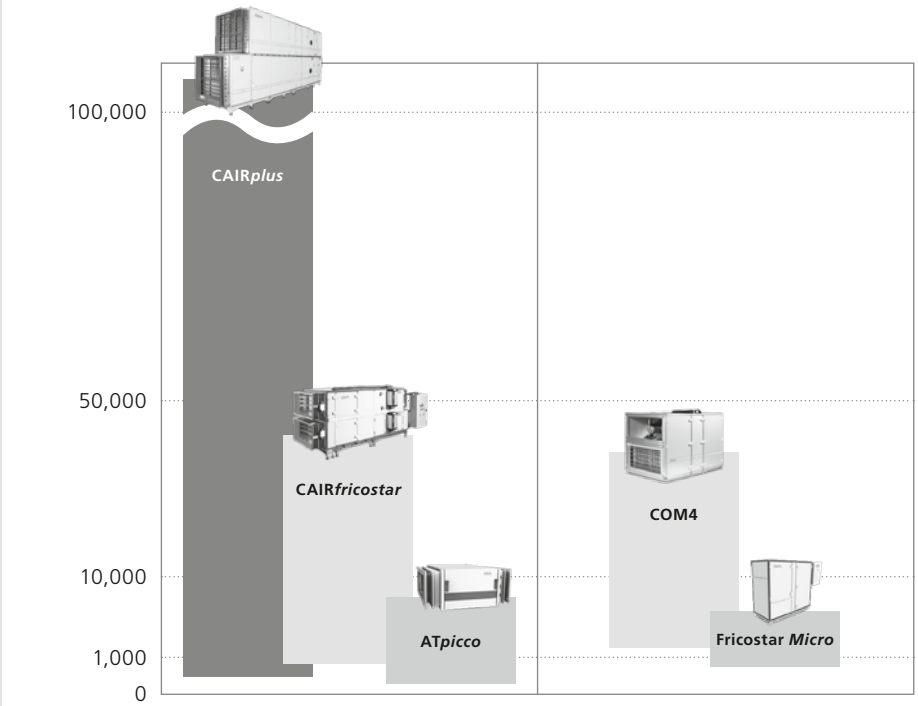
GEA Air Handling Units – Modular configuration

Solutions with maximum flexibility
GEA CAIR*plus*® SX

Product Brochure

Optimized for any application

Overview of GEA Air Handling Units



Modular
Customized configurations possible by modular configuration of the units

Compact
Pre-configured and optimized HVAC systems, ready for connection, with integrated control systems and high-efficiency energy recuperation

CAIR*plus*
High-end range of units with maximum flexibility (model sizes, enclosure versions, components, configurations, etc.)

CAIR*fricostar*
Optimized solution for climate control of indoor swimming pools and wellness areas

AT*picco*
Full-capacity air-handling unit with flat design for installation above a suspended ceiling

COM4
Compact universal system solution for many and various application areas

Fricostar *Micro*
Space-saving units for climate control of relatively small indoor swimming pools (also for retrofit)

Project requirements never exactly repeat themselves: with its especially designed product ranges, GEA Air Treatment can satisfy all expectations. For some applications, only the exchange of air is required; for others, however, there are more sophisticated requirements with respect to temperature, humidity, and air purity. Modular units allow free selection of components and functions and can be matched to their requirements down to the smallest detail. Compact units are optimized to their applications, with high-efficiency energy recuperation. They are delivered ready for connection, with integrated control systems.

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With modular configuration – and with virtually unlimited possibilities

When room air lies within the narrow range of optimal indoor comfort temperatures, we feel comfortable. This applies not only for home applications, but also for production, office, and sales rooms.

Indoor room climate is influenced by many factors: the number of persons in a room, the number of computers, the lighting, and many more. This is why central air handling is so important for closed rooms. But climate also plays an essential role in production processes. Good HVAC conditions must prevail, for example, in the food and beverage industry. In hospitals and in the pharmaceutical industry, hygiene furthermore plays a critical role.

GEA central air handling units implement heating, cooling, humidifying and dehumidifying, filtration, and cost-effective energy recuperation. And GEA Air Treatment is constantly working to improve the quality and engineering of these functions. One result here is the new generation of central air handling units: GEA CAIR*plus*.

For use both in new buildings and in the modernization of existing facilities, GEA CAIR*plus* allows optimal planning and design of central HVAC solutions. The various models can be flexibly selected and matched to any requirements, and are dimensioned by means of GEA planning software. At GEA Air Treatment, quality and innovative technology stand in the foreground of these efforts: ensured by constant inspection, further development, and maintenance of production processes at the state of the art.

The greatest share of the costs of a central air handling unit arises from its operating expenses spread over its entire service life – and not from the original acquisition price. As a result, GEA CAIR*plus* units can be economically outfitted with high-efficiency energy recuperation and with energy-saving drive systems. CAIR*plus* already now conforms to the EU directive that goes into effect in mid-2011 and that stipulates the use of electric motors from efficiency class IE2/EFF1. CAIR*plus* is furthermore certified according to Eurovent and the German Association of HVAC Manufacturers, which assures greater transparency and safety.

In addition, completely smooth inner surfaces and good access to all components guarantee high hygienic standards. GEA regularly monitors the currently valid official regulations and assures that they are being met by GEA CAIR*plus*.

Choice of model configurations

- All model configurations are available for GEA CAIR*plus:* indoor and outdoor versions, vertical or horizontal installation – as well as configurations with units on top of each other, behind each other, or next to each other.

Simple installation and maintenance

- In addition to space for their installed components, GEA CAIR*plus* units also provide extra installation space for piping and cabling. Large service hatches additionally make it significantly easier to maintain and service the units.
- All hatch locks, threaded connections, and hinges are integrated into the unit frame. Even partition joints do not require any additional length of the units. As required, individual components can be simply installed on the installation site from the outside.
- The lifting lugs in the top profile section of the units make it simple and easy to transport them to the installation site (for units delivered up to 1,500 kg).

Eurovent and the German Association of HVAC Manufacturers

Tested + certified = maximum safety

Measuring means acquisition of knowledge. And the customers get exactly what they expect. This is the motto of the Eurovent Certification Program. As a result, documentation and software are subjected to strict tests.

HVAC systems by GEA Air Treatment satisfy the most stringent of quality requirements and are subjected to periodic testing.

Directives EN 13053 and EN 1886 stipulate the criteria to be applied in these tests. Independent testing institutions periodically inspect these characteristics in accordance with Eurovent certification stipulations.

Modelbox Test – enclosure properties in accordance with EN 1886
Enclosures are provided to an independent testing institution every 6 years, which tests these enclosures in accordance with the following properties.

- Mechanical stability (D1 ... D3)
- Enclosure leakage (L1 ... L3)
- Filter-bypass leakage (G1 ... F9)
- Thermal insulation (T1 ... T5)
- Thermal-bridge factor (TB1 ... TB5)
- Sound insulation of the enclosure.

Real Unit Test – software performance characteristics as per EN 13053
In these tests, an independent expert selects one unit type every 3 years at the manufacturer's plant. This type is then exactly manufactured as a specimen copy, measured by a testing institute, and compared to the software data. The manufacturer's software is then certified only if all the performance characteristics of the copy are successfully verified. The following performance data are tested:

- Mechanical stability
- Enclosure leakage
- Filter-bypass leakage
- Air flow rate
- Available static pressure
- Power consumption
- Noise emitted from the enclosure
- Noise transmitted by the air flow
- Heating capacity
- Cooing capacity
- Energy recuperation efficiency
- Pressure loss on the water side

Inspection of the production plants

Once every year, an expert visits the production plant of the certified manufacturer. This inspection checks conformity of the manufactured units with the design software.

Tested efficiency – certification of energy characteristics

Consumption by HVAC systems represents a major share of the energy used by buildings. To reduce this consumption and, in turn, CO2 emissions, measures are being taken in many countries to increase the efficiency of HVAC systems. But how it is possible to objectively assess energy efficiency on the basis of simple characteristic values? Numerous factors influence the energy consumption of a central air-handling unit:

- The air speed in the unit
- The power consumption of the motors
- The efficiency and the pressure drop of the energy recuperation
- Climate conditions at the installation site.

