Air Handling Systems for Stores

robatherm
the air handling company

ECE, Stadtgalerie Passau

Air Handling Systems for Stores:

Good Indoor Climate for Better Sales.

Properly air-conditioned stores are more attractive to the customer.

Customers' dwell times increase; so do sales.

Air handling thus increases turnover of goods.

Consumer researchers agree on this point: The customer's mood has a decisive influence on buying behaviour.

Apart from decoration and the merchandise on offer, numerous other factors strongly influence the customer's feeling of comfort. Principal among these, however, are lighting and the indoor air conditions in the store. They act on a sub-conscious level, triggering the wish to buy again. This turns walk-in customers into regulars, giving a business a further economic edge.

The advertising budget required for regular customers, for instance, will be lower by a factor of 4 to 6 than that allocated to prospects. Moreover, regular customers actively acquire new customers among their friends and acquaintances, from which considerable multiplier effects ensue.

Also, the buying behaviour and interviews with regular customers convey ample information on the public image of a business. Regular customers thus serve as a barometer of opinion on, e. g., the presentation of the merchandise. Furthermore, the price more and more becomes a secondary factor, an emotional bond already having been established based on positive experience.

The competition among stores is enormous. Differences between the numerous DIY stores, health and beauty retailers, discounters, furniture stores, supermarkets and shopping centres lie particularly in "intrinsic values". Comfort conditions offered to the customer gain more and more importance for better sales.

Indoor comfort during the summermonths requires indoor air temperatures between 20 °C and 22 °C. In most cases, this cannot be achieved relying solely on natural ventilation such as window ventilation. Differently used rooms exhibiting different heat loads also require controlled air supply and extraction. Air handling systems are, therefore, essential technical equipment in stores. Only they can ensure perfect indoor air temperatures, creating comfort for customers and staff. This is a further advantage, for the constant indoor climate ensures constantly high staff performance.
Air handling systems in stores will, therefore, quickly pay for themselves.

Air-handling systems are essential to ensure a permanently perfect indoor climate.

Increased customer loyalty through customer satisfaction.

Increased sales through longer dwell times.

Improved staff performance through comfort.

High Demands on Air Handling Systems.

The air handling system must ensure perfect indoor air conditions at all times while still allowing economic operation. Many different factors must be taken into consideration.

Demand-based volume flow control cuts operating costs disproportionately.

Heat recovery is mandatory.

Efficiency improvements amortise within 1 to 3 years.

”Free cooling“ reduces cost of operation.

Internal loads

Lighting makes a particularly significant contribution to internal heat loads in stores. An intelligently designed ventilation system is the first and most important step towards reducing the cost for operation of the building services. Light fixtures combined with extract-air terminals, to give just one example, remove heat where it is generated.

Operating times

The building services in stores are operated over extended periods. More than 5,000 h/a are quite common. A considerable portion of the time of operation being made up by part-load operation, demand-based volume flow control is extremely effective. The cost for operation of an air handling system exceeds its investment cost within a few years. Additional investments for efficiency-improving measures will, in most cases, amortise within less than three years.

Heat recovery

Only with efficient heat recovery air handling units (AHUs) can operate in an economically and ecologically acceptable manner. Therefore, with the coming into force of the Energy Savings Ordinance ”EnEV 2009“ in Germany, heat recovery becomes mandatory for air handling systems exceeding 4,000 m^3/h. Furthermore, economic efficiency shall be checked as per VDI 2071.

Sound attenuation

Acoustically, air handling systems should, of course, be as unobtrusive as possible. Permissible sound pressure levels must, therefore, be reliably observed. Aiming to be close to the customer, stores are often built in mixed-use zones or in commercial zones in the direct vicinity of residential areas.
The relevant regulations regarding ambient noise thus require careful observance. Sound reflected by roof-mounted elements or by neighbouring buildings is not to be neglected in this context.

Chilling

Conventional space cooling uses a centralized water chiller; decentralized chillers (direct chillers) are an alternative.
In case of centralized water chilling, the refrigerant is supplied to the points of use via lossy pipes.
Direct chilling is particularly convenient where the cooling power output is required solely for conditioning the room air.
This solution is often advantageous in department stores such as furniture or electrical and electronics stores.

Cool outdoor air can be used for ”free cooling“ in order to control the temperature of the building during transition periods and at night-time.

Standards and guidelines

The overall energy efficiency of buildings within the EU is subject to requirements stipulated in the EPBD (Energy Performance of Buildings Directive).
This directive has been implemented into German legislation by the Energy Savings Act (EnEG) and the Energy Savings Ordinance (EnEV).

Some of the current standards and guidelines, however, contain contradictory information regarding system design.
In this case, it is the planner's responsibility to take decisions after consultation with the customer, and to make specific agreements in writing.

Concerning stores, the requirements laid down in DIN EN 13779 "Ventilation for non-residential buildings" and – in Germany – particularly VDI 2082 "Ventilation and air-conditioning systems for sales outlets" shall be taken into consideration.

