# VENTILATION AND INDOOR CLIMAT

DECENTRALIZED VENTILATION


AIRMASTER®
ventilation in balance

# RECOGNISE THIS?

The air is damp and warm. Your eyes are dry and irritated. Your head seems heavy and you have difficulties concentrating.

A poor indoor climate has a big impact on our ability to function and well-being in our daily life. Surveys show that a poor indoor climate negatively impacts our performance levels by 5-10%. For children this impact is even greater*

That is why we need a world-class indoor climate.

**Geo Clausen, International Centre for Indoor Environment and Energy, Technical University of Denmark.*

**CONTENT**

# WORLD-CLASS INDOOR CLIMATE

## ...imagine if we could develop a ventilation unit that catered to our behaviour, needs and well-being.

...and just imagine if demand controlled mechanical ventilation with heat recovery could be part of the perfect energy solution for the renovation and building projects of the future.

This was the task and business idea that Henrik Stæhr and Kim Jensen formulated in 1991 when they set up Airmaster in Aars, Denmark.

And they succeeded. Airmaster now offers a range of decentralised ventilation units where expensive and energy-intensive ducted systems has been replaced by energy-efficient and flexible end-to-end solutions that never waste energy. High performance, intelligent controls and extremely low noise levels mean that Airmaster is world-class.

Airmaster A/S is still owned by Henrik Stæhr and Kim Jensen, and both still work at Airmaster A/S where they contribute their experience and vision in an operationally focused and growth-oriented business.

Day-to-day management is in the hands of Managing Director Kim Jensen.

# BEING IN A BAG

More stringent building regulations mean that renovation projects and new-builds are now very air-tight – so air-tight that they almost feel like being in a bag.

**BUILDINGS NEED TO BREATHE**

Buildings should be tight – but they should still be able to breathe. This sounds contradictory. What we mean is that buildings should be tight so that we do not use too much energy on heating and that they should be able to breathe in order for humid and 'used' air to escape. Buildings should not breathe through random holes, but through controlled and on-demand ventilation.

**OUR HEALTH IS AT STAKE**

Not all buildings have a good indoor climate. This is often because the building contains too much humidity. This can cause both health-related and financial problems. For the building this can mean rot and mould in the structure which can give us asthma and allergies if they are allowed to develop. More and more people are diagnosed with asthma and allergies. Part of the explanation is a poor indoor climate.

## DID YOU KNOW THAT...

...high levels of $CO_2$, high room temperature and high humidity = a poor indoor climate.

...we need to open doors and windows wide to create a draught two to three times a day for 5-10 minutes - to maintain a healthy indoor climate.

...indoor air is full of chemicals and particles from e.g. furniture, floor covering, electronics and painted surfaces. Chemicals and particles flying around in the air and binding to the dust.

# HIGH $CO_2$ LEVELS CAN DAMAGE YOUR HEALTH

We have all walked into a room where the air feels heavy and stagnant. Air has several components where oxygen, nitrogen and $CO_2$ dominate. These need to be in their natural balance.

When $CO_2$ levels in the air increase, this is an indicator of human activity. Human activity is good, but the 'used' air must be replaced by new and fresh air so that the air can regain its natural balance.

$CO_2$ levels tell us whether sufficient amounts of fresh air are being injected considering the number of people in the room. If you are exposed to very high levels of $CO_2$, it may damage your health, e.g.:

- Headache
- Dizziness
- Fatigue
- Restlessness
- Pins and needles in your legs
- Respiratory difficulties
- High blood pressure

**DIFFERENT LEVELS OF $CO_2$:**

**400-1000**

400-1000 ppm is a normal level of $CO_2$ in staffed rooms with a good intake of fresh air.

**1000-2000**

At 1000-2000 ppm you will usually feel tired and find it hard to concentrate.

**2000-5000**

At 2000-5000 ppm you will usually have a headache, be sleepy and generally feel unwell.

**5000-**

5000 ppm and above constitutes $CO_2$ poisoning.

## AN EVERYDAY EXAMPLE

$CO_2$ measurements taken in a traditional classroom at Gl.Hasseris School show very clearly how vital good ventilation is for air quality. The blue line shows the level of $CO_2$ with an Airmaster unit in operation. The red line shows measurements taken in the same room without ventilation. Figure 1 shows measurements taken over one school day and Figure 2 shows measurements taken over a whole school week.

