



Local ventilation system with heat recuperation MIKrovent®

Product-Technical Catalog

mikrovent.io



Preface

Let's start with »why«

Have you ever wondered how clean and healthy is the air you breathe at home or in your office? Would you like to know when the ducts of the central ventilation system in the hotel, where you spend your carefree vacation, were last cleaned?

If not, you will perhaps dedicate more attention to the above questions after reading this catalog. Here you can browse the most important general information about ventilation. Through presentation of various information about ventilation systems we will also present our local ventilation units, which we have been developing and producing for the last 10 years. If you do not find all the answers to your questions in this catalog, we kindly invite you to visit MIKrovent Academy on our website, where you can learn about and further explore other facts about ventilation.



Yours truly,
MIKrovent Team



How did it all begin?

Beginning with a vision

1990

It was 1990, when MIK Celje started its journey to success. In that year, Franci Pilberšek, a student of architecture, unleashed his entrepreneurial spirit, and decided to establish his own company. After buying the business premises and setting up a production line in Vojnik, he entered serious entrepreneurial waters and began with the purchasing and processing of moldings for picture frames.

1998

From moldings to window profiles

Franci Pilberšek soon expanded the moldings business and, together with his colleagues, decided to enter a new industry. In 1998 MIK Celje opened a new 1,700m² production site for the production of PVC windows in Celje, which was upgraded to a computer aided production line in 2000. Over the years, the company continued to develop, it introduced new products in its product range (winter gardens, blinds, roller shutters, aluminum and wooden windows and doors, etc.) and was awarded the title of the leading manufacturer of windows and doors and provider of complete glazing solutions for buildings in the Slovenian market, which is still true today. The company boasts numerous domestic and foreign references, e.g. in the field of residential as well as commercial buildings.

2007

Healthy entrepreneurship drives innovation

As a provider of high-quality windows and doors, MIK Celje soon became aware that windows and doors – produced according to standards – seal the room to such an extent that the quality of living quickly deteriorates. This is also true for our most critical commodity – air. A properly-ventilated room is one of the most important factors for a pleasant and healthy indoor living. If we wish to ventilate a room well, we must resort to cross-ventilation, i.e. we must completely open the window and ensure at least three to five minutes of draft, several times a day. To obtain ventilation-related energy savings, while providing for required fresh air, the first solution that springs to mind is mechanical ventilation – either central or local. In 2007, in line with the modern principles of energy-efficient construction and renovation of existing buildings, MIK Celje resorted to innovation and developed the MIKrovent local ventilation system in collaboration with Prof Dr Peter Novak.

2015

Innovation meets market

From a manufacturer of windows and moldings MIK Celje developed into a company whose main goal is to raise the quality of living and life in general. In addition to producing high-quality windows and doors, MIK Celje also pursued its mission with the production of its own ventilation units that help meet needs of a diverse group of customers in both living and business premises.

With the idea of developing a ventilation unit, MIK Celje started its path toward a co-natural, green economy, which is the current goal of entire Europe. MIK Celje became a promoter of circular and green economy that – by developing its own ventilation unit – does not only contribute to local development, but has also helped Slovenian knowledge and Slovenia reach the top of global innovation. In 2015, the company opened the 'Prof Dr Peter Novak Development Center', named after the mastermind and initiator of the innovative MIKrovent ventilation system's development.

Innovating

today.

For better

future.

Slovenian knowledge – Global solution

The MIKrovent R&D team members share and are connected by a number of common characteristics, such as enthusiasm, passion for innovation, and creativity. We are especially proud that we were able to successfully combine Slovenian knowledge in order to produce a global solution. We combine and connect cutting edge knowledge in the fields of ventilation, energy, engineering, electrical engineering, economics and marketing, while we evaluate the solutions for improving our products through various methods, research, and studies. Product development involves building intensive connections with global brands and suppliers, as we are well aware that experience sharing and combining knowledge in different fields constitute the only way to an ideal solution. This is why our innovation does not apply solely to our end products, but also their integral components.

MIK – Where innovation never ends

Through years of research, development and innovation we were able to design and launch several different models of the ventilation system. As a company that does not only offer, but develops its products, MIK Celje believes that innovation never ends, nor should end. With team spirit, integration of different, interdisciplinary knowledge we promote innovative thinking and aspire to the idea that good ideas and solutions require thinking outside the box – which is what we do. We always try to look at each situation from the users' perspective, recognizing market needs and adapting to them at the right time. This is one of the reasons we can safely claim that besides a top product, MIK Celje also has the staff with the required knowledge, commitment and innovative and positive mind-set to develop many other amazing future innovations.



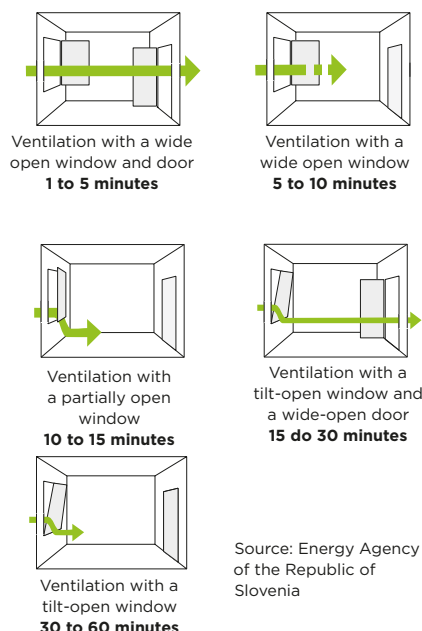


Why do we ventilate?

A properly-ventilated space is critical for the creation of pleasant and healthy indoor living conditions. Many users as well as suppliers of windows and doors dedicate far too much attention to thermal insulation while forgetting the significance of ventilation.

In 2018, the World Health Organization (WHO) reported their research findings and expressed great concern regarding the dangerously high levels of air pollution in many areas around the world.

New data show that 9 out of 10 people breathe air containing high concentrations of contaminated particles, such as black carbon, which penetrate deep into human lungs and cardiovascular system. The organization estimates that each year about 7 million people die due to exposure to fine particles in polluted air, leading to diseases such as stroke, heart disease, lung cancer, chronic respiratory diseases and respiratory infections, including pneumonia.



Why do I need a ventilation unit?

Fresh indoor air is essential for our health, however, we often neglect the significance of good air quality. Most people ventilate their premises by opening windows, thinking this can provide enough fresh air for breathing. Besides the fast and efficient ventilation offered by natural draft, we can also purchase multiple accessories that help enhance ventilation.

To help you achieve ventilation-related energy savings, while still providing the much needed fresh indoor air, the market also offers ventilation units and systems that provide for a more healthy ambient air through mechanical ventilation.

Mechanical ventilation is the only way to ensure the adequate or planned volume of air flow inside living premises. This will help you avoid occasional draft required for indoor air flow in case of natural ventilation, while saving, as these devices ventilate premises in a much more efficient way, while keeping out outdoor noise, winter cold or summer heat.

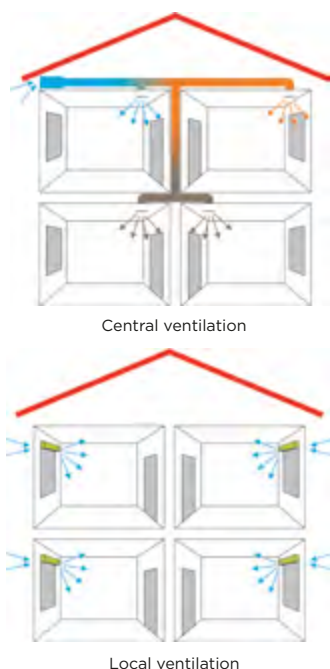
Today, regulations and standards for installation of modern windows in several EU member states also mandate installation of ventilation systems, while EU tends to the bidirectional decentralised ventilation, such as MIKrovent, in a significant way.

