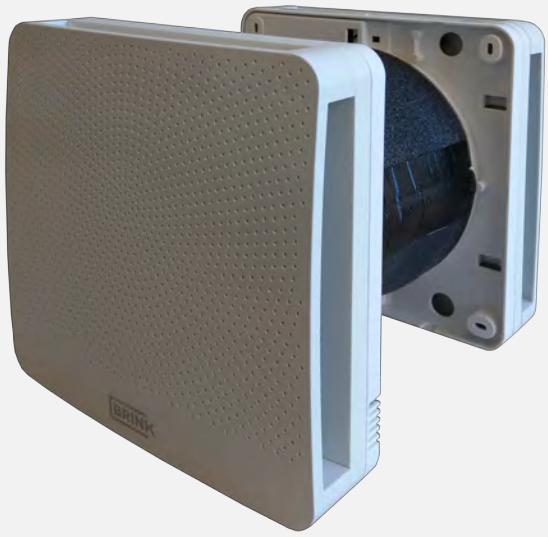
BRINK

Air for life

Design Guide

Multi Air Supply system
English



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1 General system description

The Multi Air Supply system comprises a Brink balanced heat recovery ventilation system (HRV) combined with one or more Indoor Mixfans in each habitable room, such as living rooms and bedrooms. Unlike in the case of a conventional HRV design, there are no air ducts. The supply air is blown into the central stair core -hall and landing- the so-called circulation area of the home. That makes balanced ventilation easy to implement in existing buildings and it enhances the air quality, comfort and energy performance of homes. Apart from the easy applicability, this system has the advantage of a fully automatic, demand-controlled CO_2 control system that warrants optimum air quality. The air quality in the circulation area is monitored by an active CO_2 sensor. When the CO_2 concentration increases, the flow of clean outside air is increased. The control value of this sensor is from 600 ppm to 800 ppm.

The Indoor Mixfans use air from the stair core -hall/landing- to ventilate the habitable rooms, such as the bedrooms and the living room. One or more Indoor Mixfans installed in the wall or above the door between the circulation room and the habitable room, draw air from the bedrooms and the living room as needed. Simultaneously, air from the stair core flows back to the bedrooms and the living room through an overflow provision, in many cases a gap under the door. When an interior door is not closed, part or most of the mixing already takes place in a natural way. As with a normal ventilation system, opening windows in the habitable rooms does not have a negative effect on the air quality and is permitted as usual. Indoor Mixfans recognise when clean outside air is coming in through windows and so they can reduce the ventilation rate.

It must be assessed individually for every property what the best configuration will be. For example, a living room with an open-plan kitchen does not always require an Indoor Mixfan, because the air supply to the living room can be regulated by increasing the exhaust rate in the kitchen. The mechanical extraction in the kitchen creates underpressure, as a result of which the supply air is also supplied from the circulation area without the assistance from an Indoor Mixfan. If an Indoor Mixfan with a built-in CO_2 sensor is not required in a living room with an open-plan kitchen, a separate CO_2 sensor must be installed in the living room. To guarantee sufficient flow between the circulation area and the living room, a grille is installed above the door because the capacity of the gap underneath the living room door is insufficient.

Air from the stair core is extracted through overflow provisions to the wet areas. The wet areas usually include the kitchen, the bathroom and the toilet. The HRV unit mechanically extracts the air from these rooms, and recovers the thermal energy to heat or cool the incoming air. Then the HRV unit sends the exhaust air directly to the atmosphere.

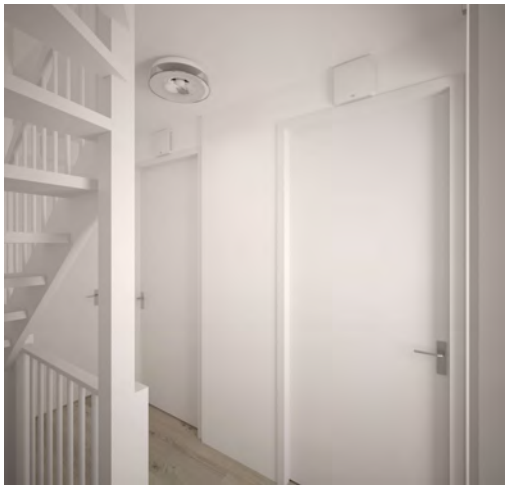
System components:

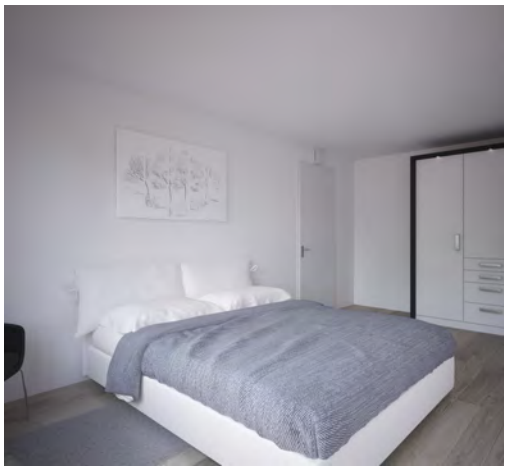
A = HRV= Unit
B = Indoor Mixfan bedrooms
C = Indoor Mixfan habitable room
D = Circulation area

2 Specific system operation

The air supply to the habitable rooms is arranged through the circulation area. The air in the circulation area is a mixture of fresh outdoor air and a small share of air that has been extracted from the habitable rooms by the Indoor Mixfans. That means that compared to the outdoor air, the air in the stair core will slightly be contaminated by air from the habitable rooms. Since a dwelling has several habitable areas with different functions, such as living and sleeping, and not all habitable rooms will be occupied at the same time, this initial contamination will remain very limited.

Application of a CO_2 controlled Indoor Mixfan per room in combination with CO_2 control of the central HRV unit, warrants the CO_2 level in the home and prevents that the hygienic limit value of 1,200 ppm is exceeded (IAQ class 2 of 800 PPM above the outside air concentration according to EU standard EN 16798-1).





3 Warranted air quality

This innovative ventilation systems for the bedrooms and the living room differs from conventional designs with heat recovery, among other aspects, in terms of air flow direction.

The Dutch research institute TNO has issued a 'warranted air quality' declaration for this ventilation concept. The declaration is partly based on a simulation and it demonstrates that this ventilation concept can be used to maintain good air quality.

A prerequisite is that the Multi Air Supply system is based on the design principles described in Chapter 6.

4 National Ventilation Regulations and the Multi Air Supply system

In Switzerland and Germany, the principle of connection fans between the circulation area and the habitable rooms is already in use and it has been incorporated into the ventilation regulations.
In other countries where an energy upgrade of dwellings is also a hot issue and, basically, heat recovery is a must to achieve this objective, the regulations may still need to be adapted.

5 Multi Air Supply system and energy efficiency

The Multi Air Supply system is highly energy efficient because it includes a central ventilation unit with heat recovery and a CO_2 controlled room control system.

Moreover, the electrical rated power of the Indoor Mixfans is very low (<2W at 50m^3/h).

6 Design principles

6.1 Design principles Multi Air Supply system
The Multi Air Supply system is based on a standard balanced ventilation system The main difference is that the supply air from outside is fed into the habitable rooms via the stair core and the Indoor Mixfan instead of directly via air supply ducts.

Capacity requirements according to national ventilation regulations:
1. The capacity requirements for the air supply of the central HRV unit must be determined in accordance with the relevant national ventilation regulations. A recommendation for the unit settings for an average family home is shown below.

- Modes HRV unit
    - Basic values for the HRV unit settings for every mode are as follows.
        - Mode 0: 50 m^3/h
        - Mode 1: 100 m^3/h
        - Mode 2: design flow rate
        - Mode 3: maximum unit capacity or design flow rate

2. The exhaust capacity and layout for the exhaust ventilation ducts are 100% comparable with a heat recovery ventilation system design. When the thermal energy from the exhaust air has been transferred, the air is sent directly to the atmosphere.

3. A CO_2 sensor must be connected to the central HRV unit for monitoring the air quality in the circulation room with setpoints of 600 ppm low and 800 ppm high.

