FRÄNKISCHE

profi-air® Controlled home ventilation

Technical Information

DRAINAGE SYSTEMS
ELECTRICAL SYSTEMS
BUILDING TECHNOLOGY
INDUSTRIAL PRODUCTS

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1. Introduction

Fresh and clean air is the basis for a healthy indoor environment. Air, one of the most important substances for living, should therefore always be available in optimum quality, in sufficient quantities and free of pollutants. Since modern human beings spend most of their time in closed buildings, the ambient air quality substantially influences their health and productivity.

As a result, maintaining a high ambient air quality must be the highest priority when planning or renovating buildings. The German Energy Conservation Ordinance (Energieeinsparverordnung, EnEV) favours increasingly insulated and therefore more impervious buildings, which prevents the natural inflow of fresh outside air. The problems resulting from this are, on the one hand, increasing ambient air pollution due to the human factor, such as moisture and carbon dioxide, and, on the other hand, released smells from interior furnishing and evaporation. Allergic reactions and mould growth are the consequences.

This can be avoided by applying controlled home ventilation. Sufficient fresh air under all weather conditions without inconvenient airing and draught as well as minimising energy consumption by using modern heat recovery systems are the main arguments in favour of controlled home ventilation. Additionally, special filters are available which prevent dust, pollen and spores from entering the building.

Controlled home ventilation in combination with other modern building technology systems is already and mostly used in the field of low energy buildings and passive houses. However, controlled home ventilation has become more and more important also when taking energy-saving measures as part of building renovations.

The following chapters of this manual summarise all important information regarding controlled home ventilation with profi-air and serve as a well-founded compendium for professional planning, dimensioning and installation.

profi-air - the reliable, flexible, modern and hygienic ventilation system

Reliable
since with profi air, FRÄNKISCHE as a well-established expert for corrugated pipes provides you with a universal, technologically advanced complete system for air distribution manufactured entirely at our facilities.

Flexible
since profi-air provides tailored solutions to meet your specific needs using tunnel pipes and/or round pipes.

Modern
since profi-air is installed with innovative and simple sealing and connection technology and profi-air touch ventilation units can be operated using a touch screen, smartphone or tablet.

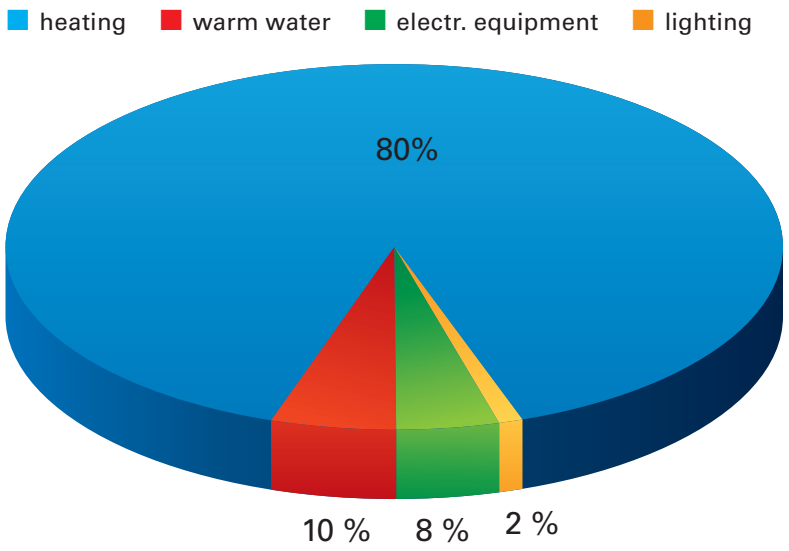
Hygienic
since profi-air products contain both antistatic and antibacterial agents making them absolutely sterile. This has been certified by the Institute for Environmental Hygiene and Toxicology (Institut für Umwelthygiene und Toxikologie) with their HY certification!

2. Controlled home ventilation

The topic of controlled home ventilation comprises various different fields of knowledge. In order to correctly understand the topic it is necessary to explain some basics and framework conditions. This chapter covers the different building standards, provisions and regulations in general as well as basic terms and energetic aspects of home ventilation.

2.1 Building standards and regulations

40 % of the European overall energy consumption and 36 % of CO_2 emissions can be attributed to buildings. The continuous growth of this sector leads to increasing energy consumption. 90 % of the energy consumption of a private household in Germany is caused by heating and warm water. With almost 80 %, the major part of this energy consumption constitutes room heating, a large part of which has been escaping through walls, windows, the roof, doors or the floor up to now.



Energy consumption - private household in Germany

20-20-20 targets

The development and expansion of renewable energies is an important component of the European climate and energy policy. The 20-20-20 targets set by the European Union require the individual EU member states to achieve the following by 2020:

- reducing the greenhouse gas emissions by at least 20 % as compared to 1990,
- striving for energy efficiency increases towards 20 %,
- achieving a share of 20 % of renewable energies in the overall energy consumption.

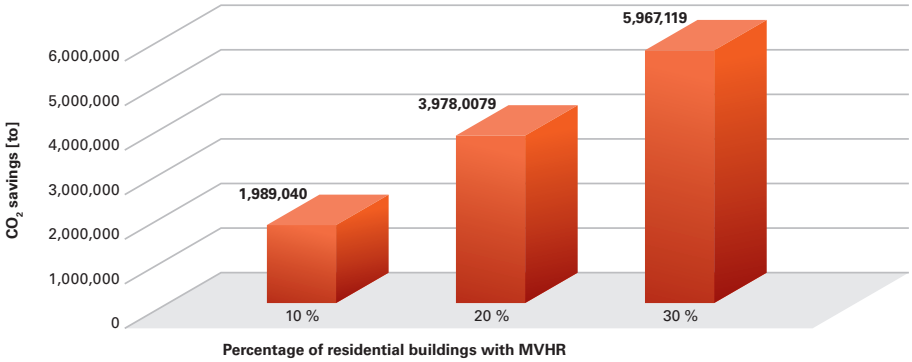
EU buildings directive

The 2002/91/EC Energy Performance of Buildings Directive (EPBD) deals with the overall efficiency of buildings and has become effective in 2003. In this directive, the EU requests each member state to present a plan for minimising energy consumption and reducing CO_2 emissions in the building sector. The currently valid new version of 2010 again tightens the efficiency standards. Zero energy buildings have been implemented and are required to become the standard by 2020. New buildings but also renovations are affected, depending on the scope of measures.

2. Controlled home ventilation

IEKP programme

With its "Integrated Energy and Climate Programme" (Integriertes Energie- und Klimaprogramm, IEKP) introduced at the end of 2007, the German government set the course for a modern, secure and climate-friendly supply of energy in Germany. Ever since, different measures and regulations have ensured improvements of energy efficiency and increased utilisation of renewable energies.



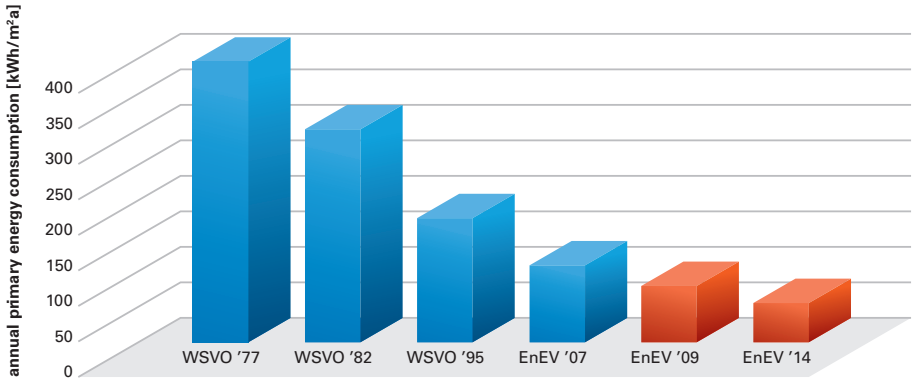
Possible CO_2 savings depending on the installation of ventilation systems provided that approx 30 % of residential buildings will have ventilation systems by 2020 (new buildings and remodelling rate 1 - 2 %)

(Source: FGK Status Report)

Controlled home ventilation with heat recovery can make an important contribution to that. If this technology is consistently funded and installed in new and existing buildings, CO_2 savings of almost 6 million tons can be accomplished by 2020. This corresponds to approx. 4 % of the savings target set by the German government. Please find further information under **www.bmwi.de**.

German Energy Conservation Ordinance

The German Energy Conservation Ordinance (Energieeinsparverordnung, EnEV) aims at creating a low energy footprint for newly constructed and existing buildings. The low energy footprint is to be achieved using existing means to save energy and under an economic point of view. EnEV 2009 includes remarkably higher requirements for residential buildings than the previous versions. The maximum primary energy requirements allowed for new buildings and renovations are now 30 % below the acceptable maximum requirements of EnEV 2007. The EnEV 2014 amendment adopted in October 2013 reduces the allowed primary energy requirements of new buildings again by 25 % as of 01 Jan. 2016.



Primary energy requirements development - residential buildings

This results in buildings with increasing air tightness to accomplish the lowest possible heat losses. The inflow of outside air via so-called joint ventilation can no longer be guaranteed and the required exchange of air does not take place anymore. Therefore, EnEV states in its currently valid version: **"Buildings to be constructed must be implemented such that the minimum exchange of air required for health and heating purposes is ensured."**

How this should be achieved is not defined in detail.
The hygienic outside air exchange can be accomplished in two ways:

- manual airing (rush airing) by the owner with regards to the hygienic requirements and taking into consideration the energetic aspects
- mechanical ventilation system

Both variants are equally suitable, however, the effort is quite different.

2. Controlled home ventilation

EEWärmeG

Besides EnEV, also the Renewable Energy/Energies Heat Act (Erneuerbare-Energien-Wärmegesetz, EEWärmeG) has contributed to achieving the energy savings targets by the German government since 01 Jan. 2009. By 2020, the share of renewable energies in the supply of heat is to increase to a minimum of 14 %.

EEWärmeG requires builders to cover a certain amount of their heat requirements from renewable energies. For example, a share of 15 % is set for the use of solar energy and a share of 50 % for the use of solid biomass or geothermics. The owners, however, can attend to this "usage duty" also by applying other climate-friendly measures; by insulating their buildings more extensively, by obtaining heat from heat grids supplied by renewable energies or by using heat and waste head from a combined heat and power cycle (CHP). Depending on the utilisation of these measures, different weightings regarding the fulfilment of the requirements are set.

Also home ventilation with heat recovery belongs to these compensating measures:

- share in heat energy requirements at least 50 % from waste heat
- heat recovery level of the system at least 70 %

The fulfilment of EEWärmeG has positive effects on EnEV. The higher the share of renewable measures, the lower is the annual primary energy requirement of a building.

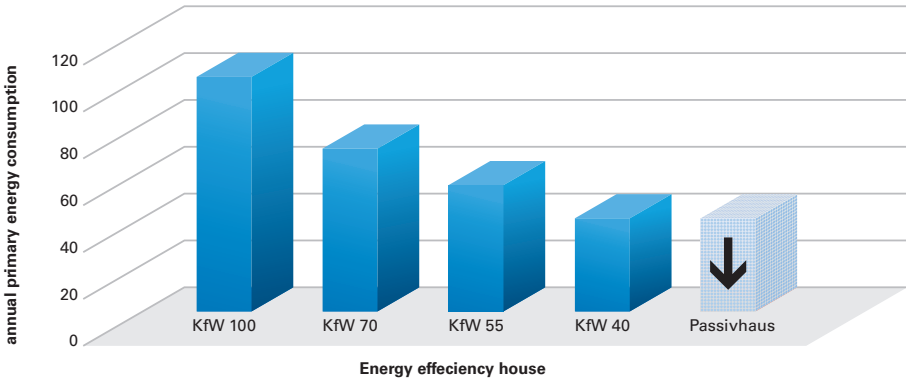
Reconstruction loan corporation (KfW)

The energetic quality of a building is evaluated according to the annual primary energy requirement and the transmission heat loss. The maximum values for these two key figures defined in EnEV must be met when constructing a comparable new building. The subsidy standard assigned results from this.
Currently, the following definition applies to new buildings:

KfW efficiency house 100 = minimum requirement of EnEV 2009
KfW efficiency house 70 ≤ 70 % annual primary energy requirement as set in EnEV
KfW efficiency house 55 ≤ 55 % annual primary energy requirement as set in EnEV
KfW efficiency house 40 ≤ 40 % annual primary energy requirement as set in EnEV

The so-called passive house is not explicitly stated but still noteworthy. To meet this standard, the annual primary energy consumption must be significantly below that of a KfW efficiency house 40:

Passive house < 15 kWh/m²a annual primary energy requirement



KfW standard new building

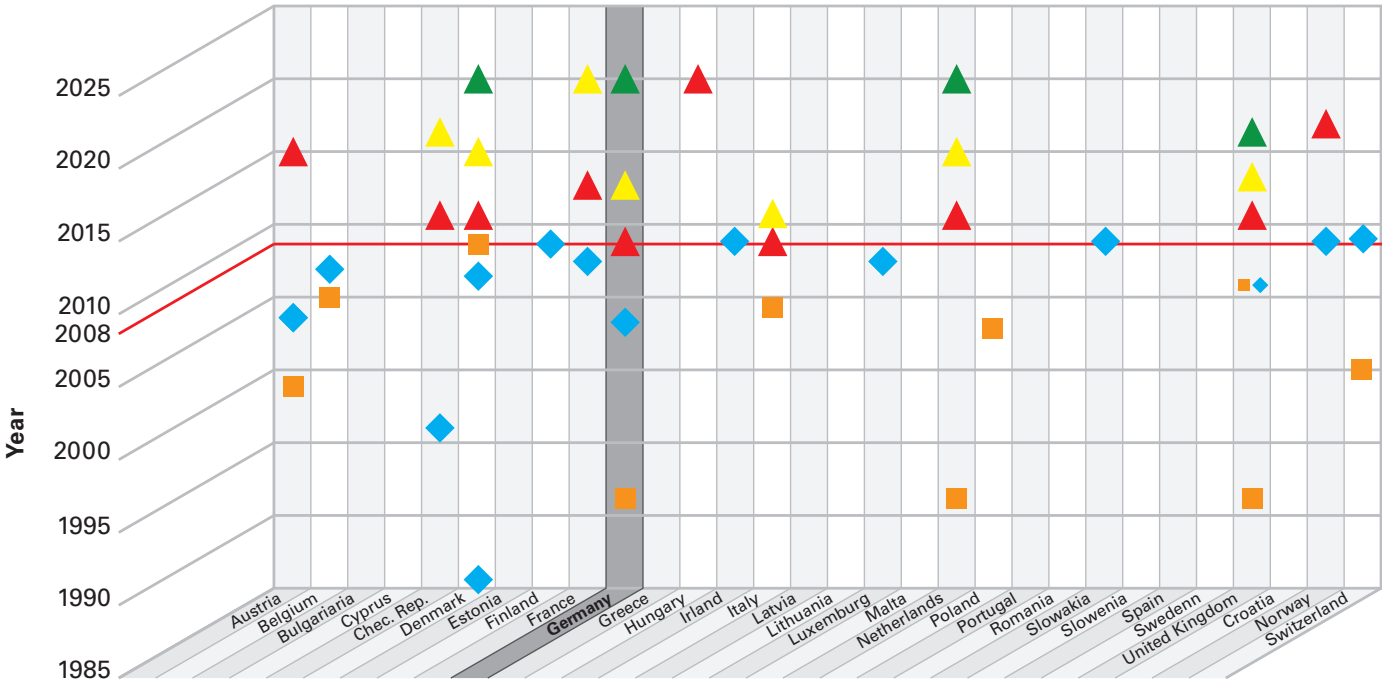
Energy-efficient building and renovating

The KfW bank supports the achievement of the 70, 55 and 40 standards for new buildings. If controlled home ventilation is considered, it is contained in the funding according to the KfW programme "Energy-efficient building".
As part of the KfW programme "Energy-efficient remodelling" containing the standards KfW 115, 100, 85, 70, 55 and KfW monument, controlled home ventilation for single- and two-family homes completed before 01 Jan. 1995 is eligible for funding as an individual measure. House owners can select between a credit at a reduced rate of interest and an investment cost allowance. Eligible for funding are centralised, decentralised or room-based ventilation systems with heat recovery, demand-controlled exhaust air systems as well as compact units with air/air-heat transmission and exhaust air heat pumps. Detailed and constantly updated information can be found on the KfW website.

2. Controlled home ventilation

Effects and prospects for the future, opportunities for CHV

The EU's objectives are ambitious, and all member states must reach them. The construction industry enjoys increasing turnover figures regarding new buildings and renovation. Zero energy buildings will be the standard by 2020. Therefore, an increasing number of lowest energy buildings can be expected over the next few years. The figure below shows an overview with regards to the introduction of energetic directives and future time objectives for implementing energetic measures in Europe. The strict regulation of energy consumption and the implementation of planned energy saving measures will make it obligatory in the near future to integrate a CHV measure.



official government decision for the introduction of energy policy measures (example Germany 2002, introduction of EnEV)

NGO decision (non-governmental organisation)

planned energy objectives ➔ example: Denmark 2015 ➔ Low Energy Class 1 - 50 % lower energy consumption of a new building as compared to 2008
Denmark 2020 ➔ 75 % lower energy consumption of a new building as compared to 2008

The implementation of a CHV system is recommended for hygienic reasons already now. Another aspect for the future of controlled home ventilation is the acceptance by the customer. For customers, the direct benefits are important, e.g. no exposure to noise through opened windows, pollen filtering and no annoying mosquitos in the house. Of course, the windows can still be opened additionally. The increasing sensitivity of customers towards technology and health is an important factor.
The building of the future will probably be ventilated in a controlled way. The air quality is measured using sensors, and air is exchanged automatically as required depending on need and pollutant concentration. Pollen and fine particulate air filters purify supply and circulating air and therefore provide an optimum retreat for allergy sufferers. To avoid respiratory diseases as a result of dry air, supply air moisture is set to the respective required room moisture and monitored accordingly. The outside air is cooled in the summer and heated in winter using earth-air heat exchangers. Therefore, the overall performance of the system increases.

2.2 Definitions and terms

Ventilation

Ventilation is the exchange of used room air for fresh outside air.

Free ventilation

Ventilation by exchanging inside and outside air through pressure differences due to wind and/or temperature differences.

Mechanical ventilation

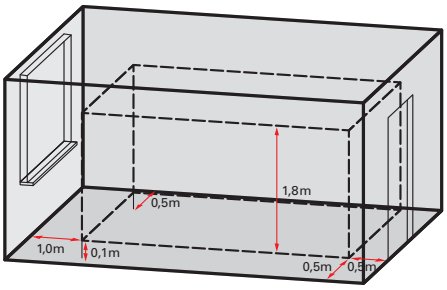
Ventilation by exchanging air through continuous-air machines (fans).

Controlled home ventilation (CHV)

Defined, fan-based ventilation of rooms.

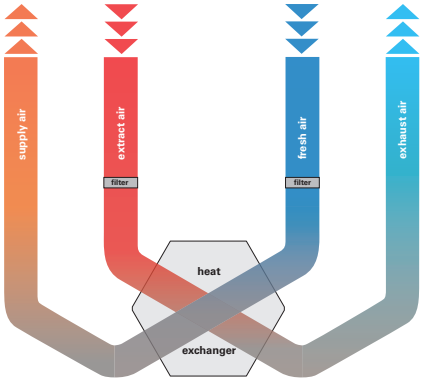
Comfort zone

The zone within a room where the person feels most comfortable is called the comfort zone. This zone may not be affected by draughts.



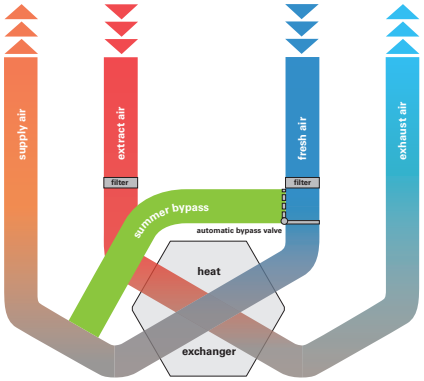
Heat recovery (HR)

Heat recovery in general describes different procedures for utilising heat which would otherwise be lost as waste heat. When using ventilation systems the heat of exhaust air can be transferred to the fresh supply air using a heat exchanger.



Bypass

Routing a bypass separated from the main stream. In the field of CHV, bypass lines are the state of the art. Using the bypass, the heat exchanger in the system is bypassed. Precooled/heated air from the outside or from an earth-air heat exchanger is fed into the rooms.



Ventilation rate

Relation between the air volume flow rate of the ventilation system and the room volume of the ventilated room.

LW [h-1] = air volume flow rate [m³/h]/room volume [m³]

i.e. with a ventilation rate of 0.5 1/h, the room volume is exchanged completely every 2 hours.

2. Controlled home ventilation

Individual related air rate

Outside air volume flow rate related to a person. In the field of controlled home ventilation, 30 m³/h*P is the default person air rate.

Fresh air (outside air)

Total air volume fed in from outside.

Supply air

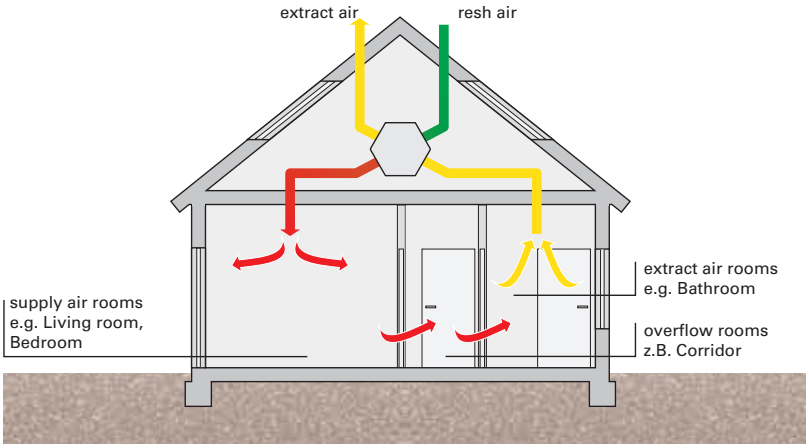
Total air volume flowing into a room.
The air flow from the ventilation system to the rooms (supply air rooms) is defined as supply air.
Examples of supply air rooms: living room, bedroom, children's room, etc.

Exhaust air

Total air volume flowing from a room.
The air flow from the wet rooms (exhaust air rooms) to the ventilation system is defined as exhaust air.
Examples of exhaust air rooms: bathroom, toilette, kitchen, etc.

Extract air

Total air volume led to the outside.
The air flow which is led from the ventilation system to the outside is defined as extract air



Earth-air heat exchangers or brine heat exchangers

Earth-air heat exchangers or brine heat exchangers use the constant soil temperature in a depth of approx. 1.5 m. For earth-air heat exchangers, the outside air is fed through large pipe cross sections, for brine heat exchangers, an intermediate circuit of brine is built.
Both systems can be used for heating outside air in the winter (anti-icing system) or for temperature control in the summer.

Ventilation for protection against moisture

Required ventilation to ensure building protection (moisture) under typical conditions of use in case of partially reduced moisture loads. It is assumed that the users are absent from time to time and that no laundry will be air-dried in the utilisation unit.

Reduced ventilation

Required ventilation to ensure hygienic minimum requirements and building protection (moisture) under typical conditions of use in case of partially reduced moisture and substance loads. It is assumed that the users are absent from time to time - e.g. during working hours.

Nominal ventilation

Required ventilation to ensure hygienic requirements and building protection when the users are present (normal operation) - e.g. at home.

Intensive ventilation

Temporarily required ventilation with increased air volume flow rate to reduce load peaks - e.g. party.

2.3 Standards and rules

DIN 1946-6	Ventilation and air conditioning - part 6: Ventilation of residential buildings; requirements, execution, approval DIN 1946-6 is the main standard in the field of controlled home ventilation. It defines the required supply and exhaust air volume flows, dependent on the area or usage (e.g. kitchen, bathroom, toilet, etc.) and the condition of heat insulation. Furthermore, it ensures that ventilation systems are planned, installed and operated properly with regards to hygienic, energetic and sound aspects. Hygienists, planning experts, testing centres and system manufacturers cooperated to create the DIN 1946-6 standard for home ventilation systems. DIN 1946 supports expert companies delivering and installing home ventilation systems as well. Provisions for approval and transfer protocols allow the end customer to easily evaluate the system condition together with the expert company.
DIN 4102	Fire behaviour of building materials and building components
DIN 4108-7	Heat insulation and energy savings in buildings - part 7: Air tightness of buildings, requirements, planning and execution recommendations and examples
DIN 4109	Sound protection in structural engineering; requirements and evidence
DIN 18017-3	Ventilation of bathrooms and toilets without external windows; with fans
DIN EN 308	Heat exchanger inspection procedure to define performance criteria
DIN EN 779	Particle air filter for general ventilation and air conditioning
DIN EN 832	Thermotechnical behaviour of buildings, calculation of heating energy requirements - residential building
DIN EN 13141	Ventilation of buildings - performance tests of building parts/products for the ventilation of residential buildings
VDI 2081	Heat recovery in ventilation and air conditioning systems
VDI 2087	Air-duct system - assessment principles
VDI 3801	Operating ventilation and air conditioning systems
VDI 6022	Hygienic requirements for ventilation and air conditioning systems
VDMA 24186	Performance programme for maintaining ventilation systems and other technical equipment in buildings

2. Controlled home ventilation

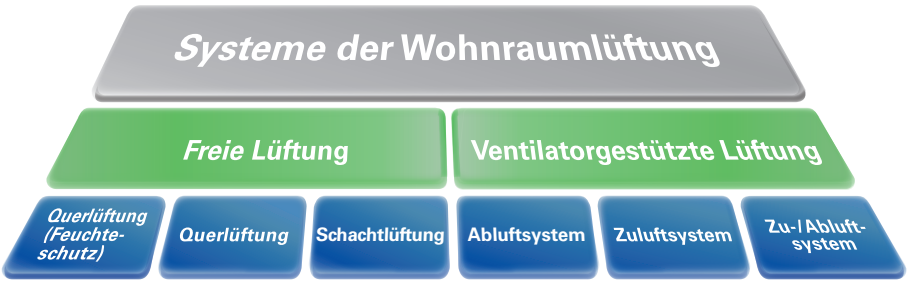
EnEV	Directive on energy-saving heat insulation and energy-saving installation engineering in buildings (Energy Conservation Ordinance)
LüAR	Policy on fire protection requirements of ventilation systems (Ventilation System Directive)
BauO	Building code (Bauordnung, BauO) or state building code (Landesbauordnung, LBO) of the respective German state; is a substantial part of public building law in Germany

2.4 Home ventilation systems

In DIN 1946-6, different ventilation systems are described. On the following pages, we provide you with detailed information on the different ventilation systems. In general, a difference is made between "free ventilation" and "meachanical ventilation (fan based)".

For free ventilation systems, a difference is made between transverse ventilation for protection against moisture, transverse ventilation and shaft ventilation. For mechanical ventilation, the systems are differentiated based on the air flow directions they support, e.g. exhaust air, supply air and supply/exhaust air systems.

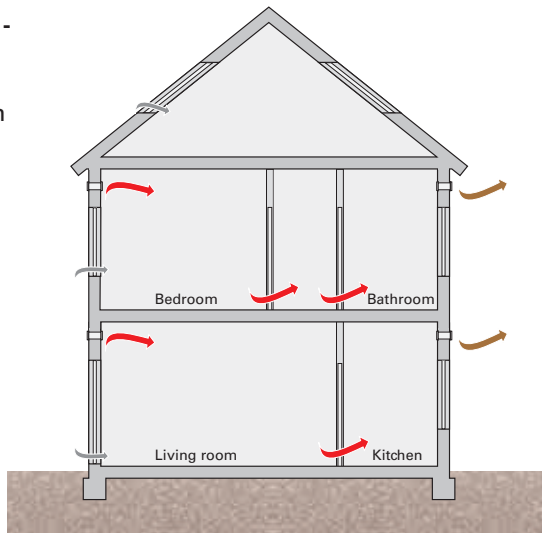
According to DIN 1946-6, volume flow rate (infiltration) resulting from the building envelope is not a ventilation system but is considered when dimensioning the different systems. Ventilation through the window is, according to the definition, not a ventilation system either. It is not taken into consideration when dimensioning the ventilation systems to ensure the required outside air flow. Ventilation through the window can be used to reduce load peaks.



Free ventilation

Transverse ventilation (protection against moisture)/transverse ventilation

Transverse ventilation is part of free ventilation which mainly results from wind pressure on the exterior building surface.

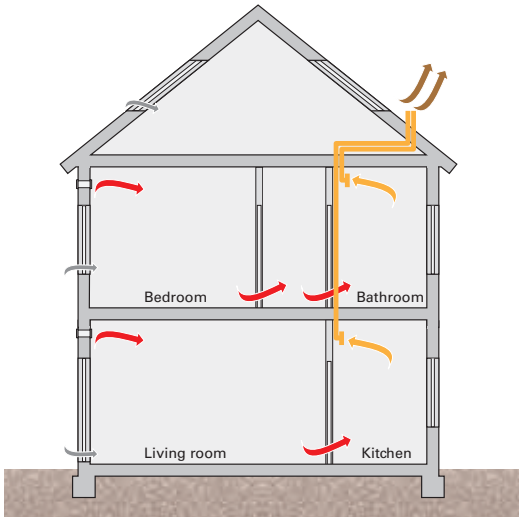


Caption:
- supply air
- extract air
- infiltrated air

2. Controlled home ventilation

Shaft ventilation

Shaft ventilation, too, is a kind of free ventilation and mainly results from the thermal buoyancy in vertical ventilation shafts, see schematic diagram.

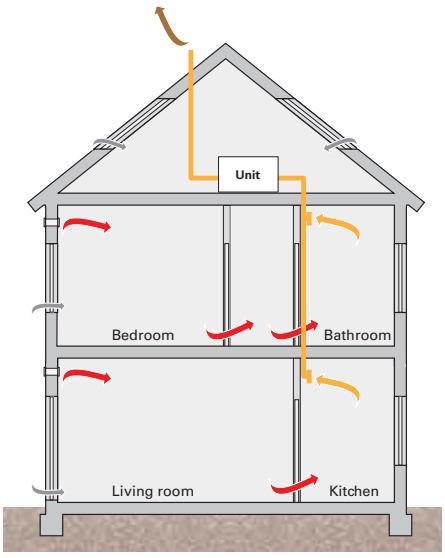


Caption:
- supply air
- exhaust air
- extract air
- infiltrated air

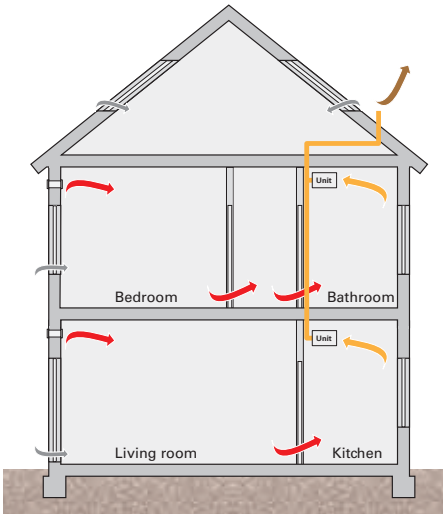
Mechanical ventilation

Exhaust air systems

An exhaust air system is a ventilation system or ventilation unit with fan-based and fan-supported exhaust air. Supply air flows as filtered fresh air via outside air passages into the building due to the negative pressure. For exhaust air systems, a general differentiation is made between centralised and decentralised systems.



Centralised exhaust air system



Decentralised exhaust air system

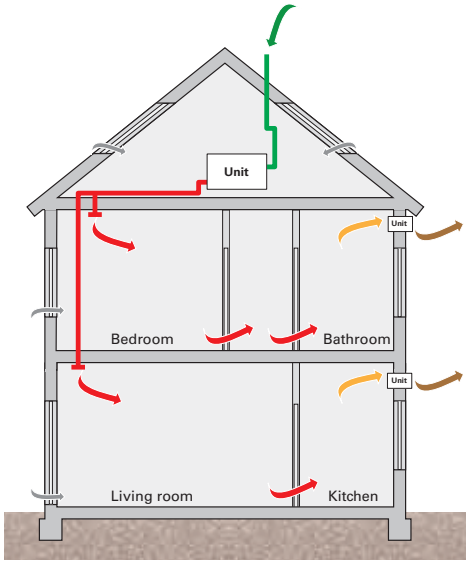
Caption:
- supply air
- exhaust air
- extract air
- infiltrated air

2. Controlled home ventilation

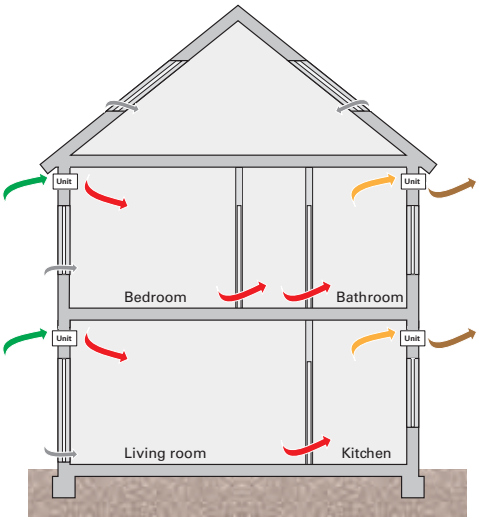
Supply air systems

A supply air system is a ventilation system or ventilation unit with fan-based and fan-supported supply air. Exhaust air flows out of the building as extract air due to the positive pressure. A differentiation is made between centralised and decentralised supply air systems.

