

APARTMENT VENTILATION

Design, installation, and setup



VALLOX
HOME *of* FRESH AIR

MATTERS TO OBSERVE IN THE DESIGN OF APARTMENT VENTILATION

VENTILATION FOR PEOPLE

The starting point for the dimensioning of the outdoor air flow must be a healthy, safe, and comfortable indoor air quality. At least $8 \text{ dm}^3/\text{s}^1$ of outdoor air must be brought into each room intended for living.

Dimensioning of the ventilation

Standard ventilation should be dimensioned on the basis of the planned operation time or the 'At home' situation, i.e. the normal number of people in the rooms. This ensures that the ventilation is also sufficient in the bedrooms. There must be room for increasing the efficiency of the ventilation by at least 30% e.g. in order to dry wetrooms or when the number of people in the premises increases temporarily. Also include the boost values in the ventilation plan. When the ventilation can be controlled room-specifically, the efficiency of the ventilation can be lower than the operating time air flows e.g. when the apartment is empty. The supply and extract air flows of the Away mode can be, at the maximum, 60% lower than the air flows of the At home mode. When the air flows of the Away mode are also included in the ventilation plan, the person adjusting the settings does not need to make assumptions.

Need-based ventilation

When the design of a ventilation system is started, the desired features and auxiliary equipment should be discussed with the client to determine the specifications of the system. It is often difficult to upgrade the system afterwards as regards the equipment.

It is sensible to adjust the ventilation based on the need. Alternatively, automated control can be used. Humidity and carbon dioxide sensors enable smart At home/Away/Boost automatics. The location of sensors and control panels should also be specified in the plan. The location of the control panel should be chosen so that it enables easy control of ventilation based on the need, e.g. in the lobby.

It must be possible to control the air flows according to the need on the basis of the load or the air quality¹.

Location of the unit

Install the ventilation unit in a location where it does not cause noise disturbance and is easy to maintain. Changing the filters of a unit that is located e.g. in a walk-in closet is not necessarily pleasant. The most efficient heat recovery cells are large and their removal for cleaning requires space. Space must also be reserved for any repair measures. External equipment, such as duct radiators, also require space for maintenance measures.

A short duct system

The duct system should be designed so that it is as short as possible. A long and complex duct system is expensive and has a negative impact on the SFP rate and the sound level. The exterior diameter of the BlueSky ducts is only 75 mm, making them perfect for installation inside dropped ceilings, intermediate floors, enclosures, and dividing walls. The ducts should always be installed on the indoor side of the vapour barrier, where possible, as this removes the need to use thermal insulation.

Sound-dampening

The sound-dampening should be designed carefully. Especially in the bedroom, a sound level that meets the set requirements can, in practice, be considered disturbing. Observe the conduction of noise in structures.

Connections

Ensure that the electric designer is notified of the connections needed by the ventilation unit. Specify a suitable location for the control panel of the ventilation unit. It is advisable to install cabling for a carbon dioxide sensor e.g. in the bedrooms, even when the sensors are not installed immediately. Modern ventilation units can also be controlled through a cloud-service, which requires a LAN cable. The wiring required by the house automation connection should also be taken into account in the design phase.

¹A guide for the dimensioning of ventilation in residential buildings, 30 November 2019

Annual efficiency

Select a ventilation unit that has a high annual efficiency. The annual efficiency is very significant for the E-figure and energy consumption of the building. The annual efficiency can be calculated by using the manufacturer's dimensioning program.

Post-heating and freeze protection

The more efficient the ventilation unit is, the less post-heating is needed. The dimensioning program specifies the energy needed for the post-heating of the ventilation unit. Electricity is often the most sensible post-heating method of modern ventilation units, whose energy consumption is low.

The freeze protection automation of the heat recovery cell is one of the most important features of the ventilation unit. Its operation determines the energy consumption and reliable operation of the ventilation unit in winter. Ensure that the ventilation unit does not alter the pressure balance inside the apartment during defrosting. The need-based defrosting automatics by Vallox utilise the thermal energy contained in the extract air for defrosting. Preheating is not needed in such a situation and the ventilation unit does not alter the ratio between the air flows.

Intake of fresh air / blow-out of exhaust air

The outdoor and exhaust air ducts should also be designed so that they are as short as possible. The exhaust air of apartment ventilation can also be led outdoors through an exhaust/ blow-out air device (wall-mounted air blow-out device) or through a combined air blow-out / air intake device. Verify any special requirements for wall-mounted air blow-out devices with the local building control authorities.

Replacement air

An air supply duct should be included in the ventilation plan for each fireplace. The additional supply of outdoor air required by fireplaces must be designed so that the ventilation unit operates in a controlled

manner and does not have a negative impact on the pressure levels within the apartment. The fireplace mode of Vallox ventilation units creates a temporary overpressure that makes lighting a fire in the fireplace easier. A separate fireplace switch that is located in the vicinity of the fireplace and must be included in the ventilation plan can also be connected to the units. The Fireplace mode can never be used to replace the air supply duct of the fireplace.

The replacement air needed by the central vacuum cleaner and the cooker hood must be observed. The extract air flow of an efficient cooker fan can be several times higher than the total ventilation of the apartment, for which reason a ventilation unit cannot fully compensate for the extraction.

Insulation of the ducts

If the ventilation ducts cannot be installed in a warm space, they must be insulated. The thermal insulation of the ventilation ducts should be as good as the thermal insulation of the rest of the building. Defective insulation of the supply air duct in a cold space causes the temperature of the supply air to reduce inside the ducts, which can result in a draft. Inadequate insulation of the extract air duct reduces the efficiency of the heat recovery and increases the energy consumption of post-heating.

Using the ventilation system for cooling

Modern ventilation units have an automated heat recovery bypass for cooling in the summer. A duct radiator (connected to e.g. a geothermal heating system) can be installed in the ventilation duct network for cooling. The cooling capacity of the ventilation unit is, however, limited, and the power needed for cooling depends on factors such as the thermal load generated by the sun. Often the cooling capacity of the ventilation unit is insufficient unless special attention has been paid e.g. to the sun protection of the windows by installing long eaves or awnings. A temperature survey should be completed of the building in the summer to determine the heating impact of the sun.

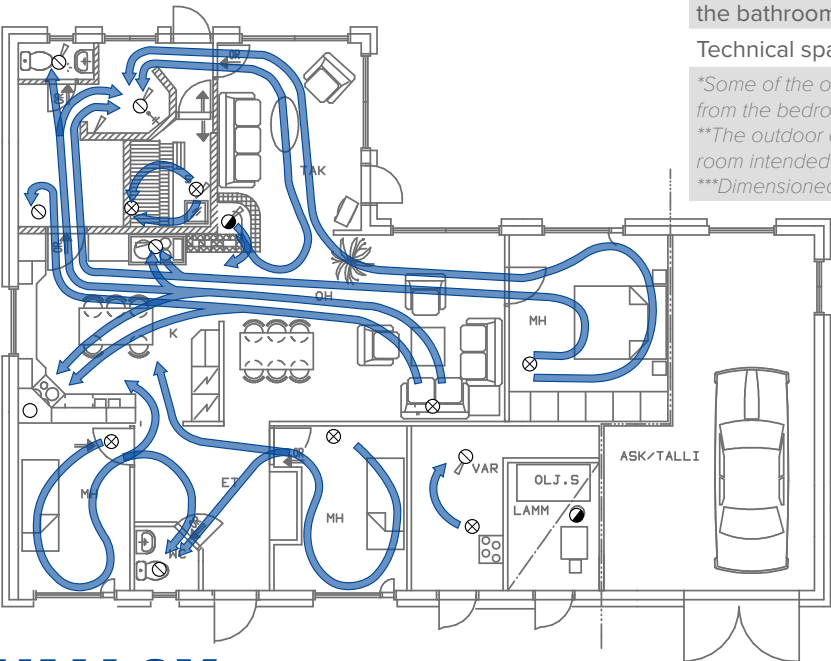
DIMENSIONING OF AIR FLOWS

The design and implementation of the ventilation system should be based on the location, intended purpose and use of the building, so that it contributes to the creation of a healthy, safe, and pleasant indoor climate during normal weather conditions and use¹.

The ventilation volume of the apartment is always calculated by using a 2.5 metre room height, as high rooms do not increase the ventilation need and low rooms do not reduce it. The outdoor air flow must be at least 0.35 dm³/s/m², equalling 1.5 times the ventilation in a room with a free height of 2.5 metres.

The ratio between the supply and extract air flows must be designed so that there is no harmful over- or underpressure in the apartment. An overpressure can push the humidity contained in the room air into the exterior wall structures, and an underpressure can bring the impurities contained in the structures into the room air. The ventilation of the apartment is designed so that there is a slight underpressure. This ensures that a measurement error, dirty filters, or pressure differences between the layers do not create an overpressure. In addition, rooms with an extract air valve must have underpressure when compared with rooms with a supply air valve. When air flows from rooms with supply air valves towards extract air valves, it also flushes corridors, halls and other intermediate spaces.

¹ Decree of the Ministry of the Environment on the Indoor Climate and Ventilation of New Buildings 1009/2017



When higher space-specific air flows are needed, the air flows of the bedrooms and the bathroom will also be increased. This design principle ensures sufficient ventilation in the bedrooms, especially at night, even when standard ventilation is used. As transmitted air flows from supply air rooms to extract air rooms, halls and corridors are ventilated at the same time, without the need to design specific valves for these areas.

Room space	Outdoor air flow dm³/s	Extract air flow dm³/s
The largest or only bedroom or a bedroom with an area of over 11 m²	12	
Other bedrooms	8	
Other rooms intended for living, such as the lounge, under 22 m² in size, kitchen excluded*	8	
Other rooms intended for living, such as the living room, with an area of over 22 m², kitchen excluded*	0.35 dm³ /s /m²	
Kitchen space, kitchen, kitchen cabinet, islet kitchen** <i>The air flow of the cooker hood / kitchen space must, in the boost situation, be at least 25 dm³/s. The availability of outdoor air during the boosting must be ensured.</i>		8 (25)
Bathroom with or without a toilet**		10
Separate toilet**		7
Walk-in closet**		6
Storage**		6
Apartment sauna	6	6
A utility room that is separate from the bathroom**		8
Technical space***		3

**Some of the outdoor air can be replaced with transmitted air coming from the bedroom.*
***The outdoor air can be replaced with transmitted air coming from a room intended for living.*
****Dimensioned according to the thermal load, at least 3 dm³/s.*

Dividing the total air flow of the apartment in normal use. Source: A guide for the dimensioning of ventilation in residential buildings, 30 November 2019 (The Finnish Association of HVAC Societies FINVAC ry)

Usually, the supply and extract air valves must not be located in the same room, except for the sauna, because this does not enhance the ventilation in the room but increases the total air flow inside the building, the energy consumption of the ventilation system, and the sound level. At the same time, the transmitted air and the ventilation of general premises will reduce.

