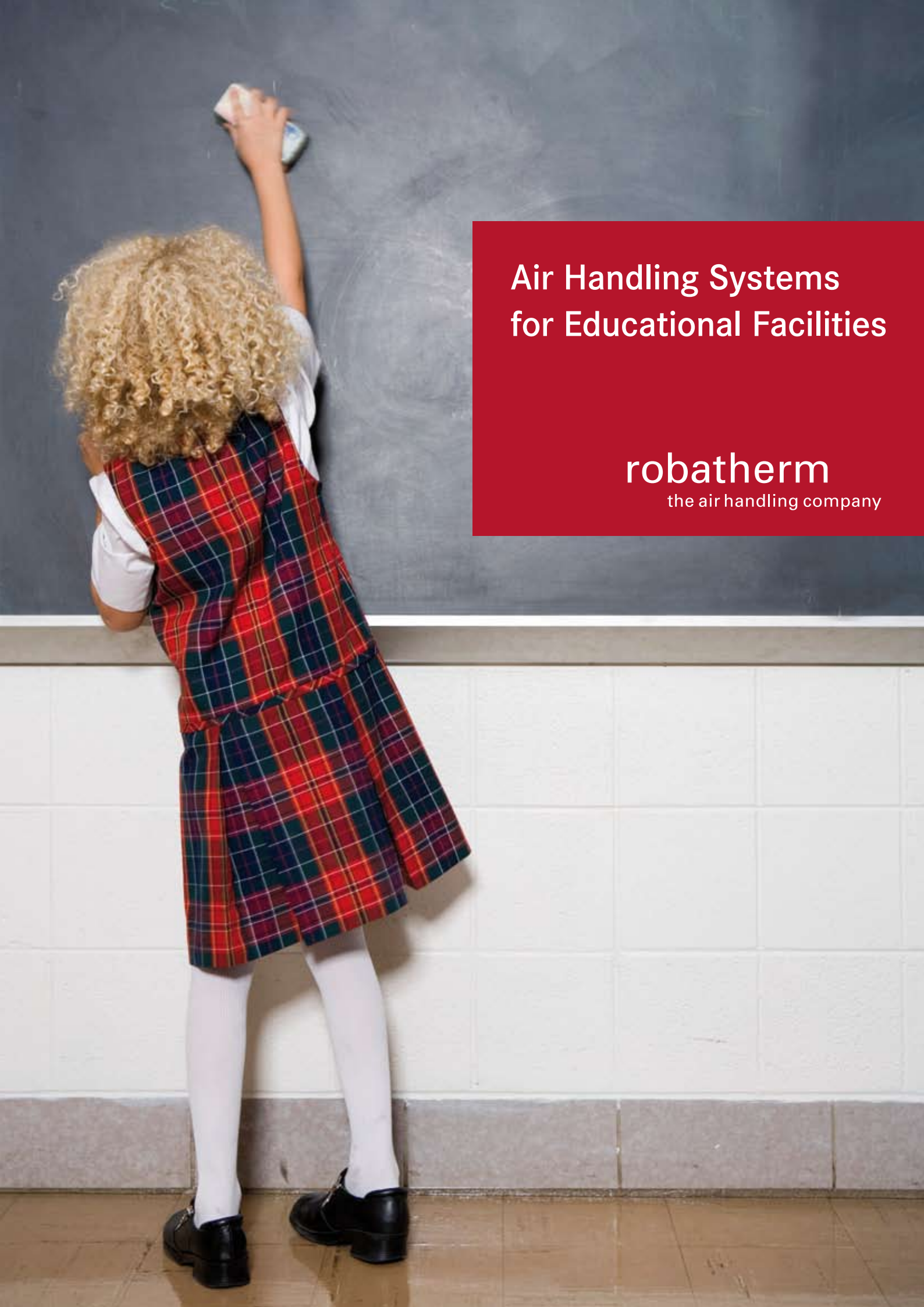


Air Handling Systems for Educational Facilities

robatherm
the air handling company

Increase Educational Quality and Comfort.

Air quality has a decisive impact on the attentiveness and learning ability of pupils and students.

Education is our most valuable commodity. Our children's development and education are the capital of the future. Optimal educational opportunities are not only a question of curricula. Successful learning is impossible in air with excessive carbon dioxide concentration (CO_2).

Many educational facilities such as kindergartens, schools or universities are in great need of renovation. Building fabric and the general conditions students and teachers are exposed to, have long been out of date. Moreover, the high energy demand of non-renovated buildings cost municipalities more and more money.

Renovating or even reconstructing is the answer. In accordance with legal requirements, this will result in a particularly airtight building envelope. Air quality will be even poorer than in the old building if renovation and reconstruction measures cut down on air handling investments.

Without controlled outdoor air supply, chemical and biological substances turn into hygiene problems. Simple window ventilation, inviting noise and fine dust into classrooms, often adds to the adverse effects – especially in congested areas. As a consequence of insufficient ventilation, mood disorders of both, students and teachers are increasing.

Air handling systems are indispensable for minimizing the negative effects of contaminants, humidity, and CO_2. Combined with efficient heat recovery, these systems afford hygienically impeccable indoor air and high comfort at low energy cost. Improving comfort conditions and energy efficiency at the same time is not only possible, but is even supported financially by the government. A financial aid of up to 25 percent of the capital cost currently makes it particularly attractive to retrofit or replace air handling systems in educational facilities in Germany (as of 2010).

Sustainable
indoor air quality.

Airtight buildings
call for an effective ventilation concept.

Learning success
thanks to controlled outdoor air supply.

Benefit
from aid programs.

Air Handling Systems Improve Learning Climate.

Among other things, the readiness to learn is the result of air quality and a comfortable room climate. Air handling systems must satisfy both requirements.

Comfort increases learning success.

Clean outdoor air improves well-being.

Main-emissions are CO_2, H_2O, VOCs, and heat.

Natural ventilation entails high heat losses.

Demand-based control through dedicated room sensors.