Caption:
- fresh air
- supply air
- exhaust air
- extract air
- infiltrated air



Centralised supply air system

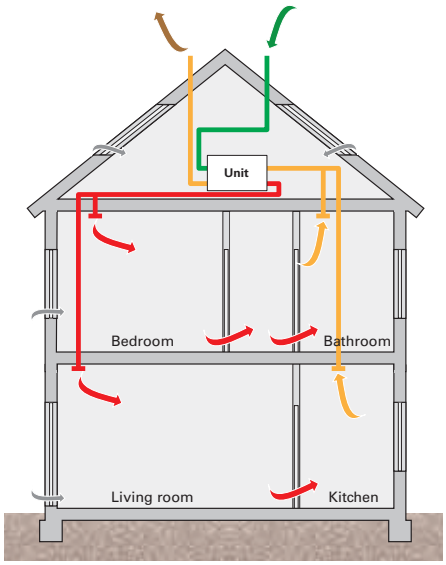


Decentralised supply air system

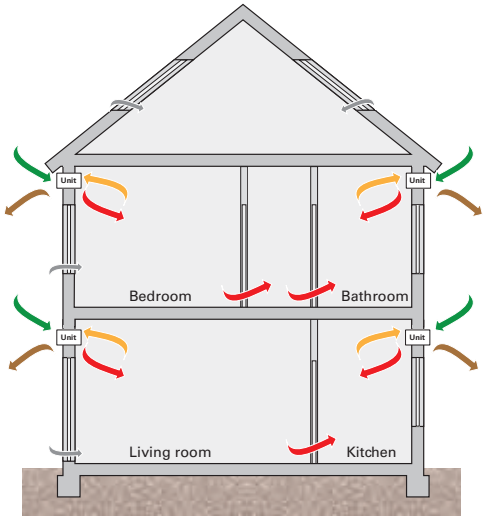
Supply/exhaust air system with heat recovery

A supply/exhaust air system is a ventilation system or ventilation unit with fan-based and fan-supported supply and exhaust air. For these systems, too, a differentiation is made between centralised and decentralised systems. These systems have the advantage that both air flow directions (supply and exhaust air) are always led via one unit, which provides an opportunity to easily re-cover heat.

Caption:
- fresh air
- supply air
- exhaust air
- extract air
- infiltrated air



Centralised supply/exhaust air system



Decentralised supply/exhaust air system

2.5 Reasons and influencing factors in favour of CHV

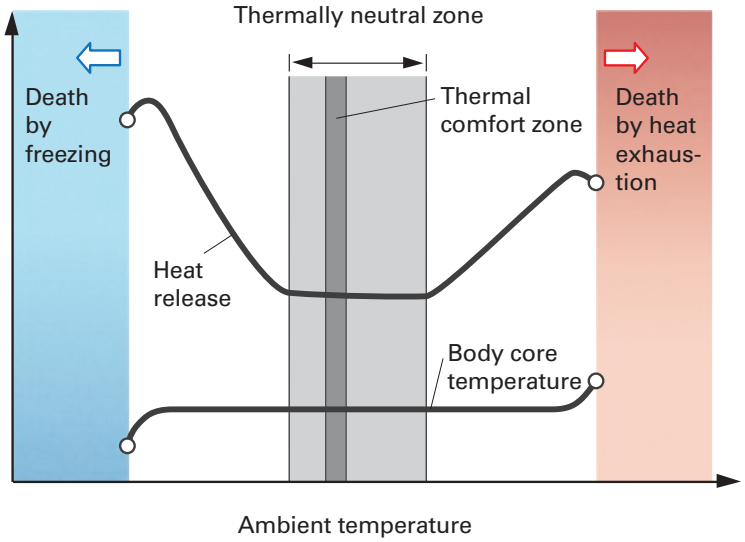
As for every investment, also for controlled home ventilation the expenses must be compared to the benefits. However, not all advantages can be evaluated from a monetary point of view. In the following, the most important reasons and influencing factors in favour of the installation of a CHV system are described.

These are the following aspects:

- thermal comfort
- building protection and health
- comfort and security
- energy efficiency and profitability

Thermal comfort

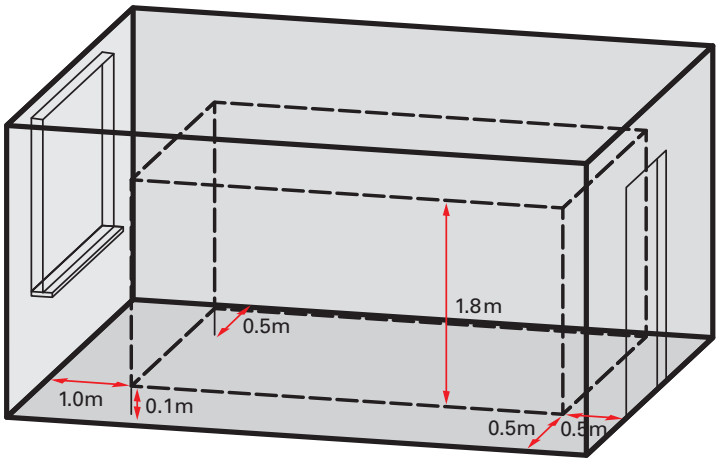
The thermal comfort in a building is determined by the so-called operative room temperature (resultant temperature) and the influence of the room air flow.
The human body reacts to these influencing factors. It always tries to keep the body temperature at a nearly constant level by unconsciously making a "thermal regulation". As long as this is possible, i.e. the thermal balance of the person is balanced (heat release = heat development), the body feels comfortable (see figure). However, this is significantly influenced by the environment.



Schematic connection between ambient temperature of a person and the body core temperature and heat release

If the following conditions are given for the human body in the living zone of a room due to unconscious body reactions and sensations, we speak of a thermally comfortable room climate:

- lowest thermal regulation efforts of the organism to maintain a constant body temperature
- effortless, imperceptible heat release
- felt ambient temperature not too cold or warm (neutral)



Comfort zone of a room

These conditions are again influenced by factors such as physical activity, clothing of the person and room climate parameters (air temperature, moisture, air velocity, temperature of the surrounding areas).

The room climate parameters are closely connected with the type of
- building construction (heat insulation, window area share)
- heating (temperature, underfloor heating or radiators) and the
- ventilation (air temperature, valve layout),

which is particularly evident in the winter.

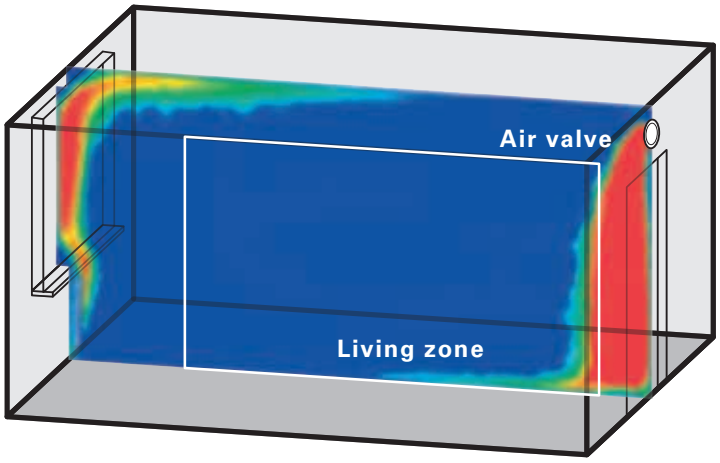
Compliance with EnEV and the resulting hygienically required minimum air exchange therefore substantially influences the thermal comfort. Therefore, it is important to keep disturbing factors within the living zone as low as possible or avoid them at all. Minimising the draught risk is the decisive factor to achieve this.

Important influencing factors are:

- air exchange volume
- supply air temperature
- air outlet layout

CHV system with **air valve on inner wall**, radiator,
air exchange 0.5 h^{-1h}
supply air temperature 17 °C

Source: dena Thermische Behaglichkeit im Niedrigenergiehaus

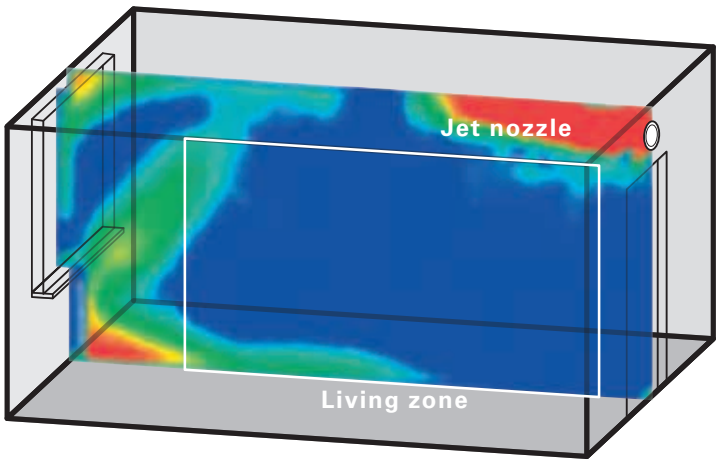


critical zone

uncritical, comfort zone

CHV system with **jet nozzle on inner wall**, radiator,
air exchange 0.5 h^{-1h}
supply air temperature 17 °C

Source: dena Thermische Behaglichkeit im Niedrigenergiehaus



critical zone

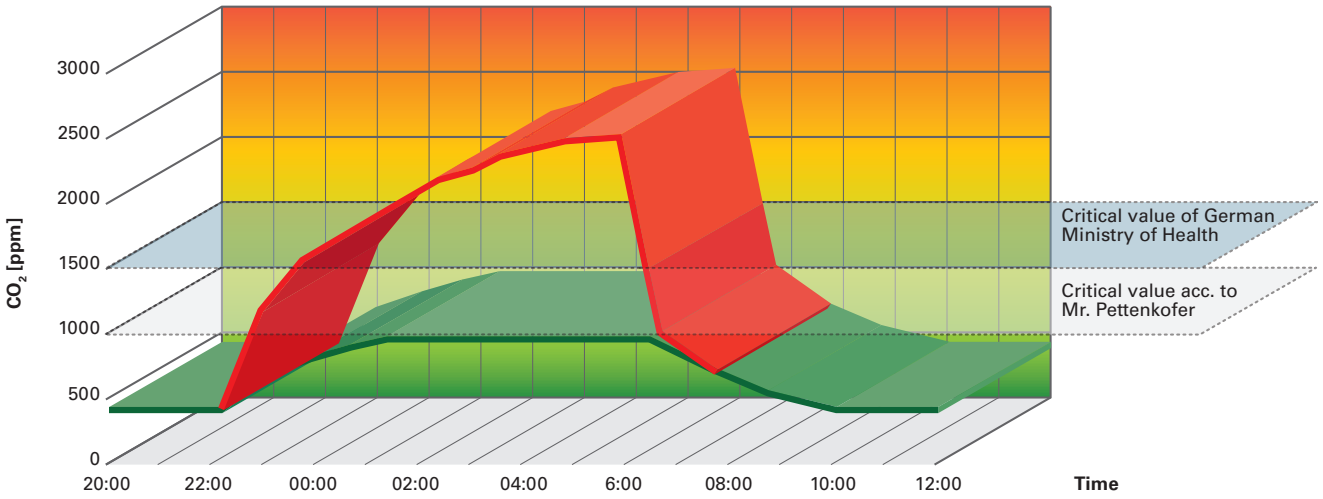
uncritical, comfort zone

The professional dimensioning of a controlled home ventilation system according to DIN 1946 and its proper installation ensure the maintenance of thermal comfort on the part of the ventilation.

2. Controlled home ventilation

Building protection and health

The air exchange in a building significantly influences the CO_2 concentration in the air and therefore the room air quality. On average, the human being inhales air 10 to 15 times a minute, i.e. a daily volume of 12,000 l air flow through our lungs. The carbon dioxide concentration increases rapidly in closed rooms and leads to insufficient endogenous burning and the person looses energy. People exhale approx. 12 l CO_2 per hour in their sleep; during housework they exhale three times as much CO_2.

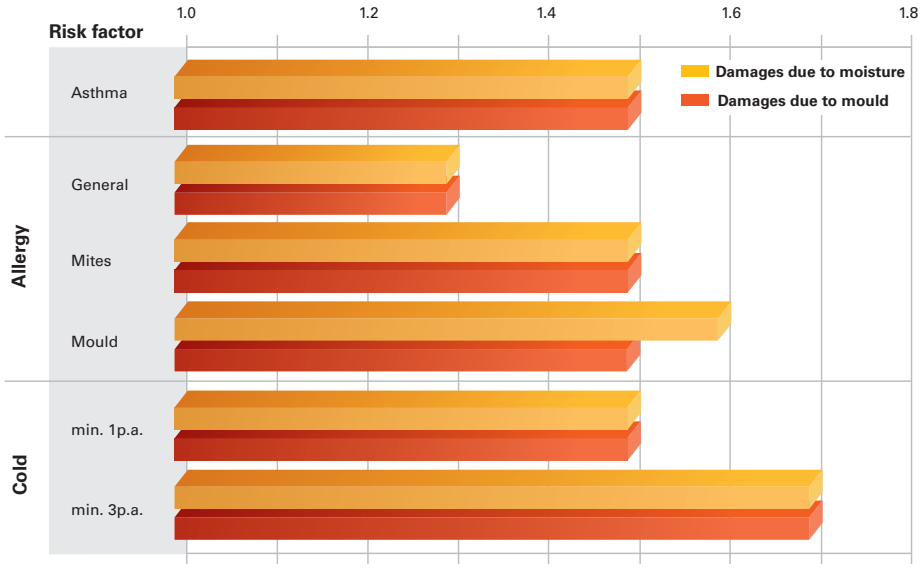


CO_2 concentration in a bedroom at night, 2 people

The chart shows the advantages of a home ventilation system as compared to window ventilation in a bedroom. The measurement clearly shows that the maximum limit of 1500 ppm is reached and largely exceeded after approx. 1.5 hours when 2 people are in the room and no home ventilation system is installed. When using a mechanical ventilation system, the threshold of 1000 ppm set by Pettenkofer is always met. This results in a relaxing sleep and higher productivity.

Studies have shown that a four-person household needs a daily volume of 2000 - 3000 m³ of fresh air. Therefore, the entire room air must be exchanged every 1.5 to 2 hours in a 75 m² home. Additionally, up to 15 kg water vapour may develop. One hour of cooking or a full bath increase this value again by a whole kilogramme of water vapour.
The moisture resulting from this must be discharged regularly, otherwise mould formation cannot be avoided. This applies equally to new and renovated buildings.
Moreover, the used air forms a dangerous toxic cocktail containing chemicals, mite feces and other substances, which may substantially affect human health.

In order to minimise the above-mentioned problems it is advisable to air the rooms at least four times a day for 4 to 8 minutes through the windows (rush airing). Much more effective and safe is the usage of controlled room ventilation. Mechanical ventilation systems suck in the air filled with CO_2, smells and moisture from the rooms and constantly feed in fresh air in a controlled way.



2. Controlled home ventilation

What is important is the correct metering of the air volume. Too little fresh air via the ventilation system means that an additional window must be opened. Too much fresh air, however, may cause insufficient moisture, especially in the winter. By using CO_2 and moisture sensors, the air quality can be controlled. In normal operation, the air supply is increased automatically if more moisture is caused by the people present. If no person is present, the air volume decreases automatically.

Ventilation mode	Percent of maximum volume flow rate
1 Protection against moisture	5 – 20 %
2 Absence mode	40 %
3 Normal mode	70 %
4 Intensive mode (party)	100 % (with time limit)

Comfort and security

When using a controlled home ventilation system, it is no longer necessary to open windows and terrace doors for ventilation. This significantly reduces the risk of burglaries since potential burglars have no opportunity to enter a house by forcing open tilted windows. In particular during absence (holidays, working day) and at night, security is increased without affecting the hygienic minimum air exchange.

Another important aspect is the reduction of external sound immissions. The missing sound protection of an opened window is a decisive disadvantage of window ventilation. Especially along busy streets, the noise level affects the ventilation behaviour of the residents, i.e. the windows are opened remarkably less often. This again affects the air quality and air hygiene. The interior level in bedrooms should be between 25 and 30 dB(A) (at the ear of the sleeping person) in order to ensure a quiet sleep. While the residents usually can control the noise immission individually by closing and opening the windows, this cannot be achieved at night while the residents are sleeping. To ensure the required air hygiene also at night, a window must be opened. However, the sleeping person is thus unconsciously exposed to high sound levels which may lead to cardiovascular diseases in the long run. Furthermore, polluted air is fed into the building in an uncontrolled way.

This issue can be resolved by using a controlled home ventilation system. Windows can remain closed and a quiet sleep is possible.

Energy efficiency and profitability

The question as to how efficient an investment is from an economic point of view is mandatory. Generally, the monetary aspects have priority. Regarding a ventilation system the main focus should not be on payback or profitability (ROI). Another, much more important reason should be given priority: the maintenance and improvement of internal room air.

The consistent and cost-effective maintenance of a room temperature of 20 °C using different heating systems is not a point of discussion anymore and is taken for granted.

The maintenance of fresh and healthy air in the building must also be considered a standard condition. Modern buildings are more and more frequently built with tight insulation, and the natural air exchange between the inside and outside is lost. Therefore, ventilation systems are a standard which should not be refrained from.

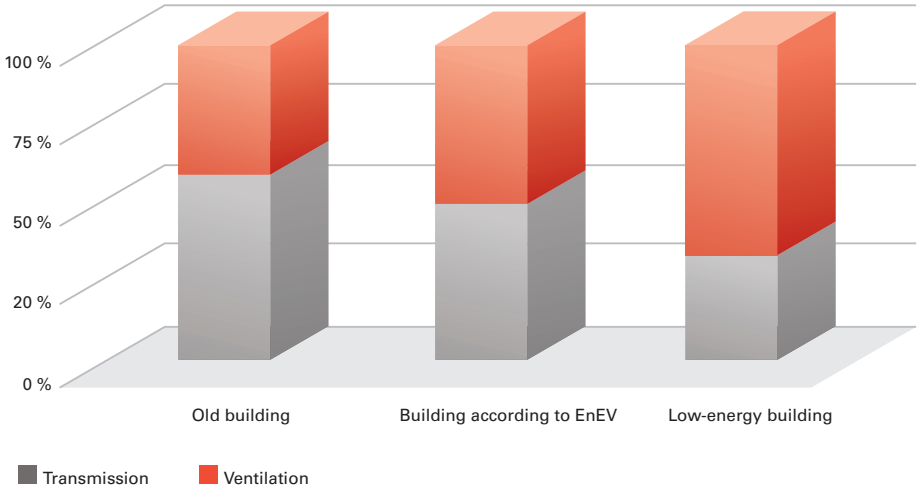
A difference is made between:

- mere exhaust air systems
- supply and exhaust air systems (controlled home ventilation)

The mere exhaust air system (wall outlets) is significantly less expensive than the supply and exhaust air system, but it also provides less comfort and does not minimise the ventilation heat losses. Investment costs of approx. € 2500 – € 3500 must be budgeted for an exhaust air system in an average single-family home.

Modern supply and exhaust air systems have a heat exchanger which heats up the supply air and then

leads it into the room. The thermal comfort increases and the ventilation heat losses are reduced. Investment costs of € 10,000 - € 12,000 should be budgeted. The amortisation of this kind of system highly depends on the usage behaviour and assumes that hardly any window is opened during the heating period.



Relative share of ventilation losses in the overall heat losses of a residential building

To give you a point of reference with regards to the profitability, the possible investment amounts must be compared to the cost savings. The cost savings can be divided into different areas. On the one hand, the annual operating costs and the resulting energy savings, on the other hand, the possible savings of heating areas or reduction of the heating system. Furthermore, the type of installation, the routing and the selected materials substantially affect the cost analysis.

The annual operating costs are calculated based on the energy consumption of the fans. The energy savings result from the difference between the ventilation heat losses as compared to window ventilation or a mere exhaust air system.

Using DIN 4701 part 10 and/or DIN 18599, the heating, ventilation and system technology can be evaluated and the air exchange rates and heat recovery levels can be translated into saved heating energy. Using these results, it is possible to draw conclusions regarding the profitability of the system. Due to the complexity of the topic and the individual usage, it is impossible to make any general statements.

Health should generally have priority over the profitability of the system.

3 profi-air® controlled home ventilation - system overview

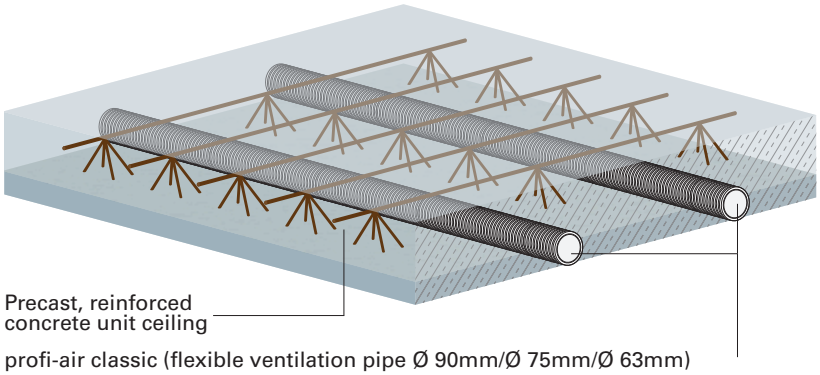
3.1 profi-air - the flexible air distribution system for individual requirements

Due to the various different system components of profi-air which perfectly match each other, fitters are provided with suitable combination options for all construction site situations in the fields of new buildings or remodelling. The flow-optimised design of the profi-air components is decisive for the efficiency of the overall ventilation system and just as important as the utilisation of energy-efficient ventilation units.

profi-air classic - the flexible round pipe system

The profi-air classic pipe system is ideal for installation in concrete. The flexibility of the corrugated pipe allows for very small bend radii without the need for additional fittings.

profi-air classic uses a sophisticated connecting method throughout. The smooth inner pipe surface allows for volume flow rates of up to 45m³/h in nominal diameter 90, up to 30m³/h in nominal diameter 75 and up to 23m³/h in nominal diameter 63.

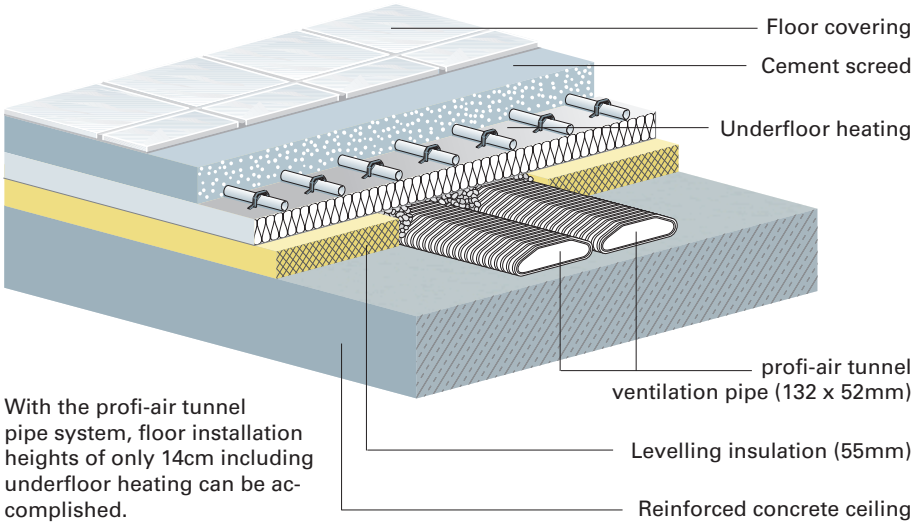


profi-air classic (flexible ventilation pipe Ø 90mm/Ø 75mm/Ø 63mm)

profi-air tunnel - the innovative flat duct pipe system

With the extremely low installation height of the profi-air tunnel pipe of only 52mm, the routing of profi-air tunnel on unfinished floors, in the wall or at the ceiling does not pose a problem.
Due to its tunnel-shaped construction, the pipe is extremely hard-wearing and protects itself against unintentional deformations. Specifically developed sealing and connecting elements easily and securely connect the individual profi-air fittings and pipe sections.

The smooth inner surface of the profi-air tunnel pipe allows for flow rates of up to 45m³/h.

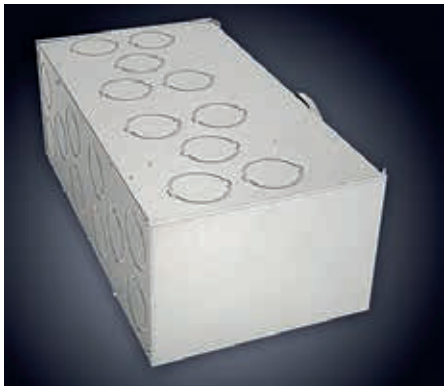


With the profi-air tunnel pipe system, floor installation heights of only 14cm including underfloor heating can be accomplished.

3 profi-air® controlled home ventilation - system overview

profi-air classic manifold and profi-air tunnel flat manifold

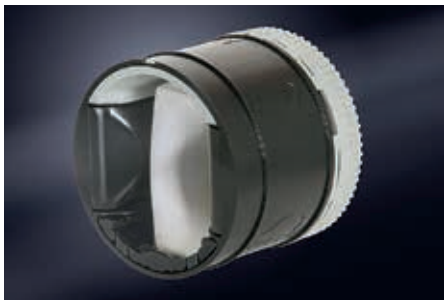
The profi-air classic supply/exhaust air manifolds are available with 5, 10 or 15 outlets. Using the manifold connection couplings, profi-air classic pipes NW63, NW75 or NW90 as well as profi-air adapters to profi-air tunnel pipes can be connected. The layout of the manifold outlets allows for the simultaneous use as straigth as well as 90° on both sides can be removed for inspection and cleaning of the manifold.



The profi-air flat plastic manifold has various connection options with an absorption capacity of up to 5 profi-air tunnel pipes. The connection to the ventilation unit is made using oval duct system. The ISO pipe system can be used as an alternative. The very flat construction allows for installations even in cramped locations. For inspecting the manifold, the inspection openings can be completely removed.

profi-air classic constant airflow regulator

The incorporation of constant airflow regulators facilitates the often long and difficult process of adjusting the ventilation system. The adjustable constant airflow regulator is installed in the manifold outlets and limits the air volume in the respective cable line. The setting range of the constant airflow regulator is between 20 m^3/h and 50 m^3/h; additionally, our product portfolio includes a static constant airflow regulator with 15 m^3/h. As an alternative, the system can be adjusted in the traditional way by making the settings at the supply/extract valve.



profi-air tunnel airflow restrictor

The profi-air tunnel airflow restrictor serves, similar to the constant airflow regulator, for volume flow limitation. Due to the calculated air volume, individual segments from the regulating element are released and the setting of the air volume flow rate is implemented. The regulating element can be installed in any profi-air tunnel sealing and connecting element.

3.2 profi-air 250/400 touch - the modern ventilation units for controlled home ventilation

The newly developed ventilation unit profi-air 250 touch and profi-air 400 touch have been designed for use in single-family and multi-family homes.

The combination of highest-quality components, energetically efficient and whisper-quiet ventilation, and an innovative control solution makes the profi-air touch ventilation unit one of the most advanced and sophisticated units on the European ventilation market.
The profi-air 250 touch ventilation unit has been designed for buildings with an area of up to approx. 250 m² and the profi-air 400 touch ventilation unit for buildings with an area of up to approx. 400 m².

Certification guaranteed

We can guarantee this already today, because our profi-air touch ventilation units have been tested, approved and certified by renowned institutions in Germany and Europe.
Both the general building authority approval by the German Institute for Building Technology (DIBt)® and compliance with other important European standards and guidelines confirm that the new profi-air touch ventilation units feature the necessary requirements for functionality and quality already at their market launch.

Deutsches Institut für Bautechnik DIBt

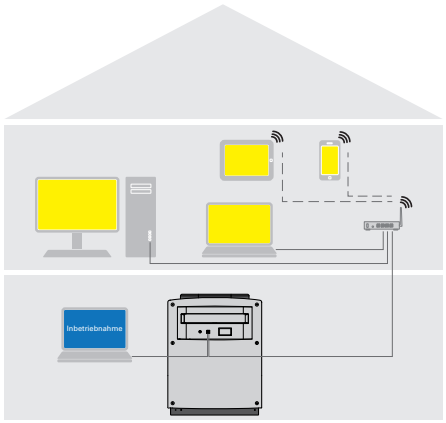
EN 308 and **EN 13141-7** (Europe)
SAP App Q (England)

Easy handling

Profi-air touch control technology leaves nothing to be desired and is highly user-friendly. A functional touch screen is located directly on the unit and can be used to easily and directly adjust and control home ventilation. There is no need for any other external control panels. A particular highlight of profi-air touch is the high-tech LAN port which can be used to connect the unit to your laptop computer or WLAN router.

You can thus contact your ventilation unit via IP address at any time within your home network from any smartphone, tablet, laptop or desktop computer using an internet browser. This renders unnecessary other unsuitable and space-consuming control panels.

After establishing a connection with the WLAN router, you can control the unit at any time from anywhere in the house, set and adjust it to current conditions or, for instance, create and save special weekly programmes. The neatly arranged and quick menu makes controlling profi-air touch a breeze.



Connection options

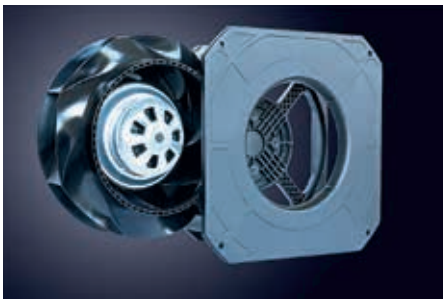
Touch screen on the profi-air ventilation unit/optional tablet control

3 profi-air® controlled home ventilation - system overview

profi-air 250/400 touch ventilation units - highlights

RadiCal fans

The flow-optimised core of the ventilation unit consists of high-quality expanded polypropylene (EPP) and contains two state-of-the-art EC RadiCal fans. RadiCal fans pay special attention to performance, energy-efficiency and low noise development. These fans are significantly below the values specified by the European ErP directive for optimising consumption characteristics of electronic devices already today. Individual control of the fans allows for balancing pressure differences in the supply and exhaust air systems. Settings can be made in intervals of 0.1 V.



Heat recovery

The integrated plastic cross counter flowheat exchanger has a heat recovery efficiency of max. 91 % for profi-air 250 touch and max. 90 % for profi-air 400 touch. Thanks to this high degree of efficiency, there are no draughts since supply air is heated to almost room temperature even with outside temperatures of around 0° C.

Frost protection system

In addition, profi-air 250 touch and profi-air 400 touch ventilation units feature a thermostatic frost protection system. This anti-icing system is controlled by reducing the outside air flow rate and monitored by measuring air temperatures. The measurements for the successful DIBt approval confirm the efficiency of the anti-icing system. In case using a thermostatic frost protection system is not possible due to other regulations, e.g. due to the installation of a room air-dependent fireplace, frost protection can be provided alternatively by installing an earth-to-air heat exchanger, brine exchanger or an electric preheater coil.

Summer bypass

Tightly sealed houses frequently heat up from strong solar radiation alone. In the evenings, the room temperature can therefore be higher than the temperature of the outside air. For these cases, profi-air touch ventilation units feature an integrated automatic summer bypass which bypasses the functions of the heat exchanger and thus directly allows filtered outside air to cool the inside. If the bypass is active, the whole outside air flow bypasses the heat exchanger to avoid heating the supply air.

Filters and maintenance

By default, profi-air touch ventilation units are equipped with F5 supply air filters and G4 exhaust air filters. Optional F7 supply air filters which have premium filter characteristics for people suffering from allergies and protect even more reliably from outside environmental influences can also be installed.
Filters are maintained solely by periodic filter replacement the necessity of which is displayed on the display of the profi-air touch ventilation units in a time-controlled way.

In addition, according to DIN 1946-6, the heat exchanger and fans should be checked for contamination every 2 years and cleaned, if necessary. Please find more information on maintenance in the device manual.

profi-air sensor/actuator box

You can additionally connect various sensors, such as temperature, moisture or CO_2 sensors or pre-heating element to profi-air touch ventilation units. Sensors or pre-heating element are connected to the ventilation unit via the profi-air sensor/actuator box which is connected to an interface on the unit. All connections can be established via this box without having to open the ventilation unit.

The electronics engineer can therefore establish all necessary wiring to the sensor/actuator box before the device is installed on the construction site. The necessary connection between the sensor/actuator box and the profi-air touch ventilation unit is eventually established via a CanBus connector on the device.

