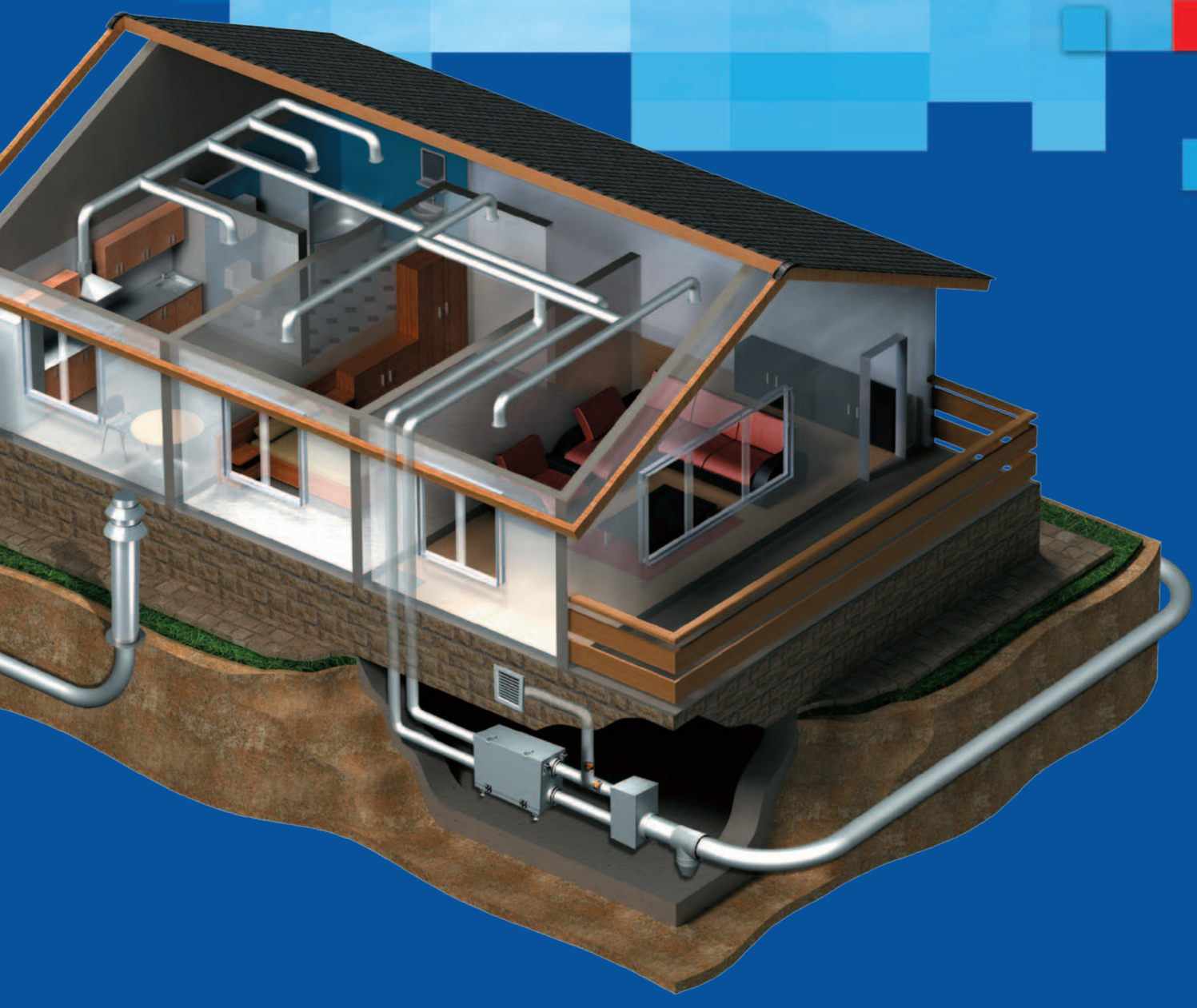
ENERGY SAVING VENTILATION

GEO VENTS GEOTHERMAL SYSTEMS



VENTS®

2010

Fresh air in your house!

CONTENTS

THE GEO VENTS and GEO VENTS DUO systems are designed to provide comfortable microclimate inside premises with minimum energy demand using the heat of the earth's surface layers.

The use of these systems contributes a lot to the improvement of energy efficiency and the decrease of operating costs.

The earth's surface is a natural heat accumulator. Solar radiation is the basic thermal energy source. Surface layers of the upper ground are subject to seasonal temperature fluctuations. These factors as well as the soil characteristics determine the ground temperature. At 3m depth and deeper, below the freezing point, the ground temperature remains constant all the year and is equal to the average annual outside air temperature. The ground temperature at 1,5-3,2 m depth ranges from +5 up to +7°C in winter and +10 up to +12°C in summer. These ground temperature conditions can be utilized by devices made for this purpose. The experimental results proved that the geothermal heat exchanger can warm up the intake air up to 0°C or more in winter and cool it down from +18 to 20°C in summer.

GEO VENTS and GEO VENTS DUO allow the most efficient extraction and use of geothermal energy with the ground heat exchanger to cool down air in summer and heat it up in winter.

THE GROUND HEAT EXCHANGER (GTO) INTEGRATED INTO GEO VENTS SYSTEM

is the easiest way to utilize the geothermal energy.

The air duct system is laid below the freezing point of the ground and serves as a heat exchanger between the ground and the air moved through these air ducts. As the ground temperature at 1.5-3.2 m is +5 to +7°C in winter and +10 to +12°C in summer, the air transferred in the air ducts is heated during winter time and cooled during summer time through the air duct wall.

In case of correct placement of the air ducts the geothermal energy extraction efficiency is quite high at relatively low electric energy consumption.

The more powerful system

GEOTHERMAL HEAT EXCHANGER GEO VENTS DUO

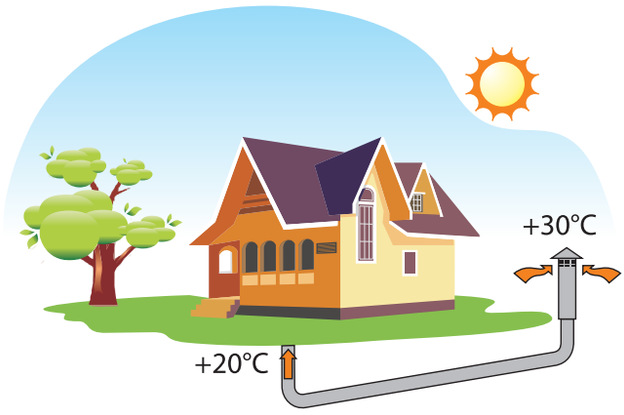
The geothermal heat exchanger GEO VENTS DUO is an annular tube heat exchanger. Extract air from the premise moves through the internal air duct and the intake air from outside moves through the external air duct. The spiral seamed ducts made of stainless steel have a high thermal conductivity and are used as the first stage of the heat recovery. The air supplied to the premise is heated or cooled by geothermal energy. This is achieved by heat exchange with the exhaust air through the internal air duct wall. Due to the design of the geothermal heat exchanger the air ducts laid in the ground have less length. With that the thermal characteristics of the geothermal heat exchanger become even more perfect.

The air duct length and diameter are determined by the air flow rate and the level of capital investment and operating costs. With regard to the filter replacement the operating costs for the geothermal systems are similar to the costs for the air handling units.

GEOTHERMAL VENTILATION IS THE BEST SOLUTION FOR FREE ENERGY

The use of GEO VENTS or GEO VENTS Duo provides the following benefits:

- **Air warming up/cooling down. This means considerable energy saving**
- **Freezing protection of the air handling unit heat exchanger**

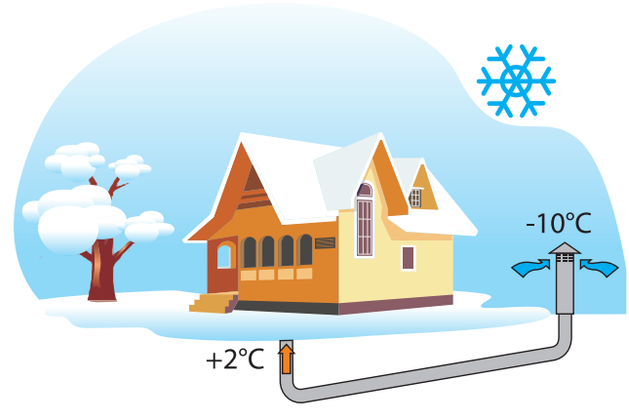


COMFORTABLE MICROCLIMATE DURING SUMMER TIME

The geothermal heat exchanger provides intake air cooling during summer time. Air from outside is supplied through the air intake device to the geothermal heat exchanger where it is cooled by geothermal energy. After that the cooled air is supplied through the air ducts to the VENTS VUT air handling unit. For the unit operation in the summer period the summer block is placed instead of the heat exchanger. This design solution provides internal temperature decrease as well as a decrease of electric energy input for air conditioning and better microclimate in the house.

OPERATION IN LOW-SEASONS

During low seasons when the difference between indoor and outdoor temperatures is insignificant the fresh air can be supplied through the intake grille located at the wall above the surface. In the periods when the indoor and outdoor temperature difference is high the air can be supplied through the geothermal heat exchanger thus ensuring the heating/cooling of intake air.



ECONOMY DURING WINTER TIME

The fresh air is supplied through the air intake located at the geothermal heat exchanger where it is pre-heated and supplied further to the VENTS VUT air handling unit for further air warming-up.

Air pre-heating inside the geothermal heat exchanger prevents icing of the unit heat exchanger and prolongs the effective time of the heat recovery use as well as minimizes the costs required for the additional air heating in the water heating coils/electric heater.

Use of geothermal system combined with VENTS VUT air handling unit with heat recovery is the best solution for the residential house ventilation.

This system ensures permanent air exchange within the building and ensures comfortable micro-climate for the people inside. This system saves heat in winter and coolness in summer and protects the house from overheating. Moreover, it reduces energy consumption and heating costs. Geothermal energy ventilation systems are applied in cottages, stockhouses, shops, restaurants, industrial premises.

EFFICIENCY OF VENTILATION WITH GROUND HEAT EXCHANGER AND HEAT RECOVERY

It is necessary to warm up the intake air during winter and low seasons and cool it down during the summer period to enjoy breathing in comfortable fresh air. See below the calculation of the thermal energy consumption for warming-up of supply air without heat recovery but with geothermal systems for the moderate European climate.