Learning, teaching, and living: those are the activities in modern educational facilities. Indoor air quality always plays an important part in these complex living spaces. As a general rule, people stay indoors during about 90 percent of wintertime. Children, adolescents and students unfortunately spend most of this time in often overcrowded rooms with poor-quality air, high CO_2 concentration leading to fatigue, headaches, and a lack of performance. Teachers, too, complain. Exciting and instructive lessons are thus hardly possible.

Controlled air change

Controlled supply of outdoor air with high oxygen content and the removal of vitiated air are the main tasks of ventilation. The direct impact of increased outdoor air rates on students' performance was investigated and confirmed in various studies some time ago already.

Internal loads

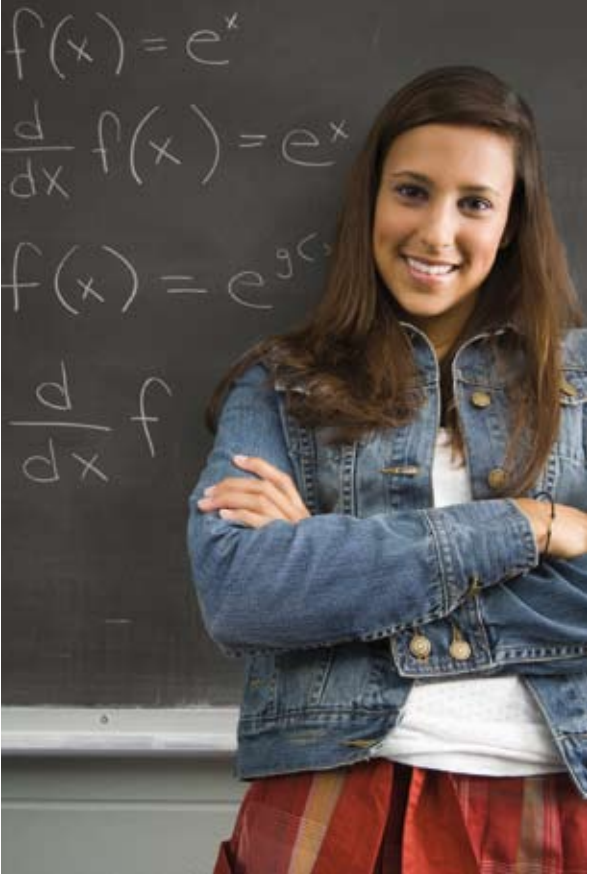
Aside from the thermal loads, material loads are a particular problem due to the high occupancy during classes. Principal loads include carbon dioxide and humidity. Likewise odors emitted by occupants (bioeffluents) or volatile organic compounds (VOCs) emanating from furnishings increase CO_2 concentrations and are thus more intensively perceived. Only controlled replacement of contaminated air ensures proper indoor quality and comfort.

Heat recovery

Whereas heat losses are high with natural (window) ventilation, air handling units equipped with efficient heat recovery (HR) allow ecological operation in an economical way. Thanks to a demand-controlled airflow rate, the operating costs of the entire facility remain manageable. The heating system, too, can be smaller as less reheating energy is required as opposed to simple window ventilation.

Sound attenuation

Minor sound emissions are a basic requirement for educational facilities. Therefore, future impacts of AHUs towards occupants and environment has to be carefully considered from the early design-stage. Emissions to the outside environment and its reflections have to be taken into account as much as the sound emittance to the classrooms.



Demand-based control

Enormous short-term peak loads are typical in classrooms and comparable rooms, hence demand-controlled load management is particularly effective here. Mixed-gas sensors or CO_2 sensors in the room or extract air duct are the ideal setpoint devices for this purpose. Overshooting is prevented by supplying the maximum outdoor air rate already before reaching the upper threshold limit value (approx. 1,000 ppm CO_2). The lower switch point is specified as a compromise between indoor air quality (mind. IDA value) and operating costs. Time-controlled preconditioning is regularly a convenient solution for utilized rooms.

Important standards and guidelines pertaining to educational buildings

Requirements regarding buildings	Requirements regarding air handling systems	Requirements regarding AHUs
Energy Savings Act (EnEG) Saving of energy in buildings	**DIN EN 13779** Ventilation for non-residential buildings	**DIN EN 13053** Rating and performance for units, components and sections
Renewable Energies Heat Act (EEWärmeG) Promotion of renewable energies in the heat sector	**DIN EN 15251** Indoor environmental input parameters	**DIN EN 1886** Air handling units – Mechanical performance and measurement methods
Energy Savings Ordinance (EnEV) Energy-saving thermal insulation and energy-saving installations in buildings	**DIN 18032-1 and DIN 18032-3** Halls and rooms for sports and multi-purpose use	**VDI 3803** Air-conditioning systems – Structural and technical principles
DIN V 18599 Energetic evaluation of buildings	**LüAR** Guideline for fire protection in ventilation systems	**VDI 6022** Hygienic requirements for ventilation and air-conditioning systems
SchulbauV School building ordinance including additional administrative provisions of the Länder	**TA-Lärm** Technical Instructions on Noise Abatement	**AHU Guideline 01** [13] German association of AHU manufacturers – General requirements regarding AHUs
Guidebook on Indoor Air Hygiene in School Buildings [11] Guide issued by the German Federal Environment Agency (UBA)	**AHU Construction 2004 (AMEV)** Guidance on the planning and construction of air handling systems for public buildings	**FGK Status Report 13** Code of practice for the maintenance and cleaning of air handling systems
	Information on climate protection technologies in electricity use [12] Guideline for the promotion of climate protection projects	

[11] http://www.umweltbundesamt.de/uba-infomedien/search-public.php

[12] http://www.fz-juelich.de/ptj/klimaschutztechnologien

[13] http://www.rlt-geraete.de

Design Approaches Are Pillars of Efficiency.

Harmless indoor air and its efficient preparation and supply is determined by decisions made in the early design stage.

Savings by user acceptance.

Potential saving of investments to be evaluated.

Preconditioning creates comfort in summer.

