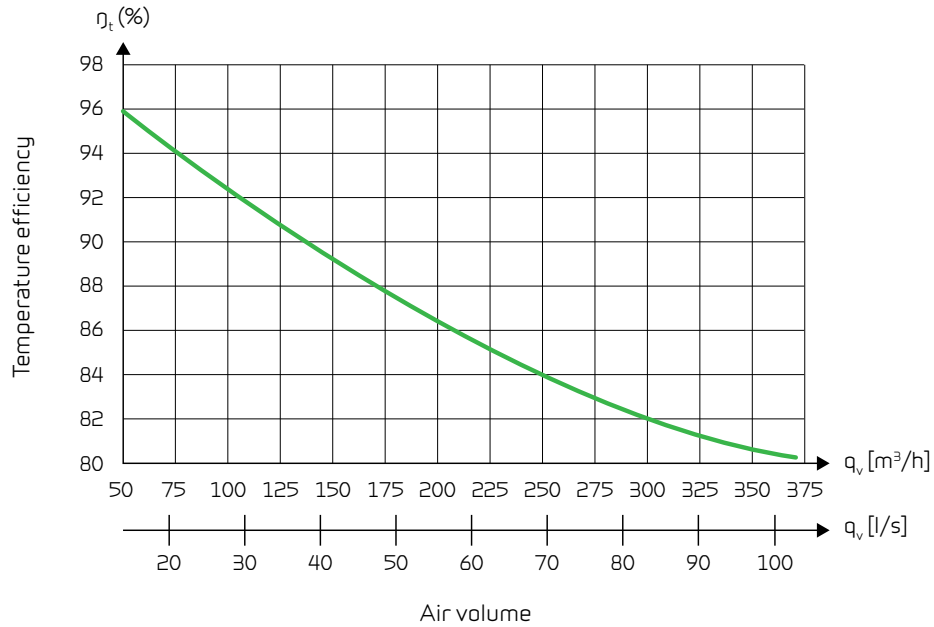
Attention! The SEL values are measured and stated as a total value for both fans.



## Temperature efficiency

Temperature efficiency for units with counterflow heat exchanger according to EN308.

*NB! Temperature efficiency is only for the counter flow heat exchanger (without heat pump operation)*



