FISCHER
MESS- UND REGELTECHNIK

developing solutions

Measurement technology for demanding measuring tasks

Building Technology

- Improvement of a building’s carbon footprint
- Dynamic filter monitoring

ENERGY EFFICIENCY

Active environmental protection with **FISCHER**

Optimisation of ventilation systems is growing more and more important. This applies to new and existing systems alike. Increased awareness of environmental protection is mirrored in the requirements posed to products and processes. The consequences of the greenhouse effect are examined and evaluated, e.g. within the scope of life cycle assessments (ISO 14040 and 14044).

In addition to these superordinate aspects, the changed energy savings regulation has entered into effect in 2016. Its purpose is, among other things, saving energy used for building technology, and pursuing the national energy-political goals. Requirements to energy standards for new and existing buildings are tightened.

This coincides with classification of buildings by efficiency class and issuing of energy passports. Standards specifically determine requirements to building automation within the building. This includes aspects such as building efficiency for the evaluation of economic efficiency of investments (EN 15232) and requirements to air quality (directive VDI 6022).

Among other things, more and more regulations and standards must be observed to lower the primary energy consumption and reduce the emission of CO_2.

EnEV - is a regulation in Germany describing minimum requirements regarding energy use of new and renovated buildings

Energy performance certificate

SOLUTION APPROACHES FOR IMPROVING AIR QUALITY

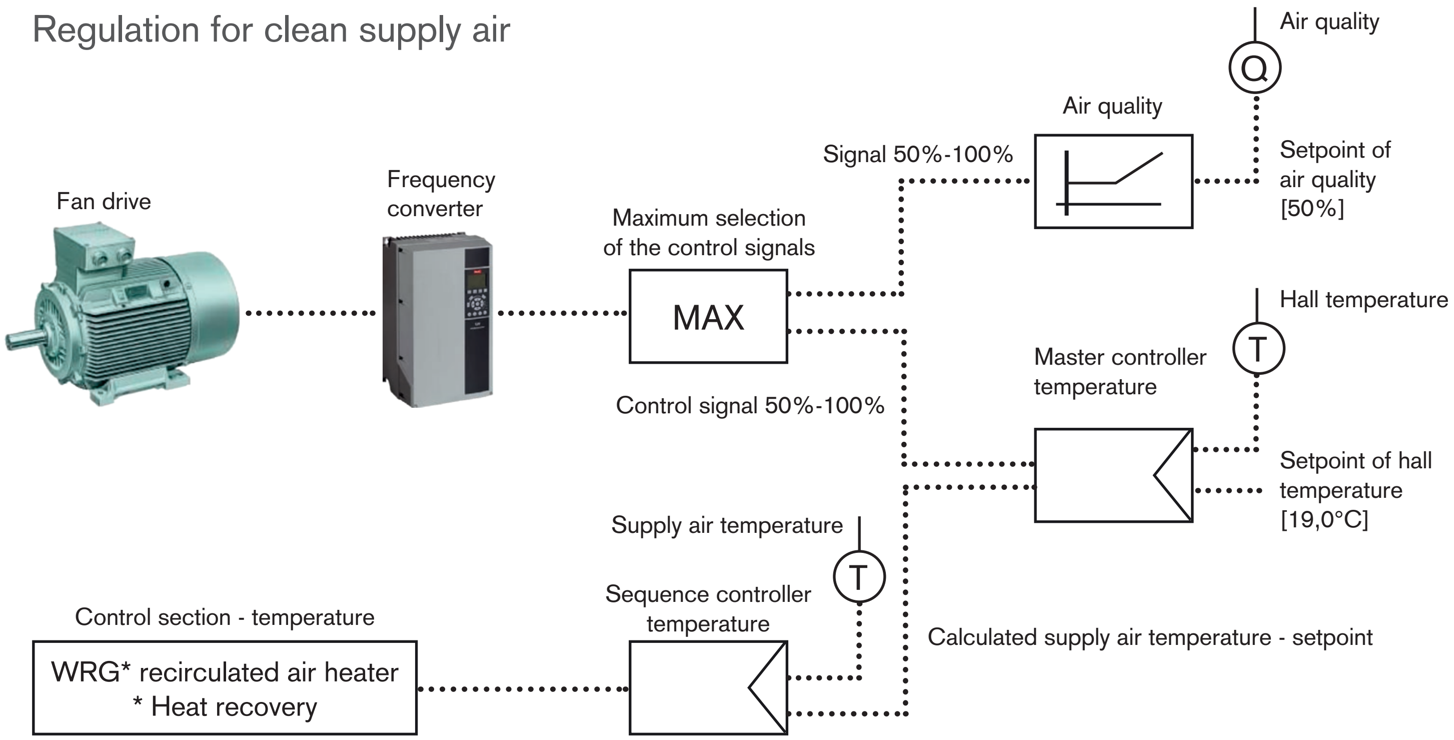
Reduction of CO_2 emissions

Variable-speed fans are one of the important pioneering solutions for energy optimisation and energy savings in ventilation systems and to improve air quality today:
Air quality recording is currently ensured by CO_2 and VOC mixed gas sensors (VOC – volatile organic compounds). VOC sensors do not record the concentration of an individual gas but assess the air quality based on the mixed gas (0 – 100%). Detectable gases include mixed gases, vapours of alkanols, cigarette smoke, breathing air, etc.

The following example for air conditioning of a production hall considered an air quality between 0 – 50% to be good. The target value was specified as 50%. If the value climbs above 50%, the control signal for the fan speed is ramped up accordingly.

The temperature control also affects the fan speed. A maximum selection switches to the respective higher signal of the two control circuits onto the frequency inverter.

Regulation for clean supply air



CALCULATION EXAMPLE

Specific speed control lowers the energy demand

Based on the responsible system constructor's own calculations, this production facility lowered its energy consumption by 50% by achieving a speed reduction of the fans by 20%.

Example		
Supply air fan 15 kW, exhaust fan 15 kW, together	30	kW
Weekly runtime (2 shifts)	80	h
Weeks per year	48	
Total runtime	3.840	h
Energy consumption	115.200	kWh
Reduction to 50%	57.600	kWh
CO_2 emission coal power plant	700	g per kWh
Reduction of CO_2 emission	**40.320**	**kg**
Price per kWh	0,10	€
Price per year	11.152,00	€
Reduction to 50%	**5.760,00**	**€**

Air quality control example calculation for reduction of CO_2 · Source: Online

USE OF CONTROLLED VENTILATION SYSTEMS

Evaluation of the volume flow measurement with **FISCHER**

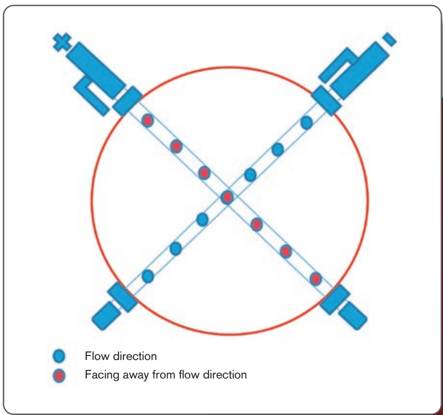
Modern fans are equipped with calibrated ring measuring lines through which the applied differential pressure is assigned to a volume flow of the fan. This differential pressure procedure compares the static pressure upstream of the inlet nozzle to the static pressure in the inlet nozzle at the point of greatest constriction.

