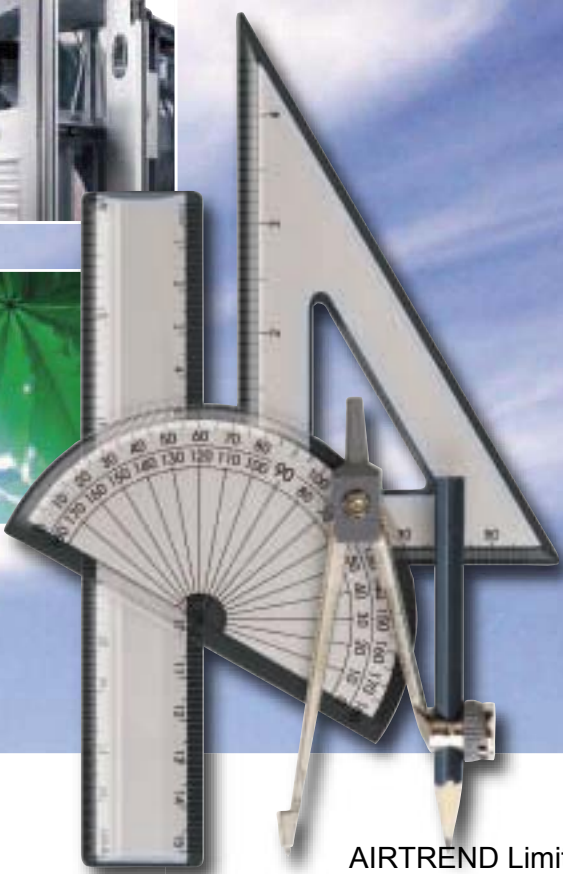


# *Air Management for Education Environments*



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## Recognising the priorities of education

When investing in Education infrastructure, there's a central priority; to ensure that all indoor environments are configured and controlled to allow maximum learning potential to flourish. Alongside this, Designers have to balance the sometimes conflicting issues of costs, energy, legislation and maintenance.

For any education establishment, a single solution is unlikely. Individual learning and support environments vary in occupancy and in function - from general or teaching zones, to those with specialist uses and activities.

So HVAC projects in this sector can typically involve a complete mix of requirements. For each individual building, large or small, whatever its specific role in the education process, Fläkt Woods has the optimum solution.



## Fläkt Woods experience – at your service

Fläkt Woods is a global leader in air management, specialising in the design and manufacture of precision technology to deliver complete, integrated solutions. Energy efficiency and environmental responsibility are always our major priorities, and our collective experience is unrivalled.

Our knowledge and reputation has been built up through a century of engineering innovation and development. This reflects an impressive track record that equips all our customers with a special confidence. An assurance that, whatever the need or application, Fläkt Woods can deliver the

product, the performance and the service that is required. Precisely.

Our expertise is not confined to original manufacture and supply. It is available to you from the selection process onwards, and continues well beyond installation, throughout each system's operating life.

When you first select and install one or more of our systems, our partnership with you is only just beginning. Because you'll always be able to call on Fläkt Woods experience. We're at your service.



## Legislation

Being a global manufacturer and supplier makes meeting legislation easier for Fläkt Woods. It means that Fläkt Woods must produce solutions at standards that equal the most stringent legislation and guidelines around. Only by doing this can we ensure that we meet standards in every market.

In Europe, all countries now have to design their new buildings to meet energy targets that are set out in the Energy Performance in Buildings Directive (EPBD). All Fläkt Woods Energy Performance of Buildings Directive solutions are designed to enable full compliance with this and other directives regarding ventilation and air conditioning.

## Environmental Assessment Schemes

It has now become very common for new buildings to try and achieve environmental standards such as those set out in LEED and BREEAM programs. Fläkt Woods, with its market leading knowledge and products in energy recovery, has helped many projects achieve the very highest levels in both of these schemes.



