

IPSUM Optimization System

Demand Controlled Ventilation



Fläkt Woods has the capability to combine energy efficient (e³) products into fully integrated (i³) systems.

FläktWoods



IPSUM from Fläkt Woods

IPSUM – a giant step forward!

Demand Controlled Ventilation adjusts the level of air to the room's actual needs. This means that a high indoor climate quality can be achieved at the same time as energy consumption is kept to a minimum.

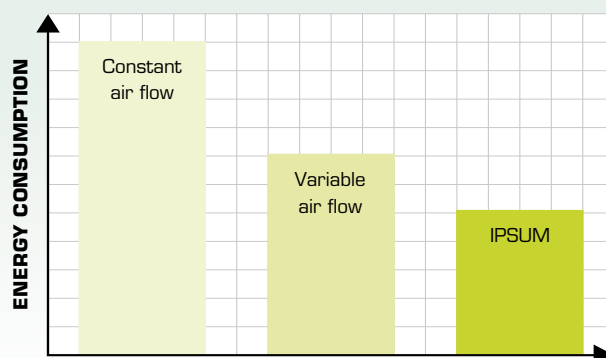
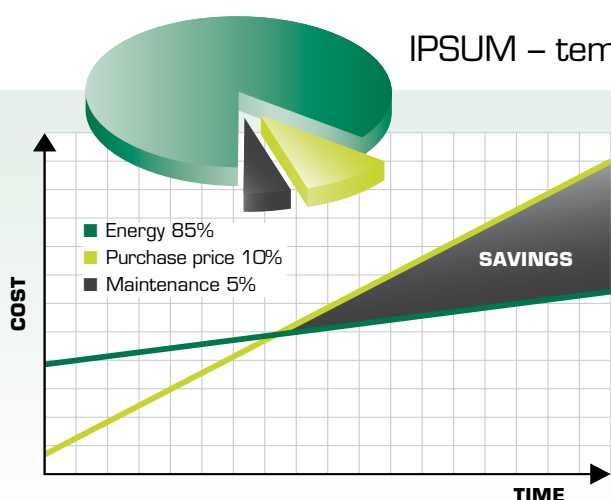
Natural areas for demand controlled ventilation are rooms with sharply varying loads such as conference rooms and meeting rooms. However, even in modern office spaces loads vary a great deal. Many studies show that often no more than half of the workplaces in an office are in use at the same time.

Fläkt Woods has long worked with simple systems for demand controlled ventilation. With our new IPSUM optimization system we are taking another

giant step forward. IPSUM will help you optimize the pressure and temperature in your climate control system. The development of IPSUM has also concentrated on simplicity. For example, this means providing a web interface that uses a number of smart functions to help you with commissioning and in-service monitoring. A prerequisite for IPSUM is that the Air Handling Unit is equipped with fan control.

Take a step forward with IPSUM!

IPSUM – temperature and pressure optimise your system



Customer benefits

1. Pressure optimisation provides energy savings
2. Temperature optimisation provides energy savings
3. Free cooling provides energy savings
4. Energy monitoring in real time
5. The fire protection function provides increased safety
6. Full control down to room level

BMS/
SCADA

EMSF

EMPA

EMSS

Optimix Active air
terminal device

Wega Wega Power

Nova Stella

STRA-04 Occupancy
detectorSTRA-14 Occupancy
detectorSTRA-14 Occupancy
detector

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How it works

SYSTEM OVERVIEW

IPSUM optimises the pressure and temperature setpoints in the Air Handling Unit to achieve the lowest possible operating costs. In addition to the product dependent components necessary for a VAV system, the IPSUM system consists of three components.

- *IPSUM System Optimizer* – Optimises operational data for the air handling unit.
- *IPSUM System Router* – Links rooms, floors and zones.
- *IPSUM Connection Unit* – Connects the products to the system, for example room controllers and actuators.

IPSUM will manage waterborne and air-borne systems – even where the installation contains a mix of both.

IPSUM System Optimizer

The heart of the system is the *IPSUM System Optimizer*. This compiles operational data and optimises the installation's operating point for energy consumption. Each *IPSUM System Optimizer* can manage up to 30 *IPSUM System Routers*.

IPSUM System Router

Larger or oddly shaped buildings can easily be subdivided using the *IPSUM System Router*. Each *IPSUM System Router* can manage up to 30 *IPSUM Connection Units*.

IPSUM Connection Unit

Room components can easily be connected to the system using an *IPSUM Connection Unit*. They can be used to connect room controllers, VAV actuators etc. In total the system can contain up to 300 *IPSUM Connection Units*.

Characteristics

1. Pressure optimisation

The duct pressure is optimised to its lowest level while maintaining room comfort. The adjustment of the air handling unit's air pressure setpoints are calculated on the basis of the actual positions of the dampers.

2. Temperature optimisation

The supply air temperature is optimised to the lowest air flow that will maintain room comfort. The adjustment of the air handling unit's temperature setpoints are calculated on the basis of the heating and cooling demands of the room controllers.

3. Free cooling

Changes the control sequence for the chilled beams, so that airborne cooling is used before liquid-borne cooling when the Air Handling Unit has identified an opportunity to use free cooling.

4. Energy monitoring

Energy savings are displayed directly in the web interface, in real time.

5. Fire protection function

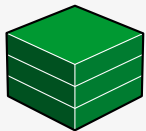
In the event of a fire alarm the dampers can be controlled so that they move to a predetermined position: close all, open all, open the supply air dampers or open the extract air dampers.

6. Full control

The IPSUM architecture provides full monitoring and control of the climate system not only at zone level but right down to room level.