WINTER	**The daily average temperature within 80 days during winter time is -5°C. To make it feel comfortable, heat it up to +20°C as described below:**	
	Energy demand for heating up an air flow of 300 m³/h by Δt=25°C in case of no heat recovery:	P(W) = L(m³/h) x 0.34 x Δt(°C) = 300 m³/h x 0,34 x 25/1000 = 2,550 kW.
	With the use of the geothermal system the intake air is heated from outdoor temperature up to +5°C and the energy amount transferred to the air flow is:	P(W) = L(m³/h) x 0.34 x Δt(°C) = 300 m³/h x 0,34 x 10/1000 = 1,02 kW.
	With the further use of the VENTS VUT air handling unit with heat recovery the air is heated up to +12°C:	P(W) = L(m³/h) x 0.34 x Δt(°C) = 300 m³/h x 0,34 x 7/1000 = 0,714 kW.
	Sample calculation for 80 days operation of the air handling unit. Assumption: 50% of the operating time in full capacity mode, various capacity modes in different time periods around the year.	
	Energy demand in case of no heat recovery system:	80 *days x* 24h x 0.5 x 2,55kW = 2 448 kWh.
	With the use of the geothermal system efficiency increases as the air flow decreases and the required energy demand drops to:	80 days x 24h x 0.6 x 1,02kW = 1175 kWh.
	With the further use of the VENTS VUT air handling unit with heat recovery the required energy demand drops to:	80 days x 24h x 0.5 x 0,714kW = 685 kWh.
SPRING/ AUTUMN	**The daily average temperature level within 180 days during low season is +5°C. To make it feel comfortable it needs to be heated up to +20°C as described below:**	
	Energy demand for heating up an air flow of 300 m³/h by Δt=15°C in case of no heat recovery:	P(W) = L(m³/h) x 0.34 x Δt(°C) = 300 m³/h x 0,34 x 15/1000 = 1,53 kW.
	With the use of the geothermal system the intake air is heated from outdoor temperature up to +10°C and the energy amount transferred to the air flow is:	P(W) = L(m³/h) x 0.34 x Δt(°C) = 300 m³/h x 0,34 x 5/1000 = 0,51 kW.
	With the further use of the VENTS VUT air handling unit with heat recovery the air is heated up to +15°C:	P(W) = L(m³/h) x 0.34 x Δt(°C) = 300 m³/h x 0,34 x 5/1000 = 0,51 kW.
	Sample calculation for 180 days operation of the air handling unit. Assumption: 50% of the operating time in full capacity mode, various capacity modes in different time periods around the year.	
	Energy demand in case of no heat recovery system:	180 days x 24h x 0.5 x 1,53kW = 3305 kWh.
	With the use of the geothermal system the system efficiency increases as the air flow decreases and the required energy demand drops to:	180 days x 24h x 0.6 x 0,51kW = 1322 kWh.
	With the further use of the VENTS VUT air handling unit with heat recovery the energy demand drops to:	180 days x 24h x 0.5 x 0,51kW = 1102 kWh.
SUMMER	**The daily average temperature within 60 days during summer period is +20°C; however during the day time this temperature remains at a level of +26°C within 8 hours. To make it feel comfortable it needs to be cooled down to +20°C by air conditioners. Their cooling capacity shall provide cooling by Δt=6°C.**	
	Energy demand for cooling down the air flow of 300 m³/h by Δt=6°C in case of no heat recovery:	P(W) = L(m³/h) x 0.34 x Δt(°C) = 300 m³/h x 0,34 x 6/1000 = 0,612 kWt;
	With the use of the geothermal system air is cooled down to +22°C. Amount of power meanwhile transferred to the air flow in the dry cooling mode:	P(W) = L(m³/h) x 0.34 x Δt(°C) = 300 m³/h x 0,34 x 4/1000 = 0,408 kW.
	Sample calculation for energy demand. Assumption: full capacity mode at 70% of the operating time, 8 hours per day:	
	Energy demand in case of no heat recovery system:	60 days x 8ч x 0.7 x 0,612kWt = 206 kWh.
	With the use of the geothermal system the system efficiency increases as the air flow decreases and the required energy demand for cooling drops to:	60 days x 8ч x 0.7 x 0,408kWt = 137 kWh.

Thus the total energy demand for intake air heating or cooling makes:	Thermal energy demand per year [kWh]	Thermal energy saving per year [kWh]
With no heat recovery system	**5959**	**-**
With use of heat recovery system	**3325**	**2634**
With use of geothermal system and VENTS VUT air handling unit with heat recovery:	**1538**	**4421**

The use of the geothermal heat exchanger in the system **provides thermal efficiency increase** of the Geo Vents Duo air handling unit by **Ɛ=2634/(4421-2634)*100% = 147%**

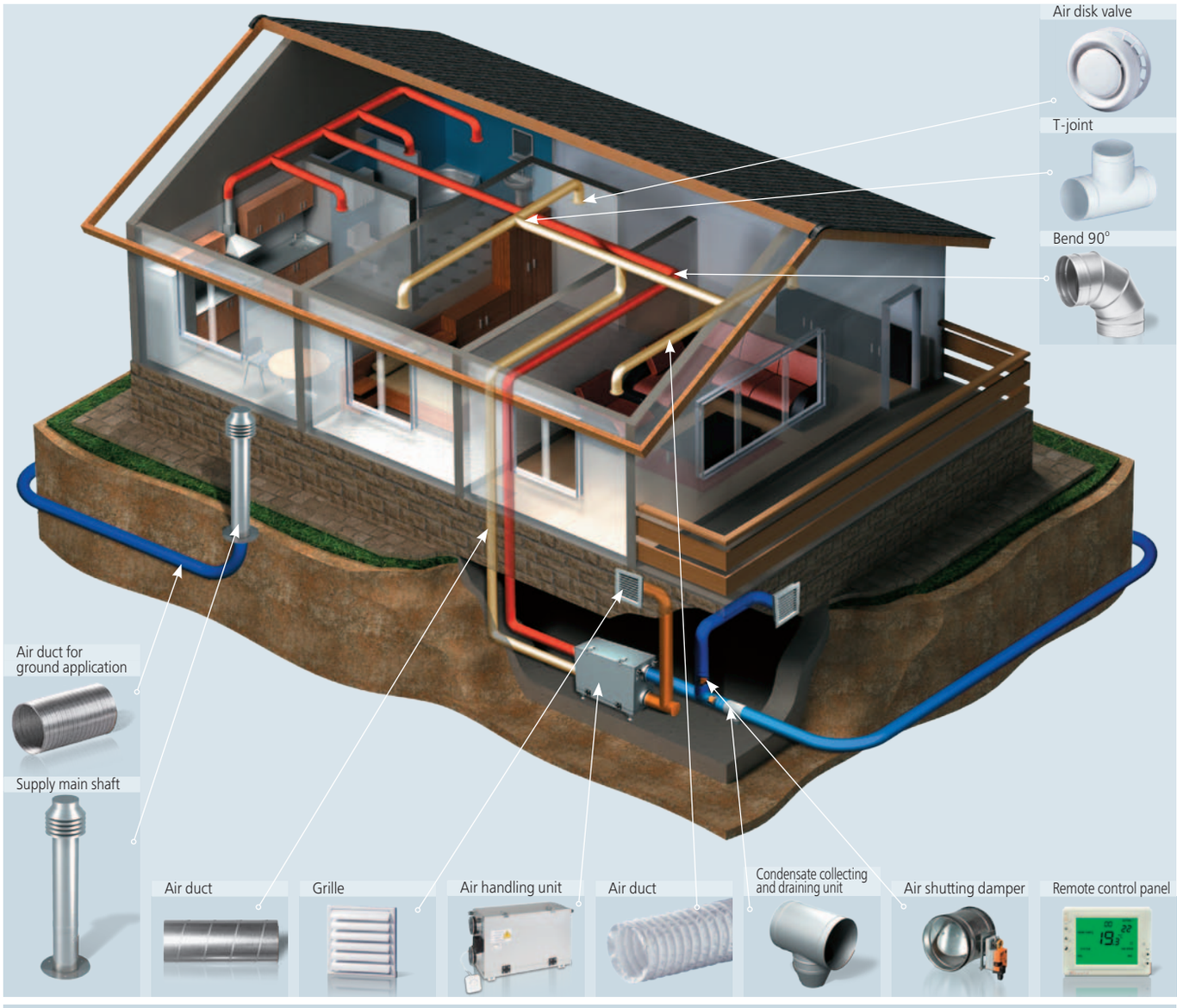
The GEO VENTS DUO system extracts the low-grade ground energy which means that it serves as a thermal pump. SPF factor, the seasonal power factor (EN14511), is used to determine the system efficiency. This factor is calculated as the amount of thermal energy gain in ratio to the amount of electrical energy consumption with respect to the seasonal air/ground temperature fluctuations.

The electrical energy consumption of the ventilation system for extraction of 2634 kWh thermal energy per year is 635 kWh.

Thus **SPF = 2634/635 = 4,14**

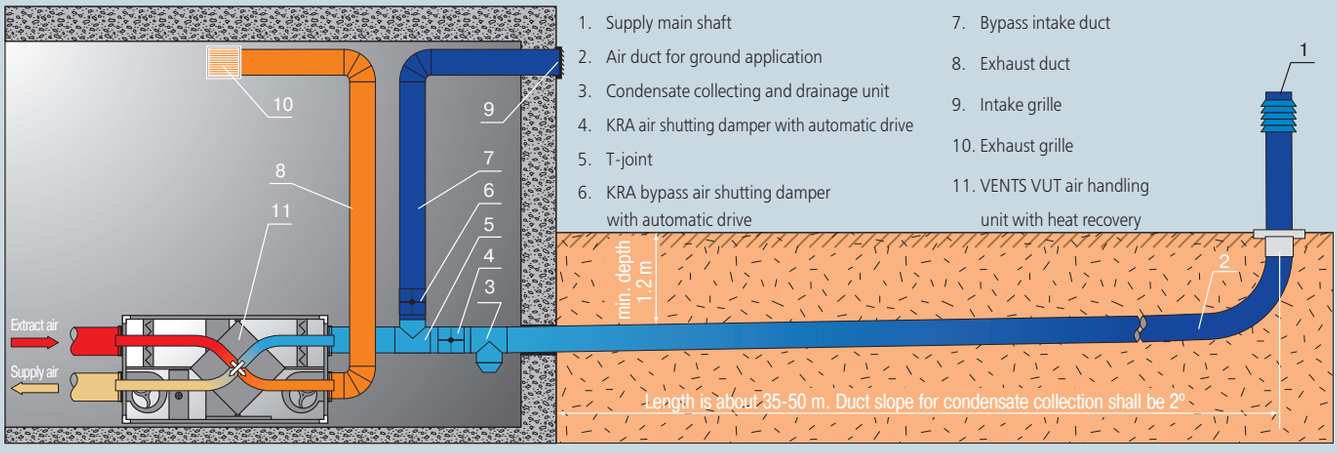
SYSTEM ARRANGEMENT EXAMPLE IN BUILDINGS WITH BASEMENT FLOOR

Mounting the geothermal ventilation system in a building with basement floor is always combined with mounting of the basic system elements such as condensate collecting and drainage unit, by-pass valve, reducers and air handling unit with heat recovery in the basement floor.