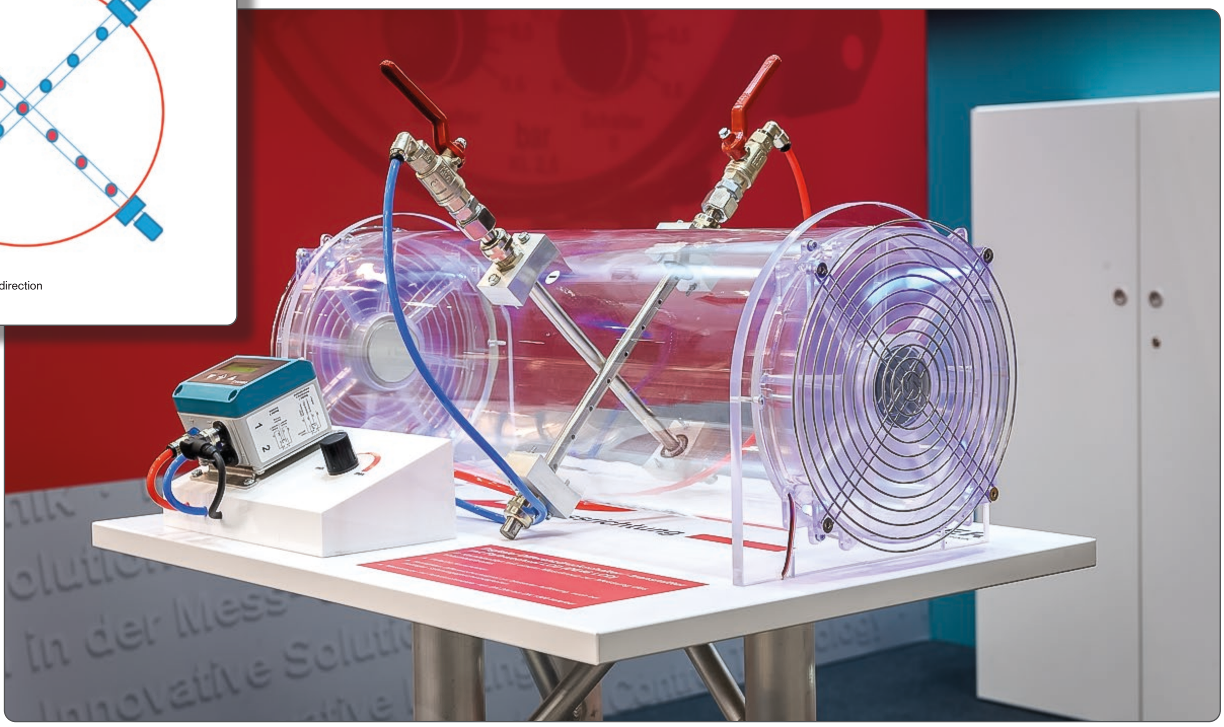
The principle of conservation of energy makes it possible to assign the differential pressure P_W (differential pressure of the static pressures) to the volume flow Q_V as follows:

$$Q_V = k \times \sqrt{\Delta P_W}$$

k considers the specific nozzle properties in this. The k-value usually reflects a specific fan size. These characteristic curves are individually documented for the different fan series.

By storing the characteristic curves (pressure-volume flow chart), the differential pressure encoder, other sensors and the controller that controls the frequency inverter of the fan then form a closed control chain.