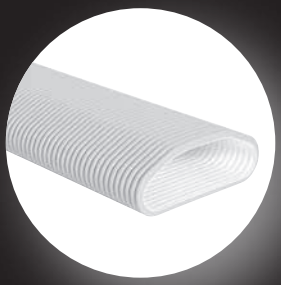
The profi-air sensor/actuator box features the following connection options:

- up to 4 humidity or CO_2 sensors
- electric pre-heater
- electronic filter
- push-button
- service contact OFF

profi-air® - refreshingly simple...

profi-air tunnel
rotary adapter

profi-air tunnel pipe



profi-air tunnel
elbow vertical 90°

profi-air tunnel
outlet 90° for valves

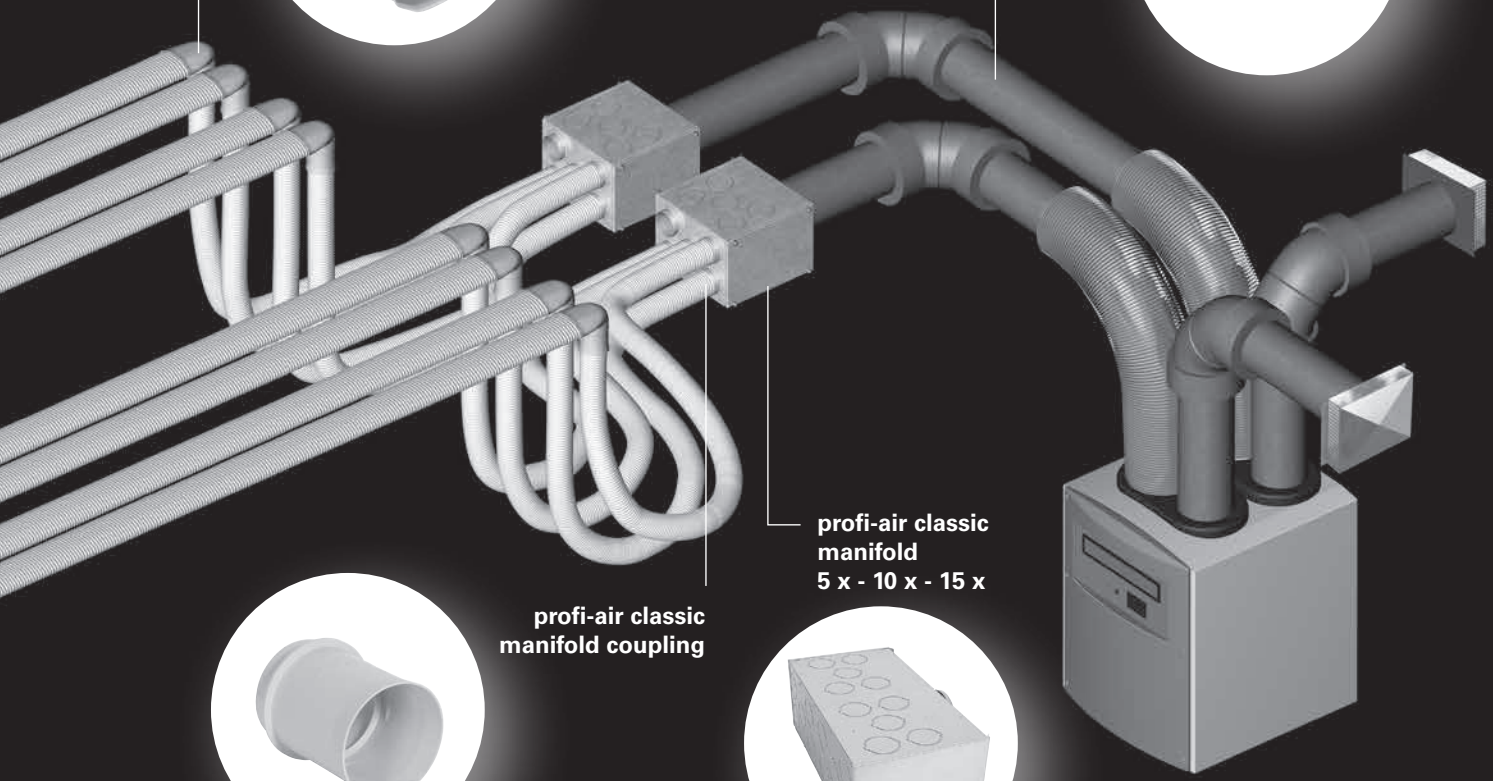
profi-air tunnel
elbow vertical 90°

profi-air tunnel
sealing and connecting element

FRÄNKISCHE

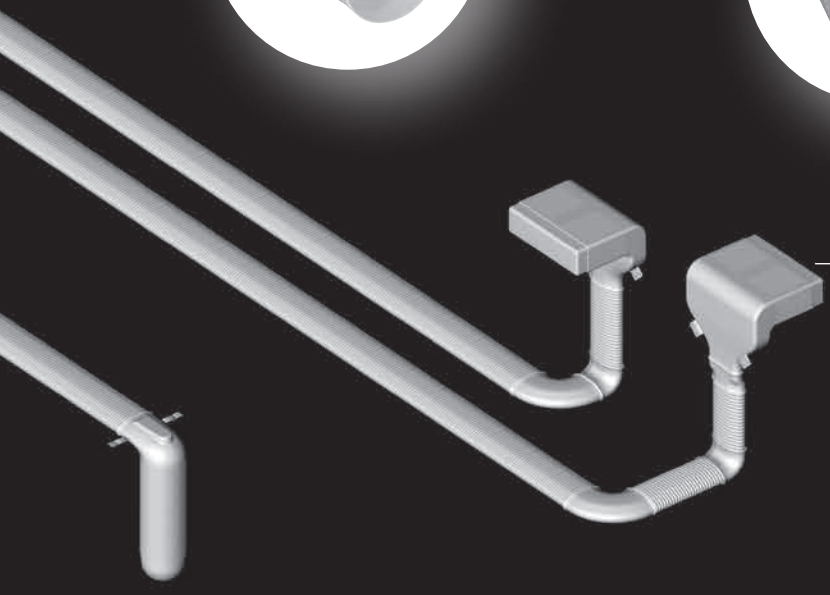
profi-air tunnel
adaptor elbow 90°
NW 75
NW 90

profi-air iso pipe
iso elbow 90°
iso coupling
Ø 160 mm, 180 mm



profi-air classic
manifold
5 x - 10 x - 15 x

profi-air classic
manifold coupling



profi-air tunnel
outlet 90° for profi-air grills

4 Planning

4.1 Air volume measurement according to DIN 1946-6

In May 2009, the revised DIN 1946-6 (ventilation of residential buildings) was published. Ever since, a standard ventilation concept must be created for every new building and for comprehensive remodelling. The dimensioning is based on DIN 1946-6. This standard applies to free and ventilation of residential buildings and room groups used in similar fashion. It sets requirements for planning, execution, commissioning, maintenance and operation considering building physics, ventilation, hygienic and energetic aspects. To rooms without windows, bathrooms and toilets in residential buildings, DIN 18017-3 applies additionally.

The standard requires evidence that four ventilation modes are installed, i.e. four outside air flow rates which ensure sufficient air exchange under different conditions of use.

Ventilation for protection against moisture

Basic ventilation to avoid damages due to moisture depending on heat insulation level of the building in case of partially reduced moisture loads (e.g. temporary absence of the users). This mode must be ensured constantly and without the user's interaction.

Reduced ventilation

Ventilation required additionally in order to ensure hygienic minimum standards taking into account average pollutant loads when the users are temporarily absent. This mode must be ensured user-independently as far as possible.

Nominal ventilation

Describes the required ventilation to meet hygienic and health-related as well as building protection requirements when the residential building is used under standard conditions. The user may be involved to some extent with active window ventilation.

Intensive ventilation

Serves to lower load peaks (e.g due to cooking, washing). Here, too, the user may be involved to some extent with active window ventilation.
According to DIN 1946-6, a technical ventilation measure becomes necessary if the air volume infiltrating the building is lower than the required air volume to maintain protection against moisture.

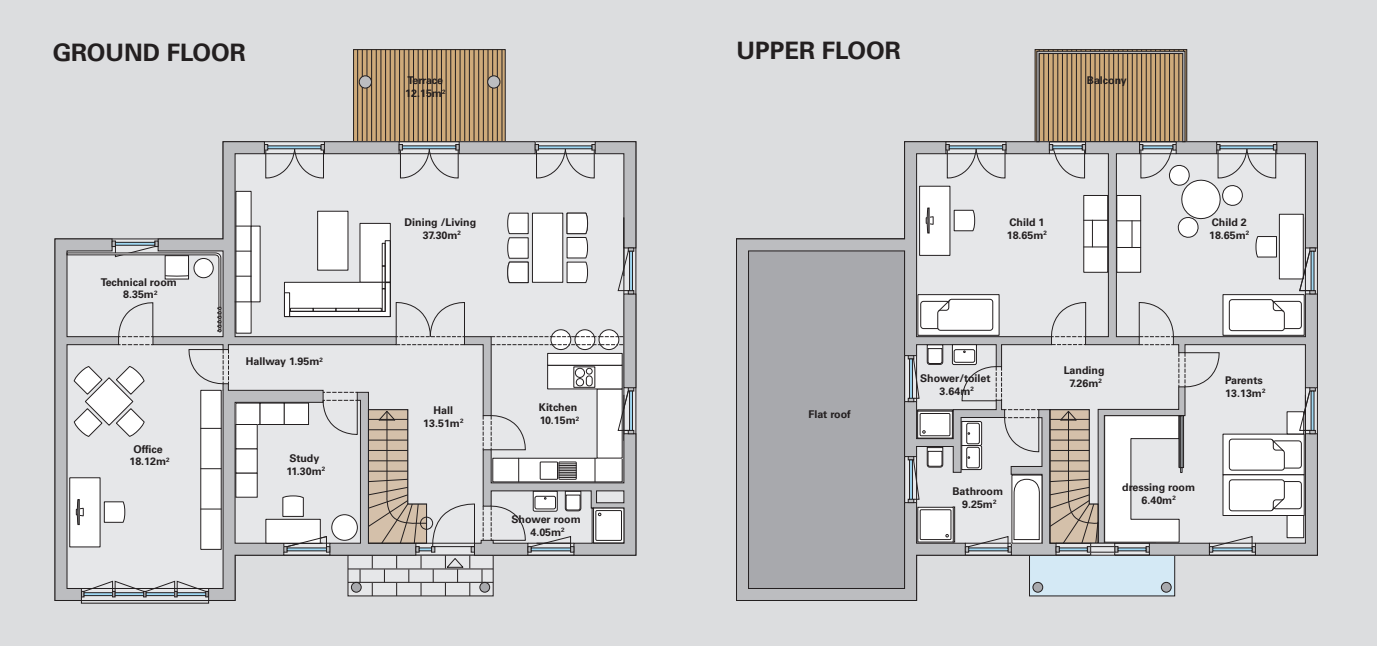
Air volume infiltration < air volume for protection against moisture
➔ technical ventilation measure according to DIN 1946-6

Air volume infiltration > air volume for protection against moisture
➔ no technical ventilation measure required, free ventilation

In order to verify this in advance, an estimate of the air volume/protection against moisture and air volume infiltration ratio is made based on the building data.

The individual steps to determine the air volume according to DIN 1946-6 are explained and illustrated in the following, first theoretically and then using a continuous example.
For easier illustration and explanation, we will assume that a ventilation is used in case a technical ventilation measure becomes necessary.

The subsequent practical example refers to a single-family home with ground level and upper floor (without basement) in a region with low wind levels which is occupied by four people.



To be able to perform standardised dimensioning, the following steps must be executed in advance:

4.1.1 Air volume measurement for maintaining protection against moisture
- a) Calculation of the total area A_{NE}
- b) Calculation of nominal ventilation $q_{v, ges, NE, NL}$ and air volume for protection against moisture

4.1.2 Determination of building infiltration
- a) Correction factor $f_{wirk, Komp}$
- b) Correction factor $f_{wirk, Lage}$ and pressure exponent n
- c) Default values $n_{50, Ausl}$
- d) Design differential pressure Δp
- e) Total volume V_{NE}
- f) Calculation of building infiltration and determination of the necessity for a technical ventilation measure according to DIN 1946-6

4.1.1 Air volume measurement for maintaining protection against moisture

For determining the air volume, i.e. the outside volume flow rate for protection against moisture, the type of heat insulation of the utilisation unit (NE) is important at first.
A difference is made between high and low heat insulation:

High heat insulation: new building after 1995 or complete refurbishment with corresponding heat insulation level (at least according to WSchV 95, includes EnEV)

Low heat insulation: all buildings put up before 1995 as well as non- or partially refurbished buildings (e.g. only replacement of windows resulting in higher tightness of the building envelope, but low heat insulation level)

For calculating the air volume required for protection against moisture, the nominal ventilation of the utilisation unit must be determined first, which again requires calculating the total area A_{NE} of the utilisation

Ventilation for protection against moisture high heat insulation:

$$q_{v,\,ges,\,NE,\,FLh} = 0.3 \times q_{v,\,ges,\,NE,\,NL}$$

$q_{v,\,ges}$ = outside air volume flow rate
NE = utilisation unit
FLh = high protection against moisture
NL = nominal ventilation

Ventilation for protection against moisture low heat insulation:

$$q_{v,\,ges,\,NE,\,FLg} = 0.4 \times q_{v,\,ges,\,NE,\,NL}$$

$q_{v,\,ges}$ = outside air volume flow rate
NE = utilisation unit
FLg = low protection against moisture
NL = nominal ventilation

a) Calculation of the total area A_{NE}

For calculating the **total area A_{NE}**, the individual room areas A_R of all rooms in the building must first be determined.

The **total area A_{NE}** of the utilisation unit is then derived from the total of the individual room areas A_R.

EXAMPLE:

Type of room	Room area A_R [m²]
Ground floor	
Office	18.12
Technical room	8.35
Dining	17.30
Living	20.00
Kitchen	10.15
Shower room	4.05
Hall	13.51
Study	11.39
Hallway	1.95
Total ground floor	**104.82 m²**
Upper floor	
Bathroom	9.25
Shower/toilet	3.64
Child 1	18.65
Child 2	18.65
Parents/dressing room	19.53
Landing	7.26
Total upper floor	**76.98 m²**
Total	**181.80 m²**

Result: total area **A_{NE} = 182 m²**

b) Calculation of nominal ventilation $q_{v, ges, NE, NL}$ and air volume for protection against moisture

Nominal ventilation $q_{v, ges, NE, NL}$ describes the air supply required to maintain hygienic and healthy standards as well as building protection when the residential building is used under standard conditions.

Nominal ventilation:

$$q_{v, ges, NE, NL} = -0.001 \times (A_{NE})^2 + 1.15 \times (A_{NE}) + 20$$

After calculating the nominal ventilation, the air volume required for protection against moisture can be determined.

EXAMPLE:

Nominal ventilation (for a total area A_{NE} = 182 m²):

$q_{v, ges, NE, NL} = -0.001 \times (182\ m^2)^2 + 1.15 \times 182\ m^2 + 20$

$q_{v, ges, NE, NL} = 196\ m^3/h$

Ventilation for protection against moisture high heat insulation:

$q_{v, ges, NE, FLh} = 0.3 \times 196\ m^3/h$

$q_{v, ges, NE, FLh} = 58.8\ m^3/h$

Ventilation for protection against moisture low heat insulation:

$q_{v, ges, NE, FLg} = 0.4 \times 196\ m^3/h$

$q_{v, ges, NE, FLg} = 78.4\ m^3/h$

As an alternative, the air volume for protection against moisture can also be determined using Table 1 as soon as the total area of the utilisation unit A_{NE} is known:

Utilisation unit area A_{NE} (in m²)	< 30	50	70	90	110	130	150	170	190	210
Ventilation for protection against moisture high heat insulation $q_{v, ges, NE, FLh}$	15	25	30	35	40	45	50	**55**	**60**	65
Ventilation for protection against moisture low heat insulation $q_{v, ges, NE, FLg}$	20	30	40	45	55	60	70	**75**	**80**	85
Reduced ventilation $q_{v, ges, NE, RL}$	40	55	65	80	95	105	120	**130**	**140**	150
Nominal ventilation $q_{v, ges, NE, NL}$	55	75	95	115	135	155	170	**185**	**200**	215
Intensive ventilation $q_{v, ges, NE, IL}$	70	100	125	150	175	200	220	**245**	**265**	285

Table 1: Minimum values of total outside air volume flow rates

To determine whether a technical ventilation measure according to DIN 1946-6 is required, after calculating the air volume for protection against moisture the building infiltration must now be determined.

4.1.2 Determination of building infiltration

Leaks on windows, doors and the building envelope provide for natural supply of external air. This procedure is referred to as building infiltration. If the building infiltration is lower than the calculated air volume flow rate to maintain protection against moisture, a technical ventilation measure according to DIN 1946-6 becomes necessary.

The building infiltration $q_{v, Inf, wirk}$ is calculated according to the following formula:

$$q_{v, Inf, wirk} = f_{wirk, Komp} \times V_{NE} \times n_{50} \times \left(\frac{f_{wirk, Lage} \times \Delta p}{50}\right)^{n}$$

$q_{v, Inf, wirk}$	effective outside air volume flow rate by means of infiltration in m³/h
$f_{wirk, Komp}$	correction factor for the effective infiltration share for a ventilation component (fixed value according to DIN 1946-6) - see a)
$f_{wirk, Lage}$	correction factor for the effective share of infiltration air depending on the building location - see b)
n	pressure exponent - see b)
n_{50}	default value for design air exchange $n_{50, Ausl}$ for 50 Pa (fixed value according to DIN 1946-6) - see c)
Δp	design differential pressure in Pa (default value according to DIN 1946-6) - see d)
V_{NE}	air volume of the utilisation unit in m³ - see e)

a) Correction factor $f_{wirk, Komp}$

For a ventilation system, the correction factor for the effective share of infiltration air $f_{wirk, Komp}$ can be determined using the following overview:

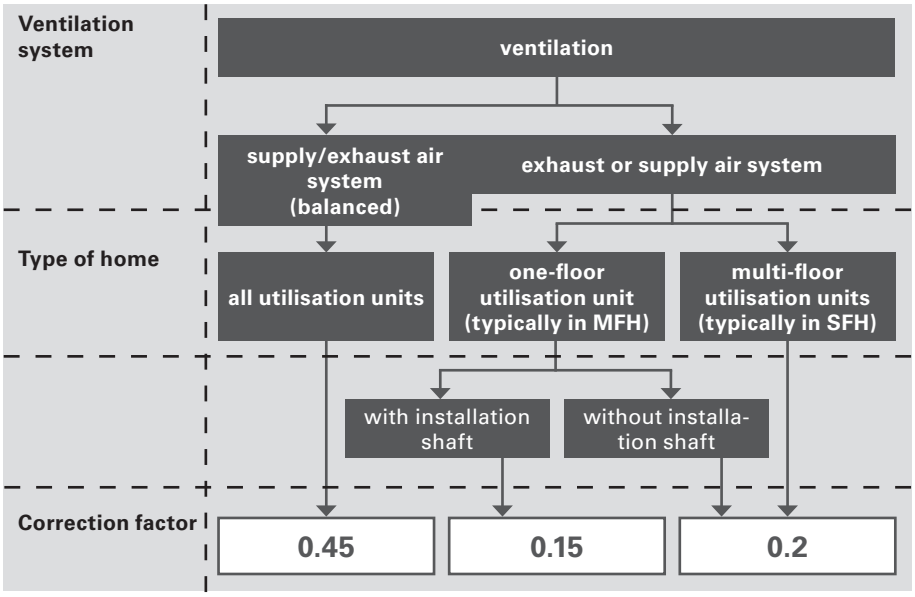


Table 2: Correction factor for the effective share of infiltration air $f_{wirk, Komp}$

b) Correction factor $f_{wirk, Lage}$ and pressure exponent n

In utilisation units with one or more floors, fixed values exist for the correction factor for the effective share of infiltration air depending on the building location and the pressure exponent n:

$f_{wirk, Lage}$ = 1.0

n = 2/3

c) Default values $n_{50, Ausl}$

The default value of design air exchange $n_{50, Ausl}$ for utilisation units with one or more floors is 50 Pa differential pressure for a ventilation system in new buildings; for refurbishments this value is always 1.0.

$n_{50, Ausl}$ = 1.0 (ventilation system; one/more floors)

d) Design differential pressure Δp

For a fan-based ventilation system, the design differential pressure Δp for buildings can be determined using the following overview:

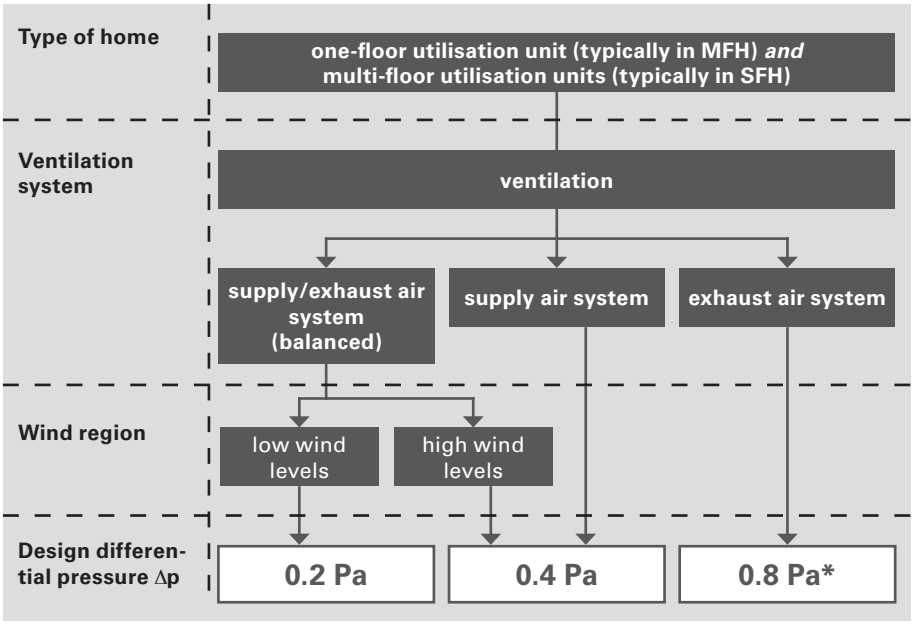


Table 3: Design differential pressure Δp for buildings in the standard case

***NB:**

The selected differential pressure must not exceed 8 Pa in order to avoid flow noises and/or inadmissibly large forces at the doors.
If room air-dependent fireplaces exist, 4 Pa must not be exceeded.

Finally, to determine the building infiltration the total volume V_{NE} of the utilisation unit (NE) must be calculated.

e) Total volume V_{NE}

For calculating the **total volume V_{NE}**, the individual room volumes V_R of all rooms in the building must first be determined, regardless of whether it is a supply, exhaust or overflow room!

For determining the room volume V_R, the clear room area A_R of a room is multiplied by its clear height h. The **total volume V_{NE}** of the utilisation unit is then derived from the total of the individual room volumes V_R.

EXAMPLE:

Type of room	Room area A_R [m²]	Room height h [m]	Room volume V_R [m³]
Ground floor			
Office	18.12	2.50	45.30
Technical room	8.35	2.50	20.88
Dining	17.30	2.50	43.25
Living	20.00	2.50	50.00
Kitchen	10.15	2.50	25.38
Shower room	4.05	2.50	10.13
Hall	13.51	2.50	33.78
Study	11.39	2.50	28.48
Hallway	1.95	2.50	4.88
Total ground floor	**104.82 m²**		**264.55 m³**
Upper floor			
Bathroom	9.25	2.50	23.13
Shower/toilet	3.64	2.50	9.10
Child 1	18.65	2.50	46.63
Child 2	18.65	2.50	46.63
Parents/dressing room	19.53	2.50	48.83
Landing	7.26	2.50	18.15
Total upper floor	**76.98 m²**		**192.45 m³**
Total	**181.80 m²**		**457.00 m³**

Result: **total volume V_{NE} = 457 m³**

f) Calculation of building infiltration and determination of the necessity for a technical ventilation measure according to DIN 1946-6

Using the determined factors and formula values, the building infiltration can be calculated and then proportioned with the required air volume to maintain protection against moisture in order to learn whether a technical ventilation measure according to DIN 1946-6 is required.

EXAMPLE:

Building infiltration

$$q_{v,\,Inf,\,wirk} = f_{wirk,\,komp} \times V_{NE} \times n_{50} \times (f_{wirk,\,Lage} \times \Delta p/50)^{n}$$
$$= 0.45 \times 457\ m^3/h \times 1.0 \times (1.0 \times 2\ Pa/50)^{0.667}$$
$$= \mathbf{24\ m^3/h}$$

Protection against moisture,

high heat insulation $q_{v,\,ges,\,NE,\,FLh}$ = 58.8 m³/h

low heat insulation $q_{v,\,ges,\,NE,\,FLg}$ = 78.4 m³/h

Building infiltration < protection against moisture

24 m³/h < 58.8 m³/h

24 m³/h < 78.4 m³/h

→ A technical ventilation measure according to DIN 1946-6 is required

Due to the necessity for a technical ventilation measure, the following steps are required for standardized dimensioning of the CHV system:

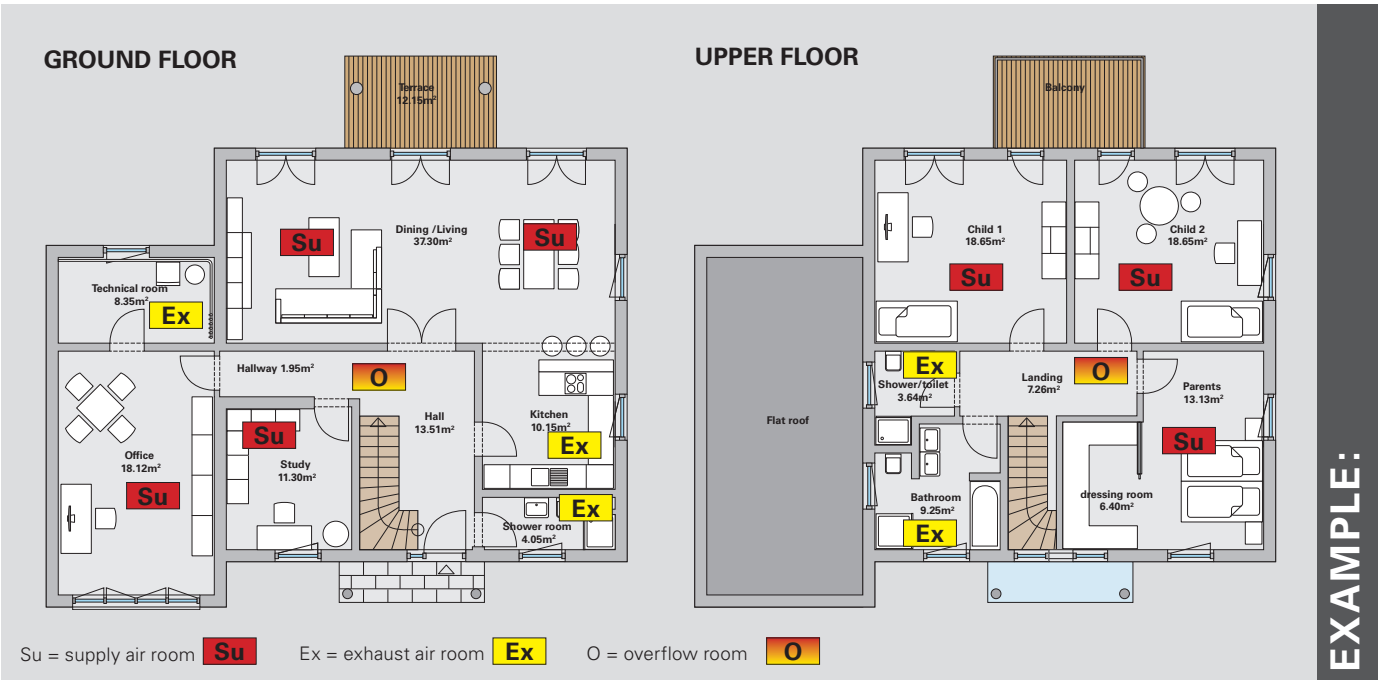
4.1.3 Definition of supply and exhaust air rooms
4.1.4 Determination of the required total flow rate
4.1.5 Determination of the ventilation operating modes
4.1.6 Consideration of building infiltration
4.1.7 Calculation of supply/exhaust air flow rates
4.1.8 Definition of overflow rooms

4.1.3 Definition of supply and exhaust air rooms

As described in Chapter 2, rooms are divided into supply air, overflow and exhaust air rooms. Supply and exhaust air rooms are included in the calculation; overflow rooms usually not.

Room	Supply air	Overflow	Exhaust air
Living room	x		
Dining room	x		
Study	x		
Bedroom	x		
Children's room	x		
Spare room	x		
Hobby room	x		
Hall/hallway		x	(x)
Stairwell and landing in SFH		x	(x)
Kitchen			x
Bathroom			x
Toilet			x
Drying room			x
Laundry room			x
Utility room			x
Technical room			x

Table 4: Definition of supply air/exhaust air/overflow room



4.1.4 Determination of the required total flow rate

For determining the required total flow rate $q_{v, ges}$, the maximum value of minimum outside air flow rate according to living area (nominal ventilation) $q_{v, ges, NE, NL}$, exhaust air rooms $q_{v, ges, R, ab}$ and planned number of persons $q_{v, Person}$ must be determined first.
The highest value of these calculations must be assumed as the total flow rate $q_{v, ges}$ for further calculations:

$$\mathbf{q_{v, ges} = max\ (q_{v, ges, NE, NL}; q_{v, ges, R, ab}; q_{v, Person})}$$

a) Minimum outside air flow rate according to living area (nominal ventilation)

The minimum outside air flow rate according to living area corresponds to the nominal ventilation which has already been calculated as part of volume flow calculation for protection against moisture:

Nominal ventilation:

$$\mathbf{q_{v, ges, NE, NL} = - 0.001 \times (A_{NE})^2 + 1.15 \times (A_{NE}) + 20}$$

$$q_{v, ges, NE, NL} = - 0.001 \times (182\ m^2)^2 + 1.15 \times 182\ m^2 + 20$$

$$\mathbf{q_{v, ges, NE, NL} = 196\ m^3/h}$$

b) Minimum outside air flow rate according to exhaust air rooms

The minimum outside volume flow rates for exhaust air rooms are set in DIN 1946-6 dependent on the type of usage. The values are listed in Table 5. For calculation, the values of nominal ventilation (NL) are used and assigned to the defined exhaust air rooms.

Room	Total exhaust air flow rates $q_{v, ges, R, ab}$ in m^3/h			
	Ventilation for protection against moisture FL	Reduced ventilation RL	Nominal ventilation NL	Intensive ventilation IL
Utility room	$q_{v, ges, FL} = \frac{q_{v, ges, NL}}{q_{v, ges, NE, NL}} \times q_{v, ges, NE, FL}$	$q_{v, ges, RL} = \frac{q_{v, ges, NL}}{q_{v, ges, NE, NL}} \times q_{v, ges, NE, RL}$	25	$q_{v, ges, IL} = \frac{q_{v, ges, NL}}{q_{v, ges, NE, NL}} \times q_{v, ges, NE, IL}$
Basement room (e.g. hobby room)				
Toilet				
Kitchen			45	
Bathroom				
Shower room				
Sauna or exercise room			100	

Table 5: Total exhaust air flow rates $q_{v, ges, R, ab}$ when using ventilation for individual rooms with or without windows

The total minimum outside air flow rate according to exhaust air rooms $q_{v, ges, R, ab}$ is then derived from the total of the individual exhaust air volumes.

EXAMPLE:

Type of room	Area A_R [m²]	Room height h [m]	Room content V_R [m³]	Supply air [m³/h]	Exhaust air [m³/h]
Ground floor					
Office	18.12	2.50	45.30		
Technical room	8.35	2.50	20.88		25
Dining	17.30	2.50	43.25		
Living	20.00	2.50	50.00		
Kitchen	10.15	2.50	25.38		45
Shower room	4.05	2.50	10.13		45
Hall	13.51	2.50	33.78		
Study	11.39	2.50	28.48		
Hallway	1.95	2.50	4.88		
Total ground floor	**104.82 m²**		**264.55 m³**	**0 m³/h**	**115 m³/h**
Upper floor					
Bathroom	9.25	2.50	23.13		45
Shower/toilet	3.64	2.50	9.10		45
Child 1	18.65	2.50	46.63		
Child 2	18.65	2.50	46.63		
Parents/dressing room	19.53	2.50	48.83		
Landing	7.26	2.50	18.15		
Total upper floor	**76.98 m²**		**192.45 m³**	**0 m³/h**	**90**
Total	**181.80 m²**		**457.00 m³**	**0 m³/h**	**205 m³/h**

c) Minimum outside air flow rate according to number of persons

The minimum outside air flow rate depending on occupancy rate of the utilisation unit can be found in Table 6:

If due to living area or number of persons a higher total volume flow rate is calculated as compared to the total of all exhaust air rooms, the exhaust air volume must be increased accordingly.

Number of persons	Volume flow rate in m³/h
1	30
2	60
3	90
4	120
5	150
6	180

Table 6: Total volume flow rate according to number of persons $q_{v, Person}$

EXAMPLE:

Single-family home with 4 persons

The minimum outside air flow rate according to the number of persons is listed in Table 6:

→ **$q_{v, Person}$ = 120 m³/h**

Using the determined minimum outside flow rates, the required total flow rate $q_{v, ges}$ can now be determined:

according to living area $q_{v, ges, NE, NL}$ = **196 m³/h**
according to exhaust air rooms $q_{v, ges, R, ab}$ = **205 m³/h**
according to persons $q_{v, Person}$ = **120 m³/h**

→ $q_{v, ges} = \max (q_{v, ges, NE, NL}; q_{v, ges, R, ab}; q_{v, Person})$
→ $q_{v, ges} = \max (196\ m^3/h; 205\ m^3/h; 120\ m^3/h)$
→ **$q_{v, ges}$ = 205 m³/h**

4.1.5 Determination of the ventilation operating modes

As described at the beginning of Chapter 4.1, the standard requires evidence that four ventilation modes are installed which ensure sufficient air exchange under different conditions of use:

- ventilation for protection against moisture = $q_{v, ges, NE, FL}$
- reduced ventilation = $q_{v, ges, NE, RL}$
- nominal ventilation = $q_{v, ges, NE, NL}$
- intensive ventilation = $q_{v, ges, NE, IL}$

The flow rates for ventilation for protection against moisture and the nominal ventilation have already been calculated in the previous calculations:

Ventilation for protection against moisture $q_{v, ges, NE, FL}$ = **58.8 m³/h** (in case of high heat insulation)
= **78.4 m³/h** (in case of low heat insulation)

Nominal ventilation $q_{v, ges, NE, NL}$ = **196 m³/h**

The calculation of the missing flow rates for the ventilation operating modes "reduced ventilation" and "intensive ventilation" of the utilisation unit is made, as the determination of flow rates for protection against moisture, using a defined factor which is multiplied by the calculated flow rate for nominal ventilation:

Reduced ventilation:

$$\mathbf{q_{v, ges, NE, RL} = 0.7 \times q_{v, ges, NE, NL}}$$

Intensive ventilation:

$$\mathbf{q_{v, ges, NE, IL} = 1.3 \times q_{v, ges, NE, NL}}$$

EXAMPLE:

Reduced ventilation:

$q_{v, ges, NE, RL} = 0.7 \times q_{v, ges, NE, NL}$

$q_{v, ges, NE, RL} = 0.7 \times 196$ m³/h

$\mathbf{q_{v, ges, NE, RL} = 137.2}$ **m³/h**

Intensive ventilation:

$q_{v, ges, NE, IL} = 1.3 \times q_{v, ges, NE, NL}$

$q_{v, ges, NE, IL} = 1.3 \times 196$ m³/h

$\mathbf{q_{v, ges, NE, IL} = 254.8}$ **m³/h**

As an alternative, reduced ventilation and intensive ventilation can also be determined using the already known Table 1 as soon as the total area of the utilisation unit A_{NE} is known:

Utilisation unit area A_{NE} [in m²]	< 30	50	70	90	110	130	150	170	190	210
Ventilation for protection against moisture high heat insulation $q_{v, ges, NE, FLh}$	15	25	30	35	40	45	50	**55**	**60**	65
Ventilation for protection against moisture low heat insulation $q_{v, ges, NE, FLg}$	20	30	40	45	55	60	70	**75**	**80**	85
Reduced ventilation $q_{v, ges, NE, RL}$	40	55	65	80	95	105	120	**130**	**140**	150
Nominal ventilation $q_{v, ges, NE, NL}$	55	75	95	115	135	155	170	**185**	**200**	215
Intensive ventilation $q_{v, ges, NE, IL}$	70	100	125	150	175	200	220	**245**	**265**	285

Table 1: Minimum values of total outside air flow rates

4.1.6 Consideration of building infiltration

As the last calculation step for determining the total flow rate of the utilisation unit relevant to ventilation, the building infiltration must be taken into account and subtracted from the total flow rate calculated in Chapter 4.1.4. Due to leaks in the building envelope, outside air is infiltrated or exfiltrated because of a natural differential pressure. This inward or outward flow must be subtracted from the total air flow rate to calculate the value of the total flow rate of the utilisation unit in m³/h which is relevant to the further calculations.

→ $q_{v, ges, Inf} = q_{v, ges} - q_{v, Inf, wirk}$

EXAMPLE:

$q_{v, Inf, wirk}$ = 24 m³/h (the value for building infiltration has already been determined in Chapter 4.1.2.)

$q_{v, ges}$ = 205 m³/h

→ $q_{v, ges, Inf} = q_{v, ges} - q_{v, Inf, wirk}$

→ $q_{v, ges, Inf}$ = 205 m³/h - 24 m³/h

→ **$q_{v, ges, Inf}$ = 181 m³/h**

4.1.7 Calculation of supply/exhaust air flow rates

The calculated total flow rate of the utilisation unit considering the infiltration $q_{v, ges, Inf}$ is now allocated to the individual supply and exhaust air rooms.
This is done using the supply air factors (Table 7) and exhaust air values (Table 5) set in DIN 1946-6.