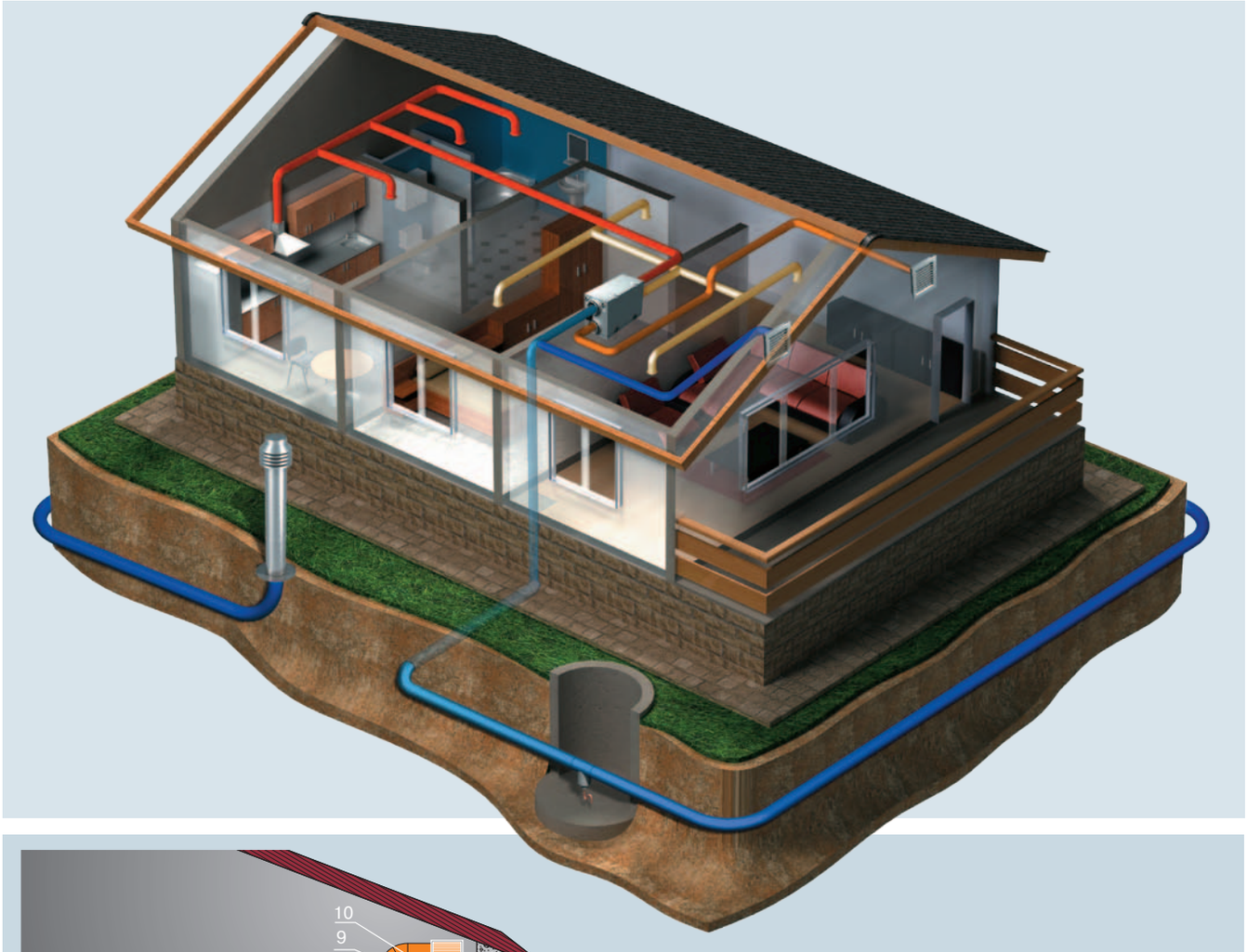
Installation scheme of GEO VENTS in buildings with basement floor

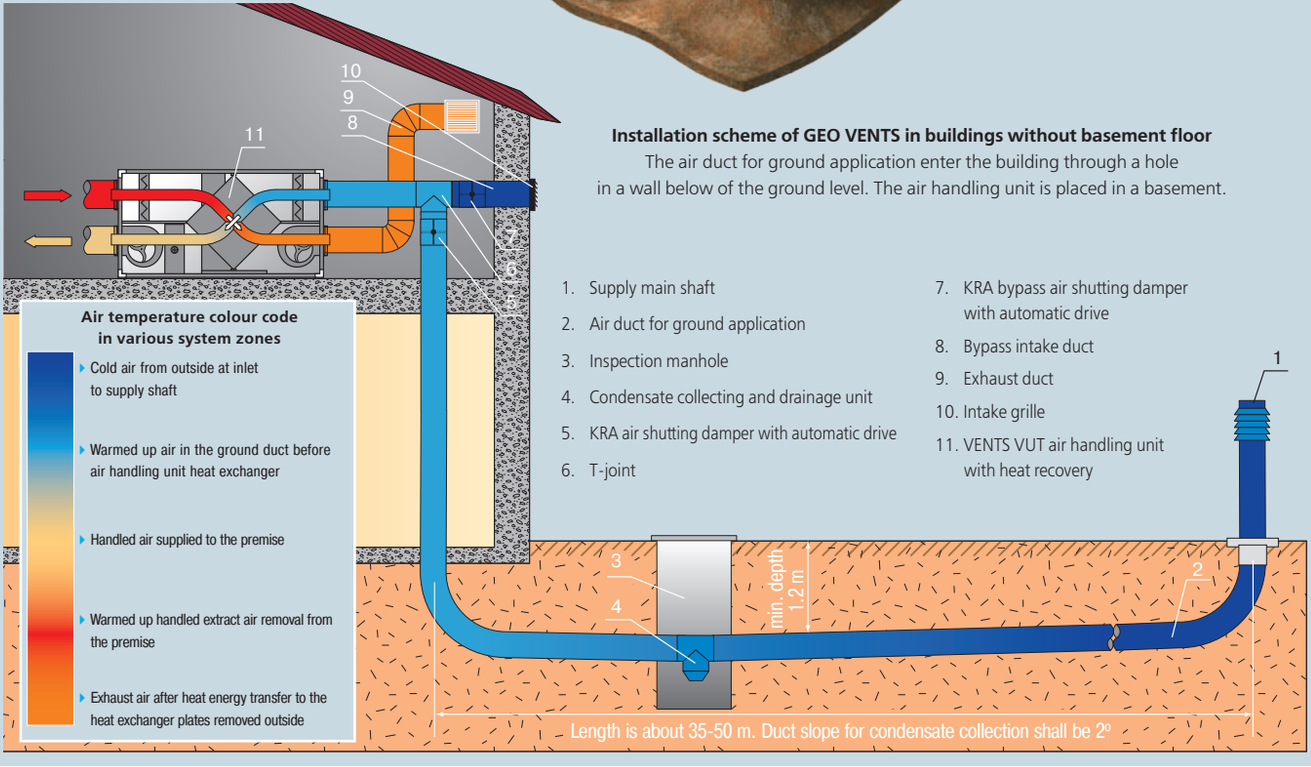
The air duct for ground application enters the building through a hole in a wall below the ground level. The air handling unit is placed in a basement.



SYSTEM ARRANGEMENT EXAMPLE IN BUILDINGS WITHOUT BASEMENT FLOOR

Mounting the geothermal ventilation system in a building without basement floor is always combined with the manhole with the condensate collecting and drainage unit. The air handling unit and its components need to be installed in a specially designed place.





Installation scheme of GEO VENTS in buildings without basement floor

The air duct for ground application enter the building through a hole in a wall below of the ground level. The air handling unit is placed in a basement.

1. Supply main shaft
2. Air duct for ground application
3. Inspection manhole
4. Condensate collecting and drainage unit
5. KRA air shutting damper with automatic drive
6. T-joint
7. KRA bypass air shutting damper with automatic drive
8. Bypass intake duct
9. Exhaust duct
10. Intake grille
11. VENTS VUT air handling unit with heat recovery

GEO VENTS SYSTEM DESCRIPTION AND STRUCTURE

The air duct system is laid below the freezing and point serves as a heat exchanger between the ground and the air moved through these air ducts. The air that is moved in the air duct is heated or cooled by the ground depending on the season of the year.

GEO VENTS SYSTEM COMPRISES:

- The ground heat exchanger for intake air pre-heating or pre-cooling.
- The VENTS VUT air handling unit with heat exchanger. The thermal energy gets transferred from the extract air to the warmed up supply air from the geothermal heat exchanger.
- Air ducts for air transportation into the premise.
- Grilles and swirl diffusers for air distribution in the room.

THE GEO VENTS SYSTEM ADVANTAGES

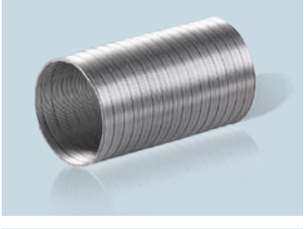
- Pre-heating of the intake air during the winter time as well as cooling and dehumidification of the supply air during the summer time. Significant reduction of operating costs.
- The VENTS VUT ventilation unit with heat exchanger provides heat transfer from the exhaust air to the supply air. Energy-efficient EBM electronically-commutated motors increase the system energy efficiency.
- High system inertness. Whereas the outside air temperature can quickly change the ground temperature at 1,5 m depth has a permanent value as well as the supply air temperature at the heat exchanger inlet.