The Eurovent energy label

Analysis of these factors is summarized in Eurovent efficiency classes A to <E, with A the greatest efficiency. The basis of evaluation is EN 13053, which assigns various classes to the influencing factors of air speed, efficiency of air movement, energy-recuperation efficiency, and pressure drop of energy recuperation. In addition, the Eurovent system considers the climate conditions at the site. In cold climate regions, the use of an efficient energy-recuperation system has a higher rating value than in warm regions. The design temperature for winter operations takes this into account in calculations. Eurovent uses the special labels A↳ to <E↳ to designate systems that do not handle outdoor air. Evaluation of such systems considers only air speed and efficiency of air movement. There is a trade-off between the individual evaluation classes: for example, excessive air speed can be set off by energy recuperation with greater efficiency.

German Association of HVAC Manufacturers

In addition, efficiency classes A+, A, and B are awarded as per the stipulations of this association. Equipment that fails to satisfy these requirements receives no classification. Criteria of one class are considered to be satisfied only if all conditions are observed.

Calculation of the Eurovent energy-efficiency classes

Class		A/A↳	B/B↳	C/C↳	D/D↳	E/E↳	<E/<E↳
Air speed							
V_{class}	m/s	1.8	2.0	2,.2	2.5	2.8	–
Energy recuperation							
η_{class}	%	75	67	57	47	37	–
Δp_{class}	Pa	280	230	170	125	100	–
Power consumption of the fan							
$f_{class\text{-}Pref}$		0.90	0.95	1.00	1,.06	1.12	–

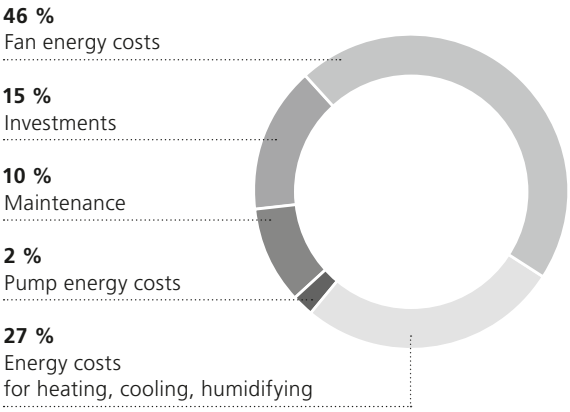
Eurovent assigns energy efficiency ratings from A to <E (label A shows the greatest efficiency)

RLT
Raumlufttechnische Geräte
Herstellerverband e.V.

The German Association of HVAC Manufacturers awards efficiency labels A+, A, and B. Systems that do not satisfy all requirements do not receive a label.

Life-cycle cost calculation

Consideration of all costs in advance



Example of an office building
Calculations performed by GEA L*plus* software (see page 7) are based on Eurovent recommendations for determination of life-cycle costs, and likewise take into account important standards and regulatory frameworks (such as DIN V18599-3 and VDI 2067-1).

Energy labels provide the basis of assessing the energy quality of an HVAC unit by a simple rating number. For exact statements on the expected operating costs, however, it is necessary to calculate the life-cycle costs (LCC).

LCC Guidelines for Air Handling Units provide the basis for this calculation. These guidelines are provided in accordance with DIN V18599-3 and VDI 2067-1. Calculation in turn takes place in accordance with climate conditions at the equipment site, as well as with operating times. Building behavior is simulated by scenarios that select the supply and exhaust-air temperatures as a function of outdoor-air conditions. Further influencing variables such as energy prices, investment costs, and costs for maintenance and servicing round out the basis for calculation.

Several equipment configurations can be calculated in parallel and can be compared to each other. The result is a presentation that – in addition to costs of the individual energy media – also indicates the total costs accruing throughout the life cycle being considered.

Life Cycle Costs

Investment costs	Energy costs	Maintenance	Disposal
Planning Initial acquisition Installation	Electric power Heating and cooling Water	Cleaning and maintenance Repair	Disassembly Recycling and disposal

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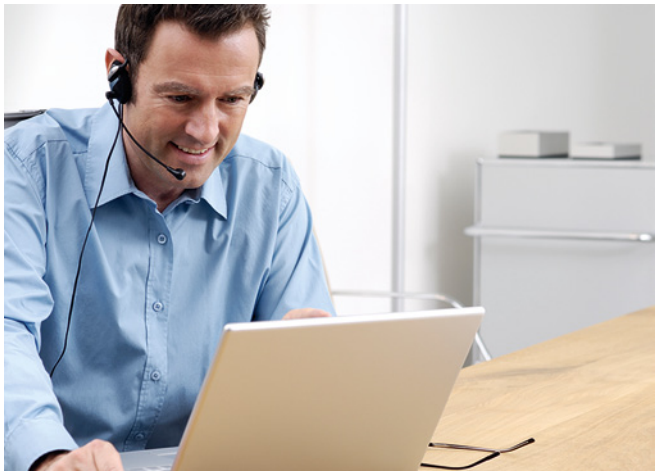
GEA L*plus* design software

For fast and reliable engineering design



GEA CAIR*plus* central air handling units are characterized by their great diversity of models, which provide a tailored solution for each requirement being presented, and for every building situation. Each unit is individually designed with the GEA L*plus* design software.

Time is money: and this especially applies to the project engineering of HVAC facilities. We have developed the GEA L*plus* design software to make your selection and configuration as fast and as simple as possible for a precision climate-control system that is optimal for your needs.

GEA CAIR*plus* precision climate-control systems have the advantage that all products can be designed to meet individual requirements. The GEA L*plus* design software helps you to implement your desired system at the turn of a hand. The system makes configuration proposals in accordance with your entry of information. L*plus* immediately calculates and outputs unit subdivisions, configuration of the modules, as well as dimensions and weights. Believe us: there is no way for faster and more reliable planning. And you will gain valuable time for other tasks.

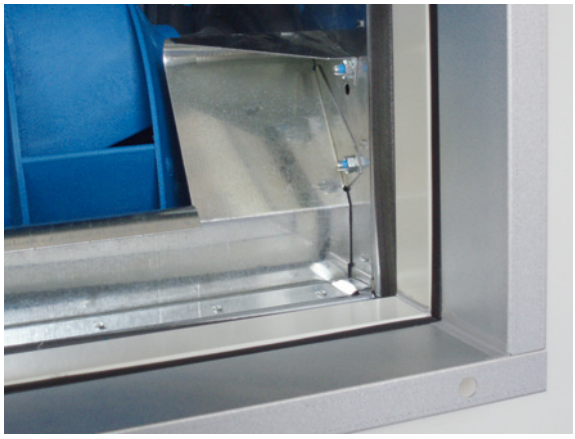
Benefits of using GEA L*plus* design software

- Individual configuration proposals
- Determination and display of unit sub-divisions, modular configurations, dimensions, and weights
- Calculation of life-cycle costs (LCC)
- Simple program handling
- Fast, reliable selections and planning
- Valuable time gain for other tasks
- Indication of energy-efficiency classes (Eurovent and German Association of HVAC Manufacturers)
- Regular monitoring by Eurovent of the validity of the calculation procedure

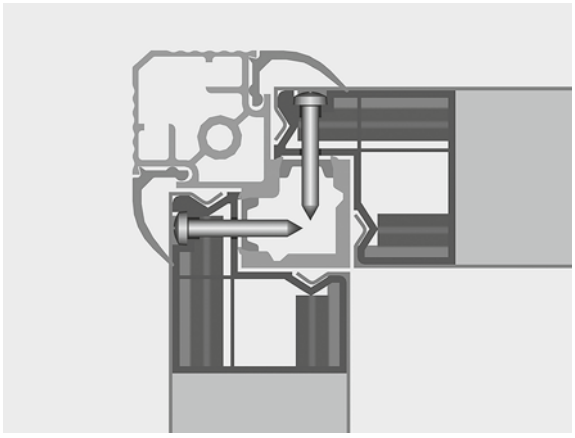
GEA L*plus* design software covers all products by GEA Air Treatment. The free full version can be downloaded under www.gea-airtreatment.com under the menu link Media/ Download/L*plus*. Or, it can be ordered from us.

Assurance of high hygiene standards

Hygiene-tested HVAC systems



Hygiene connection frame



The enclosures of GEA CAIR*plus* units are completely smooth on the inside, which makes them easy to keep clean. This assures optimal conditions for hygienic operations in accordance with VDI 6022, VDI 3803, and DIN 1946 Part 4.

In the design and structural engineering of GEA CAIR*plus* central air handling systems, great emphasis has been placed on equipment design that assures conformity with high hygiene standards.