What kind of ventilation do I need?

The market offers two types of ventilation units and systems, i.e. **central** and **local**.

Central ventilation: If you opt for central ventilation you should consider this already when designing the house or building, and include the investment costs and location of air ducts in the design itself. Central systems offer good thermal efficiency and are usually distinguished by quieter operation, however, such systems require more installation space and come at a higher investment cost. The main disadvantage of a central ventilation system is that air distribution costs fall out higher, due to the long air path.

Local ventilation: An undisputed fact, also recognised by numerous experts, is that local ventilation systems provide a healthier and more efficient ventilation compared to central ventilation systems. They can be installed practically anywhere, in each and every room. As the path of air is shorter, air distribution costs are significantly lower, while users can adjust the unit's operation in each room according to their current needs. Due to simple installation, maintenance and cleaning, as well as its suitability for different-sized apartments and buildings, local ventilation system are gaining popularity and are now becoming even more popular than central ventilation systems.



About ventilation

MIKrovent Academy

Local ventilation units can be either unidirectional or bidirectional

Unidirectional ventilation systems (such as the majority of ventilation systems available on the market) are pressure based. The unit first discharges air, which is warm in winter and cold in summer. The energy and heat emitted by outlet air are stored in a thermal ceramic panel (thermal storage), until the fan changes its mode of operation and begins supplying fresh air from the outside. This air is slightly heated or cooled when traveling through the ceramic panel, however, in case of high temperature difference between indoor and outdoor air, heat losses increase accordingly. This system is also called flip-flop or in-out. The popularity of such devices on the market is decreasing, as bidirectional ventilation systems offer a more efficient and healthy alternative.

Due to the above, the EU promotes **bidirectional** ventilation systems, which comprise a mere 15% of the offer in European markets. One of such systems is also MIKrovent. Bidirectional systems are based on the principle of constant air exchange – the system's operation is based on counter-current circulation. Inlet and outlet air constantly flow through the system, while they meet only in the heat exchanger, where outlet air emits its energy and heat to the inlet air. As both inlet and outlet air travel through separate ducts, we prevent contact of dirty and clean air at all times.

It's all about heat recovery

In practice, we distinguish between two types of heat recovery-based ventilation systems, i.e. regenerative and recuperative.

Regenerative systems are applied in unidirectional ventilation systems. The word regeneration means to improve a system by making it more active or efficient, and to retain some desirable properties. This is true of regenerative systems – the energy of outlet air is stored in a ceramic plate of a unidirectional ventilation system, which then transfers the desired properties to the inlet air. Problems with regenerative systems occur in case of large temperature difference of indoor and outdoor air (e.g. indoors: +20°C, outdoors: -10°C). The ceramic plate is heated to +20°C by energy from the outlet air for about 70 seconds. For the next 70 seconds inlet air with a temperature of -10°C enters the room. However, due to the large temperature difference, the plate will not be able to heat the inlet air to +20°C for all 70 seconds. That is why regenerative systems incur greater heat losses than recuperative systems.

Recuperative systems are applied in bidirectional ventilation systems. In engineering and the energy industry, the word recuperation describes a technical process for recovering energy and heat. Thus, in the case of recuperative bidirectional ventilation systems, the outlet air simultaneously and



About ventilation

MIKrovent Academy

continuously transfers its properties to the inlet air in the heat exchanger (the system heats or cools fresh air with the energy of the outlet air) without interruptions or interim storing of energy in a plate. The efficiency of heat transfer of a heat recovery system is essential, as it tells us how much energy it will save. This is indicated by the thermal efficiency rate, which is expressed with percentage (%).

Heat exchangers

The heat exchanger or recuperator plays an essential role in every ventilation unit capable of extracting energy. The inlet (clean) and outlet (exhaust) air meet in the heat exchanger, where the exhaust air transfers its energy and heat to the fresh inlet air.

Whereas fans regulate the air flow and filters provide clean air, are heat exchangers essential for transferring energy (highly efficient recuperators can achieve up to a 95% heat recovery rate).

The use of conventional heat exchangers is recommended in predominantly humid climates, as they transfer the heat from the outlet to the inlet air.

In extremely dry climates is the use of enthalpy heat exchanger more recommended, since it transfers humidity from the outlet air leaving the room to the dry inlet air entering the room, thus helping regulate indoor humidity levels and maintain a pleasant indoor comfort zone.

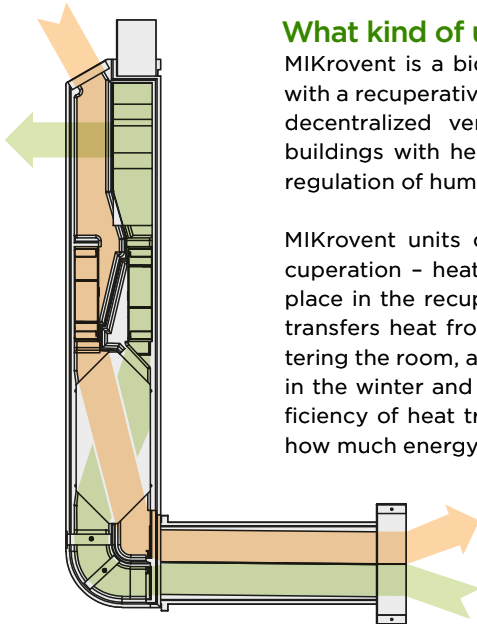
Shutters

Shutters are an essential part of every ventilation unit. Their primary function is to close the air inlet and outlet when the ventilation unit is idle, thus preventing uncontrolled ventilation (e.g. during strong winds). When the unit is idle, shutters also provide for the air tightness of the building, which is especially important in multistory buildings. The shutters can be controlled automatically or manually, however, only units with shutter motors provide air tightness in all conditions.



About MIKrovent

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What kind of unit is MIKrovent?

MIKrovent is a bidirectional local ventilation unit with a recuperative function. The system provides decentralized ventilation of new and existing buildings with heat recovery as well as optional regulation of humidity in living spaces.

MIKrovent units operate on the principle of recuperation – heat recovery. Heat recovery takes place in the recuperator (heat exchanger) which transfers heat from the exhaust air to the air entering the room, and thus retains the heat indoors in the winter and the cold in the summer. The efficiency of heat transfer is essential, as it tells us how much energy a ventilation system will save.

MIKrovent bidirectional ventilation units are based on counter-current circulation and thus provide a continuous air exchange without interruptions. Moreover, the air within the unit travels along separate ducts to prevent mixing of clean and dirty air.

The operation of the shutters is automated according to the operation protocol and environment. Due to that, shutters will open and close automatically, when needed.