GEO VENTS SYSTEM COMPONENTS

GTO-K SERIES SUPPLY MAIN SHAFT WITH FILTER

Designed for air intake and filtration before air supply to the geothermal heat exchanger. The 1,1-1,5 m main shaft is mounted on the concrete bottom.

GTO K 200



AIR DUCT OF THE GEOTHERMAL HEAT EXCHANGER

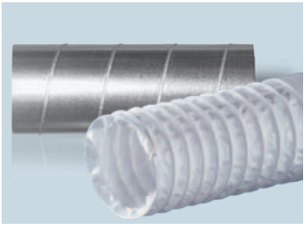
The stainless steel air duct is laid in the ground below the freezing point for the most efficient use of the geothermal energy. The air duct length depends on the system type and ranges between 25-50 m. To ensure the condensate drainage the air duct slope shall be 2° or more.
THERMOVENT N 200

GTO-OK SERIES CONDENSATE COLLECTING AND DRAINING UNIT

One of the required components of the geothermal ventilation unit. Designed for collection and draining of condensed water from the geothermal heat exchanger.
GTO OK 200

AIR HANDLING UNIT WITH HEAT RECOVERY

Models of **VENTS VUT EH EC, VENTS VUT WH, VENTS VUT WH EC, VENTS VUT PE EC, VENTS VUT PW EC series** provide the required air exchange and heat recovery for additional thermal energy saving.



SPIROVENT, POLYVENT AIR DUCTS FOR INTERNAL VENTILATION

Air ducts for internal ventilation.

KRA SERIES AIR SHUTTING DAMPER WITH AUTOMATIC ACTUATOR

Air shutting damper equipped with the automatic actuator for the automatic opening or closing of the ventilation duct.

FITTINGS

Mounting elements of the internal ventilation.

ELECTRONIC REGULATORS AND SWITCHES

For control of various operating modes of the ventilation with air handling units

SUPPLY AND EXHAUST GRILLES

To provide air exchange in the premise.

DOOR GRILLE

For installation to a door leaf of bathroom and kitchen to provide air circulation in the premise.

INTERNAL AIR DISTRIBUTION SYSTEM ELEMENTS

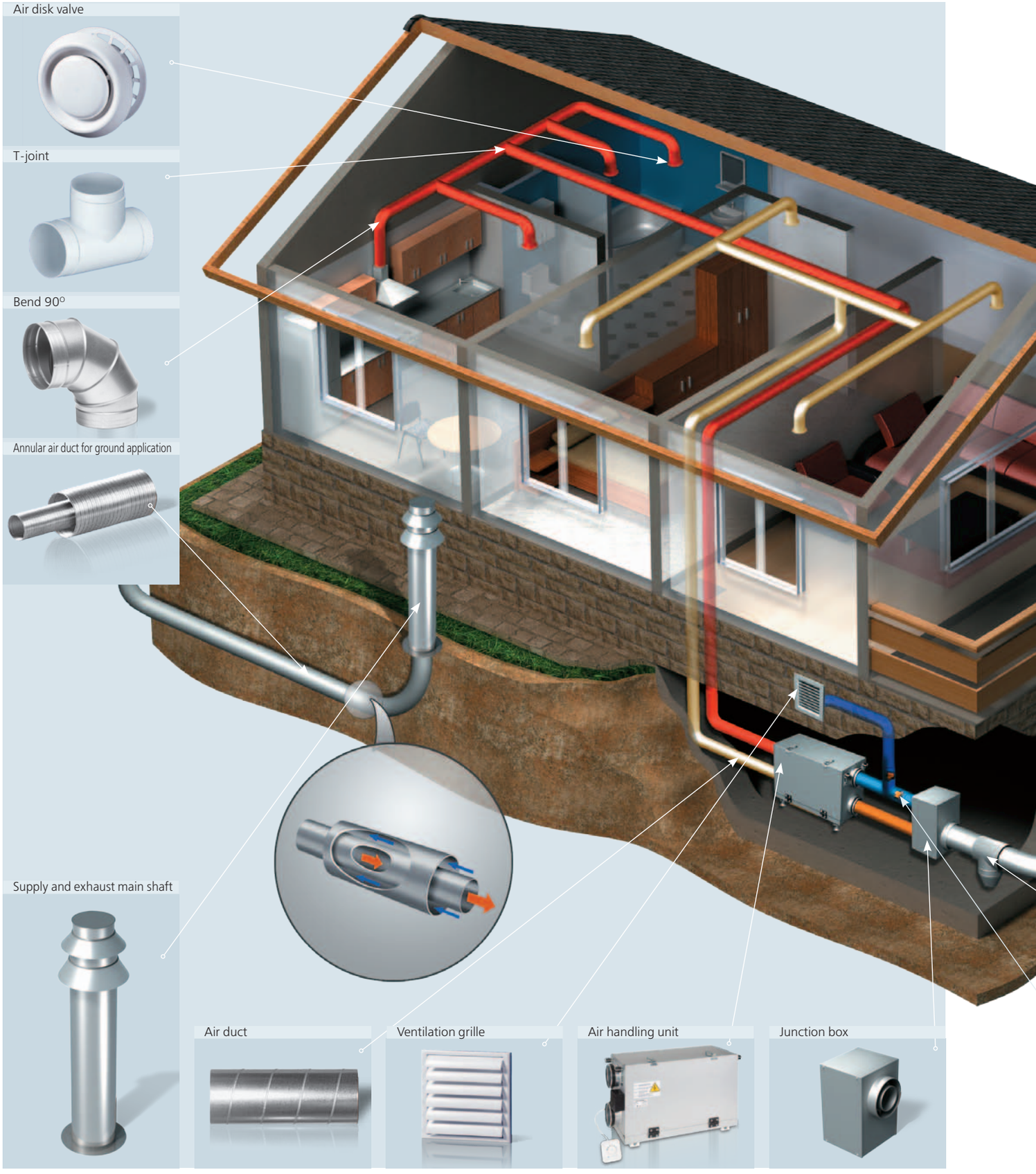
For controlled air distribution inside the room.

PLASTIC DUCTING SYSTEM (PLASTIVENT)

Air duct and mounting elements system for internal air ducting integration.

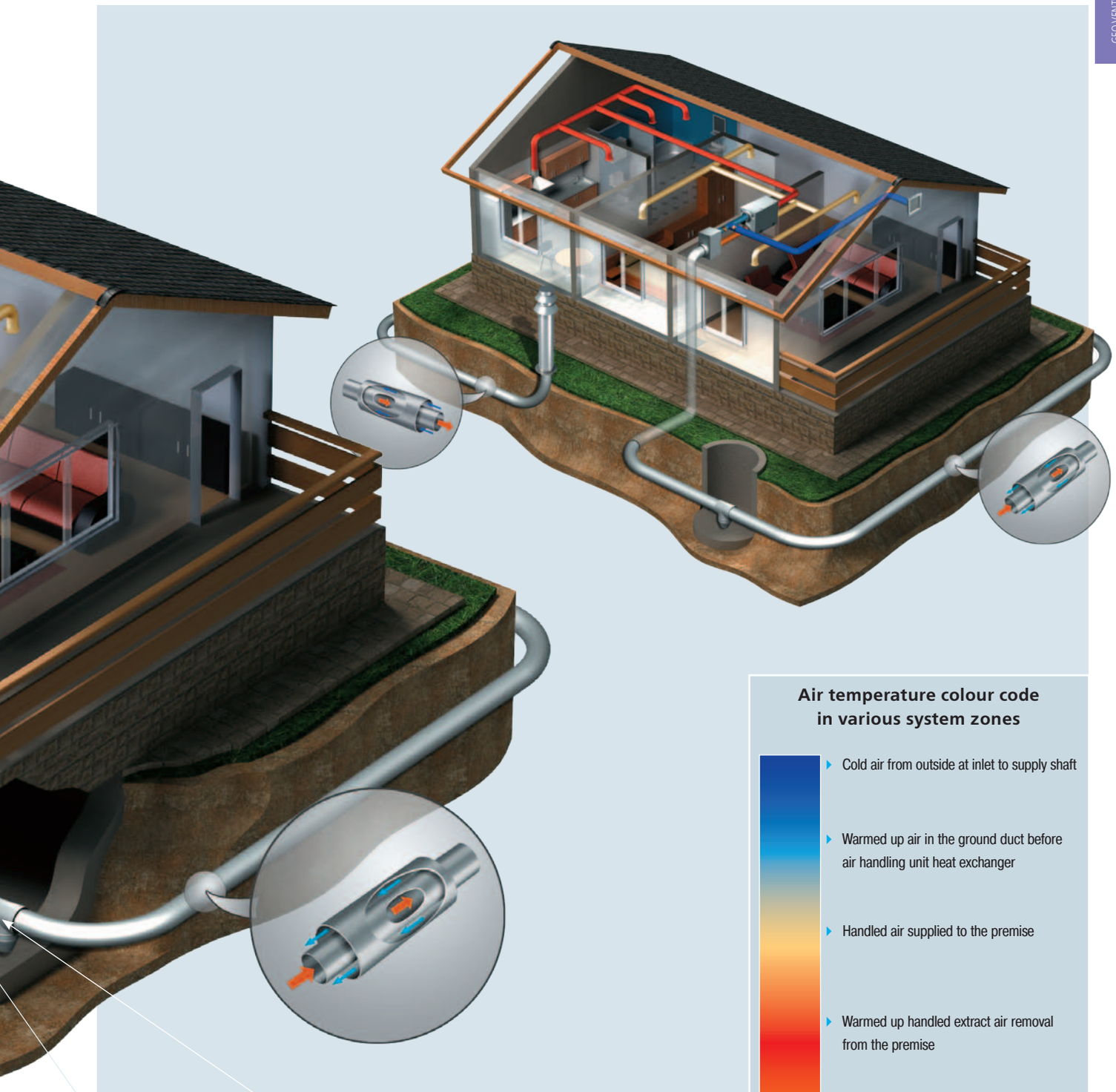
SYSTEM ARRANGEMENT EXAMPLE IN BUILDINGS WITH BASEMENT FLOOR

Mounting the geothermal ventilation system in a building with basement floor is always combined with mounting of the basic system elements such as the condensate collecting and drainage unit, by-pass valve, reducers and the air handling unit with heat recovery in the basement floor.



