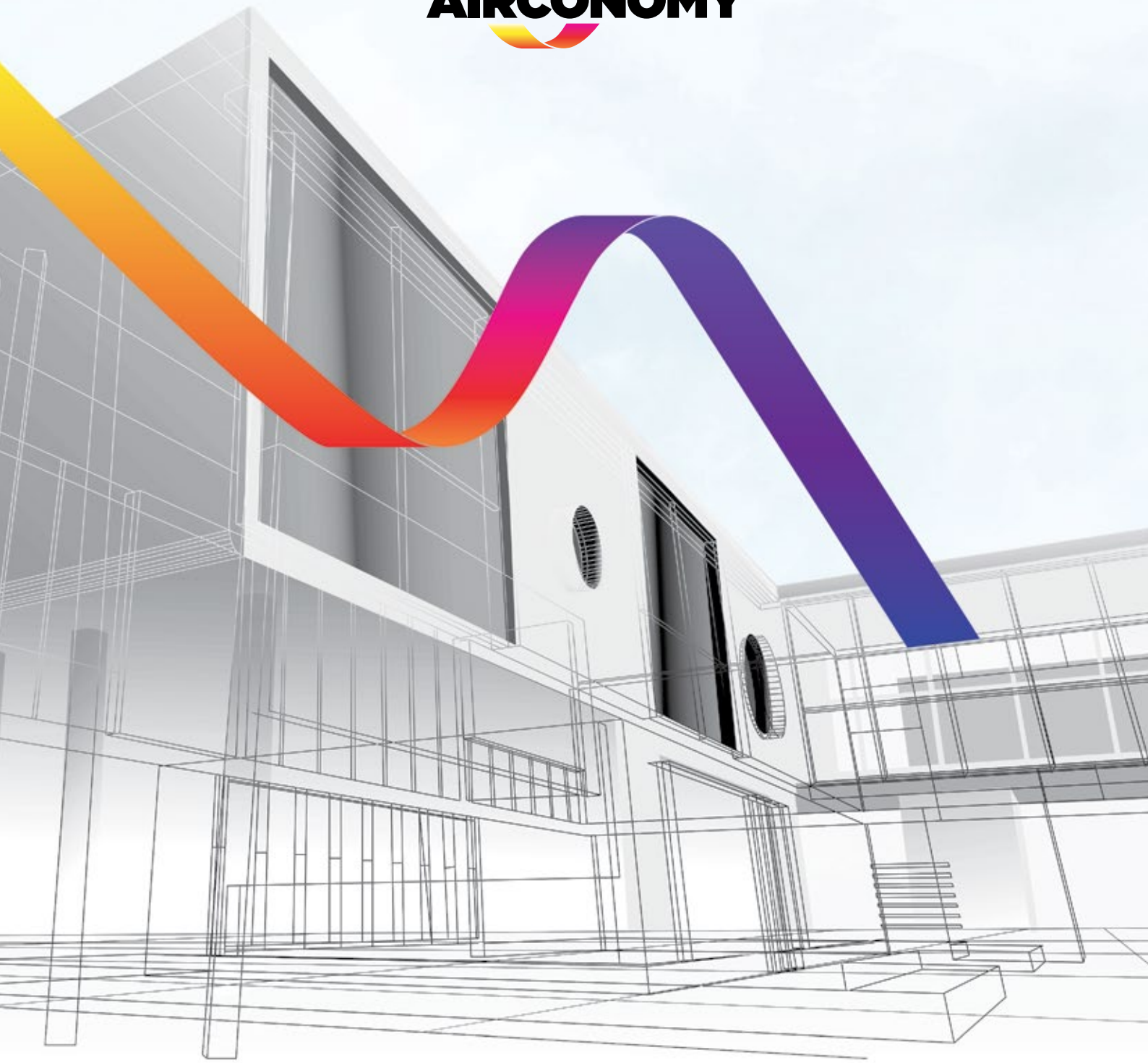
AIRCONOMY®



HEATING. VENTILATION. COOLING.
IN ONE SYSTEM.

THE PRINCIPLES

IN MODERN BUILDINGS VENTILATION IS ABSOLUTELY ESSENTIAL.

Every builder, whether developer or self-builder, should build with the latest technology. In our modern world, the **environment and climate protection** are important issues. Equally important are healthy living and working. Statutory requirements such as **Building Regulations** and **EU directives** must also be taken into account.

Building Regulations Part L

Building regulations demands for buildings (by EnEV):

• Airtightness:

Buildings should be constructed so that the heat-conducting envelope should be airtight.

• Building insulation and cold bridges:

Buildings should be adequately insulated against external air, earth and building components with low temperatures. To this end a minimum heat loss has been defined. Cold bridges should be minimized.

CONSEQUENCE 1: MOULD FORMATION

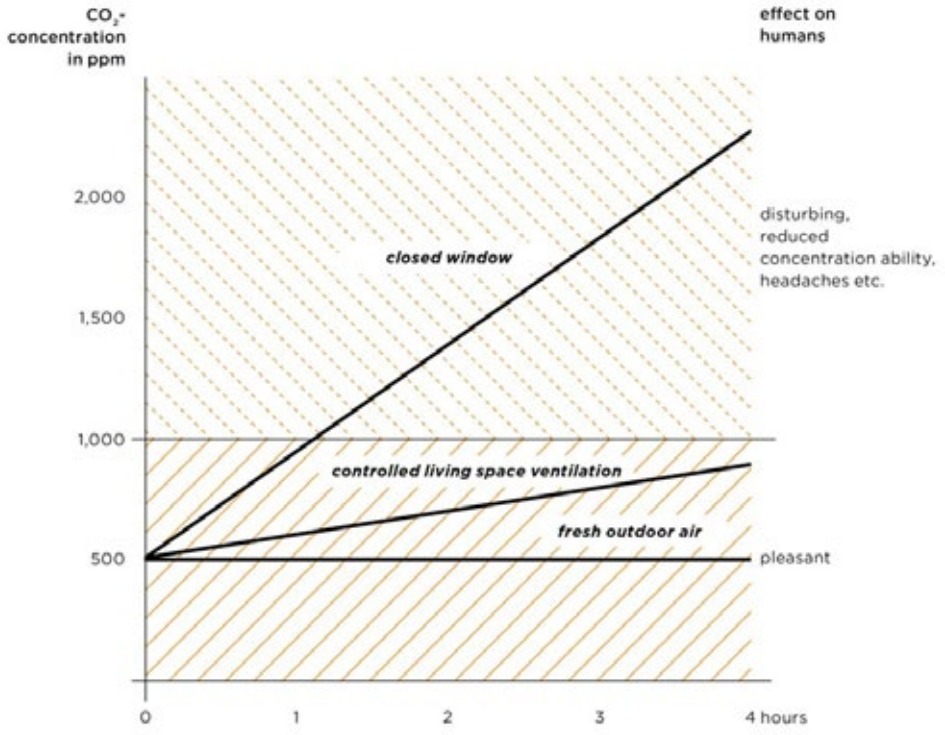
Mould formation. Insufficient air changes increase humidity in buildings.

Type of damage	Buildings affected in Germany	
	Percentage	Number
Damage from damp	21.9 %	Approx. 7.8 Mio.
Mould infestation (Visible and in ventilation)	5.8 %	Approx. 2.1 Mio.