The dimensioning of the ventilation unit must be suited to the size of the space and other aspects that affect the ventilation. Using half of the maximum efficiency of the ventilation unit during the use of the apartment leaves sufficient room for increasing the efficiency of the ventilation e.g. during the drying of the wetrooms. The indicative square metre volumes of Vallox ventilation units are based on this dimensioning. The number of persons and the volume of rooms and wetrooms, as well as special premises, such as a pool, can affect the dimensioning of the ventilation unit. Too small a ventilation unit and duct network do not enable sufficient boosting of the ventilation and can cause noise problems. Over-dimensioning rarely produces any benefits either.

In large houses, it might be sensible to install two or even more ventilation units. This keeps the length of the ducts shorter and the noise levels lower. The building can be divided into zones according to the ventilation need, e.g. one zone for wetrooms and one for living spaces, enabling a different efficiency of ventilation to be used in different zones.

CALCULATION OF THE SFP RATE

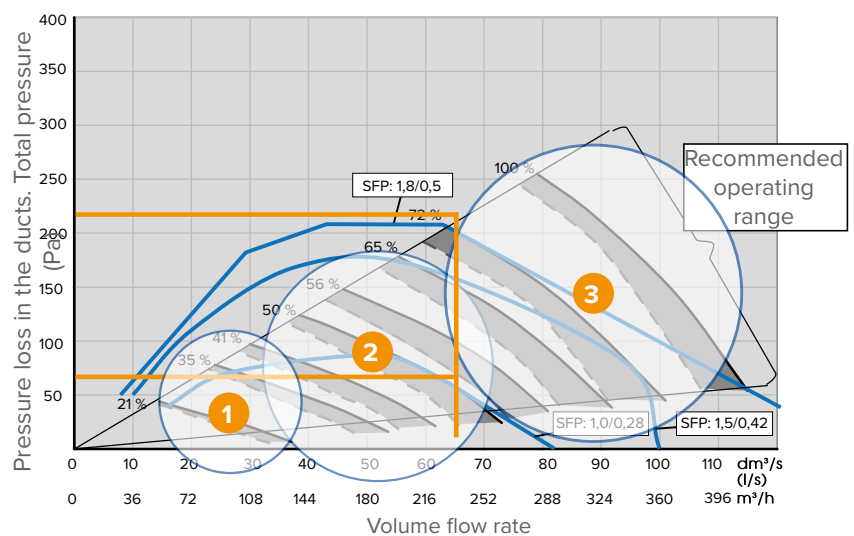
The SFP rate of the supply and extract air ventilation system, i.e. the specific fan power or the power consumption of the fans in relation to the air flow, must be a max. 1.8 kW/(m³/s). To achieve this, a ventilation unit with DC fans is principally needed together with careful design, a short and wide duct network, valves with a low pressure loss, and professionally implemented adjustment.

The SFP rate is calculated by dividing the combined input power of the fans of the ventilation units (W) by the designed rated air flow (dm³/s). The input power of the fans can be found in the technical specifications of each ventilation unit. In the calculation, an assumption must be made of the speed at which the air flows are measured. The ventilation system designer will calculate the SFP rate in the design phase based on the presumed initial data. If, for instance, the pressure loss of the duct network measured in the measuring phase differs from the calculation data, the ventilation can be adjusted by using a lower or higher fan speed than presumed.

A selection example

At the 50% efficiency level, the ventilation unit produces 65 dm³/s, if a pressure increase of roughly 60 Pa is sufficient for the duct system. If the pressure increase needed is more than 200 Pa, the system must be adjusted by using the 72% efficiency level and the highest permitted SFP rate 1.8 kW / (m³/s) is exceeded.

- 1 Away ventilation
- 2 Standard ventilation = 0.35 dm³/m²
- 3 Boost ventilation = Space-specific values



An example of the calculation of the SFP rate:

Air flow 50 dm³/s

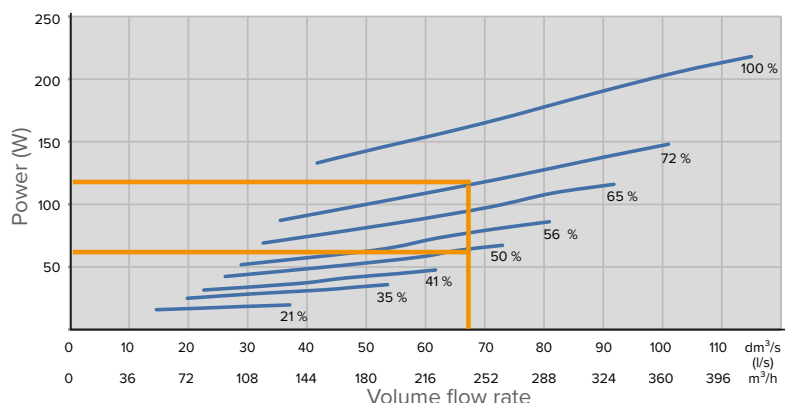
Adjustment at the 47% efficiency level:

$$\frac{65 \text{ (W)}}{65 \text{ (dm}^3\text{/s)}} = 1.0 \text{ (SFP)}$$

Adjustment at the 72% efficiency level:

$$\frac{120 \text{ (W)}}{65 \text{ (dm}^3\text{/s)}} = 1.85 \text{ (SFP)*}$$

*) Does not meet the requirements!



LOCATION OF THE VENTILATION UNIT AND THE VALVES

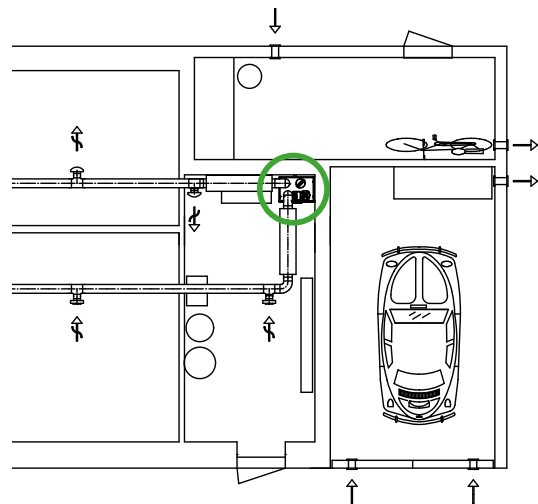
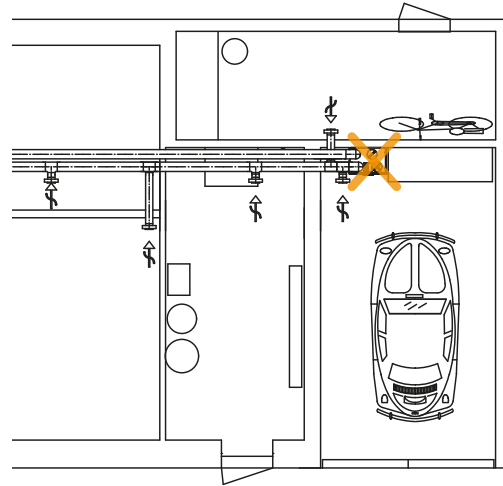
The best location for the unit is at the centre of the building, from where the ducts are easy to lead into the rooms and outdoors. It is usually beneficial to locate the ventilation unit close to the wetrooms. When the location of the unit is being selected, the noise it produces in its surroundings and the space required for servicing need to be observed.

The wall on which the unit is installed must have sound-dampening at the minimum. The unit should not be mounted on a wall that borders on the bedroom. The noise that travels through the walls of the duct above the unit must also be observed and it must not be conducted e.g. into the intermediate floor of the bedroom.

Good installation locations include technical spaces and a utility room that also include other household appliances. The installation of external water, electrical, and condensing water connections must also be observed when the location is determined.

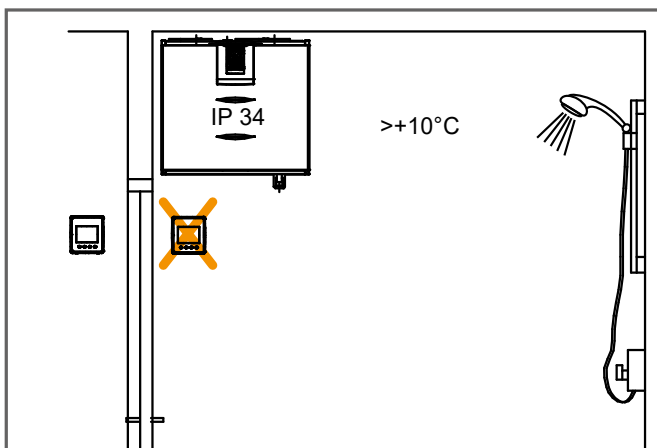
The ventilation unit must always be installed in a warm space ($> +10^{\circ}\text{C}$) and the protection class of the ventilation unit must be sufficient for the installation space. The control panel of the ventilation unit must be located in a warm and dry place.

It is often sensible to locate the ventilation valves of the rooms in the centre zone of the building. This makes the installation and possible insulation of the ventilation ducts easier. The efficiency of air replacement in the room is also often better when the valve is located in the centre zone.

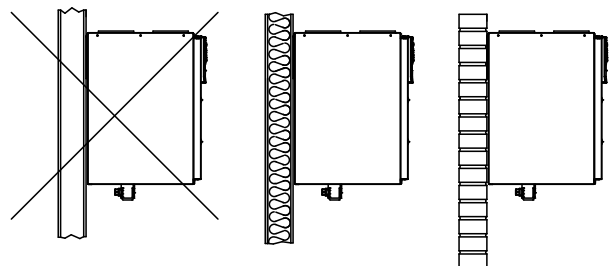


The ventilation unit should not be placed in a different fire compartment than the apartment (e.g. in a garage or boiler room).