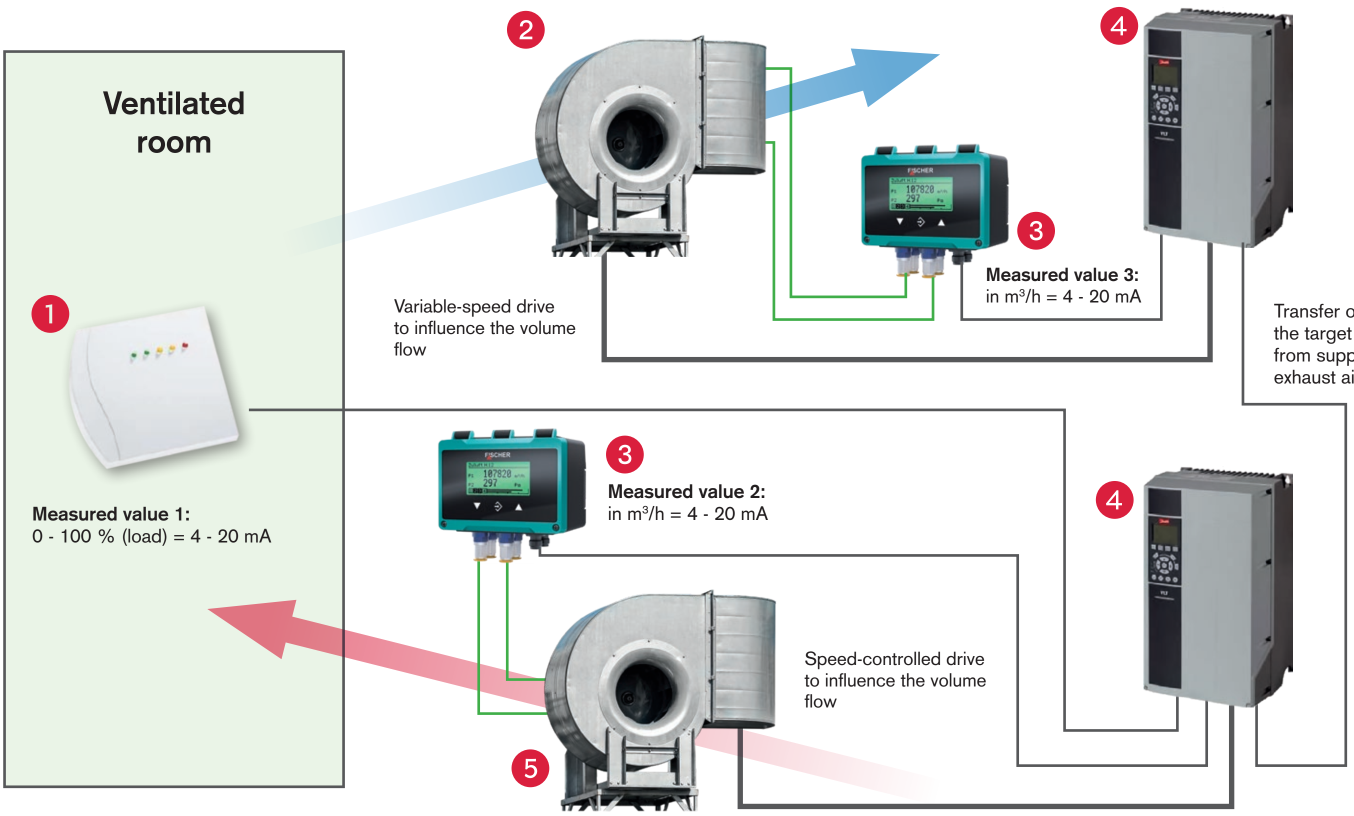
USE OF CONTROLLED VENTILATION SYSTEMS

Re-equipment of existing systems with measuring grids/crosses

If there are no calibrated nozzles, existing systems can be re-equipped by installing measuring grids/crosses as well. These components are placed in sequence in ventilation ducts and the differential pressure is recorded by measuring the flow directions towards and away from the volume flow. Common distances in measuring grids are, e.g., at 200 mm for offset placement of the pipes.

Schematic setup of the measurement

The measuring principle described is very well suited for new construction or re-equipment of existing systems, using radial fans.



1. Air quality measurement
2. Radial fan exhaust
3. Volume flow measurement FISCHER DE90
4. Frequency converter with integrated controller
5. Radial fan supply air

Source: Online

FISCHER KNOW-HOW SINCE 1950

Precise measuring technology to match your requirement

Ventilation systems without measuring technology are built to run continually at a consistent power. They are often oversized to secure the fresh air supply. Thus they supply more fresh air than is effectively needed.

In the past, the degree of contamination of the filters could not always be determined. This brings considerable disadvantages, such as higher costs, lower air quality and undesired interruptions of operation for filter change.

FISCHER developed the DE90 to counter this issue. FISCHER DE90 ist part of the FISCHER PRO-LINE®.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FISCHER DE90

- Large LC display with colour change display
- Simple operation and parameter setting
- Variable connection concept
- Flexible and quick installation option

THE REVOLUTION IN VENTILATION CONTROL

Dynamic filter monitoring with FISCHER DE90

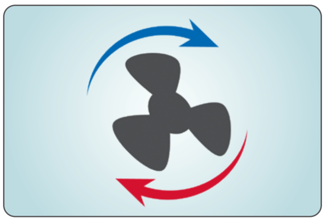
Static operation – periodic filter change

The fan speed is kept constant and the filters are cyclically replaced since the degree of filter contamination cannot be determined. In the course of operation, the filters clog increasingly, and the air volume flow reduces. The costs per m³ air increase since the filter resistance to be overcome grows and the transported air volume drops.