Source: Sächsische Energieagentur SAENA GmbH

CONSEQUENCE 2: CO2-CONCENTRATION

Stale, oxygen deficient air can cause breaks in concentration, headaches and nausea.



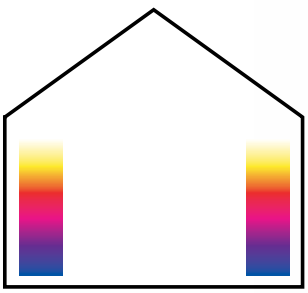
Alternative 1: Ventilation by window
Alternative 2: Controlled Ventilation

MODERN UNDERFLOOR HEATING – AN ADVANTAGE FOR EVERY BUILDING.

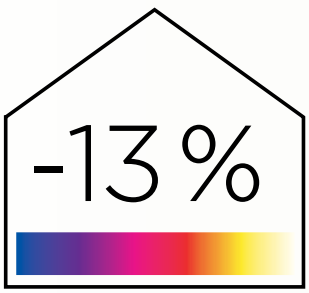
The installation of modern low-temperature systems and renewable heating systems such as heat pumps, condensing boilers or biomass boilers can reduce heating costs significantly. Increased thermal insulation creates an air-tight building envelope that also minimizes heat losses. This saves money and valuable natural resources. The installation of underfloor heating also offers advantages. The gentle radiant heat and pleasant floor surface temperature guarantee a unique feeling of comfort. This emphasises how well underfloor heating combines with alternative energy heating and modern heating controls.

And best of all, the low flow temperatures save up to 13% in energy costs!

Primary energy use
Calculations according to DIN 4108-6 and DN 4701-10/12



with radiators



with low-temperature underfloor heating

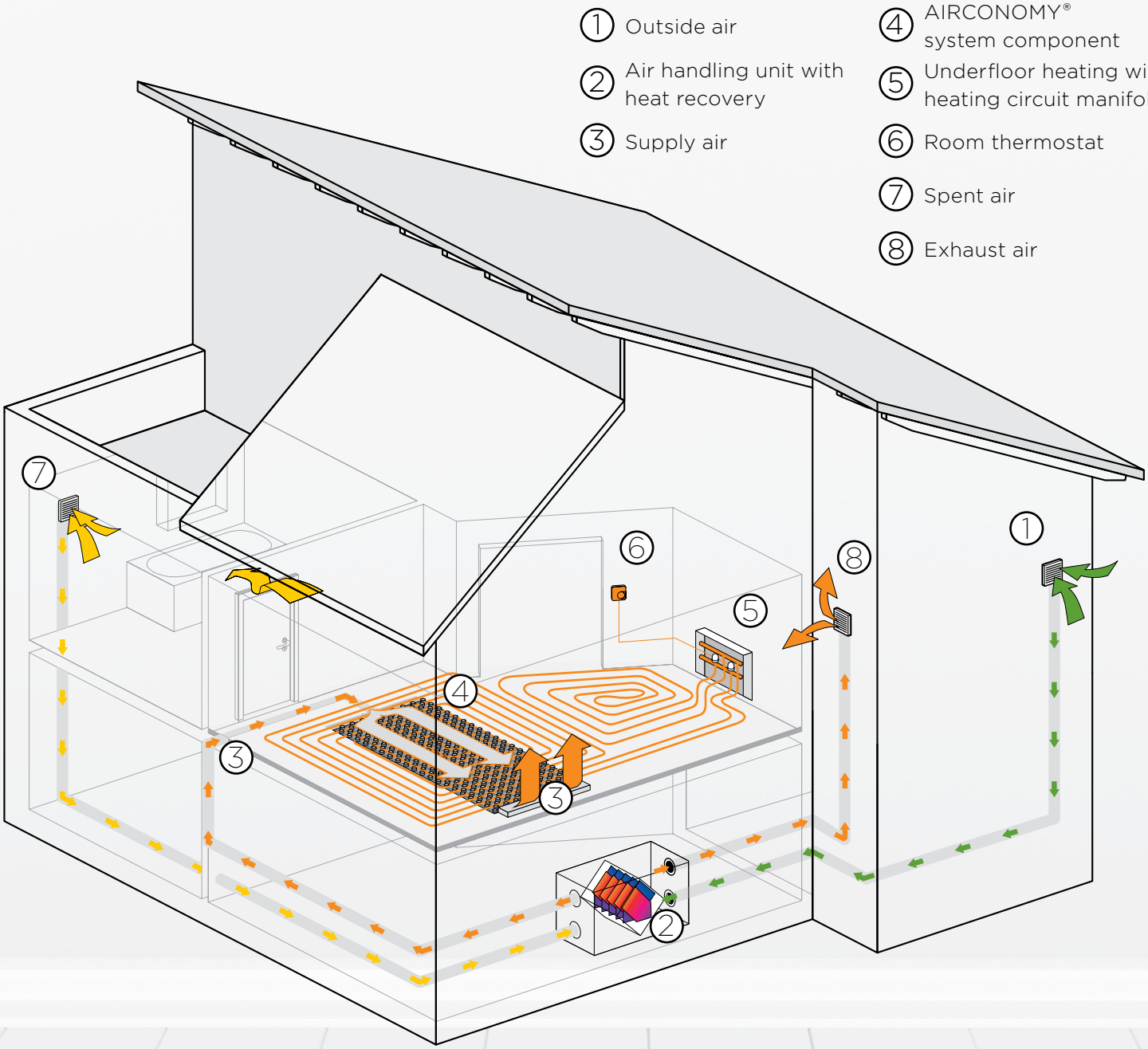
AIRCONOMY®

THE FUNCTIONS

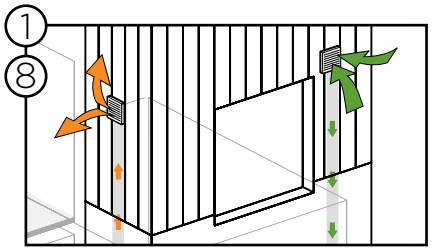
THE MULTIFUNCTIONAL SYSTEM FOR INNOVATIVE BUILDING SERVICES

AIRCONOMY® combines hot water underfloor heating with controlled ventilation and heat recovery. Thanks to the floor construction the heating demand is satisfied by the underfloor heating on the floor surface and by the supply of warm air.

As a result of the large heat exchanger surface very low heating flow temperatures can be achieved. AIRCONOMY® has been created for the connection of low temperature heat sources like condensing boilers, heat pumps and other renewable energy systems.

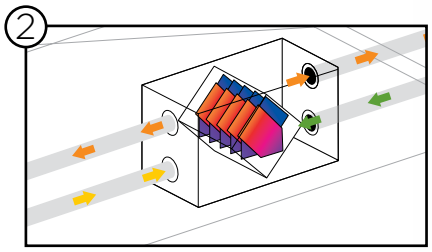


1. OUTSIDE AIR



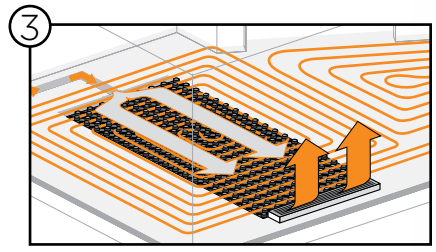
The fresh air drawn in from the building‘s facade is described as outside air. At the outlet the exhaust air is blown into the open. The 2 openings should be on different sides of the building, so that the spent air is not drawn into the building again. The ventilation supply and extract air can be transmitted using various ducting systems.