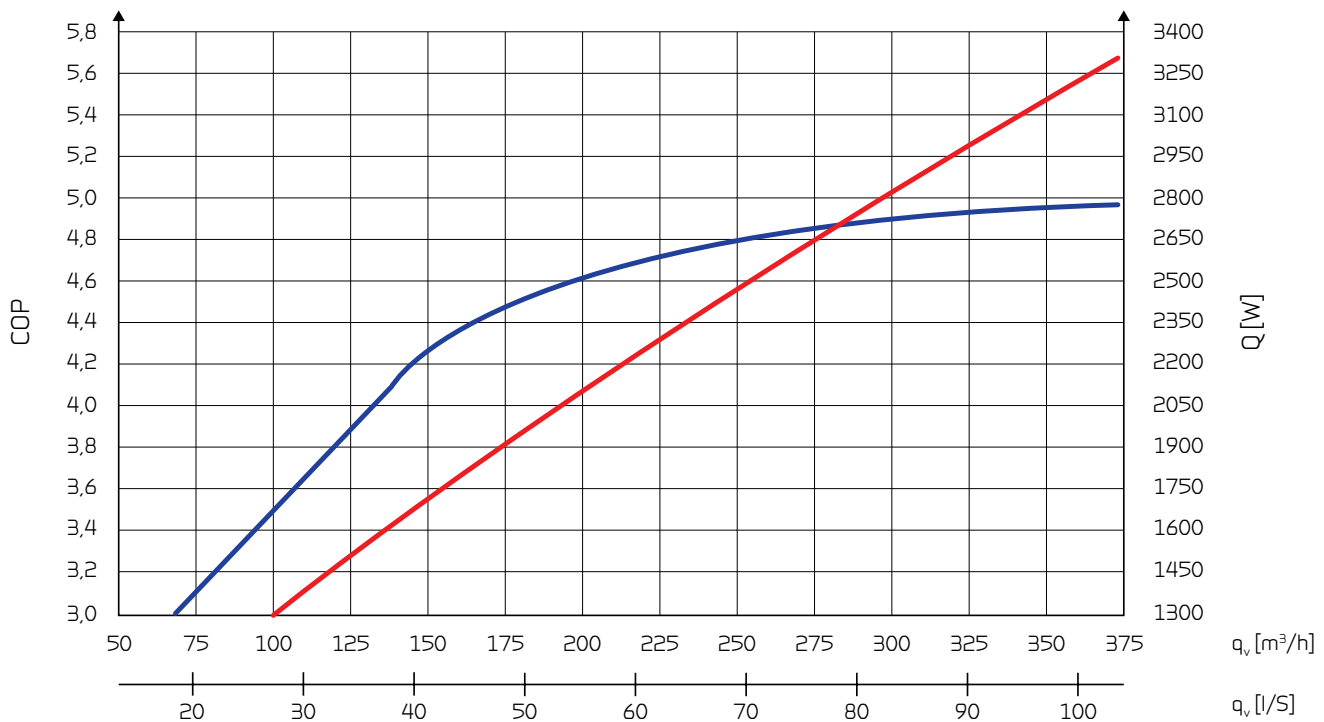
## Heat output supply air

Heat output  $Q_s$  [W] as a function of  $q_v$  [ $\text{m}^3/\text{h}$ ] and outdoor air temperature  $t_{21}$  [ $^{\circ}\text{C}$ ]. In accordance with EN 14511,  $t_{11}=21^{\circ}\text{C}$  (extract air)  
 Heat output is the contribution to room heating added to the fresh air via Combi S 302 Polar Top to the supply air.  
 The ventilation loss is the heat output that is lost without heat recovery at the given volume flow air.

## COP (air-air)

Heat output factor COP [-] supply air as a function of outdoor temperature  $t_{21}$  [ $^{\circ}\text{C}$ ] and volume flow  $q_v$  [ $\text{m}^3/\text{h}$ ] in accordance with EN14511 at a room temperature  $t_{11} = 21^{\circ}\text{C}$

COP according EN14511 is calculated for the heat pump and counter flow heat exchanger combined.



- COP air-air
- Heat output supply air

## Sound data

Sound data is for  $q_v = 210 \text{ m}^3/\text{h}$  and  $P_{t, \text{ext}} = 100 \text{ Pa}$  in accordance with EN 9614-2 for surface and EN 5136 for ducts.

Sound output level  $L_{\text{WA}}$  drops with falling air volumes and falling back-pressure.

At a given distance, the sound pressure level  $L_{\text{pA}}$  will depend on the acoustic conditions at the installation site.

### Sound output level ( $L_{\text{wa}}$ )

Octave band Hz	Surface dB(A)	Supply air dB(A)	Extract air dB(A)
63	-	51	38
125	-	59	46
250	-	66	51
500	-	61	41
1.000	-	56	31
2.000	-	54	28
4.000	-	47	20
8.000	-	40	13
Total $\pm 2$	46	69	53

# AUTOMATION

## CTS602 Control



The CTS602 HMI touch panel is featuring a wide range of functions, e.g., menu-controlled operation, weekly programme settings, filter monitor with timer, fan speed adjustment, summer bypass, supply-heating element control, error messages etc.

The CTS602 comes with factory settings, including a default setting which can be customised to operational requirements to achieve optimum operation and utilisation of the system.

There is an option for selecting between 2 front page images for the main screen.

Operating instructions for the CTS602 can be found in a separate user manual supplied with the unit.

## Nilan User APP

By purchasing a Nilan gateway, the user can gain access to the unit via a Nilan User APP. The APP enables the user to access and monitor the current operation, also from the outside of the property.

The APP allows you to adjust the default settings of, for instance, room temperature, fan speed level and the humidity control system.

The APP shows when filter change is next due. This is an important function, and you are automatically notified when filters need changing or an alarm is triggered.

It also provides you with useful trend curves so you can follow the operation of the unit for the previous week with regards to, for instance, room temperature or humidity level.

Using a LAN connector, you connect the gateway to the Modbus of the unit and then to the user's internet router via a LAN or a WiFi connection. This creates a secure cloud connection between the unit and the smartphone.



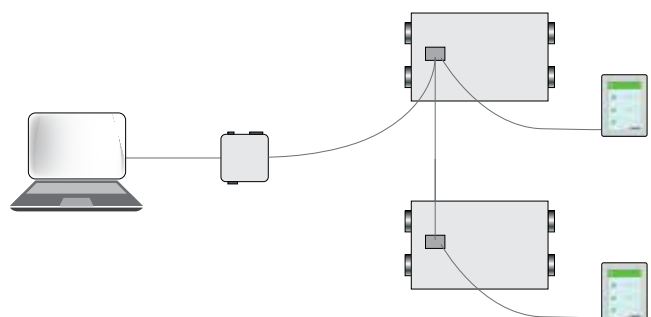
## External communication

The CTS602 control unit communicates by default with Modbus RTU RS485 communication. A CTS system using this form of communication can easily be connected to the unit.