Important standards and guidelines pertaining to stores

Requirements regarding buildings	Requirements regarding air handling systems	Requirements regarding AHUs
Energy Performance of Buildings Directive (EPBD) Act on the saving of energy in buildings **Energy Savings Act (EnEG) (EnEG)**[1] Act on the saving of energy in buildings **Energy Savings Ordinance (EnEV)** Ordinance on energy-saving thermal insulation and energy-saving installations in buildings **DIN V 18599**[1] Energetic evaluation of buildings; Calculation of the net, final and primary energy demand for heating, cooling, ventilation, domestic hot water and lighting **VDI 3807-4**[1] Characteristic values of energy and water consumption of buildings **MVkVO**[1] Model Ordinance on the Construction and Operation of Stores	**DIN EN 13779** Ventilation for non-residential buildings **DIN EN 15251** Indoor environmental input parameters for design and assessment of energy performance of buildings **VDI 2082**[1] Ventilation and air-conditioning systems for sales outlets **VDI 2081**[1] Noise generation and noise reduction in air-conditioning systems	**DIN EN 13053** Rating and performance for units, components and sections **DIN EN 1886** Mechanical performance and measurement methods **VDI 3803**[1] Air-conditioning systems – Structural and technical principles **VDI 6022**[1] Hygienic requirements for ventilation and air-conditioning systems **AHU Guideline 01**[1] German AHU manufacturers' association (Herstellerverband Raumlufttechnische Geräte e.V.) General requirements for air handling units

[1] Valid in Germany; deviating or additional national rules and regulations to be observed as well!

Efficiency Already During the Conceptual Design Phase.

The planning stage involves specifications which have a decisive influence on the energy demand and on the cost for operation of air handling systems.

Life cycle cost is dominated **by cost of operation.**

Energy-efficient air handling units feature an energy-efficiency label.

Check **outdoor air conditions.**

Avoid supply-air terminals close to refrigerated display cases.

Consider **savings potentials** of chilling.

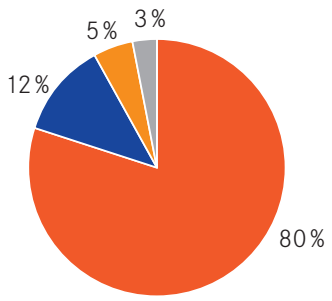
The energy demand of a store over its time of use is the decisive cost factor. In view of increasing energy prices, efficient operation must be kept in mind especially during the planning stage.
The costs of operation and for energy consuption for central air handling units make up about 80 % of the total life cycle cost. The investment cost, on the other hand, is a rather small contribution, accounting for about 12 %. This means that here, too, keeping an eye on efficient equipment and low operating costs is worthwhile!
”Energy efficiency classes“ have been defined to allow a harmonized assessment of the energy efficiency of air handling units. These classes serve as a practical reference. Combining optimized built-in components and a low flow velocity in the AHU casing achieves the highest energy efficiency classes.

Ambient air conditions

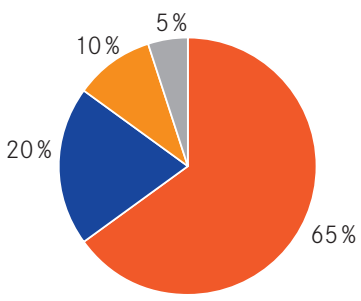
Often used standard design conditions do not comply any longer to the actual summer conditions. Caused by the climate change, temperatures and humilities continuously change. Extreme weather conditions appear more often. In addition, geographic differences have a big impact to the design of air handling units. Using the tables here below helps avoiding both, over and low design of equipment for cooling technology.

Indoor air conditions

If the indoor air temperature outside opening hours is lowered by just 1 K during winter, the heating power output required by the building is reduced by about 6 % and the cooling power output to be afforded by the refrigerated display cases is lowered by about 5 %. Time control and demand-based control of the building services can yield considerable savings here.



Distribution of life cycle cost of a central air handling unit (full air conditioning system)



Power consumption in supermarkets as investigated by North Rhine-Westphalian Energy Agency (Energieagentur NRW)