2. AIR HANDLING UNIT WITH HEAT RECOVERY



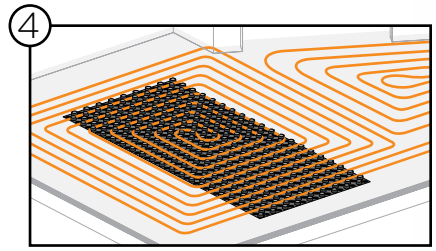
In the heat exchanger of the air handling unit most of the energy contained in the exhaust air is transferred to the cold outside air. Any resulting condensate is expelled via a siphon. The exhaust air is fed over the roof or building facade.

3. SUPPLY AIR



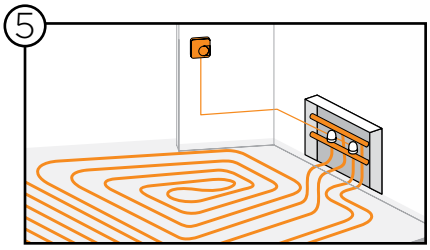
The outside air is drawn from the outer walls, lead through the heat exchanger in the air handling unit and then to the outlet modules that are set into the screed underneath the windows. Low flow volumes ensure a draft-free flow of air into the ventilated areas.

4. AIRCONOMY® SYSTEM ELEMENT



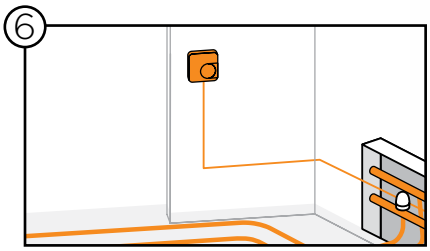
At the heart of the AIRCONOMY® system is the system module, which functions as a heat exchanger. The AIRCONOMY® system module has profiles for fixing the pipes on the upper surface and truncated cones on the lower surface. Due to the truncated cones on the lower surface a 2 cm high ventilation channel is created, through which the supply air widely spreads and flows to the relevant floor outlets. By flowing through the AIRCONOMY® system module the supply air is either heated or cooled, depending on demand. Due to the special geometry of the system module it functions not only as a heat exchanger but also as a highly efficient sound damper.

5. UNDERFLOOR HEATING WITH HEATING CIRCUIT MANIFOLD



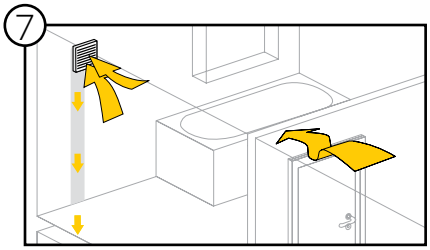
The room temperature is controlled by the reliable, tried and tested underfloor heating system. Mild radiant heat, which is spread over the entire floor surface area, ensures comfortable temperatures. The supply air which is lead through the floor is therefore tempered by the underfloor heating.

6. INDIVIDUAL ROOM CONTROL



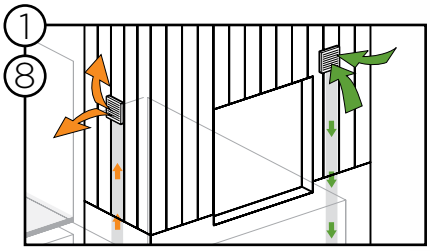
All components of the AIRCONOMY® distribution and control technology are optimally designed to integrate. From manifold cabinets, to a variety of heating circuit manifolds, to wireless controls. The system concept is systematically implemented. Every room in the entire building can be individually adjusted according to the demand for comfort.

7. SPENT AIR



The flow of spent air should preferably be to areas where moisture and smells are at their highest, generally in the kitchen and bathrooms. The warm spent air can be channelled through conventional spiral ducting or flat duct in shafts, suspended ceilings or the floor slab of the room above through extract air valves or inconspicuous shadow gaps to the central heat recovery system.

8. EXGHAUST AIR



The fresh air is drawn in from the building‘s facade is described as outside air. At the outlet the exhaust air is blown into the open. The two openings should be on different sides of the building, so that the spent air is not drawn into the building again. The ventilation supply and extract air can be transmitted using various ducting systems.

HEATING. VENTILATION. COOLING.

The functions described here are from an energy point of view very economical. On the one hand the energy required for heating and the energy demand are very low, on the other hand the whole room is evenly covered, and at the same time the required replacing of ventilated air is ensured.

AIRCONOMY® HEATS

The required heating performance is largely delivered by the radiant heat from the underfloor heating system. This has the effect of lowering the room temperature – compared to the heating by radiators – because the operative perceived temperature is regarded as comfortable. Because the supply air is in direct contact with the heating pipes, the system module works as a large scale heat exchanger, so that the inflowing air makes a contribution to the heating load. The most comfortable temperature profile in the room results in the arrangement of the outlets in front of the windows.

AIRCONOMY® VENTILATES

The distribution of supply air through the floor ducting and the system module has the distinctive advantage that the supply air channels are not visible once the screed has been laid. By the correct layout of supply air, spent air and overflow areas, the building is well ventilated. The air supply and distribution in the rooms is implemented to heat from the bottom floor to the top floor. This form of ventilation corresponds with the natural flow principle. Air and natural heat transport occur in the same direction.