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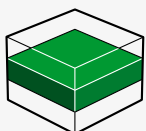
IPSUM easily links and optimises your ventilation system



System level



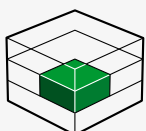
Air and waterborne products can be used in the same system



Zone level



Waterborne climate control system
Wega/Nova/Stella chilled beam



Room level



Waterborne climate control system
Wega/Nova/Stella chilled beam

LIFE CYCLE COST

ENERGY EFFICIENCY



Packaged Air Handling Unit eQ



e3coStar Small packaged Recovery Units



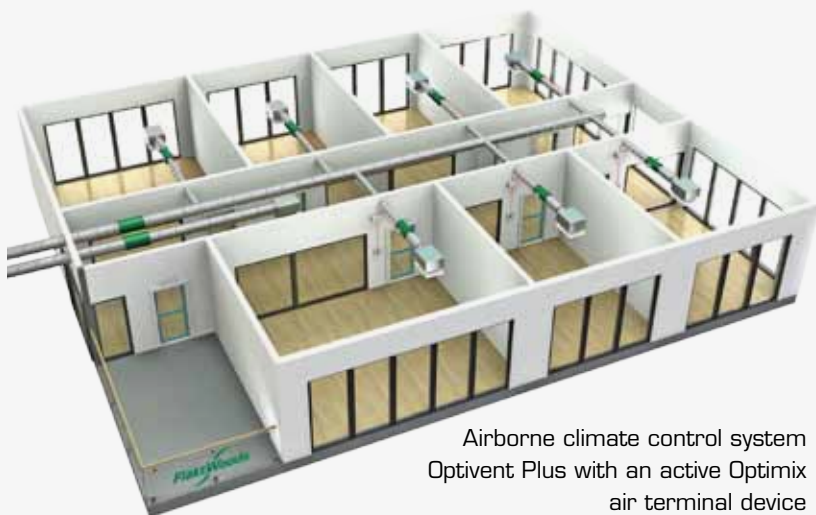
Modular Air Handling Unit eQ/eQL

IPSUM can be connected to different types of Air Handling Units



IPSUM System Optimizer

The IPSUM System Optimizer is positioned close to the air handling unit. Each air handling unit needs its own Optimiser. The Optimizer can manage up to 30 Routers.



Airborne climate control system Optivent Plus with an active Optimix air terminal device



IPSUM System Router

The IPSUM System Router can manage up to 30 Connection Units. It links communication between the Connection Unit and the Optimizer.



Airborne climate control system Optivent Plus with an active Optimix air terminal device



IPSUM Connection Unit

The IPSUM Connection Unit is connected to system components such as chilled beams, air terminal devices, dampers and room controllers. The system can contain up to 300 Connection Units.

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IPSUM monitors and optimises your system



- Full control
- Open communication
- Cost-effective
- Built-in web
- Combining water and air

Both commissioning and in-service monitoring is easy with the unique smart functions and integrated web server. Good room comfort is combined with optimal operating economy. The supply air temperature is adjusted to reduce the need for external heating and cooling air flow.

FUNCTIONS

The IPSUM System Optimizer is in communication with all zone dampers and room products. It also communicates with the air handling unit in order to minimize pressure losses in the system. The air pressure setpoints of the air handling unit are adjusted so that at least one damper or air terminal device in the system is in the fully open position.

The temperature optimisation adjusts the supply air temperature to the total demand for heating and cooling in the system. This reduces the need for external heating and cooling in the room. The function is easily set in the IPSUM System Optimizer.

An IPSUM system can contain traditional VAV products and chilled beams with a VAV function. When the air handling unit identifies the potential to utilize free cooling, IPSUM switches the con-

trol sequences in the Wega, Nova and Stella room controllers. When no more free cooling can be utilized IPSUM restores the control sequence to its default setting.

In the event of a fire alarm IPSUM can force the dampers in the installation to open or close completely. For safety reasons this function is activated through a separate digital input.

COMMISSIONING

The IPSUM system itself identifies the components connected to the internal communication bus. Many smart functions that facilitate commissioning and balancing are accessible from the built-in web server.

The first tool that is accessed is a function that checks that the room controllers, damper actuators and IPSUM units are correctly interconnected. If any

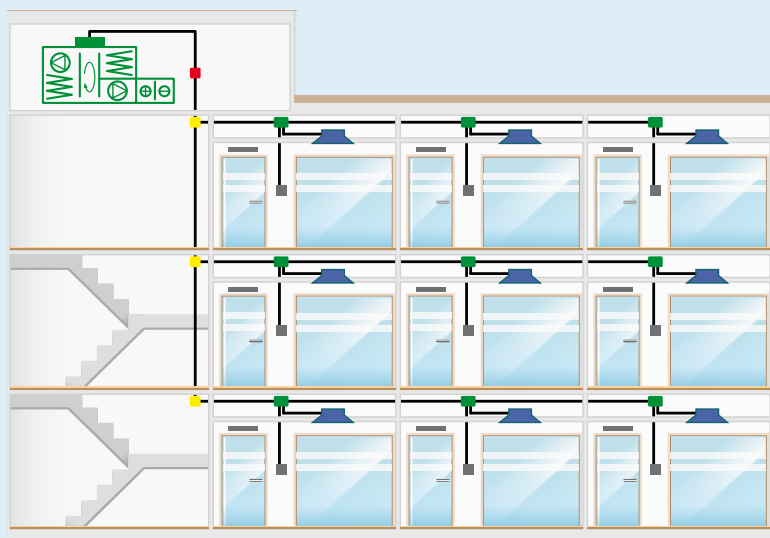
cables are mixed up the system tells you where to fault-trace.

To facilitate the connection of a computer the IPSUM System Optimizer and IPSUM System Router can be given fixed addresses during the commissioning process. To speed up commissioning, settings can be copied between rooms and zones respectively. A number of rooms or zones can be configured simultaneously by selecting them.

During commissioning, rooms, floors or zones can be set to a predetermined mode, returning to normal operation after a set time. This function allows supply air dampers, extract air dampers, heating valves or cooling valves to be opened or closed completely.