The energy demand of a building is determined by the building itself, its technical equipment and the users' behavior. Only if all factors are considered and co-ordinated, the available energy saving potential can be developed. Users will be ready to accept the building services as long as they have the opportunity to influence it. Thermostates and hygrostates in each room allows adjustments to individual perceptions. Its easy handling facilitates acceptance of the entire air handling system.

The various renovation measures also greatly differ in efficiency. An investigation conducted on 19 schools in the scope of an EU-wide project compared the final-energy savings and the required capital expenditures. The very small amount of 3 percent invested in the ventilation systems of the participating schools catches the eye. The reason: HR systems were retrofitted for the most part, while new systems were installed in some cases only. However, a very remarkable energy saving of about 15 percent per year is achieved, with the room users' comfort increased at the same time.

The improvement of room climate conditions through controlled ventilation of the rooms increases the students' and teachers' performance and well-being. The options of how to supply outdoor air to the rooms are multifarious.

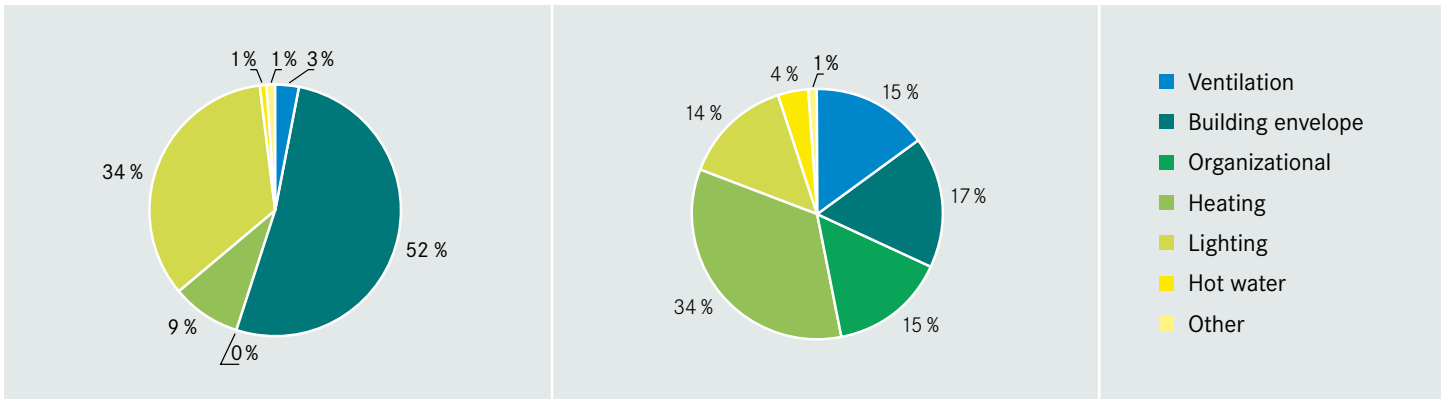
System selection

Whether to opt for a central or decentralized ventilation concept depends on the building structure and the desired comfort conditions. Façade-mounted units (decentralized) are critical in terms of maintenance effort and maintenance frequency. In most cases, hygiene problems and dissatisfied users will ensue during practical operation later on. Central air handling systems have an advantage here, as well as in part load operation despite the necessary duct work, including fire dampers.

Air supply

In demand-based ventilation-systems, air grills and diffusers are of prime importance since these devices have to work properly with very different air-volumes. To ensure a draft-free room ventilation at all times, special attention is to be paid to the characteristic of air-grills and diffusers.

Comparison capital expenditures vs. final-energy savings, at the example of renovations of Berlin schools



Source: www.check-it-out.eu

Percentage of estimated capital expenditures
Total: 4.19 million euros

Percentage of estimated final-energy savings
Total: 4,300 MWh/a

Preconditioning

Conditioning of the classrooms before classes begin fills the rooms with fresh outdoor air and brings room walls to a moderate temperature. This method effectively delays exceeding room temperatures and overshooting conditions are perceived later. Odors released from furnishings and cleaning agents are removed before the rooms are used.

Plant management

Operating costs are considerably reduced by implementing a plant or energy management system. For instance, the status of the system can be checked by means of telediagnosis, and maintenance messages can be evaluated. Periodic and early filter change allow considerable reductions of the system's energy demand. The additional adaption of the control parameters to the prevailing conditions effect more savings.

Indoor air humidity

In educational buildings, humidity loads by humans are substantial. Window ventilation alone cannot manage the humidity. On the other hand, mechanical ventilation systems often remove excessive amounts of humidity in winter. This can be avoided by implementing a heat recovery system with humidity transfer. In winter, part of the humidity released is then transferred to the dry outdoor air.

Dedicated room sensors

Demand-based control is the most efficient type of control in educational buildings. Supply losses are minimized and varying room influences are taken into account. Users can influence the control via room sensors with setpoint device. Combined with CO_2 or mixed-gas sensors, this makes the room control efficiently in terms of operating costs. With a slightly reduced efficiency, pressure detectors can be used as a low cost alternative.

Planning. Cornerstone of Success.

Solution orientated purposeful job realization.

Regulatory framework to be defined at preplanning stage.

Experience and recognized codes of practice facilitate the design.