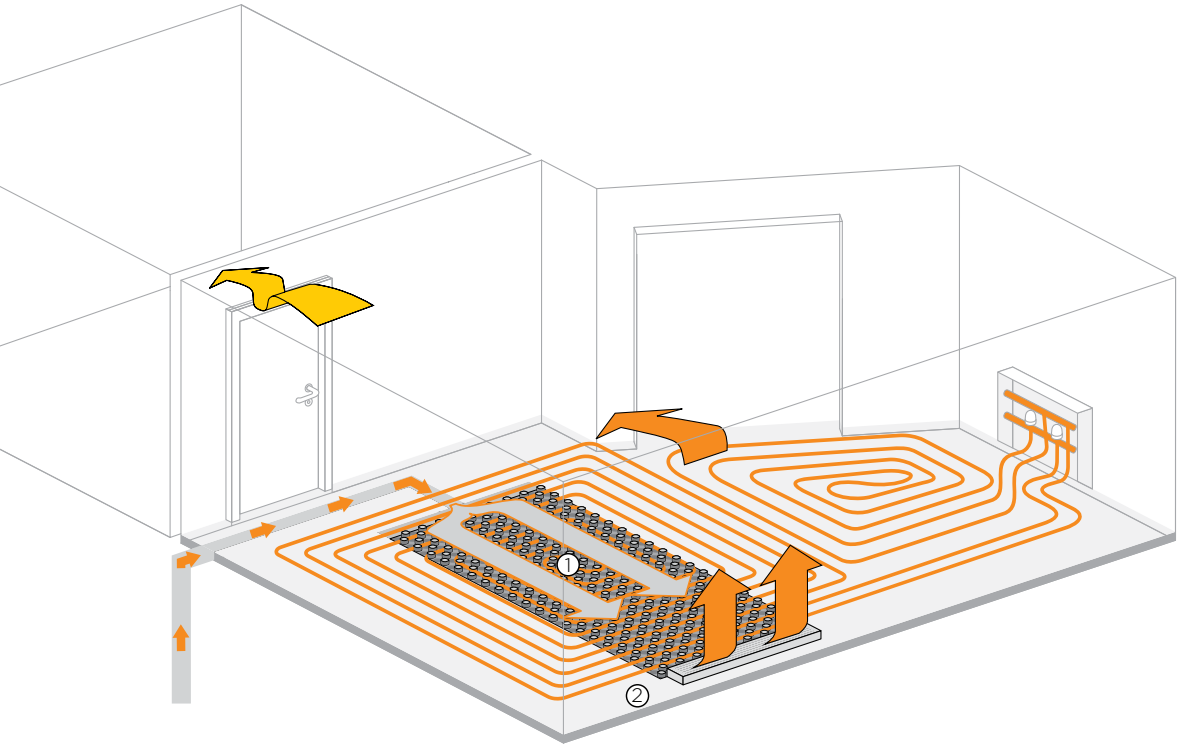
AIRCONOMY® COOLS

In the event that cooling is required, cool water flows through the heating pipes. Here again the tempered floor area and fresh air make a contribution to the cooling load. In compliance with the comfort criteria the cooling load reduces too. The cooled supply air is drier and thus increases the comfort. The cooled supply air streams into the room through the outlets installed in the floor. Due to the increased circulation, the cooling performance of AIRCONOMY® is higher than simple underfloor cooling.

COMBINATION

THE COMBINATION OF BOTH SYSTEMS ENSURES A CLIMATE OF ABSOLUTE COMFORT.

Combining stand-alone solutions from different manufacturers is costly in terms of time and expense. The optimal combination of heating and ventilation in a single system offers a multitude of advantages. Creating the ideal room temperature requires an extensive planning, which concurrently takes important points into account with regard to the demand for comfort.



1) AIRCONOMY® System module

Unobtrusively integrated into the floor, the module serves as a heat exchanger to modulate the incoming air to the desired room temperature. Due to the large cross section of the AIRCONOMY® system module, the air flow velocity is reduced, ensuring a silent and draft-free ventilation. Due to its special geometry, the system module can be either used as a heat exchanger or a highly-efficient noise damper.

2) Ventilation outlets

By placing the supply air outlet in the floor below the window, natural air convection ensures optimal air distribution in the room. At the same time it combats the cold temperatures emanating from the window. The fresh filtered supply air flows through the entire room while the used air is led back to the outside.

PLANNING SERVICE

OUR PLANNING SERVICE ENCOMPASSES A COMPREHENSIVE PROJECT QUOTATION FOR AIRCONOMY®.

During the project implementation we offer you the service of system and integration design according to your individual needs:

- Heating load
- Layout of underfloor heating according to EN 1264 including hydraulic layout
- Creation of a ventilation concept according to DIN 1946 – 6
- Determination of air volumes
- Duct network calculation
- 3-D construction of the ventilation layout
- Drawings including ducting network and floor buildup
- Automatic materials list drawing, ventilation system with die mentions
- Optional pressure drop calculation of the ducting network
- Optional noise calculation

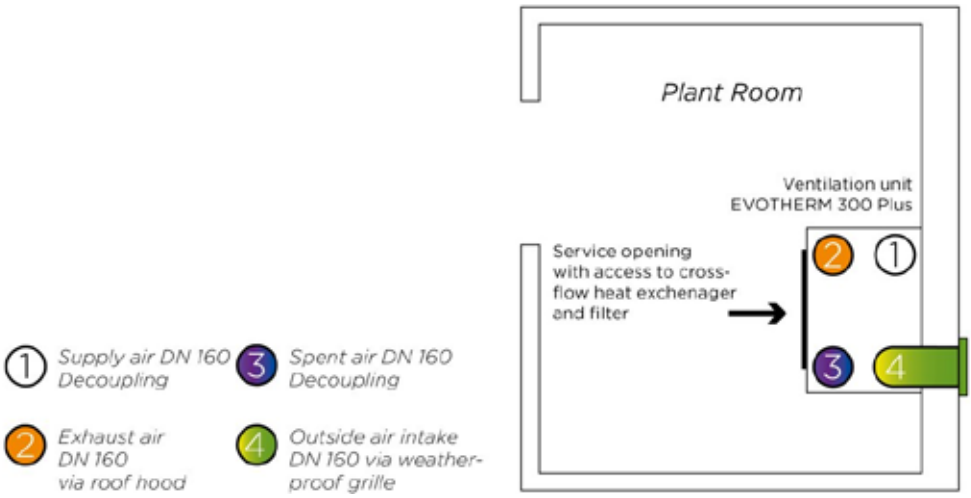
PLANNING GUIDE

THE FOLLOWING POINTS SHOULD BE TAKEN INTO ACCOUNT:

To create the specific and effective volume of airflow required for a modern hygienic building, the living areas should be divided into supply air, overflow air and extract air areas. The supply air is ducted to outlets which are installed in the window areas of living rooms and bedrooms. The extract air is drawn through the overflow air areas (hall, corridors and landings) to the high-demand areas (kitchen, bathroom and WC). For the overflow air areas air vents should be provided, acccording to DIN 1946 Part 6. Overflow air openings can be grilles, valves or door gaps with a free cross-sectional area of at least 150 cm2. For each door of the relevant room, 25 cm2 can be added to the free cross-sectional area of the overflow air opening. Between the individual areas a „room air connection“ must be established.

GENERAL DESIGN TIPS

The outside air supply opening should if possible be installed on the garden side (not the noise and contaminant-polluted street side) at a height of at least 3m above ground level. The exhaust air should preferably be extracted on the leeward side using a roof hood. Both openings should be arranged so that no short circuiting occurs.



DESIGN EXAMPLE SINGLE FAMILY DWELLING

Calculation and design for a single family residence according to DIN 1946 – 6 of May 2009 starts with establishing the surface areas and volumes of rooms that have been divided into relevant areas. The standard internal temperatures are established according to DIN EN 12831.

Example single family residence:

Surface area: 130,50 m^2

Room height: 2,50 m^2

Volume: 326,25 m^3

Area for supply air: 81,00 m^2

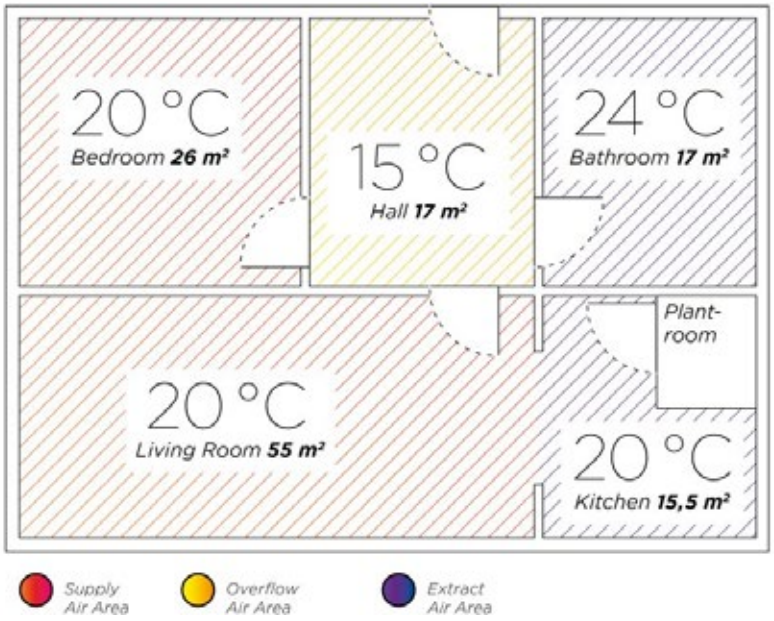
Volume for supply air area: 202,50 m^3

Area for overflow air: 17,00 m^2

Volume for overflow air area: 42,50 m^3

Area for extract air: 32,50 m^2

Volume for extract air area: 81,25 m^3



FIRE PREVENTION

For single-family dwellings there are no particular requirements regarding fire prevention. The ducts should be manufactured from a non-flammable material. In buildings where there are more than two floors and fire compartments and firewalls have been penetrated, notice should be taken of DIN 412 (fire damper and shaft training).