For calculating the supply air flow rates, the factor of the corresponding room is divided by the total of all factors set for the utilisation unit and multiplied by the value for the total flow rate less building infiltration.

Supply air flow rate

$$q_{v, LtM, R, zu} = \frac{f_{R, zu}}{\sum_{R, zu} f_{R, zu}} \times q_{v, ges, Inf}$$

$q_{v, LtM, R, zu}$ = supply air flow rate due to technical ventilation measures for an exhaust air room in m³/h;

$f_{R, zu}$ = factor for distributing the supply air flow rates according to Table 7;

$q_{v, ges, Inf}$ = total flow rate less infiltration due to technical ventilation measures for the utilisation unit when using nominal ventilation in m³/h.

Room	Factor $f_{R, zu}$ for planned distribution of the supply air flow rates
Living room	**3 (±0.5)**
Bedroom/children's room	**2 (±1.0)**
Dining room	**1.5 (±0.5)**
Study	
Spare room	

Table 7: supply air factors $f_{R, zu}$ supply air according to DIN 1946-6

EXAMPLE:

Calculation of **supply air flow rates**

$$q_{v, LtM, R, zu} = \frac{f_{R, zu}}{\sum_{R, zu} f_{R, zu}} \times q_{v, ges, Inf}$$

$\sum_{R, zu} f_{R, zu}$ = ground floor ∑ office, dining, living, study
+ upper floor ∑ child 1, child 2, parents

$\sum_{R, zu} f_{R, zu}$ = ground floor (1.5 + 1.5 + 3 + 1.5) + upper floor (2 + 2 + 2)

$\sum_{R, zu} f_{R, zu}$ = **13.5**

Ground floor:

Office = (1.5/13.5) x 181 m³/h = 20.1 m³/h ~ 20 m³/h
Dining = (1.5/13.5) x 181 m³/h = 20.1 m³/h ~ 20 m³/h
Living = (3/13.5) x 181 m³/h = 40.2 m³/h ~ 40 m³/h
Study = (1.5/13.5) x 181 m³/h = 20.1 m³/h ~ 20 m³/h

Upper floor:

Child 1 = (2/13.5) x 181 m³/h = 26.8 m³/h ~ 27 m³/h
Child 2 = (2/13.5) x 181 m³/h = 26.8 m³/h ~ 27 m³/h
Parents = (2/13.5) x 181 m³/h = 26.8 m³/h ~ 27 m³/h

For calculating the individual exhaust air flow rates, the minimum exhaust air flow rates depending on the type of usage according to Table 5 are used. The values indicated there are divided per room by the total minimum outside air flow rate and multiplied by the value for the total volume flow rate less building infiltration:

Exhaust air flow rate

$$q_{v,\,LtM,\,R,\,ab} = \frac{q_{v,\,ges,\,R,\,ab}}{\sum_{R,\,ab} q_{v,\,ges,\,R,\,ab}} \times q_{v,\,ges,\,Inf}$$

$q_{v,\,LtM,\,R,\,ab}$ = exhaust air flow rate due to technical ventilation measures for an exhaust air room in m³/h;
$q_{v,\,ges,\,R,\,ab}$ = exhaust air flow rates including infiltration according to Table 5
$q_{v,\,ges,\,Inf}$ = total flow rate less infiltration due to technical ventilation measures for the utilisation unit when using nominal ventilation in m³/h.

EXAMPLE:

Calculation of **exhaust air flow rates**

$$q_{v,\,LtM,\,R,\,ab} = \frac{q_{v,\,ges,\,R,\,ab}}{\sum_{R,\,ab} q_{v,\,ges,\,R,\,ab}} * q_{v,\,ges,\,Inf}$$

Ground floor:
Technical room = (25/205) m³/h x 181 m³/h = 21.0 m³/h ~ 21 m³/h
Kitchen = (45/205) m³/h x 181 m³/h = 39.7 m³/h ~ 40 m³/h
Shower room = (45/205) m³/h x 181 m³/h = 39.7 m³/h ~ 40 m³/h

Upper floor:
Bathroom = (45/205) m³/h x 181 m³/h = 39.7 m³/h ~ 40 m³/h
Shower/toilet = (45/205) m³/h x 181 m³/h = 39.7 m³/h ~ 40 m³/h

EXAMPLE:

Type of room	Room content [m³]	less infiltration	
		Supply air [m³/h]	Exhaust air [m³/h]
Ground floor			
Office	45.30	20	
Technical room	20.88		21
Dining	43.25	20	
Living	50.00	40	
Kitchen	25.38		40
Shower room	10.13		40
Hall	33.78		
Study	28.48	20	
Hallway	4.88		
Total ground floor	**264.55 m³**	**100 m³/h**	**101 m³/h**
Upper floor			
Bathroom	23.13		40
Shower/toilet	9.10		40
Child 1	46.63	27	
Child 2	46.63	27	
Parents/dressing room	48.83	27	
Landing	18.15		
Total upper floor	**192.45 m³**	**81 m³/h**	**80**
Total	**457.00 m³**	**181 m³/h**	**181 m³/h**

Important:

The totals of supply and exhaust air flow rates must be balanced!

4.1.8 Definition of overflow rooms

Due to the difference in pressure between supply and exhaust air room, air flows through the so-called overflow rooms. To ensure this, precautions must be taken, e.g. installing ventilation grills into the wall or door leaf and/or shortening of door leaves in the lower section (Table 8).

Air volume	[m³/h]	10	20	30	40	50	60	70	80	90	100
Door with sealing											
Shortening measure	[mm]	3	6	8	11	14	17	20	22	25	28
Overflow area	[cm²]	25	50	75	100	125	150	175	200	225	250
Door without sealing											
Shortening measure	[mm]	0	3	6	8	11	14	17	20	22	25
Overflow area	[cm²]	0	25	50	75	100	125	150	175	200	225

Table 8: Overflow outlets according to DIN 1946-6

EXAMPLE:

Determining the **overflow outlet**

Type of room: Shower room
Room content: 10.13 m³
Exhaust air volume flow rate: 40 m³/h
Type of door: without sealing
Shortening measure: 11 mm or
Overflow area: 100 cm² (e.g. as a ventilation grill)

4.2 Ventilation unit installation room

The unit location must be determined early in the planning phase since it fundamentally affects the installation of the entire system.
Usually, the unit is installed in the following rooms:

- basement
- utility room
- technical room on the top floor
- attic

Requirements regarding the equipment and properties of the installation room can be found in the installation manual of the respective unit manufacturer. However, there are some basic characteristics/properties which are mandatory for the installation room:

- frost-free throughout the year
- frost-free connection to the wastewater system for units with heat recovery
- sufficient space - e.g. manifolds or reheaters may be installed in addition to the ventilation unit which usually require more space than the unit itself
- the accessibility of the unit must be ensured for maintenance/cleaning
- connections, e.g. for power and water supply, must exist
- wall outlets are required for which should not be below or directly next to rooms which require a quiet environment (living room, bedroom)
- centralised location of the room reduces routing
- statically resilient installation surface
- if the air induction is effected via an earth-air heat exchanger, the unit should be installed in the basement or ground floor

4.3 Selection of the air distribution system

The selection of the air distribution system significantly depends on the building conditions. Space requirements and installation time are fundamental factors. Moreover, individual requirements of the customer affect the selection of an air distribution system. Planning and execution must be done carefully to avoid subsequent changes which most often involve considerable effort and high additional costs.

The following designs can be selected from the product range of Fränkische Rohrwerke:

profi-air classic air distribution system (round pipe version) for installation

- in/on concrete ceilings
- in walls (dim. 63 mm)
- as riser pipe
- inside suspended ceilings

Advantages: high flexibility, low material costs

profi-air air tunnel distribution system (tunnel pipe version) for installation

- on the concrete ceiling
- in walls
- inside suspended ceilings

Advantage: low installation height

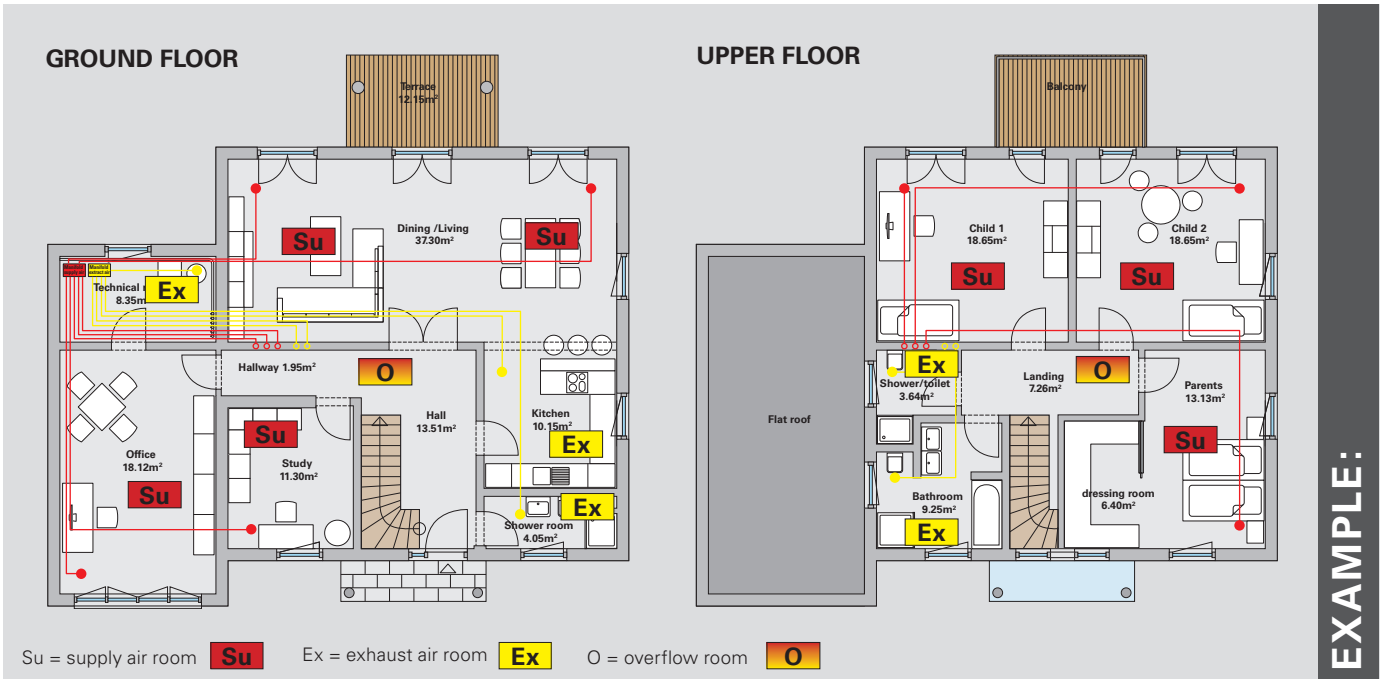
Both systems can be combined with each other as desired and are therefore equally suitable for all applications and installation situations.

4.4 Positioning of air outlets and determination of pipe sections

Before the air distribution system can be dimensioned, the positions of the air outlets must be determined. Some important facts must be observed in this regard:

- do not position the valves directly in the living zone
- preferably install floor elements (supply air) with an underfloor heating
- do not install air elements in concealed spaces (e.g. wardrobes, curtains)
- observe a distance of approx. 40 to 50 cm to the room enclosure areas
- position exhaust air valves as close as possible to the ceiling of the room
- do not install exhaust air valves directly above radiators, bath tubs or in the shower
- equip exhaust air valves with a filter

The pipe sections of the air distribution system can be determined based on the components selected in Section 4.3. To keep the max. pressure loss of the installation at a low level, short routing distances should be observed.



4.5 Dimensioning of the air distribution system - determination of the maximum pressure losses

The cross-section of the required ventilation duct can be calculated according to the following formula:

$$A = \frac{V}{s \times 3.6} \text{ [mm]}$$

s = flow velocity in m/s
V = volume flow rate in m³/h

Reference values for the flow velocity s:

Type of pipe	Air distribution zone	Recommended flow velocity s [m/s]	Insulation
supply/exhaust air	pipes after manifold	2.5 – 3.0	recommended for active units
supply/exhaust air	pipes before manifold	4.0 – 5.0	recommended for active units
supply/exhaust air	at the air outlet	0.5 – 1.0	–
supply/exhaust air	in the living zone	0.1 – 0.2	–
outside/outgoing air	main pipes	4.0 – 5.0	insulated diffusion-resistant
outside/outgoing air	earth-air heat exchanger	1.5 – 2.0	–

Table 9: Reference values for flow velocities

To facilitate dimensioning, the following air volumes can be used as reference values for the profi-air pipe system:

Pipe system	Flow velocity s [m/s] as connection pipe (pipe after manifold)	Max. air volume [m³/h]
profi-air classic NW 63	3 m/s	23
profi-air classic NW 75	3 m/s	30
profi-air classic NW 90	3 m/s	45
profi-air tunnel	3 m/s	45

Table 10: Max. air volume depending on the pipe dimension

EXAMPLE:

In the example single-family home, the supply/exhaust air pipes for the ground floor are installed in the concrete ceiling between ground and upper floor. The supply/exhaust air valves for the ground floor are installed in the ceiling.

➔ profi-air classic system from the manifold to the air outlets on the ground floor

The supply/exhaust air pipes for the upper floor are installed on the concrete floor of the upper floor. The supply/exhaust air valves for the upper floor are installed in the wall.

➔ profi-air classic system from the manifold to the concrete floor on the upper floor, then profi-air tunnel system on the concrete floor up into the wall to the air outlets.

The supply/exhaust air volumes of the individual rooms must now be compared to the max. permissible volume flow rates of Table 10 to select the correct pipe dimension and, if required, the number of pipes.

Type of room	Room content [m³]	less infiltration		Pipe dimension		
		Supply air [m³/h]	Exhaust air [m³/h]	Classic NW75	Classic NW90	tunnel
Ground floor						
Office	45.3	20		x		
Technical room	20.88		21	x		
Dining	43.25	20		x		
Living	50.00	40			x	
Kitchen	25.38		40		x	
Shower room	10.13		40		x	
Hall	33.78					
Room	28.48	20		x		
Hallway	4.88					
Total ground floor	**264.55 m³**	**100 m³/h**	**101 m³/h**			
Upper floor						
Bathroom	23.13		40		x	x
Shower/toilet	9.1		40		x	x
Room 1	46.63	27		x		x
Room 2	46.63	27		x		x
Parents/dressing room	48.83	27		x		x
Landing	18.15					
Total upper floor	**192.45 m³**	**81 m³/h**	**80 m³/h**			
Total	**457.00 m³**	**181 m³/h**	**181 m³/h**			

After the air pipes of the individual rooms (pipe sections) have been dimensioned dependent on the room volume flow rate and the flow velocity, it is important to find the so-called main pipe. It is the basis for dimensioning the ventilation unit.

The main pipe is the air route for which the highest pressure loss over the whole pipe length can be expected.

The following formula should be used for the calculation:

$$p_{v,\,ges} = p_{v,\,Rohr} + p_{v,\,ET} + p_{v,\,Z}$$

- $P_{v,\,ges}$ = total system pressure loss main pipe
- $P_{v,\,Rohr}$ = pressure loss duct and/or redirections
- $P_{v,\,ET}$ = pressure loss of installation parts (bend, transition...)
- $P_{v,\,Z}$ = pressure loss accessories (constant airflow regulator, manifold, sound damper...)

EXAMPLE:

Identification of the main pipe:

Type of room: parents
Volume flow rate: 27 m³
Velocity: 3.0 m/s

The pressure losses of the profi-air pipes, fittings, installation parts and manifolds can be found in the brochure profi-air technical data.

Pipe system	Pipe section length [m]	Pressure loss [Pa/m]	Pressure loss $p_{v,\,Rohr}$ per pipe section [Pa]
profi-air classic NW75	6	1.8	10.8
profi-air classic NW90	-	-	-
profi-air tunnel	17	1.9	32.3

Installation parts (from unit to air outlet)	Length [m]/ quantity [pc.]	Pressure loss [Pa/m]	Pressure loss $p_{v,\,ET}$ per installation part [Pa]
profi-air ISO pipe DN160	1 m	0.5	0.5
profi-air ISO pipe DN160 90° bend	1 pc.	0.8	0.8
profi-air classic manifold 10x	1 pc.	11	11
profi-air classic adaptor elbow 90° to tunnel	1 pc.	1	1
profi-air tunnel elbow horizontal 90°	2 pc.	0.7	1.4
profi-air tunnel elbow vertical 90°	1 pc.	0.7	0.7
profi-air tunnel outlet 90° for valves	1 pc.	1	1
profi-air supply valve	1 pc.	10	10
Total pressure loss in Pa			**69.5**

The main pipe must be determined for supply and exhaust air. This must be considered for setting the system operating point in Chapter 4.6.

4.6 Setting the system operating point

The fans installed in the ventilation unit generating positive pressure on the supply air side and negative pressure on the exhaust air side work against the flow resistance of the duct system. The higher the supply/ exhaust air flow rate or the higher the system pressure loss, the higher is the fan performance level. Using the fan characteristic, the fan performance can be set dependent on the flow rate and the pressure increase. Depending on the type of fan, the characteristic is different.
The operating point of the system. i.e. the intersection between pipe network and fan characteristic should be within the range of the maximum coefficient of the fan. The fan characteristic can be found in the manufacturer's documentation on the ventilation unit.

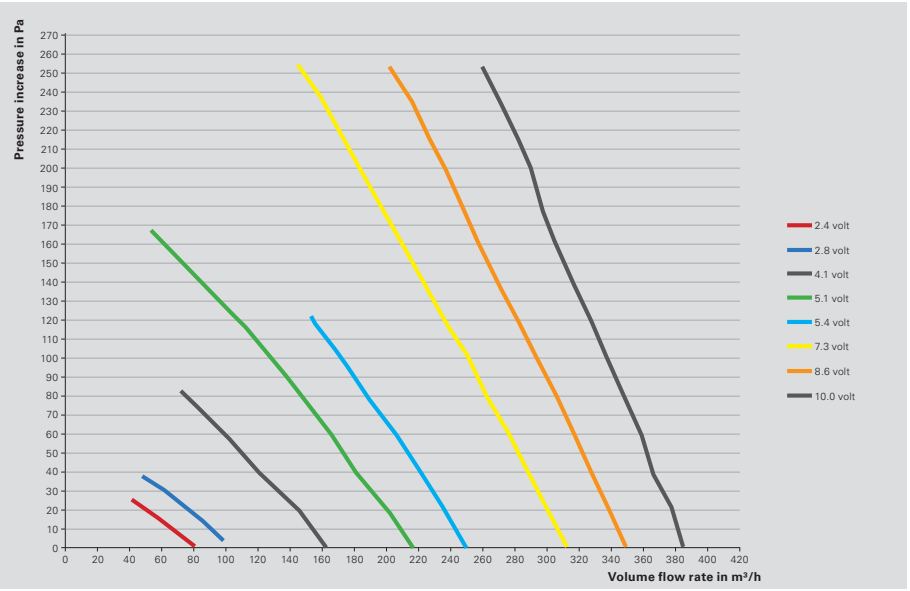


Table 11: profi-air 250 touch fan characteristic

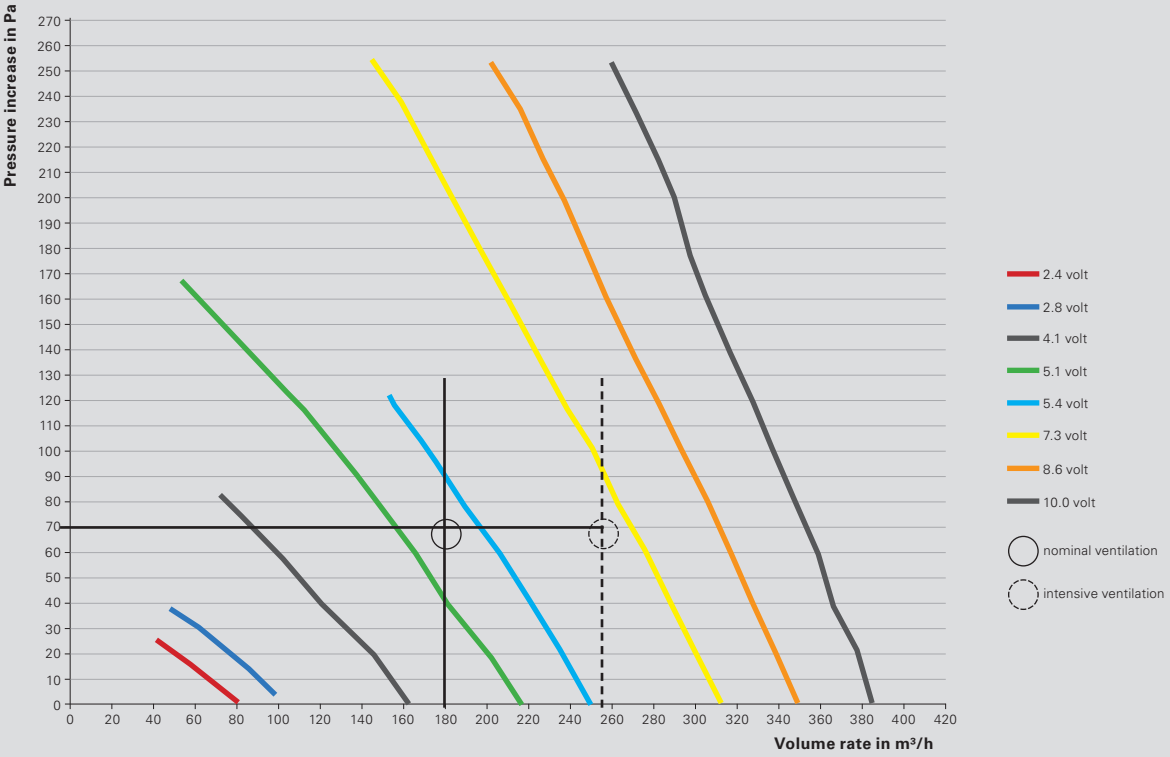
Advice:

Overdimensioning the fan performance should be avoided since this affects energy efficiency.

EXAMPLE:

According to the calculation of the nominal flow rate, a profi-air 250 touch ventilation unit is used in our example. Setting the system operating point and/or adjusting the fans is done using Table 11 which can be found in the profi-air touch installation manual (part 2).

➔ nominal flow rate = 181 m³/h
➔ intensive ventilation = 255 m³/h
➔ total pressure loss in main pipe = 69.5 Pa



If the system is to be operated according to DIN 1946-6, i.e. with the nominal air flow rate as a maximum, the 5.4. Volt curve should be selected. If the intensive ventilation mode should be available, the 7.3 Volt curve must be selected.

The choosen parameters have to be adjusted within the profi-air touch control system while the setting up process.

4.7 Principles

4.7.1 Combined use of fireplaces and ventilation

If a fireplace is used together with a ventilation system, some basic aspects must be observed. To keep the fault potential as low as possible, the district master chimney sweep must always be consulted.

Possible faults/issues may be a failure of the supply air fan, a highly contaminated outside air filter or an incorrectly set air volume. This may generate negative pressure which results in a dangerous CO or CO_2 concentration in the surroundings of the fireplace.

The type of fireplace is important for the security technology applied. A difference is made between a room air-dependent and room air-independent fireplace (with DIBt certificate/product standard).

Room air-dependent fireplaces
When a fireplace is used together with ventilation, safety equipment (e.g. negative pressure monitoring with DIBt certificate/product standard) is required. The negative pressure monitoring device shuts down the connected ventilation system in case of emergency. Sufficient combustion air supply must be ensured. In general, an external combustion air supply option is recommended.

Room air-independent fireplaces
When using a room air-independent fireplace (e.g. a chimney) with DIBt certificate/product standard, no safety equipment is required.

Illustration of the technical principle:

Fig. 1: Room air-dependent fireplace with security equipment

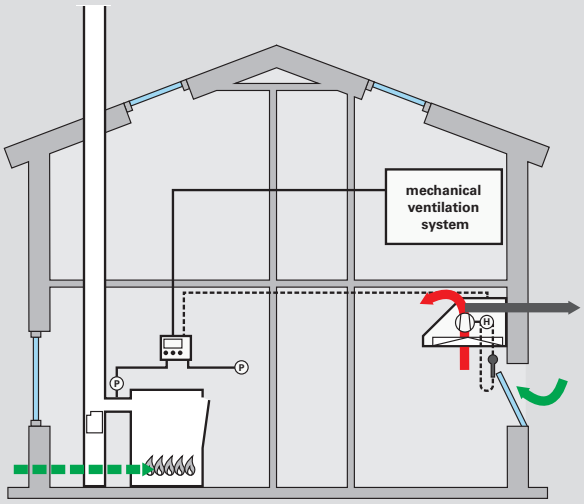
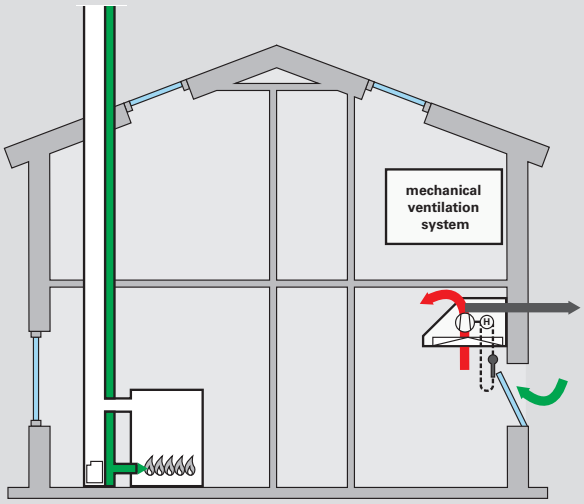


Fig. 2: Room air-independent fireplace using the example of an air flue system



Caption:

Safety equipment

negative pressure monitoring

Additional safety equipment
(in case of an exhaust air fume hood)

window contact switch

Types of air

- fresh air
- circulating air
- exhaust air

4.7.2 Fire protection

The term "fire protection" is defined as follows:

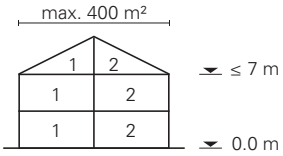
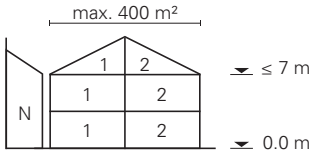
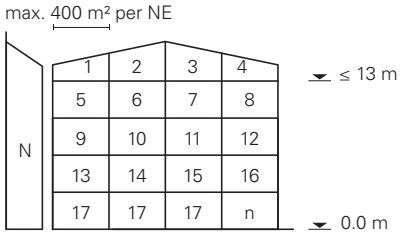
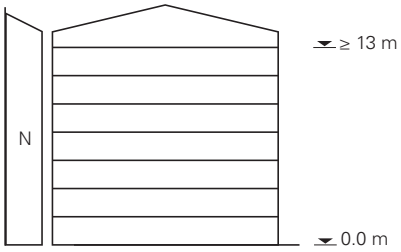
"Fire protection includes all measures preventing the development of fire or propagation of fire and smoke and allowing rescue of humans and animals as well as effective fire-fighting operations in case of fire."

The subject of fire protection is very comprehensive, therefore, it can be found in many areas of daily life. For this reason, fire protection requirements in Germany are strictly implemented in a multitude of legal regulations, provisions and policies such as the fire and fire service laws of the 16 German federal states.

The following regulations are important in the field of ventilation:

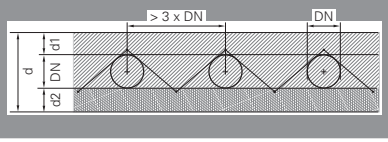
- MLüAR model ventilation system policy (Muster-Lüftungsanlagen-Richtlinie)
- LüAR ventilation system policy (Lüftungsanlagen-Richtlinie)
- RbLüAR policy on fire protection requirements of ventilation systems (Richtlinie über brandschutztechnische Anforderungen an Lüftungsanlagen)
- DIN 4102 fire behaviour of building materials and building components
- DIN 18232 smoke and heat control systems
- VDI 3819 fire protection in building technology
- MBO model building regulations (Musterbauordnung)
- LBO state building code (Landesbauordnung)

Which fire protection measures must be taken is determined on the basis of the building condition. For example, the height of the building and the number of utilisation units (self-contained flats) are decisive factors. The model building regulations define different building classes:

Building class		Fire protection requirements
Building class 1: 	Detached building with a height of up to 7 m and no more than two utilisation units with a total area of max. 400 m²	No special fire protection requirements.
Building class 2: 	Buildings with a height of up to 7 m and no more than two utilisation units with a total area of max. 400 m²	No special fire protection requirements. **Exception:** dividing walls between two utilisation units, of stairwells and dividing building walls.
Building class 3: 	Other buildings with a height of up to 7 m	Special fire protection requirements apply to these building classes for ventilation systems. **Exception:** ventilation ducts within flats or within the same utilisation unit with an area of max. 400 m² and with max. two floors.
Building class 4: 	Buildings with a height of up to 13 m and utilisation units with an area of max. 400 m² each	Special fire protection requirements apply to these building classes for ventilation systems. **Exception:** Ventilation ducts within flats or within the same utilisation unit with an area of max. 400 m² and with max. two floors.
Building class 5: 	Other buildings including underground buildings	Special fire protection requirements apply to these building classes for ventilation systems. **Exception:** Ventilation ducts within flats or within the same utilisation unit with an area of max. 400 m² and with max. two floors.

Information on the installation of flammable ventilation ducts in concrete ceilings

Ventilation pipes can be routed outside or inside the concrete ceiling. Installing the pipes inside the ceiling saves space and does not affect the floor construction. The profi-air classic pipe is particularly suitable for this purpose.
According to DIN 4102-2, fire resistance classes of ceilings with flammable components, the minimum ceiling thicknesses in the table on the right must be observed. In all cases, a fire protection expert should be consulted.

Construction characteristics 	Fire resistance class name					
	F 0		F 30-A		F 90-A	
	d_1	d_2	d_1	d_2	d_1	d_2
Minimum coverage* [mm]	50		50		50	
Minimum underlay [mm]		50		80		100
Recommended minimum ceiling thickness without considering pipe intersections with electrical conduits [mm]	d = 180		d = 220		d = 240	
Recommended minimum ceiling thickness considering pipe intersections with electrical conduits [mm]	d = 200		d = 240		d = 260	

DN = diameter ventilation pipe 75 mm or see manufacturer's specifications
* Values are valid only when a floating screed floor with a minimum thickness of 25 mm is installed.

Fire resistance classes of ceilings for steel and prestressed concrete plates made of standard concrete with flammable components

4.7.3 Sound generation and protection

By installing a controlled home ventilation system and the installation and use of a ventilation unit associated with it, sound emissions are generated which enter the residential building. The noise is mainly caused by the fans of the ventilation unit. There are different ways of sound transmission. A difference is made between:

- duct noise, fed into the rooms by the connected air distribution system
- device noise, generated by the ventilation unit in the installation room
- impact sound, generated by the attachments between ventilation unit and building

As a general rule, the noise should be kept as low as possible already at their place of origin. The following aspects should be observed to achieve this:

Minimising fan noise
- low output pressure
- sound damper directly on the unit

Minimising flow noises
- most favourable layout of the air ventilation system in terms of air flow (no sharp edges in the fittings/smooth inner surface of the pipe)

Minimising impact sound
- impact sound decoupling of ventilation unit and building
- impact sound decoupling of ventilation unit and distribution system

Minimising telephony noise between rooms
- star-shaped installation of the air distribution system
- minimum pipe length between manifold and air outlet of 4 m

Sound pressure level in rooms
The max. permissible sound pressure level for technical ventilation measures according to DIN 4109 is defined as follows:

30 dB(A) - living rooms/bedrooms
35 dB(A) - functional/installation rooms

The values required according to DIN 4109 are considered too high in everyday life, though. Therefore, the following empirical values must be aimed at:
- living rooms/bedrooms 25 dB(A)
- functional/installation rooms 30 dB(A)

4.7.4 Filters and filter classes

In the field of controlled home ventilation, filters are used to improve the room air quality and for protection against contamination of the duct system, the heat exchanger and the fans. The preinstalled filters in the unit are usually located close to the fresh air and exhaust air duct.
The installation of valve filters provides additional protection against contamination of the exhaust air ducts.

The installed filters must be inspected at regular intervals (according to DIN 1946-6 this is every 6 months) and replaced, if necessary.

The filters are grouped into filter classes. "G" stands for coarse filter and "F" for fine filter. In addition to that, both classes are classified according to the following table.