Design parameters for the meteorological stations				
Location	Temperature [°C] [1]	Absolute moisture [g/kg] [1]	Enthalpie [kJ/kg] [2]	Relative humidity [%]
Amsterdam	29,7	13,8	65,1	57,3
Bangkok	34,1	19,6	84,5	62,8
Beijing	11,7	4,8	23,9	61,6
Berlin	28,9	12,6	61,4	55,1
Bratislava	30,0	14,0	66,1	57,3
Copenhagen	26,5	11,2	55,2	56,2
Dublin	24,2	11,5	53,6	66,1
Hanoi	37,5	22,9	96,5	60,6
Helsinki	27,1	11,8	57,4	57,3
Kuala Lumpur	31,6	25,6	97,3	93,7
Ljubljana	29,8	14,7	67,5	60,6
London-Gatwick	30,8	10,1	56,9	39,7
Madrid	38,2	11,9	69,0	30,8
Manila	33,6	25,6	99,5	83,8
Moscow	30,6	12,8	63,6	50,7
Paris-Orly	30,0	14,9	68,2	60,6
Porto	32,0	13,9	67,8	50,7
Prague	31,0	14,0	67,0	54,0
Rome	30,0	19,6	80,3	79,4
Shanghai	37,0	24,3	99,8	66,1
Singapore	32,0	23,0	91,1	82,7
St. Petersburg	24,9	14,6	62,3	80,4
Stockholm-Arlanda	25,9	10,1	51,9	52,9
Vienna-Schwechat	29,6	12,6	62,1	52,9
Warsaw	31,2	11,8	61,6	45,2

[1] Temperature and moisture contend correspond to maximum enthalpy. Each of these values might be higher.
[2] Enthalpy-values of a statistically determined year as reference. Extreme values might be higher.

Air routing in the room

In most cases, conditioned air is supplied from the top of the room. Injection air terminals allow supplying air at a temperature of up to 10 K below the room air temperature, still avoiding drafts.

Using suitable temperature differences allows reducing supply air flows and operating costs. The depth of injection of the air terminals, however, should always be kept in mind, for especially in the case of refrigerated display cases, the cold-air zone of the display cases must not be flushed.

Chilling

In addition to integrated chilling, centralized chilling also offers potentials for optimizing the cost of operation. For instance, supercooling of the refrigerant in a downstream heat exchanger increases the efficiency of the cooling process. Moreover, if the thermal energy gained from this process is used to heat service water, heating energy will be saved.

Minimum outdoor-air flows

A continuous supply of fresh outdoor air is prerequisite to an optimal indoor climate. We recommend that the minimum outdoor-air rates be always determined per capita, based on the maximum possible occupancy. Technically, both, customers and staff are the most significant sources of air pollution.

Comparison of minimum outdoor-air volume flows as per various rules of technology								
Room type	DIN 1946-2 [1]		DIN EN 13779		ASR 5	VDI 2082 [2]	DIN EN 15251	
	[m³/(h·Pers.)]	[m³/(h·m²)]	[m³/(h·Pers.)]	[m³/(h·m²)]	[m³/(h·Pers.)]	[m³/(h·m²)]	[m³/(h·Pers.)]	[m³/(h·m²)]
Department store	20	3-12	45	–	40-60	6	73,1 [3]	10,4 [3]
Restaurant	30	8	45	–	60 [4]	-	30,2	20,2

[1] Superseded by DIN EN 13779.
[2] Detailed distinction between store areas and guidance on occupancies.
[3] Values for stores as per method B.1.2 can be considered too high.
[4] Acc. to ASR 5: 40 m³/(h·pers.) in case of predominantly sedentary activities, + 20 m³/(h·pers.) where intense olfactory stress is encountered.

Planning. Cornerstone of Success.

Implementing projects in a solution-oriented, purposeful fashion.

Boundary conditions to be defined at pre-planning stage.

Experience joins rules of technology to facilitate planning.

Design guidance	
General	**Air handling systems**
▸ Analysis of utilization requirements together with the building owner and/or user. (Comfort conditions, design data, occupancy, further internal loads, times of use, etc.)	▸ Outdoor-air supply according to demand in case of varying use.
▸ Recording of requirements and assumptions on which planning is based (obligation to document).	▸ Extraction of emissions at source.
▸ Compilation of a list of current standards.	▸ Pressure-loss-optimized planning of the ductwork in order to save fan energy.
▸ Reconciliation of user requirements and specified process- or workplace-related requirements on the basis of the current regulations/guidelines (possibly consultancy/ clarification with customer).	▸ Use of free cooling or adiabatic cooling.
▸ Specification of energy supply with a view to environmental protection, fire protection, energy-related legislation (user, occupants, energy provider, etc.).	▸ Outdoor air taken in without interference from emission sources.
▸ Planning and dimensioning in accordance with current standards and guidelines.	▸ No outdoor-air intakes along the main wind direction of the building or next to wet cooling towers.
▸ Updating of the standards list upon finalization of the planning stage.	▸ Provide drainage and cleaning access for outdoor-air and exhaust-air ducts.
	▸ For roof intakes, observe the greatest possible distance to the roof surface or, however, at least 1.5 times the snow height.
	▸ Distance of outdoor-air intakes and exhaust-air outlets to adjoining buildings or roof-mounted elements: no less than 8 m.
	▸ Distance between outdoor-air intake and exhaust-air outlet no less than 2 m, or arrange these openings turned at an angle of no less than 90°.
	▸ Give due consideration to installation conditions, positioning and structural conditions.
	▸ Operation and maintenance of the individual components to be considered already during planning.
	▸ Select quality brands and quality components (efficiency, reliability, longevity, etc.).