COMMUNICATION

The built-in web server displays the connected components in a tree structure. This layout can be adapted to reflect the building rather than the way that the units are connected. The web server also contains a trend log, alarm management and a function that calculates the energy savings achieved by IPSUM. IPSUM is easily connected to the build-



■ IPSUM System Optimizer ■ IPSUM System Router ■ IPSUM Connection Unit

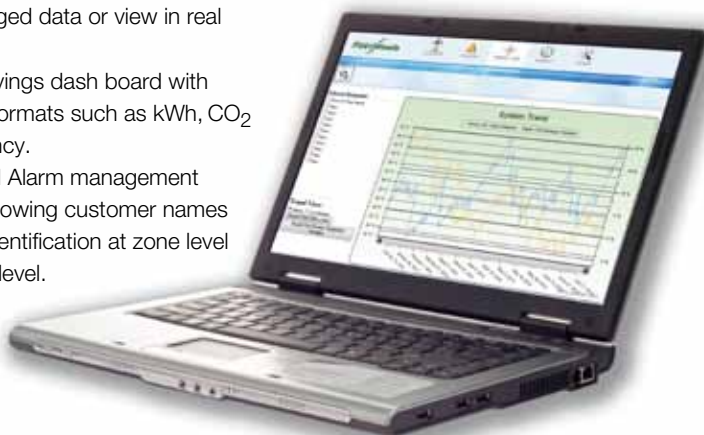
Tip: Simplify the routing of cables with the IPSUM System Router

ing automation system (BMS/SCADA) via BACnet IP, BACnet MS/TP, Modbus RTU or Modbus TCP, as support for these protocols is provided as standard.

The air handling unit is easily connected to the IPSUM System Optimizer via open Modbus communication. Exis-

ting Ethernet network can be used for communication between the air handling unit, IPSUM System Optimizer and IPSUM System Router. The optimisation signals are also available via 0...10VDC for extraneous control systems.

- Trend logging function with useful tools to help you find data easily, export logged data or view in real time.
- Energy savings dash board with common formats such as kWh, CO₂ and currency.
- A powerful Alarm management console allowing customer names for easy identification at zone level and room level.