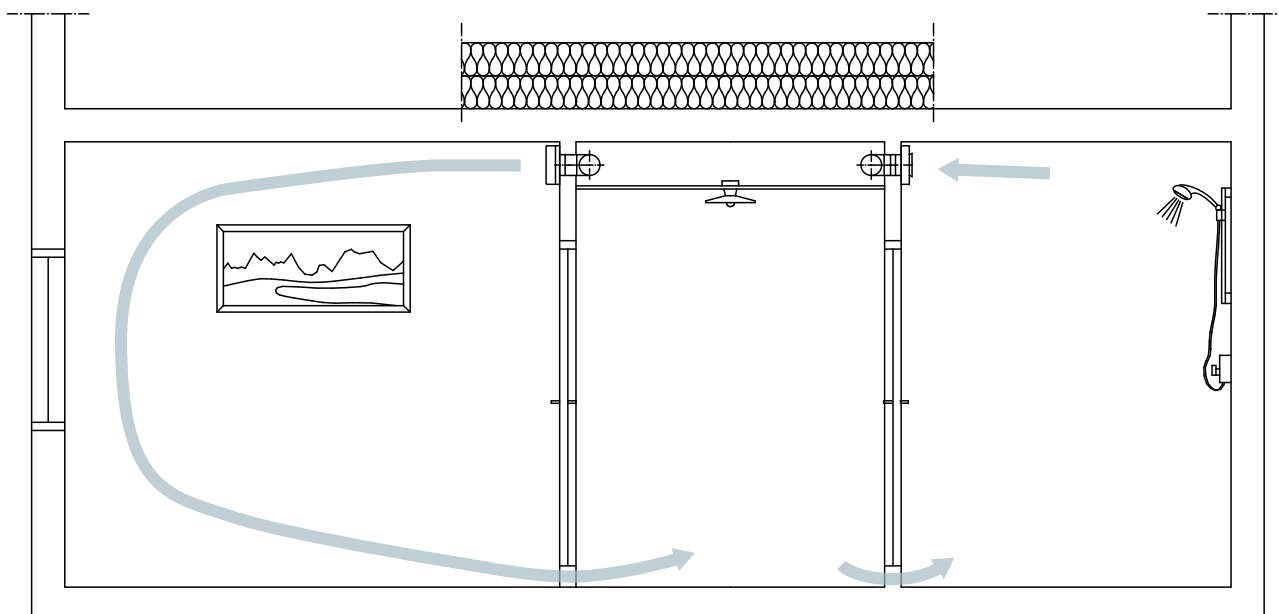
The lower image shows a correctly installed ventilation unit.



The protection class of the ventilation unit must be sufficient for the installation space. The control panel of the ventilation unit must always be located in a warm and dry place.



The ventilation unit must not be mounted on a hollow wall that amplifies the sound, but on an insulated wall that dampens the sound.



When the valve is located in the centre zone of the room, the flushing impact of ventilation is often better.

DESIGN OF THE DUCT NETWORK

Once the location of the unit and the valves have been determined, a duct network must be designed between them. The supply of fresh air to the unit and the extraction of the exhaust air out of the building must be resolved.

It is recommended that the ventilation ducts be located in a warm space on the indoor side of the vapour barrier. In such a case, there is no need to insulate the supply and extract air ducts or to make unnecessary holes in the vapour barrier. In ducts that are installed in the attic, the air will cool down to some extent in the winter despite thermal insulation. The cooling down of the extract air in the winter reduces the efficiency of the ventilation unit and increases the energy consumption of the post-heating of the ventilation. In the summer, the warming up of the supply air in a hot attic reduces the already low cooling efficiency of the ventilation.

An installation space should be reserved for the ducts on the warm side of the vapour barrier already in the design phase of the building, so that the duct network can be designed to be as short and simple as possible.

The pressure loss should be as small as possible in the duct network. The required SFP rate cannot be achieved even with a good ventilation unit, if the duct network is long or its dimensioning is narrow. The duct network can be designed so that the pressure

difference behind each valve is as similar as possible. The recommended pressure difference is under 20 Pa. This removes the need to choke the valves located close to the unit and the air flow is also sufficient at the valves that are located furthest away from the unit.

In the supply and extract air ducts, the recommended maximum air flow speed in normal use is under 3 m/s. In the exhaust and outdoor air ducts, the air flow speed can be higher. When Vallox BlueSky duct is used, the maximum air flow of 8 dm³/s must not be exceeded.

In a well-designed duct network, the air flows are easy to adjust, the system is silent, and the energy-consumption of the fans is low.

The maximum air flow in the duct, when the air speed is under 3 m/s

ø 63 mm Vallox BlueSky	8 dm ³ /s
2 x ø 63 mm Vallox BlueSky	16 dm ³ /s
ø 100 mm	25 dm ³ /s
ø 125 mm	40 dm ³ /s
ø 160 mm	60 dm ³ /s
ø 200 mm	90 dm ³ /s
ø 250 mm	150 dm ³ /s

SOUND-DAMPENING

The aim of the sound-dampening is to prevent the conduction of fan noise into the room or the conduction of sounds along the ventilation ducts from one room to another. When the Vallox BlueSky air distribution system is used, there is no direct duct connection between the rooms, for which reason no sound-dampening is needed between the rooms.

The aim of the operating time ventilation should be to achieve a sound level that is lower than the background noise. The sound level permitted by regulations is often higher than the sound level that is considered to be disturbing by persons in the room.

The sound level caused by ventilation is calculated by deducting, from the sound level produced by the ventilation unit into the duct network, the sound absorption of the sound-dampening and the ter-

minal device as per each octave band. The sound level caused by the valve is added to this, also as per each octave band. However, when a low duct pressure is used and the valve is adjusted correctly, the sound level of the valve usually has no practical significance. A sound pressure level (A) is calculated from the total, which describes the loudness of the sound in the room.

In most cases, differences are no longer observed when the sound level does not exceed 20 dB(A), because the background noise is usually louder. The noise caused by and the sound-dampening of the ventilation duct do not usually need to be observed, because the dampening offsets the noise when a sufficiently low speed is used. The noise data of the ventilation units can be found in the technical specifications of each unit.

SOUND-DAMPENING IN THE DUCT NETWORK

Vallox 096 MV, efficiency 47%, air flow 38 l/s

(the end dampening of the TINO valve has been observed)	The sound pressure level in the room dB(A)	
	Supply	Extract
Without silencers	58	44
Vallox BlueSky distribution box, 10 outlets	40	28
Silencer 125 x 450	35	23
Silencer 125 x 900	21	<20
Silencer 125 x 450 + Vallox BlueSky distribution box, 10 outlets	<20	<20
Silencer 125 x 900 + Vallox BlueSky distribution box, 10 outlets	<20	<20

Examples of the impact of different sound-dampening options on the sound level of the ventilation unit. The sound level is significantly higher in the supply air duct than in the extract air duct of the ventilation unit. In addition, noise is usually considered to be more disturbing in the bedrooms than in e.g. in the bathroom, for which reason special attention should be paid to the sound-dampening of especially the supply air duct network already in the design phase. The sound-dampening effect of the room has not been observed in the calculations. The effect is smaller in a small tiled bathroom than in larger rooms.

 = does not meet the requirements

The permitted sound level in the bedroom: 28 dB(A),
The sound level in the bathroom generally accepted in the industry: 38 dB(A)

NOISE TRAVELLING INTO THE ROOM THROUGH THE ENCLOSURE OF THE VENTILATION UNIT

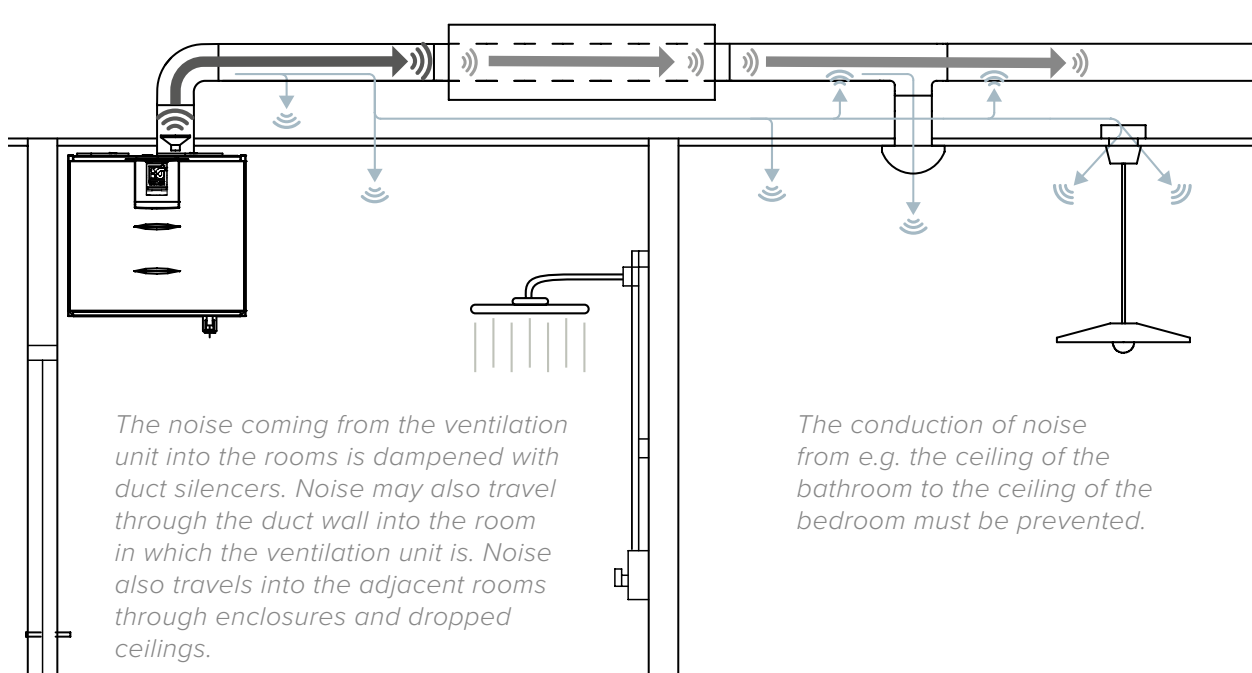
Noise travels into the room both through the enclosure of the ventilation unit and through the walls of the ducts above the unit. The noise level is the highest in the supply air duct of the ventilation unit and in the exhaust air duct. Noise conducted through the walls of the ducts can travel into the room where the unit is located through the ceiling material. The noise can also travel into the adjacent room through open structures.

The noise can also bypass the silencer inside a dropped ceiling or an enclosure. The conduction of noise must, in such a case, be prevented e.g. between the

bathroom and the bedroom ceilings. Noise travelling through the duct walls can be dampened by installing sound-dampening material around the duct or by using a more massive duct structure. Condensate insulation must be observed in the noise insulation of the outdoor and exhaust air ducts.

The sound pressure level of the ventilation unit is provided as a sound pressure level (A) by using 10 m² sound absorption.

In a small tiled bathroom, the noise is higher than in a larger room.