The following points should be considered when choosing the position of the ventilation unit:

•Good access to the device for maintenance such as changing filters or unscheduled repairs.

•The installation location should be in a frost free temperature zone. This will ensure that the condensate pipe will not be frozen and the heat loss through the device housing and ducting will be minimized.

•To prevent structure-borne noise the device should be installed with vibration cushions and acoustically decoupled from the air transmission system. This can be achieved with canvas connectors in the exit connections.

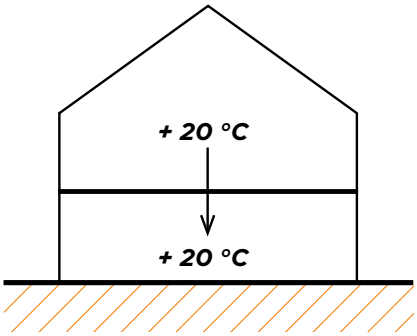
•It is essential that the device is installed in a horizontal alignment to prevent condensate leaking from the condensate tray into the workings of the device.

•The device may not be installed in an environment with strong smells.

AREAS OF APPLICATION

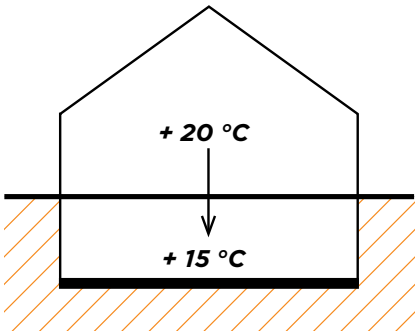
TAKING INTO CONSIDERATION: DIN EN 1269

A distinction is drawn between new build and renovation. Every area of application is divided into 3 different floor build-ups.



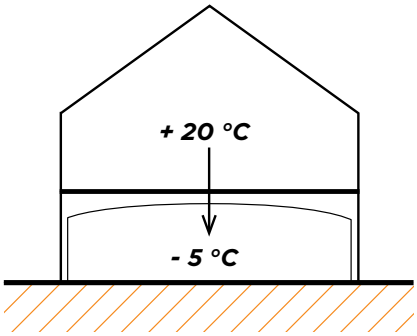
Version A

Ceilings above heated rooms



Version B

Ceilings above unheated or periodically heated rooms or directly on earth



Version C

Ceilings over areas with external air temperature

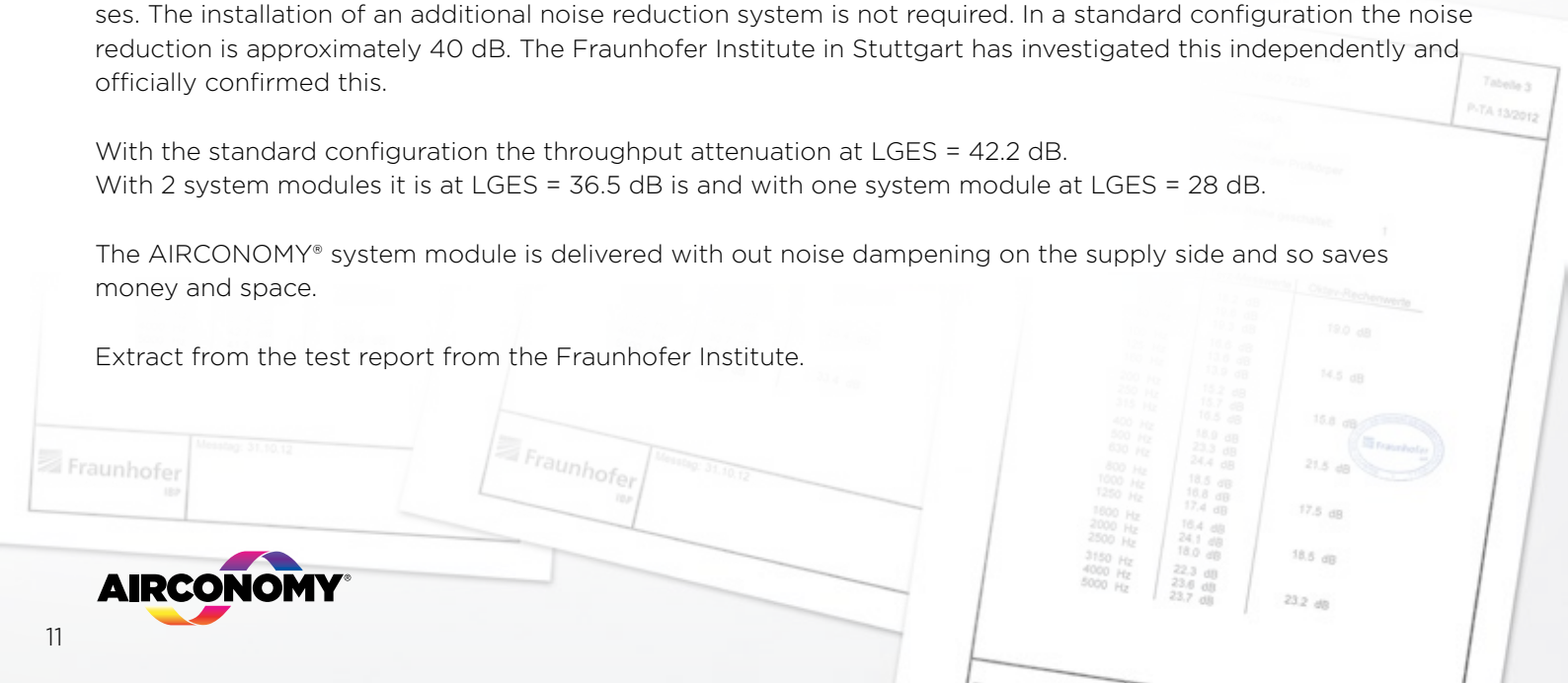
NOISE DAMPENING

Contrary to conventional systems, AIRCONOMY® is installed without a noise damper in the supply ducting. From airflow and fan noise to voices from the room next door: The AIRCONOMY® system module damps all noises. The installation of an additional noise reduction system is not required. In a standard configuration the noise reduction is approximately 40 dB. The Fraunhofer Institute in Stuttgart has investigated this independently and officially confirmed this.

With the standard configuration the throughput attenuation at LGES = 42.2 dB.
With 2 system modules it is at LGES = 36.5 dB is and with one system module at LGES = 28 dB.

The AIRCONOMY® system module is delivered with out noise dampening on the supply side and so saves money and space.

Extract from the test report from the Fraunhofer Institute.



