Demand-Controlled Ventilation and Energy Efficiency

White Paper Version 1.0

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SAUTER
Für Lebensräume mit Zukunft.

Summary

The technical operation of buildings (heating, cooling and ventilation) currently takes up around 40% of global primary energy consumption and accounts for roughly a quarter of worldwide CO_2 emissions. **Optimising energy efficiency in buildings** is crucial in combatting this threat to the environment. In buildings equipped with mechanical ventilation systems, **demand-controlled ventilation** is one of the key ways of achieving this.

Demand-controlled ventilation means that the building automation system **adjusts and minimises the supply of outside air according to the effective requirements** with the aim of optimising both room air quality and energy efficiency. Room air quality is generally assessed according to its **CO_2 content**, which is usually measured using infrared CO_2 sensors.

Demand-controlled ventilation saves energy by minimising the amount required for **driving the fans** and for **treating the supplied fresh air** (heating, cooling, humidifying, dehumidifying, etc.).

Depending on the type of installation (with or without heat recovery, with or without air mix dampers, local or supply air heating/cooling) there are different **interdependencies and control strategies** with different energy-saving options.

This white paper describes the principles, technology and effects of demand-controlled ventilation in a way that can be understood by everyone. It describes the situation as regards **individually ventilated rooms** as well as for **VAV-controlled individual rooms with a common air treatment system**, and includes facts and figures.

For **SAUTER**, energy efficiency (in other words optimum user comfort with minimum energy use) is the number one priority. All our products and solutions are consistently designed with this in mind.

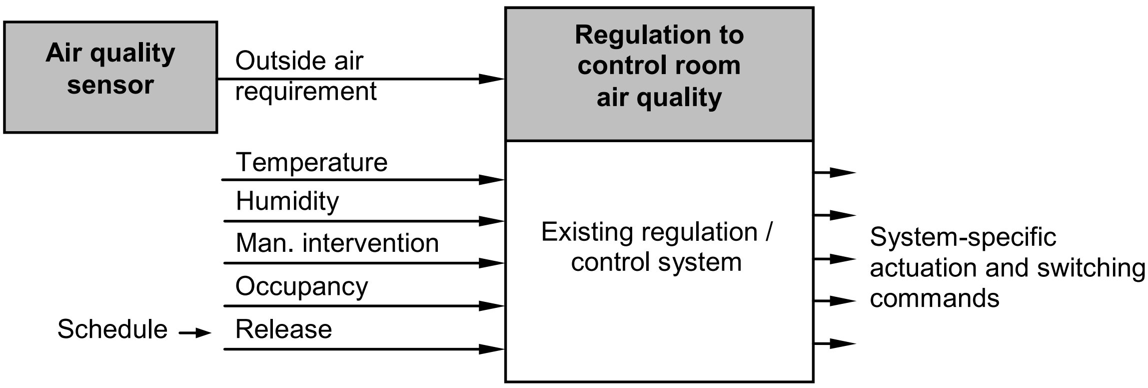
Introduction / general information:

The negative effects on our planet of climate change are becoming increasingly clear and incontrovertible. More conscious **use of energy and reduction of emissions** has become one of the most urgent and dominating challenges that humanity faces.

The technical operation of buildings (heating, cooling, ventilation, lighting, etc.) currently takes up around 40% of global primary energy consumption! It accounts for roughly a quarter of all CO_2 emissions (rising to 40% in Switzerland and Germany)! **Maximising energy efficiency in buildings** is crucial in combatting this threat to the environment.

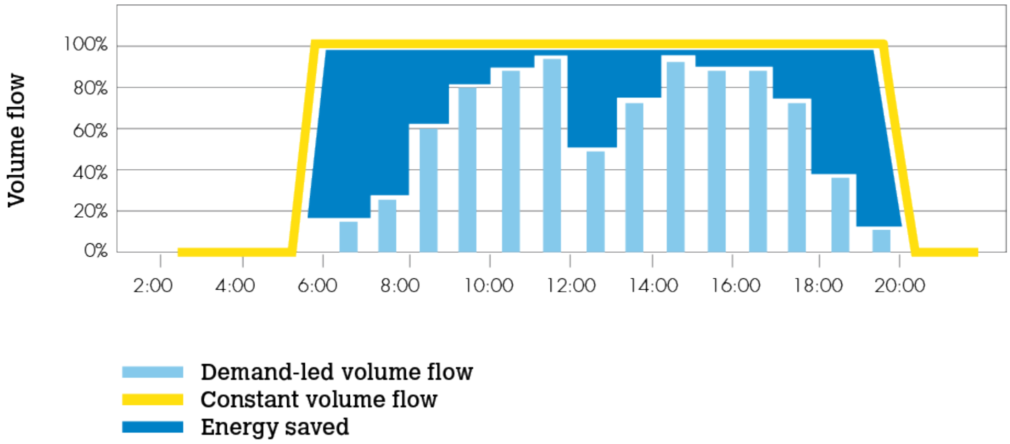
In buildings equipped with a mechanical ventilation system, the technology of demand-controlled ventilation is one of the most effective ways to implement this, along with other **key technologies** such as integrated room automation and thermal concrete core activation. Another reason why demand-controlled ventilation is becoming more important is that buildings are now increasingly airtight (as a result of improving thermal insulation).