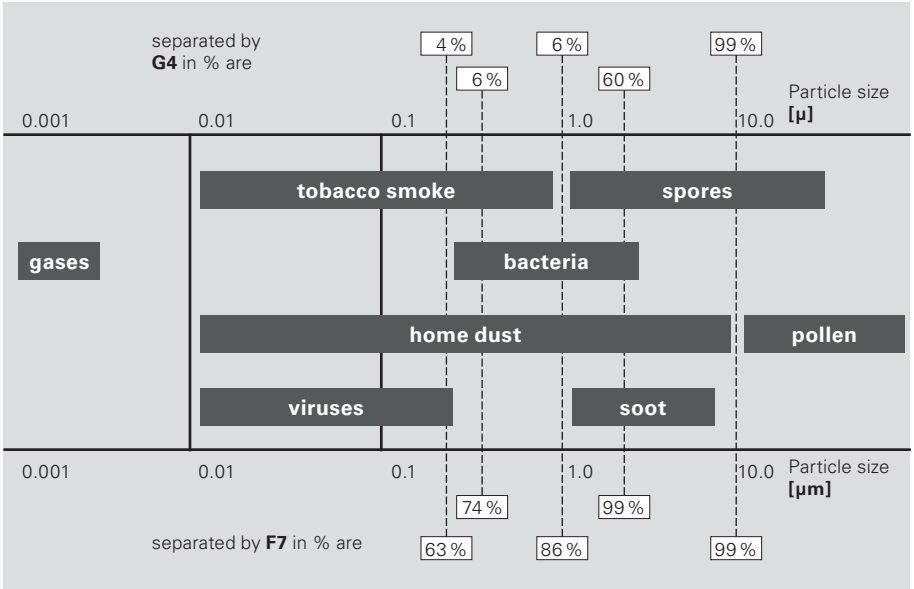
Applications (minimum requirements) for coarse dust filters with various filtration efficiencies according to DIN EN 779			
	G1 - G3	**G3 - F5**	**F5**
General information	■ ineffective against smoke and particles causing stains (soot, oil mist, etc.)	■ limited filtration of pollen ■ minimum effect with regards to smoke and particles causing stains (soot, oil mist, etc.)	■ filtration of pollen ■ limited effect with regards to smoke and particles causing stains (soot, oil mist, etc.) ■ systems with dehumidification
Special applications	■ supply air systems with low requirements regarding air purity ■ prefiltration ■ control cabinets	■ simple ventilation units in windows, fans and heat exchange aggregates ■ as a prefilter upstream of fine filters	■ climate cabinets ■ as a prefilter for air protection systems ■ as a prefilter upstream of fine filters

Applications for coarse dust filters

Applications (minimum requirements) for fine particle filter with various filtration efficiencies according to DIN EN 779			
	F5 - F7	**F7 - F9**	**F10**
General information	■ filtration of pollen ■ limited effect with regards to smoke and particles causing stains (soot, oil mist, etc.)	■ effective against all types of dust including particles causing stains (soot, oil mist, etc.) ■ effective against tobacco smoke, germs	■ very effective against particles causing stains (soot, oil mist, etc.) ■ effective against germs
Special applications	■ supply air and partial air conditioning systems for schools, kitchens, etc. ■ cooling of rooms for elevator machines ■ air curtain for food stores ■ forced-air heating ■ food stores	■ partial and full air conditioning systems for laboratories, offices, theatres, butcheries ■ telecommunications systems, optical workshops, EDP rooms	■ production facilities for drugs, laboratories, supply air for EDP, examination rooms ■ supply air for radiological laboratories ■ anterooms for steriliser and surgery rooms

Applications for fine particle filter

By default, filter classes G4 (exhaust air) and F5 or F7 (fresh air) are used in the field of controlled home ventilation. The following filtration efficiencies can be achieved using these filters:



Filtration efficiency G4/F7 filter

5 Installation and products

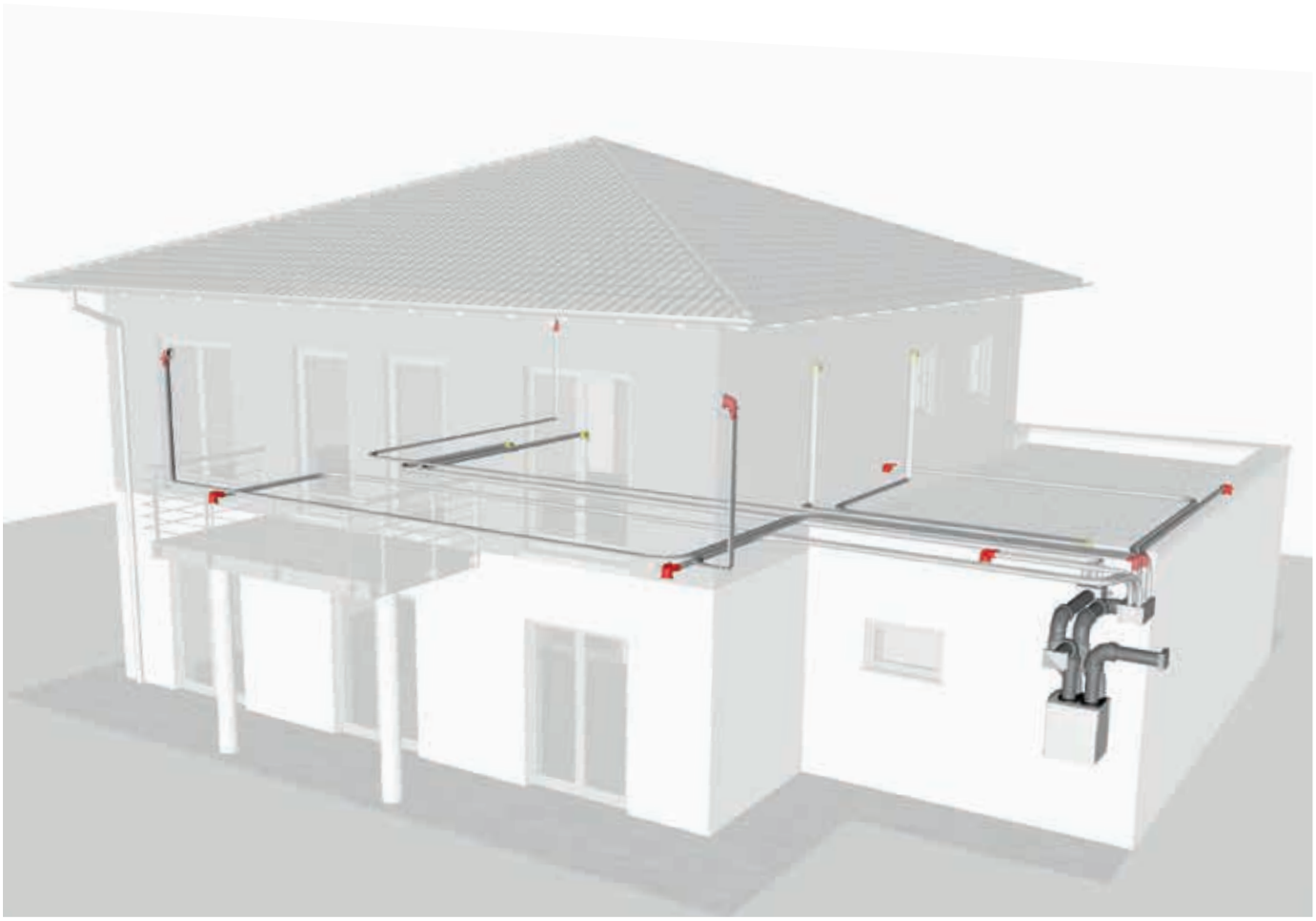
5.1 Pipe system

5.1.1 General information

The profi-air air distribution system is the main component of the ventilation system. The star-shaped distribution distributes the building's/apartments' entire required air volume from the ventilation unit via the manifolds to the individual rooms. Depending on the pipe system, different installation situations can be implemented and air volumes transported.

The following systems are available:

- profi-air classic NW 63/75/90
- profi-air tunnel



5 Installation and products

Our many years of experience as leading manufacturer of corrugated pipes and our specially developed manufacturing technology allow manufacturing highest quality ventilation pipes. Both the profi-air classic pipe and the profi-air tunnel pipe feature an antistatic and antibacterial internal coating. The pipes are additionally sealed with pipe plugs on both ends.
profi-air classic and profi-air tunnel pipes can be combined with each other using specifically designed fittings. The system allows realising all common installation variants depending on the space and installation conditions. Precise and careful installation of the pipe system, ensuring short pipe routes and using flow-optimised fittings are important factors for low pressure losses and thus increase the efficiency of the overall system.

Important notes for the installation of profi-air classic and profi-air tunnel pipes:

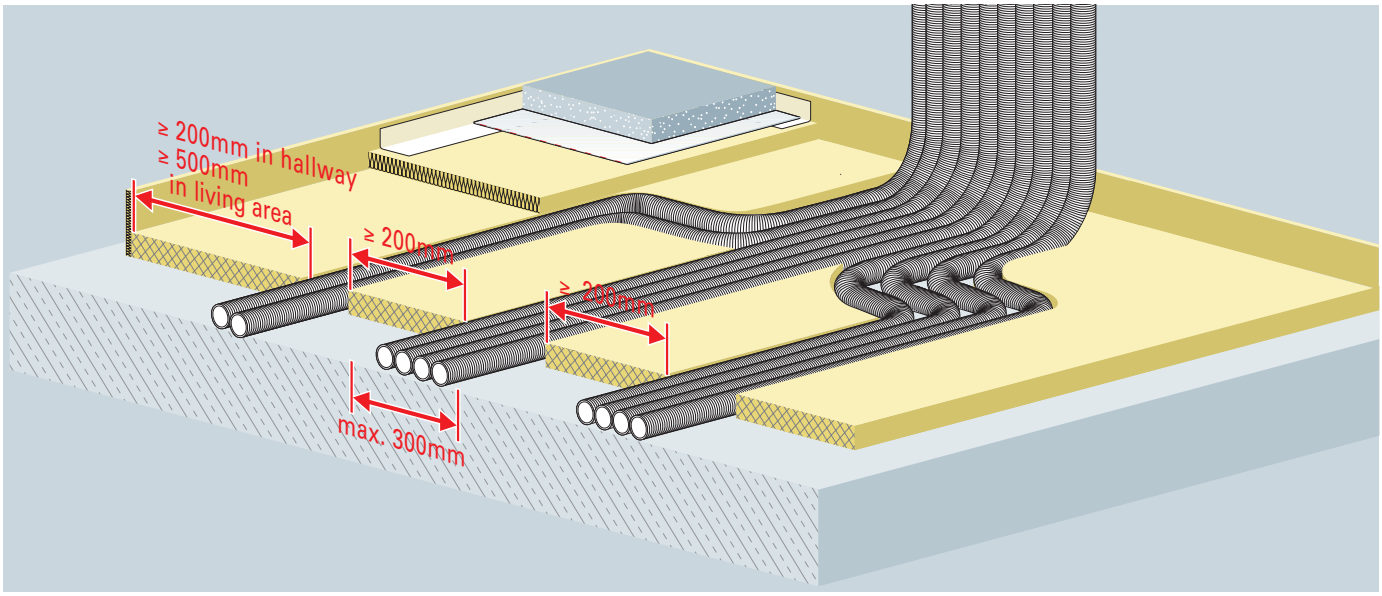
Statics

If profi-air air pipes are installed in concrete ceilings, this must be considered for the design of the ceiling construction. Complex constructions, such as ceilings that are braced against each other crosswise or long spreads, include areas in which pipes must not be installed. The responsible planner/structural engineer must thus be consulted in general.

Pipe routing in the insulation area under the screed

The installation of pipes in the floor structure can reduce the load bearing capacity of the screed. Therefore, the following minimum distances for horizontal pipe routing in residential construction must be observed according to "BEB – Bundesverband Estrich und Belag":

- route width of parallel pipes: max. 30cm
- width of the support between two pipe routes running next to each other: min. 20cm
- distance from the wall to the outer edges of the pipes or pipe runs as support for the screed: min. 20cm in the hallway / min. 50cm in the living area



In case of pipe route bundles the aforementioned dimensions have to observed as best as possible. For this appropriate pipe routings should be used. The responsible planner or composition floor layer must be consulted in general.

5.1.2 profi-air classic pipe

The profi-air classic system comprises the profi-air classic pipe and the associated profi-air classic fittings. The double-walled profi-air classic pipes are highly flexible corrugated PE pipes. The corrugation of the jacket guarantees a ring stiffness > 8 kN/m² according to EN ISO 9969 despite its high flexibility. In addition, an uninterrupted connection between manifold and air outlet can be achieved without requiring fittings in the pipe route in most cases. By reason of the simple push-fit principle which requires no tools, the defective installation will be minimized and the processing efficiency will be increased.

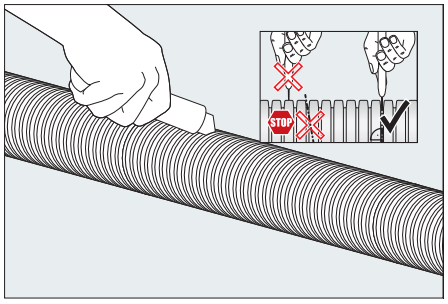
The following building elements fits for the installation of the profi-air classic system:

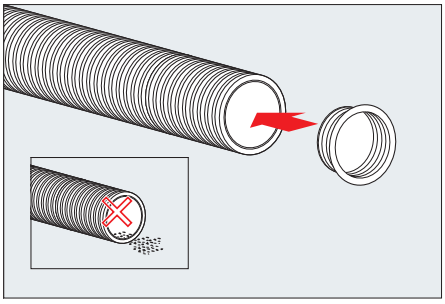
Building element:	profi-air classic		
	NW63	NW75	NW90
Bare concrete ceiling	x	x	x
Insulation level under the screed	x	x	–
Suspended ceiling	x	x	x
Walls	x	x	x
Light-weight walls	x	–	–

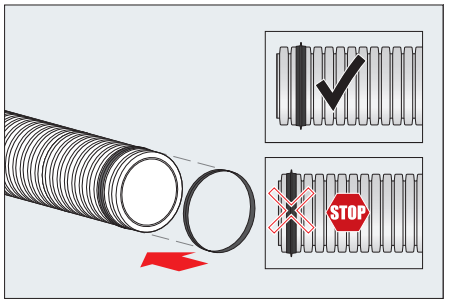
The respective pipe dimensions depend on the structure height and the available space. The integration of a ventilation system should therefore be considered already during the early stages of the planning phase.
Please find the maximum admissible air volumes in Chapter 4.5.

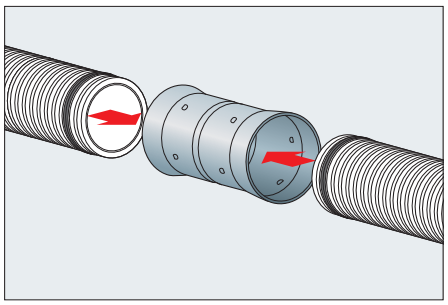
General installation and connection information

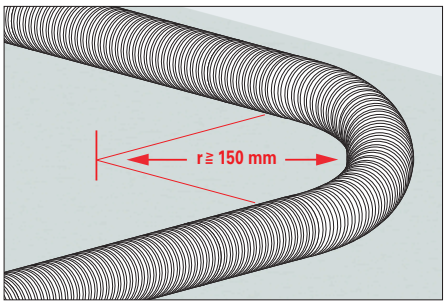
Cut the profi-air classic pipe to the required length using the profi-air knife. If using a saw, make sure that the sawdust does not enter the inside of the pipe. Fit a profi-air sealing ring to every connection. Always mount the profi-air sealing ring to the second corrugation following the pipe cut. Afterwards, push the pipe in the fitting; the pipe latches onto the fixing burls and the connection is established. Limiting burls limit the insertion depth.







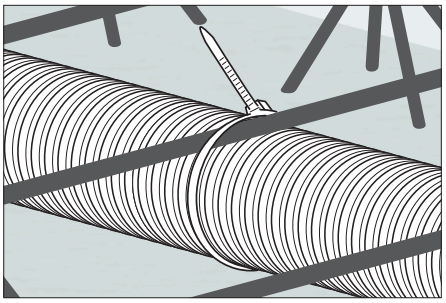




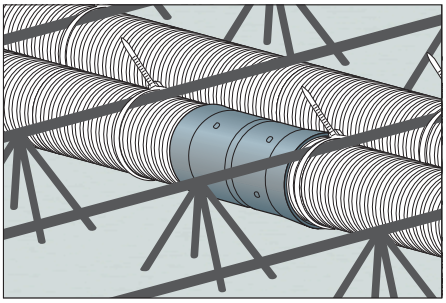
Important: Avoid open pipe sections during the construction period; seal pipes with profi-air end plugs.

Installation and connection in the bare concrete ceiling

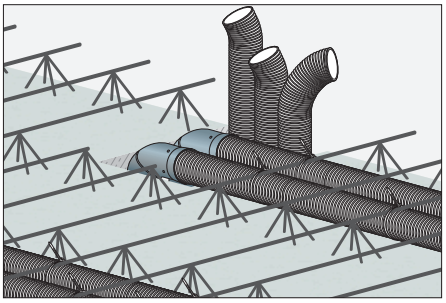
Installation of the profi-air classic pipe in the bare concrete ceiling mainly depends on the thickness of the ceiling. The prefabricated ceiling mostly used in single-family homes generally features a prefabricated lower concrete layer of approx. 5cm. When assuming an average ceiling thickness of 18cm with a clear cover of usually 5 cm, this leads to an installation area of approx. 8cm. The profi-air classic pipes NW63 and NW75 can be installed within these 8cm between the prefabricated concrete layer and the top flanges of the prefabricated ceiling or the top flexural tension reinforcement. We recommend a ceiling thickness of 21cm for NW90.



The installation of pipes should be avoided in areas with increased requirements on ceiling statics such as downstand/suspender beams, supports or block outs. Additional steel reinforcements impede installations in these areas.
profi-air classic pipes must be fastened to the spacers or the steel reinforcement in a distance of approx. 0.5m to prevent the pipes from buoying upwards when casting the concrete. In addition, the profi-air pipe needs to be fastened directly before and after the connection in case of connection couplings and air outlets. This additionally secures the push-fit connection. You may use common cable ties to fasten the pipes.

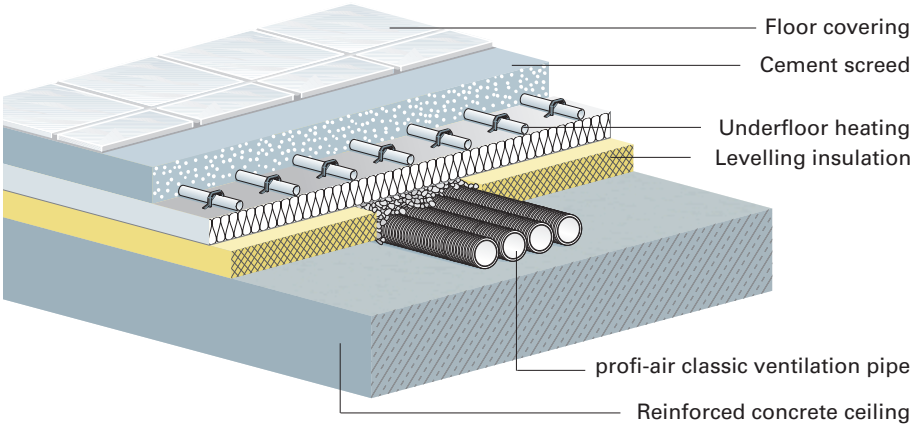


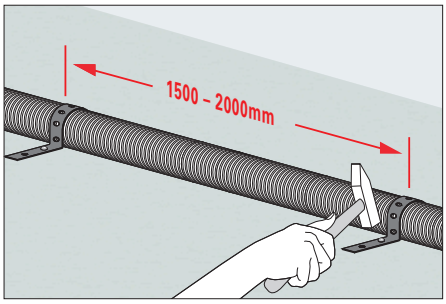
If possible, pipes should be routed straight in prefabricated ceilings to avoid pressure losses in the pipe. Make sure that pipes are not kinked or protrude beyond the reinforcement at the transition from the horizontal to the vertical pipe routing (ceeiling pentration). profi-air classic 90° elbows can optionally be used here.



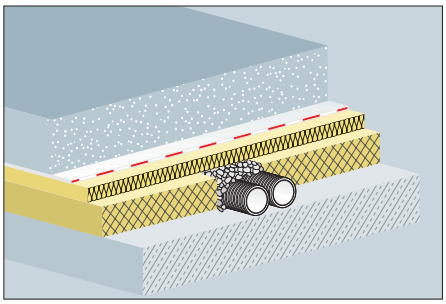
Installation and connection on top of the bare concrete ceiling or in the insulation level under the screed

profi-air classic pipes can generally be installed in the insulation level under the screed. The floor installation height is decisive for the pipe dimension to be used. The supporting substructure must be sufficiently dry and have a level surface. Avoid raised points or similar that could lead to differences in the screed thickness. The height tolerances and slope of the supporting substructure must comply with DIN 18202.
profi-air classic pipes must be fastened to the bare floor in a distance of 1.5 – 2m. In addition, the profi-air pipe needs to be fastened directly before and after the connection in case of connection couplings and air outlets. You may use common perforated tape to fasten the pipes.





The levelling layer is installed with heat or levelling insulation at least to the height of the pipe crown of the installed profi-air classic pipe. Open spaces occurring due to distances between the pipes must be filled to the top edge of the levelling layer with bound embedding. This ensures level, consistent contact with the uninterrupted impact sound insulation to be laid over the entire floor structure (DIN 18560). Do not use unbound embedding of natural or crushed sand perlites. The lining (moisture barrier) of the impact sound insulation must consist of at least 0.1mm thick PE or equivalent film, whereby the joints must overlap by at least 80 mm (DIN 18560). The joints must be taped when using self leveling screed. Correct lining of the impact sound insulation in connection with the border insulation strips prevents the screed or its mixing water from penetrating into the insulation. Pipe routing and installation of the profi-air classic 90° air outlets are executed as described above.



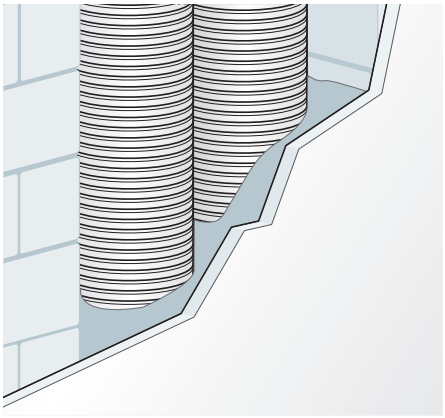
The installation of pipes on the bare concrete ceiling or in the insulation area under the screed requires compliance to the state-of-the-art technology.

Installation and connection under the ceiling

The fixing points must have a distance of 1 – 1.5m if profi-air classic pipes are installed under the ceiling or in suspended ceilings.

Installation and connection in the wall

Channels in the walls and embedding of profi-air classic pipes in the wall influence the static of the wall. The DIN 1053 bricking standard must be observed in this case.



Advice: **profi-air classic technical data**
Dimensions, weight and pressure loss diagrams can be found in the profi-air technical data brochure.

5.1.3 profi-air classic fittings

profi-air classic outlet 90°

The profi-air classic outlet 90° can be installed in / on top of the bare concrete ceiling and in the wall. The following profi-air classic outlets are available depending on the pipe connection dimensions and the required air volume:

- 3 x NW63 / DN125 ➔ 2 x NW63 factory-sealed
- 2 x NW75 / DN125 ➔ 1 x NW75 factory-sealed
- 2 x NW90 / DN125 ➔ 1 x NW90 factory-sealed

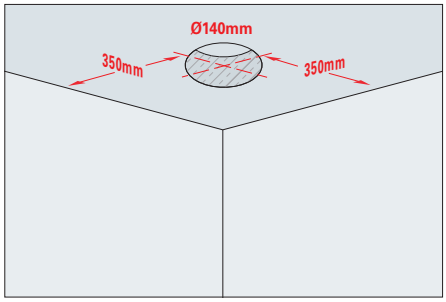
The profi-air classic outlet 90° for supply/exhaust air (DN125 valve connection) can be fixid via two fastening lugs directly on the pre-fabricated ceiling. A core hole of Ø140mm must be created beforehand.

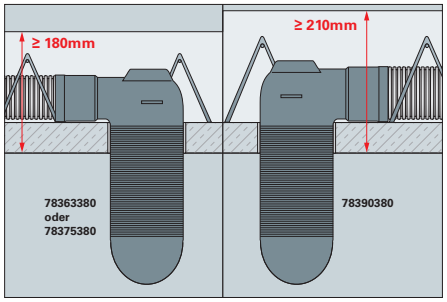
profi-air classic outlet 2 x NW90

General installation and connection information

Minimum distances/lengths must be observed depending on the application:

Installation and connection in and on top of the bare concrete ceiling





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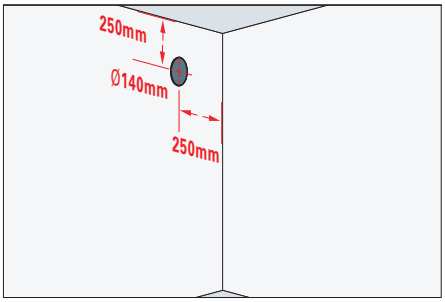
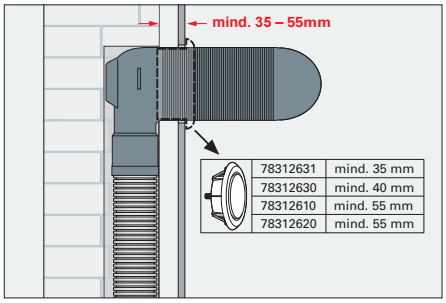
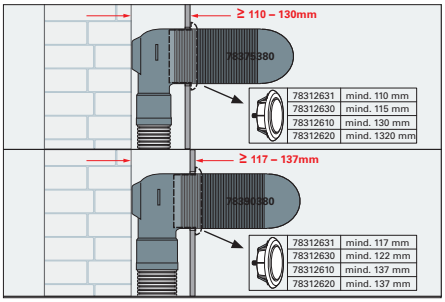
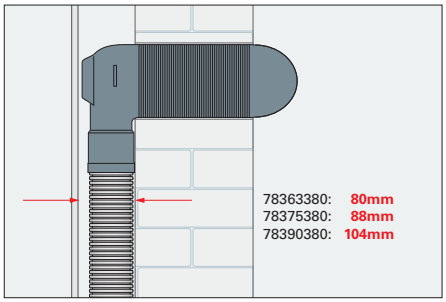
Installation and connection in the wall

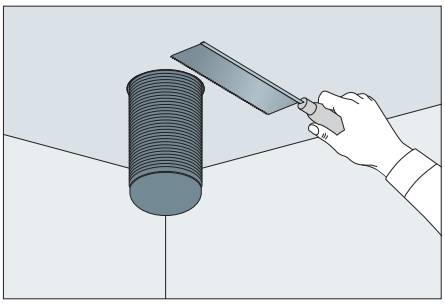


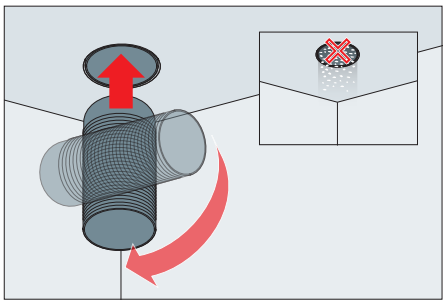


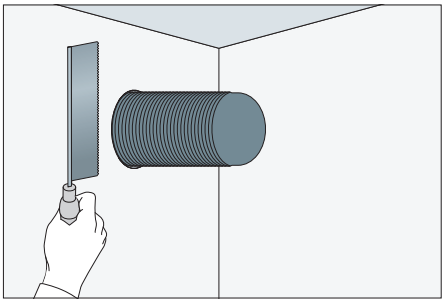


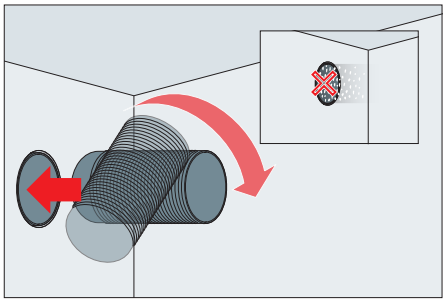


Important: Observe plaster thicknesses and ceiling construction when cutting the valve connection!









The outlet is closed at valve connection DN125. Cut the valve connection to the required length after installation. The cut serves as cover during the construction period.

Advice: **profi-air classic technical data**
Dimensions, weight and pressure loss diagrams can be found in the profi-air technical data brochure.

5.1.4 profi-air tunnel pipe

Description

The profi-air tunnel system comprises the profi-air tunnel pipe and the associated profi-air tunnel fittings. The double-walled corrugated PP pipe is highly flexible and crush resistant.
Its tunnel shape, the so-called "bread slice shape", providing the pipe with crush resistance.
The pipe's high flexibility allows routes of profi-air tunnel outlets 90° with profi-air manifolds without connections in many applications.
If required, pipes can be connected with profi-air tunnel fittings and the innovative profi-air sealing and connecting element. This component has two functions: On the one hand, it connects profi-air tunnel pipes with fittings or fittings with each other, on the other hand, it seals the established connection. By reason of the simple push-fit principle which requires no tools, the defective installation will be minimized and the processing efficiency will be increased.

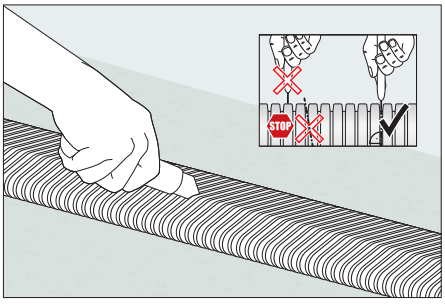
The following building elements qualify for the installation of the profi-air tunnel system:

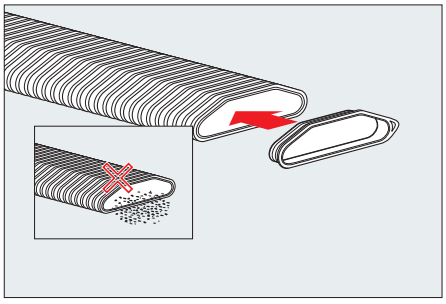
Building element:	profi-air tunnel
Bare concrete ceiling	–
Insulation level under the screed	x
Suspended ceiling	x
Walls	x
Light-weight walls	x

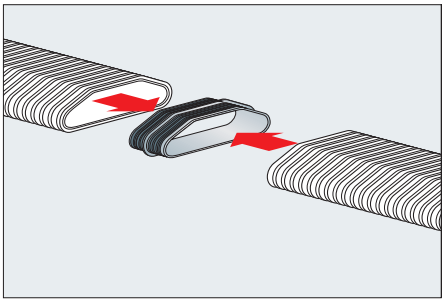
Please find the maximum admissible air volumes in Chapter 4.5.

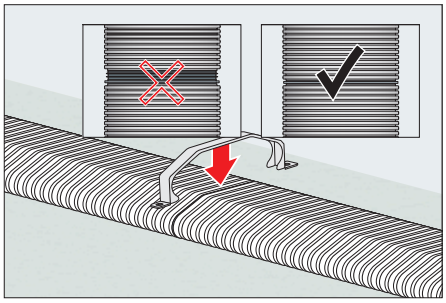
General installation and connection information

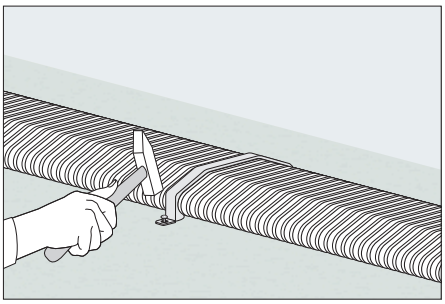
Cut the profi-air tunnel pipe to the required length using the profi-air knife. Cut the pipe perpendicular to the corrugation. Push the profi-air tunnel sealing and connecting element in the pipe or the fitting all the way on both sides and secure this connection using the profi-air tunnel mounting clip, profi-air tunnel clip or profi-air tunnel fixing clamp.
Provide additional fastenings before and after each redirection (horizontal/vertical) and every 1.5 – 2m.

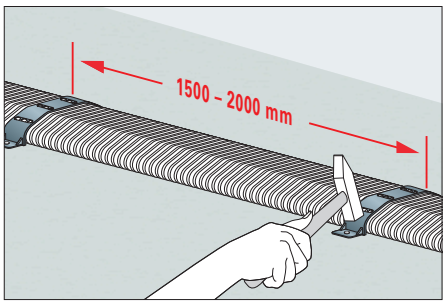


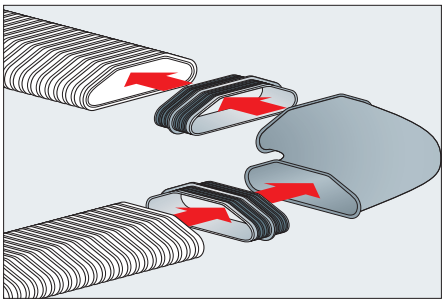


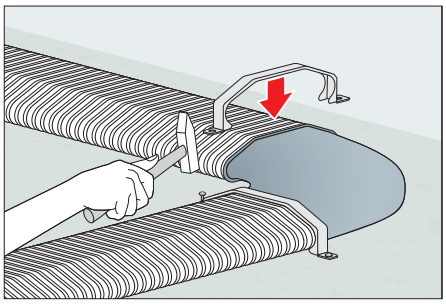


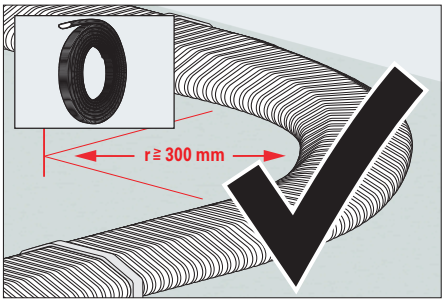


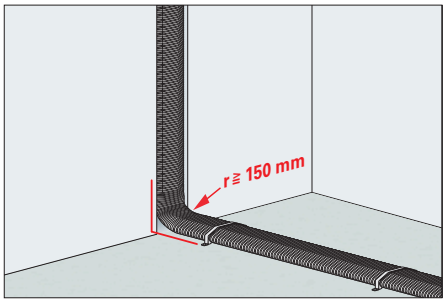












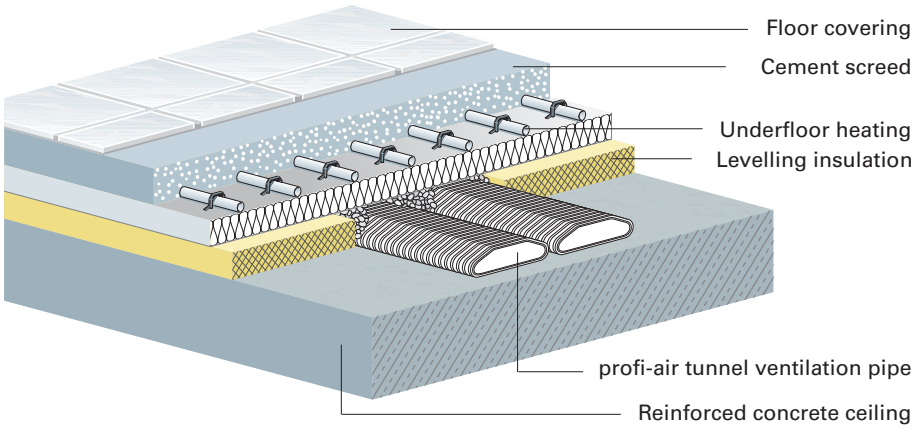
Imortant: Avoid open pipe sections during the construction period; seal pipes with profi-air end plugs.

Installation and connection in the bare concrete ceiling

Due to their widths, we do not recommend installing profi-air tunnel pipes in bare concrete ceilings. Furthermore, the connection technique is not suited for applications in concrete without additional sealing. The profi-air classic system is perfectly suited for these applications.

Installation and connection on top of the bare concrete ceiling or in the insulation level under the screed

The supporting area of the profi-air tunnel pipe must be free of bulges and irregularities to prevent possible damage to the pipe.
The height tolerances and slope of the supporting substructure must comply with DIN 18202.
The levelling layer is installed with heat or levelling insulation at least to the height of the pipe crown of the installed profi-air tunnel pipe. Open spaces occurring due to distances between the pipes must be filled to the top edge of the levelling layer with bound embedding. This ensures level, consistent contact with the uninterrupted impact sound insulation to be laid over the entire floor structure (DIN 18560).
Do not use unbound embedding of natural or crushed sand perlites. The lining (moisture barrier) of the impact sound insulation must consist of at least 0.1mm thick PE or equivalent film, whereby the joints must overlap by at least 80mm (DIN 18560). The joints must be taped when using self leveling screed. Correct lining of the impact sound insulation in connection with the border insulation strips prevents the screed or its mixing water from penetrating into the insulation.