About MIKrovent

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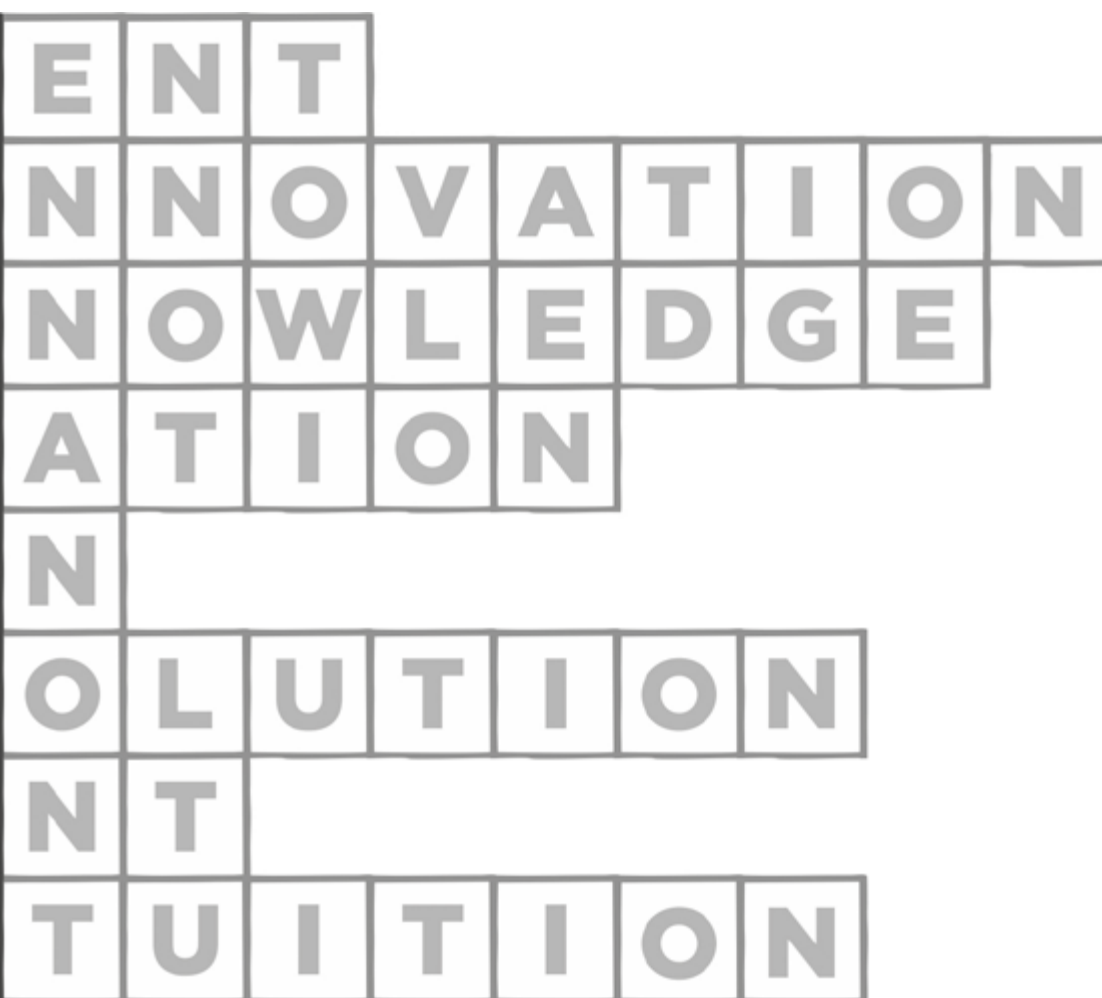
What norms and standards does MIKrovent meet?

MIKrovent is manufactured in accordance with the latest EU directives and guidelines for environmental design, energy efficiency and circular economy. All its elements are manufactured and tested in accordance with EN (EN 13141-8) stand-

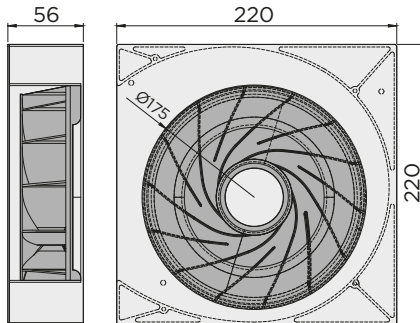
ards applicable in the EU, international ISO (ISO 9001) standards, and – to a certain extent – also with UL standards (USA). It is made of materials that can be reused or further processed, in accordance with Eco-Design guidelines.



MIKrovent 30 / 60 / 120



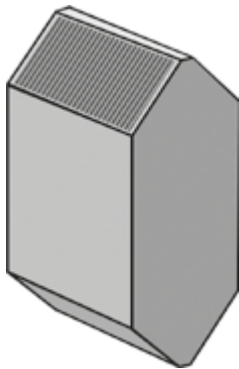
Details about MIKrovent Components



Fan

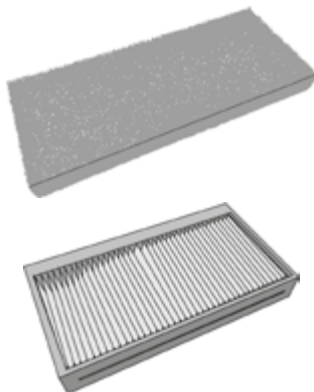
Fan is a key component of the ventilation unit and must support a guaranteed product lifetime of at least 50,000 to 70,000 hours (at unchanged performance). Depending on the required efficiency rate and the power of the unit, MIKrovent units also use different fan types, which are adjusted for optimum operation for individual air flow characteristics to ensure minimum energy consumption of each individual ventilation unit.

A combination of a standard impeller, a new electronically controlled motor and a statically solid casing enables high overall efficiency at the desired air flow rate with minimum energy consumption. Efficient, quiet and economical are the three key words we can use to describe the fan in the MIKrovent ventilation unit.



Heat exchangers

The heat exchangers in MIKrovent ventilation units are made of smooth materials, which are hygienically suitable due to their dust resistance. They boast a low resistance to air flow and high efficiency. An enthalpy heat exchanger can also be installed in the unit upon request.



Air filters

The main task of ventilation units is to supply healthy air into the room, which would be impossible without the use of high-quality filters that provide for proper air filtration. All MIKrovent units are serially fitted with two filters – an ePM 10 (G4) outlet air filter and an ePM 2.5 (F7) inlet air filter. Both filters ensure that the unit supplies clean, healthy air, rich in negative ions to the room, and maintains a healthy atmosphere throughout the day, in all seasons.

Details about MIKrovent

Components

Sensors

All MIKrovent devices units are serially fitted with humidity and temperature sensors. MIKrovent units can be fitted with other sensors and detectors (CO₂, volatile organic compounds, VOC and radon*) upon request.

A VOC sensor

is sensitive to all volatile organic compounds, which contain carbon (C), such as specific detergents, cosmetics, oils, gasoline, cigarette smoke, etc. When the ventilation system detects an increased concentration of these compounds, it responds accordingly – it increases the air supply volume and thereby removes dangerous substances from the room.

Radon

is a radioactive gas present in the Earth's crust, which can enter our homes from the soil. We are unable to detect it with our senses, as it is colorless or odorless, but we can measure it because it is radioactive. The radon sensor is an external device with a specific mounting location – radon builds up at ground level, so the sensor must also be mounted there. When the system detects elevated radon radiation levels, it increases the air supply volume, removing dangerous particles from the room.



Average amount of radon in Slovenia
Source: dr. Damijan Škrk

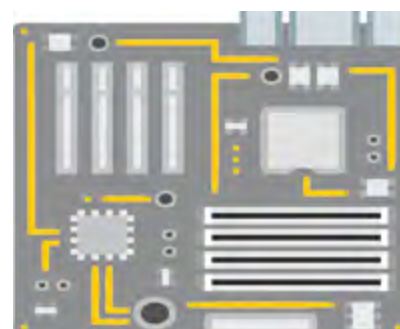
Shutters

Shutters are an essential part of the system for controlling air flows entering and exiting the MIKrovent unit. The shutters are opened or closed independently of each other according to the electronic settings and the unit's operation protocol, thus helping to optimize the operation of the ventilation system. When the unit is in idle state or in case of a power failure, the shutters close automatically and reopen after the unit restarts. They also close automatically in case of an indoor fire in order to cut off the supply of oxygen to the fire zone. Automatic closing and opening of the shutters provides for air tightness of the building even when the ventilation unit is not in operation. The shutters are vital when installing local ventilation units in tall buildings and in windy regions.