Demand-controlled ventilation means **constantly adjusting the quantity of air supplied according to the effective requirements**, in other words, only ever supplying and conditioning (heating, cooling, humidifying, dehumidifying) precisely the amount of air that is necessary for adequate, pleasant room comfort. The aim is to optimise the ventilation system as regards **both user comfort and energy efficiency**.



Principle of demand-controlled ventilation (VDMA 24773)

Demand-controlled ventilation saves energy in two ways. First, it saves energy on the **fans** – and in fact it saves an enormous amount, because the energy that is required to drive the fans (and can therefore be saved) increases by the power of three in proportion to the amount of air moved. Secondly, it saves energy for **treating the outside air**: less outside air means less energy is required for heating, cooling, humidification and dehumidification.



Potential energy savings from demand-controlled ventilation as opposed to time-controlled ventilation

The **air quality sensor** is crucially important for demand-controlled ventilation. It quantifies the air quality in the room and provides the **command variable**. For good results, it is essential to use the right type of sensor, which must be accurate, stable over time and correctly positioned in the room. **CO_2 sensors** are generally used. The amount of CO_2 in the air in the room increases proportionately to the number of people in the room and the length of time they stay there, and thus provides a **very good measure of air quality**. For particle-laden rooms (such as those where there are smells or where people smoke), **mixed gas sensors** (VOC sensors) are also used.

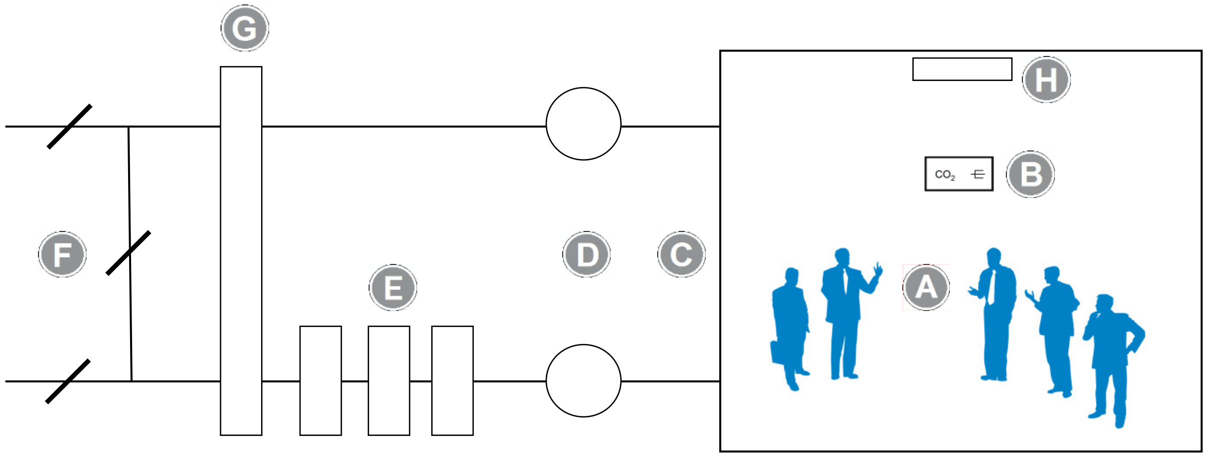
With demand-controlled ventilation based on the CO_2 or VOC content of the room air, the maximum possible rating in the corresponding category is achieved both in **building classification according to EN 15232** and building certification according to **eu.bac system**.

SAUTER not only offers all-round expertise and many years of experience, but also manufactures all the control components that are necessary for a demand-controlled ventilation system: sensors, actuators (valves, drives), controllers and automation stations, as well as the appropriate engineering tools and knowledge databases.

In keeping with our advertising slogan "**For sustainable living environments**", all our products and solutions are designed to improve energy efficiency.

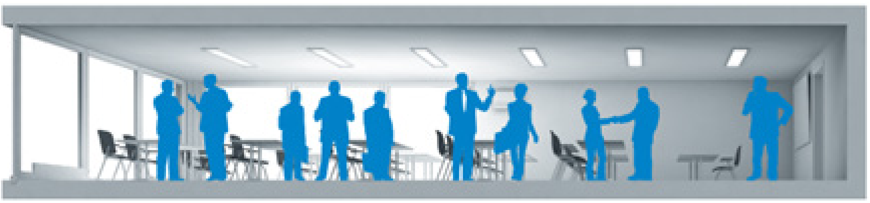
The elements of demand-controlled ventilation

And how they affect energy efficiency



A *Users / room climate*

The **room users** are of central importance to demand-controlled ventilation. They are not only the **beneficiaries** of room ventilation, but are usually also the main **controlling factor**. The necessary exchange of air is largely proportional to the number of people present and how long they stay there (as well as the intensity of their physical activity).



The **comfort** of the room users, in other words the quality of the room climate, along with the **energy saved**, is the main measure for **demand-controlled ventilation**.