GEA CAIR*plus* units are entirely smooth on the inside. There are no edges or threaded connections to restrict complete cleaning of the unit.

For stricter hygiene standards – for example, in buildings and rooms of public health institutions – additional requirements must be satisfied as described in DIN 1946, Part 4. GEA CAIR*plus* central air handling systems satisfy these requirements as well.

Hygiene requirements applicable to HVAC equipment are stipulated in the following standards and guidelines:

- VDI 6022 Sheet 1
  Hygiene requirements placed on HVAC systems and units
- EN 1886
  Mechanical properties and measurement techniques
- EN 13053
  Performance indicators
- DIN EN 13779
  General fundamentals and requirements
- DIN 1946 Part 4
  HVAC systems in hospitals

Institute for tested HVAC Hygiene 2009-2012 Air Hygiene

Hygiene-relevant standards
- VDI 6022 (D)
- VDI 3803 (D)
- ÖNORM H 6021 (A)
- SWKI VA104-01 (CH)
- DIN EN 13779 (EU)
- DIN 1946 Part 4 (D)
- SWKI 99-3 (CH)
- ÖNORM H 6020-1 (A)

tested by ILH BERLIN

Everything from one source

Integrated cooling

GEA CAIR*plus* central air handling units with integrated cooling systems are virtually entirely ready for connection, and their components have been optimally coordinated with each other. They have proved highly attractive as a result of their integrated control technology and highly efficient energy recuperation.

DX direct evaporator technology with R134a refrigerant achieves high levels of reliability and long service life. These systems are also absolutely reliable in service, even under conditions of high outdoor temperatures. Their output can be continuously matched to momentary cooling requirements. For minimized energy consumption, GEA also offers the option here of adiabatic evaporative cooling. All cooling components and the control system have been integrated in the unit.

The cooling circulation system

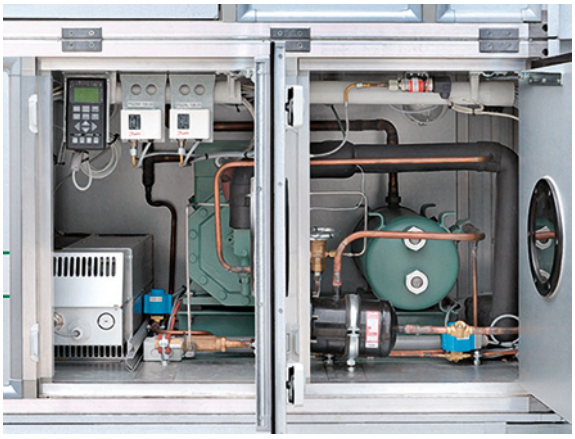
- R134a as refrigerant
- Heat exchanger as direct evaporator and refrigerant condenser
- Semi-hermetic compressor (reciprocating piston compressor up to 100 kW cooling capacity, with screw compressor for greater requirements)
- Output control by means of cylinder shut-off and frequency converter
- Control range from 30 to 100 % of the maximum cooling capacity (optional: 10 to 100 %)

The refrigerant R134a

- Good thermal and energy characteristics
- No temperature glide
- Low condensation pressure; high condensation temperatures > 60 °C are possible
- Reliable heat dissipation as a result of great temperature range
- Quiet operation; great operational reliability
- Low energy consumption
- Low global warming potential (GWP)
- No ozone depletion potential

The control system

- Control cabinet integrated into the unit and completely wired
- Control by the GEA Matrix 4700 system
- Optional bus interface
- As alternative, available in an external control cabinet



Overview of the integrated cooling technology implemented here

- Great number and variety of application areas: e.g., in offices, supermarkets, and department stores
- Small footprint
- Everything from one supplier
- No external piping
- Little engineering effort
- Simple installation
- Great energy efficiency, since the system is always connected to energy recuperation
- For air flow from 3,000 to 50,000 m³/h
- For indoor and outdoor installation
- Optional adiabatic exhaust-air humidification
- Control by the GEA MATRIX 4700
- Project-specific solutions possible

Safety in explosion-endangered areas

Air handling conformity with ATEX

With its products for numerous applications, GEA Air Treatment offers the necessary safety for explosion-endangered areas. GEA central air handling units represent a significant element here. Their many and various functions provide the basis of fully functional HVAC systems for application in explosion-endangered zones.

Explosion groups
Classification of the amount of energy required to ignite substance-dependent quantities and volumes:

- IIA = a great amount of energy
- IIB = a moderate amount of energy
- IIC = a small amount of energy

An atmosphere can be explosive as a result of local conditions and/or operational circumstances. Such specific conditions involve mixtures of air and combustible gas, vapor, mist, or dust. For an explosion of these substances, atmospheric conditions are necessary under which the process of combustion – after successful ignition – spreads to the entire uncombusted mixture. Explosion-endangered areas can develop where explosive gases, mist, vapor, or dust exist or could form. Areas in which dangerous and explosive atmospheres can occur are classified into zones, in accordance with the probability of development of such an explosive atmosphere.

Classification into zones

Danger of explosion	Example	Gas	Dust	Required category
An explosive atmosphere prevails continuously, frequently, or for long periods	In the inside of containers	Zone 0	Zone 20	1
An explosive atmosphere occasionally prevails	The area around filling and emptying openings	Zone 1	Zone 21	2
An explosive atmosphere rarely prevails, and then only for short periods of time	Areas around Zones 1 / 21	Zone 2	Zone 22	3

Breakdown into temperature classes

Temperature class		T1	T2	T3	T4	T5	T6
Ignition temperature of the combustible substances greater than	°C	450	300	200	135	100	85
Maximum permissible surface temperature of equipment	°C	450	300	200	135	100	85

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All operators of facilities with the possibility of formation of explosive atmospheres are required to classify their plants by zone: either themselves, or with the aid of a consulting company, in accordance with ATEX 137 (Guideline 1999/92/EG) and its national laws and ordnances.

The operator must also observe the fundamental measures for primary protection against explosions with "avoidance of explosive atmospheres": e.g., by means of dilution, limiting, substitution of substances, or the like.

A ventilation or climate-control unit as individual component cannot alone guarantee complete and comprehensive explosion protection, since the protective concept must cover the entire facility. The overall responsibility therefore finally lies with the user or the plant builder.

ATEX conformity certification of GEA Air Treatment
Guideline 94/9/EG – better known as ATEX 95 – contains the stipulations for "equipment and protective systems for application in explosion-endangered areas in conformity with the relevant stipulations." GEA Air Treatment delivers GEA CAIR*plus* for use in explosion-endangered areas in accordance and conformity with ATEX Guideline 94/9/EG (ATEX 95).

ATEX Conformity Certification has been provided for the following applications:

ATEX Conformity Certification for GEA Air Treatment	
Explosive gas applications	**Explosive dust applications**
II 3 G IIB T3 Inside	II 3 D T200 °C Inside
II 3 G IIB T4 Inside	II 2 D T200 °C Inside
II 2 G IIB T3	
II 2 G IIB T4	

Equipment classification in accordance with ATEX
Example: Ex II 3 G IIB T4 Inside Equipment

- **II**
  Equipment Group (I = mining; II = all other areas of application)
- **3**
  Category (3 for Zones 2, 22; 2 for Zones 1, 2, 21, 22; 1 for all zones)
- **G**
  G = gas; D = dust
- **IIB**
  Explosion Group
- **T4**
  Temperature class
- **Inside**
  Inside the equipment (if no indication given, then for inside and outside)

The right turn for the right climate

GEA MATRIX 4700 Compact System Control

Control system with numerous monitoring possibilities:

- Differential pressure measurement for monitoring of the supply and exhaust-air filter
- Position measurement of the outdoor-air louver to avoid frost damage
- Temperature measurement for avoiding frost, with additional frost-protection thermostat to provide switch-off
- Icing temperature measurement to protect the direct evaporator
- Monitoring of the safety chain for external compressor-condenser units
- Plausibility check for detection of sensor faults
- Monitoring of malfunction reports from circulation pumps, frequency converters, and energy-recuperation systems

GEA DDC cabinet for open- and closed-loop control

With both GEA MATRIX Compact System Control, or with GEA DDC System Control: the user enjoys many functionalities for operation and control of the GEA CAIR*plus*.