Planning guidance [1]

General	Air handling system
• Demand-based control reduces operating costs. • Preconditioning of room enclosure surfaces allows postponing the occurrence of maximum room temperatures to times outside the period of use. • Observe the vertical temperature gradient (max. 3 K from head to toe). • Max. volume flow to be supplied before CO_2 threshold is reached (1,000 ppm) (corresponds to 20 % dissatisfied users). • Early shading of west and east façades reduces simultaneity of internal and external loads. • Maintenance management for reducing energy costs (filter pressure losses) to be planned and agreed with the user. • Analysis of utilization requirements together with the builder-owner and/or user (comfort conditions, design data, occupancy, further internal loads, times of use, etc.). • Recording of requirements and assumptions on which planning is based (obligation to document). • Reconciliation of user requirement and specified process- or workplace-related requirements (mind spec. heat and humidity loads!) Possibly clarification with customer. • Compilation of a list of current standards. • Planning and manufacturing of the system in accordance with current standards. • Updating of the standards list upon finalization of the planning stage.	• Assess intake conditions with regard to – main wind direction – snow height – foliage – noise – other emission sources, and – position of the exhaust air outlet. • Provide ports for drainage and cleaning in outdoor air duct. • For roof intakes: distance from intake to roof surface at least 1.5 times the snow height. • With volume flow rates > 25 $m^3/(h \cdot pers.)$, there is a risk of the relative humidity level lying permanently below 30 % r.h.; Provide HR systems with humidity transfer. • In case of reduced volume flow rates, function-check the supply air terminals. • Provide dedicated room sensors with setpoint device. • Consider operation and maintenance of the individual components as early as the planning stage. • Conduct a structural analysis and check the mounting apertures at an early stage. • Extract local emissions at source (copiers, printers, etc.). • Use high-quality pocket filters with high retention capacity (class F7 or better). • Comply with hygiene standard as per VDI 6022. • Criteria for financial aid fulfilled as per “Information on climate protection technologies in electricity use”?

Design parameters [1]

Outdoor

Temperature

Winter:	-16 °C to -12 °C
Summer:	28 °C to 35 °C

Humidity

Summer:	37 % to 64 % r.h. (12 g/kg to 14 g/kg)

Temperature and humidity depending on climatic conditions.

Sound pressure level (TA-Lärm)
Daytime (6–22 h):

Solely residential zones:	50 dB (A)
General residential zones:	55 dB (A)
Mixed-use zones:	60 dB (A)

Night-time (22–6 h):

Solely residential zones:	35 dB (A)
General residential zones:	40 dB (A)
Mixed-use zones:	45 dB (A)

CO_2 background concentration

Rural areas:	approx. 350 ppm
Urban areas:	approx. 375 ppm
Densely populated areas:	approx. 400 ppm

Minimum outdoor air rate [2, 3]

Considering the outdoor air concentration and the students' age:

1 to 3 years	15.4 $m^3/(h \cdot pers.)$
4 to 6 years	15.4 $m^3/(h \cdot pers.)$
7 to 9 years	22.7 $m^3/(h \cdot pers.)$
10 to 14 years	31.7 $m^3/(h \cdot pers.)$
above 14 years	34.4 $m^3/(h \cdot pers.)$

or, according to room categories as per DIN EN 15251:

II (max. 500 ppm above ODA):	30 $m^3/(h \cdot pers.)$
III (max. 800 ppm above ODA):	18 $m^3/(h \cdot pers.)$

Indoor

Indoor-air temperature [3, 4]
Winter:

Kindergarten:	17,5 °C to 22,5 °C
Classroom:	20 °C to 24 °C
Auditorium:	20 °C to 24 °C
Cafeteria:	20 °C to 24 °C

Summer:

Kindergarten:	21,5 °C to 25,5 °C
Classroom:	23 °C to 26 °C
Auditorium:	23 °C to 26 °C
Cafeteria:	23 °C to 26 °C

Indoor-air humidity

Classrooms:	no requirements recommended, however:
Winter:	≥ 25 % r.h. [3]
Summer:	≤ 60 % r.h. [3] or max. 12 g/kg [3]

Sound pressure level [3]

(line 1: Standard design value; line 2: Typical range)

Day-care centers:	40 dB(A) 30 to 45 dB(A)
Classrooms:	35 dB(A) 30 to 40 dB(A)
Hallways:	40 dB(A) 35 to 50 dB(A)
Gyms:	40 dB(A) 35 to 45 dB(A)
Staff rooms:	35 dB(A) 30 to 40 dB(A)
Auditoriums:	33 dB(A) 30 to 35 dB(A)
Restrooms:	45 dB(A) 40 to 50 dB(A)

| [1] For further information, also on the design of buildings and the use of air handling systems, see DIN EN 13779.
| [2] Calculated taking into account CO_2 outdoor air concentration (e.g. 370 ppm), max. permissible indoor air concentration (e.g. 1,000 ppm), and age-related CO_2 emissions by students with age-appropriate activity level (activity level II: 1-3 years; activity level I: all other age groups). For deviating parameters, other minimum outdoor air volume flow rates ensue.
| [3] As per DIN EN 15251, room category II (corresponds to an expected 20 % dissatisfied users).
| [4] Values correspond to the operative temperatures. Temperatures near the lower limit increase comfort and learning success.

Solutions Made by robatherm. Flexible and Efficient.

Air handling units specifically customized on the basis of optimized AHU concepts.

Customized and optimized for your needs.

Flexible thanks to variable AHU concepts.

Certified energy efficiency according to EUROVENT and German AHU manufacturers' association.

High hygiene standard and high product quality.

Flexibility has always been one of the hallmarks of robatherm's air handling units. Thanks to modular design and maximum freedom of configuration, the specific needs of any educational facility can be met ideally.

Adaptive AHU concepts
Adaptive, preconfigured AHU concepts are also optimized in terms of operating costs. A maximum of reliability is achieved in these defined concepts. In project planning, quick and reliable access to the complete AHU data is ensured. Highest versatility is achieved by means of adaptations to limited mounting dimensions or to particular installation conditions.

Excellent hygiene
The Berlin Institute for Air Hygiene (ILH) has tested and certified the hygiene characteristics. All components of robatherm AHUs are accessible; the surfaces are most easily cleaned – for constant hygiene and sustainably reduced energy demand.

Thermal breaks
Outstanding thermal bridge factors (TB classes) are reached even with the standard design. This means that the casing's tendency of condensation is minimal. An important criterion for service life and hygiene – condensate is only very rarely found on the surface and occurs only in extreme conditions.

Low heat losses
The robatherm casing design ensures excellent thermal insulation and high airtightness. The energy input remains usable to the maximum extent.

Highest efficiency classes
Clever dimensioning and the use of optimized built-in parts are the key to reach the highest efficiency classes. AHUs by robatherm are certified in accordance with the energy efficiency classes of the German AHU manufacturers' association, and the guideline of the European certification body EUROVENT.