Design parameters [1]	
Outdoor	**Indoor**
Temperature	**Indoor air temperature [3]**
Winter: -16 °C to -12 °C	**Winter:**
Summer: 28 °C to 35 °C	Sales floors: 19 °C to 22 °C
	Grocery products: 18 °C to 22 °C
Humidity	Bakery products: 19 °C to 24 °C
Summer: 37 to 64 % r.h. (12 to 14 g/kg)	Electrical / multimedia: 20 °C to 24 °C
(temperature and humidity depending on climatic conditions)	Catering: 20 °C to 23 °C
	Summer:
Sound pressure level (TA-Lärm) [2]	Sales floors: 22 °C to 26 °C
Daytime (6 h – 22 h):	Grocery products: 18 °C to 22 °C
General residential zones: 55 dB(A)	Bakery products: 22 °C to 26 °C
Mixed-use zones: 60 dB(A)	Electrical / multimedia: 22 °C to 28 °C
Commercial zones: 65 dB(A)	Catering: 22 °C to 26 °C
Industrial zones: 70 dB(A)	
	Supply-air temperature [4]
Night-time (22 h – 6 h):	Winter: 16 °C to 22 °C
General residential zones: 40 dB(A)	Summer: 15 °C to 18 °C
Mixed-use zones: 45 dB(A)	
Commercial zones: 50 dB(A)	**Indoor humidity [5]**
Industrial zones: 70 dB(A)	Winter: ≥ 25 % r.h.
	Summer: ≤ 60 % r.h. or max. 12 g/kg
Minimum outdoor-air rate	
$\dot{V}$ = 45 m³/(h · pers.) to 60 m³/(h · pers.) or	**Sound pressure level**
$\dot{V}$ = 6 m³/(h · m²) to 12 m³/(h · m²)	Department store (as per DIN EN 13779): 40 dB(A) to 50 dB(A)
	Sales and services: 40 dB(A) to 55 dB(A)
Cooling demand (mechanical)	Self-service stores: 40 dB(A) to 55 dB(A)
Above an outdoor air temperature, t, exceeding 17°C	Incoming/outgoing goods: 40 dB(A) to 55 dB(A)
	Restaurants: 35 dB(A) to 50 dB(A)
	Staff rooms / tea rooms: 35 dB(A) to 45 dB(A)
	Air curtain area: 50 dB(A) to 65 dB(A)

[1] For further information, also on the planning of buildings and the use of air handling systems, see DIN EN 13779.
[2] Valid in Germany; deviating or additional national rules and regulations to be observed as well!
[3] Values correspond to the operative temperatures.
[4] Values correspond to supply outlet temperatures. When dimensioning the heat exchanger, take into account reheating through fan motor and ductwork amounting to approx. 1.5 K.
[5] Recommendation based on DIN EN 15251, but no requirements as per VDI 2082.

Efficient and Customized. Solutions Made by robatherm.

AHU concepts specifically optimized to suit your application.

Custom-built and optimized for your needs.

Range of air flow from 1,000 m^3/h to 320,000 m^3/h.

Energy efficiency **certified** in accordance with EUROVENT and German AHU manufacturers' association.

High hygiene standard and high product quality.

Integrated cooling- and/or control technology.

High versatility is ensured by means of our modular casing design, allowing us to configure a suitable air handling unit for any store, be it an indoor unit or a weatherproof packaged AHU to be mounted on the roof.

Broad range of air flow
Our AHUs provide air flows between 1,000 m^3/h and 320,000 m^3/h. This range will cover almost any requirement for stores thanks to our rugged casing design.

Low energy demand
The top efficiency classes are reached as a result of smart dimensioning and the use of optimized built-in components. Moreover, optional integrated cooling technology and controls ensure cost-reduced operation of your system.

Low heat losses
A panel construction with thermal break ensures very high thermal insulation and high air tightness. The energy demand is minimized, as is the tendency of condensation inside the casing.

Proven mechanical stability
The rugged and proven construction of the AHUs relies, among other things, upon galvanized sheet metal, powder-coated on the outside, as standard corrosion protection. Stainless steel is used alternatively.

Europark, Salzburg

Ease of assembly
Owing to factory integration of cooling technology and controls, a minimum of components need to be assembled, saving assembly time on site. Sturdy internal casing connections facilitate assembly even further.

Easy access
All components are arranged in the unit to warrant easy access. The high hygiene standard contributes to facilitating maintenance; less effort is required to keep the AHU at a constant high hygienic level. This high hygiene standard was tested and certified by the TÜV Süddeutschland and the Berlin Institute for Air Hygiene (Institut für Lufthygiene ILH Berlin).

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

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

Everything f

AHU control

In relying on factory-integrated cooli

Smart Control:

Optimally tailored to AHUs.

Universal function blocks.

Integrated maintenance management.