THERMAL COMFORT

The expected thermal comfort in rooms is a significant factor when choosing and installing a heating and ventilation system. In cooperation with the Technical University of Dresden studies were undertaken on the thermal comfort of the AIRCONOMY® system. A special calculation formula designed at the University, based on linked simulations, in the appropriate way:

1. the thermal performance of the building envelope,

2. the operational performance of the system,

3. the system controls and

4. finding the room flow volume allowance.

Thermally comfortable room climate

The thermally comfortable room climate is described as the relationship in the occupied zones of a space, indicated by the unconscious reactions and conscious observations:

•minimal thermoregulatory effort of the organism for preservation of a constant core body temperature (reflective reactions).

•effortless, undetectable heat emittance.

•Subjective experience of well-being, i.e. neutral climate assessment (not experiencing a climate as warm or cold).

Two fundamental comfort criteria are distinguishable:

1.Global thermal comfort

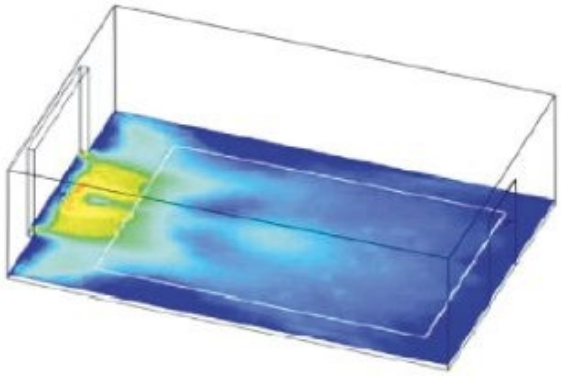
2.Local thermal comfort

Heat Retention Level	Low-Energy House
Outside temperature (ϑa)	-5 °C (International standard specification)
Room temperature (ti)	22 °C (International standard specification)
Window area	2 m x 2 m, centrally arranged
Supply and extract volume	30 m³/h; averages 0.6 h⁻¹ air changes

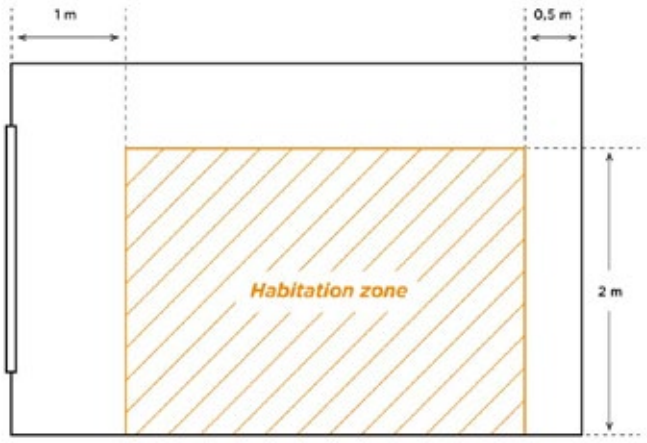
Calculation Assumptions

Class (Category)	Expectation level
A	High
B	Middle
C	Moderate
D	None

Comfort criteria



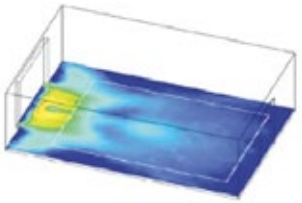
Example Illustration of a room



Habitation zone

Illustration 1

Draught risk (DR) at a horizontal level of 0.1 m height (ankle area of a seated human).



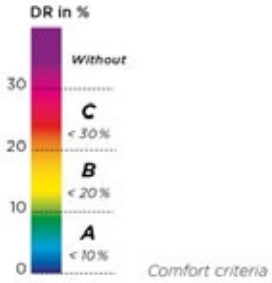
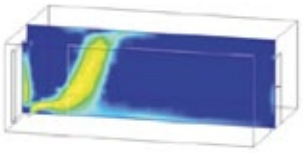


Illustration 2

Draught risk (DR) at a level horizontal to the external wall.



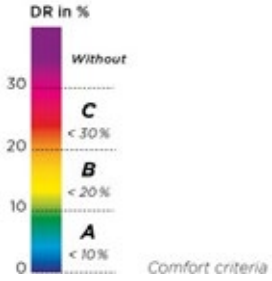


Illustration 3

Operatorative temperature (ϑop) at a vertical level 90° to external wall, supply air temperature approx. 25°C i.e.partial air heating function.

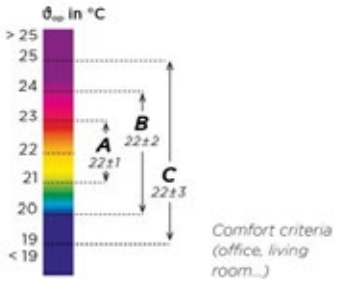


Illustration 4

Operative temperature (ϑop) in a horizontal level of 0.6 m height, supply air temperature approx. 25° C i.e. partial air heating function.

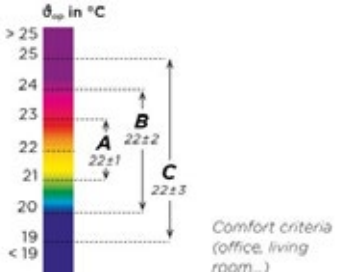
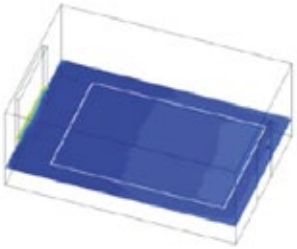
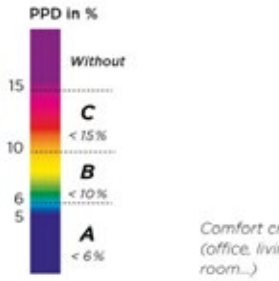


Illustration 5

Percentage of people dissatisfied (PPD) at a horizontal level of 0.6 m height (This height corresponds to the thermal focal point of a seated human).

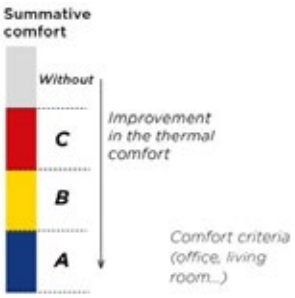




The illustration shows that the white demarcated inhabited zone consistently lies in the category A. This means that the AIRCONOMY® system will achieve a very high level of comfort. This is achieved by the unique symbiosis of mild pleasant radiant heat from the underfloor heating and the warm fresh air contribution in the window area of the room.

Illustration 6

Summative comfort (schematic illustration at a horizontal level).



AIRCONOMY®

INSTALLATION

INSTALLATION IN THE SAME WAY AS A CONVENTIONAL UNDERFLOOR HEATING SYSTEM.

The general guidelines and assumptions are the same as for the technical information for underfloor heating systems. Floor ducting to supply individual rooms with supply air is laid underneath the underfloor heating pipe and is therefore integrated into the underfloor heating. In addition the 30/50 mm high ducts are recessed into the insulation so that their upper surface is at the same height as the AIRCONOMY® system module and the AIRCONOMY® folding panel.

The heating pipes are fixed with plastic clips on the folding panel or between the pipe-locating profiles of the AIRCONOMY® system module.