University of Augsburg

Proven mechanical stability
The rugged and proven construction of the casing relies on galvanized sheet metal as standard corrosion protection. Using additional powder coating or stainless steel, it becomes the all-purpose solution.

Ease of assembly
Owing to the modular design, a minimum of components need to be assembled, which saves on-site assembly time. Sturdy casing connections facilitate assembly even further.

Intelligent control
Upon request, robatherm AHUs are delivered with integrated control. Readily wired for hook-up, they are ideal for the renovation of schools.

The physical characteristics
of the AHU casing as specified in DIN EN 1886:

- Thermal transmittance: Class T2
- Thermal bridges: Class TB1/TB2
- Casing leakage: Class L1 (M), L2 (R)
- Filter bypass leakage: Class F9
- Casing deflection: Class D1/D2

Higher Efficiency Thanks to Plant Management.

Plant visualization and interconnecting all AHUs allows savings potentials to be identified and tapped.

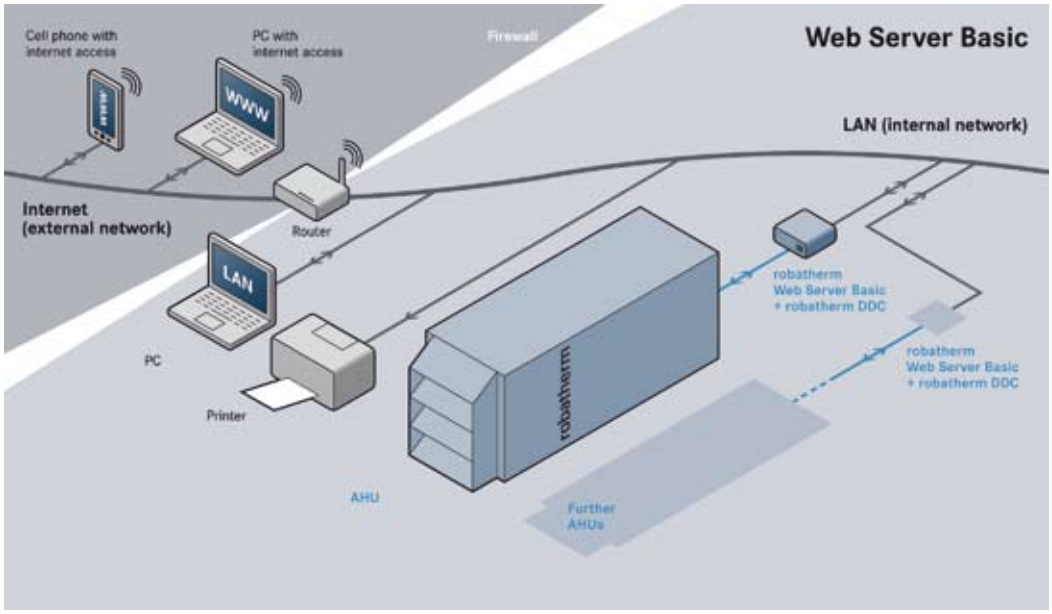
Saving opportunities
by comparison of actual value/ desired value.

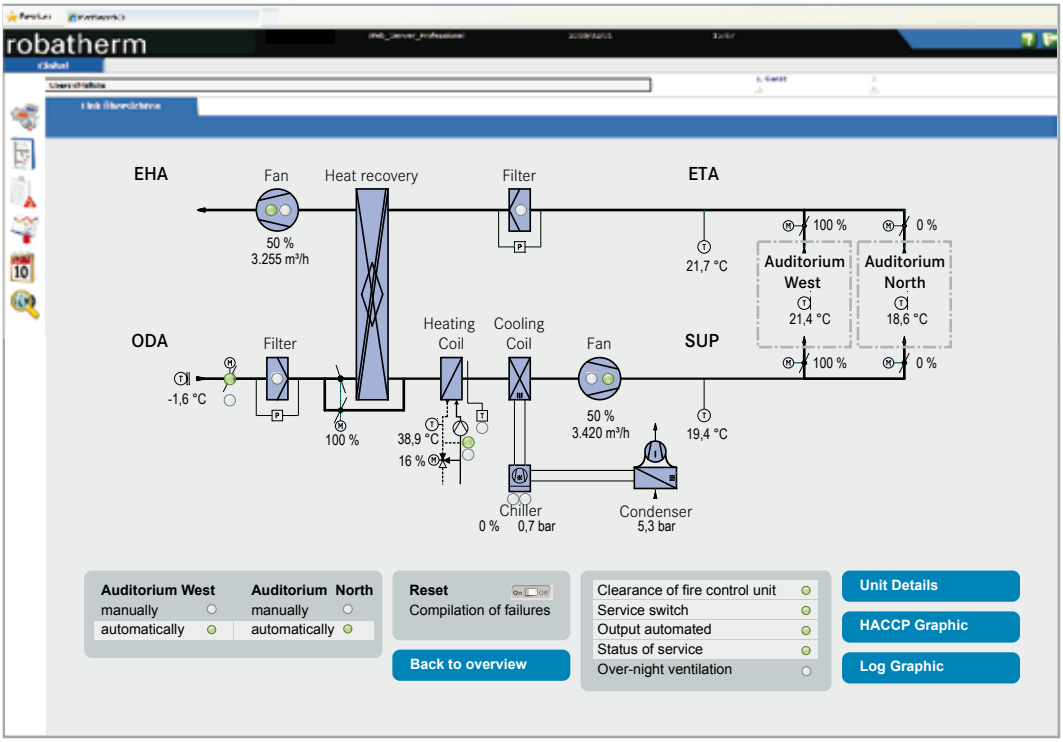
Plant management
via internet and intranet.

Failure reports
by text message or e-mail.

Analyzing operating states, interconnecting several air handling systems, and their simple on-line operation – these are the first steps toward plant management. These steps open up all the options for sustainable efficient operation of the air handling systems. Anomalies, such as the mutual interference of control circuits, can thus be detected. Data logging is an excellent tool for revealing savings potentials even for extended periods of time. Plant parameters can be monitored, evaluated and adjusted from practically anywhere.