## Maintenance

Maintenance is important to any education establishment as any down time can lead to discomfort or scheduled disruption.

All of our products are manufactured with maintenance in mind. This includes having access doors in all of our air terminal devices, diagnostic controls on our chillers and the smooth internal walls and floors in our air handling units.



# Key Issues in Creating an Environment for Learning

## Optimising Indoor Air Quality to boost learning

### Ensuring air quality and quantity

There are five aspects to indoor air quality. These are temperature, humidity, noise, draught and fresh air quantity. It is important to look after all these issues.

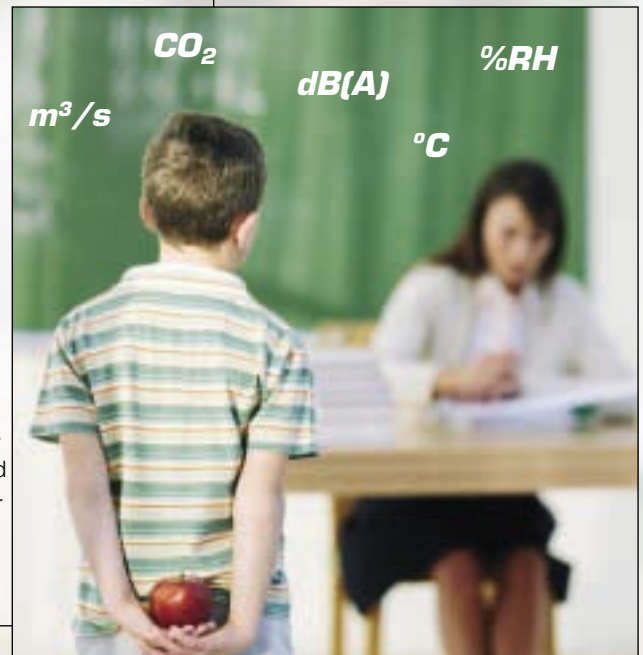
**Temperature** – ideally the temperature should be between 20 – 24degC. Studies show that the efficiency of people deteriorates when the temperature drifts outside of this band. Accident rates also increase.

**Humidity** – again, this should ideally be between 30% to 60% Relative Humidity. Below 30% RH, the body's immune systems reduce in their effectiveness leading to increase absenteeism through sickness. When the humidity exceeds 60% students find it uncomfortable and when they are uncomfortable, their concentration reduces.

**Noise** – noise is a distraction in all walks of life and it is important in learning facilities that the noise is kept to an acceptable level. This noise can come from building systems but the most intrusive noise comes from the students themselves – normally when they are bored or distracted.

**Draught** – it is important to keep draughts down as they can also distract the students. A well designed ventilation system will minimise draughts whereas openable windows can not only cause draughts (of cold or warm air depending on season) but also let in outside noise leading to further distractions.

**Fresh Air** – fresh air is probably the most important aspect of this. It is imperative that minimum quantities of fresh air are delivered to each student. As CO<sub>2</sub> levels increase, a student's ability to learn is diminished. A study at Harvard University found that absenteeism dropped by 35% when the minimum fresh air quantity was doubled.



## Cost Considerations

In a typical Education new-build project, the initial capital investment will represent only 15% of the lifetime cost of the building. Of far greater importance is energy consumption, which typically accounts for a massive 80% of the total. Effective heat recovery and innovations such as Free-Cooling Chillers provide opportunities for substantial cost savings.

Unlike most suppliers of HVAC systems, Fläkt Woods manufactures the majority of key sub-systems in-house, including thermal wheels, fans and structural assemblies. By selecting an integrated Fläkt Woods System, you can be sure that the combination of components will have been optimised for maximum overall efficiency. By taking a holistic view, substantial savings in capital and running costs can be achieved. Through the adoption of high-efficiency TE3 enthalpy wheels at Johns Hopkins School of Medicine in Baltimore, for example, boilers and chillers were reduced in size, **providing a \$1m capital cost saving.**



# Products you can depend on

Fläkt Woods is not only an experienced HVAC systems integrator. We also produce many of the components ourselves. That puts us in the unique position where our systematic demands can be closely met by component features, and component development is always done with the functionality of the entire system in mind.