In the **energy efficiency formula** here, the quality of the room air is divided by the energy used for it:

$$\textit{Energy effiency} = \frac{\textit{Quality of the achieved comfort}}{\textit{Energy spent}}$$

The decisive building management factors for the **comfort of the room users** and therefore their **productivity** are light conditions, air temperature, air quality, air humidity, air flow (chill factor, see below), surface temperatures and noise levels. The **intensity of ventilation** not only determines the air quality but also directly determines the air flow, air noise and, depending on the type of system, the air temperature and humidity.

Poor air quality (excessive CO_2 levels, smells, etc.) leads to tiredness, lack of concentration, falling attention levels, mistakes, dissatisfaction and even absences through illness, loss of work and therefore lost profits and increased costs. **Demand-controlled ventilation** ensures good air quality at all times.

Ventilation always causes **air flow** and thus affects the **chill factor (the perceived temperature)**. Air flowing over the skin increases evaporation, meaning the room feels colder and the temperature must be raised to compensate for it. This means that ventilation that is more intense than necessary can negatively affect energy efficiency in three ways: more energy for the fans, more energy for conditioning and more energy for **increasing the air temperature to compensate for the chill factor**. (This applies in heating mode. Conversely, in cooling mode, it can be useful to increase the air circulation beyond the level normally required for adequate air quality. This increases the chill factor so that the temperature can be raised to save cooling power. In cooling mode, a pleasant room temperature can be achieved more energy-efficiently and inexpensively by increasing the air circulation rather than lowering the room temperature.)

One of the convenient aspects of demand-controlled ventilation is its **tolerance of user intervention**. If the user opens a window to get more fresh air, the sensors of the demand-controlled ventilation system detect this and reduce mechanical ventilation accordingly. Here too, demand-controlled ventilation ensures that energy consumption is kept to a minimum.

Facts and figures:

- *An ideal working environment (lighting, temperature and air quality) can increase productivity and satisfaction by 15%. This has been shown by international studies since the late 1960s, such as the one by BOSTI (Buffalo Organization for Social and Technological Innovation).*
- *The ratio of costs in a commercial office building is roughly 1 ÷ 10 ÷ 100. 1 stands for energy costs, 10 for rent (overall cost of space) and 100 stands for the salaries of the occupants. This ratio clearly shows how important it is in overall economic terms to optimise room comfort and, along with it, the satisfaction and productivity of those who use the building. Just a 1% change in productivity is equivalent in terms of costs to the entire energy consumption of the building.*

B *Sensors*

The **air quality sensor** is a **key element of demand-controlled ventilation**. For good results, it is essential to use the right type of sensor, which must be accurate, stable over time and correctly positioned in the room.

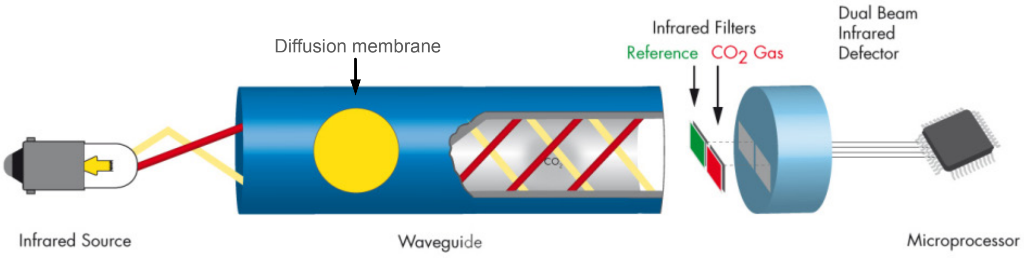
In general, **CO_2 sensors** are used to measure the air quality. The CO_2 concentration is considered to be the most important indicator of room air quality. It provides a very good measure of the number of people present in the room, as well as of the current air quality.

Increased CO_2 concentration is the result of the **respiratory process** of the people in the room. They breathe in oxygen (O_2) and breathe out carbon dioxide (CO_2). Carbon dioxide is an invisible, odourless and chemically inactive gas which is a natural component of the atmosphere. Its concentration is expressed in percent by volume or ppm (parts per million). At increased concentrations, CO_2 causes symptoms such as **reduced productivity, concentration problems and tiredness**, and has negative effects on health.

Most sensors in building management systems use the method of **infrared spectroscopy**. The measuring system consists of a light source, the measuring path, an optical filter and a receiver. The filter selects the light on a specific wavelength that is absorbed by CO_2. The signal that is received thus varies according to the concentration of CO_2 in the air.

However, it is difficult to achieve the necessary accuracy and long-term stability with **single-beam CO_2 sensors**. Dirt, dust and ageing of the light source cause deviations and gradual drift. The sensor must be regularly adjusted using an automatic calibration procedure. This in turn requires intensive ventilation of the unoccupied room, which naturally involves additional energy and costs, and is not even possible in some places, such as hospitals.

With **dual-beam CO_2 sensors**, this energy-intensive readjustment is not necessary. They use two measuring channels, the first with a filter for measuring CO_2 and the second with a filter for a reference spectrum. Using the reference measurement, they can automatically compensate for changing measuring conditions and deterioration of the light source. The accuracy and stability of dual-beam CO_2 sensors makes them ideal for all applications and types of building. Particularly high-quality devices also have a temperature compensation function and factory-set calibration distributed throughout the measuring range.