Nilan units have an open Modbus communication, i.e. not only can the unit be monitored, but its operation can also be set in the same way as it can via the operating panel.

The protocol is by default set up for a Modbus RTU30 address; however, values can be set between 1 and 247.

A Modbus converter allows you to connect one or more units to a computer to monitor and control the unit.



Functions overview		+ Standard - Accessories
Alarms	Description of errors indicated with alarms. Alarm log displaying the latest 16 alarms.	+
Joint alarm	The CTS602 control system has an output signal that is activated in the case of an alarm. It can be connected to, for example, external automation.	
Filter monitor	Filter alarm with timer that can be set to 30/90/180/360 days.	+
Data display	An overview of the current operation with regards to temperatures, fan speed level etc.	+
Week program	The CTS602 control system has 3 week programs that can be set individually (the default setting is "off").	+
Humidity control system	Enables a higher or lower degree of ventilation at a high/low level of humidity.	+
Air quality	Enables you to adjust the degree of ventilation depending on the CO <sub>2</sub> level in the air.	-
Winter low	You can prevent a low level of humidity in the dwelling by activating low ventilation at low outdoor temperatures.	+
Temperature regulation	Enables you to control the operation of the unit in accordance with the room temperature.	+
Summer/winter mode	You can set the unit to operate in summer or winter mode.	
Language	You can choose from more than 10 languages in the control panel.	+
User levels	The menu in the control panel is divided into 3 user levels: User/Installer/Factory.	+
User selection 1	Enables you to override the operating mode via an external potential free signal.	+
User selection 2	Enables you to override the operating mode as well as user selection 1 via an external potential free signal.	-
Air exchange	Stepless setting of four fan speed levels. The supply air and the extract air can be set individually.	+
Polar version	An integral frost-protection heating element prevents the heat exchanger from freezing.	
De-icing	Based on temperature, this automatic function de-ices the counterflow heat exchanger if ice has formed within it.	+
Room low	Safety function that will cause the ventilation unit to stop if the heating system for the dwelling fails. This will prevent the unit from cooling the dwelling even further.	+
External heating	The ventilation unit can control an external heat supply in accordance with the current room temperature.	+
External fire automation system	You can connect the ventilation unit to an external fire automation system or to a fire thermostat. This will signal to the unit whether to stop or continue operation.	+
Pressure sustaining regulator	You can install a pressure sustaining regulator on the side of both the extract air and the supply air.	-
Delayed start-up	You can activate a delayed start-up of the fans if you install, for instance, a shut-off damper.	+
Restore settings	You can save the current settings and subsequently restore them if, for instance, the user has altered the settings on the unit. You can also reinstall the default settings.	+
Manual operation	Different functions can be tested manually.	+
Energy saving function	You can activate a power saving function of the operation.	+
Modbus	You can set the Modbus address of the unit. The default setting is 30.	+
Data logging	It is possible to log the operational data of the unit every 1 - 120 min. Alarms are logged when they occur.	+
Control panel	You can choose from 2 different images for the main screen.	+

You can find further information about all the functions in the Software and Installation instructions for the unit.

# OPERATION

## Intelligent humidity control

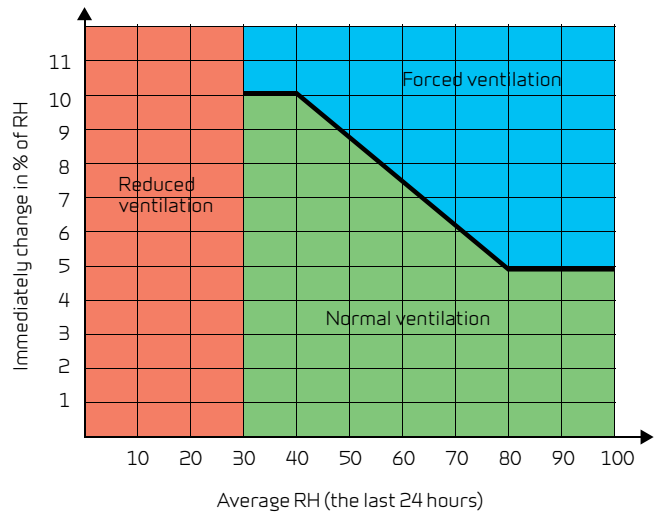
Nilan's humidity control feature automatically adapts to the needs of the family or the building.