The results are unequivocal. Without ventilation $CO_2$ levels increased to 2000 ppm during just one lesson. Seen on the basis of how many hours we spend in nurseries, in educational establishments and at work – these results are both though-provoking and alarming.

**FIGURE 1**

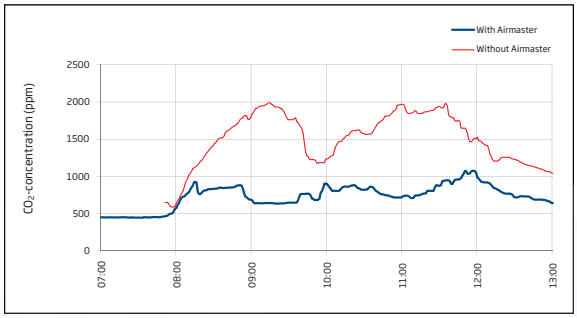
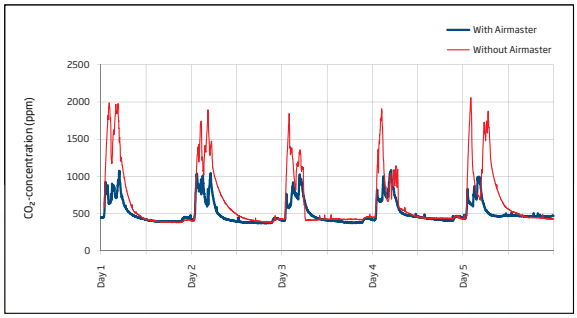



**FIGURE 2**




# EXCESSIVELY HIGH HUMIDITY

**THE TYPICAL SIGNS OF EXCESSIVELY HIGH HUMIDITY ARE:**

- Heavy levels of condensation on the inside of window panes
- Damp stains on ceilings and/or walls
- Wallpaper bubbling and coming off the wall
- Drawers and doors sticking
- Mould and resulting physical discomfort

Lack of ventilation increases the relative humidity in the rooms we use. Excessively high humidity allows dust mites to multiply and poses a risk of mould.

**DUST MITES**

Dust mites measure 0.1-0.6 mm and cannot be seen with the naked eye. They thrive in high humidity, i.e. 55-75% RH (RH = relative humidity) and reproduce at a speed that is directly linked to room temperature and humidity. They absorb humidity through their skin – so if humidity is kept below 45% RH, they will dry out and die.