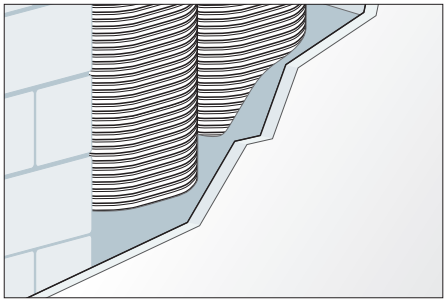


Installation and connection under the ceiling

If the profi-air tunnel pipes are installed below the ceiling or in suspended ceilings, we recommend using the straight length pipes specifically designed for this purpose. The increased stiffness and dimensional stability of the straight length pipes facilitates installation. Fixing points must be spaced 1 – 1.5m.

Installation and connection in the wall

Channels in the walls and embedding of profi-air tunnel pipes in the wall influence the static of the wall. The DIN 1053 bricking standard must be observed in this case.



5.1.5 profi-air tunnel fittings

profi-air tunnel outlet for valves

The profi-air tunnel 90° outlet can be installed on top of the bare concrete ceiling as ceiling outlet, and in the wall as wall outlet. The following profi-air tunnel outlets are available:

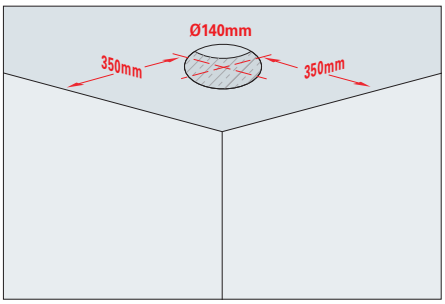
- profi-air tunnel outlet 90° for valves ➔ 2 x tunnel, 1 x DN125
- profi-air tunnel outlet 90° for valves ➔ 1 x tunnel, 1 x DN125
- profi-air tunnel outlet straight for valves ➔ 1 x tunnel, 1 x DN125

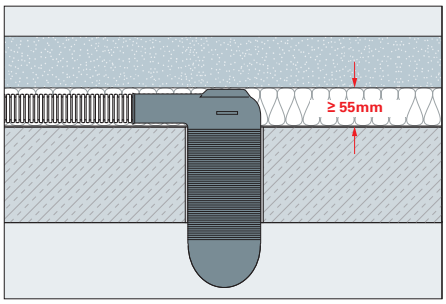
profi-air tunnel outlets 90° feature fastening lugs to fix them to the floor or the wall.

General installation and connection information
Minimum distances/lengths must be observed depending on the application.

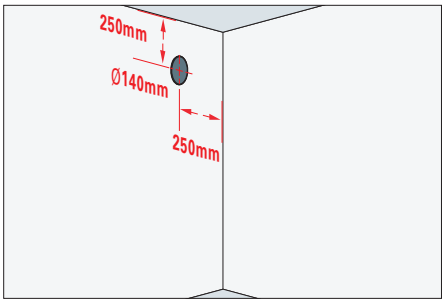
Installation and connection on top of the bare concrete ceiling or in the insulation level under the screed

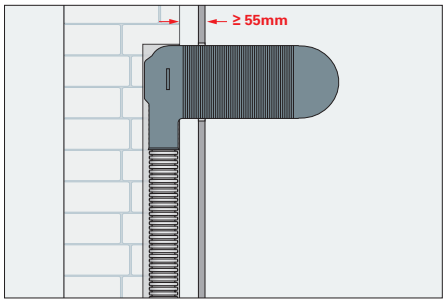
Install the profi-air tunnel outlet 90° for supply/exhaust air (DN125 valve connection) can be fixid via two fastening lugs directly on the pre-fabricated ceiiling. A core hole of ø140mm must be created beforehand.

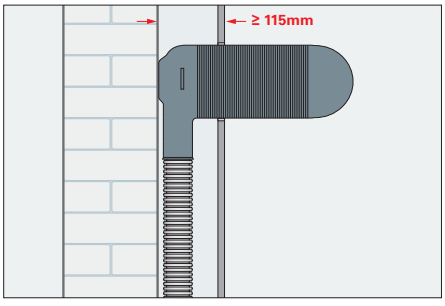


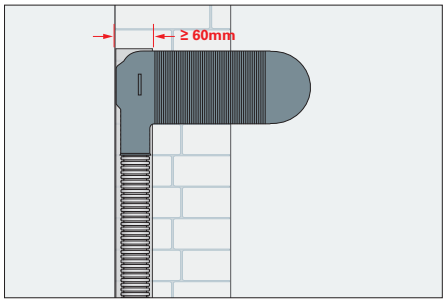


Installation and connection in the wall

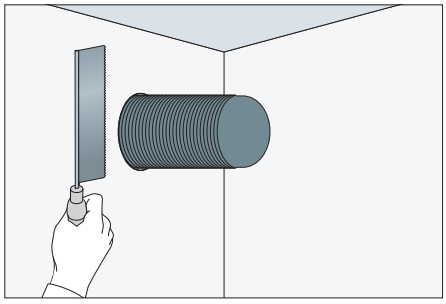




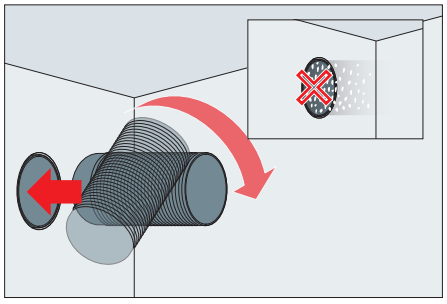




Important: Observe plaster thicknesses and ceiling construction when cutting the valve connection!



The outlet is closed at valve connection DN125. Cut the valve connection to the required length before installation.



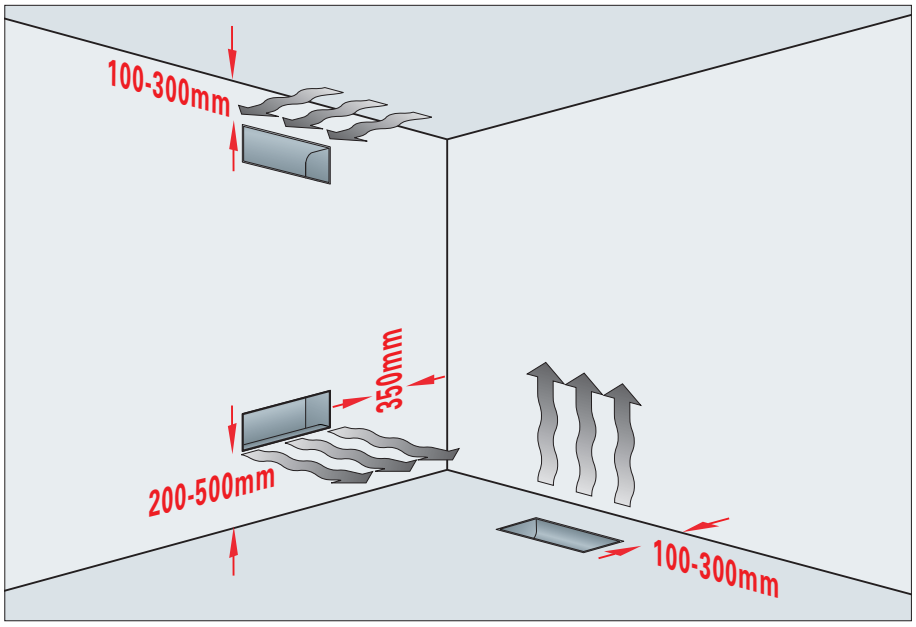
The cover can be used as seal during the construction period.

profi-air tunnel outlet 90° for profi-air grills

The profi-air tunnel 90° outlet for profi-air grills can be installed on top of the bare concrete ceiling as floor outlet and in the wall as wall outlet. Inside the outlet is a styrofoam core to stabilise the box during screed casting. Remove this core before final installation.

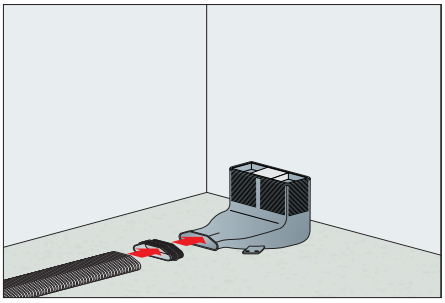
profi-air tunnel outlets 90° feature two fastening lugs to fix them to the floor or the wall.

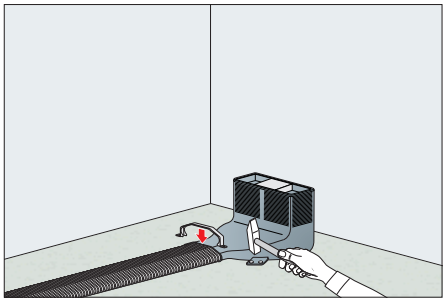
General installation and connection information
Minimum distances/lengths must be observed depending on the application.



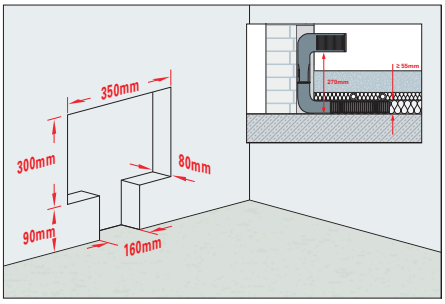
5 Installation and products

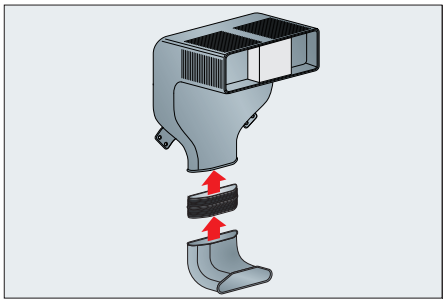
Installation and connection on the bare concrete ceiling or in the insulation level under the screed

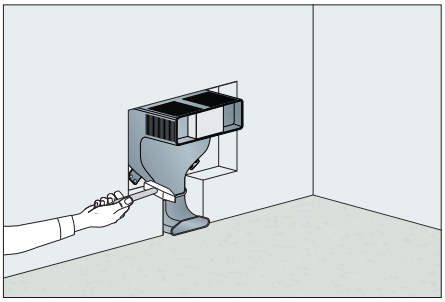


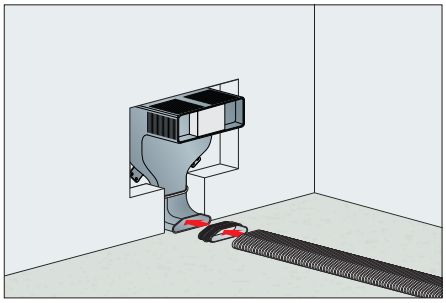


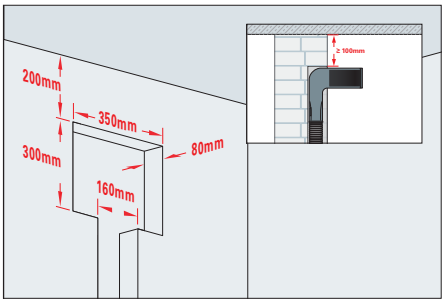
Installation and connection in the wall

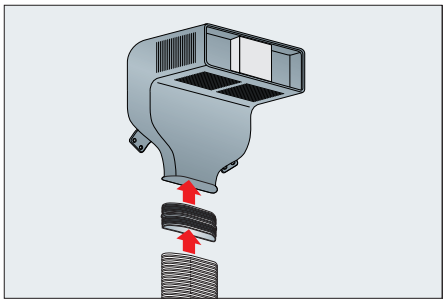


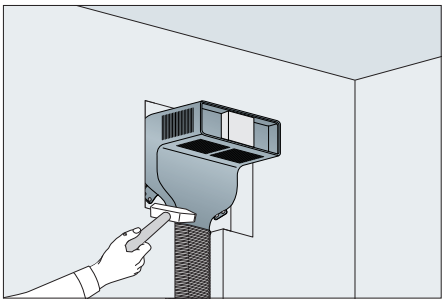


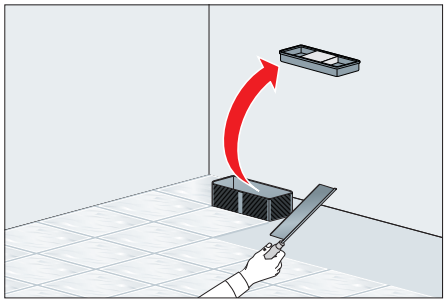
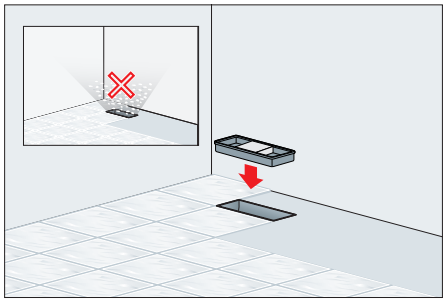
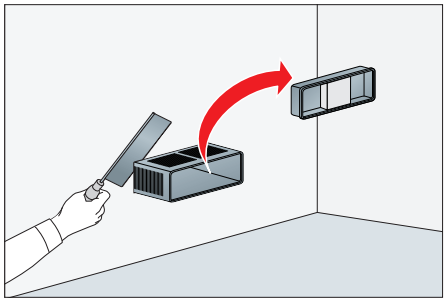
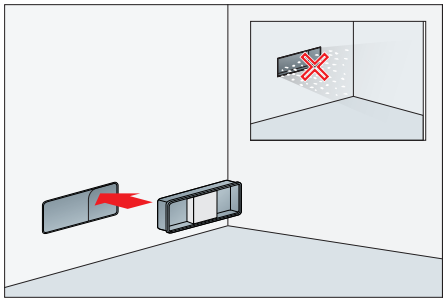
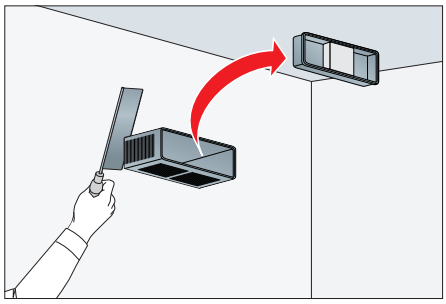
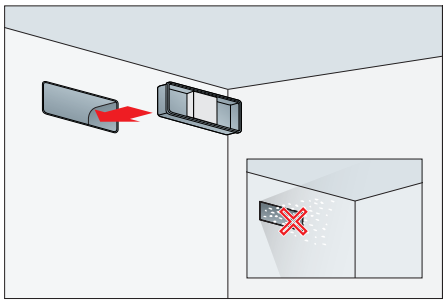










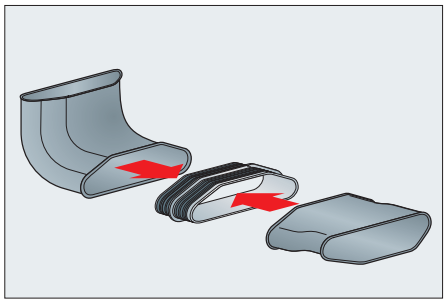
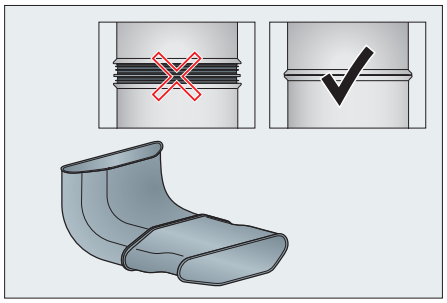
Important: The box must be closed during the construction phase in any case. Open the outlet at the grill connection before final installation. Observe plaster and flooring thicknesses.

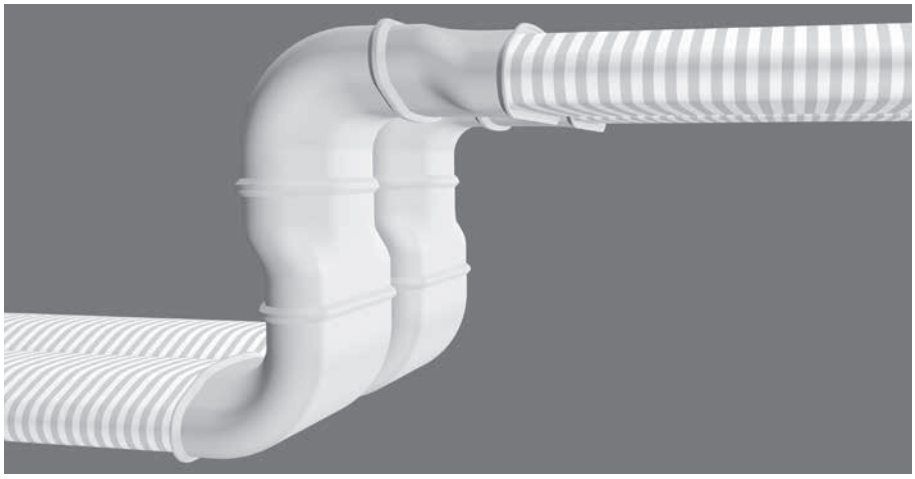
profi-air tunnel rotary adaptor

The profi-air tunnel rotary adaptor is used for axial 180° rotations of the pipe.

Installation and connection

Install the rotary adaptor using the profi-air sealing and connecting element. Use a profi-air tunnel mounting clip or a profi-air tunnel fixing clamp to support the connection after successfully connecting the pieces.



Advice: **profi-air classic technical data**
Dimensions, weight and pressure loss diagrams can be found in the profi-air technical data brochure.

5.1.6 profi-air poppet valves / wall outlet / ventilation grill

Description

profi-air valves can be used as wall and ceiling valves. The supply and exhaust air valves are made of metal, the combined supply/exhaust air valve is available in plastic.
Valves are set by adjusting the rotary discs. Different setting curves must be observed depending on the valve. profi-air valves can be supplied with the profi-air filter (disposable filter) for exhaust air valves, if required. The connection diameter of the valves is 125mm and can thus be adapted to all common outlets.

The profi-air supply and extract air wall grill features an expanded metal filter by default which separates shortenings and oils in the air and is therefore particularly suited for application in kitchens. The filter can be cleaned.

Important: We recommend using filters in the area of the exhaust air to avoid damage to the pipe system.

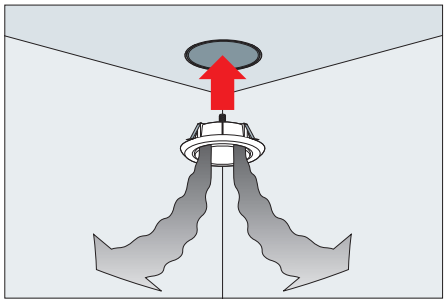
The following table shows the applications of the different profi-air valves:

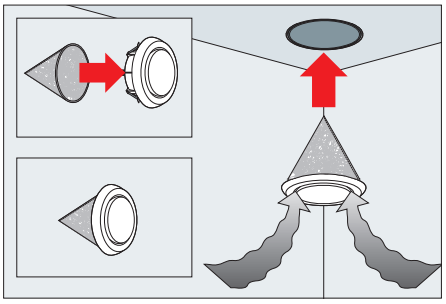
Range of products	profi-air tunnel outlet	profi-air classic outlet	profi-air outlet for cover grills
profi-air extract air valve (metal)	x	x	–
profi-air supply air valve (metal)	x	x	–
profi-air supply and extract air valve (plastic)	x	x	–
profi-air supply and extract air wall grill	x	x	–
profi-air supply and extract air grill	–	–	x

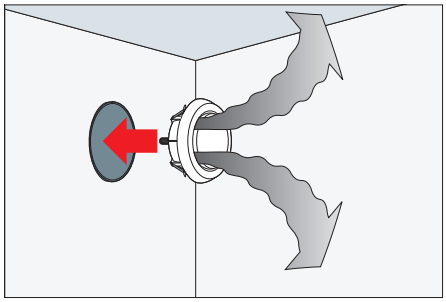
Installation and connection

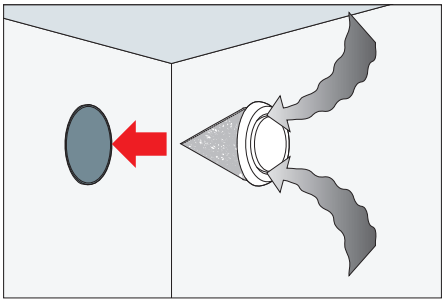
Ceiling and wall installation for profi-air extract valve (metal), profi-air supply air valve (metal)

Push the metal installation frame of the valve into the outlet and fix it to the ceiling or wall using screws. The integrated sealing ring at the metal installation frame seals the connection.
Integrate the profi-air valve in the metal installation frame by means of a 360° rotation.
profi-air filters must be fitted to the valve before connecting the valve with the metal installation frame.









Ceiling and wall installation for profi-air supply and extract air valve (plastic)

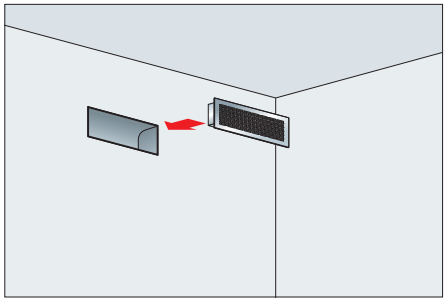
Push the profi-air plastic supply and extract air valve (plastic) into the outlet without additional installation frame.

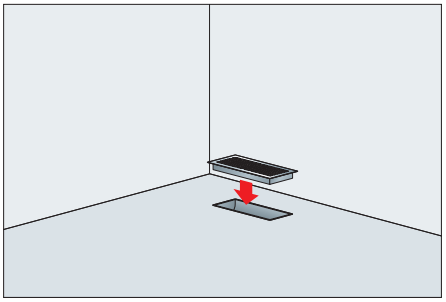
The integrated clamps establish a secure connection between valve and outlet. Install the profi-air filter as described before.

profi-air supply and extract air wall grill

The profi-air supply and extract air wall gril should always be used in kitchens. Push the wall feed-through directly in the outlet and fix it to the wall using screws. Click the cover plate in place afterwards. Adjust the valve using the two star-shaped orifices.

Floor and wall installation for profi-air supply and extract air grill





The profi-air supply and extract air grill already features an integrated installation frame and consists of only one component. Retaining collars outside the profi-air supply and extract air grill latch in the manifold upon installation of the grill and thus secure the connection.

General filter maintenance information

profi-air filter for valves (disposable filter)

Filters must be checked for contamination regularly, at least every 6 months, and replaced, if necessary. Filters can be disposed of in the household waste. The inspection interval depends on the usage of the room It could be shorter in some cases.

profi-air expanded metal filter

Regularly check the expanded metal filter for contamination, at least every 6 months, and replace, if necessary. It can be cleaned in the dishwasher or by hand with common cleaning agents (fat-dissolving). The inspection interval depends on the usage of the room It could be shorter in some cases.

Advice: **profi-air classic technical data**
Dimensions, weight and pressure loss diagrams can be found in the profi-air technical data brochure.

5.2 Manifold

5.2.1 General information

The profi-air classic manifold plus and the profi-air tunnel/oval duct manifold flat serve to distribute or collect the individual room air pipes and to directly connect to the ventilation unit. Both manifolds can be connected with the profi-air classic pipe and the profi-air tunnel pipe. The connection between the manifold and the device is established using ISO pipe or oval duct.

5.2.2 profi-air classic manifold plus

Description

The manifold is made of galvanised sheet steel and features a sound-absorbing lining. The layout of the manifold outlets allows the simultaneous use as straight as well as 90° manifold. Two lateral inspection openings which can be opened without tools allow easy access for inspection or cleaning.

The profi-air classic manifold plus can be used both as supply and exhaust air manifold and is available in three variants.

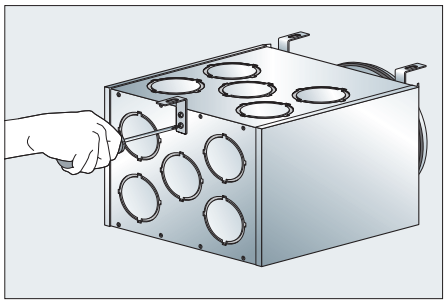
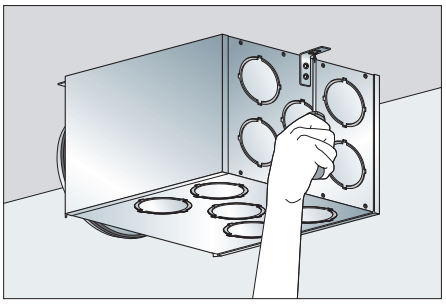
- profi-air classic manifold plus 5-fold DN 160
- profi-air classic manifold plus 10-fold DN 160
- profi-air classic manifold plus 15-fold DN 180

The manifold 15-fold must be provided with a DN 180 outlet due to the increased air volume. The manifold can be connected using the pre-insulated profi-air ISO pipe in dimensions DN 160 and DN 180. Other common products can also be used optionally. All manifold openings are factory-sealed due to reasons of hygiene. Only open them right before connecting the ventilation pipes to reduce contamination as much as possible.

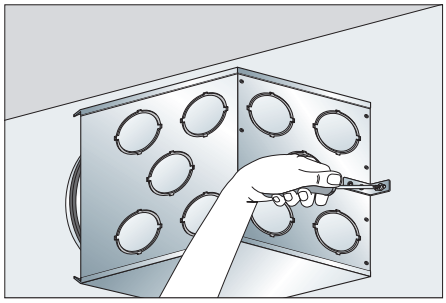
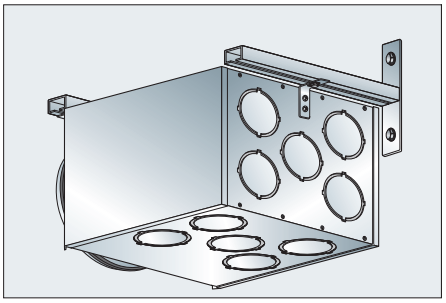
Installation and connection

Install the profi-air classic manifold plus on the wall or ceiling using the included assembly bracket.
The following installation situations are possible:

- Variant 1 (ceiling):

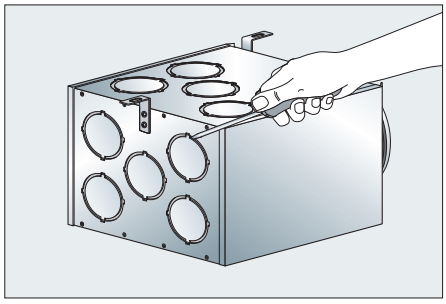
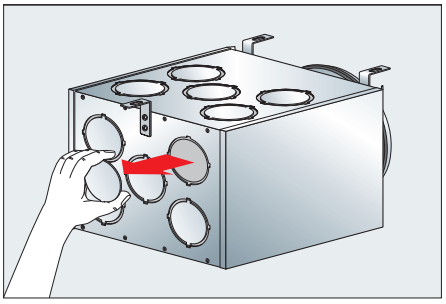



- Variant 2 (wall):

Important: The manifold must be closed during installation for all installation situations.

Connect the profi-air classic manifold using the profi-air manifold connection coupling. Thanks to the standardized bayonet joint the manifold coupling can be used for all profi-air classic manifolds. It differs due to the profi-air classic pipe connection in dim. 63/75 and 90. The profi-air manifold connection coupling is installed as follows:

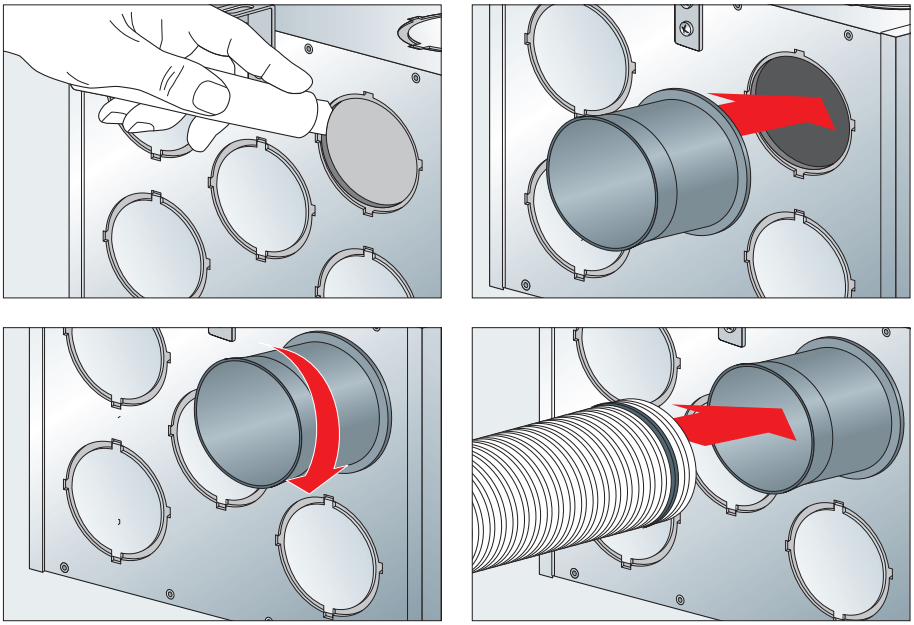
Pipes of different dimensions can be connected to the manifold.

EXAMPLE:

profi-air classic manifold plus 10-fold DN 160

- 5 x profi-air classic NW 75
- 3 x profi-air classic NW 90
- 2 x profi-air classic NW 63

In exceptions, also more than the 5, 10 or 15 outlets can be occupied.



Advice: The max. connections of the manifold outlets depend on the maximum air volume. The max. air volume of the manifold variants is defined as follows:

profi-air classic manifold plus 5-fold DN 160 → 225m³/h
profi-air classic manifold plus 10-fold DN 160 → 360m³/h
profi-air classic manifold plus 15-fold DN 180 → 450m³/h

Advice: **profi-air classic fittings technical data**
Dimensions, weight and pressure loss diagrams can be found in the profi-air technical data brochure.

Special features/accessories:

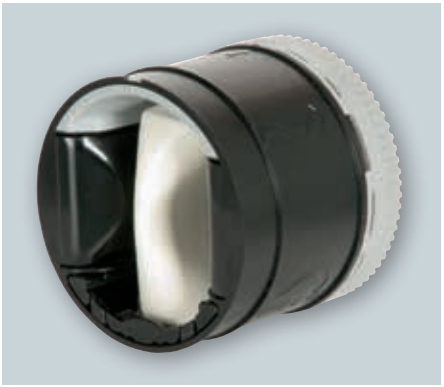
profi-air classic constant airflow regulator / booster

Description

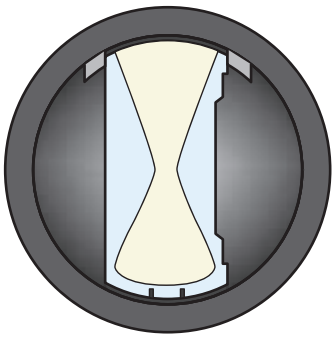
The different flow conditions in a pipe network can lead to volumetric flow rate fluctuations. Adjusting the air flow to the values calculated according to the standard ensures hygiene, guarantees comfort and limits operating costs. To ensure this, aside from the usual adjustment process of a system, the profi-air constant airflow regulator can be included in the profi-air classic manifold plus optionally.

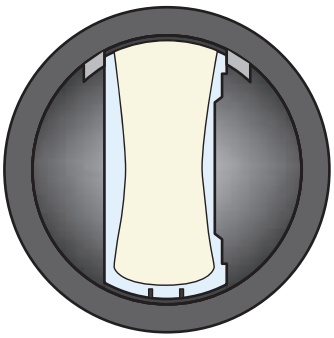
The profi-air classic constant airflow regulator automatically limits the volumetric flow rate in air pipes. This is achieved without any pneumatic or electronic assistance. The profi-air constant airflow regulator, a dynamic component, reacts to changing conditions within the system without requiring assistance by the operator.

The profi-air classic booster is only required with the intensive ventilation option. The booster has to be installed in the same way as the profi-air classic constant air flow regulator.



Functionality – constant airflow regulator



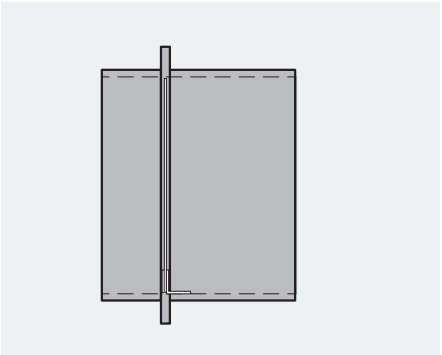


The active silicone membrane is contracted to an hourglass shape when the constant airflow regulator is in inoperative position. Due to pressure differences, this membrane blows up with increasing volumetric flow rate and thus holds a constant volumetric flow rate, independent of pressure fluctuations, in a pressure range between 50 and 200 Pa.

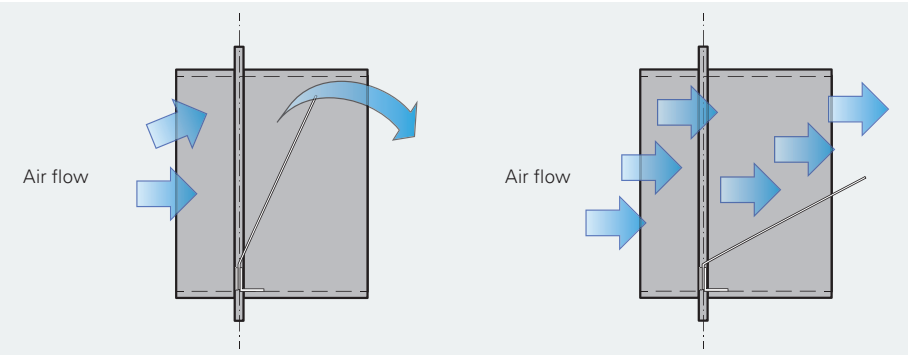
The increase/decrease in pressure at the membrane takes place via two drill holes at the constant airflow regulator. Both drill holes must be supplied with air without impedances in order to allow this adjustment process. This must be considered during installation. The minimum life of the membrane is 20 years in normal, non-corrosive air.

Functionality – booster

The profi-air classic booster operates differently from the profi-air classic constant airflow regulator. The profi-air booster includes a plastic foil which is pushed back with increasing pressure. The free cross-section thus increases.
By using the profi-air booster the adjustments If the system is switched to intensive ventilation (increase in volumetric flow rate and pressure), the volumetric flow rate in the constant airflow regulator increases minimally while the major part of intensive ventilation is provided via the self-intensifying elements.