Smart Control Web Server
robatherm has developed the Smart Control Web Server for more efficient plant management of air handling systems. The “Basic” and “Professional” versions of the web server provide access to all air handling systems of the facility via the modern communication paths of internet and intranet. Communication, diagnosis, operation and telediagnosis of all air handling systems are easily and effectively performed from any network access point. The “Professional” web server offers a particularly comfortable solution: Information from all air handling units is accessed through just one central login.





Abbreviations for types of air (as specified in DIN EN 13779): ODA = outdoor air, SUP = supply air, ETA = extract air, EHA = exhaust air, RCA = recirculation air

Operation

Measured values, control signals, and messages regarding system status, failures and maintenance are clearly displayed in the mimic diagram of the relevant system. Target values including time programs and the holidays calendar are edited in the password-protected area.

Measured-value recording

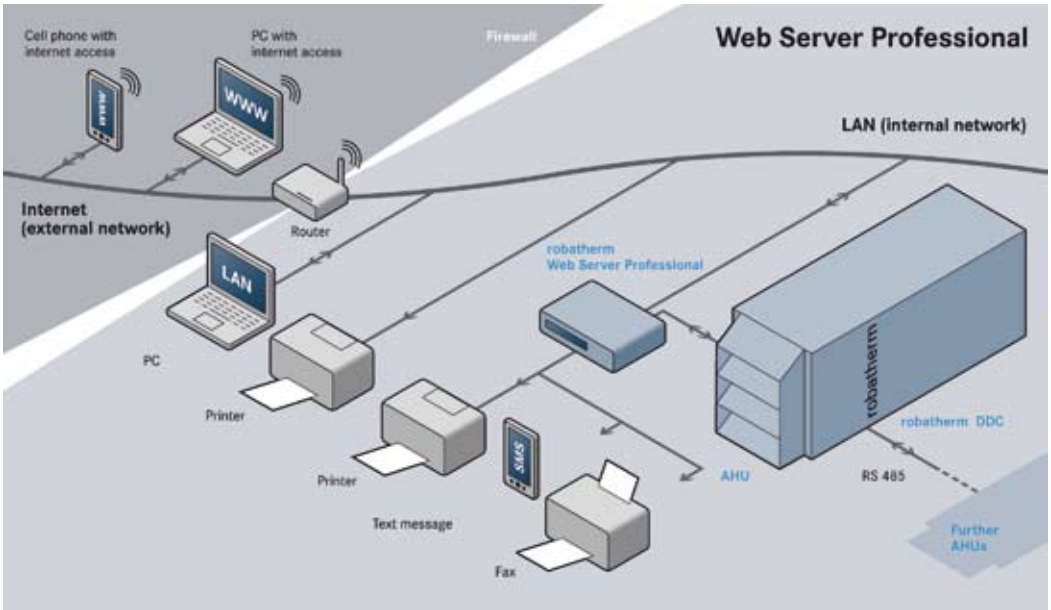
The “Professional” web server allows recording of measured data, control signals, operating states, and maintenance messages. Subsequent analysis can thus be carried out using various output formats.

Fault management

Alert and inspection messages are relayed to the users by e-mail or, in the Professional version, also by text message or fax. Tele-diagnosis, fault correction, or emergency operation are initiated via internet.

Communication

The Basic version relies on open communication protocols for communicating with higher-level building automation systems. The well-known and wide-spread protocols BACnet or Modbus are used to this end.



Long-standing Experience. Proven AHU Concepts.

Benefit from our know-how, also in the educational facility sector.

We offer AHU concepts specifically optimized for educational buildings and in compliance with the current standards and guidelines. The AHU concepts provide you with quick, specific, and competent information concerning the design of a unit and its performance data – optimized in terms of performance, function and value for money. All this is tailored to your individual requirements. You require further details or the documented “TrueBlue”-evidence of efficiency? We look forward to providing competent advice!

Equipment features

- AHU designed for outdoor installation (weatherproof)
- Rotor heat recovery
- Cross-flow plate heat exchanger
- Heat recovery loop
- Plug fan
- High-efficiency electric motor IE 2/IE 3
- Controls integrated into AHU
- Direct refrigeration integrated into AHU
- Reversible heat pump integrated into AHU
- Hydraulic set integrated into AHU
- Steam humidifier integrated into AHU
- Silencer integrated into AHU

Optimization features

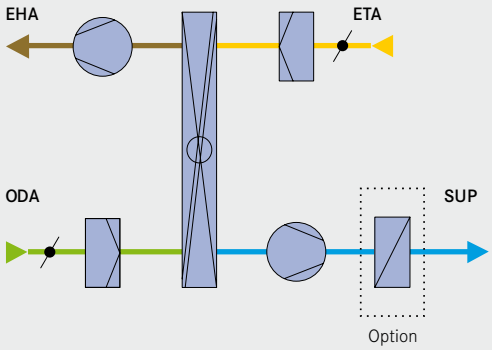
- Low investment cost
- Reduced operating cost
- High energy efficiency
- Compact design
- Easy-to-install
- Easy-to-maintain

Navigator

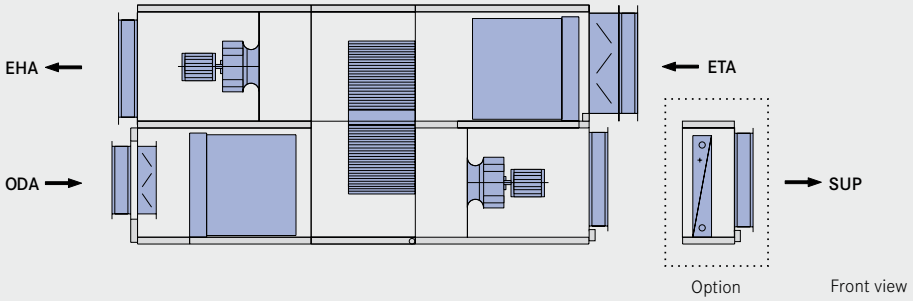
Equipment features

Optimization features

Plant flow diagram



AHU schematic



AHU equipment

Design: Indoor installation

Filters: Supply air: F7 biostatic pocket filter
Extract air: F5

HR: Rotary heat exchanger
incl. rotor controller with impeller monitor

Dampers: ODA: steel galv., tightness class 2
ETA: steel galv., tightness class 2

Adapters: All unit connections with flexible adapters

Heater: optional
$t_E \approx 11$ °C, $t_A = 22$ °C

Accessories: Inclined tube manometer
Frequency converter incl. repair switch

Options:
- antimicrobial powder coating
- desiccant rotor
- heater module
- controls and cooling
- different unit connections
- silencers
- etc.