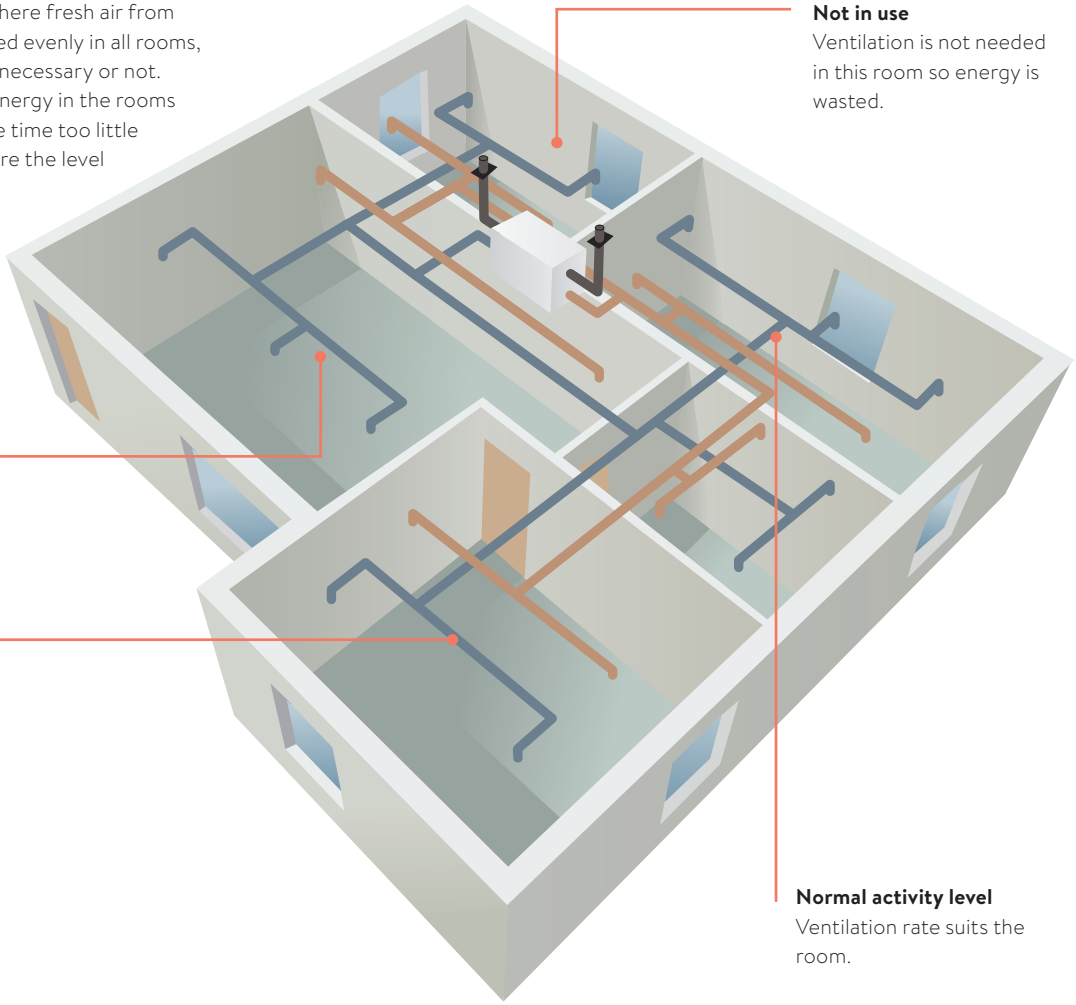
**MOULD**

A typical result of lack of ventilation is that mould develops inside the building. Mould spores contain substances that are harmful to people and animals.

**WHAT SHOULD YOU DO?**

You should ventilate the room – but in the right way! Decentralised ventilation with heat recovery ensures that nothing is left to chance.
A decentralised ventilation unit that automatically adapts the flow of fresh air to each room provides an indoor climate that is both healthy and financially viable.

**Centralised ventilation** Where fresh air from the ventilation is distributed evenly in all rooms, disregarding whether it is necessary or not. This results in a waste of energy in the rooms not in use, and at the same time too little fresh air in the rooms where the level of activity is high.




# CENTRALISED VENTILATION

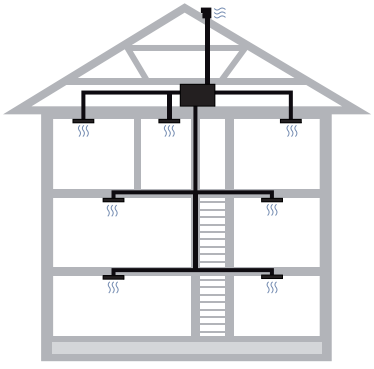
## BULKY AND EXPENSIVE

Centralised ventilation is an alternative to decentralised ventilation. Centralised ventilation involves a centrally located ventilation system which either blows out or draws air into all rooms through a major network of ventilation ducts. The planning of ventilation ducts is a large project and must be handled by an authorised ventilation specialist.