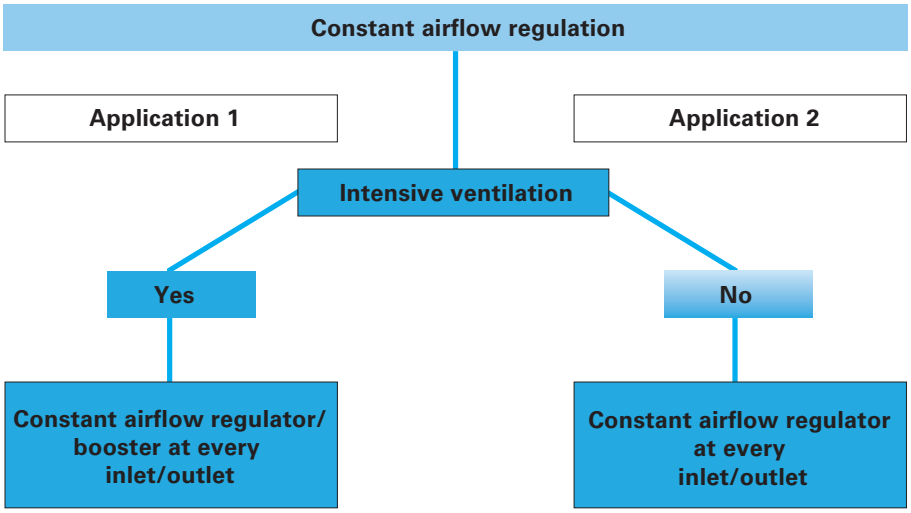


Booster
- inoperative position



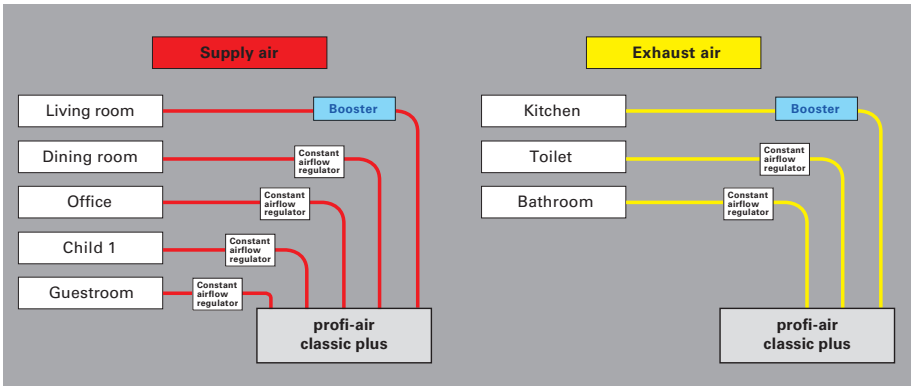
Booster
- operating condition

Application of the constant airflow regulator

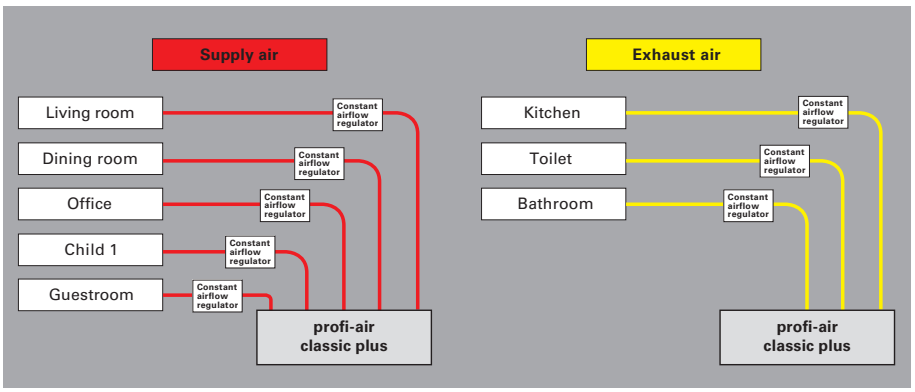


Application 1:
According to DIN 1946/6, the ventilation system should be able to realise all 4 ventilation stages, i.e. including intensive ventilation.

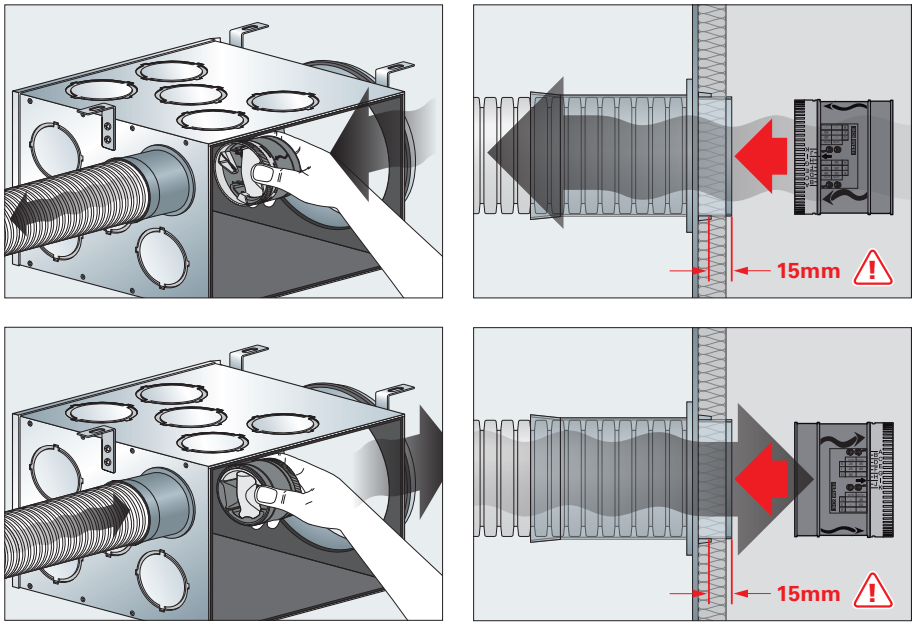
Advice: When using the booster, the air flow is adjusted via the valve.



Application 2:
The ventilation system must not be able to provide intensive ventilation. If the "intensive ventilation" option is not required, no booster is needed. The profi-air constant airflow regulator limits the max. required air volumes.

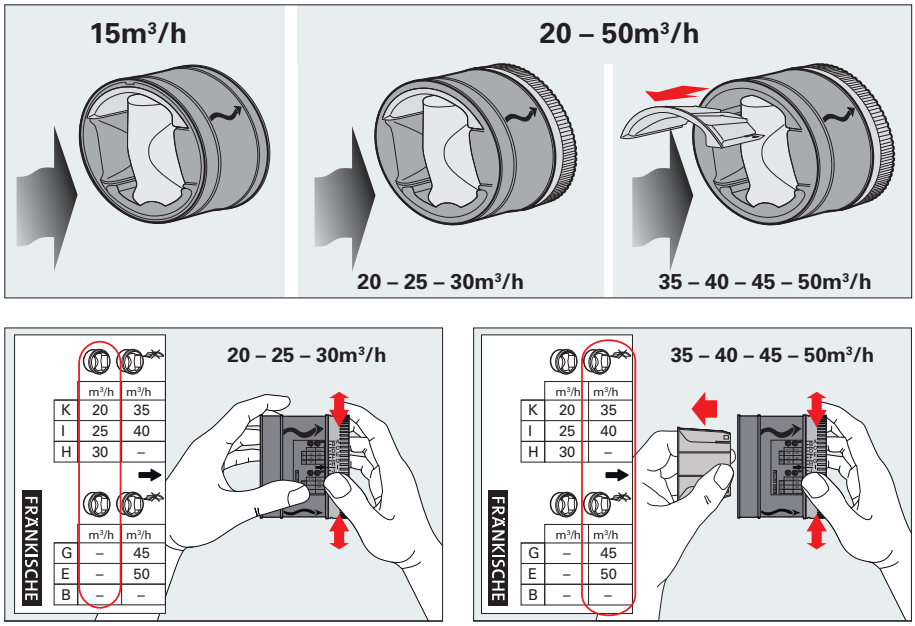


Installation of the constant airflow regulator



Advice: profi-air constant airflow regulators can be operated both horizontally and vertically.

Adjustment of the constant airflow regulator

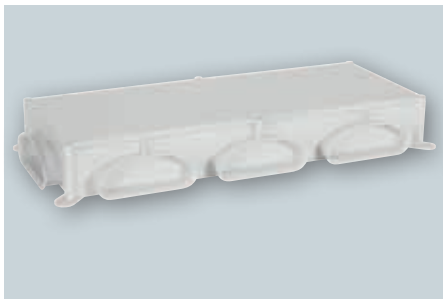


Maintenance of the constant airflow regulator

The functionality of the profi-air constant airflow regulator is not limited by possible contamination and maintenance is therefore not mandatory. If you want to clean the constant airflow regulator anyway, please make sure that no liquids enter the inside through the openings of the plastic body. Ideally, seal the openings with tape before cleaning.

5.2.3 profi-air tunnel/profi-air Ovalkanal duct manifold flat

Description



The profi-air tunnel/profi-air Ovalkanal manifold flat is completely made of plastic and can be opened for inspection purposes by unscrewing six screws. The following pipe systems can be connected to the manifold:

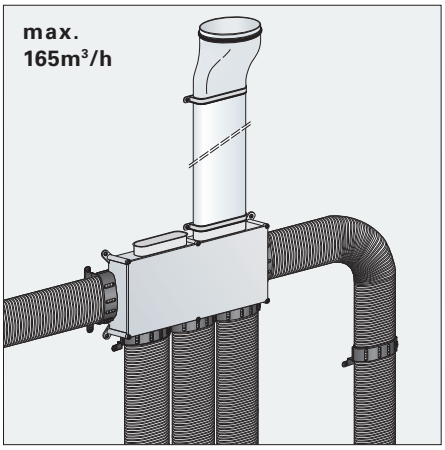
- profi-air Ovalkanal 2 x 163 x 68mm to connect the manifold to the ventilation unit
- profi-air tunnel pipe 5 x 132 x 52mm to connect the manifold to the ventilation system

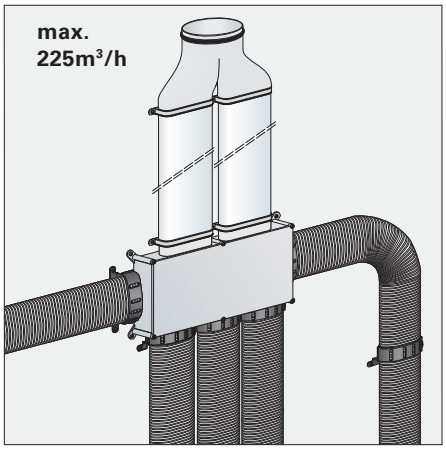
All manifold openings are factory-sealed due to reasons of hygiene. Only open them right before connecting the ventilation pipes to reduce contamination as much as possible.

Installation and connection of profi-air tunnel/profi-air Ovalkanal manifold flat

The profi-air tunnel/Ovalkanal manifold flat can be installed both in the wall and on the ceiling. Its low height allows the manifold to be installed in a suspended ceiling and/or in the individual storeys. Fasten the manifold using the four integrated fastening lugs.

Advice: Always make sure that the inspection opening is accessible.
The profi-air tunnel/profi-air Ovalkanal manifold can be installed as single or double manifold (2 x profi-air tunnel/ profi-air Ovalkanal manifold flat, parallel). Observe the max. air volumes in this case:



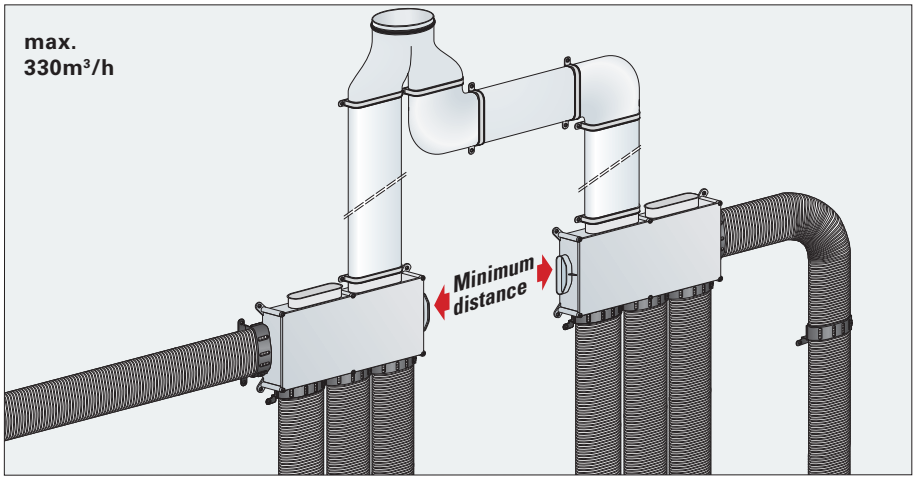


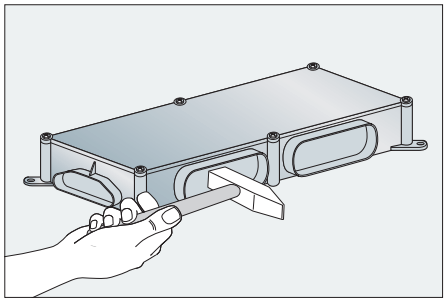
Depending on the connections with the profi-air tunnel elbow or pipe, minimum distances between the manifolds must be observed. We recommend the following minimum distances depending on the connection type:

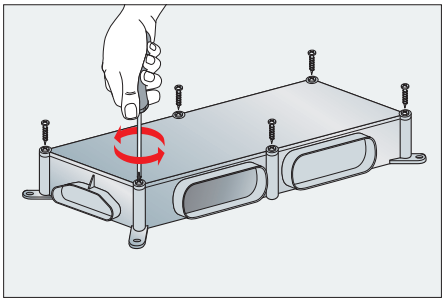
- Minimum distance
  profi-air tunnel elbow 90°
  – connection on one side ➔ 30cm
  – connection on both sides ➔ 60cm

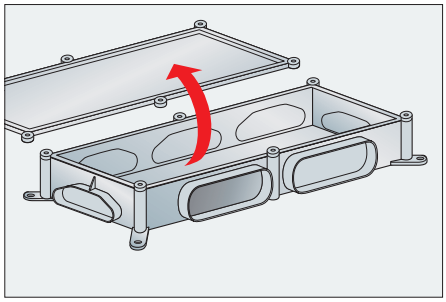
- Minimum distance
  profi-air tunnel pipe 132x52 bent:
  – connection on one side ➔ 45cm
  – connection on both sides ➔ 90cm

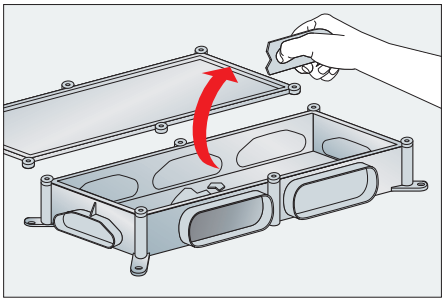
Installation and connection profi-air Ovalkanal

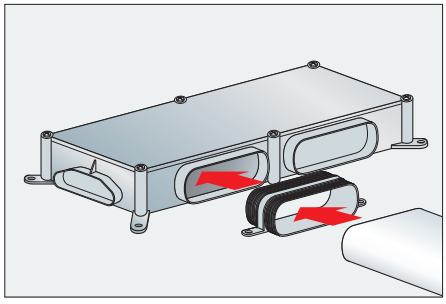


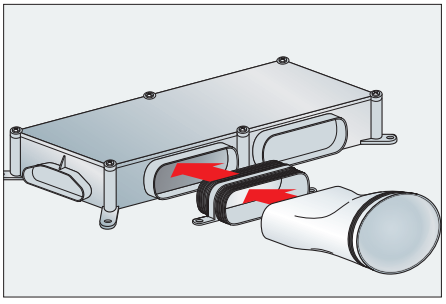


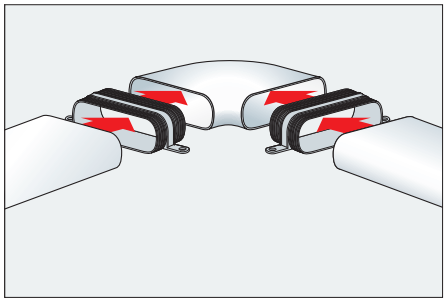


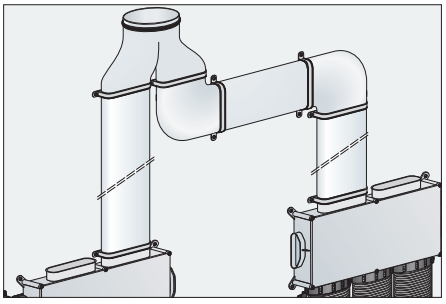




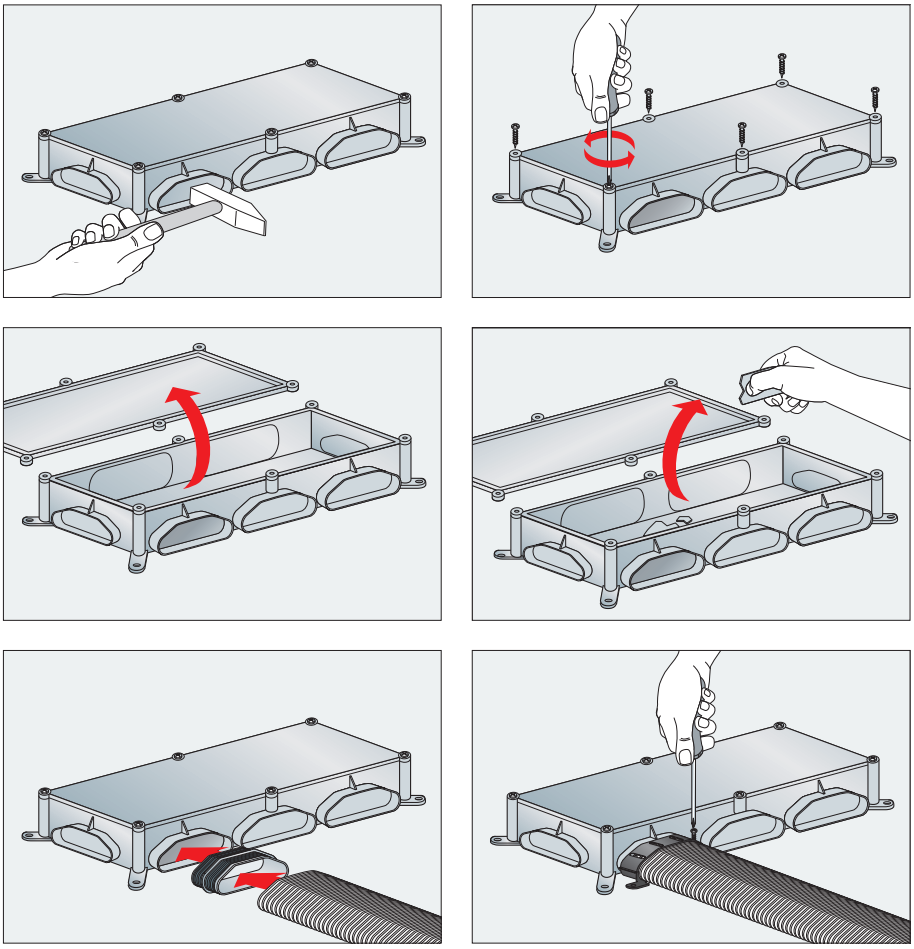








Installation and connection profi-air tunnel pipe



Advice: **profi-air tunnel/oval duct manifold flat technical data**
Dimensions, weight and pressure loss diagrams can be found in the profi-air technical data brochure.

Special features/accessories:

profi-air tunnel airflow restrictor

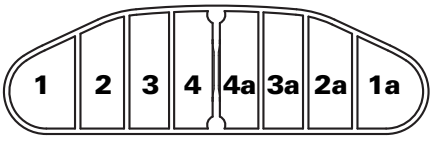
Description

The profi-air tunnel airflow restrictor limits the maximum air volume at the valve outlet. This is an element which is inserted in the outlet of dim. 132 x 52mm of the profi-air tunnel manifold flat. The use of the profi-air tunnel outlet 90° for cover grills requires the profi-air airflow restrictor; the profi-air tunnel outlet 90° for valves does not require this. Here, the air volume can be adjusted at the valve the usual way.

Functionality

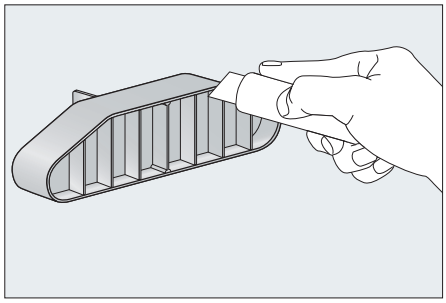
The profi-air airflow restrictor is based on the principle of unobstructed cross-sections.
A pressure loss diagram (profi-air technical data) determines how many sections must be broken out of the profi-air airflow restrictor.

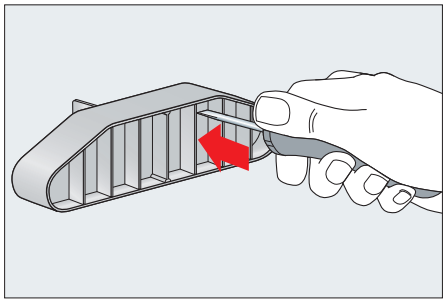
The more sections are removed, the bigger the unobstructed cross-section. The unobstructed cross-section and the required volumetric flow rate lead to the pressure loss to be expected.

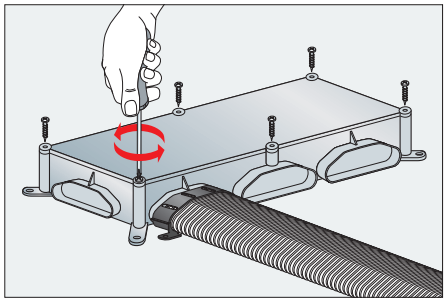


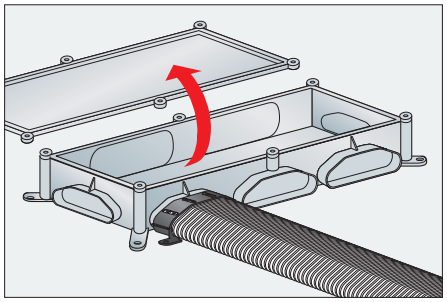
Sections 1/1a – 4/4a can be removed individually

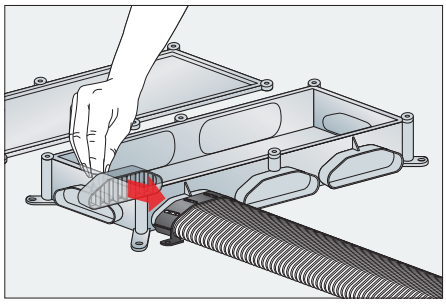
Installation and connection

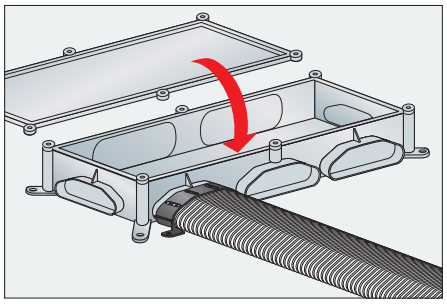


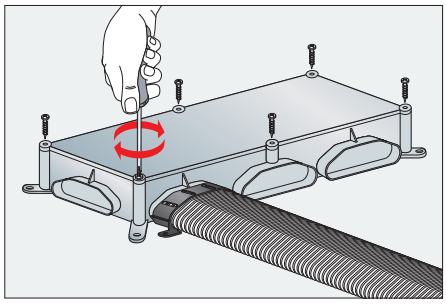




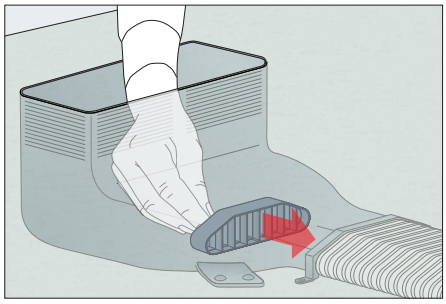








The profi-air tunnel airflow regulator is always inserted in a profi-air sealing and connecting element. This allows the profi-air airflow regulator to be installed not only in the manifold but also in the profi-air tunnel outlet 90°.



5.3 Manifold connection

5.3.1 General information

profi-air manifold connections are established using the profi-air iso pipe system or the profi-air Ovalkanal system. Select one of the two systems depending on the manifold used. Both systems can be combined with each other.

5.3.2 profi-air Iso pipe

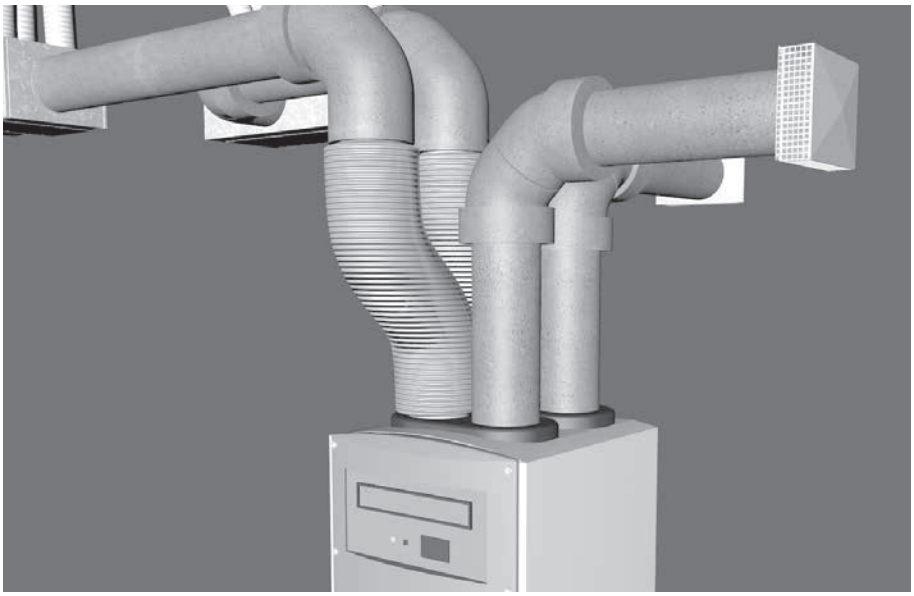
Description

The profi-air Iso pipe system made of EPP connects the profi-air classic manifold plus to the profi-air touch ventilation unit and serves as fresh and extract air pipe. The insulating properties of EPP avoid condensate defects in particular in the fresh and extract air duct depending on the outside temperature.The following components are available:

- profi-air Iso pipe DN 160 and DN 180
- profi-air Iso pipe elbow 90° DN 160 and DN 180
- profi-air Iso pipe coupling DN 160 and DN 180
- profi-air Iso pipe reducer DN 180/DN 160

Installation and connection

The fitting accuracy of the individual components guarantees airtight connections without additional sealing elements. profi-air Iso pipes are dimensionally stable up to a length of 2m, i. e. they do not require any additional wall/ceiling fastening. Use wall/ceiling fastening at your own discretion for lengths exceeding 2m. Common ventilation pipe clips or pipe clips in DN160 / DN180 can be used for this.



Advice: **profi-air tunnel/oval duct manifold flat technical data**
Dimensions, weight and pressure loss diagrams can be found in the profi-air technical data brochure.

5.3.3 profi-air oval duct system

Description

The profi-air Ovalkanal system made of ABS/PE is used to connect the profi-air tunnel/ profi-air Ovalkanal manifold flat to the profi-air touch ventilation unit.

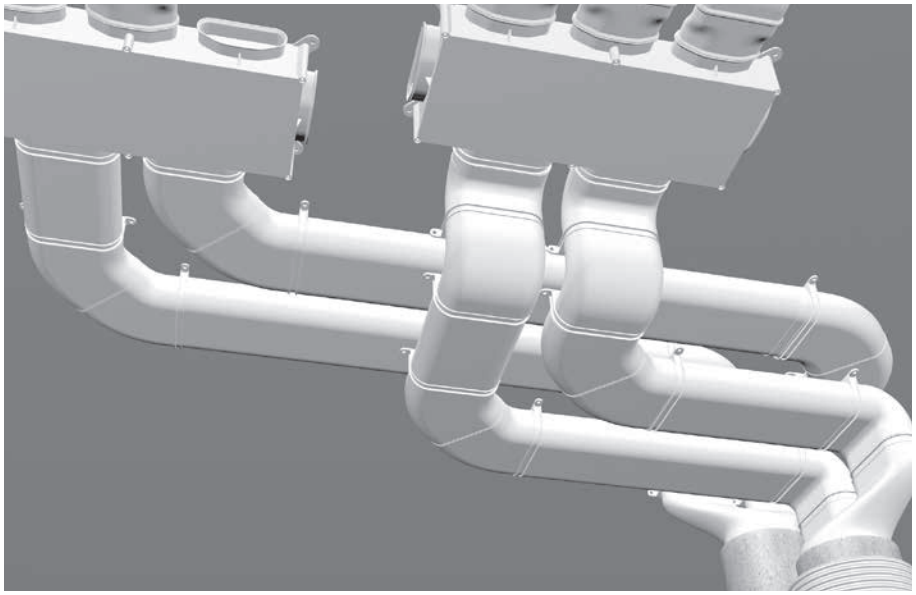
The following components are available:

- profi-air Ovalkanal adaptor DN 160
- profi-air Ovalkanal adaptor DN 125
- profi-air Ovalkanal pipe 163 x 68mm
- profi-air Ovalkanal elbow 90° vertical / horizontal
- profi-air Ovalkanal sealing and connection element

Its smooth inside surface and the flow-optimised components allow very low pressure losses in the profi-air Ovalkanal system. The maximum height of the profi-air oval duct system of 68mm allows assembly also in narrow installation situations, such as in suspended ceilings. The profi-air sealing and connecting element ensures an airtight connection thanks to its perfectly matched lip seal both between the fittings and also with the profi-air tunnel manifold. Pre-integrated fastening lugs at the profi-air sealing and connecting element allow easy fastening of the system to the wall or ceiling.

Advice: Installation in bare concrete is not permitted. When installing in bare concrete ensure on-site step protection.

Installation and connection
See Chapter 5.2.3



5.4 Fresh/extract air ducts

5.4.1 General information

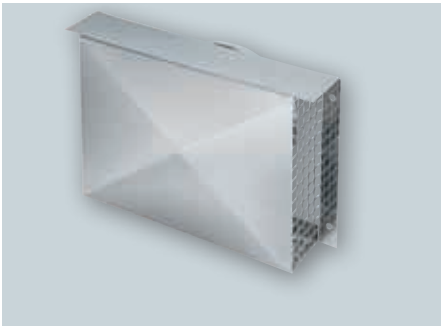
Fresh/extract air can be brought into and extracted out of the building in different ways. Depending on the installation situation and the optical requirements of the customer, this can be done with the profi-air external wall grill or the profi-air roof hood. Generally, make sure that the fresh/extract air duct is insulated to avoid condensation.

5.4.2 profi-air external wall grill

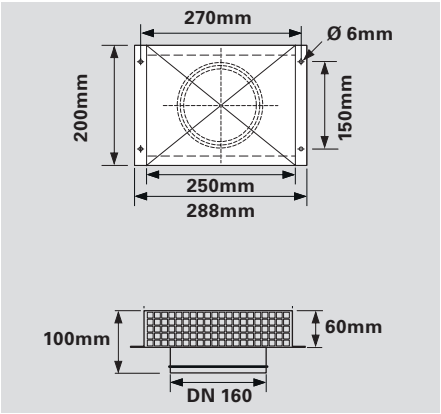
Description

The stainless steel profi-air external wall grill is connected to the fresh/extract air duct and is generally located outside the building.
Using the external wall grill prevents vermin from entering the fresh/extract air duct. In addition, the extract air flow is directed to the right/left and down which prevents draught impairment due to direct extraction. The profi-air external wall grill can be used universally as fresh/extract air grill and is available in the following connection dimensions:

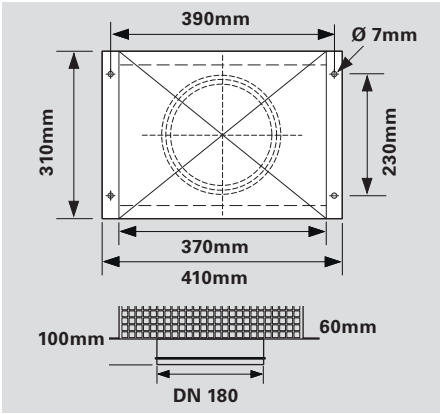
- profi-air external wall grill DN 160
- profi-air external wall grill DN 180



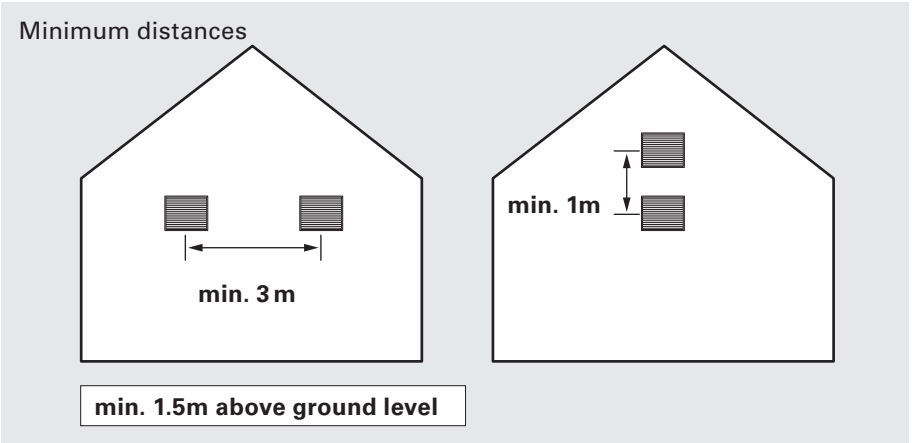
Installation and connection



profi-air external wall grill DN 160



profi-air external wall grill DN 180



Advice: The profi-air external wall grill must be accessible and the fresh and extract air flow must not be impeded. In order to prevent a shortcut between fresh and extract air, the minimum distances according to the previous drawing must be followed. Ideally, the grills are installed in the north and east of the building.
It must be followed whether the fresh and extract air ducts need to be equipped with a sound absorber due to surrounding property (neighbours) and the location of quiet rooms in the building (e. g. bedroom). The fresh and extract air ducts must be insulated. We recommend the profi-air Iso pipe for this purpose.

Advice: **profi-air external wall grill technical data**
Dimensions, weight and pressure loss diagrams can be found in the profi-air technical data brochure.