Dynamic ventilation control – cyclic filter change

These ventilation systems are controlled dynamically/demand-dependently and the filters are replaced cyclically no matter their degree of contamination. The general energy consumption is lower since the system is operated in partial-load operation. This increases the costs per m³ air since the filters are not replaced at the optimal time as the degree of contamination is not determined.

METHODS OF DYNAMIC FILTER MONITORING BY COMPARISON

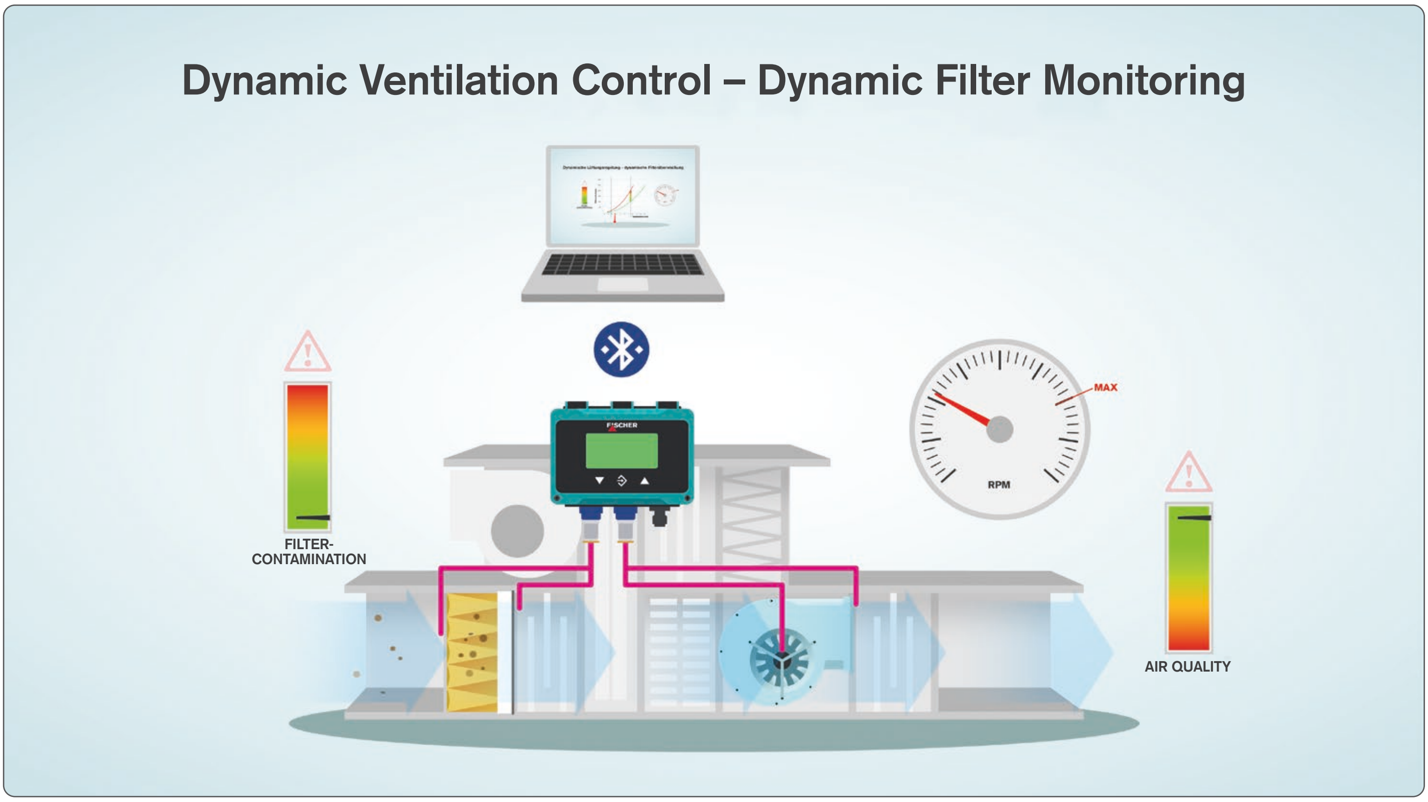


Dynamic ventilation control – **static** filter monitoring

Filter contamination is monitored, and the filters are replaced depending on the degree of contamination. The filter contamination can, however, only be recognised securely if the fan speed is at its maximum. For this, it is necessary to ramp up to that point periodically, which in turn may clearly increase energy costs.

Dynamic ventilation control – **dynamic** filter monitoring

The integrated dynamic filter monitoring of the FISCHER DE90 makes it possible to securely determine the degree of contamination of the filter at any operating point now. The device calculates the degree of contamination of the filter "live" at the respective operating point.



FISCHER DE90 IN USE

Energy-efficient filter change by smart technology

Dynamic filter monitoring at dynamic ventilation control with the FISCHER DE90 allows the replacement of filters with planning safety, minimises energy and filter change costs, and reduces the environmental strain from (partially) contaminated filters to be disposed of.

Undesired interruptions of operations due to clogged filters can also be mostly avoided with the FISCHER DE90.

The variable connection concept allows expansion of the FISCHER PRO-LINE® with additional sensors for temperature, relative humidity, and air quality.

Energy Efficient

Environmentally Friendly

Reliable for Planning

ECONOMIC EFFICIENCY CALCULATION

Dynamic filter monitoring

The following table reflects example savings from optimisation with dynamic filter monitoring using the FISCHER DE90.

The example shows that investments can pay off after a very short period, in our example just a little over 2 years. FISCHER thereby actively contributes to environmental protection.

Cost comparison			
Operating time per year	z	1.840	h/year