# Delivering Effective Solutions

## Air Distribution

### Flexicool™ Chilled Beams

Fläkt Woods have a complete range of chilled beams with matching accessories. These systems can treat high cooling demands and be used for individual regulation of the temperature. They create a very stable and comfortable environment by supplying draught free cooling. They use little or no energy leading to minimal energy cost over the lifetime of the system. Moreover, they have no moving parts and are easy to clean and maintain.



### Floormaster Displacement System

Diffusers for displacement air distribution give quiet installations with both good air comfort and high ventilation efficiency. The system also permits economical and effective air cooling. Fläkt Woods has a large range of displacement air terminal devices with different forms and capacities.



### Activent

Activent is a ventilation system for supplying and distributing air. Small air jets from the ducts mix with room air through induction. Low velocity cool air can be supplied without causing draughts or noise.



### Varimix Diffusers

Varimix® is a series of ceiling-mounted air diffusers with four different architectural designs, offering high performance with very low sound levels. Varimix diffusers are extremely flexible with easily adjustable throw and diffusion pattern. With the specially designed connection box, the airflow can be changed and measured without removing the diffusers.

The plenum box has a quiet flow measuring damper, which is removable for easy maintenance.



### Cleanvent exhaust

Using the latest Nano-technology the unique Avalon® coating ensures that the valves stay clean, significantly reducing the need for maintenance. In addition, the lack of grime and direct ensures that the air diffusion and the throw pattern continue to function as planned, ensuring optimised energy efficiency. CleanVent air terminal devices are particularly useful in places that are difficult to access.



### Optivent Room Solutions

Flow variators are products for the control and adaptation of airflows in VAV (Variable Air Volume) systems. The system saves costs and energy because the flow and cooling effects are adapted to the actual demand in the room, with the result that the total flow for the air treatment units is reduced.



When combined with an active diffuser, it is possible to maintain comfortable and effective air distribution in the room regardless of the variation in air flow rates.

Fläkt Woods offers a wide range of **integrated control** solutions for air handling and indoor climate systems. Factory mounted and pre-wired controls will reduce installation time and simplify on-site logistics. Pre-programmed and factory tested control applications based on Fläkt Woods extensive experience, also means a fast commissioning process and will secure a reliable and energy efficient operation of the system.



## eQ and eQ plus AHU

In providing environmental comfort and ventilation, an air handling unit simultaneously performs several functions including the intake of outside air to meet ventilation air requirements, thermal conditioning, moisture control, filtration to protect equipment and to remove contaminants, and attenuation of fan generated noise to control ambient levels in occupied spaces.

The design of an air handling unit should minimize water and dirt accumulation, resist corrosion and permit adequate access for inspection and maintenance. With our long experience in manufacturing AHUs, Fläkt Woods have designed a unit with all details making a unit Hygienic.



### Casing:

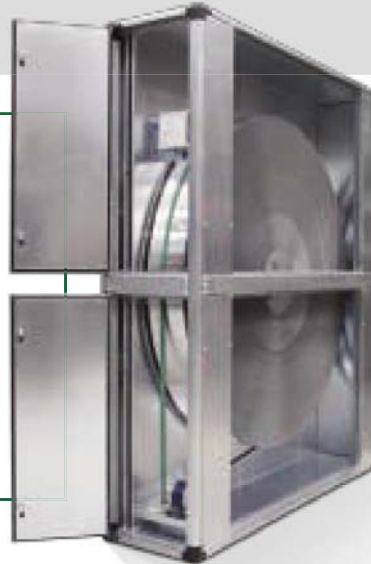
- The door locks are fitted into the door frame to allow unobstructed airflow and prevent dirt accumulation.
- All non-metallic materials are microbially inert, according to ISO 846.
- The panel joints are internally sealed with antifungal sealant. No visible internal framework for easy cleaning.
- Inspection section between components.