Communication via:
pLAN
Modbus
OPC
BACnet
LON

The control system and the equipment are optimally adjusted at the factory. The manifold thermodynamical requirements to be met by a central AHU can thus be fulfilled along with optimizing the cost of operation. For this reason, robatherm has developed the DDC software "Smart Control".

Flexible and affordable
The "Smart Control" solution remains flexible and affordable thanks defined function blocks. The programming effort for individual systems remains low.

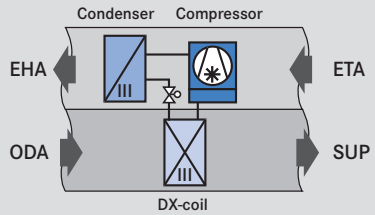
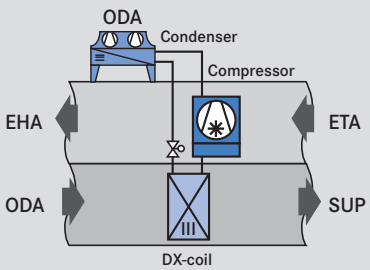
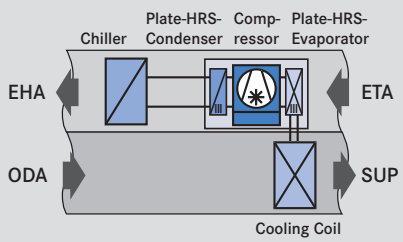
Complete controls
Controls including sensors and actuators are installed immediately after the unit has been assembled, while still at the robatherm factory. And the function blocks of the control system are parameterized in a simple way. The commissioning cost is, therefore, minimal.

Integrated maintenance management
The maintenance management included in Smart Control records immobilization and operating times of the components and automatically generates inspection reports which are displayed in plain text. Appropriate descriptions of the components are also given. Increased operational reliability and reduced maintenance effort can thus be ensured.

Communicative and open
Various communication options are at your disposal, such as:

Cost-effective "Remote Terminal":
Operating, monitoring and parameterizing up to 15 robatherm AHUs via a dedicated local network.

Comfortable "Plant Visor":
Additional plant visualization as well as recording

Integrated cooling technology		
Direct evaporation		Chilled water production
Exhaust air condenser	Outside air condenser	Exhaust air chiller
		
Packaged Air Handling Unit	Packaged Air Handling Unit	Packaged Air Handling Unit

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

from a single source.

l and cooling technology.

ng technology and controls you make full use of our competence.

of trends and alerts including alert relaying. Integration into a company's network (Intranet) or the Internet is possible.

Open communication:
Communication with higher-level building automation systems via pLan, Modbus, OPC, BACnet or LON.

Central AHUs with integrated cooling technology and exhaust-air condenser have proven the ideal all-in-one solution for various applications, e. g., large shopping malls or specialist retailers. This is for architectural reasons as well as in terms of operating cost and operational reliability.

Integrated compressors
AHUs with integrated compressors have an edge over central water chillers because of less space requirement and less distribution losses. These compressors are overall systems optimized in themselves, featuring high coefficients of performance (COP). Also from the viewpoint of redundancy, integrated compressors are advantageous where several AHUs are used, for in the event of fault, it is never the entire cooling equipment that fails.

Further savings ensue from less piping work being required and from the fact that standstill and distribution losses do not occur. Moreover, no external units such as recooling plants need to be installed.
In winter, the use of the heat carried by the extract air has additional synergistic effects. The system will then operate as a reversible heat pump.
Integrated compressors are is distinguished into the direct evaporation of refrigerant (e. g. R407C) and chilled water production.

Direct evaporation
The heat exchanger in which the refrigerant is evaporated is in direct contact with the outdoor air or recirculated air to be cooled.

Chilled water production
Water/brine is chilled in the evaporator of the chilling loop (primary loop) and is supplied as chilled water through a small distribution system directly to the various consumers (secondary loop). This method also allows the hydraulic supply and withdrawal of hot and cold flows.

The use of the waste heat from condensation for reheating the supply air following dehumidification is just as naturally possible as any required drying of the outdoor-air filter.

AHU equipment and AHU control system from a single source.

Minimal on-site installation effort.

Commissioning by robatherm.

Elimination of distribution and standstill losses.

Integrated chilling without additional external units.

Free cooling.

Reversible heat pump.

Long-standing Experience. Proven AHU Concepts.

Benefit from our know-how, also in the field of stores.

We offer AHU concepts specifically optimized for applications in stores and complying 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 price. And all this tailored to your individual requirements.
You require further details?
We will be glad to give you competent advice.