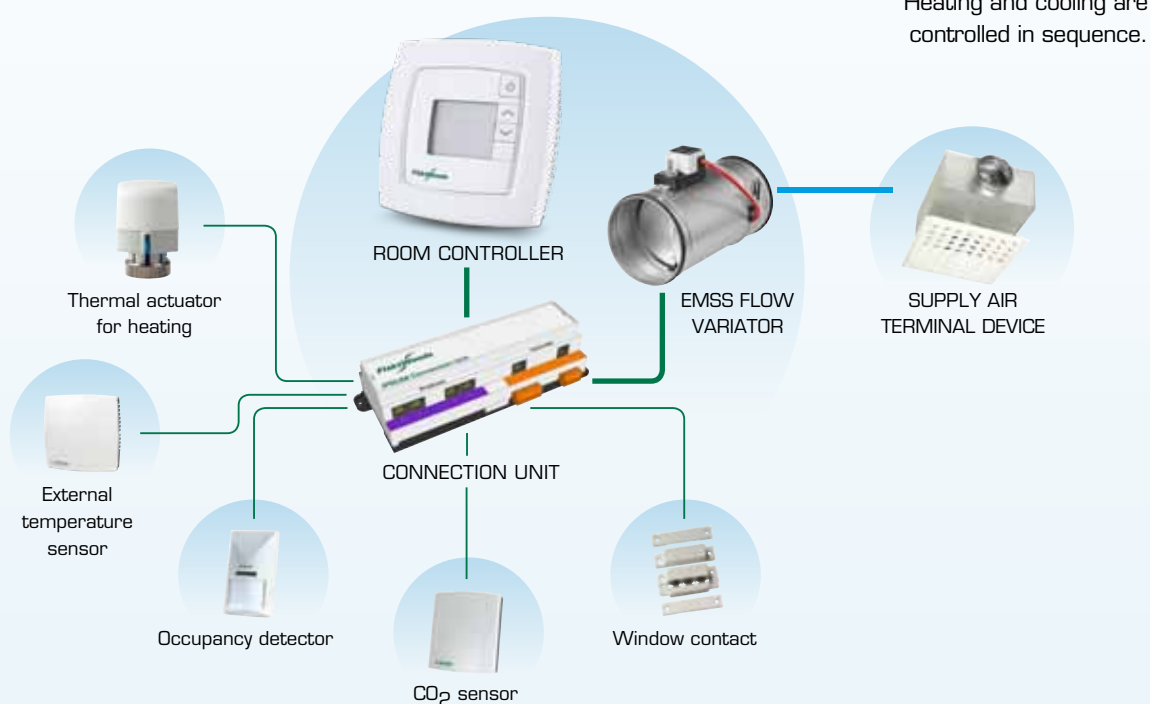


Benefits

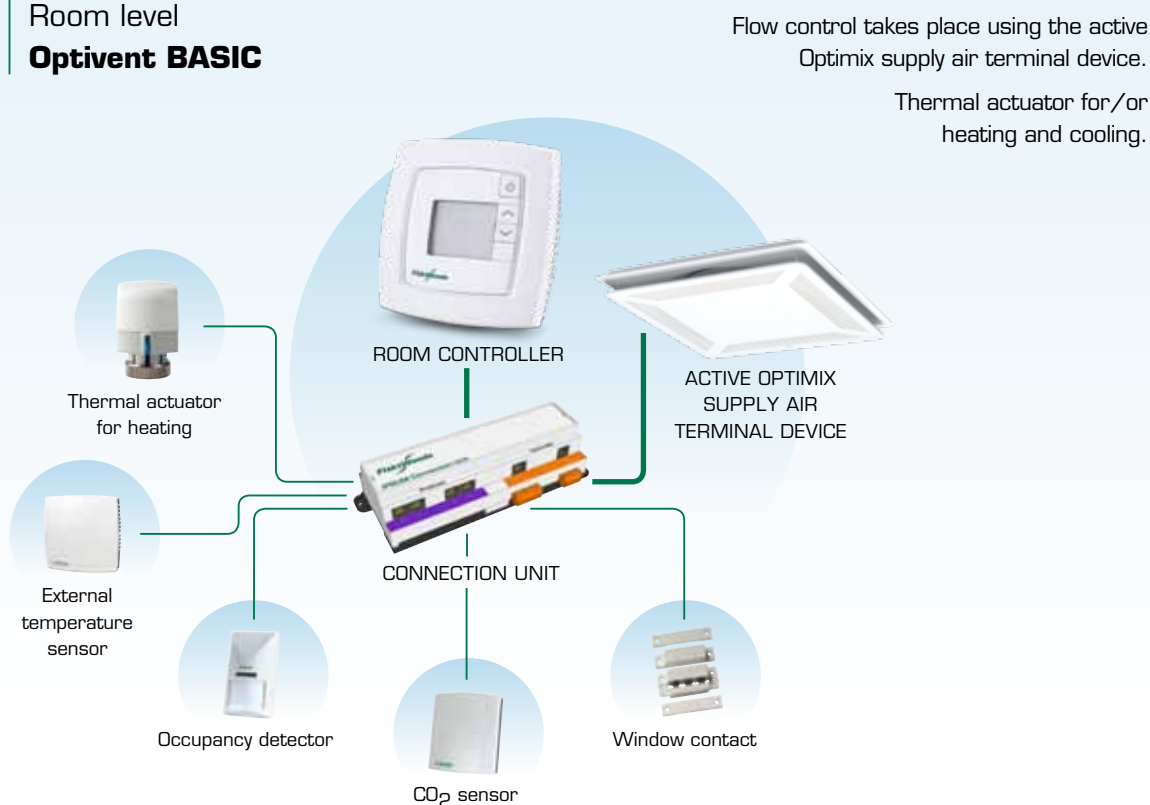
- Full control of the entire climate system allows optimal room comfort and operating economy.
- The IPSUM System Router and IPSUM Connection Unit are used for both waterborne and airborne VAV products.
- Open communication and 0...10 VDC signals allows the connection of air handling units other than the eQ or e3coStar.
- For smaller systems with a maximum of 30 IPSUM Connection Units, no IPSUM System Router is necessary.
- The built-in web interface with automatic configuration provides fast and simple installation and commissioning.

Examples of room solutions

1 Room level **Optivent Standard**



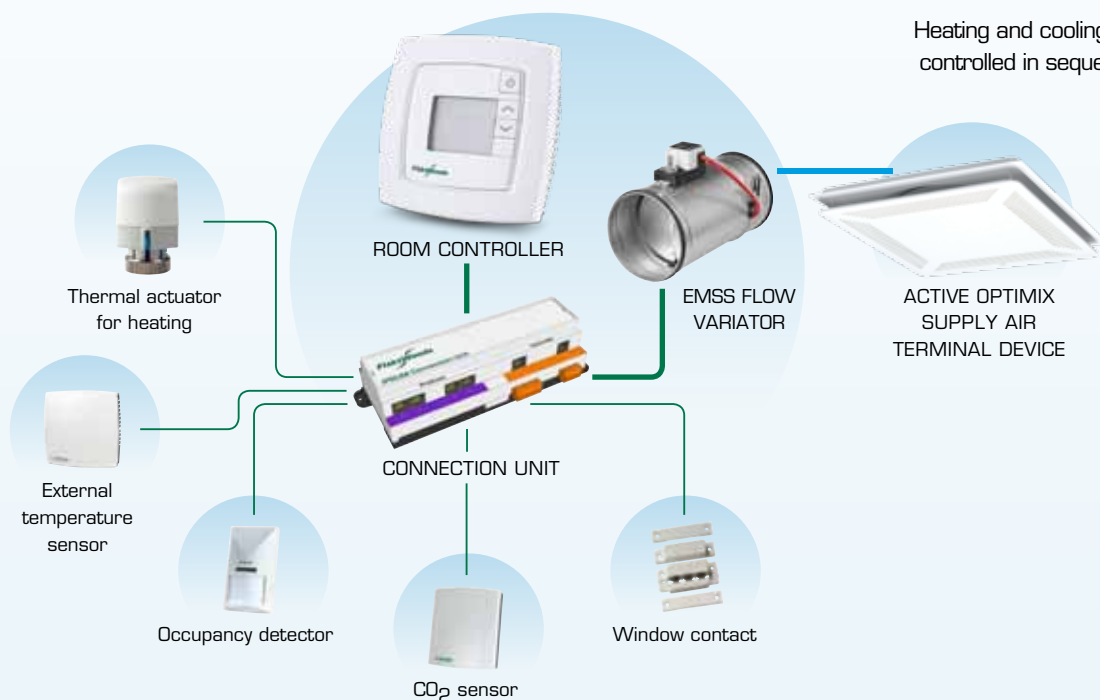
2 Room level **Optivent BASIC**



3 Room level **Optivent Plus**

Flow control takes place using the EMSS flow variator. In addition a constant throw length is obtained using the active Optimix supply air terminal device to ensure room comfort.

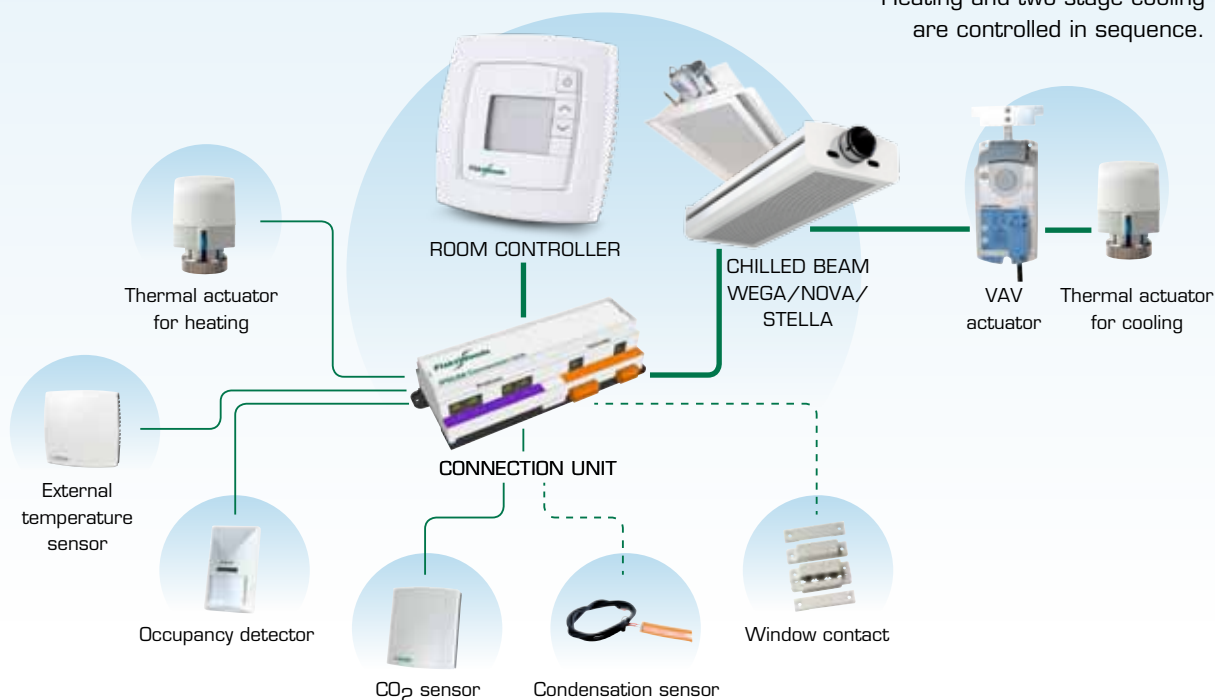
Heating and cooling are controlled in sequence.