- Central CO_2 sensor in the hall or stair core
    - Set to 600 ppm low and 800 ppm high. These settings guarantee good air quality and the HRV unit will not respond to quickly.
    - The sensor measures the CO_2 percentage of the mixed air from the HRV unit and the Indoor Mixfans.
    - The sensor should not be placed directly in the airflow of the HRV, but neither directly in the airflow of an Indoor Mixfan. The sensor should be mounted close to the exhaust -toilet or bathroom- farthest removed from the HRV unit supply.

4. If the HRV unit is installed in the attic, the supply air can be blown freely into the circulation area. However, similar to a conventional design, the unit must be fitted with mufflers and it is recommended to use the specially designed discharge grille for an even quieter supply that can also be steered in one direction with baffles to avoid the circulation zone as much as possible.

- Supply grille HRV
    - Preferably, the grille should be the one developed by Brink for this purpose. It muffles extra noise, but it also make it possible to steer the airflow. That way the airflow can be steered away from the circulation area as much as possible. This same supply grille can also be used when the central HRV unit is installed in the storage room of an apartment, for example.
    - If still a different grille or supply air valve is chosen, then it should be taken into account that a large volume of air will be blown in through this grille. It should be able to handle that. Also, in this case, the supply should be kept out of the circulation area as much as possible.

5. The CO_2 sensor in the circulation area is installed on the landing or in the hallway and should be mounted as far away from the central air supply as possible, but still near an exhaust point to prevent the CO_2 sensor from ending up in a blind spot. When supplying air from the stair core access in the attic, this will be the hall on the ground floor.

6. Every habitable room gets its own Indoor Mixfan. The Indoor Mixfan features a built-in CO_2 sensor that actively monitors the air quality in the habitable rooms. Settings CO_2 low and CO_2 high depend on the room and its occupancy and can be set via dip switches on the unit.

- Bedroom 2 adults. Settings: 50 m^3/h. CO_2 low 600 ppm and CO_2 high 1,200 ppm. This is the most quiet mode. As from a CO_2 value of 600 ppm, the Indoor Mixfan will gradually increase the flow rate and will only reach its maximum flow rate at 1,200 ppm. In practice, 1,200 ppm will not be reached, provided the gap under the door is large enough.

- Bedroom 1 person. Settings: 35 m^3/h. CO_2 low 600 ppm and CO_2 high 1000 ppm. At this setting, the Indoor Mixfan may reach its maximum flow rate of 35 m^3/h at a lower CO_2 value. When only one person is present, the Indoor Mixfan will respond quietly.
- With three people in one room, two Indoor Mixfans are required. These can then be set to 35 m^3/h. CO_2 low 600 ppm and CO_2 high 1000 ppm.
- To accommodate four people, both Indoor Mixfans must be set at 50 m^3/h and CO_2 low 600 ppm and CO_2 high 1,200 ppm.
- When two Indoor Mixfans are used for one room, they must be coupled as Master-Slave.

7. As a rule, the Indoor Mixfan is placed above an interior door -for example in the skylight- and preferably at the highest possible level in the room. When placed in the wall between a habitable room and a circulation area, a minimum distance of 1.8 m between the Indoor Mixfans and the overflow provision -gap under the door- must be maintained.

8. In a living room with open-plan kitchen, the Indoor Mixfan is "assisted" by the exhaust flow in the kitchen. The kitchen extractor flow rate may be deducted from the capacity of the Indoor Mixfans.

9. When in a living room with open-plan kitchen more than 50% of the capacity is realised by the kitchen extraction, the living room must be equipped with a separate CO_2 sensor which is connected to the HRV unit. This CO_2 sensor should be set at 1,200 ppm high and 800 ppm low. This means that the setting of a CO_2 sensor in a habitable room differs from the setting of the CO_2 sensor placed in the stair core.
- Living room with open-plan kitchen:
    - If there is an open-plan kitchen, no Indoor Mixfan is required if the kitchen exhaust capacity is at least equal to the living room capacity requirement. The supply can be realised from the stairs or the corridor with a grille high above the door. This grill must have baffles that discharge upwards so the fresh air mixes along the ceiling with the air from the room. Exhaust is through the open-plan kitchen This exhaust must be regulated in such a way that it complies with the calculated ventilation capacity for that living room.
    - A CO_2 sensor must be installed in the living room and connected to the HRV unit. The living room is ventilated on the basis of demand. Settings for this CO_2 sensor are 800 ppm low and 1,200 ppm high.
    - If no Indoor Mixfan is needed for the living room, but it does require a grille above the door, the gap under the door should be as narrow as possible to prevent draught.