How a dual-beam CO_2 sensor works

The typical measuring range of CO_2 sensors is between 0 and 2000 ppm. The concentration in the room should not exceed 1500 ppm. The recommended maximum threshold is 1000 ppm. The concentration in fresh air is around 350 ppm. The MWC (maximum workplace concentration, above which harm to health can be expected) is 5000 ppm.

260 ppm	Outside air in pre-industrial era, before 1850
350 ppm	Clean outside air today, tendency rising
700 ppm	Urban air outdoors, recommended for occupied rooms
1000 ppm	Maximum Pettenkofer value
1400 ppm	Air in poorly aired houses, threshold for offices
3500 ppm	Maximum value in a classroom after a one-hour lesson
4300 ppm	Maximum value in a bedroom, 2 persons

5000 ppm	Maximum workplace concentration (MAC value)
7000 ppm	Maximum value in a cinema after a film
20000 ppm	Short-term maximum value
40000 ppm	Exhaled air

$C0_2$ concentrations (0.035 vol % is equal to 350 ppm)

For particle-laden rooms such as restaurants or bathrooms, **mixed gas sensors** are also used. Mixed gas sensors measure the **VOC concentration** in the air (VOC stands for volatile organic compounds). As well as from tobacco smoke, these can be produced in kitchens or given off by furnishings and decor such as carpets, or by cleaning products, for example.

There is no official unit of measurement for the VOC concentration. The measuring range of the sensors usually covers particle concentrations between 0 and 1000 ppm.

Air quality sensors are available as duct sensors with a sensor tube for fitting in the return air duct or as flush-mounted or recessed devices for installation directly in the room.

SAUTER CO_2 sensors. Duct sensor / room-temperature sensor

For use in building automation systems, the devices are often combined with a **temperature sensor** in the same housing. However, on room-temperature sensors without separate ventilation, the temperature measurement is falsified by the heat emitted by the light source for the CO_2 sensor, which means that separate temperature sensors are more accurate.

The **place of installation** is very important. A duct sensor fitted in the **return air duct** provides a very precise measurement. It automatically measures the average value for the room, but only works if a constant minimum air circulation can be guaranteed. When it is installed, it must be ensured that the sealing is good, so that there can be no exchange of gas between the return air and the air outside.

The **room sensor** must be installed in a typical CO_2 reference location, normally 1.5 to 2 m above the ground. The location must be chosen to ensure a good flow of room air through the device. Due to the high concentration of CO_2 in exhaled air, it must be installed at least 1 m away from where people will be.

Facts and figures:

- *See also the table above.*
- *78% N_2 , 21% O_2 , 0.035% CO_2 (78% nitrogen, 21% oxygen, 0.035% carbon dioxide) are the components of normal outside air. If the concentration of CO_2 rises, concentration of O_2 decreases proportionately.*
- *5% (50,000 ppm) CO_2 is toxic to humans, 8% (80,000 ppm) will cause death within 30-60 minutes.*
- *Every hour, a person exhales around 15 litres of CO_2, in other words 0.015 m3/h*
- *Experience has shown that the CO_2 concentration in an unventilated classroom can exceed the 1000 ppm threshold within 10 minutes.*
- *CO_2 concentrations above 1000 ppm cause measurable impairment to human productivity: tiredness, lack of concentration, increased liability to make mistakes or even days lost to illness.*
- *The necessary sensor accuracy according to VDI 6038 is: CO_2: ±50 ppm, temperature: ±0.5 K, humidity: ±3.5% rH,*

At SAUTER:

- *All SAUTER CO_2 transducers for room air quality are dual-beam sensors with temperature compensation and linear 12-point factory calibration distributed across the entire measuring range.*
- *On the SAUTER EGQ222 transducer for room air quality, the room temperature sensor is mounted separately for an accurate temperature measurement:*

SAUTER transducer for room air quality EGQ222 with room temperature sensor

C ***Ventilation, supply air, return air***

The quantities of fresh air, supply air and return air are the positioning signals for **demand-controlled ventilation**. The higher the CO_2 (or VOC) concentration in the room, the more fresh air is demanded by the controller. If the installation is equipped with air mix dampers, the controller opens these first to increase the quantity of outside air. The output of the fans is not increased until the dampers are fully open.

If the demand-controlled ventilation is subject to a **time programme** or **detected occupancy**, additional savings can be made by completely switching off the ventilation during times when the room is unoccupied.

Vapours coming from construction materials and furnishings may make it necessary to always supply a **minimum quantity of outside air** in order to prevent unpleasant smells (stale air).

For the same reason, it may be necessary to carry out a short **airing** (intensive ventilation) before the first people arrive in the room.