4 Room level **Wega/Nova/Stella with VAV function**

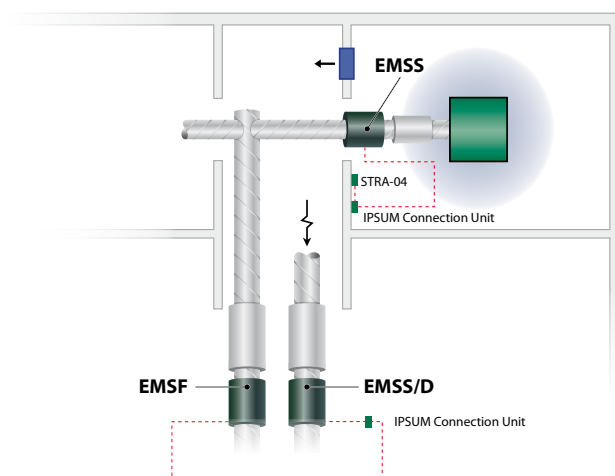
Flow control takes place using the built-in function in the chilled beam – MEC.

Heating and two stage cooling are controlled in sequence.



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Examples of room and zone solutions



Optivent Standard or Plus – central extract air

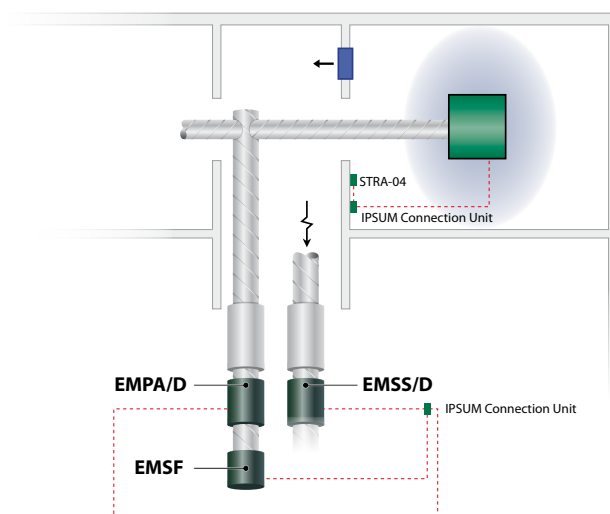
The room contains an active Optimix air terminal device to provide a variable constant throw length, or alternatively a standard air terminal device and a transfer air terminal device for extract air.

Cooling, heating and ventilation are controlled by the STRA-04 room controller with accessories such as occupancy detectors and CO₂ sensors. The STRA-04 room controller is connected to the Ipsum system. This allows for the easy monitoring and adjustment of the room climate.

An EMSS flow variator is installed in the supply air duct of each room to control and measure the supply air flow.

An EMSF flowmeter is installed at the start of the zone's supply air duct which measures the amount of supply air to the zone. This value is then sent to an EMSS flow variator to control the extract air in order to balance the ventilation in the zone.

The Ipsum system monitors the position of the dampers and minimizes the supply air duct pressure drop using the EMSS room damper, and the extract air side duct pressure drop using the EMSS zone damper.



Optivent Basic – central extract air

The room contains an active Optimix air terminal device for regulating the supply air flow and a transfer air terminal device for extract air.

Cooling, heating and ventilation are controlled by the STRA-04 room controller with accessories such as occupancy detectors and CO₂ sensors. The STRA-04 room controller is connected to the Ipsum system. This allows for the easy monitoring and adjustment of the room climate.

An EMPA pressure controller is installed at the start of the zone's supply air duct in order to maintain the static pressure, and an EMSF measuring device is installed to measure the total supply air to the zone. The value from the EMSF is then sent to an EMSS flow variator to control the extract air in order to balance the ventilation in the zone.

The Ipsum system monitors the position of the dampers and minimizes the supply air duct pressure drop using the EMPA zone damper, and the extract air side duct pressure drop using the EMSS zone damper.