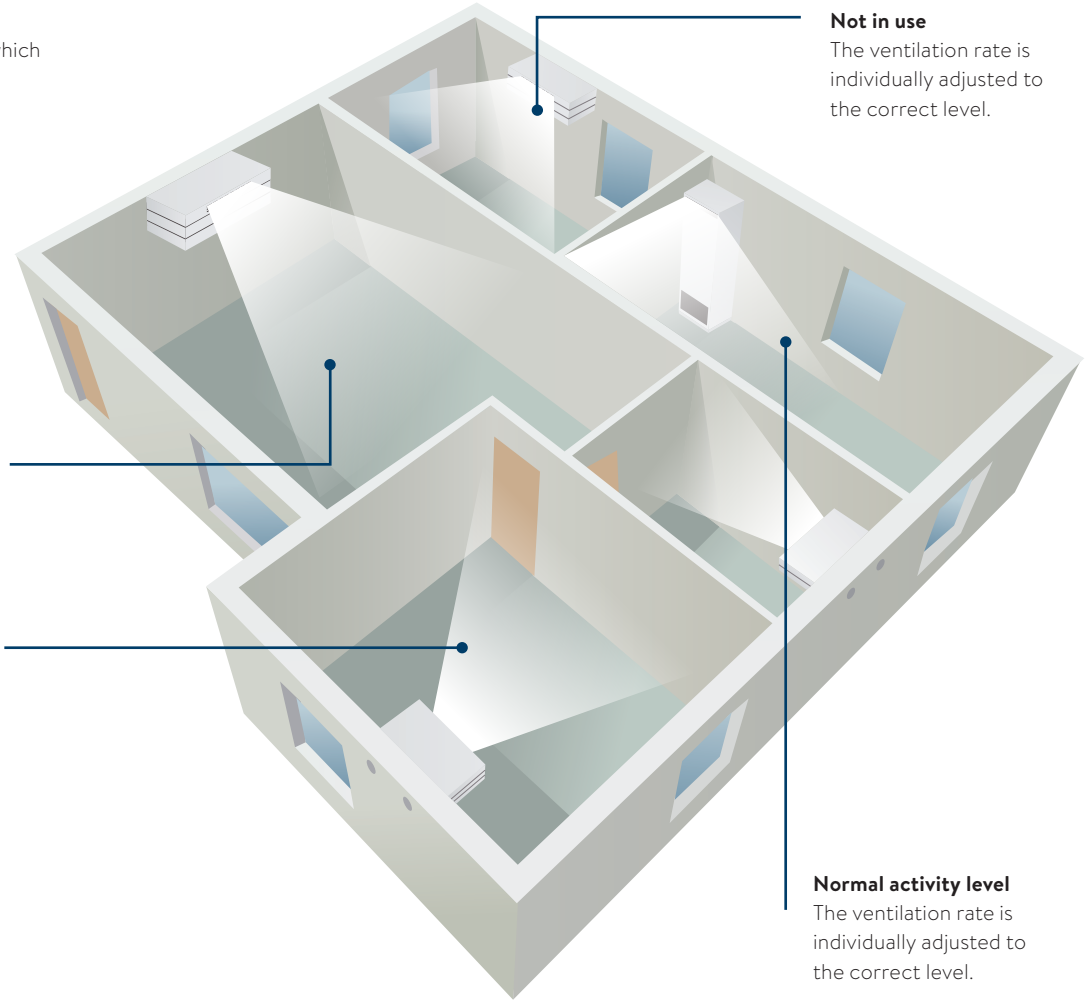
Ventilation ducts also demand a great deal of space. It is therefore often difficult to find an easy and simple solution in an existing building.

## WASTED ENERGY

Expensive and complex installation is required to adapt a centrally located system to all rooms. The system also ventilates all rooms at the same time – even when ventilation is only required in some of the rooms. This means wasted energy and increased cost.



**Decentralised ventilation**
Ventilates only the rooms which require fresh air and will be individually adjusted to the correct level.



**Not in use**
The ventilation rate is individually adjusted to the correct level.

**High activity level**
The ventilation rate is individually adjusted to the correct level.

**Low activity level**
The ventilation rate is individually adjusted to the correct level.

**Normal activity level**
The ventilation rate is individually adjusted to the correct level.

# DECENTRALISED VENTILATION

## INDIVIDUAL SOLUTIONS

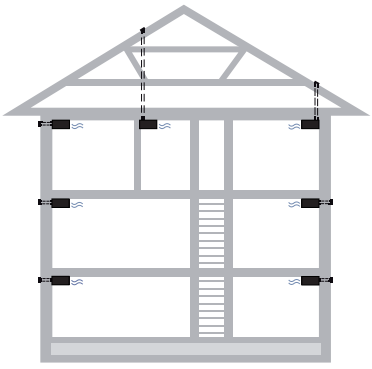
Using local AHU's from Airmaster you can tailor the optimized solution to fit all types of rooms and buildings.

The units are often mounted in such a way that a fire cell is not crossed, in that way a compulsory fire damper is not necessary. This will save time and money for maintenance and installation.

Access to the outside air is established through two holes through either ceiling or wall, directly from the unit. No ducts or pipes needed, giving the lowest possible energy consumption for air transport.

## LOCAL AHU'S MEANING SOUND INVESTMENT

Local AHU's from Airmaster means that a unit is positioned in the room where it is used to improve the indoor climate.
This way the energy is effectively used to ventilate only where it is needed and when it is needed.