The user can optimally match the functions of the central air handling unit to the respective application case: either by means of the MATRIX operator-control unit, or by the GEA MATRIX.PC startup software. The system acquires a great number of measured values and continuously monitors them, to assure safe and reliable operation of the GEA CAIR*plus*, with a minimum of difficulties. If one of the monitoring systems responds, this is reported in plain text by the operator-control unit, and in parallel via the malfunction-report output and/or via the interface to the building-services management system.

Communicative and understandable – the operator-control level

The MATRIX operator-control unit has a graphics-capable display that is operated with a menu structure analogous to that of a mobile telephone. As a result, setpoint values and switching times can be very easily entered, and current actual values and instruction messages can be simply read off. If a second operator-control unit is desired (e.g., for advance, simple entry of setpoint temperatures), this can take place via the existing GEA MATRIX.Net bus system.

Fast initial startup of the system

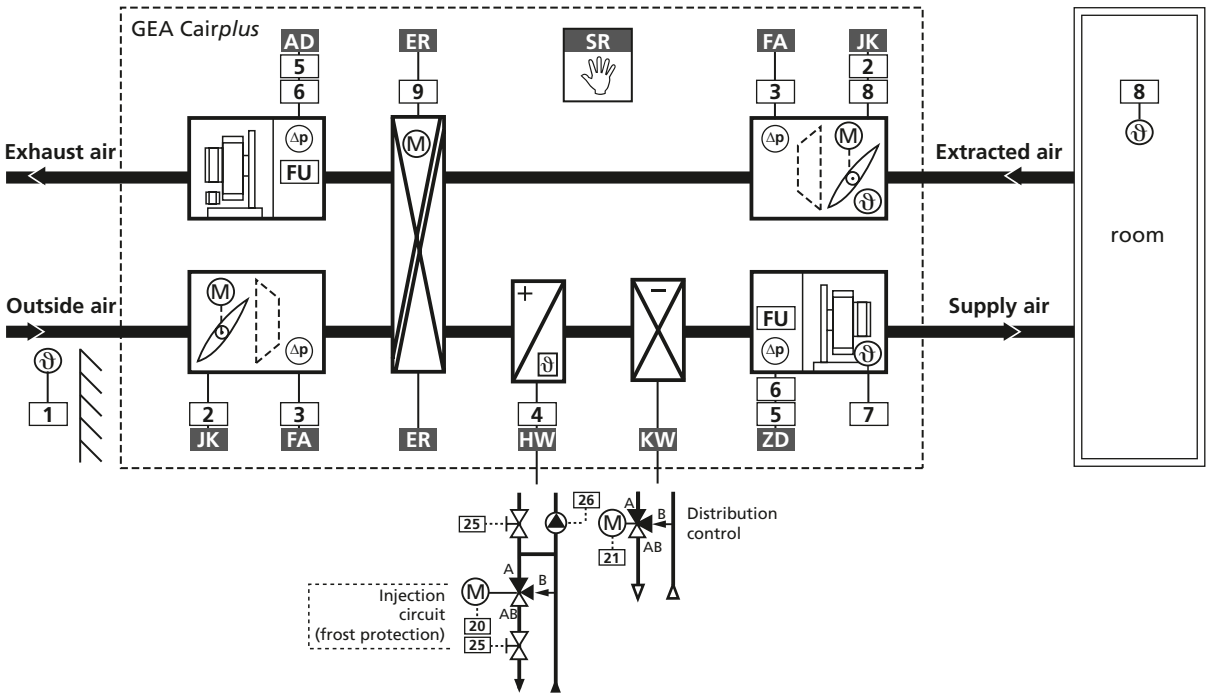
Before being delivered, the components of the GEA MATRIX Compact System Control are completely tested for their functions, with advance setting of as many functionalities as possible.

GEA MATRIX 4700 Compact System Control or GEA DDC System Control

The GEA MATRIX Compact System Control allows open- and closed-loop control of all components of GEA CAIR*plus* central air handling systems for partial climate control. An exception here is compete climate control via a humidifying and dehumidifying section. For this purpose, GEA offers a DDC system control with no restrictions in functionalities. It is configured with customizing to satisfy all details of the building-owner's requirement catalog.

MATRIX 4700 – maximum motor ratings

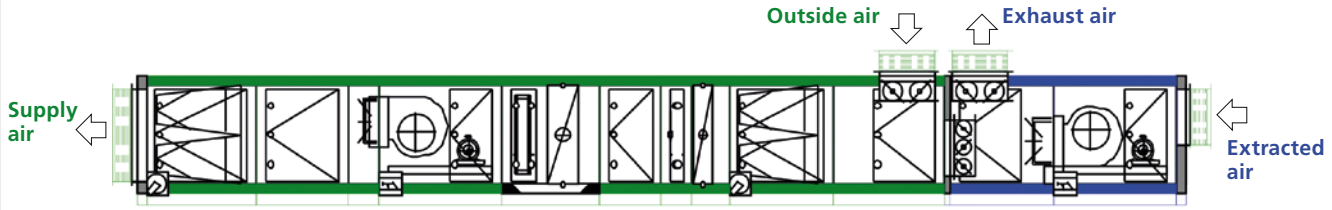
- with frequency converters: 2 x 15.0 kW
- without frequency converters: 2 x 7.5 kW



Components and functions		GEA scope of delivery or activation control	
ZD Supply-air fan with frequency converter FU	●	installed	Direct drive 3~400 Volt / 50 Hz
AD Air-extraction fan with frequency converter FU	●	installed	Direct drive 3~400 Volt / 50 Hz
JK Shutter flaps outside air / extracted air	●	installed	Counter-action shutters with gear drive
FA Filter for outside air / extracted air	●	installed	Outside air F7 / Extracted air F5
ER Energy recovery	●	ECOROT	GEA rotation heat exchanger
HW Heating (low-pressure hot water, LPHW)	●	no steam	Heating with steam upon request
KW Cooling (pumped chilled water, PCW)	●	No refrigerant	Cooling with refrigerant upon request
SR **Compact open- and closed-loop control cabinet**	●	installed	Completely wired for operation
1 Outside sensor	●	separate	GEA NTC sensor with IP54 housing
2 Servomotors for shutter flaps (outside air/extracted air)	●	installed	GEA motor drive 230 Volt
3 Pressure-drop switch (outside air/extracted air)	●	installed	Lower response sensitivity = 40 Pa
4 Frost-protection thermostat	●	installed	GEA thermostat with change-over contact
5 Pressure sensors for air-volume flow control	●	installed	Volume or pressure or signal, external 0 ... 10 Volt
6 Frequency converter (supply air/extracted air)	●	installed	For speed control of fan motor
7 Supply-air minimal-limitation sensor	●	installed	GEA NTC installed sensor
8 Extracted-air sensor, installed, &/or sep. room sensor	●	installed / separate	GEA NTC installed sensor or with IP21 housing
9 Drive motor for rotation heat exchanger	●	installed	For speed control of rotor
20 Servomotor, 3-way mixing valve (LPHW heating)	●	separate	GEA motor drive 230 Volt
21 Servomotor 3-way distribution valve (PCW cooling)	●	separate	GEA motor drive 230 Volt
3-way valves		**Hydraulics**	
A Return flow from heat exchanger		Partial medium volume	Medium: water or brine
B Bypass from supply line		Partial medium volume	Medium: water or brine
AB Return flow line to energy producer		Total medium volume	Medium: water or brine
25 Throttle valve (mechanical)		from customer	For customer-side hydraulic adjustment
26 Secondary pump for heating cycle	●	from customer	GEA activation control ON / OFF

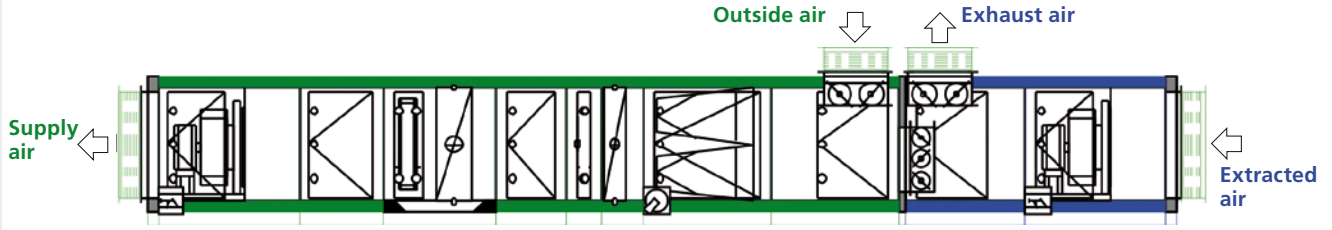
GEA CAIR*plus* with V-belt drive, without energy recuperation, mixed-air operation
Partial climate control = without humidification