Facts and figures

- *20-30% savings are possible using demand-controlled ventilation in open-plan offices when on average 40% of the people who work there are present (VDMA 24773). At an energy cost of around €1 per square metre per month (OSCAR 2010), the annual savings for an office space of 15,000 m2 amount to €36,000 – 54,000!*
- *3–5% savings are possible in open-plan offices when on average 90% of the people who work there are present. (VDMA 24773)*
- *20–50% savings are possible in lecture theatres, universities and schools. (VDMA 24773)*
- *20–60% savings are possible in foyers, halls and airport check-in areas. (VDMA 24773)*
- *40–70% savings are possible in exhibition halls and indoor sports facilities. (VDMA 24773)*
- *30–60% savings are possible in auditoriums, conference rooms, theatres and cinemas. (VDMA 24773)*
- *30–70% savings are possible in restaurants and canteens. (VDMA 24773)*

At SAUTER:

- *In the room automation solutions of the SAUTER CASE libraries, the various types of room are predefined along with their specific functions, including setpoint thresholds, time programmes and occupancy functions.*

D ***Fans***

In **simple ventilation systems** (i.e. without air mix dampers), the supply and return air fans are the **control units** of demand-controlled ventilation. They are used by the controller to regulate the volume of air exchanged. (In order to create a balance between the supply and return air, in other words to prevent positive or negative pressure in the room, it does not activate them directly, but by setting the volumes of supply and return air. Based on this, and on positive and negative pressure sensors in the supply and return air ducts, a speed controller on each fan adjusts the supply or return air volume accordingly.)

If the system has **air mix dampers**, the air quality controller first uses these dampers to adjust the supply of outside air to the current requirement. Not until they are fully open does it adjust the supply and return air flow by increasing the fan speeds.

These days, only **continuously variable fans** (via VFD) are normally used. **Multiple-level fans** were also used in the past. (The supply and return air were balanced during commissioning by adjusting the transmission ratios of the fan drives.)

Just as the **air resistance** increases to the power of three in proportion to the air velocity, the mechanical/electrical **fan drive power increases to the power of three** in proportion to the quantity of air circulated. To put it another way, if the amount of air to be circulated can be reduced by demand-controlled ventilation, the amount of energy saved on the fans increases by a power of three! (For example, if the quantity of air is halved, only an eighth of the energy is required.)

Facts and figures:

- *49% of energy can be saved on the fan if the circulated air is reduced by 20% using demand-controlled ventilation.*

At SAUTER:

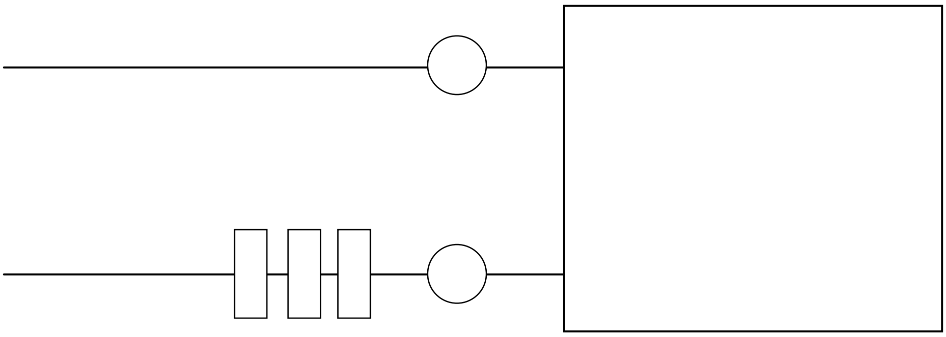
- *The SAUTER CASE Suite engineering software with many different predefined solutions in the SAUTER libraries facilitates lean, efficient and high-quality engineering of complex situations.*

E ***Air conditioning***

Depending on the requirements and system concept, the **air conditioning system** can comprise filters, heating, cooling, humidification and dehumidification.

Because the outside air is always **preheated or cooled to the supply air temperature** (also out of convenience in systems with local heating and cooling, see section H), the outside air volume always has a proportional effect on the energy required for heating and cooling. This means that (as well as saving energy on the fans) any reduction in the outside air intake achieved by demand-controlled ventilation results in corresponding energy savings for heating and cooling.

In systems where the room is solely heated and cooled by air conditioning (without local heating and cooling) and which do not have air mix dampers, the **tolerance range for room temperature** (and possibly humidity) is vitally important.



System without local heating/cooling and without air mix dampers (simplified diagram)

In this case, the quantity of outside air supplied is not only determined by the room air quality controller. The requirement for heating (or cooling) can also lead to an increase in the quantity of outside air. This results in **prioritisation of the air quantity between the**