Equipment features


AHU designed for outdoor installation (weatherproof)


Rotor heat recovery


Cross-flow plate heat exchanger


Heat recovery loop


Free-wheeling fan

High-efficiency electric motor


Controls integrated into AHU


Direct chiller integrated into AHU


Reversible heat pump integrated into AHU


Hydraulic control assembly integrated into AHU


Humidifier integrated into AHU

Optimization features


Low investment cost


Reduced operating cost

High energy efficiency


Compact design


Easy-to-install

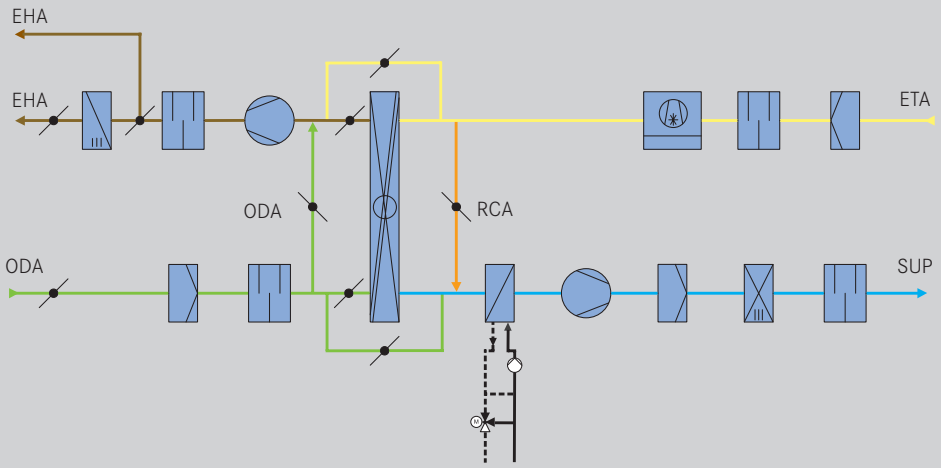

Easy-to-maintain

Navigator

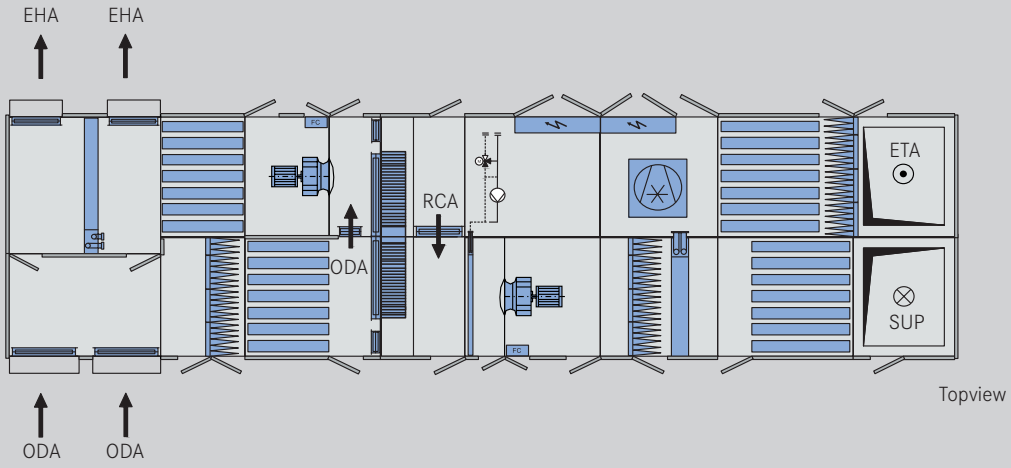
Equipment features

Optimization features

Plant flow diagram



AHU schematic



Topview

AHU equipment

Weatherproof design
Supply-air filter stages: F5/F7
Extract-air filter stages: F5
Enthalpy rotor
incl. bypass dampers for heat recovery
incl. rotor control
incl. summer mode (if $t_{ETA} < t_{ODA}$)
incl. hydraulic control assembly
Heater: $t_E \approx 5\,°C$, $t_A = 22\,°C$
Fluid: PWW 70/50 °C
Fan motor dismantling device
Four-damper system

Chiller: $t_E = 29{,}5\,°C$, $\varphi_E = 45\,\%$ r.h., $h_E = 59$ kJ/kg,
$t_A = 16\,°C$, $\varphi_A \approx 95\,\%$ r.h.
Fluid: R407C
Chiller face velocity v ≤ 2.4 m/s
(thus without droplet separator)
including complete chilling equipment with
integrated exhaust-air condenser
including controls
Direct downward duct connection
Filter differential pressure indicator
(without sealing liquid)
Lighting in all relevant areas

AHU description

Packaged air handling unit
Low cost of operation, closed-loop chilling and optimal maintenance possibilities.

Integrated design requiring no further external units on the roof.

Air-only system or minimum-outdoor-airflow only for a water/air system.

Air recirculation for heating-up purposes only (outside times of use) when used as a mini-mum-outdoor-airflow system.

Bypass dampers reduce pressure losses at heat recovery unit for efficient use of free cooling of the building (e. g. at night).

Entire cooling and control equipment integrated into AHU.