# DECENTRALISED VENTILATION

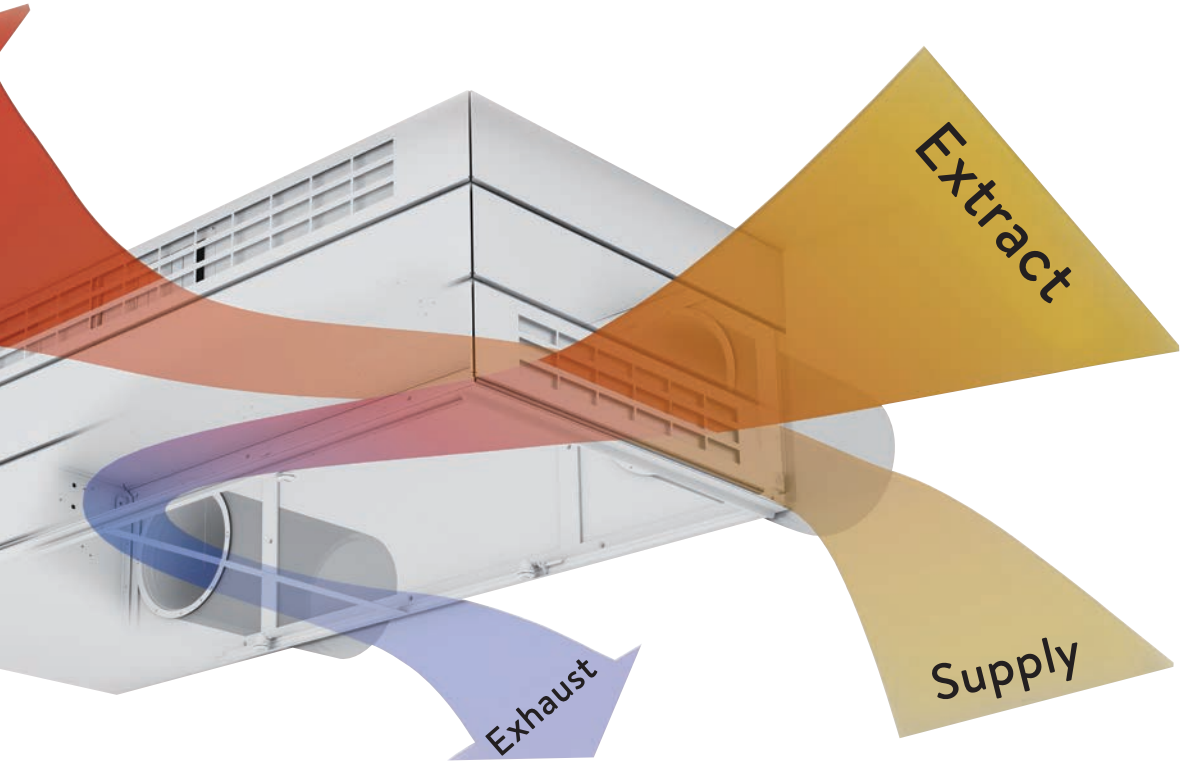

Decentralised ventilation takes into account the requirements of each room by not demanding complicated and costly installation. A centralised ventilation solution, on the other hand, often involves elaborate and expensive ducting.

**ON-DEMAND VENTILATION – ROOM BY ROOM**

Decentralised ventilation takes into account our need for being able to adapt our indoor climate to our requirements. Decentralised ventilation equals individual ventilation in each room – but only when we need it. With fully automated operation, you never use more energy than necessary to achieve the required air quality.

**LOW ENERGY USAGE AND HIGH HEAT RECOVERY**

The decentralised unit including heat exchanger is placed in the room, close to an external wall. The very short transport distance of the external air and a heat exchanger contribute to very low energy consumption. No need for long ventilation ducts – no additional energy consumption.




Ventilation in a simple,
economical and efficient way.

**INSTALLATION**
The decentralised ventilation unit is easy and quick to install, i.e. ordinary use of the room will not be disrupted for any length of time. A few hours' access to the room – and the unit is installed and ready for use. Low installations costs – seamless installation.

**HEALTH**
Decentralised ventilation provides both a healthier indoor climate and operating economy compared to a centralised ventilation solution. Increased productivity and well-being for adults and children – be it in a school, at work or in the home.

# ONLY THE BEST IS GOOD ENOUGH

At Airmaster, we take the principle of a world-class indoor climate seriously! This is why an indoor climate solution with Airmaster's decentralised ventilation unit will give you very measurable benefits.

## OPTIMUM ENERGY USE

Airmaster's decentralised ventilation units are optimised to provide a ventilation solution without wasting energy. Airmaster's solutions give you economical indoor climate solutions with real savings. Low energy usage and a heat recovery of up to 95% means large energy budget savings. Low installation costs mean quick payback period.