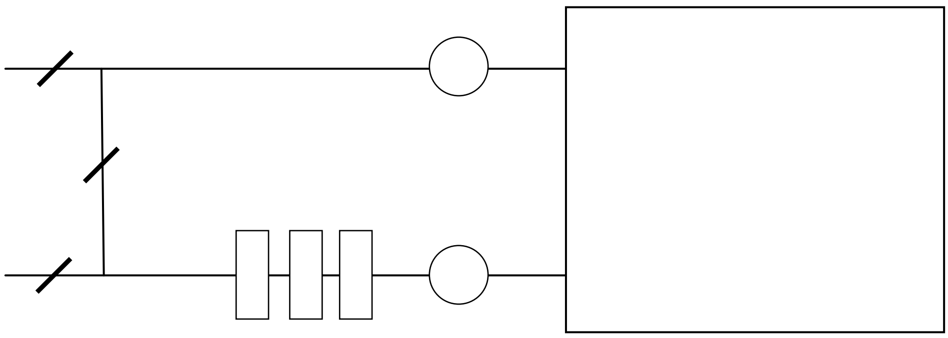
requirement for air quality and the requirement for heating (or cooling), depending which requirement is currently the greater. The narrower the room temperature tolerance range is defined (for example 22°C - 24°C), the more often the outside air supply volume is determined by the need to keep within it. And conversely: **The wider the room temperature tolerance range, the more freedom there is for demand-controlled ventilation** (regulation according to room air quality) to reduce the air volume, thus increasing potential energy savings. In an extreme case where the temperature tolerance range is zero, maintaining it takes 100% priority and there is practically no potential for demand-controlled ventilation to make energy savings. (In the same way, this also applies to the room humidity tolerance range.)

At SAUTER:

- *With the aid of the SAUTER EMS (Energy Management System), these complex conditions and interdependencies can be recorded during operation, clearly represented, analysed and thus optimised. The aim is to maximise energy efficiency as well as user comfort.*

F ***Air mix dampers***

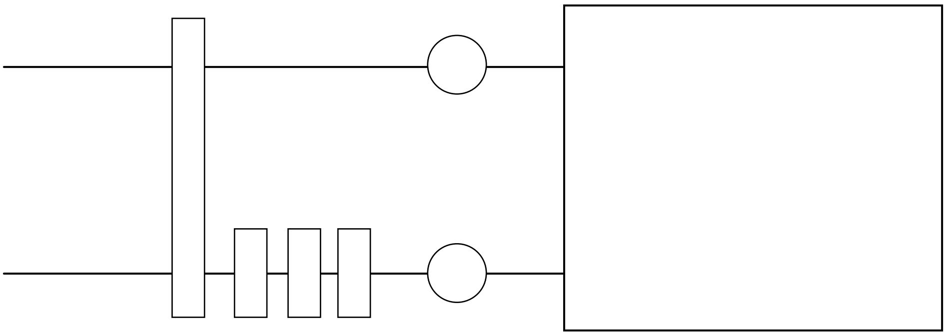
The great advantage of ventilation systems with **variable outside air addition using air mix dampers** is that the outside air supply is **separated** from maintenance of the room temperature. An increased requirement for heating or cooling does not automatically mean that the outside air supply has to be increased. The circulated air can be returned via the **circulated air damper**. This saves a great deal of energy, which is why circulated air or air mix dampers are often classified as heat recovery systems.



System with recirculated air / outside air dampers (simplified diagram)

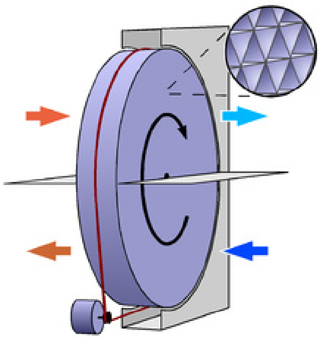
Because the regulation systems for room air quality and for heating (or cooling or humidity) are entirely independent of each other, the **temperature tolerance range** does not have the detrimental effect on energy saving through demand-controlled ventilation as described above in the section on air conditioning (section E).

Ⓖ *Heat recovery*



System with heat recovery (simplified diagram)

A **heat recovery (HRec)** system extracts thermal energy from the return air and adds it to the supply air. These systems use **plate heat exchangers** (which thermally connect the return air to the supply air via metal plates) or **rotary heat exchangers** /thermal wheels (which rotate heat-absorbing material alternately through the return and supply air ducts).



Rotary heat exchanger (diagram)

Heat recovery does not change any of the basic facts of **demand-controlled ventilation** as described above. However, it does affect the potential for energy savings with thermal air conditioning, because the heat recovery system can **recover much of the heating or cooling energy** that would otherwise be lost in the return air.

The same applies to the information in section E on air conditioning regarding the **temperature tolerance range** when a heat recovery system is installed. The only difference is that the effects of it are reduced.

Facts and figures:

- *80% is the efficiency that can be achieved by thermal wheels (heat recovery coefficient)*
- *60% is the efficiency that can be achieved by plate heat exchangers (heat recovery coefficient)*

H Local heating and cooling

In this case, the room is not heated or cooled by the supplied air, but by devices installed in the room, such as: **radiators, underfloor heating/chilled ceiling, hot or chilled beams and fan coil units**.

As with the recirculated air and air mix dampers, the big advantage here comes from **disconnecting** the outside air supply from maintaining the room temperature. Also, in this case no recirculated air is required for heating or cooling, which means significant **energy savings on running the fans** (drive energy = air volume^3 !).

Here too, the disadvantages of the **temperature tolerance range** described above in section E on air conditioning, are excluded from the potential energy savings from demand-controlled ventilation.

However, for reasons of comfort, it is also necessary to condition the **air supplied by fans** here. Air feels particularly unpleasant if it is cooler than room temperature.