It is normally not necessary to aspects the floor duct. The arrangement of the heating circuit should be done so that the duct is crossed by the heating pipe. If this is not possible then a clip rail should be glued to the ducting to accept the heating pipes. It is a prerequisite that the building works of plastering and pipe installation for building services have been completed. In winter it is imperative to guarantee no freezing. The plastering walls must be completed right up to the floor slab and the floor slab should be kept free of electrical cables and conduits.

If this is not the case then a leveling layer should be put down to create a flat surface to accommodate the heat and noise dampening.

This is also necessary when the floor slab shows unacceptable undulations. Before the start of laying, the concrete foundation should the comprehensively swept. Any areas next to earth should be sealed against rising damp. This can be achieved by laying the damp barrier PE 3/300.

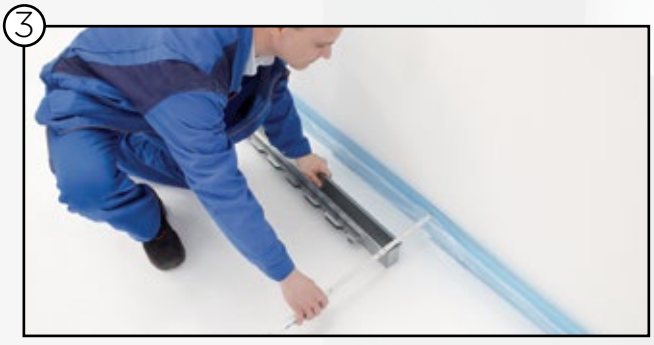
1

Install edge insulation strips

2

Lay sound insulation

3

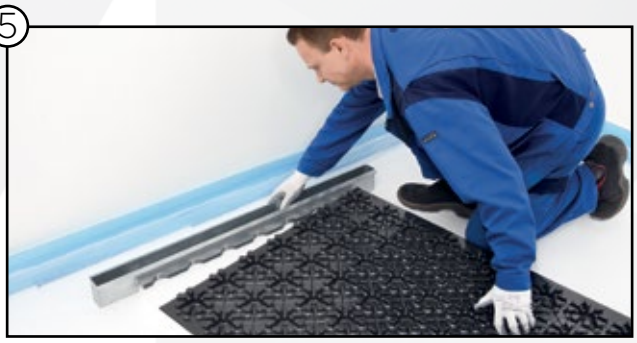


Position air outlet manifold

4

Lay distance panel to AIRCONOMY® system module

5



Insert AIRCONOMY® system module in air outlet manifold

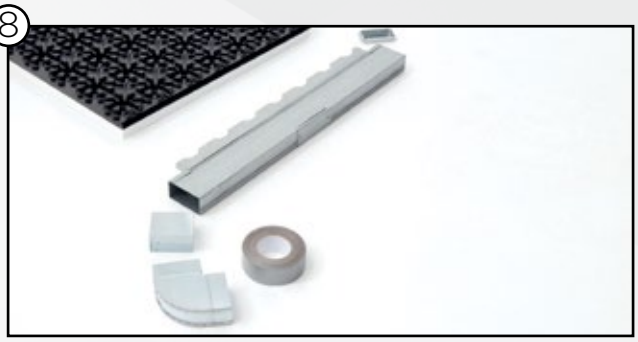
6

Install AIRCONOMY® system module connector

7

Connect second AIRCONOMY® system module

8



Shallow Duct system components in socket joint version

9

Installing shallow duct elbow

10

Sealing with floor duct tape (fabric lining)

11

Closing the open side of the inlet manifold with lid

12

Secure lid by bending the holding lugs

13

Mounting the inlet manifold onto the AIRCONOMY® system module

14

Mounting and taping the rest of the shallow ducting

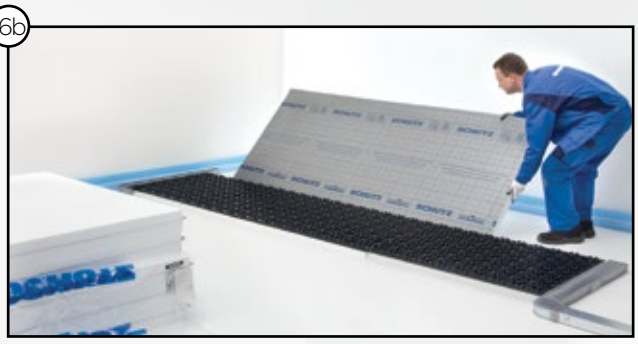
15

Mounting and taping the rest of the shallow ducting

16a

Laying the AIRCONOMY® folding panels

16b

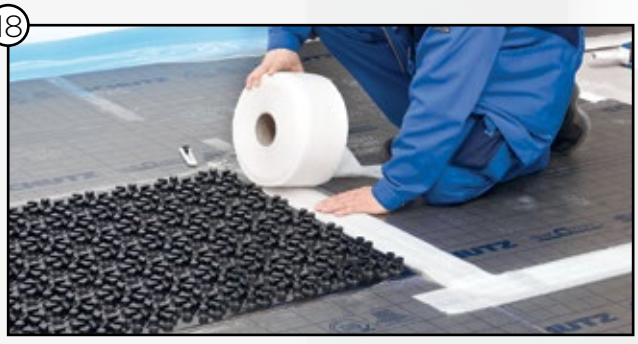


Laying the AIRCONOMY® folding panels

17

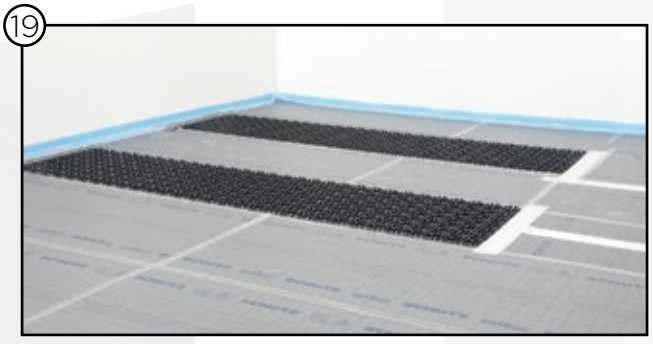
Taping the joints and edge insulation strips