### Energy Saving Components

- Highly efficient providing optimal sensible and total energy recovery (thermal wheels)
- Econet - Patented run around coil system with up to 75% energy recovery.
- Air leakage class L2 (Class B as standard)
- Plug fans with EC or IE2 motors.

## Air Treatment

Fläkt Woods has designed the **Twin Wheel system** to provide superior cooling and humidity control compared to all other solutions on the market. The purpose is to produce cool and dry air while lowering the cost for these processes compared to conventional systems.



The **TE3** total energy thermal wheel has very high sensible and latent energy recovery efficiencies, which can reduce both the chiller and heating load to produce a very low energy system. It is also protected by a 3 angstrom molecular sieve which allows only water vapour and harmless gases to be transferred to the supply air. No other contaminants such as CO<sub>2</sub>, bacteria, viruses etc, can be transmitted, leading to exceptional levels indoor air quality.

### Cooler and Combi Cooler

The Cooler is a complete DX system built into the AHU. No external components are necessary to provide the cooling/heating and due to the extract temperatures, high COP's are obtained.

The Combi Cooler has an additional chilled water circuit which enables the client to run a cooling system such as chilled beams without the need of any further chillers. A true 3 in one.



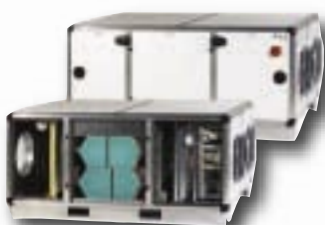
### Free Cooling Chillers

Where dry cooling systems such as chilled beams are used, it can be worthwhile installing a free cooling chiller. The example shown is based on a project in London with typical chilled beam flow return temperatures of 14/17°C. In this case the extra cost of free cooling option was recovered in energy cost savings within 13 months, and the complete chiller cost will be paid back in under 5 years.



### e3co Heat Recovery Range

The e3co range of energy recovery mini AHU's offer efficiencies of up to 93% and are ideally suited to deliver fresh air into classrooms. The units can be designed as void sized, side by side units or as double decked, providing complete flexibility in where they are installed.



### Topmaster



Topmaster is a small packaged AHU complete with thermal wheel, heating/cooling coils and controls. They are designed to fit in small spaces with all duct connections on the top. There are two sizes, upto 300l/s and upto 500l/s.

# Precisely the right system for all Education environments

Fläkt Woods has long experience of working in close partnership with Local Government and other authorities and organisations responsible for delivering educational facilities, whether new or refurbished.

For any educational establishment, a single solution is unlikely. Individual learning and support environments vary in occupancy and in function – from general or teaching zones, to those with specialist uses and activities.

So HVAC projects in this sector can typically involve a complex mix of requirements.

## 1 Gymnasium/indoor sports

Differing types of activity and occupancy mean a broad spectrum of functional requirements to ensure efficient removal of used air and the introduction of fresh supplies. Systems need to contain and control the periodic build up of high humidity levels and temperature.

### Recommended products

- AIR DISTRIBUTION: **FloorMaster DV** displacement; **Activent** ducting; Drum louvres served by
- AHUs: **EU, eQ** and **VEKA** with
- CHILLERS: **ClimaFläkt**
- FANS: Boxed (**MiniBox, SingleBox, TwinBox, Copford**); Roof Units (**DSP, DSM** and **DSC**)



## 2 Toilets

Fast, efficient removal of odours and air-borne pollutants contribute to the maintenance of cleanliness and an acceptable environment in communal sanitary areas.