10. Usually, a gap under the door is used as an overflow provision. When the overflow provision is also used as a supply component for the kitchen extractor, the limited capacity of this type of overflow provision (25 m^3/h for a 1 cm door gap) makes it necessary to install a sound-absorbing grille in the interior door. This must not affect the soundproofing characteristics of the interior door.
- Indoor Mixfan living room without open-plan kitchen
    - A living room without open-plan kitchen or exhaust provision will require one or several Indoor Mixfans. In this case the central CO_2 sensor of the HRV unit should be placed in the hallway as closely as possible to an exhaust point, so a toilet or kitchen.
    - If the home is designed in such a way that a dining table or couch is likely to be placed in the circulation area, close to the door to the hallway, for the sake of comfort a different supply to the living room must be chosen than the one underneath the door. The gap under the door needs to be sealed and a different point must be chosen for the air supply from the hallway to the living room. For example, this could be a supply grille in the wall between the hallway and the living room.
    - If there is insufficient room in this wall and the only available space is above the living room door, that is where the supply grille will be placed. In this case, the Indoor Mixfan above the door is omitted. This does require mechanical extraction in the living room for drawing in air from the corridor through underpressure (extraction point just like in the wet rooms).

11. Precondition for application of the ventilation concept with the Indoor Mixfan is, that all habitable rooms are adjacent to the central circulation area in the dwelling. See chapter 6.2 on hybrid application for exceptions.

12. The Indoor Mixfan operates standalone in a habitable room. No wiring is required mutually between the Indoor Mixfans and between the Indoor Mixfans and the central HRV unit.

13. Open connection stair core
- The supply grille of the HRV unit must have an open connection to the Indoor Mixfans and to the exhaust points in the toilet, bathroom and kitchen.
- If there are doors in the stair core, a connection must be made with the aid of a grille or an acoustic grille.

14. Operation

- Preferably, a multiple switch, optionally wireless, should be installed in both the bathroom and the kitchen. It allows the user to temporarily select cooking/showering mode.
- At regular automatic operation, mode 1 must be selected.
- Active system control is easy by switching between automatic and high mode for cooking and showering, but adequate ventilation is also guaranteed with the HRV unit in automatic mode.

6.2 Design principles hybrid connection Multi Air Supply system

Some homes, such as smaller apartments, may have one or more habitable rooms that are directly adjacent to the room where the HRV unit is installed. In that case, it may be more cost-effective to supply the air to such rooms directly through a short supply channel and to equip the other more distant areas with an Indoor Mixfan. Precondition for spaces where no use is made of the Indoor Mixfan is, that they must be equipped with an individual CO_2 sensor connected to the HRV unit. Such CO_2 sensors must be set to the hygienic upper limit of 1,200 ppm and to 800 ppm low. A maximum of four CO_2 sensors can be connected to the HRV unit.

In some cases the habitable rooms are not adjacent to the central circulation area in the home. Also in this case, it can be decided to supply these habitable rooms through their own supply channel. Another possibility is to place an exhaust duct in these habitable rooms so that the supply is activated by the resulting underpressure.

7 System components
Multi Air Supply system

- HRV unit (Flair or Renovent Sky)

- E bus CO_2 sensor for monitoring mixed air in the circulation area (connected to the HRV unit)

- Sound-absorbing supply grille (300 x 200mm)

- Indoor Mixfan with built-in CO_2 sensor per habitable room

- Optional E-bus CO_2 sensors (maximum 3) in a hybrid application



Not included in the system components are the following regular HRV connection components, such as:

- External air supply
- External air outlet
- Condensate discharge
- Mufflers