18



Covering the shallow duct with floor duct tape

19



Stage 1 complete

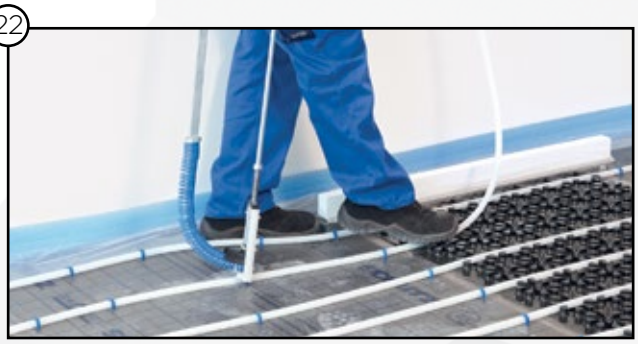
20

Fitting the air outlet screed protector

21

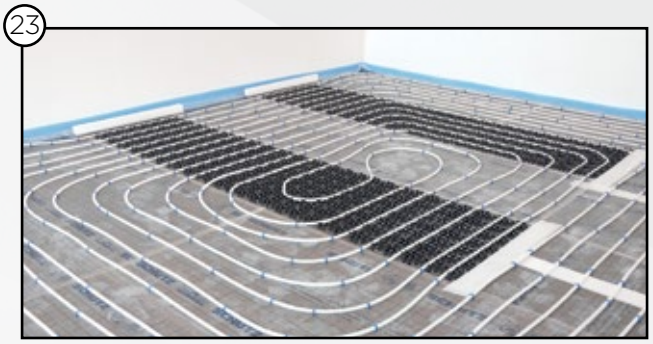
Taping the air outlet screed protector

22



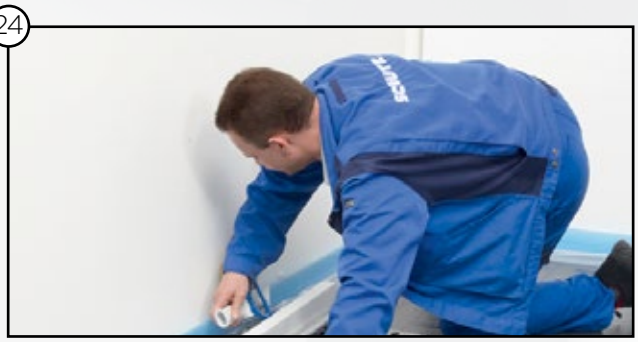
Securing the heating pipe

23



Heating pipe layout example

24

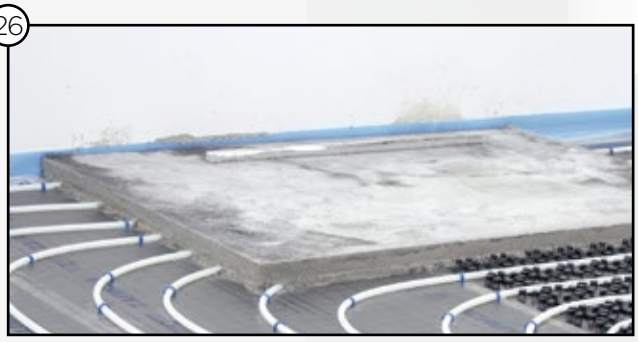


Check the air outlet screed protector before installing the screed

25

Installing the screed

26



Air outlet screed protector after screed installation

27

Removal of the air outlets screed protector

28

Cleaning the air outlet manifold

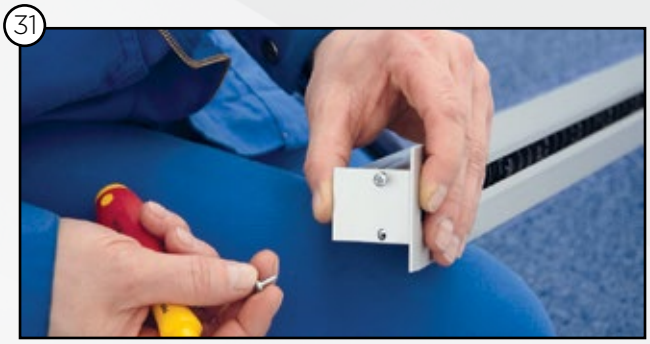
29

Laying of the floor covering

30

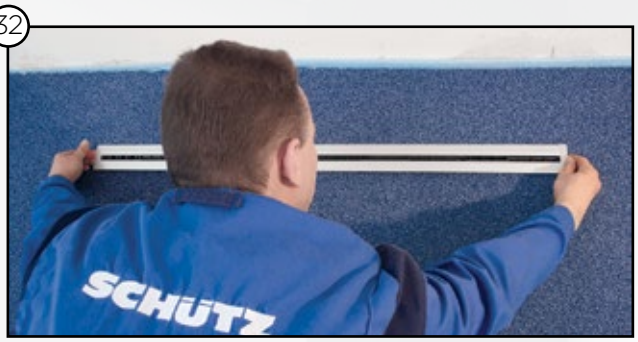
Cutting around the air outlet

31



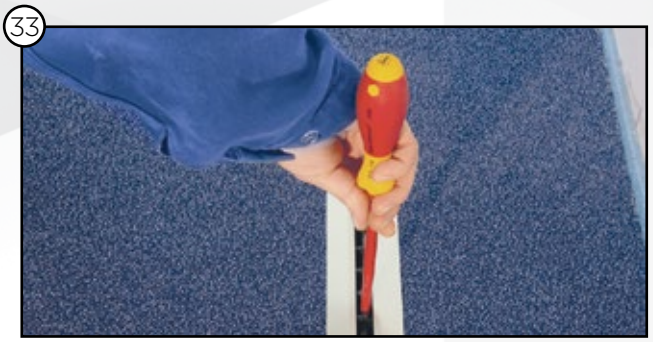
Mounting the slit ventilation profile

32



Installing the profile

33



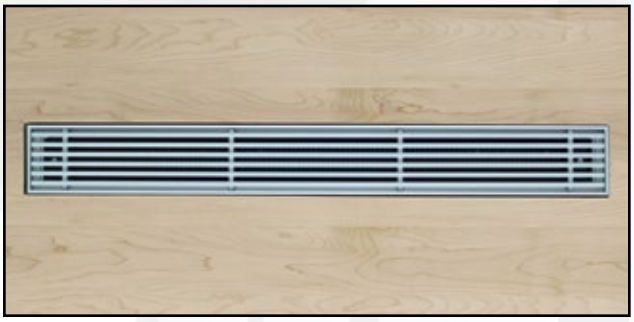
Screwing down the slit profile... And done!

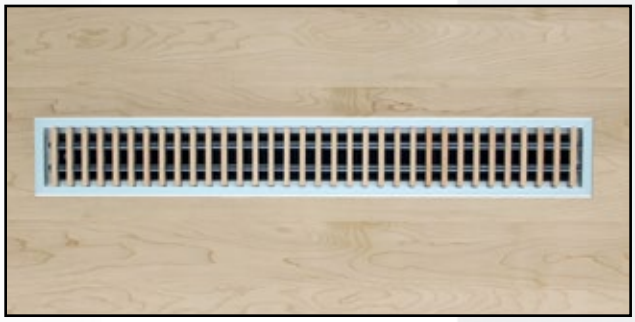
SYSTEM COMPONENTS

MOST COMPONENTS OF THE AIRCONOMY® SYSTEM ARE INTEGRATED INTO THE FLOOR.

As a result room furnishing and arrangement is flexible. Very few components are in eyesight.
Here is an overview of all visible system components.

Visible elements





Ventilation units

Different models are available depending on the project and the requirements.
You can receive further information on request.

REFERENCES

AIRCONOMY® - NOT ONLY FOR HOMES.

AIRCONOMY® is not only ideal for new build, but also for renovations. The system can be customised to suit the demands of unusual building techniques, and as a result the system can be found in the widest architectural variety of buildings across Europe.

Notwithstanding the distinctive features of each building, they have something in common: **Heating. Ventilation. Cooling. In one system.**

MULTI-FAMILY DWELLING NEUSS (D)

In two residential blocks the AIRCONOMY® system provides a round-the-clock pleasant living climate. Installed directly on the concrete slab, AIRCONOMY® has a build height of only 13.8 cm, naturally including sound insulation, underfloor heating pipe, supply and extract air ducts as well as final screed. In total 35 new residential units were built including 2,560 m² of AIRCONOMY®. With great success! In spring 2013 the second section on more than 2,560 m² was started.

Project details

Build type:	Redevelopment
Area:	2.560 m²