### Recommended products

- FANS: Boxed (**MiniBox, SingleBox, TwinBox, Copford**). In-line Centrifugal (**ILCs**)
- CONTROLS: **iFan** controls
- CLEANVENT EXHAUST: with nano-technology coating



## 3 Admin/staff areas

Variable occupancy during the working day requires sensitivity to demand, as well as the maintenance of optimum air quality and comfort to facilitate staff concentration at work.

### Recommended products

- CHILLED BEAMS: **Flexicool IQ** or **QP**
- AIR DISTRIBUTION: **FloorMaster DV** displacement; **Activent** ducting; **QZ** fan coil units; grilles and **Varimix** diffusers served by
- AHUs: **EU, eQ** and **e3co HR** with
- FANS: Boxed (**MiniBox, SingleBox, TwinBox, Copford**) & **Heat Recovery Units: Axial (JM Aerofoil)**; In-line Centrifugal (**ILCs**)
- CHILLERS: **ClimaFläkt**
- CONTROLS: **eQ** integrated controls & **iFan** controls





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### Smoke control

The safety of staff and students must always be a priority. In stairwells, lobbies and atriums, the extraction of hot, smoky gases must be controlled. This can be achieved by using fully designed natural or powered extract systems (or via a designed pressurisation system).

#### Recommended products

- POWERED: Axial fans (**JM Aerofoil**, **JM High Temperature Aerofoil**, **JM Bifurcated**, **JM MaXfan**)
- NATURAL: Louvred smoke vents, glazed casement vents, glazed louvred vents

Illustration by  
is Game

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### Classrooms

High occupancy levels during teaching periods require energy-efficient and controllable demand-based management of air quality and temperature. The comfort, health and alertness of staff and pupils is ensured during the learning process, but operating costs can be minimised when these facilities are unoccupied.

#### Recommended products

- CHILLED BEAMS: **Flexicool IQ** or **QP**
- AIR DISTRIBUTION: **FloorMaster DV** displacement; **Activent** ducting; **Optivent** VAV; **QZ** fan coil units; grilles and **Varimix** diffusers served by
- AHUs: **EU**, **eQ** or **e3co HR** with
- CHILLERS: **ClimaFläkt**
- FANS: Boxed (**MiniBox**, **SingleBox**, **TwinBox**, **Copford**) & **Heat Recovery Units**: Axial (**JM Aerofoil**); In-line Centrifugal
- CONTROLS: **eQ** integrated controls & **iFan** controls





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## Library

An environment conducive to study requires unobtrusive draught-free and quiet control of temperature, air purity and humidity.

### Recommended products

- CHILLED BEAMS: **Flexicool IQ** or **QP**
- AIR DISTRIBUTION: **FloorMaster DV** displacement; **Activent** ducting; **Optivent VAV**; grilles and **Varimix** diffusers served by
- AHUs: **EU**, **eQ** or **e3co HR** with
- CHILLERS: **ClimaFläkt**
- CONTROLS: **eQ** integrated controls



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## Kitchen

As well as normal ventilation, food preparation areas typically need additional air management functions, including ambient cooling, safeguards against carbon monoxide, and the effective containment and neutralising of food smells. These include canopied solutions for cooking facilities.

### Recommended products

- AIR DISTRIBUTION: Displacement; **Activent** Ducting; Drum louvres served by
- AHUs: **EU**, **eQ** and **VEKA** with
- CHILLERS: **ClimaFläkt**
- FANS: Boxed (**PowerBox**, **PowerBox GreaseFighter**); Axial (**MaXfan**, **JM Aerofoil**, **JM Bifurcated**); Plate fans; **MPS**
- CONTROLS: **eQ** integrated controls



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## Restaurant

An area that can be virtually empty for much of each day, punctuated by periods of very high occupancy and heat generation. The comfort and health of users needs to be balanced with energy efficiency considerations when not in use.