Filtration - supply air - cooling - heating - filtration - outside air / / exhaust air - recirculated air - extracted air



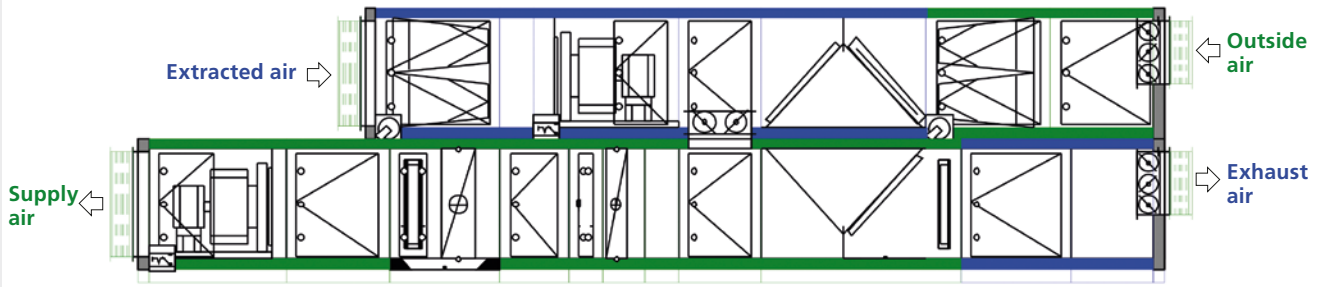
GEA CAIR*plus* with direct drive, without energy recuperation, mixed-air operation
Partial climate control = without humidification

Supply air - cooling - heating - filtration - outside air / / exhaust air - recirculated air - extracted air



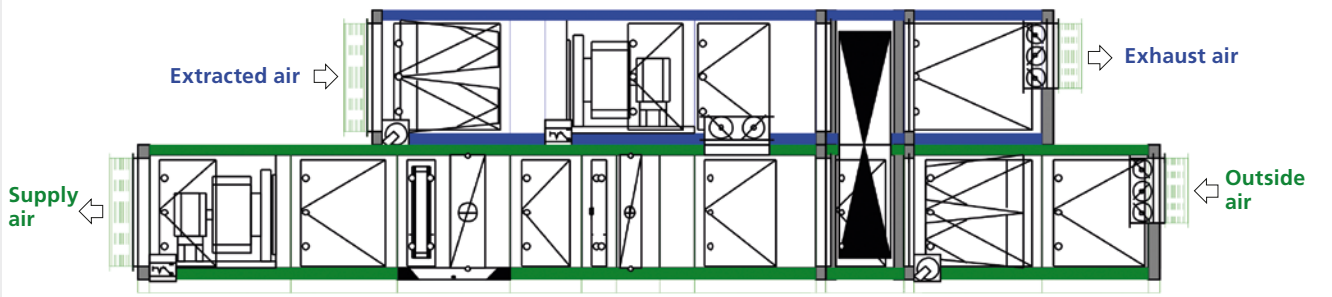
GEA CAIR*plus* with direct drive and ECOPLAT energy recuperation, mixed-air operation
Partial climate control = without humidification

Supply air - cooling - heating - recirculated air - ECOPLAT - filtration - outside air // filtration - extracted air - recirculated air - ECOPLAT - exhaust air



GEA CAIR*plus* with direct drive and ECOROT energy recuperation, mixed-air operation
Partial climate control = without humidification

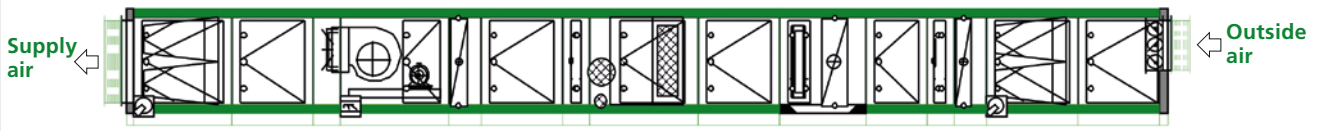
Supply air - cooling - heating - recirculated air - ECOROT - filtration - outside air // filtration - extracted air - recirculated air - ECOROT - exhaust air



Activation control of the valve drives as desired: with or without mounted or separate frequency converters.

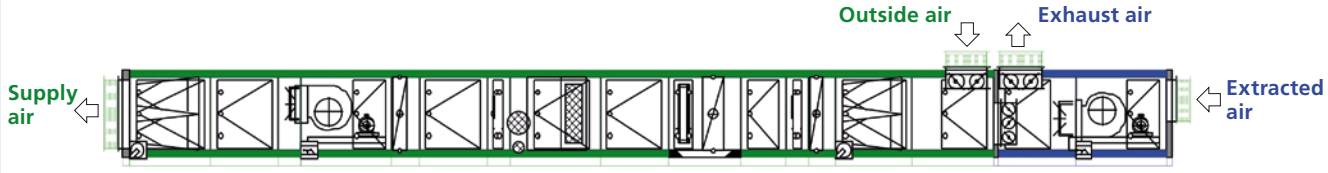
GEA CAIR*plus* with V-belt drive, without energy recuperation, with humidification and dehumidification, 100 % outside-air operation
Full climate control = with humidification and dehumidification

Filtration - supply air - dehumidification - humidification - cooling - heating - filtration - outside air or recirculated air



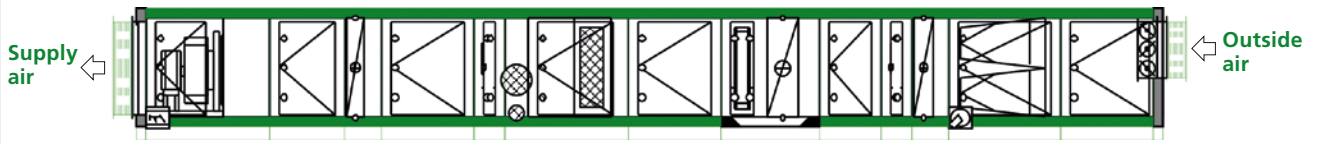
GEA CAIR*plus* with V-belt drive, without energy recuperation, with humidification and dehumidification, mixed-air operation
Full climate control = with humidification and dehumidification

Filtration - supply air - dehumidification - humidification - cooling - heating - filtration - outside air // exhaust air - recirculated air - extracted air



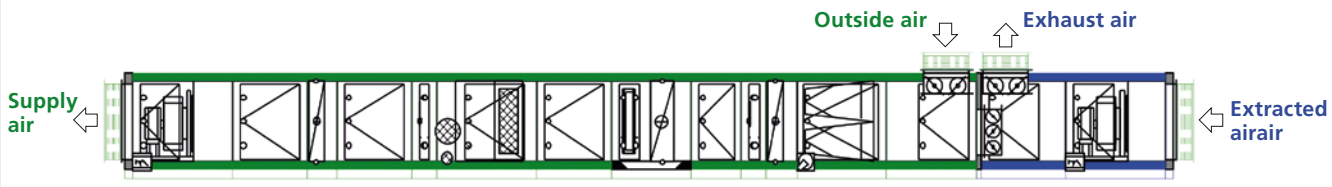
GEA CAIR*plus* with direct drive, without energy recuperation, with humidification and dehumidification, 100 % outside-air operation
Full climate control = with humidification and dehumidification

Supply air - dehumidification - humidification - cooling - heating - filtration - outside air or recirculated air



GEA CAIR*plus* with direct drive, without energy recuperation, with humidification and dehumidification, mixed-air operation
Full climate control = with humidification and dehumidification