## FULLY AUTOMATED OPERATION

A decentralised ventilation unit from Airmaster enables you to adapt your indoor climate to each individual space – while giving the option of fully automated operation. Indoor climate solutions often form part of a building's other automation which is why Airmaster offers modern solutions that can be linked to the most standard systems. Easy overview and efficiency at the same time.

## A COMFORTABLE ROOM TEMPERATURE – EVEN WHEN IT IS HOT OUTSIDE

As the only provider, Airmaster offers the option of an integrated cooling module in its ventilation solutions. The specially developed cooling module has been designed to lower the temperature of the external air by up to 15°C. This provides added comfort in rooms that may periodically become hot.

## SCANDINAVIAN DESIGN – THOUGHT THROUGH AND FUNCTIONAL

"Our design team sets great store by making Airmaster's ventilation unit a discreet element in the room in which it is installed.

The Airmaster design is characterised by the cubic ventilation unit being visually divided into sections. This is done by breaking up the panels with dark joints. The joints help to 'dissolve' the box visually, making it appear slimmer and lighter – and thereby less dominating. The discreet, but recognisable design makes Airmaster's ventilation units an integrated architectural element – the horizontal lines have been created to form relationships with other lines in the room. The ventilation grilles have been located and designed to harmonise with the over-all design of the unit.

With their clean and light design, Airmaster units tap into the Scandinavian approach to design favoured by design-people."

*Klaus Schroeder, industrial designer MA partner & CEO, design-people*


SILENCE?
YES, OF COURSE!

Airmaster's ventilation solutions are characterised by high performance at a very low noise level.

**ARE YOU ALSO TIRED OF NOISE?**

Ventilation units that are installed in rooms where people are expected to work, teach or just sit must be quiet. Too much noise in a room reduces our well-being. We find it difficult to concentrate which often means that we are not very productive – this is something we all recognise.

**WE FOCUS ON ACOUSTICS**

Airmaster is known for products with very low noise levels. To continue and develop Airmaster's leading position in decentralised ventilation, we are continuously expanding our development division. In 2011, we invested in a test centre where we are able to simulate all imaginable climatic and acoustic conditions.

# TESTING AND DEVELOPMENT

We spend a great deal of our total resources on product development and documentation. In total, more than 10% of our employees work on development and documentation.

We work on the development of new technology in partnership with universities, including the University of Aalborg (AAU) and the Technical University of Denmark (DTU). We also participate in several research-based projects involving the efficient, decentralised ventilation solutions of the future.

Our electronics are EMC-tested to the highest standards at recognised laboratories (EMC = Electromagnetic Compatibility).