LIST OF COMPONENTS

Room level

- IPSUM Connection Unit
- STRA-04
- Optimix (RAPB/RAOB) or standard air terminal device
- EMSS flow variator and silencer
- Transfer air terminal device

Accessory – Room level

- STRZ-09 Occupancy detector
- STRZ-18 CO₂ sensor
- STRZ-70 Actuator and valve for heating
- STRZ-05 External temperature sensor STRZ-05

- STRZ-38 Window contact
- STRZ-24 Transformer

Zone level

- IPSUM System Router
- IPSUM Connection Unit (for EMSS)
- EMSS/D Variable flow damper and silencer
- EMSF Flowmeter

System level

- IPSUM System Optimizer

LIST OF COMPONENTS

Room level

- IPSUM Connection Unit
- STRA-04
- Optimix (RAPB/RAOB)
- Transfer air terminal device

Accessory – Room level

- STRZ-09 Occupancy detector
- STRZ-18 CO₂ sensor
- STRZ-70 Actuator and valve for heating
- STRZ-05 External temperature sensor STRZ-05
- STRZ-38 Window contact
- STRZ-24 Transformer

Zone level

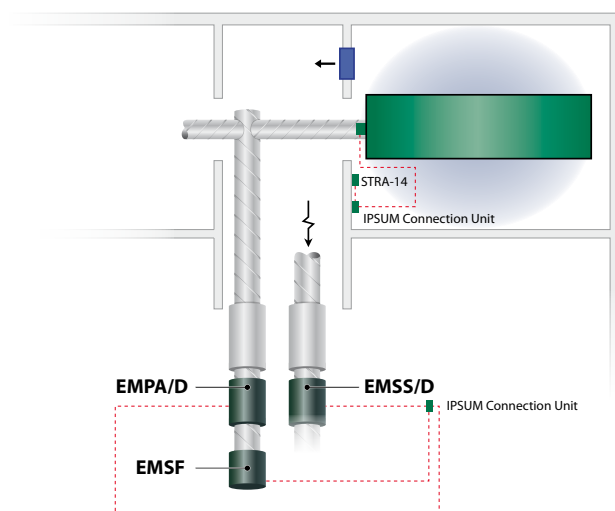
- IPSUM System Router
- IPSUM Connection Unit (for EMSS and EMPA)
- EMSS/D Variable flow damper and silencer
- EMPA/D Constant pressure damper and silencer
- EMSF Flowmeter

System level

- IPSUM System Optimizer

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Examples of room and zone solutions



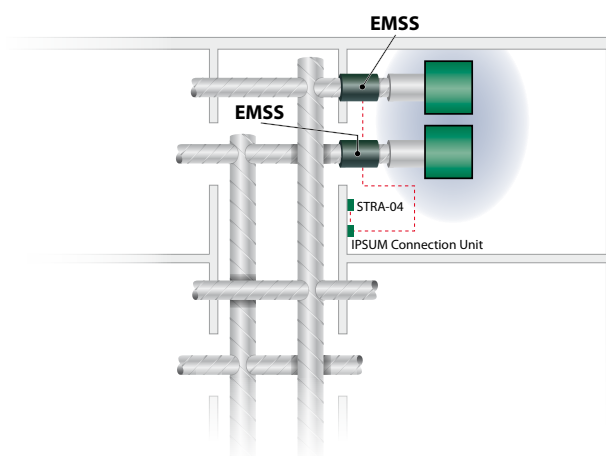
Chilled beams with a VAV function – central extract air

The room contains a Wega/Nova/Stella with a motorized VAV function (MEC) for regulating the supply air flow and a transfer air terminal device for the extract air.

Cooling, heating and ventilation are controlled by the STRA-14 room controller with accessories such as occupancy detectors and CO₂ sensors. The STRA-14 room controller is connected to the Ipsum system. This allows for the easy monitoring and adjustment of the room climate.

An EMPA pressure controller is installed at the start of the zone's supply air duct in order to maintain the static pressure, and an EMSF measuring device is installed to measure the total supply air to the zone. The value from the EMSF is then sent to an EMSS flow variator to control the extract air in order to balance the ventilation in the zone.

The Ipsum system monitors the position of the dampers and minimizes the supply air duct pressure drop using the EMPA zone damper, and the extract air side duct pressure drop using the EMSS zone damper.



Optivent Standard or Plus – balanced ventilation at the room level

The room contains an active Optimix air terminal device to provide a variable constant throw length, or alternatively a standard air terminal device.

Cooling, heating and ventilation are controlled by the STRA-04 room controller with accessories such as occupancy detectors and CO₂ sensors. The STRA-04 room controller is connected to the Ipsum system. This allows for the easy monitoring and adjustment of the room climate.

An EMSS flow variator is installed in the supply air duct of each room to control and measure the supply air flow. This value is then sent to an EMSS flow variator installed in the room's extract air duct to control the extract air flow in order to balance the ventilation in the room.

The Ipsum system monitors the position of the dampers and minimizes the supply air duct pressure drop using the EMSS room damper, and the extract air side duct pressure drop using the EMSS room damper.

LIST OF COMPONENTS

Room level

- IPSUM Connection Unit
- STRA-14
- Wega/Wega power/Nova/Stella (IQIF/IQIH/IQFH/IQFF)
- IQAZ-23(MEC) Actuator for the VAV function in a chilled beam
- STRZ-70 Actuator and valve for cooling
- Transfer air terminal device

Accessory – Room level

- STRZ-09 Occupancy detector
- STRZ-18 CO₂ sensor
- STRZ-70 Actuator and valve for heating

- STRZ-05 External temperature sensor STRZ-05
- STRZ-16 Condensation sensor
- STRZ-38 Window contact
- STRZ-24 Transformer

Zone level

- IPSUM System Router
- IPSUM Connection Unit (for EMSS and EMPA)
- EMPA/D Constant pressure damper and silencer
- EMSF Flowmeter

System level

- IPSUM System Optimizer

LIST OF COMPONENTS

Room level

- IPSUM Connection Unit
- STRA-04
- Optimix (RAPB/RAOB) or standard air terminal device
- 2 EMSS flow variators and silencers

Accessory – Room level

- STRZ-09 Occupancy detector
- STRZ-18 CO₂ sensor
- STRZ-70 Actuator and valve for heating
- STRZ-05 External temperature sensor STRZ-05

- STRZ-38 Window contact
- STRZ-24 Transformer

Zone level

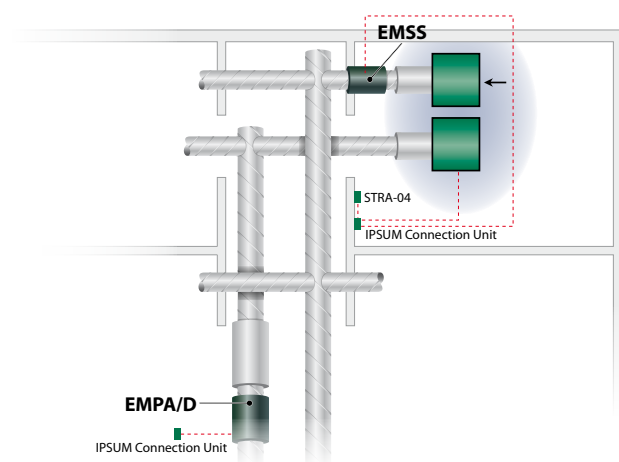
- IPSUM System Router

System level

- IPSUM System Optimizer

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Examples of room and zone solutions