5.4.3 profi-air roof hood system

Description

The profi-air roof hood is required if fresh/extract air shall be supplied or extracted via the roof.
The following components from the profi-air range of products are available for this purpose:

- profi-air roof hood
- profi-air lead tile
- profi-air steel tile for flat roofs

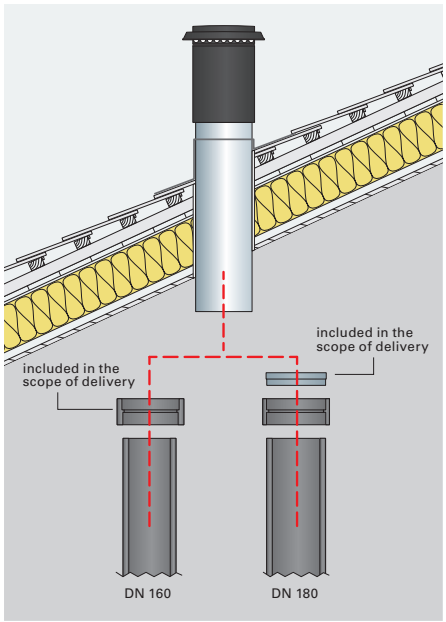
Select the appropriate profi-air roof tiledepending on the pitch of the roof. The profi-air roof hood is insulated and can be inserted universally in the steel tile for flat roofs or in the lead tile.

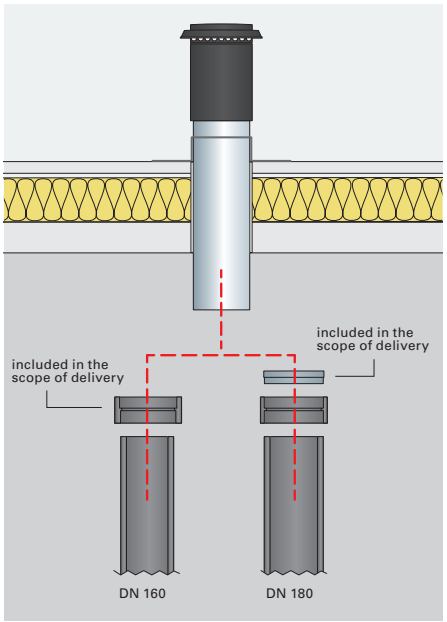
Installation and connection

Installation instructions

Select the respectively required products depending on the roof construction/pitch. The steel tile for flat roofs or the lead tile must be covered according to the pertinent regulations and standards before installing the roof hood. Insert the roof hood in the steel tile for flat roofs or the lead tile from above
and adjust it vertically. Make sure that the rain collar of the roof hood overlaps the collar of the steel tile for flat roofs or the lead tile. Fasten the roof hood on-site below the roof construction. Properly seal all roof penetrations of the building envelope.

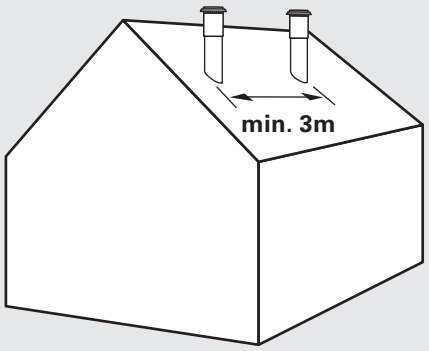
Establish the connection between the roof hood and Iso pipe using the EPP coupling included in the scope of delivery (roof hood DN 160) or rubber coupling (roof hood DN 180).

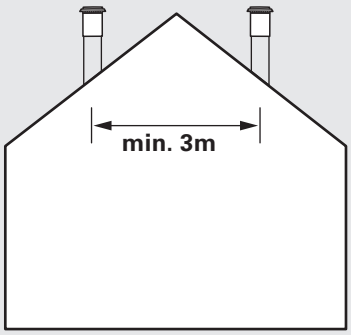




Important: Exception for roof hood DN 180
Slip the rubber coupling over the lower part of the roof hood. Then insert the installed rubber coupling into the EPP coupling NW180 and connect it to the iso pipe DN 180.

Minimum distances





Advice: The fresh and extract air ducts must be insulated. We recommend using the profi-air Iso pipe for this. Alternatively, the connection can be established with metal pipes which must be insulated vapour-tight. The installation of the profi-air roof hood system should be agreed upon with the local roofer to avoid possible sealing defects.

5.5 profi-air 250 / 400 touch ventilation units

5.5.1 General information

The ventilation units of the profi-air series by FRÄNKISCHE are an important component of a controlled home ventilation system. They provide the rooms with the required fresh air and remove extract air. Using the integrated cross-flow heat exchanger made of plastic, these ventilation units generate a high heat transfer. The supply air is heated to nearly room temperature even during low outside temperatures of around 0° C. All ventilation units of the profi-air series are equipped with fully automated summer bypass flaps to avoid undesired heating of the outside air in the transitional periods.

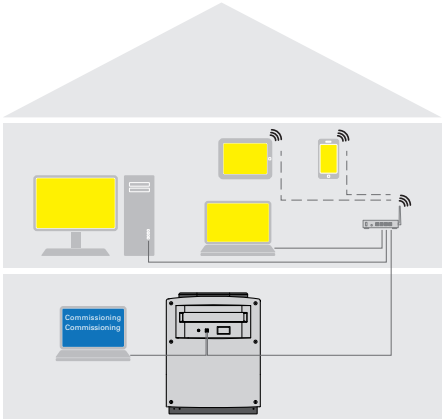
5.5.2 Applications

The ventilation units profi-air 250 touch and profi-air 400 touch have been designed for use in single-family and multi-family homes.

- profi-air 250 touch ➔ up to 250 m² ventilated area
- profi-air 400 touch ➔ up to 400 m² ventilated area

5.5.3 Connection options to profi-air touch ventilation units

- Connection of a laptop / PC and WLAN router via the RJ45 interface
- Connection to the sensor-actuator box (see accessories) via the CAN bus plug



5.5.4 Anti-freeze strategies with profi-air touch ventilation units

General anti-freeze strategies with profi-air touch ventilation units

The anti-freeze function is released, both with and without pre-heater, from an outside air temperature of ≤ 0 °C. The result from continuous measurement and monitoring of the air temperatures forms the basis for the calculation algorithms of the profi-air touch control.

Anti-freeze without pre-heating element

Falling below the calculated proportionalities leads to shutting off of the supply air ventilator. The supply air ventilator switches on automatically after a defined cut-off time and the measuring and monitoring process starts again. When using a room air-dependent fireplace in the building, this type of anti-freeze may not be used. A pre-heating element must be included in this case.

Anti-freeze with pre-heating element

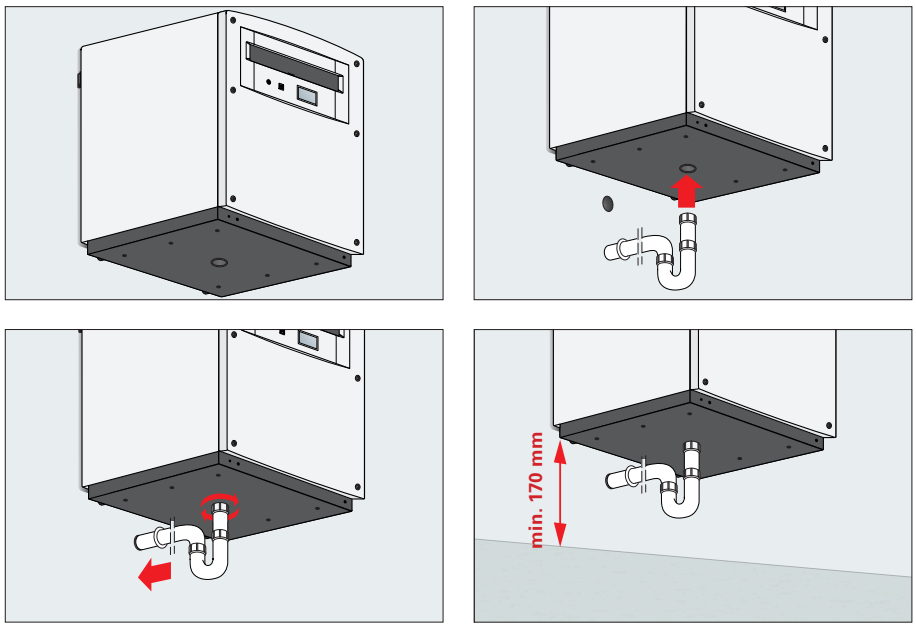
Falling below the calculated proportionalities leads to a release of the pre-heating element; a release contact switches the on-site heating element (e. g. electronic heating element, brine heating element). The switching on or off moment is controlled via the supply air temperature.

5.5.5 Condensate connection with profi-air touch ventilation units

Condensate develops in the heat exchanger of the profi-air touch due to heat recovery. This accumulated water is discharged from the device in a controlled way via a condensate outlet. The condensate outlet is located on the bottom of the device.

Connect a siphon on-site to the 5/4" connector with MT. The siphon minimises the odour transfer from the drains and prevents the device from extracting external air.
The condensate must be discharged in the drains by free drainage through an additional siphon to be installed on-site.
Since the water seal of a common siphon can dry out, we recommend using a waterless or ball siphon. The ball siphon is available as accessory.

Installation and connection



Advice: Only connect the condensate pipe after the wall installation of the device.

5.5.6 Setting options of the profi-air touch control

Advice: See ”profi-air 250/400 touch operating manual”

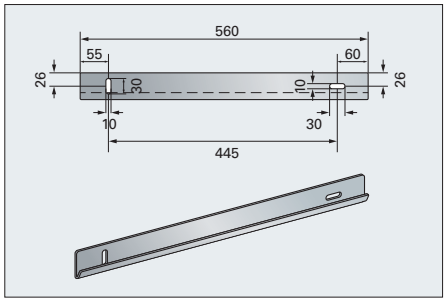
5.5.7 Accessories

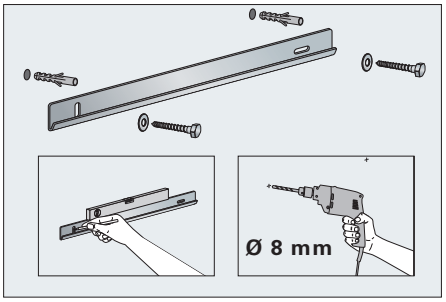
profi-air wall mounting set for profi-air 250/400 touch

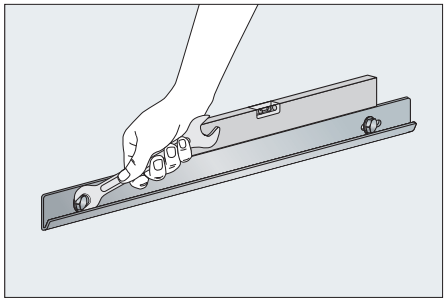
The "wall mounting set" is used for sound-decoupled fastening of the ventilation devices profi-air 250 touch and profi-air 400 touch on a stable wall. One mounting rail is fixed to the device and one to the wall. The two included rubber buffers and the slipped on edge protection at the fastening rail ensure sound decoupling from the building. The rubber buffers must be screwed in the base plate of the ventilation unit on the rear side.

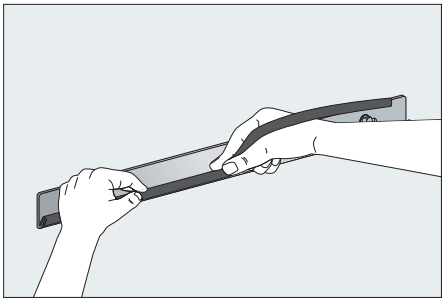
The device can be adjusted using the long holes in the wall fastening rail and the adjustable rubber buffers.

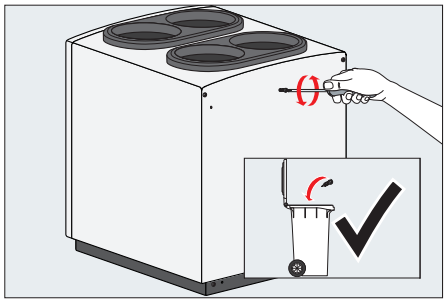
Installation and connection of profi-air wall mounting set

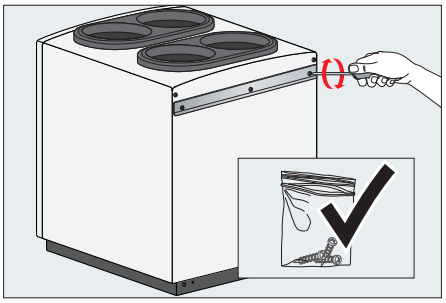


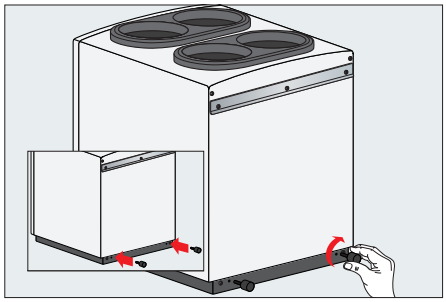


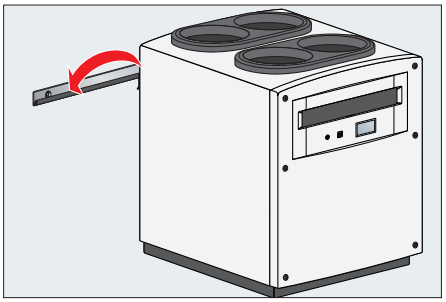


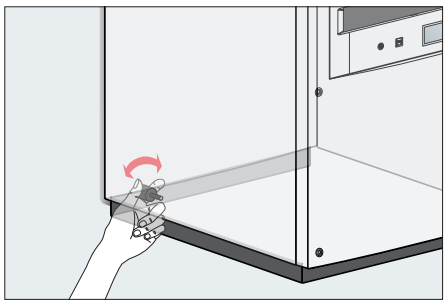


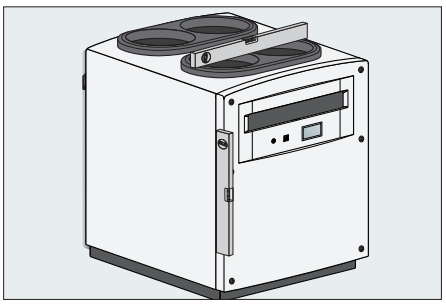






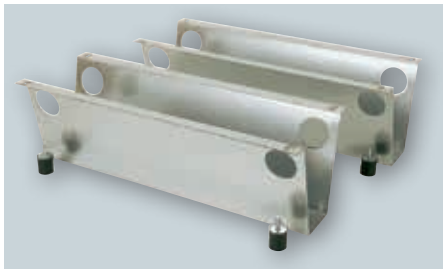






profi-air floor mounting set for profi-air 250/400 touch

The "floor mounting set" is used for the sound-decoupled setup of the ventilation units profi-air 250 touch and profi-air 400 touch. The two floor stands are screwed to the base plate of the ventilation unit. The four included rubber buffers must be screwed to the floor stands and ensure sound decoupled setup.



Advice: Only connect the condensate pipe after the installation of the floor stands of the device.

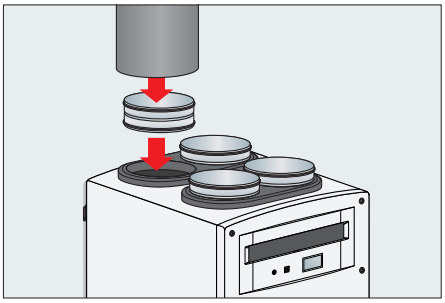
profi-air 250 touch connection set (Iso or spiral pipe)

The profi-air 250 touch connection set includes four double nipples DN 160 incl. lip seal. These double nipples establish the connection between the ventilation device (fresh, extract, exhaust and supply air connection) and the selected pipe system (profi-air Iso pipe and spiral pipe). The lip seal ensures an airtight connection to the pipe system.

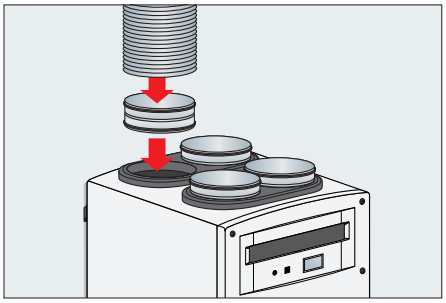
profi-air 400 touch connection set (spiral pipe)

The profi-air 400 touch connection set for spiral pipes includes four double nipples DN 180 incl. lip seal. These double nipples establish the connection between the ventilation device connector (fresh, extract, exhaust and supply air connection) and the selected spiral pipe system. The lip seal ensures an airtight connection to the pipe system.

Installation and connection



Connection ISO pipe to profi-air touch 250

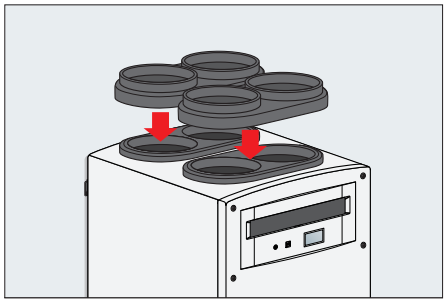


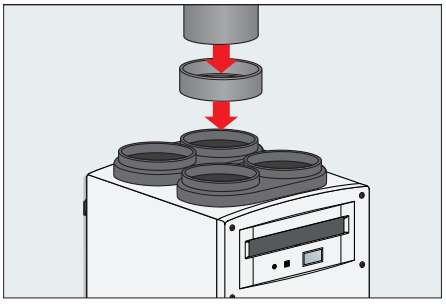
Connection spiral pipe to profi-air touch 250/400 touch

profi-air 400 touch connection set (iso pipe)

The profi-air 400 touch connection set includes two EPP adaptor attachments which are attached to the ventilation unit. The expanded connector distance therefore allows the connection of the profi-air iso pipe DN 180. The connection between adaptor attachment and profi-air Iso pipe is established using the included ISO pipe couplings.

Installation and connection

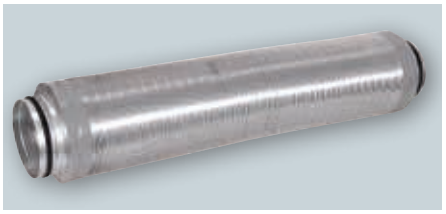




profi-air telephonie silencer

The profi-air telephonie silencer is used to minimise the airborne sound created by the ventilators installed in the ventilation unit. It consists of two flexible aluminium pipes and a sound adsorption package made of synthetic resin bound mineral wool. Its design makes the telephonie silencer very flexible and allows 90° bends. The lip seals at the telephonie silencer connections ensure an airtight pipe connection to profi-air iso pipes and spiral pipes.

We recommend installing two telephonie silencer for profi-air touch ventilation units (1x supply air, 1x exhaust air).
If the fresh air or extract air grill is located very close to a room requiring noise protection (e.g. bedroom) or the neighbouring premises, it might make sense to install two additional telephonie silencer (1x fresh air, 1x extract air).



- profi-air 250 touch ➔ sound absorber DN 160
- profi-air 400 touch ➔ sound absorber DN 180

DN inside	DN outside 25mm package	Integral attenuation (dB) in octave bands (Hz) TSD 1000mm long						
		125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
160	210	2	4	10	13	43	18	14
180	230	2	3	9	22	35	15	12

profi-air sensor-actuator box

The profi-air sensor-actuator box expands the connection options to the profi-air touch ventilation unit. The following connections are possible:

- service off switch
- electric pre-heater
- electronic filter
- push-button
- up to four humidity or CO_2 sensors

Advice: Connection plan see "profi-air 250/400 touch operating manual"

profi-air CO_2 sensor and profi-air humidity sensor

The CO_2 or humidity sensors allow controlling the profi-air touch ventilation unit automatically depending on the air quality. Either CO_2 concentration or relative humidity are used as indicators of the air quality in the rooms. The sensors control the ventilation unit as required and adjust the air flow according to the actual requirements.
The ventilation modes are switched as follows:

Ventilation mode	Moisture	CO_2
Mode 2	< 60% relative humidity	< 1000 ppm
Mode 3	60 to 85% relative humidity	1000 to 1500 ppm
Mode 4	< 85% relative humidity	< 1500 ppm

6 Commissioning, maintenance and servicing

6.1 Commissioning, maintenance and servicing

Commissioning of a home ventilation system

During commissioning, the previously calculated air volumes for the respective ventilation mode are set, adjusted and tested. Before commissioning can take place, the works listed below must be completed since smooth operation can only be guaranteed afterwards:

- the unit is installed in a frost-free installation room
- the installation of the unit including condensation discharge is complete
- fresh and extract air ducts have been connected, including insulation
- all supply and exhaust air valves can be accessed
- unit, filter and pipe system are not contaminated
- power supply and electrical connection have been established
- any external controls have been connected
- internal fitout works (e.g. drywall installation) have been completed
- any required silencers have been installed
- in general, the intended use of the ventilation system according to the operating and installation manual is guaranteed

To adjust the air volumes for the individual rooms, an appropriate air volume meter (e.g. hydrometric vane with measuring funnel) is required.

To properly commission a home ventilation system **with profi-air classic constant airflow regulators**, the following steps are required:

- all valves (supply and exhaust air) must be fully opened
- the constant airflow regulator must be installed in the manifold
- if the intensive ventilation mode is required, a so-called profi-air booster must be installed in at least one supply and one exhaust air room instead of the constant airflow regulator. The valves must then be calibrated by adjusting the annular clearance at the ventilation valve.
- setting the fan performance in the nominal ventilation mode (profi-air touch - mode 3)
- control measurement of all supply and exhaust air valves
- adjustment of the fan performance in the nominal ventilation mode and another control measurement for all supply and exhaust air valves, if necessary
- the fan performance in the other modes must be set according to the following scheme:
  - protection against moisture/mode 1 = 0.3 x mode 3
  - reduced ventilation/mode 2 = 0.7 x mode 3
  - intensive ventilation/mode 4 = 1.3 x mode 3

When making adjustments **without the profi-air classic constant airflow regulator**, the air volumes must be adjusted and calibrated at the valves using the annular clearance or for ventilation grills using the profi-air tunnel airflow restrictor.

All collected data and values have to be documented. The corresponding templates for a gapless documentation are provided on the next pages.

After calibrating the air volumes, the other regulation points should be reviewed and adjusted, if necessary (e.g. anti-icing system/weekly programme/automatic summer bypass, etc.).

Finally, the users should be introduced to the most important regulation functions and instructed how to replace filters. They should also receive the operating manuals for the profi-air touch.

6 Commissioning, maintenance and servicing

Maintenance and servicing of a home ventilation system

To permanently ensure a hygienic home ventilation system, it is particularly important to maintain and service the system at regular intervals. For this reason, we recommend signing a maintenance contract with an installer for maintaining and cleaning the system. According to DIN 1946-6, the parts listed below should be inspected regularly and replaced or cleaned, if necessary.

Parts	Maintenance/inspection intervals
Air filter Inspection of all air filters for contamination and replacement. If necessary also in the ventilation unit, in ehaust air valves, pre-heaters or eart-air heat exchangers.	every six months
Ventilation unit Inspection and cleaning, if necessary, of the heat exchangers, fans. Inspection of condensation discharge and siphon	every 2 years
Air distribution Inspection and cleaning, if necessary, of the ventilation ducts, manifolds and ventilation valves	every 2 years

6.2 Commissioning forms

- **profi-air project planning request**
- **profi-air commissioning assignment**
- **profi-air commissioning transfer protocol**
- **profi-air volume measurement protocol**

FRÄNKISCHE

profi-air® project planning request

Please send the completed application form by fax to
0 95 25 / 88 - 2153

Date

Project planning number
(completed by FRÄNKISCHE and returned by e-mail)

Contact

Sender

☐ Owner ☐ Planner ☐ Plumber/fitter
☐ Architect ☐ Wholesaler ☐ FRW sales representative

Mr./Mrs./Ms.
First name
Last name
Company
Street
Zip code/city
Country
Phone
Mobile
E-mail

Contact partner

☐ Owner ☐ Planner ☐ Plumber/fitter
☐ Architect ☐ Wholesaler ☐ FRW sales representative

Mr./Mrs./Ms.
First name
Last name
Company
Street
Zip code/city
Country
Phone
Mobile
E-mail

Construction project

Name

Street
Zip code/city
Country

Information on construction project

Type of building	Utilisation units	Condition of the building	Construction progress
☐ Regular	☐ SFH, without self-contained flat	☐ New building	☐ Planning phase
☐ Low-energy house	☐ SFH with self-contained flat	☐ Renovation	☐ Already under construction
☐ Passive house	☐ MFH	☐ Year of construction	☐ Begin of construction

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profi-air® project planning request

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Ventilated spaces

☐ Basement	____ m²	☐ within the thermal envelope
☐ Ground floor	____ m²	
☐ Upper floor	____ m²	
☐ Attic	____ m²	☐ within the thermal envelope
☐ _____	____ m²	☐ within the thermal envelope

Ventilation unit

Unit type	Place of installation	Constant airflow regulator
☐ profi-air touch	☐ Basement	☐ yes
☐ Third-party manufacturer	☐ Utility room	☐ no
_____	☐ Thermally insulated attic	
	☐ _____	

Chimney/fireplace

☐ none ☐ room air-dependent ☐ room air-independent

Air distribution system

System	Place of installation	Outside/outgoing air ducting
☐ **profi-air® tunnel**	☐ insulation under screed	☐ Exterior wall
☐ **profi-air® classic NW 63**	☐ in the concrete ceiling	☐ Exterior wall/roof
☐ **profi-air® classic NW 75**	☐ in the suspended ceiling	☐ Roof
☐ **profi-air® classic NW 90**	☐ In the attic (thermally insulated)	
	☐ _____	

Please send the following documents together with the profi-air application form by e-mail to FRÄNKISCHE:

– Layout (including information on room sizes and uses)
– Cross section of the building (including information on room heights)

The e-mail address is: **kundenservice.haustechnik@fraenkische.de**

Please note that project planning will not be possible without these documents.

FRÄNKISCHE

Assignment for commissioning of a controlled home ventilation system according to the current commissioning price list

Commissioning module with the cat. no.

Send to: fax 09525/88-2153 or e-mail: kundenservice.haustechnik@fraenkische.de

Client

Company/name _____ Phone _____

Street _____ Mobile _____

Zip code/city _____ Fax _____

System installation location/building

Company/name _____ Phone _____

Street _____ Mobile _____

Zip code/city _____ can be contacted from _____ to _____

Source of supply/wholesale

Company/name _____ Phone _____

Street _____ Mobile _____

Zip code/city _____ Fax _____

Unit type: profi-air 250 touch ☐ profi-air 400 touch ☐

Who planned the ventilation system? FRÄNKISCHE ☐ Third party* ☐

*When planning was conducted by third parties, the documents (air route and air volume planning) must be handed over to FRÄNKISCHE for review beforehand.

Number if planned by FRÄNKISCHE _____

FRÄNKISCHE pipe system yes ☐ no ☐

If no, which manufacturer: _____

What kind of distribution exists? star ☐ ring ☐

Have constant airflow regulators been installed? yes ☐ no ☐

Checklist for commissioning: Please tick all items separately! ☑

- The unit is installed in a frost-free installation room ☐
- The installation of the unit including condensation discharge is complete ☐
- Outside and outgoing air ducts have been connected, including insulation ☐
- All supply and exhaust air valves can be accessed ☐
- Unit, filter and pipe system are not contaminated ☐
- Power supply and electrical connection have been established ☐
- Any external controls have been connected ☐
- Internal fitout works (e.g. drywall installation) have been completed ☐
- Any required sound dampers have been installed ☐
- In general, the intended use of the ventilation system according to the operating and installation manual is guaranteed ☐

For the avoidance of doubt, an incomplete or not properly performed installation may lead to increased efforts which will be charged at an hourly rate of € 64.–.
In extreme cases, commissioning may be cancelled.

Desired date for commissioning: _____ **Alternative date:** _____

Advice: A lead time for planning of at least 10 business days is necessary for the commissioning date.

I hereby confirm that all indicated works have been carefully performed and place the order for commissioning.

Date/place/name/client (company stamp) _____ Date/place/name/invoice recipient (company stamp) _____

FRÄNKISCHE

Commissioning TRANSFER PROTOCOL

according to price list cat. no. DL _____

Fränkische Rohrwerke, profi-air ventilation unit with heat recovery

This is to confirm that by the installation company

_____

_____

_____

in the building of the user,

_____

_____

_____

a ventilation unit with heat recovery **profi-air** with summer bypass

type 250 touch ☐ type 400 touch ☐

serial no.: _____ year of construction: _____

has been installed.

The installation was performed according to the currently valid technical guidelines.

The following volume flow rates have been set:

	Supply air	Outgoing air
Mode 1 (FL protection against moisture)	_____ m³/h _____ V	_____ m³/h _____ V
Mode 2 (RL reduced ventilation)	_____ m³/h _____ V	_____ m³/h _____ V
Mode 3 (NL nominal ventilation)	_____ m³/h _____ V	_____ m³/h _____ V
Mode 4 (IL intensive ventilation)	_____ m³/h _____ V	_____ m³/h _____ V

The following options have been connected:

Sensor 1 (moisture/CO_2 sensor) ☐	**Button (mode switching button)** ☐
Sensor 2 (moisture/CO_2 sensor) ☐	**E-filter (electronic air filter)** ☐
Sensor 3 (moisture/CO_2 sensor) ☐	**preheater coil (electronic preheater coil)** ☐
Sensor 4 (moisture/CO_2 sensor) ☐	**Service off** ☐

FRÄNKISCHE

Commissioning TRANSFER PROTOCOL

Fränkische Rohrwerke, profi-air ventilation unit with heat recovery

Notes and comments on the system:

On _____ the entire system was transferred to the user

in good order and condition; the operating manual was handed over as well. The user was introduced to the functions and operation of the system.

Place, date

Company stamp and legally binding signature

Signature by the user

Page 2 of 2

FRÄNKISCHE

COMMISSIONING PROTOCOL - air volume measurement

Supply air							
Type of room	Floor	TARGET [m³/h]	Meas. 1 [m³/h]	Meas. 2 [m³/h]	Meas. 3 [m³/h]	Meas. 4 [m³/h]	Meas. 5 [m³/h]
Total supply air							

Exhaust air							
Type of room	Floor	TARGET [m³/h]	Meas. 1 [m³/h]	Meas. 2 [m³/h]	Meas. 3 [m³/h]	Meas. 4 [m³/h]	Meas. 5 [m³/h]
Total exhaust air							

Site name: _____

Zip code/city: _____

Date: _____

7 Service

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- **Practical support in pilot projects**
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Fri. 7:30 am – 12:00 pm
Technical Service hotline
0800 101 40 79

Fax

+49 9525 88-2153 / -2500

e-mail

info.gb_h@fraenkische.de
technik.gb_h@fraenkische.de

Adress

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Hellinger Straße 1
97486 Königsberg/Germany
Phone +49 9525 88-2297

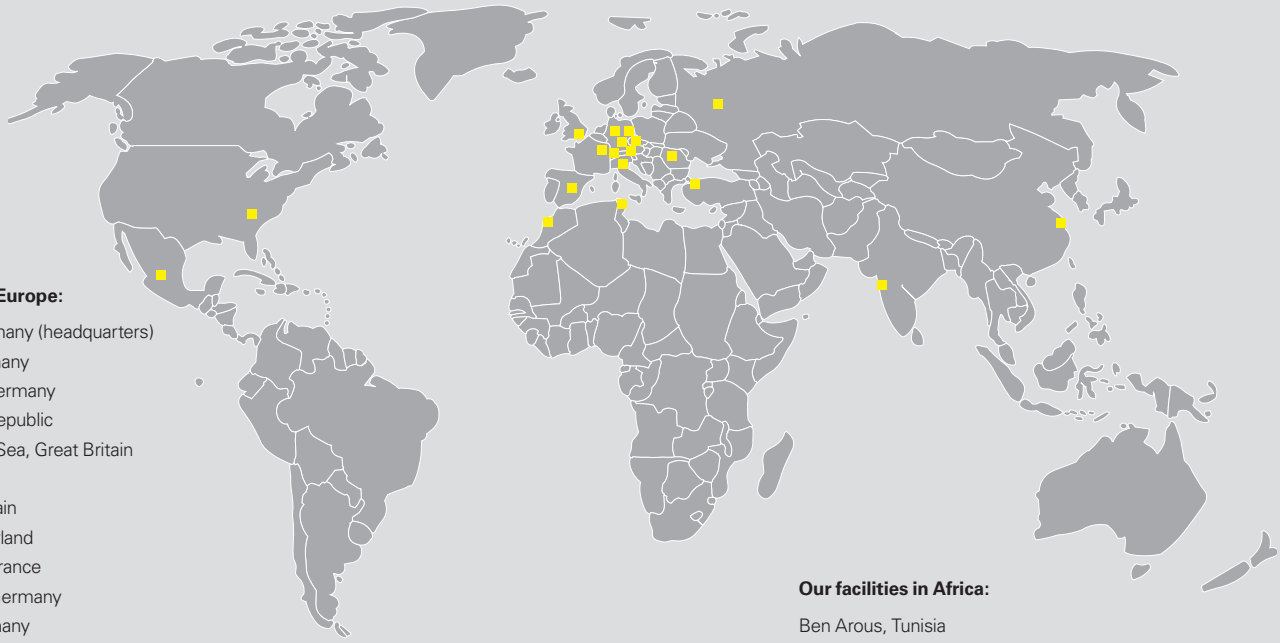
Internet

www.fraenkische.com

FRÄNKISCHE

Rooted in Königsberg –

globally successful!



Our facilities in Europe:

Königsberg, Germany (headquarters)
Bückeburg, Germany
Schwarzheide, Germany
Okříšky, Czech Republic
St.-Leonards-on-Sea, Great Britain
Moscow, Russia
Yeles/Toledo, Spain
Rebstein, Switzerland
Torcy-le-Grand, France
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FRÄNKISCHE is an innovative, growth oriented, medium-sized family-owned enterprise and industry leader in the design, manufacturing and marketing of technically superior corrugated pipe systems for drainage, electrical, building technology and industrial applications.

We currently employ about 2,500 people worldwide. Both our many years of experience and expertise in plastics processing, our consulting services and the large array of products are highly valued by our customers.

FRÄNKISCHE is a third generation family owned business that was established in 1906 and is now run by Otto Kirchner. Today, we are globally represented with production facilities and sales offices. The proximity to our customers enables us to develop products and solutions that are perfectly tailored to our customers' needs. Our action and business philosophy focus on our customers and their needs and requirements for our products.

FRÄNKISCHE – Your partner for sophisticated and technologically advanced solutions.

FRÄNKISCHE ROHRWERKE Gebr. Kirchner GmbH & Co. KG | 97486 Königsberg/Germany
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