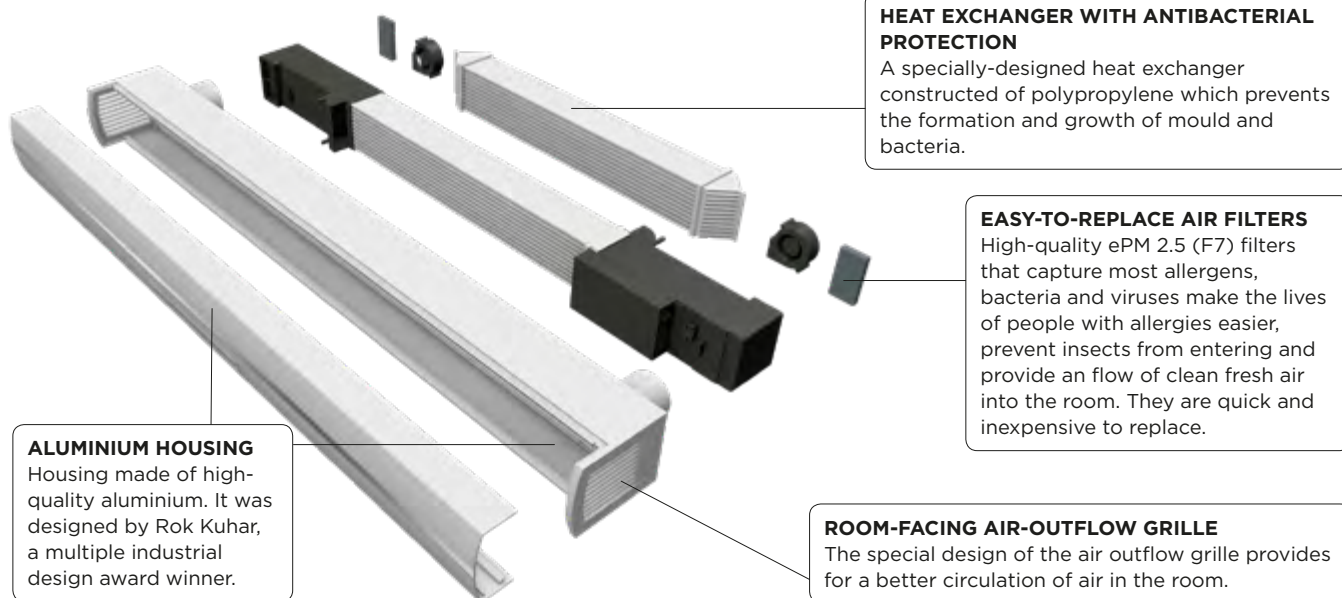
Automatic control and electronics

In collaboration with an electronics supplier, we developed our own operation protocol, which we regularly check, test, update and upgrade, and - by doing so - we ensure its continuous improvement. MIKrovent offers all functions of a central ventilation system, so its automatic control complies with the highest requirements. The operation algorithm monitors and adjusts its operation based on the data received from sensors, shutters and fans, or only warns the user about a change in conditions.



* Available soon.

MIKrovent Home³⁰ is the first unit from the family of MIKrovent local ventilation units. Due to its minimalist design, it is intended for ventilation of individual rooms in residential buildings. With a maximum air flow of up to **30m³/h**, it is intended for ventilation of rooms up to **20 – 25m²** and occupied by one or two persons simultaneously.

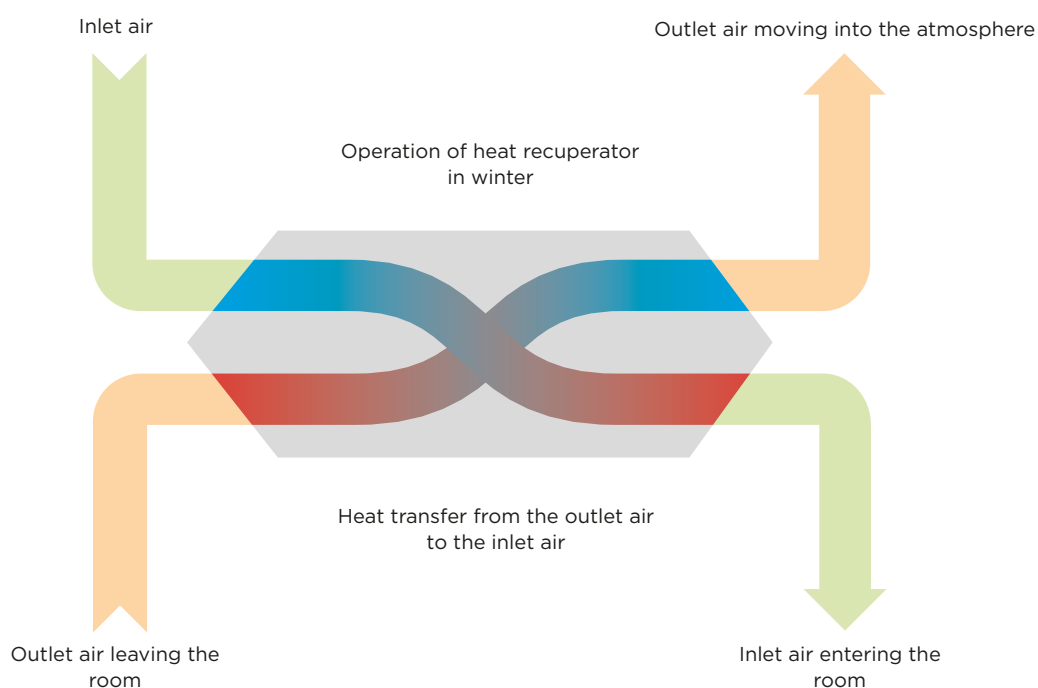


Operation

The air in the MIKrovent Home³⁰ unit flows along two separate ducts. Both the inlet and the outlet air are first filtered and then each flow along separate ducts as well as through separate chambers within the ventilation unit.

Both air flows meet in the heat exchanger without any mixing – the outlet air solely emits energy and heat to the inlet air. If needed, the MIKrovent Home³⁰ unit can be upgraded with an enthalpy

heat exchanger which will transfer heat and humidity between inlet and outlet air. MIKrovent Home³⁰ is serially fitted with an ePM2.5 (F7) inlet air filter and a ePM10 (G4) outlet air filter.



Home³⁰

MIKrovent assortment

13

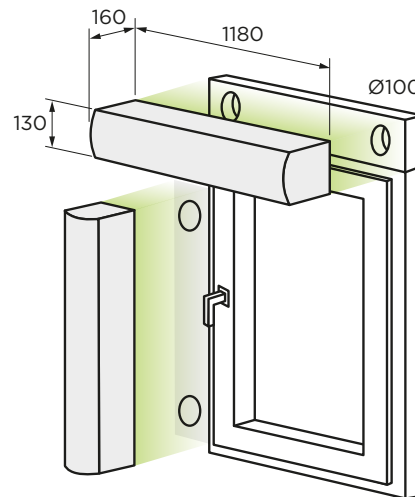
Installation location

MIKrovent Home³⁰ can be installed in various locations and can remain completely unnoticed in the room. Due to its compact aesthetical design, it can be installed in a window extension above or next to a window, or separately on a wall. If there is a window extension available, the unit can be installed on a window of any brand.

The installation of MIKrovent Home³⁰ requires two Ø100mm bores into the wall or two Ø80mm bores for openings in the window extension profile above or next to a window. Two sup-

plied standard plastic tubes with an external diameter of Ø76mm for insertion into the bore can be shortened prior to mounting to fit the wall thickness and are inserted into the bore. The gap between the tube and the bore is sealed with polyurethane foam.

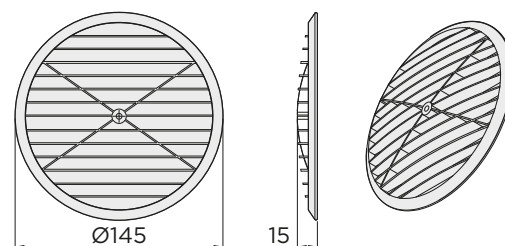
If you are considering buying new windows and want to install MIKrovent Home³⁰ in the window extension, show the MIKrovent Home³⁰ window extension installation plan to the chosen window manufacturer in order to properly plan the extension profile dimensions.