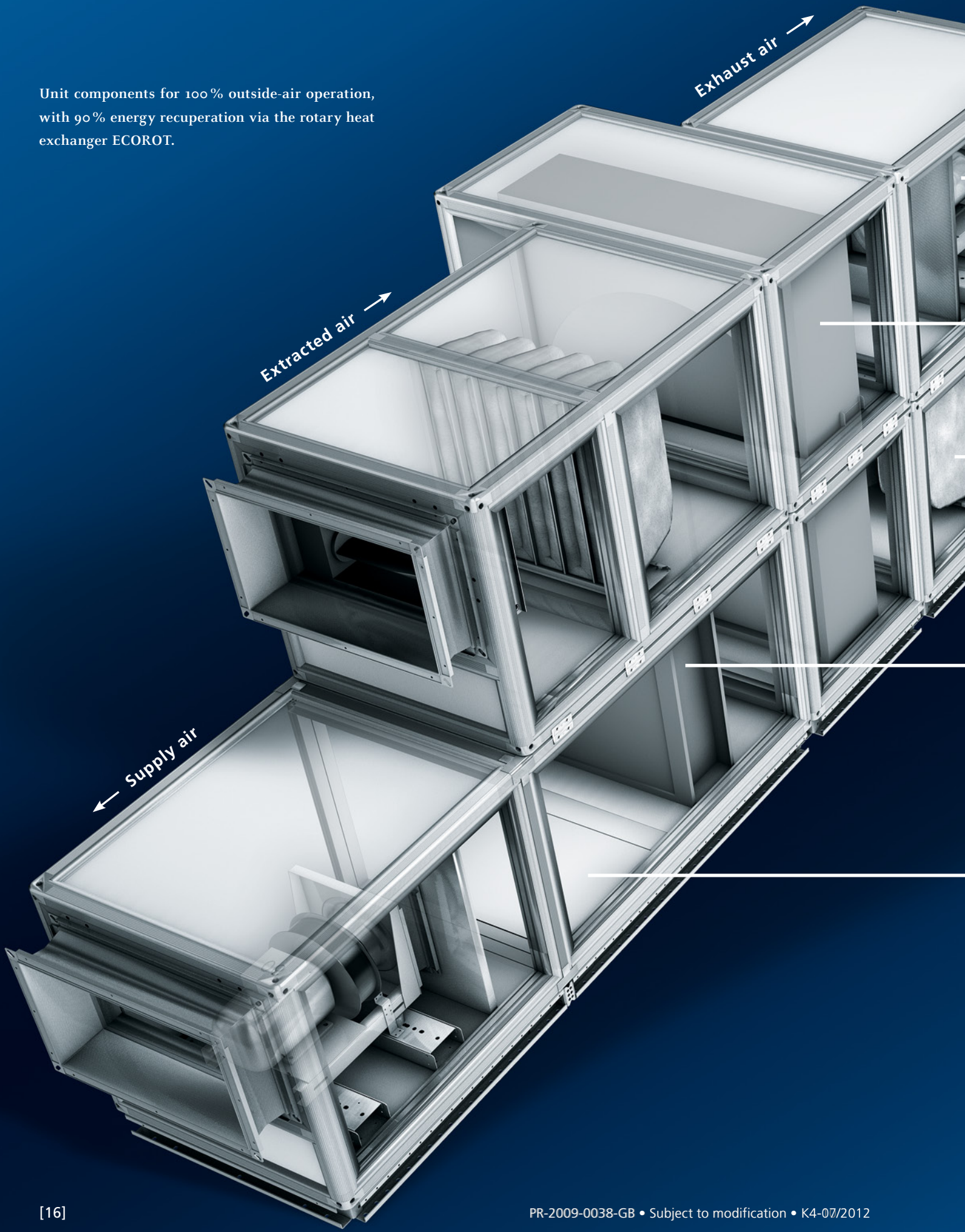
Supply air - dehumidification - humidification - cooling - heating - filtration - outside air // exhaust air - recirculated air - extracted air

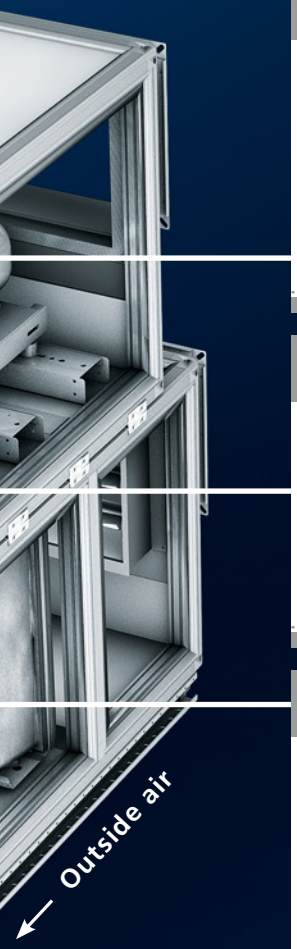


Activation control of the valve drives as desired: with or without mounted or separate frequency converters.

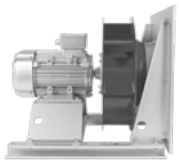
Unit components

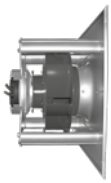
Unit components for 100 % outside-air operation, with 90 % energy recuperation via the rotary heat exchanger ECOROT.



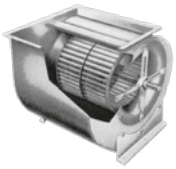


Fans - with blades curved forward (V) or backward (R)


Backward-curved direct drive via B5 motor


Backward-curved direct drive via EC motor


Backward-curved belt drive via B3 motor


Forward-curved drive via B3 motor

Energy recuperation


ECOFLOW

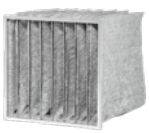

ECOSTAT


ECOPLAT


ECOTWIN


ECOROT

Air filters


Bags


Panels


Cassettes

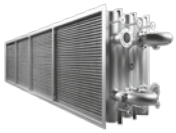

HEPA filters


Grease separation

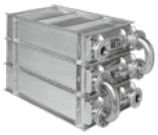

Activated carbon

Heat exchangers


Copper


Steel


Plain-ended pipe

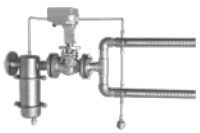

Stainless steel


Electrical heating grill

Humidifiers


Humidifier dummy section

Electrical steam generator


Saturated-steam lance


Evaporation


Spray humidifier

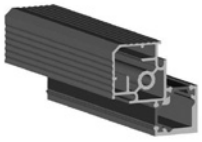
Configuration options - routing of airflow - unit profile

Areas of application: indoor/outdoor installation for horizontal airflow routing - vertical airflow only for indoor installation

- Single supply- and extracted-air units — Configurations: horizontal or vertical
- Combined supply- and extracted-air units — Configurations: one behind, over, or next to the other
- Unit width in modular grid of: — 640 mm … 3,120 mm
- Unit height in modular grid of: — 520 mm … 3,120 mm
- Height of base frame: — 80 mm
- Unit interior completely smooth as per stipulations in VDI 6022, VDI 3803, and DIN 1946 (Part 4)
- Special design forms and special measurements are available upon request

Enclosure frame profile sections – 60 mm

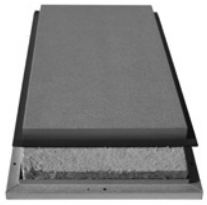
Areas of application: indoor and outdoor installation



- Frame profile sections made of aluminum AlMgSi 0.5
- Frame profile sections made of aluminum AlMgSi 0.5 with powder coating
- Frame profile sections made of aluminum AlMgSi 0.5 with powder coating
- RAL colors (but not metallic) available as per customer's request

Enclosure panels – 50 mm wall thickness

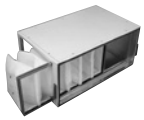
Areas of application: indoor and outdoor installation



- Inner shell: aluminum-zinc AZ 185, with anti-fingerprint coating in accordance with DIN EN 55928, Part 8; Corrosion Protection Class III
- Inner shell: sheet steel, galvanized, with powder coating
- Inner shell: stainless steel V2A, material no. 1.4301 or V4A, material no. 1.4571
- Outer shell: aluminum-zinc AZ 185, with anti-fingerprint coating in accordance with DIN EN 55928, Part 8; Corrosion Protection Class III
- Outer shell: sheet steel, galvanized, with powder coating
- RAL colors (but not metallic) available as per customer's request

Material properties of installed components

Areas of application: indoor and outdoor installation



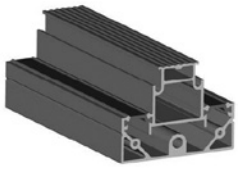
- Sheet steel, galvanized
- Sheet steel, galvanized, with powder coating or with higher-quality material properties for greater corrosion protection