The intelligent CTS 602 control unit does not need to have a set level input for air humidity (RH) to control the air exchange. By using the integrated humidity sensor, the control unit calculates the average level itself for the last 24 hours. The average level provides a basis for deciding whether to change the air exchange if the air humidity fluctuates.

This ensures that the unit always runs at its most efficient, based on the actual air humidity level and not on a theoretical one.

This helps save energy because it automatically adapts to the requirements in the home. Whether a large family or a single person is living in the building has a considerable influence on how much humidity is produced.

The unit also adjusts automatically to summer and winter level.

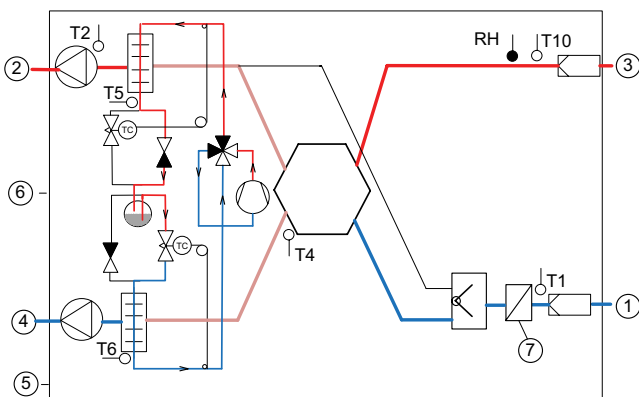


*If the air humidity changes by more than 5-10% in relation to the average level, the unit responds with a higher rate of air exchange accordingly.*

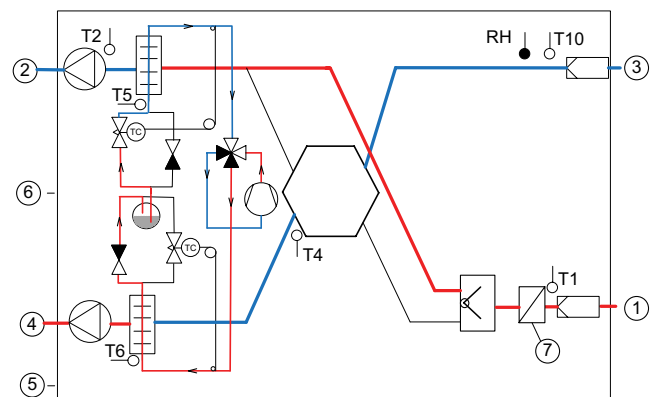
*At an air humidity below 30% is reduced ventilation step activated (adjustable between 15 and 45%)*

## Functional diagram

Heating



Cooling



### Connections

- 1: Fresh air
- 2: Supply air
- 3: Extract air
- 4: Discharge air
- 5: Condensate drain
- 6: Electrical connection
- 7: Pre-heating element (frost protection)

### Automation

- T1: Fresh air sensor
- T2: Supply air sensor
- T4: Discharge air and defrost sensor
- T10: Room sensor/Extract air sensor
- RH: Humidity sensor

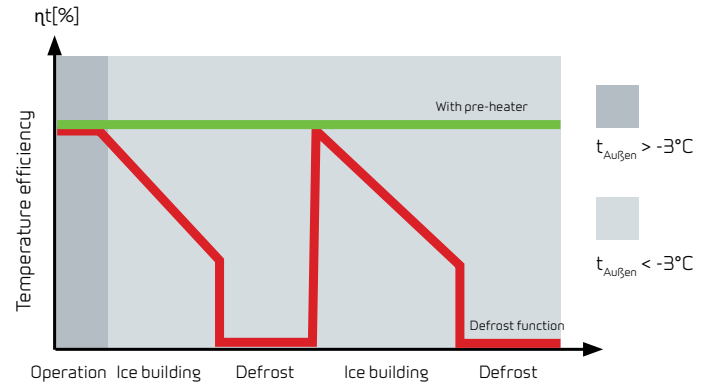
# Frost protection

All ventilation units with a counterflow heat exchanger will ice up if the outdoor temperature is below freezing for a prolonged period.

The extracted air condenses when it is cooled down during heat recovery. The high temperature efficiency will slowly turn the condensate to ice, which will block up the counterflow heat exchanger unless action is taken to remedy this.