Appearance and grille design

The standard outer grille is made of durable plastic and comes in white, as seen in classic ventilation systems worldwide. It prevents precipitation or entry of unwanted foreign objects, while providing adequate ventilation

for a smooth and efficient indoor operation of the MIKrovent ventilation system. Its minimum thickness of 15 mm prevents exposure to external mechanical damage.



Office⁶⁰ & Professional¹²⁰

MIKrovent assortment

MIKrovent Office⁶⁰ and **MIKrovent Professional¹²⁰** are the second and third unit in our range of ventilation systems. They are developed for ventilating large spaces – both residential, multifunctional rooms in private homes, as well as public spaces such as hotel rooms, offices, etc. With a maximum air flow up to **60m³/h** and **120m³/h**, they can ventilate rooms in size of **30 – 60 m²**, simultaneously occupied by **3 or more** persons.

360° AIR-DIRECTION VENTS

The innovative design enables the user to control 20 fine-adjustable air vents to provide optimal distribution of air.

THE OPTION TO CREATE YOUR OWN DESIGN

The graphical design of the housing can be tailored to individual preferences. Now you can showcase your favourite moments on the housing; chose the housing colour and enjoy the look you want.

SOUND INSULATION HOUSING

A special sound-insulation design reduces the noise level for up to 20%.

EASY-TO-REPLACE AIR FILTERS

High-quality PM 2.5 (50%) (F7) filters that capture most allergens, bacteria and viruses make the lives of people with allergies easier, prevent insects from entering and provide a flow of clean fresh air into the room. They are quick and inexpensive to replace.

READY-TO-USE MOUNTING PLATE

For quick and simple wall installation.

HIGH-CAPACITY QUIET-RUNNING FANS

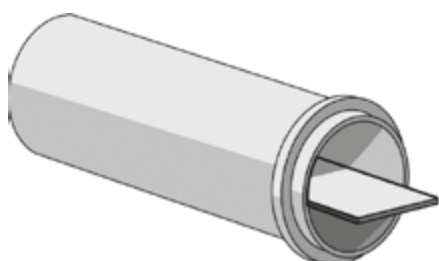
Compact, quiet, high-capacity and energy-efficient fans are an intelligent fit for the device concept and provide for an excellent user experience.

CHOOSE BETWEEN AN ENTHALPY OR REGULAR HEAT EXCHANGER

The choice between a regular or an enthalpy heat exchanger depends on the indoor relative humidity; enthalpy exchangers can be used for rooms with a low relative humidity while regular heat exchangers are suitable for high-humidity areas.

INNOVATIVE OUTER GRILLE DESIGN

The outer grille with air-flow separation function prevents the outgoing and ingoing air from mixing. Its design allows for the grille to be installed either above or under the outer layer of the building.



Operation

Inlet air enters the MIKrovent® Office⁶⁰ and MIKrovent® Professional¹²⁰ ventilation units through the grille and the duct, whereas the grille and the duct are separated by an intermediate separation plate. Despite the bore through the wall, it is the separation plate that actually prevents the mixing of dirty inlet air with outlet air. The inlet and outlet air flow along two separate ducts. After entering through the shutter, both air flows are separated and travel through filters to meet in a conventional heat exchanger, where the outlet air

emits energy and heat to the inlet air. If needed, both units can be upgraded with an enthalpy heat exchanger which will transfer heat as well as humidity between outlet and inlet air. Both devices are serially fitted with an ePM 2.5 (F7) inlet air filter, and an ePM10 (G4) outlet air filter.

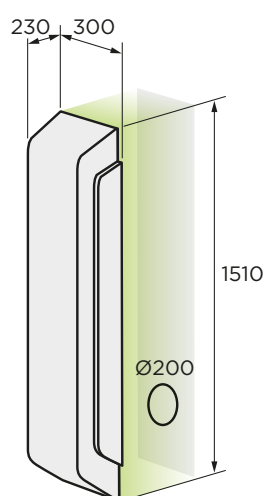
Rotating nozzles allow the user to perfectly adjust the air stream of fresh inlet air into the room.

Office⁶⁰ & Professional¹²⁰

MIKrovent assortment

Installation location

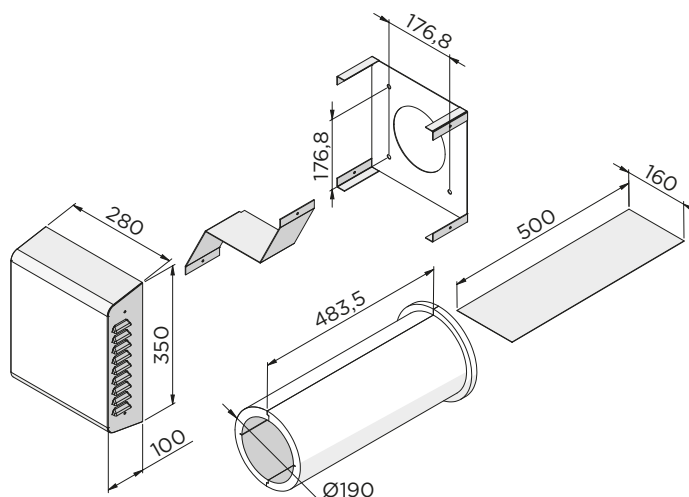
In order for the MIKrovent Office⁶⁰ and Professional¹²⁰ units to operate smoothly, they must be mounted on a wall. As both units supply larger air volumes, a larger Ø200mm bore through the wall is also required. A polystyrene cartridge body is adjusted lengthwise, inserted into the bore, and sealed with polyurethane foam. In order to ensure clean ventilation and prevent the mixing of inlet and outlet air, a separation plate for the separation of both air flows is installed into the bore.



Appearance and grille design

The spare outer grille provides a long lasting and durable solution regardless of climate, as 1.5 mm stainless steel sheets, in combination with other components, also provide robustness and resistance to unintended impacts. The interior is divided into two chambers, which capture the supply air into the ventilation unit and exhaust the stale air from the unit. The entire contact surface is sealed off by a pre-cut rubber tube. It is suitable for building renovations, or installation on insulation of the building.

If you do not wish the outer grille to alter the appearance of the façade, we developed a special mountable you can use. Check the details in the Accessories section.



Technical information

MIKrovent assortment

Type of the device		Home ³⁰	Office ⁶⁰	Professional ¹²⁰
Purpose of the device		Individual rooms in homes, 20 - 25 m ²	Multifunctional living spaces, hotel rooms, offices ..., 30 - 60 m ²	Larger rooms, classrooms, kindergartens, halls ..., 60 - 120 m ²
Possible location		Horizontally/Vertically on the wall or Horizontally/Vertically in the window extension	Vertically on the wall	Vertically on the wall
Air flow [m ³ /h] [cfm]		10-30 m³/h 5.9-17.65cfm	20-60m³/h 12-35cfm	60-120m³/h 35-75cfm
Heat recuperation [%]		up to 83	up to 91	up to 87
Energy recuperation ¹ [%]		/	up to 70	up to 70
Supply voltage [V]		230 VAC 50 Hz	230 VAC 50 Hz	230 VAC 50 Hz
Power required [W]		up to 20	up to 50	up to 75
Noise level ² [dB]		up to 35	up to 35	up to 40
Dimensions LxWxH [mm][inch]		1180 / 160 / 130mm 46.46 / 6.3 / 5.12inch	1510 / 300 / 230mm 23.4 / 11.81 / 9.05inch	1510 / 300 / 230mm 23.4 / 11.81 / 9.05inch
Filters of	inlet air	ePM 2.5 (F7)	ePM 2.5 (F7)	ePM 2.5 (F7)
	outlet air	ePM 10 (G4)	ePM 10 (G4)	ePM 10 (G4)
Outdoor temperature operational range [°C][°F]		from -25 to 50 °C from -13 to 122 °F	from -25 to 50 °C from -13 to 122 °F	from -25 to 50 °C from -13 to 122 °F
Controls		Remote control / WiFi ⁴ / ModBus ³	Remote control / WiFi ⁴ / ModBus ³	Remote control / WiFi ⁴ / ModBus ³
Sensors		Temperature, Humidity, CO ₂ ³ , VOC ³ , Radon ⁴	Temperature, Humidity, CO ₂ ³ , VOC ³ , Radon ⁴	Temperature, Humidity, CO ₂ ³ , VOC ³ , Radon ⁴

¹ Using an enthalpy heat exchanger.