CONNECTIONS

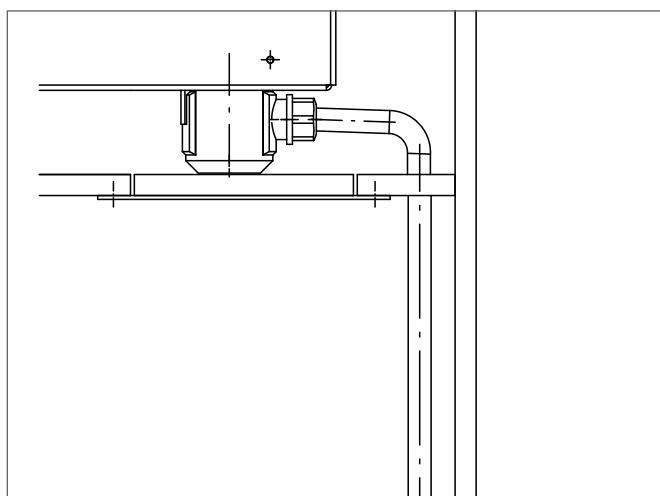
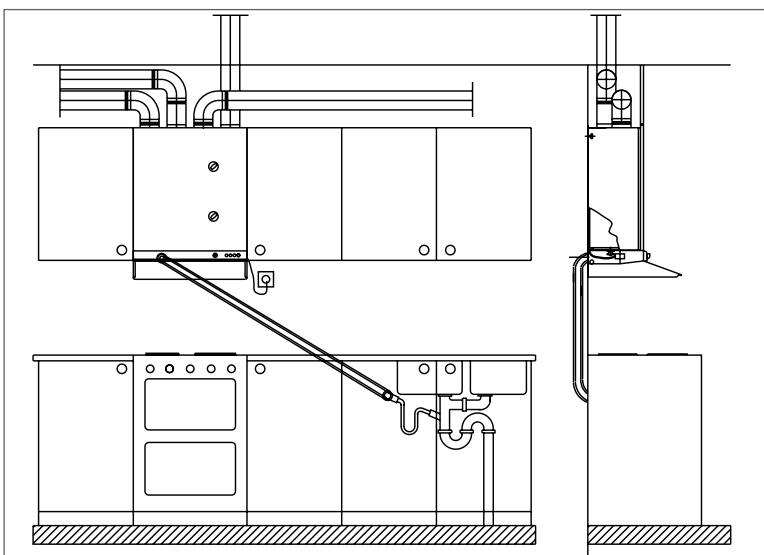
CONDENSING WATER CONNECTIONS

The heat recovery cell of the ventilation units condenses water when the outdoor air is cold and there is humidity in the extract air. If the humidity level of the room air is high e.g. due to showering or drying of clothes, the amount of condensing water can be up to several litres per day. The condensing water generated by the ventilation unit must be led to a floor drain or into the siphon of the sink, never directly into the sewer.

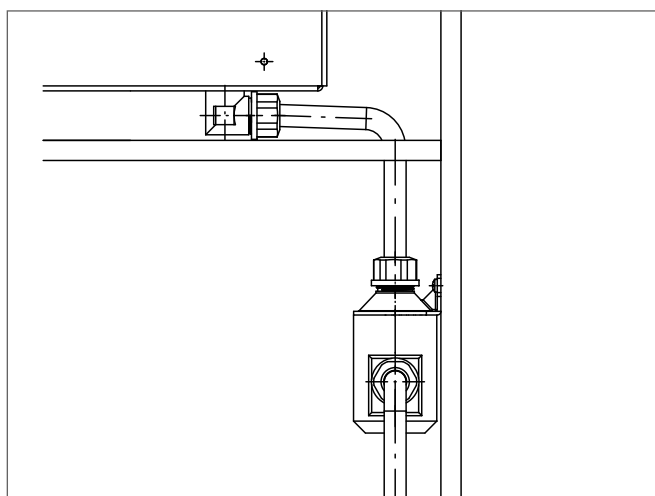
Nearly all Vallox ventilation unit models are equipped with the patented Vallox Silent Klick siphon, which prevents the noise caused by water when the siphon dries.

After the siphon, the installation can be made by using a plastic or copper pipe. The drainage must, after the siphon, be installed at an angle so that it always points downwards.

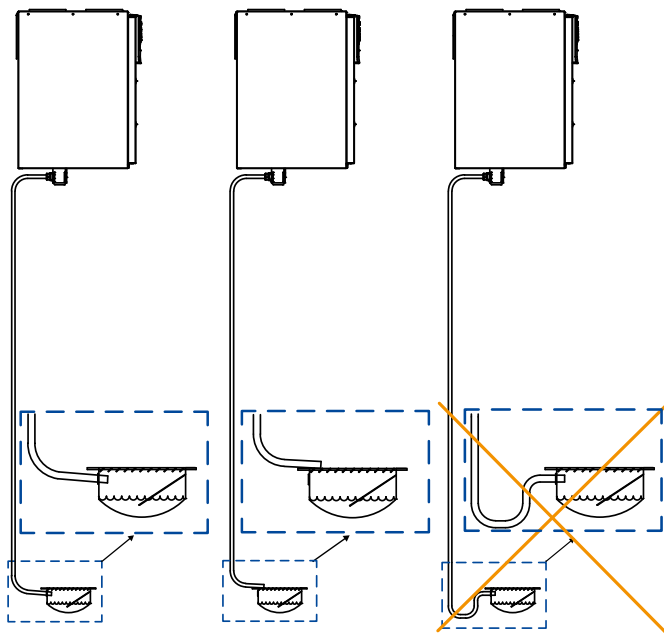
An example of the condensing water connection of the Vallox K model that is equipped with an integrated cooker hood.



Installation of the Vallox Silent Klick siphon on the bottom pool of the ventilation unit.



Installation of the Vallox Silent Klick siphon on the wall. The elbow underneath the unit takes up less space than the siphon.



The condensing water pipe must, after the siphon of the ventilation unit, be installed at an angle so that it always points downwards. Any upward sections prevent the drainage of water from the ventilation unit.

CONTROL PANEL AND SENSOR CONNECTIONS

The control panel should be located in a place where it is easy to use, e.g. the lobby, to make the need-based adjustment of ventilation as easy as possible.

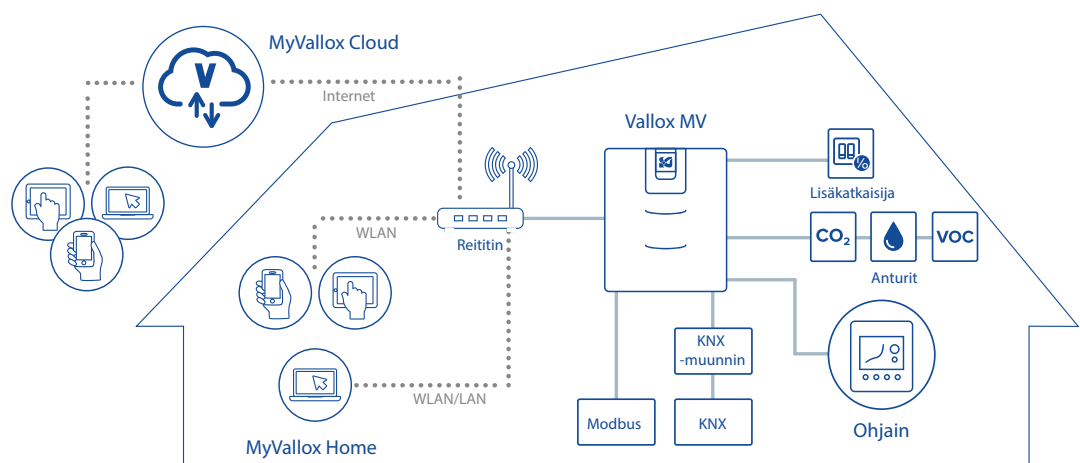
It is advisable to install carbon dioxide sensors at least in the bedrooms and possibly also in the living room or some other similar space, where the number of people may temporarily exceed the standard dimensioning. Vallox MV ventilation units have an integrated carbon dioxide sensor, so no separate room-specific sensors are usually needed.

It is advisable to install a humidity sensor in the wetrooms so that ventilation is boosted automatically when the humidity level increases. Control panels and sensors require cabling between them and the ventilation unit. Vallox MV ventilation units have an integrated humidity sensor, so no separate room-specific sensors are usually needed in residential use.

OTHER CONNECTIONS

Vallox MV ventilation units can also be controlled through the wireless network of the home or through a cloud service. **This requires leading a LAN cable from the router to the ventilation unit.** Any wiring required by the house automation connection should also be taken into account in the design phase.

When selecting the location of the ventilation unit, observe the required electrical connections and the cabling of the control panel and any air quality sensors, fireplace switches, and external control.



HEATING OF THE SUPPLY AIR

The ventilation unit uses the heat of the extract air to heat up the air that is blown into the building in winter. If the temperature of the supply air is, after the heat recovery cell, lower than the desired supply air temperature, the supply air blown into the living premises can be heated more either with an electric or post-heating liquid radiator (depending on the unit model).

The more efficient the heat recovery cell of the ventilation unit is, the less the supply air needs to be heated by means of the post-heating. The highly efficient cross-counter flow cells can heat the supply air to over +17°C almost throughout the year. This makes the preheating of supply air almost unnecessary, with the result that the higher procurement and installation costs of a liquid radiator cannot be written off within a reasonable period of time.

The supply air temperature should not be set unnecessarily high: a couple of degrees below the room temperature is optimal. This also enables a minor cooling impact when e.g. a fireplace or the sun creates additional thermal loading in the apartment in winter.

If the ventilation unit is equipped with a post-heating liquid radiator, its freezing protection must be ensured in winter also during disturbance situations, such as a power cut or a breakage of the pump. If the outdoor air duct is short, the connection to the liquid radiator must be protected against freezing e.g. by means of water-glycol solution or the outdoor air duct must be equipped with an automatically closing damper.

The energy requirement of the post-heating radiator kWh/v (Air flow 40 dm³/s, Central Finland)

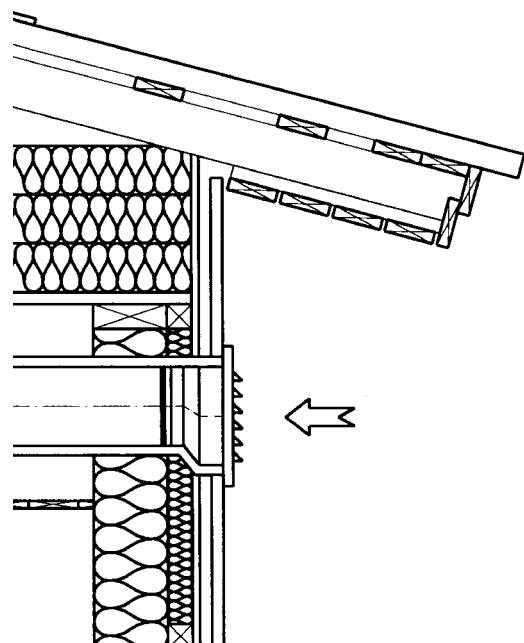
	Annual efficiency	Set supply air temperature			
		+16°C	+18°C	+20°C	+22°C
		Annual energy requirement in kWh			
Vallox 096	75%	0	200	800	1300

OUTDOOR AND EXHAUST AIR

INTAKE OF OUTDOOR AIR

It is recommended that the outdoor air is taken into the ventilation unit from the eastern or northern wall of the building to avoid the heating impact of the sun. The outdoor grille must be located so that it is not close to waste collection shelters, parking spaces, or busy streets. The outdoor grille must not be located on a balcony or in an inside corner where exhaust gas, tobacco smoke, or other smells or snow that can block the grille can accumulate.