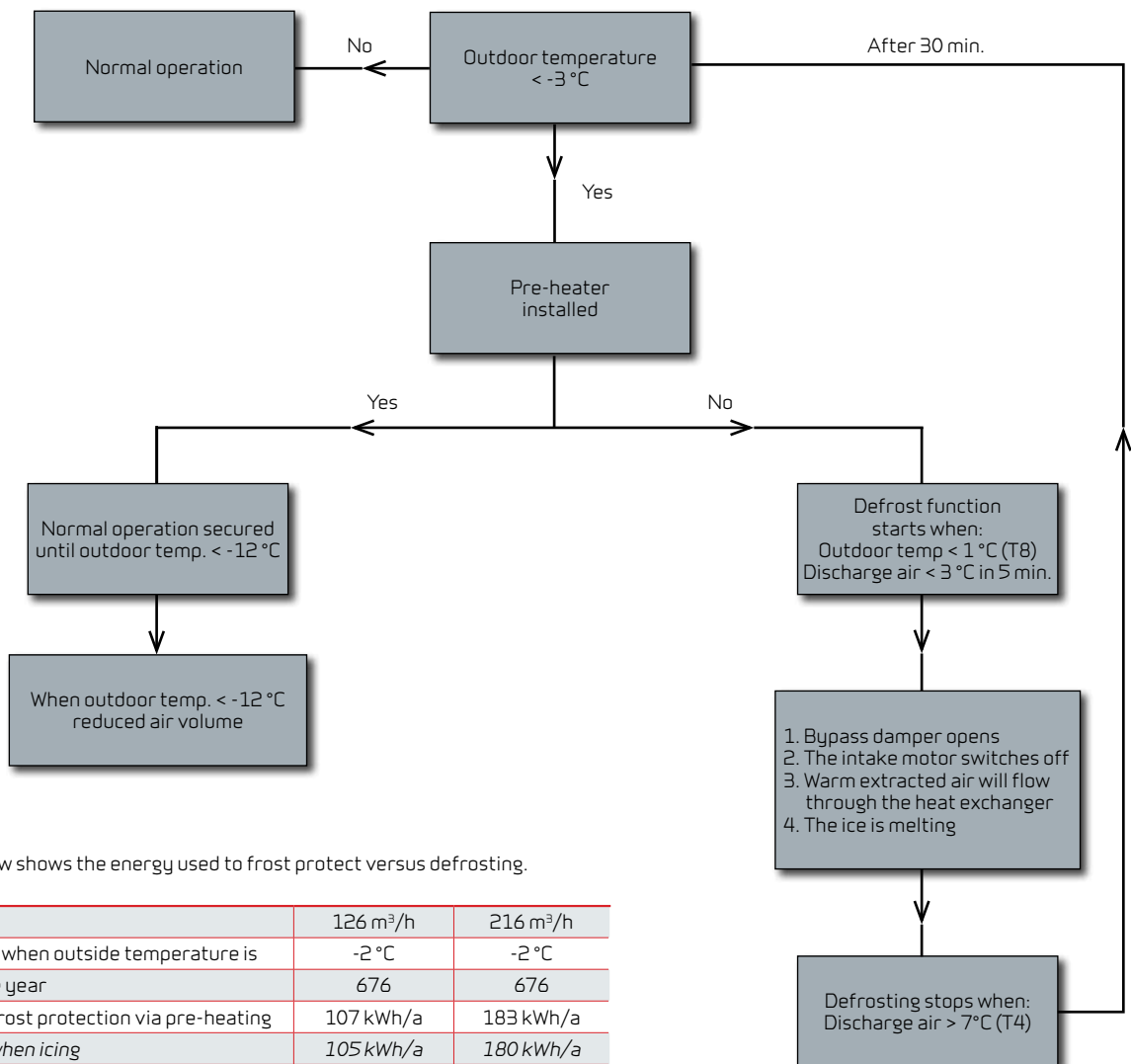
Consideration must be given to whether the unit's operation can be protected during a lengthy period of frost or whether it is acceptable to decrease its operation.

In homes which are occupied at night, it would be advisable to protect the unit against frost when the outdoor temperature is coldest by using a pre-heating element. On the other hand, if the ventilation is for an office, it may be acceptable to decrease the operating level at night.



The energy used for the preheating is not wasted, as it ensures a constant high temperature efficiency

## Frost protection



The example below shows the energy used to frost protect versus defrosting.