² At 8dB indoor sound dampening.

³ On request.

⁴ Coming soon.

Table of air flows and recuperation for **MIKrovent Home³⁰**

Intensity level	Recuperation [%]	Outlet air flow [m ³ /h]	Inlet air flow [m ³ /h]
1	83	5	7
2	71	10	13
3	63	16	18
4	57	23	24
5	54	30	30

Table of air flows and recuperation for **MIKrovent Office⁶⁰**

Intensity level	Recuperation [%]	Outlet air flow [m ³ /h]	Inlet air flow [m ³ /h]
1	91	20	20
2	88	31	30
3	88	40	40
4	86	50	50
5	84	61	61

Table of air flows and recuperation for **MIKrovent Professional¹²⁰**

Intensity level	Recuperation [%]	Outlet air flow [m ³ /h]	Inlet air flow [m ³ /h]
1	87	57	61
2	87	73	78
3	84	87	91
4	82	105	103
5	80	117	116



Operation and control

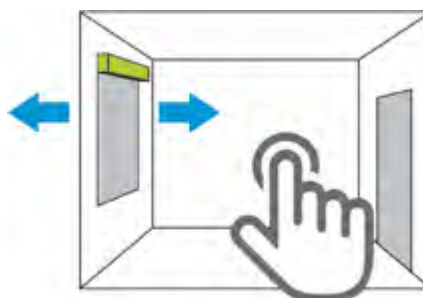
MIKrovent Academy

MIKrovent units operate according to the built-in sensors and operation protocols, and further adjust their operation to environment conditions. For example, when the unit detects an increased concentration of CO₂ or high temperature differences between the indoor and outdoor air, it adjusts its operation mode.

There are four operation modes available in order to provide an optimum volume of fresh air in all conditions, in an unobtrusive manner for the surroundings:

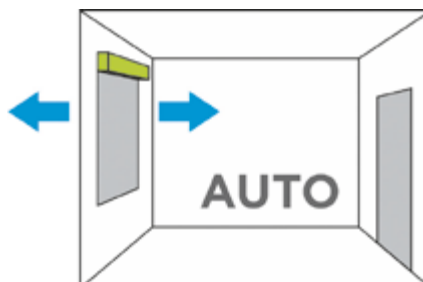
MANUAL

mode is designed to adjust the unit to your specific needs. The user adjusts the volume of unit's air supply and can choose from 5 intensity levels.



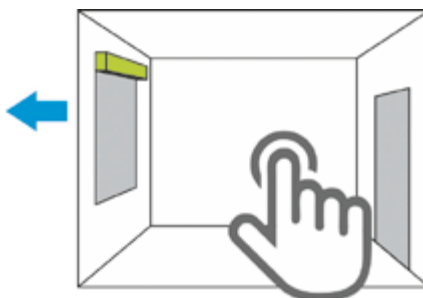
AUTOMATIC

mode is intended for use when we want the MIKrovent unit to operate automatically in accordance with the prescribed operation protocol, or when the room is unoccupied for a longer period of time (but we still want to maintain optimal indoor living conditions).



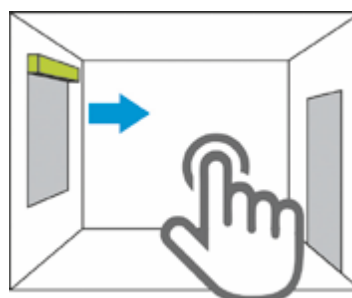
OUT

mode is intended solely for discharging air from the room. This mode is recommended when we want to quickly reduce the volume of stale air in the room (e.g. due to unpleasant odors). This mode must not be used if there is an open fire in the room (e.g. a fireplace), as it may result in a lack of combustion air in the furnace, resulting in a build-up of carbon monoxide, a toxic gas harmful to our health. You can choose from 5 intensity levels.



IN

the unit only supplies air to the room. You can choose from 5 intensity levels. This mode is often used in the summer, when the air cools down at night and it can cool the room (walls), thus providing for cooling-related energy savings.



Operation and control

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Remote control

One of the most wide-spread control modes is via a remote control – an option also available with MIKrovent ventilation units. The ventilation unit can operate in 4 different modes and at 5 intensity levels set via remote control. The user can also set a weekly programmer.



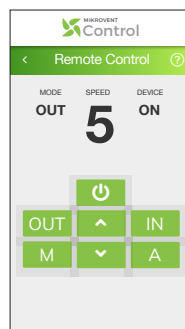
ModBus

ModBus is a communication protocol that, due to its simplicity and common availability, has become a widely popular and widespread communication protocol for communication between different devices. It is a serial communication protocol for industrial electronic devices, based on serial communication between the master unit and one or more slave units connected into a single unit either directly or via a modem.



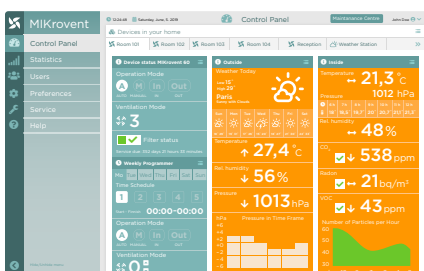
Republic of Slovenia
**Ministry of Economic
Development and
Technology**

Investment »Smart energy-efficient local ventilation system with recuperation - SMART MIKrovent 40« is co-financed by the Republic of Slovenia and the European Union from the European Regional Development Fund.



Smart MIKrovent

A modern twist to the classic remote control mode is Smart MIKrovent, which provides the user with an upgraded user experience. You can connect to your MIKrovent ventilation units via a WiFi connection with a smart device or computer, regardless of your location. You can properly ventilate your apartment by the sea before your arrival, change the operation settings of all units at one location, monitor the analytics of all units, or simply order spare filters when needed.¹



Smart Home

A further upgrade of Smart MIKrovent is its connectivity and integration into a Smart Home system. The unit can be connected with well-established systems for smart control and smart home connectivity, such as Alexa, Google Home, etc. Tell your MIKrovent unit what kind of air you want with a single voice command.²

^{1,2} Available soon.



Maintenance

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To provide for proper operation of the units over their entire product lifetime, they must be properly maintained. Since MIKrovent is designed and built for easy maintenance, the user only needs to change the inlet and outlet air filter in a timely and correct manner.

The **outlet air filter** is washable. We recommend that you wash it several times a year to ensure good filtration of the indoor air. After washing, it must be properly dried and installed back into the unit. When washing is no longer effective (e.g. when cells begin to tear), it should be replaced with a new filter.

The **inlet air filter** retains extremely small air particles, which can also penetrate into human lungs. This is why the filter is made of special non-washable material. The inlet air filter should be replaced when an automatic warning signal in the unit appears and informs us a change is required. The frequency of replacements depends on the level of air pollution in the surroundings. If the outside air is extremely polluted, the filter will clog sooner; this is why we need to replace it more often. Nevertheless, we recommend you replace the inlet air filter at least once a year.

Besides the correct and timely replacement of air filters, regular maintenance and repairs also contribute to healthy ventilation and proper operation of the unit. Authorized repairers are trained to service MIKrovent units and will be able to quickly repair any potential product defects, if they occur. In addition to replacing the filters (if you do not replace them yourself), they will also check the operation of other components in the MIKrovent system, thus ensuring proper and smooth operation of your ventilation system.