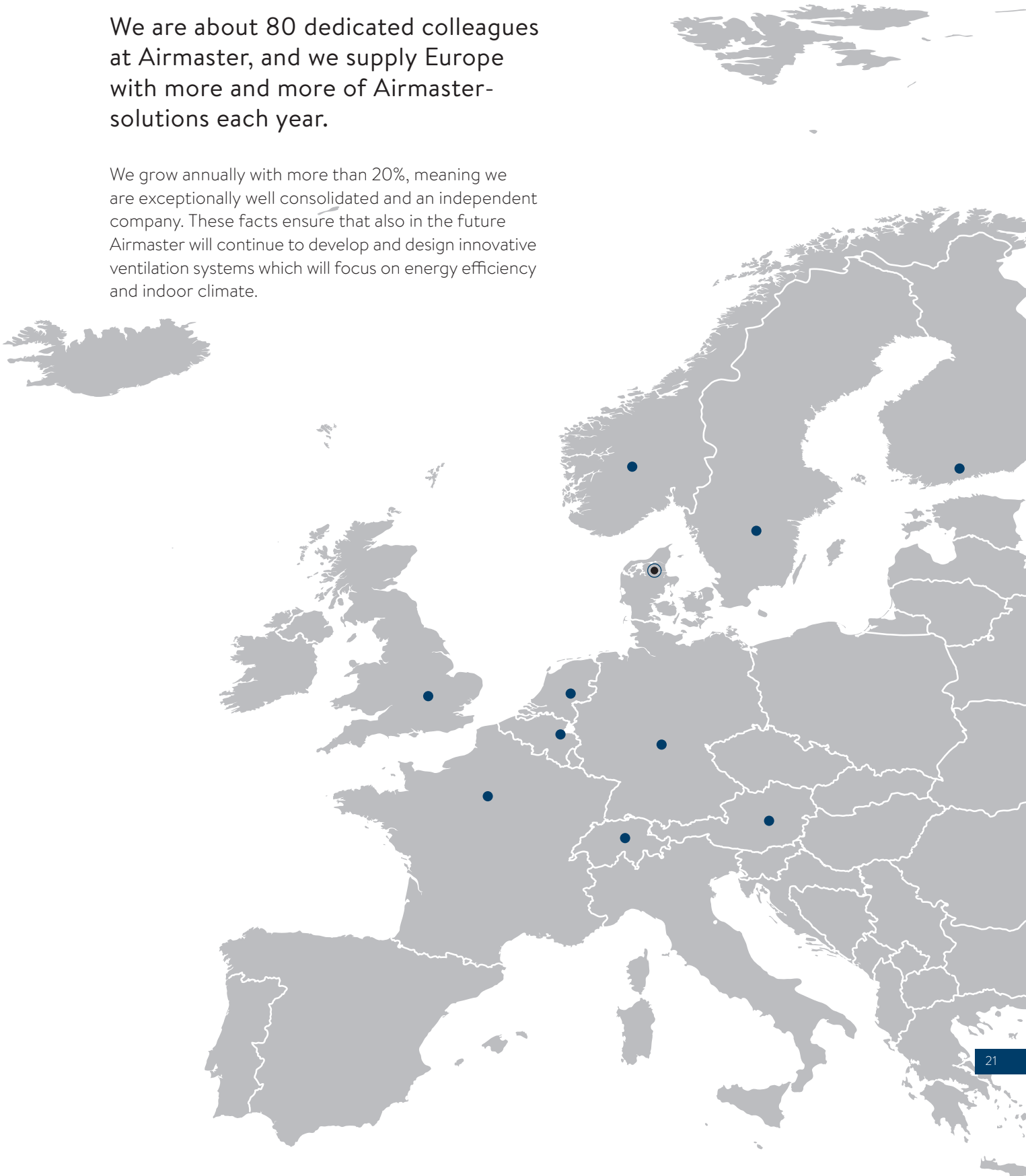
During operational tests, all data are recorded consecutively. This means that we achieve a unique overview of the reaction of the controls to different operating conditions. During the analysis of the continuous stream of data, we are able to optimise the parameters of the controls and the geometry of the products.

In brief – Airmaster's ventilation solutions must be the best solutions in terms of energy efficiency, comfort and healthy indoor climate.

# AIRMASTER IN EUROPE

We are about 80 dedicated colleagues at Airmaster, and we supply Europe with more and more of Airmaster-solutions each year.

We grow annually with more than 20%, meaning we are exceptionally well consolidated and an independent company. These facts ensure that also in the future Airmaster will continue to develop and design innovative ventilation systems which will focus on energy efficiency and indoor climate.



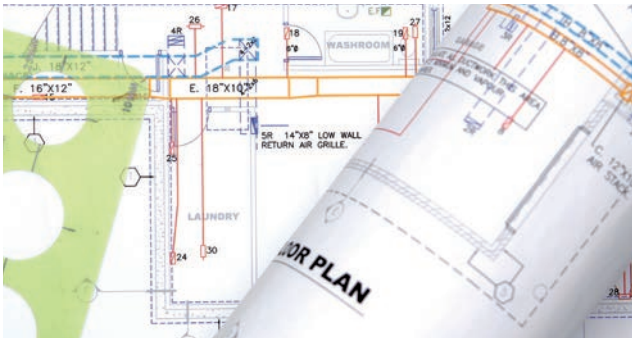
# AIRMASTER

**RENOVATIONS, EXTENSIONS AND NEW-BUILDS**

Airmaster adapts to the rooms and not vice versa. With our wide range of products, our units can be used in practically any kind of room: large and small, with many people or just a few. Irrespective of whether your building is permanent or modular, Airmaster will be able to meet your ventilation requirements.
The decentralised solution from Airmaster is unrivalled for renovation, extension and restructuring projects.

See how quick and easy it is to assemble and install a unit.

# HAS THE SOLUTION




**NO NEED FOR STRUCTURAL CHANGES**
Airmaster's direct access to the outdoors makes it simple, quick and cost-effective to provide most buildings with ventilation – no structural changes to the buildings are necessary. In most instances, installation can be carried out without affecting the daily routines in the building.

**PARTNERSHIP AND CONSULTANCY**
We work with architects, engineers, installers and wholesalers. In fact, we often work on projects from the very first drawing to completed installation and contribute our expertise in project dimensioning.