One special form of local heating/cooling is the solution with **fan convectors and outside air dampers**. Various versions of this exist: heating only or heating/cooling, with single-level, multi-level or continuously variable fan, with or without heat recovery. The outside air damper always takes the form of an air mix damper. In terms of demand-controlled ventilation, the fan convectors with outside air dampers are a local ventilation system with air mix dampers, and all the information above on that type of installation applies in the same way.

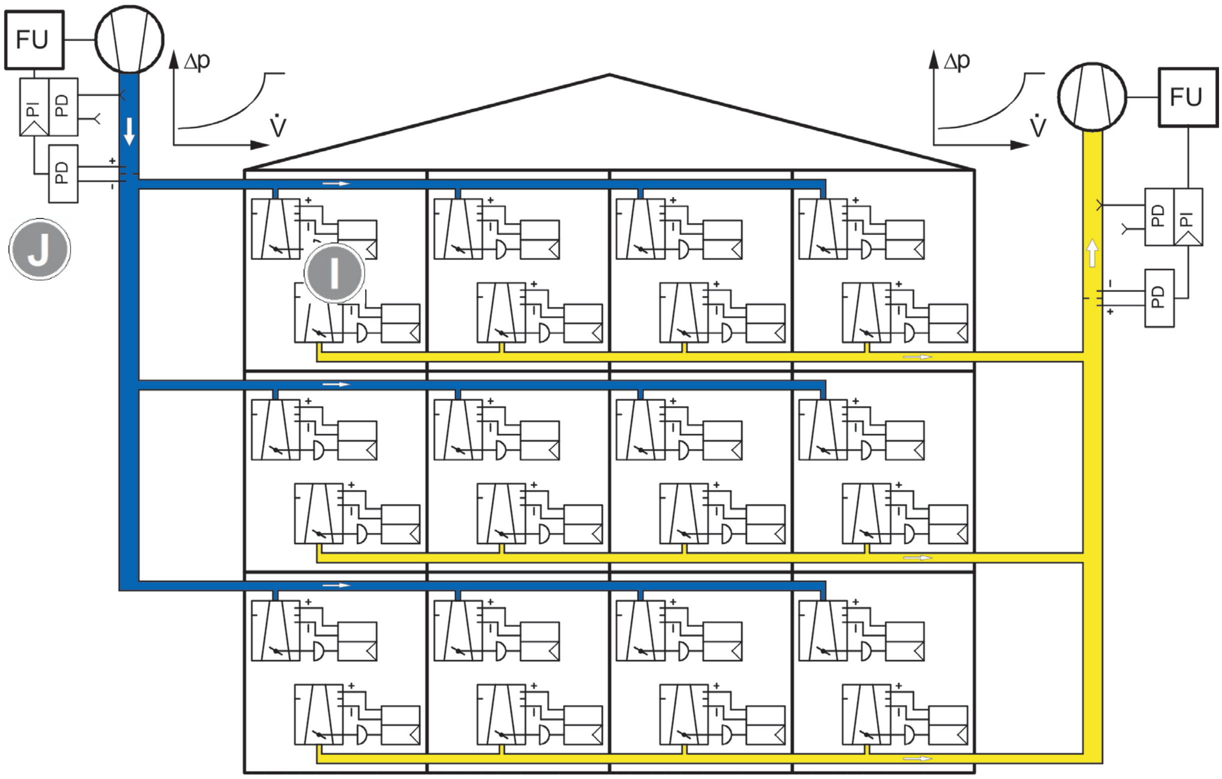
Energy requirements of various types of system

Type of system	**Heating/cooling requirement**		**Dependency on room temperature tolerance range**
	Fans	**Outside air**	
Without heat recovery, without air mix dampers	Yes	Yes	Yes
With heat recovery	Yes	Reduced 1	Reduced 2
With air mix dampers	Yes	No	Reduced 3
With local heating/cooling	No	No	No

1) Reduced energy requirement because outside air is preheated by HRec
2) Reduced effect because outside air is preheated by HRec
3) Reduced effect: Fans only, no outside air required for heating/cooling

Effect of system type on potential savings from demand-controlled ventilation

Individual rooms with VAV:



VAV rooms with central ventilation system

Individual room with VAV regulation

In buildings with central ventilation systems and **VAV regulation for individual rooms**, demand-controlled ventilation is implemented in every room using VAV (variable air volume) boxes. In the same way as described above for rooms with individual ventilation systems, in each room the **air exchange, CO_2** (and possibly the temperature) are **regulated** according to the current requirements and kept to a minimum. To do this, the VAV controller receives a setpoint for the outside air volume from the room controller and actuates the damper of the VAV box according to the volume flow measured across the orifice.