Operation costs

The costs incurred by the operation of MIKrovent units are related to either energy savings, or they comprise the costs of replacing filters or the costs of annual servicing.

Below is a calculation of power consumption required for the operation of MIKrovent units, assuming that the machine operates in an automatic mode throughout the entire year. In the cal-

culations we applied statistical data on the price of 1 kWh = € 0.17 (Slovenia, 2018), or 1 kWh = € 0.29 (Germany, 2018).

MIKrovent type		Home ³⁰	Office ⁶⁰	Professional ¹²⁰
Average hourly power consumption		6	20	30
Average annual power consumption		6 W x 24 h x 365 = 52.560 Wh = 52,6 kWh	20 W x 24 h x 365 = 175.200 Wh = 175,2 kWh	30 W x 24 h x 365 = 262.800 Wh = 262,8 kWh
Annual power consumption costs	Slovenia	53 kWh x 0,17 € = 9,01 €	175 kWh x 0,17 € = 29,75 €	263 kWh x 0,17 € = 44,71 €
	Germany	53 kWh x 0,29 € = 15,37 €	175 kWh x 0,29 € = 50,75 €	263 kWh x 0,29 € = 76,27 €

The cost estimate is an approximate calculation of electricity consumption, if all of the above assumptions apply.



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Scope of delivery

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When purchasing MIKrovent units, the customer receives a ventilation unit in classic white with serially fitted temperature and humidity sensors, a set of inlet and outlet air filters, a remote control, an external grille, a connecting cable with a 230 VAC plug, and all required installation materials including a tube for the bore up to a thickness of 50cm (which can be adjusted lengthwise at the installation site) and polystyrene. Consumables (such as polyurethane foam) are not included and must be supplied by the customer.

Customers can request a design of the unit and grille of their choice, additional sensors, or other unit control modes (Mod-Bus) at a surcharge.

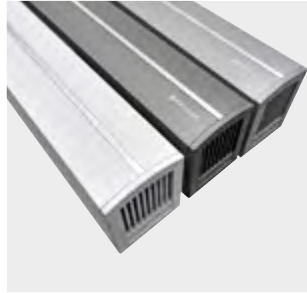


Optional accessories

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Are your premises furnished in a special style, and you are afraid that MIKrovent will stand out?

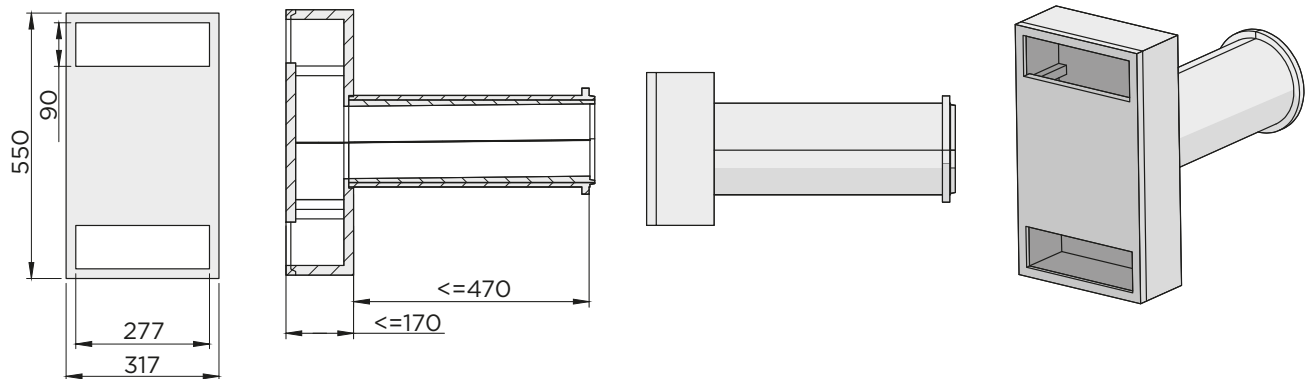
No need to fear! If needed, MIKrovent can blend in with its surroundings. Personalize your device and adapt it to your wishes.



You do not want the outdoor grille to affect the look of your building's façade?

We developed a special mountable grille.

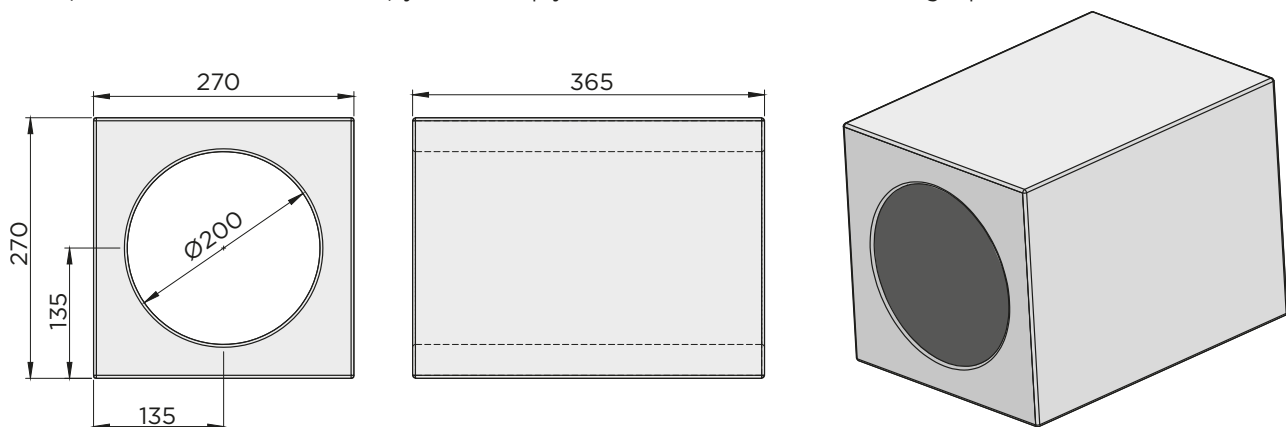
The flush mount grille offers an appropriate solution for mounting in polystyrene insulation of new buildings or renovated buildings with new insulation. The inside is divided in two chambers; one for supply of inlet air to the unit and one for exhaust of stale air from the unit. The inlet and outlet air travel through two aluminum grilles (90mm x 277mm). The flush mount grille is also suitable for heritage-protected buildings.



Are you building from scratch and you wish to make room for MIKrovent today?

We have a solution.

MIKrobrick is an EPS thermal insulation component that helps you reserve the room needed for the hole suitable for the MIKrovent Office⁶⁰ and MIKrovent Professional¹²⁰ systems, already when designing a new building. Due to its external dimensions (270 mm x 270 mm x 365 mm) you can simply cut MIKrobrick to the desired length prior to installation.



... pay attention to what you are buying.

The unit must supply fresh, purified air, rich in negative ions to the room. This can only be achieved by using short non-metal pipes and high quality ePM2.5 filters, capable of retaining harmful fine air particles, such as accumulated black carbon and dust particles.

Unidirectional ventilation units apply the regenerative principle of heat recovery. In such units, the air travels along one duct in both directions and the energy is stored in a ceramic honeycomb, while the unit operates with interruptions. Two units are required for continuous ventilation.

We often end up buying a product simply due to its nice packaging, perhaps we were attracted by the ad, or the salesperson persuaded us into buying the product by telling us what we wanted to hear. This is also often the case when people buy ventilation units. Due to a relatively fierce competition in the market your need to properly prepare for the purchase, and consider the facts; especially, you need to compare the technical specifications in detail – so you do not end up with apple-to-orange comparisons. You do not buy a ventilation unit for a short term – it is an investment in your health, and a long-term investment.

The main task of ventilation units is to supply healthy air to the room, while contributing to lower costs. What matters, are the properties of air when it enters the room after travelling along ducts and through filters.