Volume flow	V	30.000	m^3/h
Efficiency factor	η_{tot}	0,50	
Static pressure difference	Δp_{tot}	50	Pa
Electricity costs		0,10	€/kWh
Calculation Energy cost savings	$W=(\Delta p_{tot} * V * z)/ \eta_{tot}$	**1.533,30** **153,00**	kWh/year €/year
Filter change costs, exemplary		300,00	€/pcs.
Number of filter changes saved		1	/year
Filter change cost savings		**300,00**	€/year
Equipment costs FISCHER DE90 (2-channel, 600 Pa, hose screw fitting)	one-time	355,00	€
Installation and planning costs, exemplary	one-time	710,00	€
Total costs	one-time	**1.065,00**	€
Amortisation time		**2,3**	years

Price list, as of Rev. 1.02 / 12 February 2020 · Kindly note: Please use SI units for calculation developing solutions

FISCHER MESS- UND REGELTECHNIK

FISCHER Mess- und Regeltechnik GmbH supplies an optimally customised model series for these applications.

The measuring instruments are distinguished by:

- Families of measuring instruments for various measuring tasks
- Comfortable menu navigation
- Tables for asymmetric tank containers or flow measurements may be saved
- Some instruments with extended proofs (EAC, SIL, PLd, DNV GL, EX, structural testing, etc.)
- Industry-compliant equipment for housings and process connections
- Special instruments with colour-change displays for visualisation of operating conditions (e.g. warnings, alarms)
- Extended range with touch-sensitive user interface
- Customer-specific system solutions

Numerous references from the areas of system planning, system engineering and construction and from operators prove the quality of our products.

FISCHER Mess- und Regeltechnik GmbH offers individual concept solutions for your application.

We are an owner-operated family business with efficient decision-making processes.

We offer our customers tailored systems and product solutions, as well as OEM products.

Our devices and solutions are optimally suited for a variety of applications, such as:

- Pressure measurement
- Differential pressure measurement
- Flow measurement
- Temperature measurement
- Level measurement
- Humidity measurement
- Control systems

Our sales engineers are available for a detailed consultation regarding our products and solutions.
Contact details can be found on our website:
www.fischermesstechnik.de

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