### Recommended products

- AIR DISTRIBUTION: **FloorMaster DV** displacement; **Activent** ducting; Drum louvres served by
- AHUs: **EU**, **eQ** or **e3co HR** with
- CHILLERS: **ClimaFläkt**
- FANS: Axial (**JM Aerofoil**); Boxed; Plate; Roof Units & **Heat Recovery Units**
- CONTROLS: **eQ** integrated controls & **iFan** controls

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## Auditoria

High occupancy levels in auditoria require energy-efficient and controllable demand-based management of air quality, temperature and humidity. The comfort of occupants is ensured during lectures, whilst operating costs can be minimised when these facilities are unoccupied.

### Recommended products

- AIR DISTRIBUTION: **FloorMaster DV** displacement; **Activent** ducting; Drum louvres served by
- AHUs: **EU**, **eQ** or **e3co HR** with
- CHILLERS: **ClimaFläkt**
- FANS: Boxed (**MiniBox**, **SingleBox**, **TwinBox**, **Copford**) & **Heat Recovery Units**; Roof Units (**DSP**, **DSM** and **DSC**)
- CONTROLS: **eQ** integrated controls & **iFan** controls

# Energy recovery

## Maximising the potential



With the right air management technology installed in buildings, there's impressive scope for cutting energy consumption and costs.

On average, 68% of a non-domestic building's energy needs are shared between heating, cooling and ventilation.

An efficient energy recovery system is a vital ingredient because it positively affects the load on the cooling and heating functions.

### Reducing energy bills

Recent changes to Building Regulations, requiring lower rates of air-leakage from buildings, have also raised the potential for energy recovery.

But this opportunity to improve the overall energy performance of a building can only be realised if the right energy-recovery technology is deployed. Efficiency is key to minimising consumption and reducing the bills.

Fläkt Woods has the technology options to ensure you maximise that potential.

### Supplying more heating using recovered energy

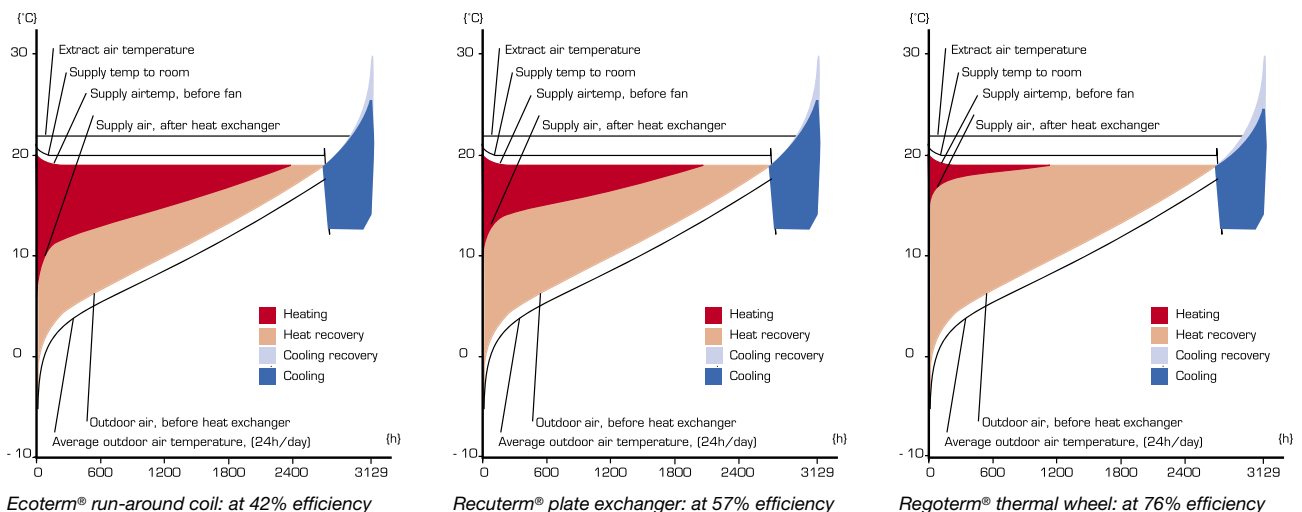
Each type has its own merits apart from its comparative energy recovery efficiency rating. Accordingly, ultimate choice (*see opposite*) may also be influenced by specific application needs.