The flow resistance of the outdoor grille must be as low as possible. The free flow area of the outdoor grille must be at least the same as the cross-sectional area of the outdoor air duct. Depending on the type of the grille, the outdoor grille must usually be 1-2 sizes larger than the duct and it must not be equipped with an insect net.



BLOW-OUT OF EXHAUST AIR

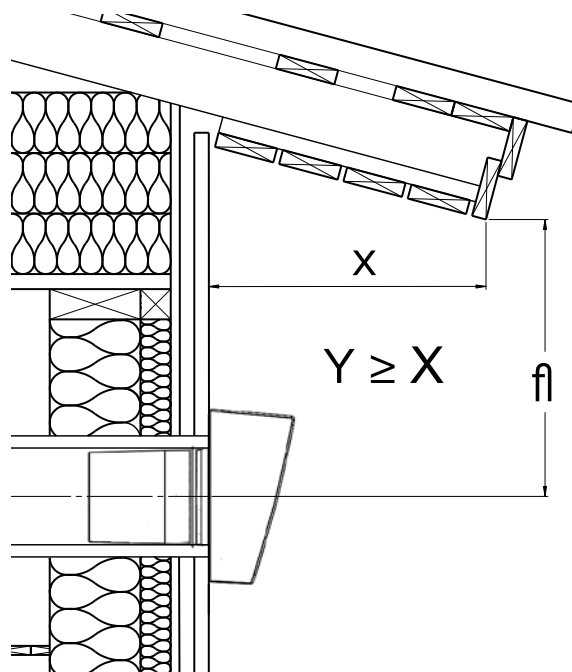
The exhaust air of the ventilation unit can be blown out through the ceiling feed-through located on the roof or by using the wall-mounted air blow-out device installed on the exterior wall.

Exhaust air must be led out of the building so that it does not place a humidity load on the structures or cause noise or smell disturbances e.g. on a terrace or balcony. If exhaust air is led to the roof, it must be observed in the design that the exhaust air does not melt snow on the roof in winter. It must be observed in the installation of a wall-mounted air blow-out device that there are no buildings or other obstacles in the air blow-out area. The wall-mounted air blow-out device must not be located immediately underneath eaves or other overhangs or in an inner corner, to prevent the humidity contained in the extract air from condensing into the structures of the building.

The ceiling feed-through must be dimensioned so that it is sufficiently loose, usually one duct size larger than the exhaust air duct. The wall-mounted air blow-out device must be dimensioned so that the initial speed when the operating air flow is used is at least 5 m/s. If the apartment is equipped with automatics that recognise the need to boost ventilation due to the use of the cooker hood, the use of the wetrooms, or the need to remove humidity, the initial speed of 5 m/s must be exceeded when the boost air flow is used.

The intake of outdoor air and the blow-out of exhaust air can be implemented by using a combined wall-mounted air intake and air blow-out device (Vallox Out/In Vario) that does not enable the mixing of the exhaust air and the fresh air that is taken from outdoors.

Verify any special requirements for wall-mounted air blow-out units from the local building control authorities.

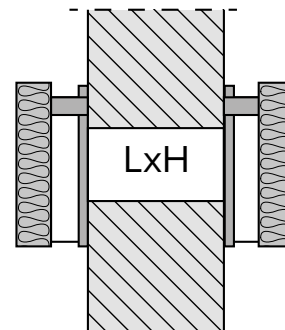


The vertical distance of the wall-mounted air blow-out device from e.g. the eaves is at least the same as the length of the eaves. Always comply with the installation instructions provided by the manufacturer.

TRANSMITTED AIR

To ensure that the ventilation of the apartment works in the desired manner, there must be transmitted air routes between the rooms into which the air is transmitted and the other premises. The easiest way to implement this is to remove the thresholds of the doors to also allow air to travel from room to room when the door is closed. If an air-tight and sound-dampening door needs to be installed, separate transmitted air routes equipped with sound traps need to be installed. If the supply air and extract air flows of the room are the same, no transmitted air routes are needed.

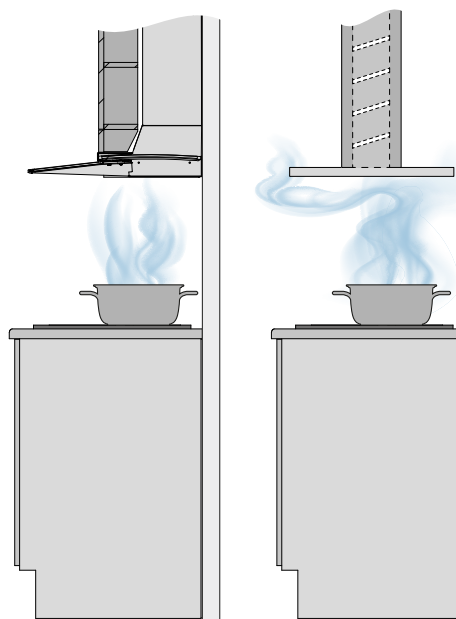
Instead of a door vent, a sound-dampening transmitted air grille can be used as the transmitted air route



REMOVAL OF COOKING SMELLS

A separate system, either a cooker fan or a combination of a cooker hood and a roof fan, is usually the best solution for removing cooking smells from above the cooker top. When a separate system is used, the extract air flow of the cooker top is usually significantly higher than when extract air flow is created with the ventilation unit.

In multi-storey and terraced buildings and in small holiday homes, the removal of cooking smells can also be implemented through the ventilation unit and the heat recovery cell.



Tips for more efficient cooking smell removal

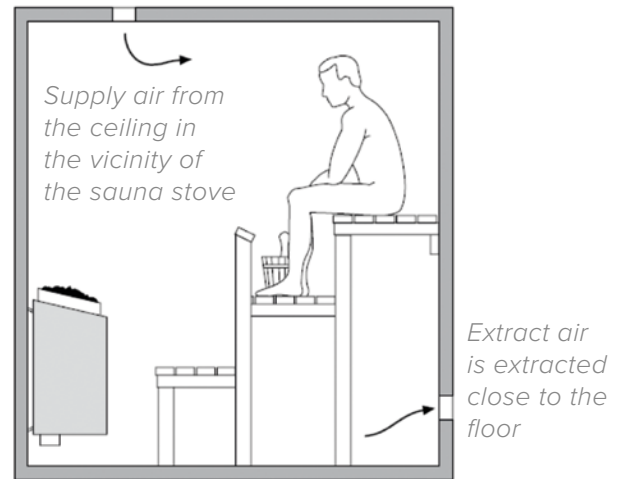
A cooker hood that has an excellent smell absorption capacity and is installed sufficiently low together with a loose dimensioning of the duct of the cooker hood enables the most efficient removal of cooking smells. The grease filter must be washed regularly. The automatic boosting of ventilation when the damper of the cooker hood opens also helps to remove cooking smells.

The removal of cooking smells works better when located next to a wall than in an islet kitchen, where the cooking smells spread easily into the room air due to the air flows generated by passing people.

VENTILATION OF THE SAUNA

The supply air is led to the wall or ceiling above the sauna stove and the extract air is extracted from underneath the sauna benches roughly 30 cm above the floor surface. No extract air valve that can be opened is needed in the ceiling of the sauna.

Install a directional supply air valve at least 500 mm and a non-directional valve at least 1000 mm from the temperature sensor of the sauna stove. Follow the instructions of the sauna stove manufacturer.



© Eurofins

FIREPLACES

The supply of combustion air to the fireplaces must be specified in the ventilation plan. Because the combustion air needed by the fireplace cannot, in an air-tight building, be taken through the exterior wall structure, an air supply duct must be led to each fireplace from outdoors. The best location for the duct is specified by the manufacturer for each fireplace model. If the combustion air is taken in an uncontrolled manner through the exterior wall structure or through the fresh air valve, there is a risk that this will cause a draft and the condensation of the humidity contained in the room air in the structures.

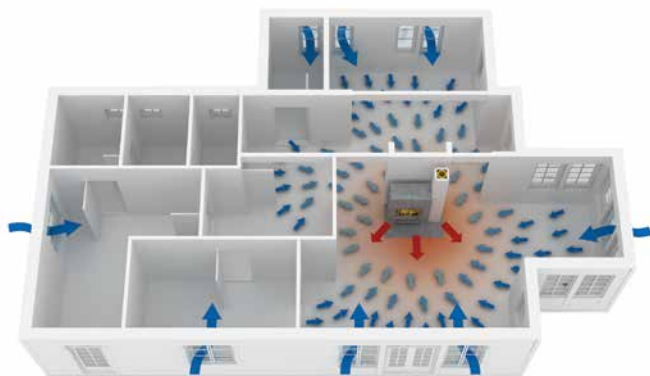
A specialist must design the additional intake of outdoor air required by the fireplace and separate extractions, so that the ventilation system of the

building operates in a controlled manner without a negative impact on the pressure inside the building or the rooms¹.

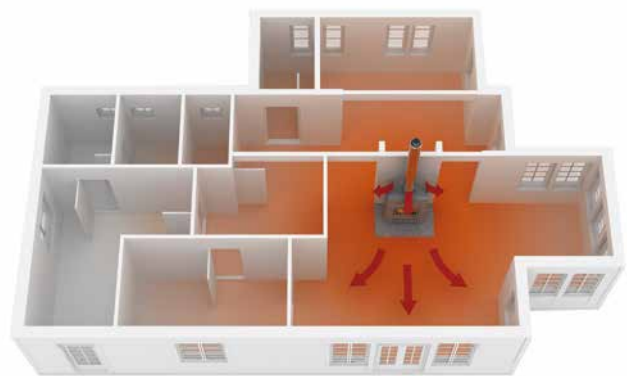
The air supply duct of the fireplace must be designed so that it does not cool down the room or the structures. In a warm space, the air supply duct must be insulated by using closed cell insulation to prevent the generation of condensing water. The air supply duct of the fireplace must be equipped with a shut-off valve.

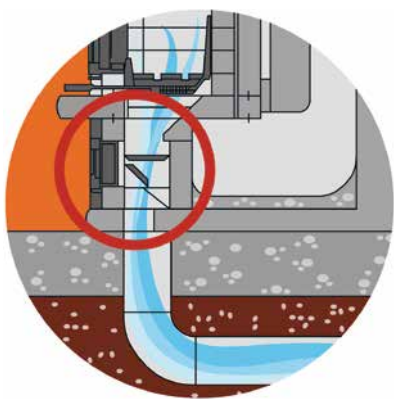
The fireplace mode of the ventilation unit makes lighting a fire in the fireplace easier. The fireplace mode can never replace the air supply duct.