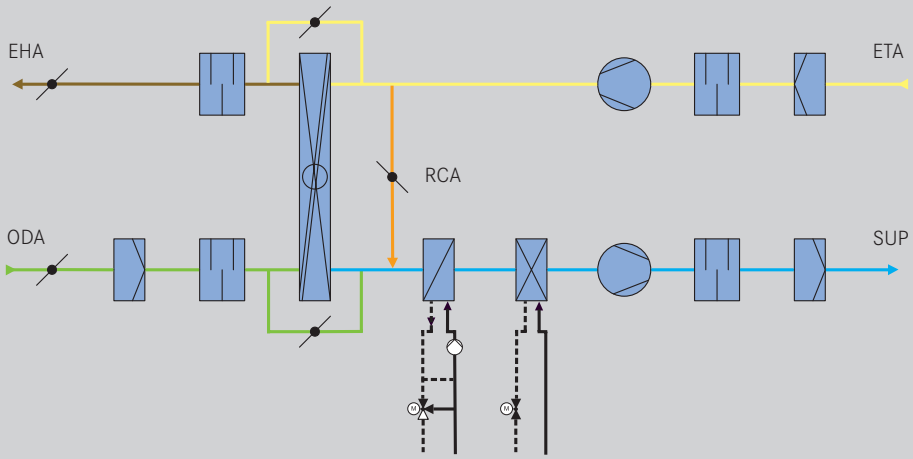
Commissioning upon installation by robatherm service team.

Hydraulic control assembly for heating coils installed complete in AHU, ready for connection.

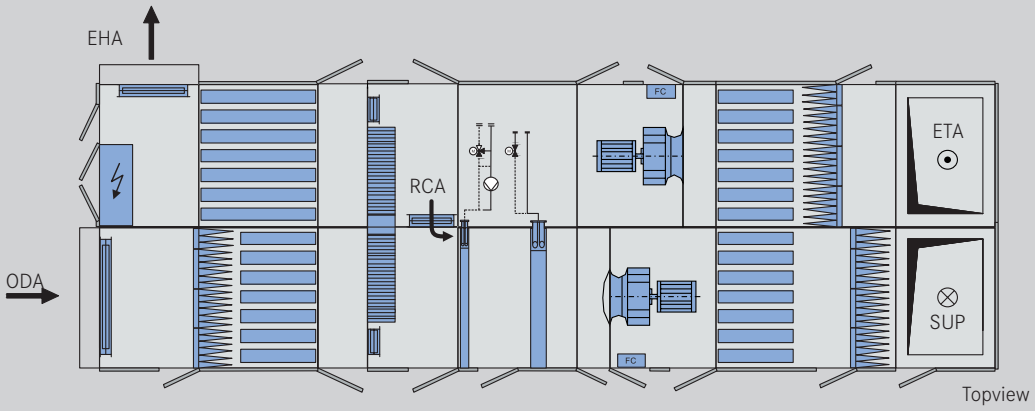
Abbreviations for types of air (as specified in DIN EN 13779): ODA=outdoor air, SUP=supply air, ETA=extract air, EHA=exhaust air, RCA=recirculated air

Navigator	Equipment features	Optimization features

Plant flow diagram



AHU schematic



AHU equipment

Weatherproof design
Delivered in max. 7 units.
Supply-air filter stages: F5/F7
Extract-air filter stages: F5
Installation space for control cabinet
Enthalpy rotor
incl. bypass dampers for heat recovery
incl. rotor control
incl. summer mode (if $t_{ETA} < t_{ODA}$)
incl. hydraulic control assemblies

Heater: $t_E \approx 10$ °C, $t_A = 22$ °C
Fluid: PWW 70/50 °C
Chiller: $t_E = 29{,}5$ °C, $\varphi_E = 45$ % r.h., $h_E = 59$ kJ/kg,
$t_A = 16$ °C, $\varphi_A \approx 85$ % r. h.
Fluid: PCW 6/12 °C + 30 % glycol
Chiller face velocity v ≤ 2.6 m/s
(thus without droplet separator)
Direct downward duct connection
Fan motor dismantling device
Inclined-tube gauge for filter differential pressure
Lighting in all relevant areas

AHU description

Low cost of operation, easy assembly and optimal maintenance possibilities.
Delivery units are unsplit depth-wise.
Air-only system or minimum-outdoor-airflow only.
Air recirculation for heating-up purposes only (outside times of use) when used as a minimum-outdoor-airflow system.
Bypass dampers reduce pressure losses at heat recovery unit.
Therefore, more efficient use of free cooling of the building (e. g. at night).

Hydraulic control assemblies integrated complete in AHU, ready for connection.
Control cabinet integration prepared for customer's control system or for robatherm solution.
Visually attractive thanks to infloor duct connections.
Direct-drive fans allow trouble-free operation.
Frequency converter is factory-installed, ready-wired and parameterized.
Connection to separate repair switch.