Optivent Basic – balanced ventilation at the room level

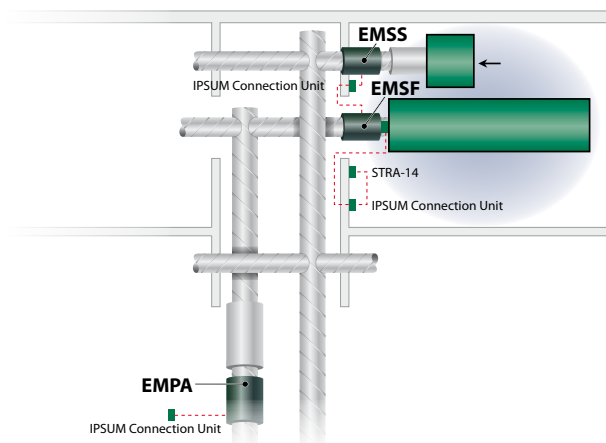
The room contains an active Optimix air terminal device for the control and measurement of the supply air flow.

Cooling, heating and ventilation are controlled by the STRA-04 room controller with accessories such as occupancy detectors and CO₂ sensors. The STRA-04 room controller is connected to the Ipsum system. This allows for the easy monitoring and adjustment of the room climate.

The Optimix measured value is sent to an EMSS flow variator installed in the room's extract air duct to control the extract air flow in order to balance the ventilation in the room.

An EMPA pressure controller is installed at the start of the zone's supply air duct in order to maintain the static pressure.

The Ipsum system monitors the position of the dampers and minimizes the supply air duct pressure drop using the EMPA zone damper, and the extract air side duct pressure drop using the EMSS room damper.



Chilled beams with VAV function – balanced ventilation at the room level

The room contains a Wega/Nova/Stella with a motorized VAV function (MEC) for regulating the supply air flow.

Cooling, heating and ventilation are controlled by the STRA-14 room controller with accessories such as occupancy detectors and CO₂ sensors. The STRA-14 room controller is connected to the Ipsum system. This allows for the easy monitoring and adjustment of the room climate.

An EMSF flowmeter is installed in the supply air duct of each room to measure the supply air flow. This value is then sent to an EMSS flow variator installed in the room's extract air duct to control the extract air flow in order to balance the ventilation in the room.

An EMPA pressure controller is installed at the start of the zone's supply air duct in order to maintain the static pressure.

The Ipsum system monitors the position of the dampers and minimizes the supply air duct pressure drop using the EMPA zone damper, and the extract air side duct pressure drop using the room's EMSS extract air damper.

LIST OF COMPONENTS

Room level

- IPSUM Connection Unit
- STRA-04
- Optimix (RAPB/RAOB) or standard air terminal device
- EMSS flow variator and silencer

Accessory – Room level

- STRZ-09 Occupancy detector
- STRZ-18 CO₂ sensor
- STRZ-70 Actuator and valve for heating
- STRZ-05 External temperature sensor STRZ-05
- STRZ-38 Window contact
- STRZ-24 Transformer

Zone level

- IPSUM System Router
- IPSUM Connection Unit (for EMPA)

System level

- IPSUM System Optimizer

LIST OF COMPONENTS

Room level

- IPSUM Connection Unit
- STRA-14
- Wega/Wega power/Nova/Stella (IQIF/IQIH/IQFH/IQFF)
- IQAZ-23(MEC) Actuator for the VAV function in a chilled beam
- STRZ-70 Actuator and valve for cooling
- EMSF Flowmeter
- EMSS/D Flow variator, silencer, extract air terminal device

Accessory – Room level

- STRZ-09 Occupancy detector

- STRZ-18 CO₂ sensor
- STRZ-70 Actuator and valve for heating
- STRZ-05 External temperature sensor STRZ-05
- STRZ-16 Condensation sensor
- STRZ-38 Window contact
- STRZ-24 Transformer

Zone level

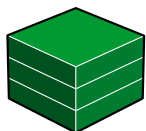
- IPSUM System Router
- IPSUM Connection Unit (for EMPA)
- EMPA/D Constant pressure damper and silencer

System level

- IPSUM System Optimizer

IPSUM from Fläkt Woods

The IPSUM components that optimise Demand Controlled Ventilation

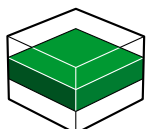


System level

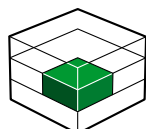


IPSUM System Optimizer

- Optimises system operation
- Max. 1 air handling unit per IPSUM System Optimizer
- Connecting air handling units: Modbus RTU, Modbus TCP or 0...10VDC/potential free
- BMS connection: BACnet IP, BACnet MS/TP, Modbus RTU and Modbus TCP
- User interface: built-in web server
- Connected to other IPSUM units via Modbus RTU or Modbus TCP
- Status indication: LED
- Connection through an RJ plug or removable terminal block
- Power supply: 24 VAC or 230 VAC
- Enclosure class: IP20 for DIN rails, IP54 in electrical equipment cubicles



Zone level



Room level



IPSUM System Router

- Links the IPSUM System Optimizer with the IPSUM Connection Unit
- For smaller systems with less than 30 IPSUM Connection Units, no IPSUM System Router is necessary.
- Max. 30 IPSUM System Routers per system
- User interface: built-in web server
- Connected via Modbus RTU and Modbus TCP (only to Optimizer)
- Status indication: LED
- Connection through an RJ plug or removable terminal block
- Power supply: 24 VAC or 230 VAC
- Enclosure class: IP20 for DIN rails, IP54 in electrical equipment cubicles