¹ Decree of the Ministry of the Environment on the Indoor Climate and Ventilation of New Buildings, 1 January 2018



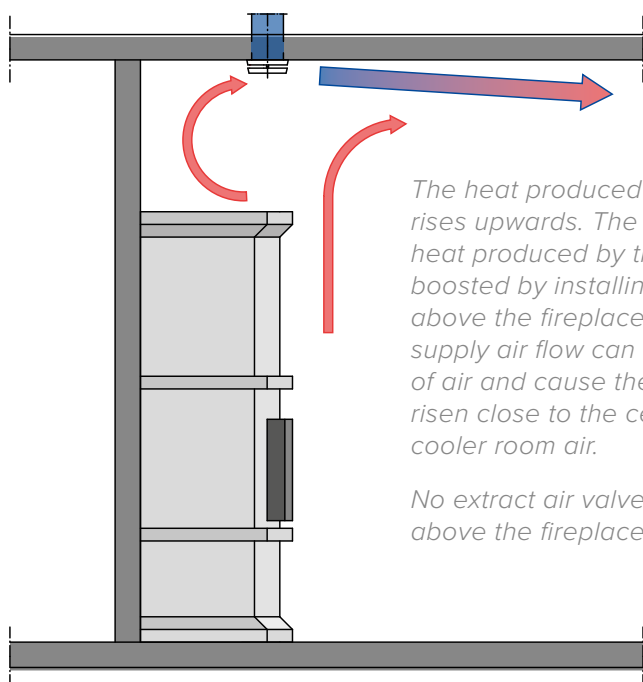
If the fireplace takes the combustion air from the room, this cools down the building. Images © Härmä Air





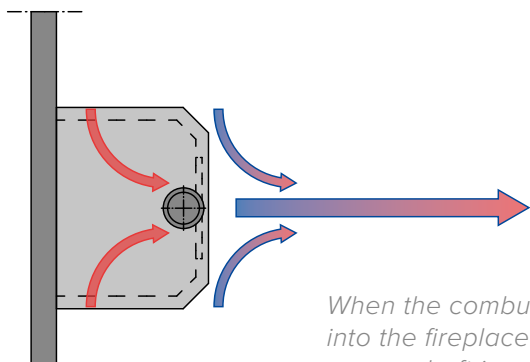
© NunnaUuni Oy

There are several possible options for the controlled intake of the supply of air of the fireplace. Follow the instructions of the fireplace manufacturer. The image shows a supply air duct led underneath the fireplace and equipped with a shut-off valve.



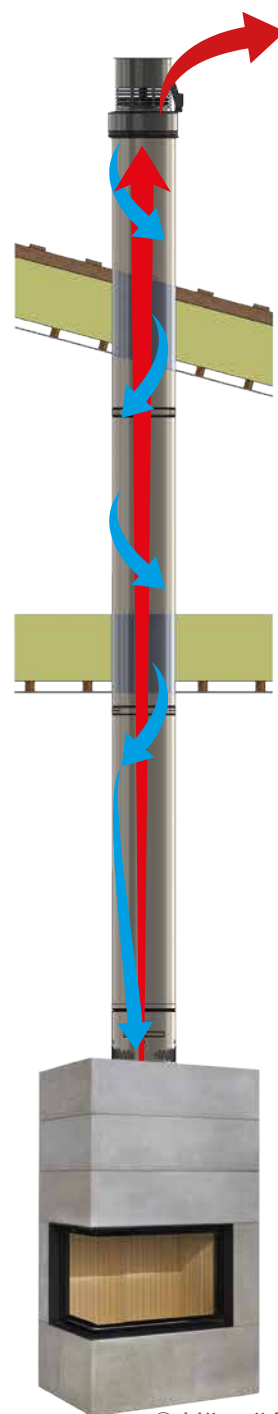
The heat produced by the fireplace rises upwards. The spreading of the heat produced by the fireplace can be boosted by installing a supply air valve above the fireplace. Even a very small supply air flow can move a large volume of air and cause the warm air that has risen close to the ceiling to mix with the cooler room air.

No extract air valve should be installed above the fireplace.



© NunnaUuni Oy

When the combustion air is led directly into the fireplace in a controlled manner, no draft is generated and there will be no need to open the window even in an air-tight building.



© HärmäAir

INSTALLATION OF THE VENTILATION UNIT

Before installing the Vallox ventilation unit, read the instructions provided with the unit to learn about the available installation options.

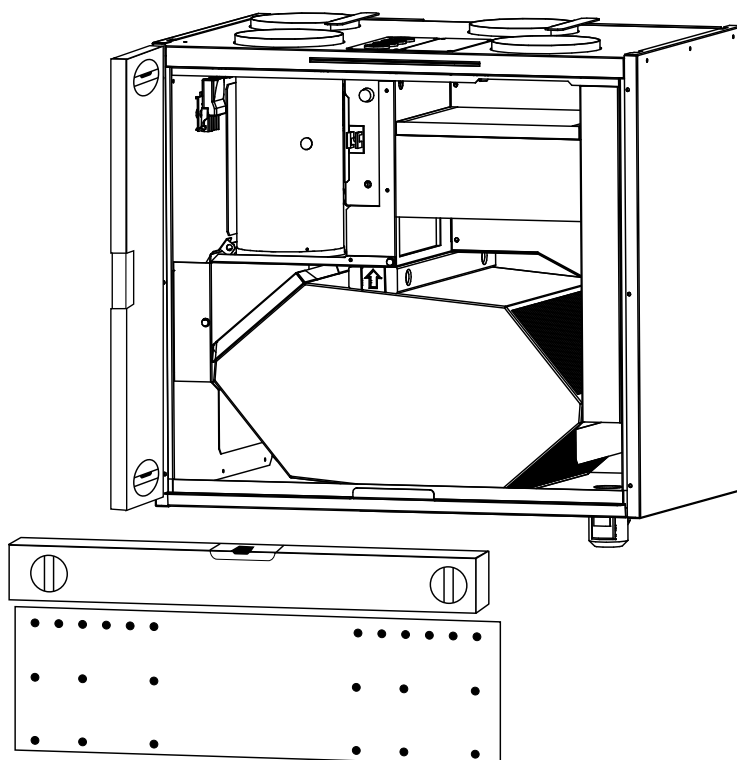
Also observe the required electrical connections and the cabling of the control panel and any air quality sensors, fireplace switches, and external control (e.g. LAN or house automation). The cable types of the sensors, control panels, etc. are specified in the technical specifications of each unit.

Depending on the model of the ventilation unit, it can be mounted on the wall, on the ceiling structures either with a ceiling mounting plate or the unit's own mounts, or on a base on the floor. Depending on the model of the ventilation unit, the wall, ceiling, or floor mounting accessories can be optional and not all mounting methods are possible with all models.

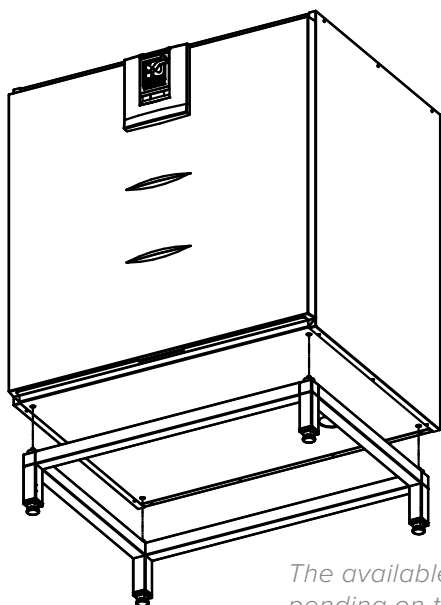
The wall on which the unit is installed must have sound-dampening at the minimum. It must be ensured in the mounting that the structures can withstand the weight of the unit. In addition, the unit must be mounted so that it does not touch the structures on any side. The opening of the unit door or possible service door and the service space required by the unit must be observed.

Regardless of the installation method, it must be ensured that the unit is horizontally and vertically level to ensure that condensing water can exit the unit freely.

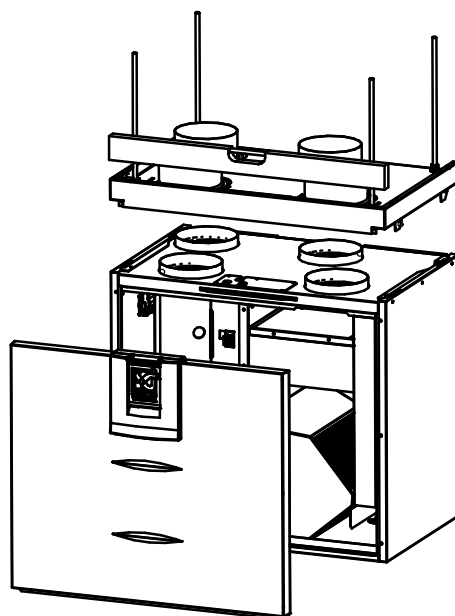
Before installing the unit, it must be ensured that the electric and pipe connections can be completed when the unit is in place.



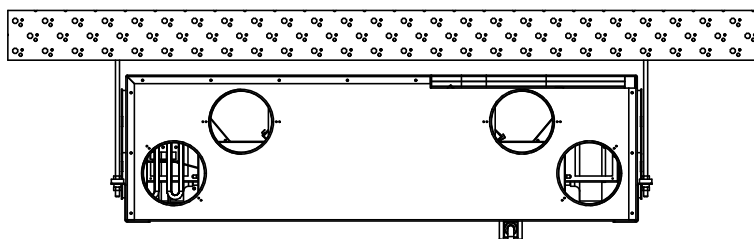
Installing the ventilation unit by using a wall-mounting plate: Always ensure that the ventilation unit is level.



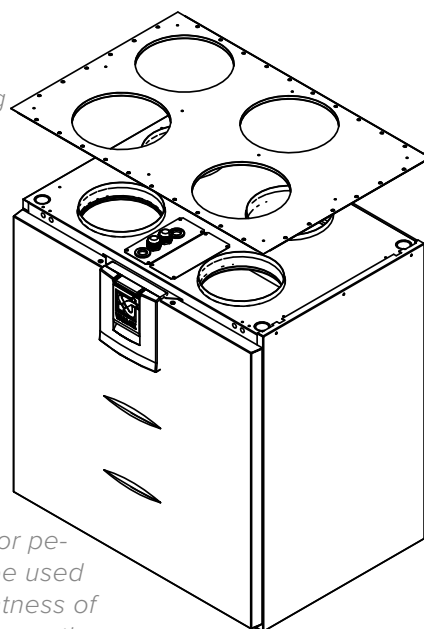
The available installation options vary depending on the model of the Vallox ventilation unit.