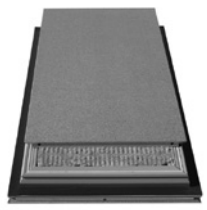
Types of application

Areas of application: indoor and outdoor installation

- Series-production version in accordance with VDI 6022 and VDI 3803
- Hygiene version in accordance with DIN 1946, Part 4
- EEx version for greater safety in accordance with ATEX Guideline 94/9EG (ATEX 95)
- Unit frame with lifting lugs for up to 1,500 kg, or transport gear for unit base frame for greater loads
- Special version upon request

Properties as per prEN 1886 Enclosure wall = 50 mm Inside and outside installation	CAIR*plus* SX-K	Without additional thermal separation							
	Test criterion	Unit	Pressure	Limit value	Class				
	● Mechanical stability	mm/m	–	10	D2				
	● Leakage	l/s/m²	–400 Pa	0.15	L1				
	● Leakage	l/s/m²	+700 Pa	0.22	L1				
	● Filter bypass leakage	%	+400 Pa	0.5	F9				
	● Thermal insulation	W/m²/K	–	1.0 < U < = 1.4	T3				
	● Thermal bridging factor	–	–	0.45 < = kb < = 0.60	TB3				
	● **Frequency range**	**Hz**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
	Acoustic insulation	**dB**	17	21	27	30	31	31	40

Properties as per prEN 1886 Enclosure wall = 50 mm Inside and outside installation	CAIR*plus* SX-M	With additional thermal separation of the frame profile sections							
	Test criterion	Unit	Pressure	Limit value	Class				
	● Mechanical stability	mm/m	–	10	D2				
	● Leakage	l/s/m²	–400 Pa	0.15	L1				
	● Leakage	l/s/m²	+700 Pa	0.22	L1				
	● Filter bypass leakage	%	+400 Pa	0.5	F9				
	● Thermal insulation	W/m²/K	–	1.0 < U < = 1.4	T3				
	● Thermal bridging factor	–	–	0.60 < = kb < = 0.75	TB2				
Intermediate profile section	● **Frequency range**	**Hz**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
	Acoustic insulation	**dB**	16	19	26	29	31	32	42

Properties as per prEN 1886 Enclosure wall = 50 mm Inside and outside installation	CAIR*plus* SX-T	With complete thermal separation of the frame profile sections and the panels							
	Test criterion	Unit	Pressure	Limit value	Class				
	● Mechanical stability	mm/m	–	10	D2				
	● Leakage	l/s/m²	–400 Pa	0.44	L1				
	● Leakage	l/s/m²	+700 Pa	0.63	L1				
	● Filter bypass leakage	%	+400 Pa	0.5	F9				
	● Thermal insulation	W/m²/K	–	0.5 < U < = 1.0	T2				
	● Thermal bridging factor	–	–	0.60 < = kb < = 0.70	TB2				
	● **Frequency range**	**Hz**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
	Acoustic insulation	**dB**	15	27	29	31	31	34	40

High-performance radial fan for V-belt drive
Impeller 2-side intake for standard IEC motors, model type B3

Range of application: 1,000 … 125,000 m³/h

- Fan blades curved forward
- Impeller size 180 … 1,250
- Impeller in spiral enclosure, sheet steel, galvanized
- Output control by means of motor speeds or frequency converter
- Range of operation: -20 °C … + 80 °C

Technical data for comparison
Air flow in 10,000 m³/h/500 Pa external

SFP 1.15 kW/m³/s

Impeller diameter	mm	500
Fan efficiency	%	66.4
Rating at the shaft:	kW	2.5
Operating point, P electrical	kW	3.4
Rating of motor at 1,500 rpm	kW	3.0
Sound power level on the air-discharge side	dB(A)	86
Sound power level on the air-intake side	dB(A)	89

High-performance radial fan for V-belt drive
Impeller 2-side intake for standard IEC motors, model type B3

Range of application: 1,000 … 125,000 m³/h

- Fan blades curved backward
- Impeller size 180 … 1,250
- Impeller in spiral enclosure, sheet steel, galvanized
- Output control by means of motor speeds or frequency converter
- Range of operation: -20 °C … + 80 °C

Technical data for comparison
Air flow in 10,000 m³/h/500 Pa external

SFP 0.95 kW/m³/s

Impeller diameter	mm	500
Fan efficiency	%	81.0
Rating at the shaft	kW	2.0
Operating point, P electrical	kW	2.7
Rating of motor at 1,500 rpm	kW	3.0
Sound power level on the air-discharge side	dB(A)	83
Sound power level on the air-intake side	dB(A)	84

Open-running high-performance radial fan for direct drive
Impeller 1-side intake with directly flange-connected standard IEC motors

Range of application: 1,000 … 85,000 m³/h

- Fan blades curved backward
- Impeller size 225 … 1,250
- Impeller open-running, without spiral enclosure
- Motors as per efficiency class Eff 1 or Eff 2
- Output control by means of frequency converter
- Range of operation: -20 °C … + 40 °C

Technical data for comparison
Air flow in 10,000 m³/h/500 Pa external

SFP 0.92 kW/m³/s

Impeller diameter	mm	560
Fan efficiency	%	78.5
Rating at the shaft	kW	2.0
Operating point, P electrical	kW	2.5
Motor rating	kW	2.2
Sound power level on the air-discharge side	dB(A)	89
Sound power level on the air-intake side	dB(A)	87

Open-running high-performance radial fan for direct drive
Impeller 1-side intake
with directly flange-connected standard IEC motors

Range of application: 1,000 … 12,000 m³/h

- Fan blades curved backward
- Impeller size: 280 … 630
- Impeller open-running, without spiral enclosure
- Great efficiency as a result of EC external-rotor motors
- Output control by means of frequency converter
- Range of operation: -20 … + 40 °C

Technical data for comparison
Air flow in 10,000 m³/h/500 Pa external

SFP 0.92 kW/m³/s

Impeller diameter:	mm	560
Fan efficiency	%	76.1
Rating at the shaft:	kW	1.9
Operating point, P electrical	kW	2.4
Motor rating:	kW	2.2
Sound power level on the air-discharge side	dB(A)	89
Sound power level on the air-intake side	dB(A)	87

Coarse- and fine-particle filters as bag filters
Filter classes G4 … F9 in accordance with DIN EN 779

Area of use: separation of coarse- and fine-particle dust					Length of bag	Filter area per m²
● G4	Synthetic fiber			Am 90 %	360 mm	5.0 m²
● F5	Synthetic fiber	Em 47 %		Am 98 %	534 mm	10.0 m²
● F5	Synthetic fiber	Em 47 %		Am 98 %	360 mm	11.0 m²
● F7	Synthetic fiber	Em 85 %		Am 99 %	534 mm	16.0 m²
● F7	Synthetic fiber	Em 85 %		Am 99 %	380 mm	15.0 m²
● F9	Micro-glass filter	Em 95 %		Am 99 %	600 mm	21.0 m²

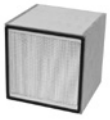
Coarse- and fine-particle filters as panel filters
Filter classes G4 … F9 in accordance with DIN EN 779

Area of use: separation of coarse- and fine-particle dust					Installation depth	Filter area per m²
● G4	Polypropylene	Em 50 %		Am 96 %	96 mm	22.1 m²
● F5	Polypropylene	Em 50 %		Am 96 %	96 mm	22.1 m²
● F7	Polypropylene	Em 88 %		Am 99 %	96 mm	22.1 m²
● F9	Polypropylene	Em 88 %		Am 99 %	96 mm	22.1 m²

Fine-particle filters as cassette filters
Filter classes F6 … F9 in accordance with DIN EN 779

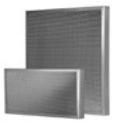
Area of use: separation of fine-particle dust with a minimum of space requirements					Installation depth	Filter area per m²
● F6	Micro-fiberglass fleece	Em 73 %		Am 98 %	298 mm	34.0 m²
● F7	Micro-fiberglass fleece	Em 86 %		Am 99 %	298 mm	34.0 m²
● F9	Micro-fiberglass fleece	Em 96 %		Am 99 %	298 mm	38.0 m²

HEPA filters with seal-seat test groove and seal-seat test pipe in accordance with DIN 1946, Part 4
Filter class H13 in accordance with DIN EN 1882



Area of use: separation of micro-fine particles in strict hygiene areas					Installation depth	Filter area per m²
● H13	Micro-fiberglass fleece			Am 99.95 %	292 mm	42.3 m²