SYSTEM ARRANGEMENT EXAMPLE IN BUILDINGS WITHOUT BASEMENT FLOOR

Mounting the geothermal ventilation system in a building without basement floor is always combined with the manhole with the condensate collecting and drainage unit. The air handling units and its components need to be installed in specially designed places.



Air shutting damper

Condensate collecting and draining unit

Remote control panel

Air temperature colour code in various system zones

- Cold air from outside at inlet to supply shaft
- Warmed up air in the ground duct before air handling unit heat exchanger
- Handled air supplied to the premise
- Warmed up handled extract air removal from the premise
- Exhaust air after heat energy transfer to the heat exchanger plates removed outside
- Cold exhaust air at the exhaust outlet of supply-intake shaft

GEO VENTS DUO SYSTEM DESCRIPTION AND STRUCTURE

The unique combination of the spiral annular seam ducts together with the air handling units with heat recovery provides the best and efficient use of the geothermal energy and the heat of the exhaust air. The first stage of the heat recovery takes place in the spiral seam ducts made of stainless steel and the second stage takes place in the air handling unit.

GEO VENTS SYSTEM COMPRISES:

- The ground annular heat exchanger for pre-heating or pre-cooling of the intake air. Extract air from the premises moves through the internal air duct and the intake air from outside moves in the external air duct.
- The VENTS VUT air handling unit with heat exchanger. The thermal energy gets transferred from the air extracted from the room to the warmed up supply air from the geothermal heat exchange.
- Air ducts for the air transportation into the premise.
- Grilles and swirl diffusers for air distribution into the premise.

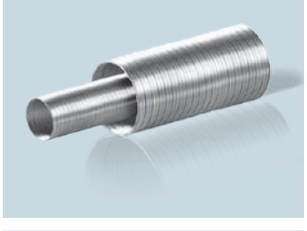
GEO VENTS DUO SYSTEM ADVANTAGES

- Pre-heating of intake air during winter time as well as cooling and dehumidification of supply air during summer time that reduces operating costs significantly.
- VENTS VUT ventilation unit with heat exchanger provides heat transfer from exhaust air to supply air and energy-efficient EBM electronically-commutated motors increase the system energy efficiency.
- High system inertness. Whereas the outside air temperature can quickly change the ground temperature at 1,5 m depth has a permanent value as well as the supply air temperature at the heat exchanger inlet.

GEO VENTS DUO SYSTEM COMPONENTS

GTO-K DUO SERIES SUPPLY MAIN SHAFT WITH FILTER

Designed for air intake and filtration before supplying to the geothermal heat exchanger and exhaust air removal. The main shaft of 1,1-1,5m height is mounted on the concrete bottom.
GTO-K DUO 125/200; GTO-K DUO 150/250

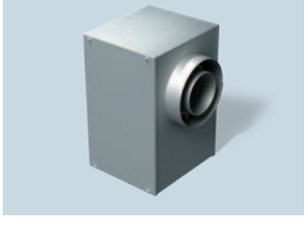


AIR DUCT OF THE GEOTHERMAL HEAT EXCHANGER TERMOVENT N DUO

The annular air duct made of stainless steel is laid in the ground below the freezing point for the best use of the geothermal energy. The air duct length depends on the system type and ranges between 25 and 50 m. To ensure the correct condensate drainage the air duct slope needs to be 2° or more.
THERMOVENT N 125/200; THERMOVENT N 150/250

GTO-OK DUO SERIES CONDENSATE COLLECTING AND DRAINING UNIT

The essential components of the geothermal ventilation unit. Designed for collecting and draining of condensed water from the geothermal heat exchanger.
GTO-OK DUO 125/200; GTO-OK DUO 150/250

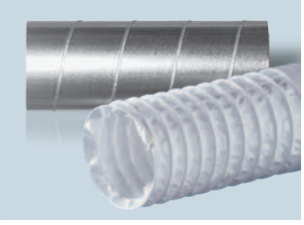


GTO-A-DUO JUNCTION BOX

Designed for connection of the internal air ducts to the geothermal heat exchanger.
GTO-A DUO 125/200; GTO-A DUO 150/250

AIR HANDLING UNIT WITH HEAT RECOVERY

VUT mini, VUT mini EC, VENTS VUT H, VENTS VUT H EC, VENTS VUT EH, VENTS VUT EH EC, VENTS VUT VH VENTS VUT WH EC, VENTS VUT PE EC, VENTS VUT PW EC series models provide the required air exchange and heat recovery and save thermal energy.



SPIROVENT, POLYVENT AIR DUCTS FOR INTERNAL VENTILATION

Air ducts for internal ventilation.

KRA SERIES AIR SHUTTING DAMPER WITH AUTOMATIC ACTUATOR

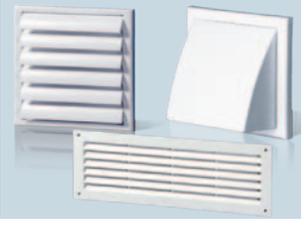
Air shutting damper equipped with the automatic actuator for the automatic opening or closing of the ventilation duct.

FITTINGS

Mounting components for the internal air duct system

ELECTRONIC REGULATORS AND SWITCHES

For control of various operating modes of the ventilation with air handling units



SUPPLY, EXHAUST AND DOOR GRILLES

To provide air exchange in premise.

AIR DISTRIBUTION INTERNAL SYSTEM ELEMENTS

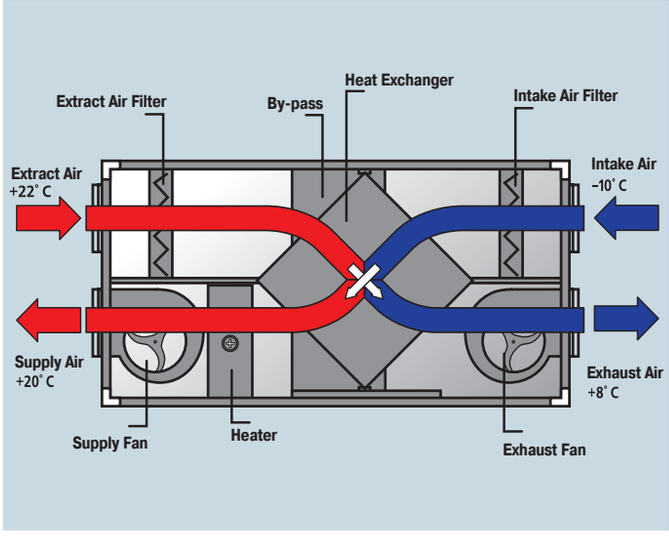
For controlled air distribution inside the room.

PLASTIC DUCTINGS SYSTEM (PLASTIVENT)

Air duct and mounting elements system for internal air ducting integration.

DESIGN AND OPERATING LOGIC OF THE AIR HANDLING UNITS (VUT WH EC)

Fresh cold intake air from outside is supplied to the VENTS VUT WH EC unit through the air ducts. The intake air is filtered and passes further through the heat exchanger where it is warmed up and supplied to the premises by the supply fan. The warm stale air from the premises is extracted through the air ducts to the VENTS VUT WH EC unit. There it is filtered and then the air stream moves further through the heat exchanger and is exhausted outside by the exhaust fan. The heat energy of the warm polluted air extracted from the premise is transferred to the cold intake air from outside. The air streams are not mixed during the heat recovery process. That reduces the thermal heat losses and cuts the heating costs in the winter time respectively.



AIR HANDLING UNITS COMPONENTS

Casing

The casing is manufactured from two compound aluminum-zinc layers internally filled with mineral wool for heat and sound insulation. The internal sheet is made of aluminum-zinc steel plates with varnish coating to ensure long service life. The internal galvanized steel plate provides the hygienic purity of the unit surface and prevents dirt accumulation on the panel. The side panels can be easily removed for inspection and service of all the unit elements.

Fan

The air supply and exhaust is effected by means of two centrifugal single-inlet EC fans equipped with backward curved blades. The EC motor is a synchronous brushless electronically commutated motor. EC motors have an energy demand up to 50% less compared to standard motors of the same capacity. The operating costs for their maintenance are by 30% less. Such fan design ensures minimum noise level combined with high capacity.

Automation and control system

The VENTS air handling units are equipped with a built-in multifunctional automation system with control panel. The control panel is equipped with multifunctional buttons, failure and alarm indication and graphic LCD indicator as a standard.

Functions:

- Keeping permanent supply air temperature level
- Keeping permanent indoor temperature level
- Ventilation rate control
- Heat recovery by means of plate heat exchanger
- Plate heat exchanger freezing protection
- Electric heater overheating protection
- Correct emergency shutdown of the heaters
- Filter clogging indication
- Setting unit operation mode
- Setting unit week operation program with ventilation rate control
- Daily timer
- Seasonal operation mode setting
- Filter replacement timer
- Automatic detection of connected devices
- Failure indication by means of text and light alarm messages
- Failure light alarm indication
- Interface language option

Filter

The G4-F7 incorporated filters provide a high degree of air purification. Panel type filters on metal frames. Filter size match the European Norms and Standards. Filter clogging control by the built-in automation system and easy filter removal and cleaning ensure filter quality and durability.

Heater:

The electric heater is designed for air handling unit operation at low outside temperature and is included as a standard. The heater is made of ribbed heat resistant stainless steel to increase the heat exchange surface area and is equipped with two thermal overheating protecting thermostats.

Anti-vibration rubber mount

The mounting of the unit on the anti-vibration rubber mounts makes its operation totally quiet and vibration-free and disables vibration transfer to buildings.

Condensate drain pan

The unit comprises the steel drain pan for the condensate drainage. The branch pipes are located at the unit bottom and are connected to the drainage system.

ADVANTAGES OF AIR HANDLING UNIT'S HEAT EXCHANGERS

Heat exchanger (recuperator)

The plate heat exchanger made of polystyrene has a large surface area and a high efficiency. The extract air transfers heat to the plates and the plates transfer the heat to the supply air flow. This way the heating costs are reduced.

The supply and extract air flows do not get mixed which ensures absence of contamination, odours and microbe transfer. The heat exchange efficiency reaches 95% and effects reducing heating costs for supply air. The by-pass damper provides switching to no heat recovery mode if required.