# THE WIDEST RANGE ON THE MARKET

Whether you position a unit under the ceiling or standing on the floor, the same criteria apply: quick, flexible installation which can be adapted to the room's purpose, location and design.

**CHOOSING THE RIGHT UNIT**
The size, location and purpose of a room have a major impact onthe kind of ventilation required. Rooms that alternate between being full and empty make great demands on the dimensioning and control of the ventilation.
This is why Airmaster's ventilation solutions come in a wide variety of product rnges and models with different intelligent control options.
Correct dimensioning of the ventilation system minimises energy consumption, while optimum control constantly monitors the need for ventilation.

Great flexibility often means great complexity – but not with Airmaster. Choose between wall-mounted and floor-mounted models.

## WALL-MOUNTED UNITS

**HORIZONTAL MODEL** Intake and exhaust is led horizontally out through the wall on which the unit is installed. The external wall is finished off with louvered grilles.

**VERTICAL MODEL** Intake and exhaust is led up vertically out through the roof. It is finished off on the outside with roof caps and flashing.

Both horizontal and vertical models are available with supply air in the middle or lower panel. This means that up to 2/3 of the unit can be integrated in the ceiling.

# FLOOR-MOUNTED UNITS

**HORIZONTAL MODEL**
is placed along the wall, against a wall or free-standing, e.g. as room divider. Intake and exhaust are led horizontally through the wall. This model is also available as a vertical model where intake and exhaust are led up through the roof.

**HORIZONTAL MODEL**
is located on the floor and injects air either at floor or ceiling level. Intake and exhaust are led horizontally through the wall. This model is also available as a vertical model where intake and exhaust are led up through the roof.

# CHOOSE THE RIGHT CAPACITY

**AM 150**
147 $m^3$/h at 35 dB(A)
115 $m^3$/h at 30 dB(A)

**AMC 150**
147 $m^3$/h at 35 dB(A)
115 $m^3$/h at 30 dB(A)

**AM 300**
300 $m^3$/h at 35 dB(A)
240 $m^3$/h at 30 dB(A)

**AM 500**
550 $m^3$/h at 35 dB(A)
430 $m^3$/h at 30 dB(A)

**AM 800**
725 $m^3$/h at 35 dB(A)
650 $m^3$/h at 30 dB(A)

**AM 900**
830 $m^3$/h at 35 dB(A)
690 $m^3$/h at 30 dB(A)

**AM 1000**
1100 $m^3$/h at 35 dB(A)
950 $m^3$/h at 30 dB(A)

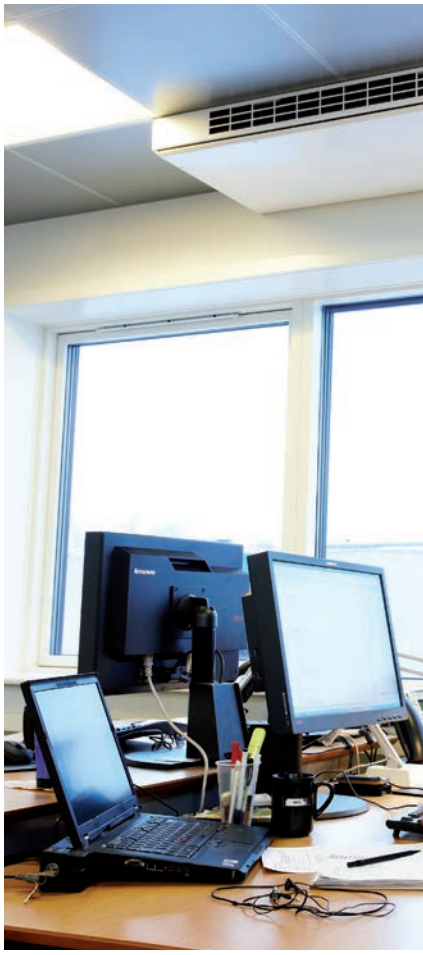
**AM 1200**
1310 $m^3$/h at 35 dB(A)
1050 $m^3$/h at 30 dB(A)


HOTELS
RESTAURANTS

OFFICES
MEETING ROOMS

BARRACKS

# AIRMASTER WIDELY USED



Our wide range and easy and flexible assembly and installation mean that Airmaster's ventilation solutions can be used in a wealth of applications - here are just a few:

KINDERGARTENS

HOSPITALS

CLINICS

SCHOOLS

EDUCATIONAL ESTABLISH-MENTS

FITNESS STUDIOS

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