Air volume	126 m <sup>3</sup> /h	216 m <sup>3</sup> /h
Frost protection when outside temperature is	-2 °C	-2 °C
Hours during the year	676	676
Energy used to frost protection via pre-heating	107 kWh/a	183 kWh/a
Loss of energy when icing	105 kWh/a	180 kWh/a
Loss of energy when deicing	200 kWh/a	343 kWh/a
Energy savings by using frost protection	198 kWh/a	340 kWh/a

Average calculation by Danish dry weather data.

# ACCESSORIES



## EM-box

An EM-box allows heat recovery from the air from the range hood and thereby helps to heat the supply air. The EM-box is equipped with a steel filter which efficiently cleans the range hood air of fat particles and thereby protects the system.



## Pollen filter ISO ePM1 50-65% (F7)

A pollen filter class ISO ePM1 50-65% (F7) can be fitted in the unit.



## DBTU damper

If there is not enough space to fit an EM-box, Nilan offers a DBTU damper, which can be fitted between kitchen and bathroom. The damper functions precisely like the EM-box but requires longer cables.



## Expansion PCB

The expansion PCB provides additional functions for the CTS 602 control unit, e.g., controlling the EM box.



## Heating cable

To protect the condensation outlet against frost, a 3 or 5 metre-long self-regulating heating cable can be ordered.



## Noise-attenuating flexible hose

For easy fitting and excellent noise attenuation between the system and the distribution box and/or between the system and roof vents.



## Gateway with APP solution

Combi Polar can be controlled with a smartphone APP via a gateway connection.

Connect the Nilan Gateway to the CTS602 control system. This allows for a cloud connection to the unit. The gateway is available in two different versions - with either a LAN or a WiFi connection to a router.



## Extension cable HMI control panel

The control panel for the ventilation unit is connected up with a short wire so it can be installed close to the unit. If you place the unit so the control panel is out of sight, for instance in a cupboard or in the loft, you can order a 15 m extension cable with plug. This allows you to place the control panel where it is visible to the user.

It is important that the control panel is visible so the user can see alarms when, for example, filters need replacing.

# DELIVERY AND HANDLING

## Transport and storage

Combi S 302 Polar Top comes in factory packaging that protects it during transport and storage.

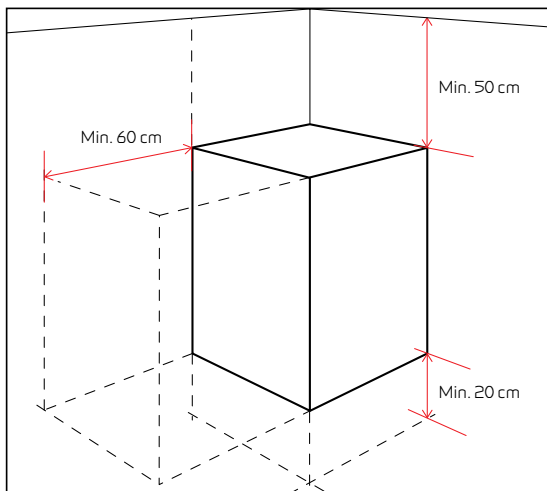
Combi S 302 Polar Top must be stored in a dry place in its original packaging until installation.

The packaging should only be removed immediately prior to installation.

## Installation conditions

During installation, future service and maintenance should be taken into account. We recommend a minimum space in front of the unit of 60 cm.

The unit must be installed level for the sake of the condensate drain. The condensate drain requires clearance of min. 12,5 cm under the drain nozzle.



*Combi S 302 Polar Top*

# INFORMATION FROM A TO Z

Nilan develops and manufactures premium-quality, energy-saving ventilation and heat pump solutions that provide a healthy indoor climate and low-level energy consumption with the greatest consideration for the environment. In order to facilitate each step in the construction process - from choosing the solution through to planning, installation and maintenance - we have created a series of information material which is available for download at [www.nilan.dk](http://www.nilan.dk).



## Brochure

General information about the solution and its benefits.



## Product data

Technical information to ensure correct choice of solution.



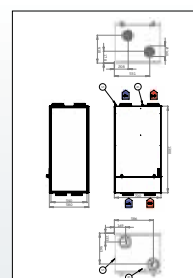
## Installation instructions

Detailed guide for installation and initial adjustment of the solution.



## User manual

Detailed guide for regulation of the solution to ensure optimum day-to-day operation.



## Drawings

Tender documents and 3D drawings are available to download for planning purposes.

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Visit us at [www.nilan.dk](http://www.nilan.dk) to find out more about our company and solutions, download further information and find your nearest dealer.



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