AHU description

Low capital expenditures and compact dimensions for use in even the most confined spaces. Suited for high-occupancy rooms such as classrooms or auditoriums.

Desiccant rotors (optional) protect from excessively dry indoor air in winter, particularly in case of high specific volume flow rates.

Efficient heat recovery thanks to low pressure losses combined with high heat recovery coefficients allows cost-effective operation.

Small number of components for ease of installation. Upon request, also bolted together at the factory. Access for maintenance afforded by removable filters and large doors.

Direct-drive fans allow trouble-free operation. Motor control unit ready installed, wired, and parameterized.

Sound attenuation in the ducts to be adjusted by customer to the permissible or agreed values (see Design parameters).

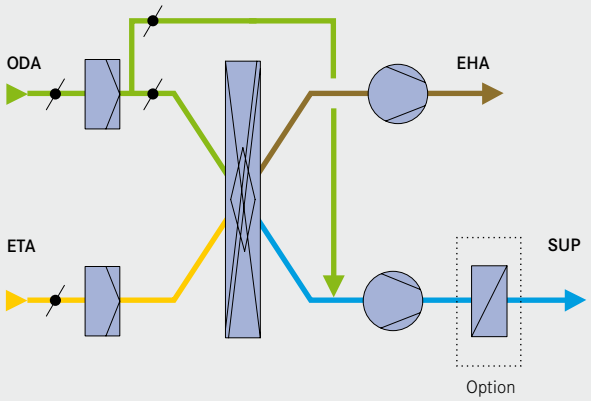
Abbreviations for types of air (as specified in DIN EN 13779): ODA = outdoor air, SUP = supply air, ETA = extract air, EHA = exhaust air, RCA = recirculation air

Navigator

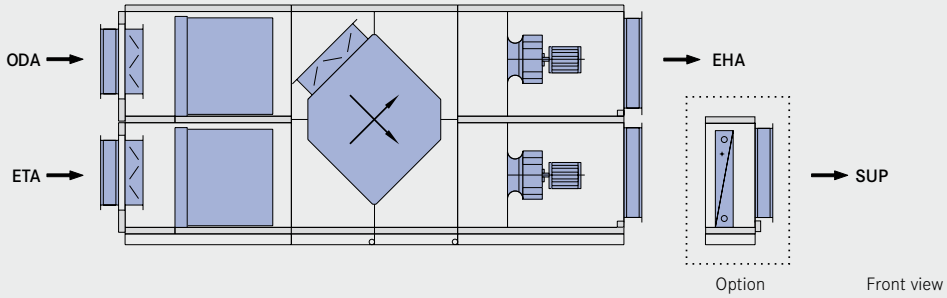
Equipment features

Optimization features

Plant flow diagram



AHU schematic



AHU equipment

Design:	Indoor installation
Filters:	Supply air: F7 biostatic pocket filter Extract air: F5
HR:	Cross flow plate heat exchanger (heat recovery coefficient, dry ≥ 80 %)
Dampers:	ODA: steel galv., tightness class 2 ETA: steel galv., tightness class 2
Adapters:	All unit connections with flexible adapters
Heater:	optional $t_E \approx 12$ °C [1], $t_A = 22$ °C [1] only where ice protection is required
Accessories:	Inclined tube manometer Frequency converter incl. repair switch
Options:	- antimicrobial powder coating - heater module - controls and cooling - different unit connections - silencers - etc.

AHU description

Low operating costs and most easy access for maintenance despite compact design. Suited for odorous areas such as gyms, locker rooms, or cafeterias.

Separation of airflows in the HR system. No transmission of substances (e.g. odor, humidity) from extract air to supply air (recuperative HR).

Heat recovery with high heat recovery coefficient requires only minimal reheating energy while pressure losses are moderate.

Ease of installation thanks to small number of components, also bolted together at the factory. Plate heat exchanger ensures high indoor air quality combined with minimal maintenance effort.

Direct-drive fans allow trouble-free operation. Motor control unit ready installed, wired, and parameterized.

Sound attenuation in the ducts to be adjusted by customer to the permissible or agreed values (see Design parameters).

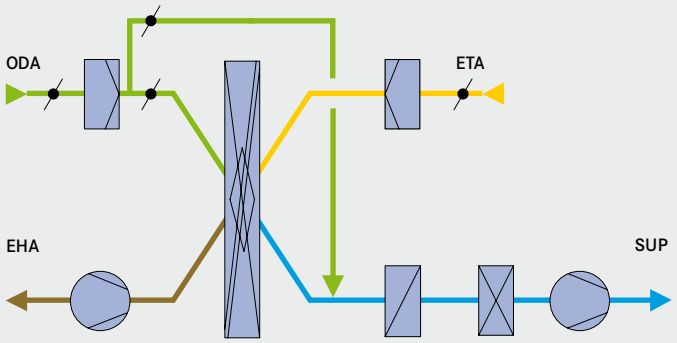
Abbreviations for types of air (as specified in DIN EN 13779): ODA = outdoor air, SUP = supply air, ETA = extract air, EHA = exhaust air, RCA = recirculation air