The design of the plate heat exchangers prevents contact between the extract and the supply air flow as they are divided by the heat exchanger plate walls. This design ensures that there is no transfer of contaminants, odours and microbes from the extract air flow to the supply air flow. The amount of the recuperated thermal energy depends exclusively on thermal conductivity of the applied materials and temperature difference between two flows. So warm extract air is cooled down and the cold intake air is warmed up.

The use of the plate heat exchangers in the ventilation system results in shorter payback periods and better ecological characteristics ensuring the further advantages:

- Low energy demand;
- Low investment for thermal energy generation and its distribution;
- No movable parts which means durability and long service life with continuous operation;
- Highly efficient heat recovery and little investment result in high self-repayment;
- Environmental friendly

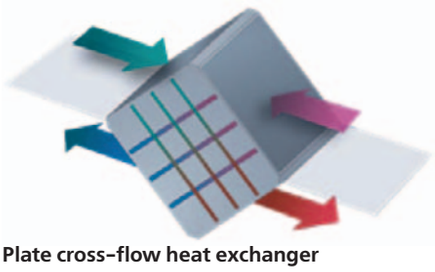


Plate cross–flow heat exchanger

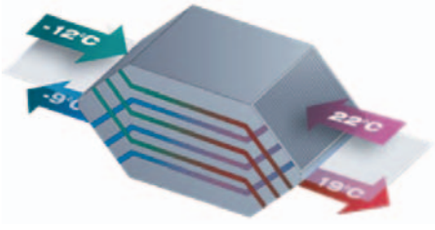
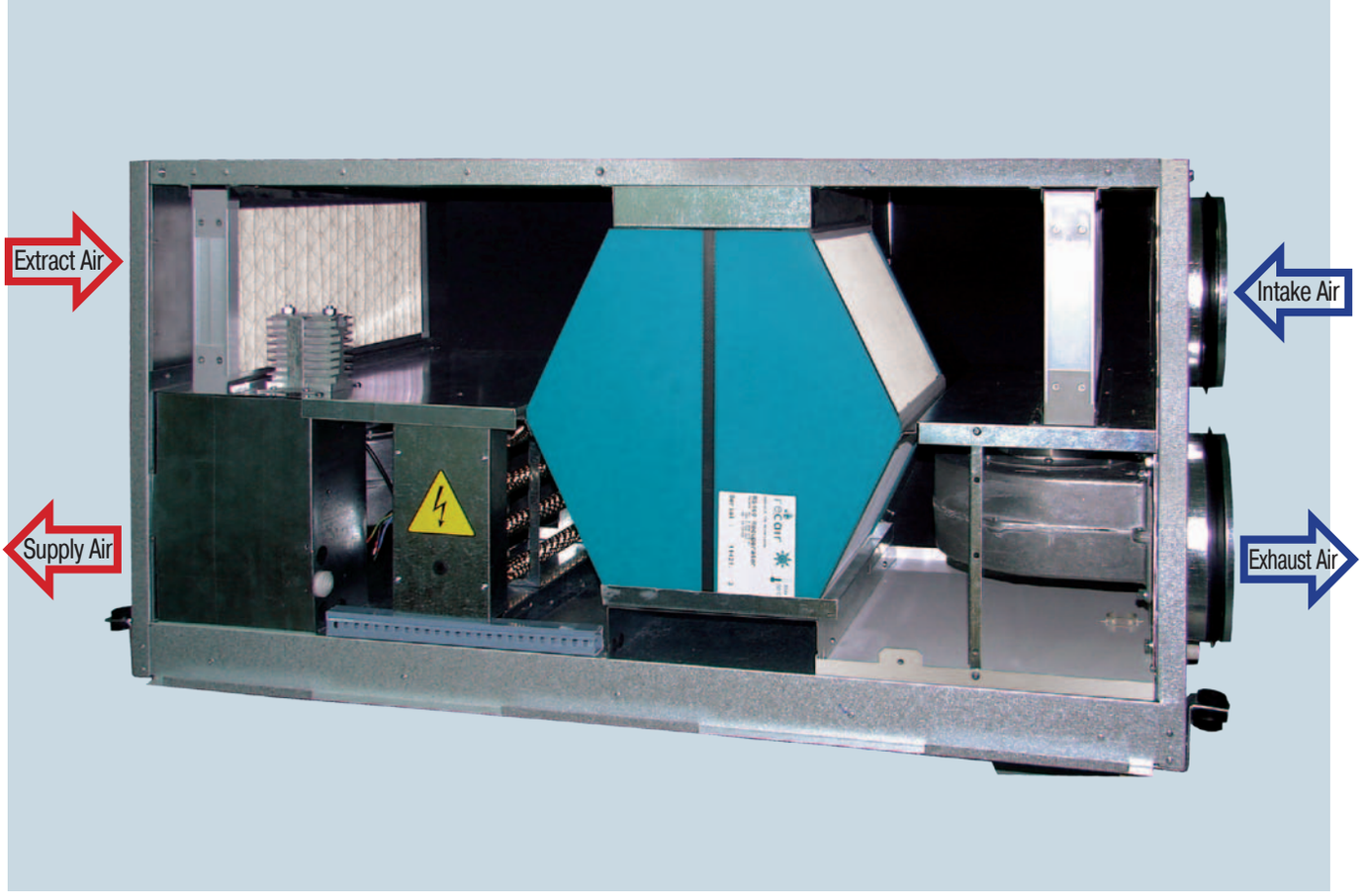


Plate counter–flow heat exchanger



AIR HANDLING UNITS WITH HEAT RECOVERY

VENTS VUT V MINI SERIES

Air handling units with air capacity up to 300 m^3/h in compact sound- and heat-insulated casing with vertical duct connections.

VENTS VUT H MINI SERIES

Air handling units with the air capacity up to 300 m^3/h in compact sound- and heat-insulated casing with horizontal duct connections.

The VENTS VUT Mini air handling unit is a complete air handling unit designed to provide both supply and exhaust ventilation with air cleaning and heat recovery. The thermal extract air energy is used to heat up the supply fresh air through the heat exchanger. All models are designed for connection to ∅100 and 125 mm round ducts.

VENTS VUT V MINI EC SERIES

Air handling units with air capacity up to 345 m^3/h and recuperation efficiency up to 85% in compact sound- and heat-insulated casing with vertical duct connections.

VENTS VUT H MINI EC SERIES

Air handling units with air capacity up to 345 m^3/h and recuperation efficiency up to 85% in the compact sound- and heat-insulated casing with horizontal duct connections.

The VENTS VUT Mini air handling unit is a complete air handling unit for supply and exhaust ventilation, air cleaning, heat recovery and extract air removal. The thermal extract air energy is used to warm up the fresh supply air through the heat exchanger. Applied in ventilation and air conditioning systems for premises of various purposes that require an economic solution and a controllable ventilation system. Energy consumption of EC-motors is 30-70% less than energy consumption of AC motors. EC motors ensure high efficiency combined with low noise level. All models are designed for connection to ∅100 and 125 mm round air ducts.

VENTS VUT H SERIES

Air handling units with air capacity up to 2200 m^3/h and recuperation efficiency up to 88% in compact sound- and heat-insulated casing.

The air handling unit VENTS VUT H is a complete ventilation units for air filtration, air supply to the premises and removal of exhaust air. In the process of operation the heat of the exhausted air is transferred to the supply air through the plate heat exchanger. All the models are designed for connection to ∅125, 150, 160, 200, 250, 315 mm round ducts.

VENTS VUT H EC

Air handling units with air capacity up to 600 m^3/h and recuperation efficiency up to 95% in compact sound-and heat-insulated casing.

The VENTS VUT H air handling units is a complete air handling unit for supply and exhaust ventilation, air cleaning, heat recovery and extract air removal. The thermal extract air energy is used to warm up the fresh supply air through the heat exchanger. Applied in ventilation and conditioning systems for premises of various purpose that require an economic solution and a controllable ventilation system. Energy consumption of EC-motors is 30-70% less than energy consumption of AC motors. EC motors ensure high efficiency combined with low noise level. All models are designed for connection to ∅160 and 200 mm round air ducts.

VENTS VUT EH SERIES

Air handling units with the air capacity up to 2200 m^3/h and recuperation efficiency up to 85% in sound-proof and heat-insulated casing with electric heater.

VENTS VUT WH SERIES

Air handling units with air capacity up to 2100 m^3/h and recuperation efficiency up to 78% in sound-proof and heat-insulated casing with water heater.

The air handling units VUT EH with electric heater and VUT WH with water heater are complete air handling units for supply and exhaust ventilation, air cleaning, heat recovery and extract air removal. The thermal extract air energy is used to warm up the fresh supply air through the heat exchanger. All models are designed for connection to ∅125, 150, 160, 200, 250, 315 mm round ducts.

VENTS VUT EH EC SERIES

Air handling units with air capacity up to 600 m^3/h and recuperation efficiency up to 95% in the sound- and heat-insulated casing.

VENTS VUT WH EC SERIES

Air handling units with air capacity up to 550 m^3/h and recuperation efficiency up to 95% in sound- and heat-insulated casing with water heating coils.

The air handling units VUT EH EC with electric heater and VUT WH EC with water heater are complete air handling units for supply and exhaust ventilation, air cleaning, heat recovery and extract air removal. The thermal extract air energy is used to warm up the fresh supply air through the heat exchanger. Applied in ventilation and conditioning systems for premises of various purposes that require an economic solution and a controllable ventilation system. Energy consumption of EC-motors is 30-70% less than energy consumption of AC motors. EC motors ensure high efficiency combined with low noise level. All models are designed for connection to ∅150, 160 and 200 mm round air ducts.

VENTS VUT PE EC SERIES

Compact suspended air handling units with air capacity up to 4000 m^3/h and recuperation efficiency up to 90% in sound-proof and heat-insulated casing with electric heater.

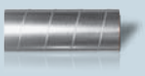
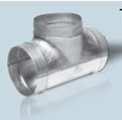
VENTS VUT PW EC SERIES

Compact suspended air handling units with air capacity up to 3800 m^3/h and recuperation efficiency up to 90% in sound-proof and heat-insulated casing with electric heater.