The image shows a ventilation unit mounted on a base on the floor on the left and mounted by using the ceiling mounting plate on the right.



Ceiling-mounted ventilation unit



An insulated attic floor penetration plate can be used to ensure the air-tightness of the vapour barrier above the ventilation unit.

In a warm space, outdoor and exhaust air ducts need to be insulated with condensate insulation. The insulation must also be completed carefully above the unit between the unit and the ceiling-mounting plate.



INSTALLATION OF THE DUCTS

INSULATION OF THE DUCTS

Supply and extract ducts in cold spaces (in or above roof insulation)
The temperature of the air passing through the duct is above +10°C

If the ducts are installed in a cold space, thermal insulation must be used. The thermal insulation of the ventilation ducts should be as good as the thermal insulation of the rest of the building. Defective insulation of the supply air duct in a cold space causes the temperature of the supply air to decrease, which can result in a draft. Inadequate insulation of the extract air duct reduces the efficiency of the heat recovery and increases the energy consumption of post-heating.

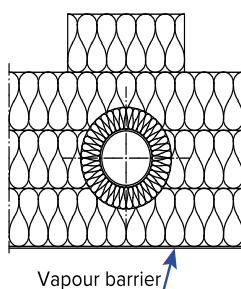
If the ventilation ducts must be led through the vapour barrier of the building enclosure, the feedthroughs must be made airtight to prevent the humidity of the

indoor air from entering the insulation layers through these leak points. Separate feedthrough sealing parts are also available for the purpose.

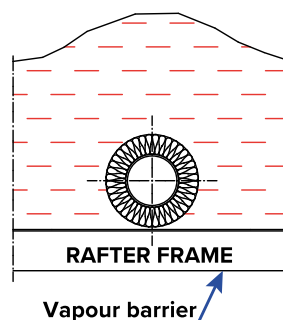
THE TEMPERATURE OF THE AIR PASSING THROUGH THE DUCT IS ABOVE +10°C

- Extract air duct
- Supply air duct

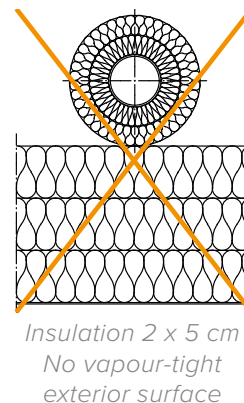
Ducts in sheet wool



Ducts in blown wool



Not a recommended option



VALLOX BLUESKY DUCTS IN THE ROOF INSULATION

The temperature of the air passing through the duct is above +10°C

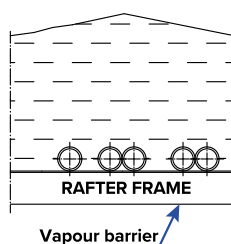
When installed in the attic, the small-diameter Vallox BlueSky duct does not usually need other insulation apart from blown wool when the duct is installed close to the vapour barrier. If the duct is installed away from the vapour barrier, adequate insulation must be ensured on top of the duct.

Any special local authority requirements must be followed.

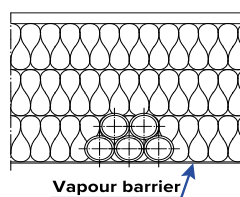
THE TEMPERATURE OF THE AIR PASSING THROUGH THE DUCT IS ABOVE +10°C

- Extract air duct
- Supply air duct

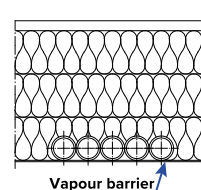
Ducts in blown wool



Ducts in the roof insulation, alternative 1



Ducts in the roof insulation, alternative 2



VALLOX BLUESKY DUCTS IN A WARM SPACE

The temperature of the air passing through the duct is above +10°C

Supply and extract air ducts should always be installed in a warm space. In such a case, thermal insulation is not needed and the cooling of the air in winter and warming in summer is minimal.

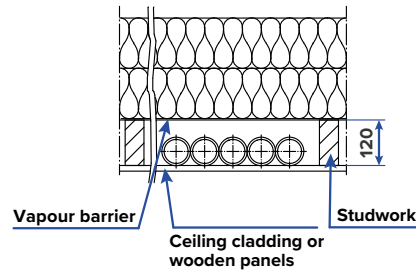
THE TEMPERATURE OF THE AIR PASSING THROUGH THE DUCT IS ABOVE +10°C

- Extract air duct
- Supply air duct



= No insulation

Ducts inside a dropped ceiling



SUPPLY AIR DUCTS FOR COOLED AIR

The temperature of the air passing through the duct is below +17°C in summer

If the ventilation unit has a duct radiator for cooling and the supply air temperature is below the dew point of the outdoor air in summer, the supply air duct must be insulated with closed cell condensate insulation.

A duct that is insulated with condensate insulation must not be installed inside thermal insulation. If a cold duct that has been insulated with condensate insulation is immersed in thermal insulation, there is a risk that the surface temperature of the condensate insulation decreases below the dew point, causing humidity to condensate on the surface of the condensate insulation as the insulation layer prevents the warming up of the condensate insulation.

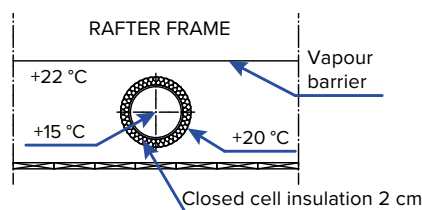
USING THE VENTILATION UNIT FOR COOLING. THE TEMPERATURE OF THE AIR PASSING THROUGH THE DUCT IS BELOW +17°C

- Supply air duct

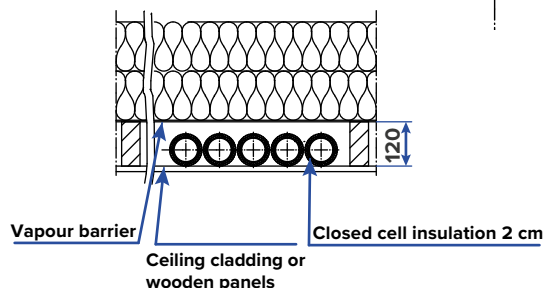
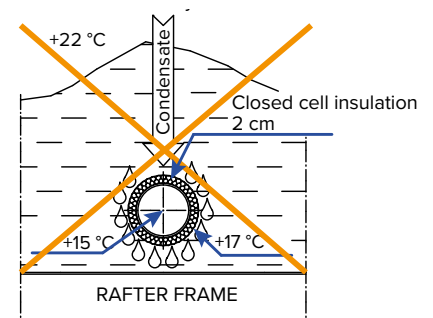


= Closed cell insulation (2 cm)

Recommended options



Not a recommended option



OUTDOOR AND EXHAUST AIR DUCTS

The temperature of the air passing through the duct is below +10°C

If a cold outdoor or exhaust air duct is located in a warm indoor space, it must be insulated with closed cell thermal insulation to prevent the humidity contained in the indoor air from condensing on the surface of the cold duct. In very efficient ventilation units, the temperature of the exhaust air can be as low as -10 °C. Outdoor and exhaust air ducts must not be installed inside the roof insulation to prevent the condensing of the humidity contained in the indoor air in the vapour barrier.

In the attic, a vapour-tight moisture barrier must never be installed on the exterior surface of the exhaust duct insulation, as the humidity leaking from the duct network must be able to evaporate into the ventilated attic space.

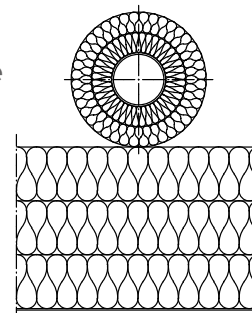
The outdoor air duct must also be insulated in the attic space so prevent the warming up of the air in an uninsulated duct on hot summer days and the condensing of water inside the duct in winter, if the ventilation unit is not, for any reason, turned on.

THE TEMPERATURE OF THE AIR PASSING THROUGH THE DUCT IS BELOW +10°C

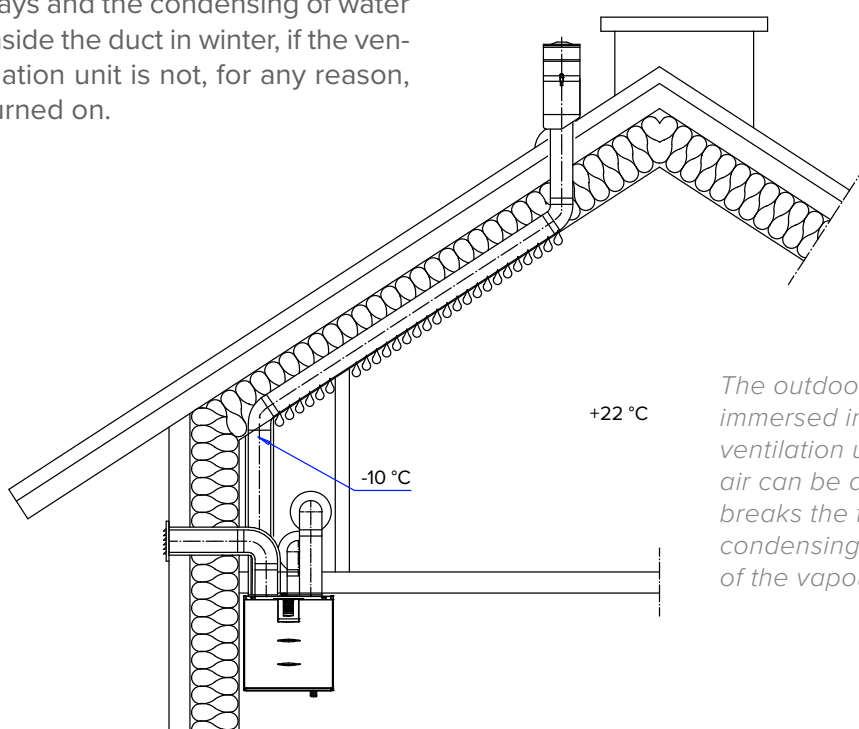
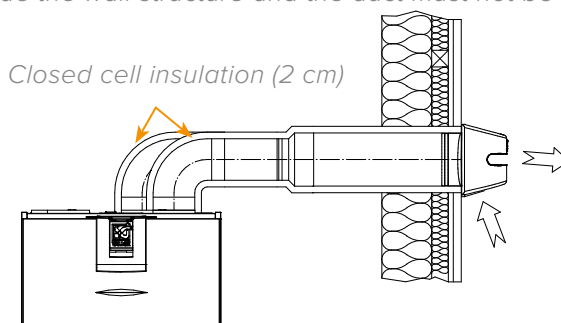
- **Insulation 2 x 5 cm**
- **No vapour-tight exterior surface**

Note!