IPSUM Connection Unit

- Connection unit for zone/room products
- Max. 30 per IPSUM System Router
- Connected to other IPSUM units via Modbus RTU
- Connection through an RJ plug or removable terminal block
- Power supply: 24VAC (option: 230/24 transformer)
- Enclosure class: IP20 for DIN rails, IP54 in electrical equipment cubicles

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System products for Demand Controlled Ventilation

■ Wega, Nova and Stella chilled beams with Motorized Energy Control

iQ Star Wega, Nova and Stella chilled beams have an integrated system for ventilation, cooling and heating that meets most climate control needs. Wega is for flush installation and Nova for exposed

installation. To achieve a pleasant indoor climate the air flow can be easily adjusted using the patent pending "Energy Control" function. To further increase flexibility EC can be motorized, MEC (Motorized Energy Control), in other words the chilled beam can be provided with a VAV function. A flexible solution allows you to change the office layout without making expensive changes to the ventilation system.

■ The OPTIMIX RAPB/RAOB active supply air terminal devices

Active supply air terminal devices are available as perforated (RAPB) or unperforated (RAOB), all sizes are system ready (600x600). Available in sizes 100–250 mm. The active air terminal device

can be used in two ways, either as a flow variator (Optivent Basic) or as a flexible active air terminal device (Optivent Plus).

■ Traditional supply air terminal devices

Traditional devices can also be used together with the EMSS/D flow variator (Optivent Standard). A nozzle device is preferable in this combination.

■ Extract air terminal devices and Transfer air terminal devices

A supply air system is not complete unless the supplied air is extracted effectively and quietly. There is a large range of extract air terminal devices available.

■ Flow variator EMSS/D

Monitor the air flow in real time, set the minimum and maximum flow simply on the built-in display. EMS is pressure independent and is calibrated after installation. A screwdriver is the only tool you need. EMS is available in the sizes 100–

630 mm and has a flow range of 4–2,493 l/s.

■ EMSF Flowmeter

The EMSF is used when the system receives transfer air from rooms and there is a centrally situated extract air terminal device. The EMSF measures all the supply air to a zone and sends a signal to an EMS flow variator in the extract air duct. This creates a balance between the supply and extract air in the zone.

■ Constant pressure damper EMPA/D

Monitor the pressure in real time, set the pressure simply on the built-in display. A screwdriver is the only tool you need for calibration. EMP is available in the sizes 100–630 mm and has an operating range up to 250 Pa.

■ STRA-04/14 Room controller

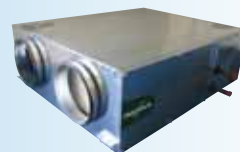
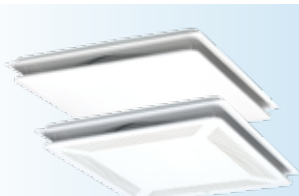
The STRA-04/14 room controller has been specifically developed to create an energy efficient and pleasant indoor climate. It is supplied with a user friendly display on which all the necessary settings can be carried out easily. STRA has a built-in temperature sensor and allows a large number of accessories such as occupancy detectors, CO₂ sensors and external temperature sensors.

■ eQ

Available in 21 sizes covering an air flow range from 0.1 m³/s to 12.5 m³/s. Then there is eQL available in 8 sizes for air flows from 8–30 m³/s. The unit can be supplied as a simple supply or extract air unit or complete air handling unit with heat recovery (Semco Rotor), energy efficient components (PM motor) and built-in control and regulation. Archive optimal energy savings combining eQ and IPSUM.

■ e3co Star

Available in six models with flows from 0.08 to 1.00 m³/s, the new cost effective unit uses a Eurovent certified aluminium heat exchanger for efficiencies of up to 70%. The product is perfect for small applications such as schools, offices, sports facilities and hospitals.



IPSUM from Fläkt Woods

The straightforward choice for good indoor climate and low energy costs



FOR PROPERTY OWNERS

- **System optimisation minimizes operating cost and CO₂ footprint**
- **Single supplier for all your climate systems**
- **A built-in web interface for complete climate management and energy monitoring**
- **Can use the buildings existing Ethernet network**



FOR CONSULTANTS

- **A cost effective system for low energy costs**
- **Fläkt Woods eQ/e3coStar Air Handling Units provide maximum IPSUM functionality**
- **Uses open communication protocols**
- **Simple but flexible system layout/selection**

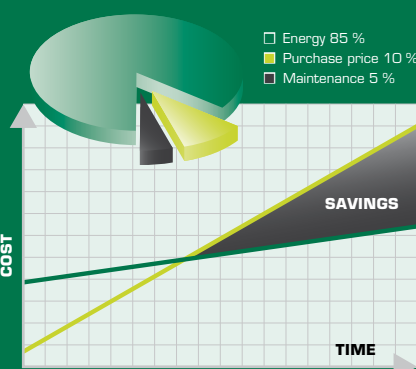


FOR INSTALLATION/COMMISSIONING ENGINEERS

- **Automatic fault-tracing**
- **Smart functions facilitate commissioning**
- **Balancing mode that returns to normal mode automatically**
- **Batch process function to make changes to multiple parts of the system in one action**

The LCC calculates it all

In our industry we use the life cycle cost analysis method when we design ventilation systems. This balances the additional costs of better components and more intelligent system control against savings on maintenance and energy over the service life of the system. Unsurprisingly a more intelligent system is a better investment. About 85% of the life cycle cost is made up of energy costs, 10% is the purchase price and 5% is maintenance.



Save energy, money and the environment with Fläkt Woods

Energy optimisation is an important aspect of ventilation and is regarded as Fläkt Woods' specialty. We use e³ to mark products and solutions that are particularly effective. They serve a dual purpose, saving both the environment and your long-term economy.

www.flaktwoods.com/energy

We Bring Air to Life

Fläkt Woods is a global leader in air management.
We specialize in the design and manufacture of a wide
range of air climate and air movement solutions.

Our collective experience is unrivalled.

We are constantly aiming to provide systems that
precisely deliver required function and performance as
well as maximum energy efficiency.



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