The ventilation unit must supply fresh, purified air, rich in negative ions to the room. This can only be achieved by using high quality ePM 2.5 (F7) filters, which can retain harmful fine air particles, such as accumulated black carbon and dust particles.

Mind the difference between unidirectional and bidirectional ventilation systems. Unidirectional ventilation units apply the regenerative principle of heat recovery. In such units, the air travels along one duct and the energy is stored in a ceramic plate while the unit operates with interruptions.

In bidirectional recuperative ventilation units, the air travels along two separate ducts, thereby preventing transfer of bacteria and dust particles from the duct to the inlet air. The energy from the outlet air is continuously transferred to

the inlet air without interruptions. **As a result, bidirectional recuperative ventilation systems provide for a healthier ventilation of your premises.**

Mind that the heat recovery rate can differ at different air flow rates. At a lower air flow rate, the unit achieves a higher heat recovery rate – the air travels slower, it transfers energy to the inlet air for a longer time, thus providing a smaller difference in the temperature of inlet and outlet air. **Manufacturers of ventilation units often claim that their unit can achieve up to a 95% heat recovery rate.** This is mostly true, but they often fail to mention at what air flow rate. For example, if the unit normally operates in the 20-80m³/h air flow rate range and achieves a 78% heat recovery rate at a 30m³/h airflow rate, it will definitely not reach a similar recovery rate at the maximum air flow rate (e.g. 80m³/h). In such cases, try to find a structured heat recovery rate table for different air flow rates – e.g. 20, 40, 60, and 80m³/h. You can usually find it in the technical catalogue and it will allow you to make a more detailed comparison of products. You can also find this information (heat recovery rate of the unit at a specific reference air flow rate) in the technical product datasheet.

The power of the ventilation unit does not equal the power of the fan. Another important aspect when comparing ventilation units is the power of the unit. Technical specifications of numerous manufacturers include information about the power of the fan, which is not so relevant.

More relevant is the information about the actual power of the ventilation unit, which is indeed powered by the fan, however, if the fan is not at least as powerful as the unit itself, the unit will fail to achieve the same air flow rate. Therefore, do not be misled by the information, e.g. the fan supports air flow rates up to 150m³/h.

If, due to its technical characteristics (i.e. flaps, outlet nozzles, electronics calibration, etc.), the unit itself does not support such air flow rates, the information about the capacity of fan to support supply and discharge air flow rates up to 150m³/h is completely irrelevant. We advise you to focus on the actual power of the unit and the air flow rates it supports.

The offers you compare should always contain the same specifications.

It turns out that offers which may seem less expensive at first sight, are often misleading. Just because the product itself is actually cheaper, this does not mean that the final investment will also be lower. When purchasing a ventilation unit, do not focus only on the product and its price, but make sure the offer includes all accessories for smooth operation as well as installation services, which can significantly increase total costs, if not included.

It may happen that the price of the ventilation unit stated by the unit manufacturer leaves out additional costs, related to the purchase of control units (needed to control the unit) or more efficient filters. The manufacturer may also forget to mention you need to purchase ducts for in-wall installation without which the air cannot flow and without which the unit cannot be installed. We thus advise you to pay attention to the scope of delivery, so you do not buy a pig in a poke.

Consider the details that play a big role when it comes to your health and final costs.

Ventilation units that are capable of recovering heat and energy (not ordinary fans) are fitted with specific sensors to detect and maintain the desired air properties during their operation. If the ventilation unit is fitted only with a temperature sensor, it will adjust its operation according to the set temperature regulation protocol. The same also applies to other sensors and detectors – e.g. humidity, CO₂, VOC, radon, and others.

There are also several modes to control your ventilation unit. You can control it with a wall-mounted control unit (for which you need to install cables and wiring from the unit to the location of the control interface in the absence of Bluetooth connectivity, ultimately incurring additional costs), with a remote control or remotely via a WiFi connection.

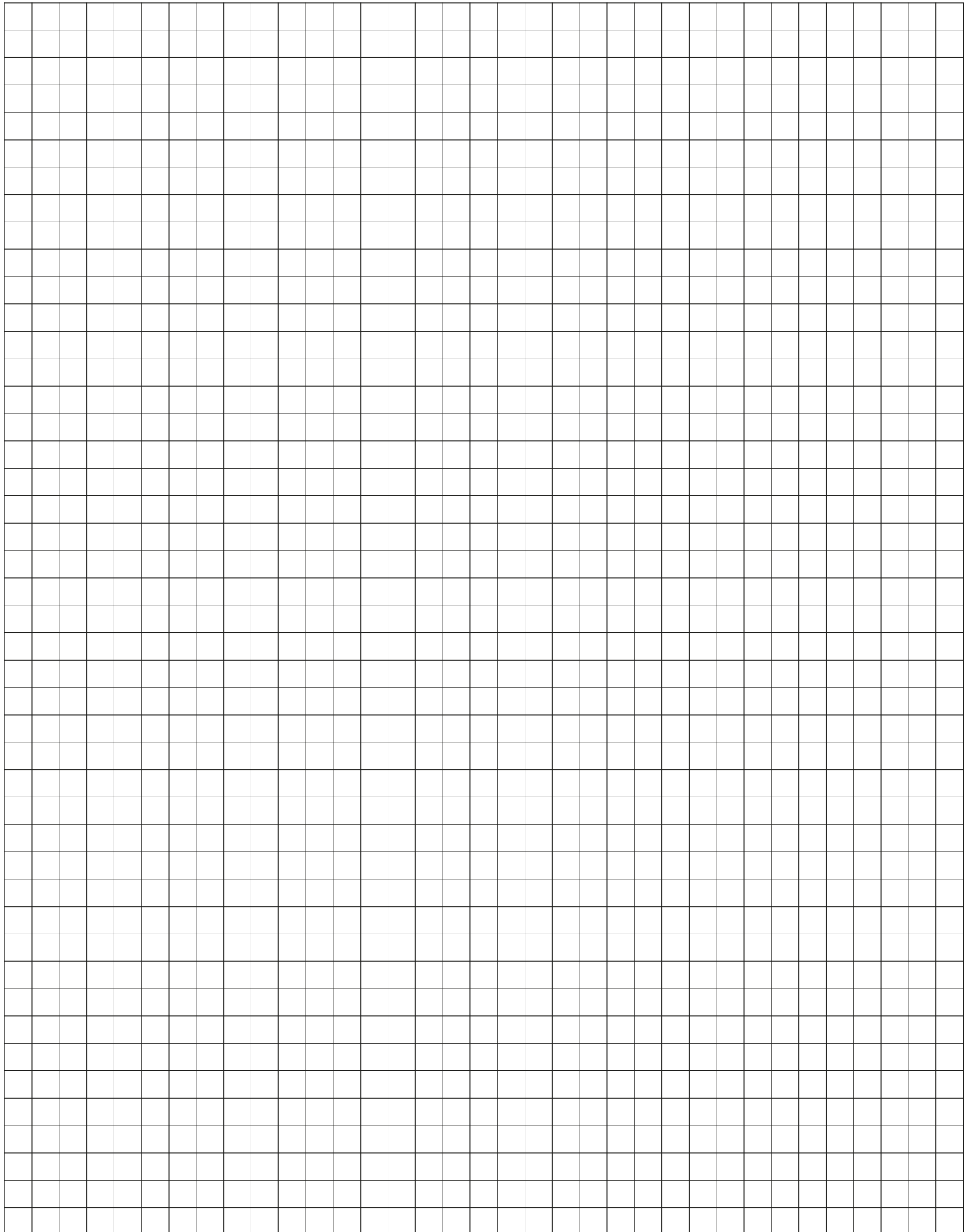
Both the sensor types as well as control modes are important factors when comparing products in terms of functionality and additional costs.



Notes

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BREATHE THE FRESH AIR.



Smart



Innovative



MIKrovent®



Know-How



MIK | Lab



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