In practice, AHUs rarely operate at peak load conditions. So the quoted efficiency ratings can actually deliver a greater proportionate reduction in energy demand for heat.

For example, 76% efficiency can typically reduce annual heating demand by as much as 95%. Meaning that, for large periods, ALL heating requirements are being provided via recovered energy.

### Examples: comparing the benefits of Fläkt Woods energy recovery technology

Increased efficiency means greater energy recovery (pink area) and reduced heating need (red area) – in both time and degree.



## Reference projects



### Middlesbrough College invests in a lifetime of energy savings

Fläkt Woods provided one of its largest ever turnkey contracts in the UK, matching the precise air handling needs for Middlesbrough's new state-of-the-art college, on the Tees Valley's biggest regeneration site. The £68m college caters for a total of 20,000 students and more than 600 staff.

#### Energy savings

The company supplied 17 air handling units from its EU range. Most of the units are fitted with the Fläkt Woods thermal wheel energy recovery system, working in combination with CoolMaster indirect evaporative cooling. This unique configuration will allow the college to reduce the peak cooling load on the chiller by as much as 30-40%.

#### CoolMaster

The CoolMaster system has an evaporative humidifier in the extract air stream. Through absorption the extract is cooled and then this cool air is transferred using a high efficiency sensible energy recovery device such as a Thermal Wheel or Econet. Using this method can normally reduce the temperature of the supply air by some 6 or 10°C.

#### Chillers and chilled beams

The contract also includes the supply of chillers and over 560 chilled beams from the new IQID range. These vary in length from 1.8m to 3.0m. IQID is a chilled beam which integrates ventilation, cooling and heating, and can be adjusted almost like a ceiling diffuser with a complete range of functions, fulfilling most needs for indoor air climate.



Fläkt Woods is an acknowledged leader in the field of education air management in the education sector. Our reference list includes:

#### Germany

- Brandenburgische Technische Universität, Cottbus
- Universität, Frankfurt am Main
- Campus Westend, Frankfurt
- Technische Universität, Dresden
- Friedrich Schiller Universität, Jena
- Technische Universität, Chemnitz
- Martin Luther Universität, Halle-Wittenberg
- Brandenburgische Technische Universität, Cottbus

#### Ireland

- Trinity college Dublin
- University college Dublin
- Cork School of Music

#### UK

- Oxford University
- South Lanarkshire Schools
- University of Nottingham
- Ark Academy, Wembley
- Caledonian University, Glasgow

#### France

- University Paris Jussieu
- University Bagnolet
- College Dunant
- College Thiers Vaillant
- School des Chènes
- School Vulaine

#### Iceland

- Laugameskóli
- Grunnskóli Sanderó

#### Portugal

- Escola de Santo André
- Escola Manuel Laranjeiro
- Escola Avelar Brotero

#### Sweden

- Jonkoping University
- Storsjo School, Umea
- Fenix High School, Vaggeryd
- Spiran, Jonkoping

#### Finland

- University of Helsinki
- University of Joensuu
- Vaasa Vocational Institute

#### USA

- Marywood University, Pennsylvania
- Johns Hopkins School of Medicine, Baltimore
- University of Maine, / Orono
- Furman University, South Carolina
- Red Wing High School, Minnesota

### Energy efficient air handling solution for Frankfurt University

**Customer:** Frankfurt University, Germany

**Need:** Energy efficient ventilation solution that can meet any air handling requirement.

**Solution:** Fläkt Woods' EU air handling units with Econet® to integrate energy recovery, heating and cooling.