Navigator

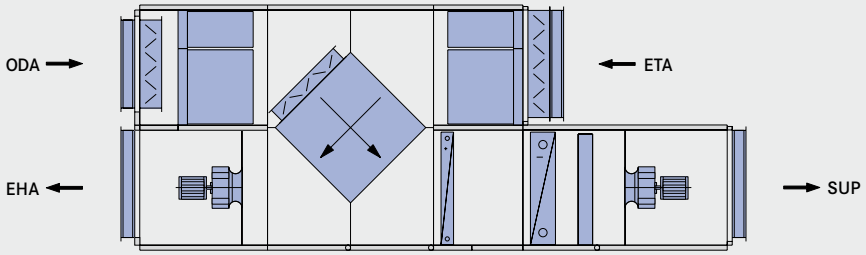
Equipment features

Optimization features

Plant flow diagram



AHU schematic



Front view

AHU equipment

Design:	Indoor installation
Filters:	Supply air: F7 biostatic pocket filter Extract air: F5
HR:	Cross flow plate heat exchanger (heat recovery coefficient, dry ~60%)
Heater:	$t_E \approx 8$ °C, $t_A = 22$ °C Fluid: PHW 70/50 °C
Cooler:	$t_E = 32$ °C, $\varphi_E = 40\%$ r.h. $h_E = 62.8$ kJ/kg $t_A = 18$ °C, $\varphi_A \approx 85\%$ r.h. Fluid: PCW 7/13 °C
Dampers:	ODA: steel galv., tightness class 2 ETA: steel galv., tightness class 2
Options:	- antimicrobial powder coating - controls and cooling - other unit connections - silencers - grease filters and enclosed motor - etc.

AHU description

Low capital expenditures and high energy efficiency at the same time. Suited for high-airflow and/or highly odorous areas such as large auditoriums, gyms, cafeterias, canteens.

Separation of airflows in the HR system. No transmission of substances (e.g. odor, humidity) from extract air to supply air (recuperative HR).

Heat recovery with moderate pressure losses ensures short payback periods and trouble-free operation.

High versatility in throughput ranges, equipment, and installation. Ease of maintenance afforded by large doors. Plate heat exchanger ensures high indoor air quality combined with minimal maintenance effort.

Direct-drive fans allow trouble-free operation. Motor control unit ready installed, wired, and parameterized.

Sound attenuation in the ducts to be adjusted by customer to the permissible or agreed values (see Design parameters).

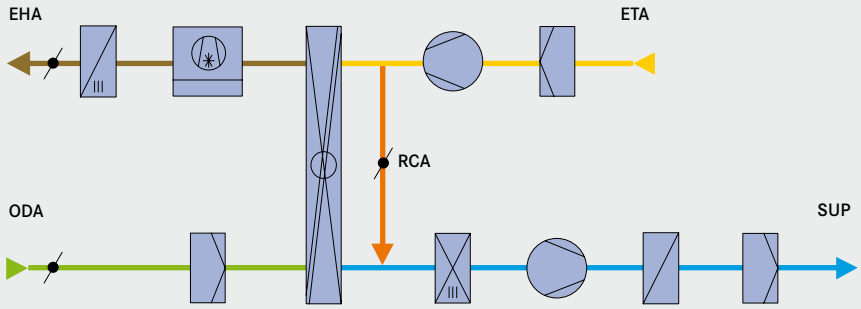
Abbreviations for types of air (as specified in DIN EN 13779): ODA = outdoor air, SUP = supply air, ETA = extract air, EHA = exhaust air, RCA = recirculation air

Navigator

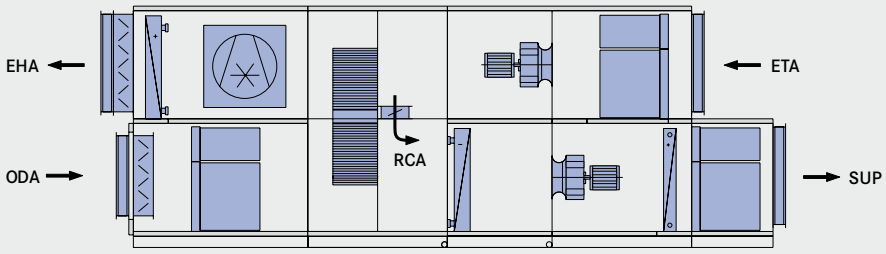
Equipment features

Optimization features

Plant flow diagram



AHU schematic



Front view

AHU equipment

Design:	Indoor installation
Filters:	Supply air: F5 biostatic pocket filter F7 pocket filter Extract air: F5 pocket filter
HR:	Rotary heat exchanger incl. rotor controller with impeller monitor, summer mode taken into account in the cooler design
Heater:	$t_E \approx 9$ °C, $t_A = 22$ °C, Fluid: PHW 70/50 °C
Cooler:	$t_E = 28.5$ °C, $\varphi_A = 50\%$ r.h. $h_E = 59.8$ kJ/kg $t_A = 18$ °C, $\varphi_A \approx 85\%$ r.h.
Dampers:	ODA: steel galv., tightness class 2 EHA: steel galv., tightness class 2
Accessories:	Inclined tube manometer Frequency converter incl. repair switch
Options:	- antimicrobial powder coating - desiccant rotor - integrated controls and cooling

AHU description

Low operating costs even in case of higher airflow rates thanks to moderate component design. Suited for high-occupancy rooms such as classrooms or auditoriums.

Desiccant rotors (optional) protect from excessively dry indoor air in winter, particularly in case of high specific volume flow rates.

Efficient heat recovery thanks to low pressure losses combined with high heat recovery coefficients allows cost-effective operation.

Integrated chilling systems allow easy, centralized maintenance; no external chillers, no distribution losses, no piping effort. Chilling system pre-piped.

High versatility in throughput ranges, equipment, and installation. Ease of maintenance afforded by large doors. Reduced installation effort on site.

For the heat-up mode (winter), the energy demand can be further reduced by means of the integrated air recirculation function.
NOTE: Mind odor transmission!

Abbreviations for types of air (as specified in DIN EN 13779): ODA = outdoor air, SUP = supply air, ETA = extract air, EHA = exhaust air, RCA = recirculation air

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