The air handling units VENTS VUT PE EC with electric heater and VENTS VUT PW EC with water heater are complete air handling units for supply and exhaust ventilation, air cleaning, heat recovery and extract air removal. The thermal extract air energy is used to warm up the fresh supply air through the heat exchanger. Applied in ventilation and conditioning systems for premises of various purposes that require an economic solution and a controllable ventilation system. Energy consumption of EC-motors is 30-70% less than energy consumption of AC motors. EC motors ensure high efficiency combined with low noise level. All models are designed for connection to ∅160(150), 200, 250, 315 and 400 mm round air ducts.

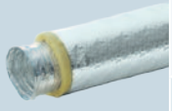
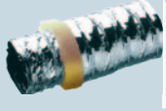
SPIROVENT AIR DUCTS FOR INTERNAL VENTILATION

Galvanized steel air ducts for ventilation arranging

	∅100 mm	∅125 mm	∅150 mm	∅160 mm	∅200 mm	∅250 mm
AIR DUCT 	Spirovent 100	Spirovent 125	Spirovent 150	Spirovent 160	Spirovent 200	Spirovent 250
COUPLING 	Coupling 100	Coupling 125	Coupling 150	Coupling 160	Coupling 200	Coupling 250
FEMALE COUPLING 	Female Coupling 100	Female Coupling 125	Female Coupling 150	Female Coupling 160	Female Coupling 200	Female Coupling 250
INTERNAL END CUP 		Internal End cup 125	Internal End cup 150	Internal End cup 160	Internal End cup 200	Internal End cup 250
EXTERNAL END CUP 		External End cup 125	External End cup 150	External End cup 160	External End cup 200	External End cup 250
BEND 		Bend 90 125 Bend 60 125 Bend 45 125 Bend 30 125 Bend 15 125	Bend 90 150 Bend 60 150 Bend 45 150 Bend 30 150 Bend 15 150	Bend 90 160 Bend 60 160 Bend 45 160 Bend 30 160 Bend 15 160	Bend 90 200 Bend 60 200 Bend 45 200 Bend 30 200 Bend 15 200	Bend 90 250 Bend 60 250 Bend 45 250 Bend 30 250 Bend 15 250
REDUCER 			Reducer 150/125	Reducer 160/125 Reducer 160/150	Reducer 200/125 Reducer 200/150 Reducer 200/160	Reducer 250/125 Reducer 250/150 Reducer 250/160 Reducer 250/200
ONE-SIDED REDUCER 			One-sided Reducer 150/125	One-sided Reducer 160/125 One-sided Reducer 160/150	One-sided Reducer 200/125 One-sided Reducer 200/150 One-sided Reducer 200/160	One-sided Reducer 250/125 One-sided Reducer 250/150 One-sided Reducer 250/160 One-sided Reducer 250/200
ECCENTRIC REDUCER 			Eccentric Reducer 150/125	Eccentric Reducer 160/125 Eccentric Reducer 160/150	Eccentric Reducer 200/125 Eccentric Reducer 200/150 Eccentric Reducer 200/160	Eccentric Reducer 250/125 Eccentric Reducer 250/150 Eccentric Reducer 250/160 Eccentric Reducer 250/200
T-JOINT 		T-joint 125	T-joint 150/125 T-joint 150	T-joint 160/125 T-joint 160/150 T-joint 160	T-joint 200/125 T-joint 200/150 T-joint 200/160 T-joint 200	T-joint 250/125 T-joint 250/150 T-joint 250/160 T-joint 250/200 T-joint 250
CROSS TEE JOINT 		Cross tee joint 125	Cross tee joint 150/125 Cross tee joint 150	Cross tee joint 160/125 Cross tee joint 160/150 Cross tee joint 160	Cross tee joint 200/125 Cross tee joint 200/150 Cross tee joint 200/160 Cross tee joint 200	Cross tee joint 250/125 Cross tee joint 250/150 Cross tee joint 250/160 Cross tee joint 250/200 Cross tee joint 250
ANGULAR T-JOINT 45 		Angular T-joint 125 45	Angular T-joint 150/125 45 Angular T-joint 150 45	Angular T-joint 160/125 45 Angular T-joint 160/140 45 Angular T-joint 160/150 45 Angular T-joint 160 45	Angular T-joint 200/125 45 Angular T-joint 200/150 45 Angular T-joint 200/160 45 Angular T-joint 200 45	Angular T-joint 250/125 45 Angular T-joint 250/150 45 Angular T-joint 250/160 45 Angular T-joint 250/200 45 Angular T-joint 250 45
SADDLE 		Saddle 125/125	Saddle 150/125 Saddle 150/150	Saddle 160/125 Saddle 160/150 Saddle 160/160	Saddle 200/125 Saddle 200/150 Saddle 200/160 Saddle 200/200	Saddle 250/125 Saddle 250/150 Saddle 250/160 Saddle 250/200

POLYVENT AIR DUCTS FOR INTERNAL VENTILATION

Flexible air ducts for ventilation arranging in the premises

	∅100 mm	∅125 mm	∅150 mm	∅160 mm	∅200 mm	∅250 mm
	Non-insulated flexible air duct from alunimum foil laminated with polyester film, designed for operating temperature of -30°C ... +250°C (for M0 model), -30°C ... +150°C (for M1 model)					
	Polyvent 605 M0 102/**	Polyvent 605 M0 127/**	Polyvent 605 M0 152/**		Polyvent 605 M0 203/**	Polyvent 605 M0 254/**
	Polyvent 605 M1 102/**	Polyvent 605 M1 127/**	Polyvent 605 M1 152/**		Polyvent 605 M1 203/**	Polyvent 605 M1 254/**
	Insulated flexible air duct from alunimum foil laminated with polyester film and insulated with 25 mm mineral wool layer, for operating temperature of -30°C ... +250°C (for M0 model), -30°C ... +150°C (for M1 model)					
	Isovent 605 M0 102/**	Isovent 605 M0 127/**	Isovent 605 M0 152/**		Isovent 605 M0 203/**	Isovent 605 M0 254/**
	Isovent 605 M1 102/**	Isovent 605 M1 127/**	Isovent 605 M1 152/**		Isovent 605 M1 203/**	Isovent 605 M1 254/**
	Non-insulated flexible air duct from plated polyester film (45 mc) for operating temperature of -30°C ... +120°C					
	Polyvent N 102/**	Polyvent N 127/**	Polyvent N 152/**		Polyvent N 203/**	Polyvent N 254/**
	Insulated flexible air duct from plated polyester film (45 mc) insulated with 25 mm mineral wool layer, for operating temperature of -30°C ... +120°C					
	Isovent N 102/**	Isovent N 127/**	Isovent N 152/**		Isovent N 203/**	Isovent N 254/**

** – 3; 6; 7,5; 10 m air duct

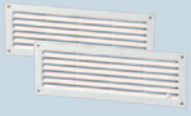
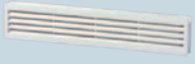
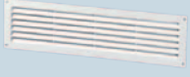
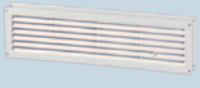
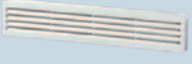
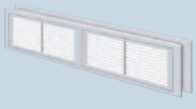
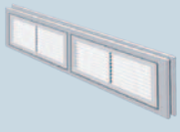
VENTILATION GRILLES

For supply and exhaust ventilation suitable for ceiling and wall mounting

	∅100 mm	∅125 mm	∅150 mm	∅160 mm	∅200 mm	∅250 mm
	Diffusers with lock rings made of ABS plastic for ceiling mounting					
	MV 100 PFs	MV 125 PFs	MV 150 PFs		MV 200 PFs	MV 250 PFs
	Air disk valves with lock rings made of ABS plastic for ceiling mounting					
	A 100 VRF	A 125 VRF	A 150 VRF		A 200 VRF	A 250 VRF
	Air disk valves with lock rings made of steel with polymeric coating for ceiling mounting					
	AM 100 VRF	AM 125 VRF	AM 150 VRF		AM 200 VRF	AM 250 VRF
	Exhaust grilles with backdraft damper and cowl for external mounting					
	MV 102 V (154*154 mm)	MV 122 V (187*187 mm)				
	Exhaust grilles with louver shutters for external mounting					
	MV 100 VJ (154*154 mm)	MV 120 VJ (187*187 mm)	MV 160 VJD (221*299 mm, ∅100-150 mm)		MV 250/200 VJ (250*250 mm)	
			MV 250/150 VJD (250*250 mm, ∅100-150 mm)			
			MV 250/150 VJ (250*250 mm)			
	Supply and exhaust grilles for wall and ceiling mounting					
	MV 100 Vs (154*154 mm)	MV 120 Vs (187*187)	MV 160 VDs (221*299 mm, ∅100-150 mm) MV 250/150 VDs (250*250 mm, ∅100-150 mm) MV 250/150 Vs (250*250 mm) MV 170 VDs (299* 221 mm, ∅100-150 mm) MV 126 VDs (182*251 mm, ∅100-150 mm) MV 125 VDs (182*251 mm, ∅100-150 mm) MV 150 VDs (204*204 mm, ∅100-150 mm)		MV 250/200 Vs (250*250 mm)	
	Round supply and exhaust grilles for wall and ceiling mounting					
	MV 100 bVs	MV 125 bVs	MV 150 bVs			

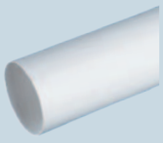
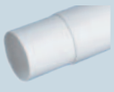
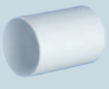
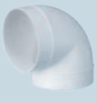
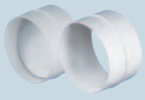
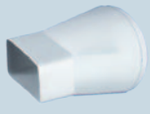
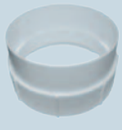
DOOR VENTILATION GRILLES