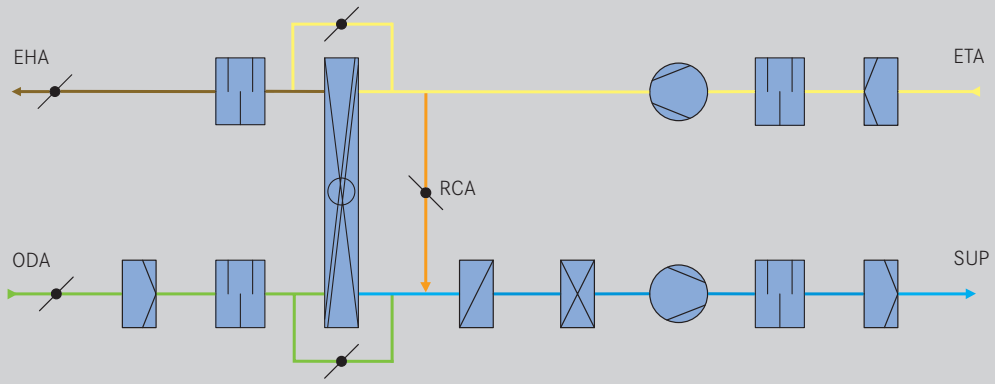
Abbreviations for types of air (as specified in DIN EN 13779): ODA=outdoor air, SUP=supply air, ETA=extract air, EHA=exhaust air, RCA=recirculated air

Navigator

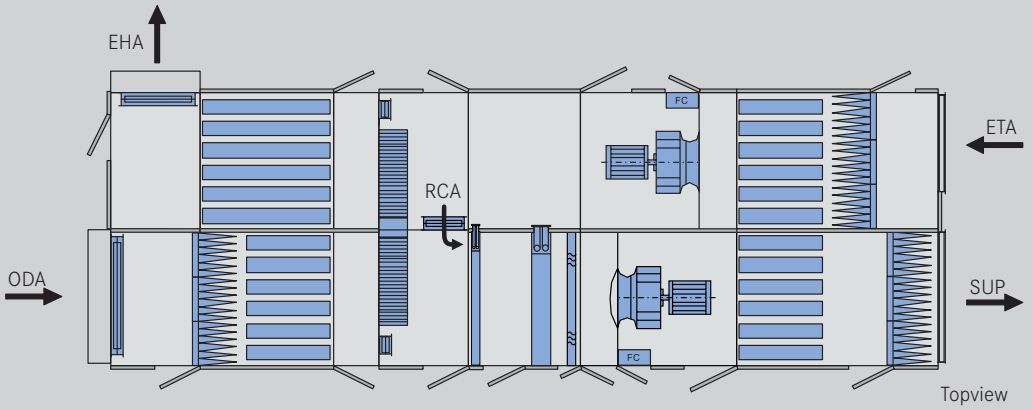
Equipment features

Optimization features

Plant flow diagram



AHU schematic



AHU equipment

Weatherproof design
Delivered in max. 6 units.
Supply-air filter stages: F5/F7
Extract-air filter stages: F5

Condensation rotor
incl. bypass dampers for heat recovery
incl. rotor control
incl. summer mode (if $t_{ETA} < t_{ODA}$)

Heater: $t_E \approx 10$ °C, $t_A = 22$ °C
Fluid: PWW 70/50 °C
Chiller: $t_E = 29{,}5$ °C, $\varphi_E = 45$ % r.h., $h_E = 59$ kJ/kg,
$t_A = 16$ °C, $\varphi_A \approx 85$ % r.h.
Fluid: PCW 6/12 °C + 30 % glycol

Inclined-tube gauge for filter differential pressure

Lighting in all relevant areas

AHU description

Low investment cost, easy assembly and optimal maintenance possibilities.

6 delivery units thanks to unsplit design.

Air-only system or minimum-outdoor-airflow only.

Air recirculation for heating-up purposes only (outside times of use) when used as a minimum-outdoor-airflow system.

Bypass dampers reduce pressure losses at heat recovery unit.

Therefore, more efficient use of free cooling of the building (e. g. at night).

Direct-drive fans allow trouble-free operation. Frequency converter with integrated repair switch is factory-installed, ready-wired and parameterized.

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

Best Choice.
Best References.

Trust and confidence emerge from quality.

That is why many well-known companies favor robatherm's solutions.

Automobile Industry

Chemical and Pharmaceutical Industry

Commercial Building

Electronic Industry

Hospital

Production

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Chemical and Pharmaceutical Industry 3M santé, BASF, Bayer, Beiersdorf, Boehringer, BP, Degussa, Du Pont, Fraunhofer Institut, Fresenius, Glaxo Smithkline, Höchst, Institut Pasteur, Krupp, Linde, L'Oréal, Labo Piette, Merckle, Mérial, Osram, Pfizer, Procter + Gamble, Roche, Sanofi, Schering, Solvay, Thomae, Urenco
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