The outdoor and exhaust air ducts must not be installed immediately above the vapour barrier.



The outdoor and exhaust air ducts must be insulated with condensate insulation in a warm space and the insulation must extend unbroken all the way to the exterior surface of the exterior wall. No duct connections should be located inside the wall structure and the duct must not be placed at an angle so that it points downwards towards the indoor premises in order to prevent any snow or ice that is transmitted into the duct from remaining inside the duct.



The outdoor and exhaust air duct must not be immersed in the roof insulation. In very efficient ventilation units, the temperature of the exhaust air can be as low as -10 °C in winter. A cold duct breaks the thermal insulation layer and can cause condensing water to collect on the inner surface of the vapour barrier next to the duct.

ADJUSTMENT AND MEASURING OF THE VENTILATION SYSTEM

The ventilation system must always be adjusted in accordance with the ventilation plan for it to operate in the designed manner. Correctly implemented adjustments ensure appropriate ventilation in each room and the correct ratio between the supply and extract air flows. An overpressure inside the building pushes the humidity contained in the indoor air into the structures of the exterior enclosure, whilst an excessive underpressure can have a negative impact on the drafts of the fireplaces. Uncontrolled leakages can also transmit impurities into the room air from outside or from the wall structures.

The SFP rate of the supply and extract air ventilation system, i.e. the power consumption of the fans in relation to the air flow, must be a max. 1.8 kW/(m³/s). To achieve this, the system needs to be adjusted by an expert.

Vallox ventilation units provide the expert adjusting the air flow settings with good starting points for implementing silent, economic, and efficient ventilation. In the latest unit models, each fan speed can be adjusted separately, and the ratio between the supply and the extract air flows can also be adjusted.

In ventilation units equipped with MyVallox Control panels, the fan speed is preset and the supply and extract air ratio is adjusted by using the control panel.

The Vallox X-line PTXP MC hood: the control voltage to the fan (0-10VDC) is adjusted by using the potentiometer on the hood. There is a specific control voltage for each speed.

The Vallox Delico PTD EC cooker hood: the control voltage is adjusted from the operating panel of the hood. The PTD EC cooker hood reports the control voltage with the flashing of the setting signal, and it can also be measured from the measuring tubes behind the grease filter.

The Vallox Delico PTD AC cooker hood has the following control voltages as the default factory settings: Away 70 V / At home 135 V / Boost 230 V. To change these values, move the transformer wires to more suitable connectors (see the wiring diagrams for instructions). Any changes to the transformer wires must be made by an electrician. It is also recommended to record the control voltages in the measurement log.

GENERAL ADJUSTMENT INSTRUCTIONS

Air flows must be adjusted by using the lowest possible fan speed. If ventilation is adjusted by using an unnecessarily high fan speed and the air flows are choked by means of valves, this increases the noise level of the ventilation system and increases the energy consumption of the fans. In addition, low-set valves prevent the adequate boosting of ventilation.

Air flows must always be measured by using clean original filters. The heat recovery must be turned on, i.e. the bypass damper or the winter-summer damper must not be in the cell bypass position, because in that position the air flow can, in some ventilation units, deviate from the winter time air flow. The correct supply/extract ratio is important, especially in winter. It must be ensured, before adjustment, that the outdoor grille does not have an insect net.

In below-zero weather, ensure that the heat recovery cell is free of ice. In units equipped with Vallox's need-based defrost automation, some ice may accumulate in the cell before the defrosting cycle starts. If there

is ice in the cell, the defrosting cycle can be started manually from the service menu of the MV models. During the defrosting cycle, the supply side of the heat recovery cell is bypassed. The duration of the cycle is, at least, 15 minutes. During the defrosting cycle, the mutual speed of the fans does not change, but in very cold weather, the efficiency of ventilation may decrease temporarily before the electrical resistors start to heat the supply air sufficiently. Measurements should not usually be taken in very cold weather or when the humidity level is exceptionally high inside the apartment.

The air flow measuring tubes of the Vallox ventilation units are installed in the duct and are either fixed or delivered with the unit. The pressure difference measured from them can be used to calculate the total air flow. This is particularly convenient if the air flows measured from the valves deviate from the design values and a leak or blockage of the ducts is suspected.

AIR FLOW ADJUSTMENT

Preparing for adjustment

Note! In Vallox MV models, it is advisable to restore the factory settings of the unit before the adjustment. This starts the setup wizard, the unit goes into the setup mode (the HR cell is not bypassed, for example), and any settings made are saved as setup settings.

1. Adjust the valves roughly to the correct position – principally relatively wide open. In the case of the Vallox MV model with the 2.0 or newer software version, open the Air volume adjustment menu from the Save and restore settings menu. In the case of an older software version, restore factory settings and select “Do you want to make expert settings?”.

Adjusting total air flows from the unit

2. Measure the pressure difference from the extraction side of the unit (between the extract air and the exhaust air ducts). See the fan curves of the unit to determine the speed at which this setting will most probably be met. Measure the pressure difference by using the fan speed that you assume to be in the correct operating range and at speeds that are 1-2 steps lower and 1-2 steps higher. In most cases, 3-4 speeds are sufficient. Depending on the ventilation unit model, the speeds of the fan curves are specified in numeric values, in efficiency (in %), or in adjustment voltage (V).

To start the adjustment:

- At non-boosted air flows during operation, i.e. in the At home mode



- Heat recovery bypass damper in the winter position - the setup wizard automatically switches the unit to the winter position

- Use clean filters

- Check the outdoor grille
Remove the insect net of the outdoor grille!

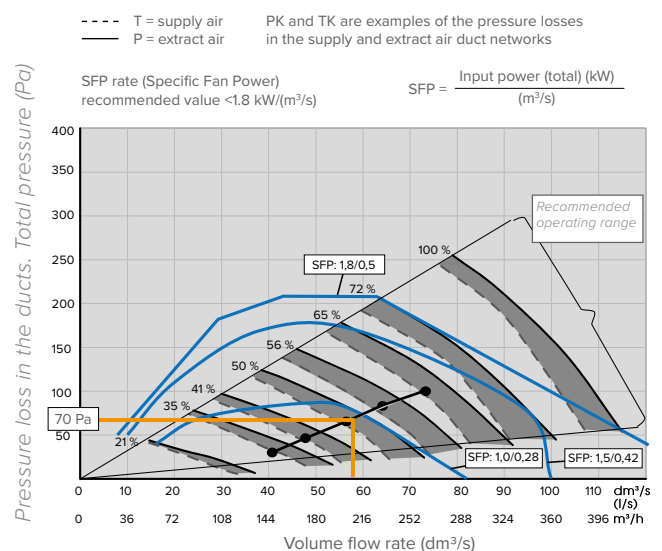
Utilise the adjustment options of the unit

- Use webhelp to study all the adjustment options



If the speeds are specified as voltages, the adjustment voltage of the fan can be measured from the measuring pins of the PTXP MC or PTC ED cooker hoods. The PTD EC cooker hood also reports the control voltage by means of the signal lights of the setting mode.

3. Mark the **measured results** in the extract curve of each speed in the fan curve of the ventilation unit's manual and connect the dots to form a line. Alternatively, the facility curve can be “drawn” by using the Vallox MySelecta product selection software.
4. Draw a **vertical line** from the air flow axis to the line you drew at the planned total extract air flow (facility curve) and from there, draw a **horizontal line** to the pressure difference axis. This will tell you how much the unit needs to increase the pressure for the total extract air flow to be correct.



5. Measure the pressure difference from the extraction side of the unit (between the extract and exhaust air ducts) and adjust by using the nearest suitable fan speed or the pressure of the “At home” mode to match the pressure requirement you just calculated. Use the fan speed percentage setting of the control panel or the potentiometer of the control panel for the adjustment. This setting only adjusts the fan speed in question. The total extract air flow is now correct.
6. Adjust the supply air flow correspondingly by measuring the pressure difference from the supply side (between the outdoor and supply air ducts).
7. If the supply air flow is too high, reduce the speed of the supply air fan. If the supply air flow is too low, increase the speed of the supply air fan until the increase of pressure in the supply side is sufficient. Do not make further changes to the supply/extraction ratio after this! The difference between the efficiency of the supply and extract fans must not exceed 30%.

MEASURING OF ROOM-SPECIFIC AIR FLOWS

1. Set the ventilation efficiency for the At home mode or for the fan speed that you adjusted in point 6. Adjust the planned room-specific standard air flows of the At home mode from the valves. If the air flow of any of the valves remains too low during the first “adjustment round”, do not increase the rotating speed of the ventilation unit. As the total air flow of the ventilation unit has been adjusted correctly, the air flow of some other valve is too high.
2. Ensure that the boost air flows specified in the plan are met or exceeded when the Boost mode or a suitable fan speed is used. Adjust the fan speed of the Boost mode, where required. Use the fan speed percentage setting of the control panel or the potentiometer of the control panel. This setting only adjusts the fan speed in question. The total extract air flow is now correct. Do not make further changes to the adjustment positions or the supply/extraction ratio of the valves.
3. If the control panel has a higher adjustment position, it can usually be reserved for full speed.
4. Measure the Away air flows (e.g. 30% smaller than the standard ventilation) in a similar manner either by using the Away mode or a suitable fan speed. Adjust the fan speed of the Away mode, where required. Use the fan speed percentage setting of the control panel or the potentiometer of the control panel for the adjustment. This setting only adjusts the fan speed in question. The total extract air flow is now correct. Do not make further changes to the adjustment positions or the supply/extraction ratio of the valves.
5. Record the reached valve-specific air flows and the fan speed used for the adjustment in the measurement log (including the adjustment voltage or percentage, if provided by the control panel) and the efficiency of the supply and extract air fans in percentage. In terraced houses, for example, the adjustment position of them and the valves can be used to “copy” the basic settings made in the first apartment to other similar apartments.
6. After the air flows have been measured, the adjustment positions of the valves will be locked and their adjustment position or the location of the valves must not be changed after this. If the valve includes a “sector plate”, the blow direction of the air flow can be changed by turning the entire valve, if the air is blowing to the living zone. The basic fan speed settings of the ventilation unit and especially the supply/extraction air ratio must never be changed without a new air flow measurement!

USER INSTRUCTION

It is important to instruct the resident on the use of the ventilation unit in different situations and on its maintenance. At the minimum, instruct the resident to adjust the efficiency of ventilation and to change the filters. Also inform the residents about the functioning of the humidity or carbon dioxide sensors.

The residents should also know that when the valves are being cleaned, it is important to remove the valve so that the adjustment position does not change. Round valves can be removed from the ceiling with their frames by turning and then cleaned. If the adjustment is, in the valve, done with a magnetic tape or a sticker, the number of open holes must be the same after the adjustment.



The operating instructions of Vallox ventilation units can be found on the Vallox website (www.vallox.com).