For supply and exhaust ventilation

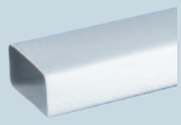
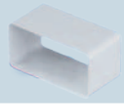
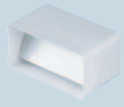
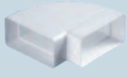
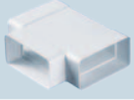
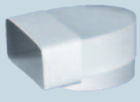
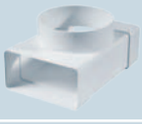
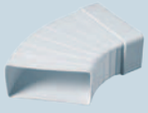
	Model	Dimensions [mm] LxH	Minimum door leaf thickness	Material
	MV350 – MV350R	368*130	32	Plastic
	MV430/2	453*91	29	Plastic
	MV450 – MV450R	462*124	32	Plastic
	MV450/2 – MV450R/2	462*124	32	Plastic
	MV440 /2	460*120	29	Plastic
	MV380/2	382*107	29	Plastic
	MV460/2	482*124	32	Plastic
	MVMA 400*60 MVMA 400*80 MVMA 400*100 MVMA 500*60 MVMA 500*80 MVMA 500*100 MVMA 600*60 MVMA 600*80 MVMA 600*100	400*60 400*80 400*100 500*60 500*80 500*100 600*60 600*80 600*100	30 30 30 30 30 30 30 30 30	Aluminum Aluminum Aluminum Aluminum Aluminum Aluminum Aluminum Aluminum Aluminum
	MVM 250*80 MVM 475*80	252*89 475*80	26 26	Steel with polymeric coating Steel with polymeric coating

PLASTIVENT PLASTIC ROUND DUCT SYSTEM

Plastic ducting for internal application

	∅100 mm	∅125 mm	∅150 mm	∅200 mm
	Round ducts			
	10035 (L: 350 mm) 1005 (L: 500 mm) 1010 (L: 1000 mm) 1015 (L: 1500 mm) 1020 (L: 2000 mm) 1025 (L: 2500 mm)	20035 (L: 350 mm) 2005 (L: 500 mm) 2010 (L: 1000 mm) 2015 (L: 1500 mm) 2020 (L: 2000 mm) 2025 (L: 2500 mm)	30035 (L: 350 mm) 3005 (L: 500 mm) 3010 (L: 1000 mm) 3015 (L: 1500 mm) 3020 (L: 2000 mm) 3025 (L: 2500 mm)	40035 (L: 350 mm) 4005 (L: 500 mm) 4010 (L: 1000 mm) 4015 (L: 1500 mm) 4020 (L: 2000 mm) 4025 (L: 2500 mm)
	Telescopic round duct			
	1805 (L: 500 mm) 1810 (L: 1000 mm)	2805 (L: 500 mm) 2810 (L: 1000 mm)		
	Flexible air duct connector			
	1113	2123	3133	4143
	Bend for 90° round duct connection			
	T-joint for 90° round duct connection			
	131	232	333	434
	Wall plate			
	15	25	35	45
	Round duct connector (with backdraft damper)			
	111 1111 (with backdraft damper)	212 2121(with backdraft damper)	313 3131(with backdraft damper)	414 4141 (with backdraft damper)
	Round duct connector with plate			
	151 1511 (with backdraft damper)	252 2521 (with backdraft damper)	353 3531 (with backdraft damper)	414 4141 (with backdraft damper)
	Round duct reducer			
	110 (∅100-80)	211 (∅125-100) 216 (∅130-120)	312 (∅150-125) 310 (∅150-125-120-100-80)	413 (∅200-150)
	Flat and round duct reducer			
	511 (55*110- ∅100) 711 (60*120- ∅100)	812 (60*204- 125)		
	Round duct holder			
	16	26	36	46
	Threaded joint for flexible ducts			
	1214 (left thread) ∅104-116 1214R (right thread) ∅105-114 1215 (left thread) ∅101-116 1215R (right thread) ∅99-110			

PLASTIVENT PLASTIC FLAT DUCT SYSTEM

	55*110	60*120	60x204
	Flat Ducts		
	50035 (L: 350 mm) 5005 (L: 500 mm) 5010 (L: 1000 mm) 5015 (L: 1500 mm) 5020 (L: 2000 mm) 5025 (L: 2500 mm)	70035 (L: 350 mm) 7005 (L: 500 mm) 7010 (L: 1000 mm) 7015 (L: 1500 mm) 7020 (L: 2000 mm) 7025 (L: 2500 mm)	80035 (L: 350 mm) 8005 (L: 500 mm) 8010 (L: 1000 mm) 8015 (L: 1500 mm) 8020 (L: 2000 mm) 8025 (L: 2500 mm)
	Flat Flexible Duct Connector		
	5153	7173	8183
	Flat Duct Connector (with backdraft damper)		
	515 5151 (with backdraft damper)	717 7171 (with backdraft damper)	818 8181 (with backdraft damper)
	Vertical bend for flat duct connection		
	5252	7272	8282
	Horizontal bend for flat duct connection		
	5251	7271	8281
	T-joint for flat duct connection		
	535	737	838
	Flat duct holder		
	56	76	86
	Connecting bend for flat and round ducts		
	521 (55*110- ∅100)	721 (60*120-∅100)	821 (60*204-∅100) 822 (60*204-∅125) 823 (60*204-∅150)
	T-joint for connection of round and flat ducts		
	531 (55*110- 100)	731 (60*120-∅100)	831 (60*204-∅100) 832(60*204-∅125) 833 (60*204-∅150)
	Reducer for flat duct connection		
		517 (60*120 - 55*110)	518 (60*204 - 55*110) 718 (60*204 - 60*120)
	Wall plate		
	55	75	85
	End grille		
	571 572 (adjustable)		871 872 (adjustable)
	Reducer		
		115 (∅106 - 55*110) 1156 (∅103 - 55*110) 1157 (∅100 - 55*110)	
	Multi-purpose angle for flat duct connection		
	52510		82810

BACKFDRAFT DAMPERS AND SHUTTERS

The backdraft spring-loaded KOM damper is constructed for automatic shutoff of the round ducts and for prevention of air backflow when the ventilation system is off. The damper vanes are opened with the air stream pressure and are closed by the spring. The KOM1 backdraft damper is designed for automatic shutoff of the air duct when the fan is not running and is gravitationally operated. The KR air shutters are designed to regulate the air flow and the KRA air shutting dampers are designed for automatic shutoff of the round air duct.

	∅100 mm	∅125 mm	∅150 mm	∅160 mm	∅200 mm	∅250 mm
	Backfdraft damper of KOM Series					
	KOM 100	KOM 125	KOM 150	KOM 160	KOM 200	KOM 250
	Backfdraft damper of KOM1 Series					
	KOM1 100	KOM1 125	KOM1 150	KOM1 160	KOM1 200	KOM1 250
	Air shutter. KR Series					
	KR 100	KR 125	KR 150	KR 160	KR 200	KR 250
	Air shutting damper. KRA Series					
	KRA 100	KRA 125	KRA 150	KRA 160	KRA 200	KRA 250

SILENCERS

The silencer is designed for absorption of noise produced by the ventilating equipment operation and spread along the ducting systems.

	∅100 mm	∅125 mm	∅150 mm	∅160 mm	∅200 mm	∅250 mm
	Silencers. SR series					
	SR 100/600	SR 125/600	SR 150/600	SR 160/600	SR 200/600	SR 250/600
	SR 100/900	SR 125/900	SR 150/900	SR 160/900	SR 200/900	SR 250/900
	SR 100/1200	SR 125/1200	SR 100/1200	SR 160/1200	SR 100/1200	SR 250/1200
	Silencers. SRF series					
	SRF 100/600	SRF 125/600	SRF 150/600	SRF 160/600	SRF 200/600	SRF 250/600
	SRF 100/900	SRF 125/900	SRF 150/900	SRF 160/900	SRF 200/900	SRF 250/900
	SRF 100/2000	SRF 125/2000	SRF 100/2000	SRF 160/2000	SRF 100/2000	SRF 250/2000

CLAMPS

The clamps are designed for quick and reliable mounting and connection of various round ventilation system components. C series clamps are made of stainless steel (C series) or galvanized steel (C.. Z.) strips. The clamps are tightened with screws. CBR 3000 series clamps are plastic band clamps in plastic covering (roll 30 m x 9 mm x 0,8 mm + 50 SU 50 locking devices).By using a band of the worm drive clip of the required length and the locking device you get the required diameter clamp.

	∅100 mm	∅125 mm	∅150 mm	∅160 mm	∅200 mm	∅250 mm
	Clamps. C Series					
	C 100	C 125	C 150	C 160	C 200	C 250
	Clamps. CB Series					
	CB 60-110	CB 60-135	CB 60-165			

ELECTRONIC REGULATORS AND SWITCHES

RS-1-300 SPEED CONTROLLER

For the manual switch on/off and variable speed control of single phase AC-induction motors. Several fans can be operated in parallel as long as the total current does not exceed the controller's current range.

SPEED CONTROLLER RS-1-400

Technical Data:	RS-1-300	RS-1-400
Voltage at 50 Hz [V]	1~ 230	1~ 230
Rated Current [A]	1,5	1,8
Overall dimensions LxWxH [mm]	95x85x60	78x78x63
Maximum operating temperature [°C]	40	35

RTS-1-400 , RTSD-1-400 TEMPERATURE REGULATOR

Used for temperature mode control in ventilation, heating and air conditioning systems. This temperature regulator can be used for control of the fan and fancoil dampers, the air heating units with 230V three speed fans and operates as an automatic heating or cooling controller.

Technical Data:	RTS-1-400	RTSD-1-400
Voltage at 50 Hz [V]	1~ 230	1~ 230
Rated Current [A]	2,0	2,0
Number of speeds	3	3
Temperature regulation range [°C]	+10...+30	+10...+30
Overall dimensions LxWxH [mm]	88x88x51	88x88x51
Maximum operating temperature [°C]	40	40
Remote Control Panel	no	yes

RT-10 TEMPERATURE REGULATOR

Used for maintaining the set air temperature level and control of the ventilation, heating and air conditioning systems.

Technical Data:	RT-10
Voltage at 50/60 Hz [V]	1~ 220-240
Overall dimensions LxWxH [mm]	84x84x35
Maximum operating temperature [°C]	40

P2-1-300, P3-1-300 SPEED SWITCH

Used for the speed ON/OFF switching and speed select switching for multi-speed motors.

Technical Data:	P2-1-300	P3-1-300
Voltage at 50 Hz [V]	1~ 230	1~ 230
Rated Current [A]	5,0	5,0
Number of speeds	2	3
Overall dimensions LxWxH [mm]	88x88x51	88x88x51
Maximum operating temperature [°C]	40	40

R-1/010 SPEED CONTROLLER

Used for smooth speed control of EC motors with the control input 0-10 V

Technical Data:	P-1/010
Voltage at [V]	10-48V DC
Input signal [V]	0-10
Max.current mA	5mA
Overall dimensions LxWxH [mm]	78x78x63
Maximum operating temperature [°C]	35

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