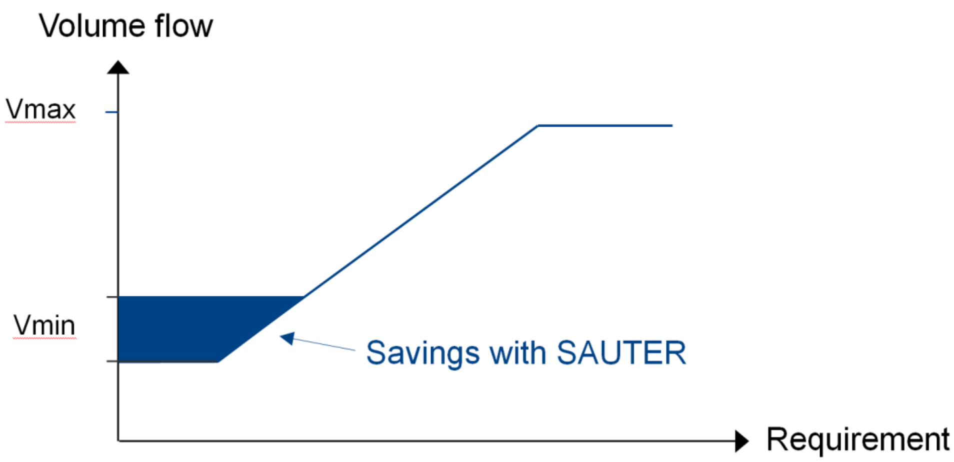
The information on energy savings from demand-controlled ventilation are the same as in the systems described above, but the **total savings** are the accumulated savings for each room. In the central air treatment system, the duct pressure is kept constant so that no more air than necessary is treated.

At SAUTER:

- *SAUTER ASV115 VAV compact controller for demand-controlled ventilation in any application (e.g. offices, conference rooms, hotel rooms)*

Sauter ASV115 VAV compact controller

- *One of the outstanding features of the ECP100 differential pressure sensor used in the SAUTER ASV115 VAV compact controller is its extremely high resolution, excellent zero point stability and integrated measuring range adjustment option. These unique features make it possible to precisely detect the tiniest pressure differences of only 1 Pa. This extends the control range of the demand-controlled ventilation system downwards, which results in significant energy savings and a corresponding reduction in operating costs.*



Additional energy savings with components from SAUTER

J ***Duct pressure minimisation***

Energy efficiency can be further increased in buildings with single-room VAV regulation and a central ventilation system using **variably regulated duct pressure**. The duct pressure is minimised by regulating it along a predefined curve **according to the momentary volume flow**. The higher the air volume flow, the higher the duct pressure setpoint.

The VAV controllers in each room automatically equalise the variable duct pressure because they regulate the volume flow to the setpoint given by the room controller.

The aim is to **minimise** the **duct pressure** so that the VAV controller in the room that needs the most air opens its damper as fully as possible.

The energy savings come from the reduced energy requirement for the fans of the central air treatment system, because they no longer need to increase the pressure in the duct more than is necessary.

With pressure/demand-controlled air volume flow on the level of the central air treatment system, the maximum possible rating in the corresponding category is achieved both in **building classification according to EN 15232** and building certification according to **eu.bac system**.

At SAUTER:

- *With the ASV115 VAV compact controller (from firmware V2.10), SAUTER offers a device which can handle both single-room VAV regulation and duct pressure regulation.*
- *SAUTER CASE VAV provides ready-made applications for engineering duct pressure regulation with the ASV115.*
- *Using the SAUTER EMS (Energy Management System), you can analyse and optimise the complex interactions and interdependencies of the single-room VAV controllers and central air treatment during operation.*

Conclusion

The **physical construction** of a building (thermal insulation, heat storage capacities, tightness of the building envelope, sunshade, etc.) forms the basis for optimising comfort while maximising energy efficiency. Just as important are the **building services components** (mechanical and technical design of the ventilation, heating, cooling and heat recovery systems, etc.).

When carefully, comprehensively and expertly executed, **building automation**, particularly the **demand-controlled regulation of the ventilation system** described here, ensures optimum and energy-efficient utilisation of these basic resources.

All three aspects – the physical construction, the building services systems and the building automation system – play their part in maximising energy efficiency. The maximum achievable result depends on the **sum effect and optimum interaction** of all possible measures.

Particularly when redeveloping existing buildings, investing in building automation is the **most economically efficient course of action**. The potential improvement in energy efficiency in relation to the capital invested is significantly better than any other option (such as insulating the building envelope or completely renewing the building services systems).

SAUTER provides you with exactly the right type of building automation for every type of building – big or small, old or new. Just call us for advice!

Index:

The author

Franklin Linder, El.Ing. BE is a technical editor at SAUTER Head Office in Basel. He has 20 years of experience in the development, marketing and application of building automation systems.

Company portrait

As a leading provider of solutions for building automation technology in ‘green buildings’, SAUTER provides pleasant conditions and a sense of well-being in sustainable environments. SAUTER develops, produces and markets energy-efficient total solutions and offers a comprehensive range of services to ensure that buildings are operated with optimal energy usage. Our products, solutions and services ensure high energy efficiency throughout the entire life-cycle of a building, from planning and construction through to operation, in office and administrative buildings, research and educational establishments, hospitals, industrial buildings and laboratories, airports, leisure facilities, hotels and data centres. With over a century of experience and a track record of technological know-how, SAUTER is a proven system integrator, with a name that stands for continuous innovation and Swiss quality. The recipient of awards for the best automation system and the best energy service, as well as eu.bac and BTL certifications, SAUTER provides users and operators with an overview of energy flows and consumption, enabling them to track the development of their costs.