Grease filters as panel filters
Filter class G3 in accordance with DIN EN 779



Area of use: separation of grease (but not oils)					Installation depth	Filter area per m²
● G3	Aluminum wire mesh			Am 87 %	48 mm	0.77 m²

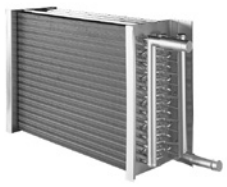
Activated-carbon filters as cartridge filters with bayonet fitting

Area of use: separation of gaseous odors and pollutants					Installation depth	Filter area per m²
● Activated-carbon cartridges, with 16 cartridges per 1/1 cell					450 mm	64.0 l

Em = efficiency, Am = degree of separation

Finned tube heat exchanger – Series SD 181 … SD 400
Materials: copper / aluminum

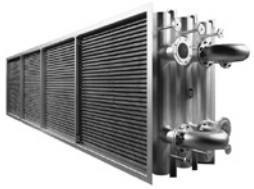
Area of application: pumped warm water (PWW), pumped hot water (PHW), pumped cold water (PCW), or refrigerant (R)



- Core copper pipe with attached aluminum, strip-coated aluminum, or copper fins
- Fin interval optimized in accordance with performance requirements: 1.8 … 4.0 mm
- Frame as chosen: galvanized sheet steel, aluminum, copper, or stainless steel
- Direct evaporator with intake manifold and refrigerant distributor made of copper
- Optional: heat exchanger, complete, dip-coated, for enhanced corrosion protection
- Maximum operating pressure: 16 bar; temperature of medium: 110 °C
- Special versions available as requested

Finned tube heat exchanger – Series FE and FV
Materials: galvanized steel (FE) / stainless steel (FV)

Area of application: pumped warm water (PWW), pumped hot water (PHW), saturated steam (SD), thermo-oil, and pumped cold water (PCW)



- Core pipe with fins galvanized together in dip bath
- Fin interval optimized in accordance with performance requirements: 2.1 … 6.0 mm
- Frame as chosen: galvanized sheet steel or stainless steel
- Steam heat exchanger with vertically configured core pipes
- Optional: Stainless-steel heat exchanger (FV), material no. 1.4301 or 1.4371
- Maximum operating pressure: 16 bar; temperature of medium: 110 °C
- Special high-pressure version available: 25 bar, with German TÜV certification

Smooth-pipe heat exchanger – Series SD000 – Series FE000 – Series FV000
Materials: copper / steel / stainless steel

Area of application: unfiltered air flow, filter icing protection, filter bacterial protection, low outputs

- Properties the same as described for Series SD, FE, or FV, but here without fins
- As icing protection in front of outside-air filters. By heating = reduction in relative humidity
- As bacterial protection in front of the outside-air filter. By heating = reduction in relative humidity
  Here, also see VDE 6022, Sheet 1, and DIN 1946, Part 4
- For after-heating with high temperatures of medium, and for low outputs
- Recommended maximum temperature increase: 3 K
- Maximum operational pressure: 16 bar; temperature of medium: 110 °C

Electrical heat exchanger – electrical frost-protection heating – gas-fired heater

Area of application: electrical or gas-driven heating systems

Electrical heat exchanger

- Electrical heat exchanger with a maximum surface temperature of 100 °C at the heating grids
  With safety temperature limiter and monitor as per VDE/DIN 57100, VDI 3803
- Electrical frost-protecting heating as heating for idle equipment, installed in equipment compartments
  For protection of frost-sensitive installed elements in weatherproof enclosures
- Directly natural-gas-fired stainless-steel heat exchanger

ECOFLOW – finned-tube heat exchanger, Series DD, as combined circulation system (KVS)
Materials: copper / aluminum

Area of application: operation of separately installed supply/extracted-air units – energy transport via brine circulation

- Properties as for Series SD heat exchangers
- 100 % separation of supply and extracted air flows
- Optional: Series FE steel heat exchanger
- A frost-protection control system is necessary to prevent frosting of the extracted-air heat exchanger; optional via the GEA hydraulic module

- Approximate maximum efficiency 70 %
- Danger of frosting in the extracted-air heat exchanger yes
- Cooling recuperation yes
- Moisture recovery no

ECOSTAT – finned-tube heat exchanger, Series SD, as heatpipe unit, with or without integrated bypass louver
Materials: copper / aluminum

Area of application: operation of supply/extracted-air units installed one over the other, or next to each other - energy exchange via aluminum plates

- Properties as for Series SD heat exchangers
- Fin interval: 2.1 … 2.5 mm
- Core copper pipe filled with R134a refrigerant
- Autonomous operation, without auxiliary power, by evaporation of the refrigerant in the core pipes

- Approximate maximum efficiency 60 %
- Danger of frosting in the extracted-air heat exchanger no
- Cooling recuperation no
- Moisture recovery no

ECOPLAT/ECOTWIN – aluminum-plate heat exchanger with or without integrated bypass louver
Material: aluminum spacers

Area of application: operation of supply/extracted-air units installed one over the other, or next to each other - energy exchange via aluminum plates

ECOTWIN

- Standard plate heat exchanger ECOPLAT
  Plate interval 3.0 … 12.0 mm
  Optional: high-performance class
- Double-plate heat exchanger ECOTWIN
  Plate interval 6.0 … 12.0 mm
  High-performance class
  Optional: with integrated recirculated-air louver
- Optional: ECOPLAT / ECOTWIN with surface finish for corrosive environments

- Approx. max. efficiency for ECOPLAT 70 %
- Approx. max. efficiency for ECOTWIN 80 %
- Frosting danger in extracted-air heat exchanger yes
  At extracted-air humidity > 45 %, a frost-protection control system is required.
- Cooling recuperation yes
- Moisture recovery no

ECOROT – rotary heat exchanger with 3 optional storage cores
Material: aluminum storage mass

Area of application: operation of supply/extracted-air units installed one over the other, or next to each other - energy exchange via aluminum storage mass

- Rotating aluminum storage mass
- Condensation rotor with moisture exchange in case of condensation
  Optional: epoxy-coated storage mass in case of corrosive environment
- Enthalpy rotor with enhanced moisture exchange, especially in case of condensation
- Sorption rotor for high transmission of latent throughout the entire year

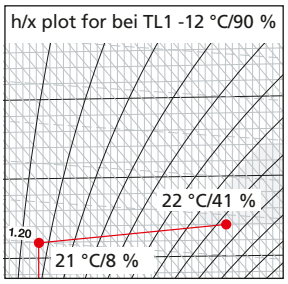
- Approx. max. efficiency 90 %
- Frosting danger in extracted-air no
- Cooling recuperation yes
- Moisture recovery yes
- Optional: 2 parallel rotors (ECOROT-DUO) for configuration of units one behind the other
- Control device for continuously variable speed adjustment

Electrical steam humidifier
Maximum humidification output: 232 kg/h for electrical connection ratings of 4 x 43.5 kW

Area of application: steam humidification by production and release of pure water vapor, free of minerals

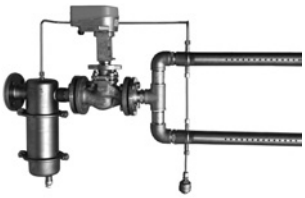
HygroMatik HyLine

- Maximum steam volume for operation with mains water: 232 kg / 4 x 43.5 kW
- Maximum steam volume for operation with partially demineralized water: 232 kg / 1 x 45.0 kW
- Steam humidifier for fully automatic production and release of water vapor
- Supply and treatment of water for the unit: from user's mains network
- Water feed via solenoid valve
- Regenerable steam cylinder
- Electronic control system with microprocessor control



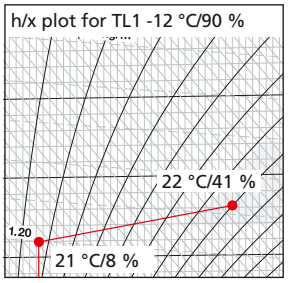
Saturated-steam humidifier for outside steam networks
Maximum humidification output: 451 kg/h of steam at 1.5 bar

Area of application: dry steam humidification via installed saturated-steam lance



HygroMatik DDS

- Incoming steam feed from user's own network
- Steam lance and steam dryer made of stainless steel
- Built-in lance heating
- ARI valve with 24-volt servodrive for 0 … 10 V actuating signal
- Condensate drain in form of ball float

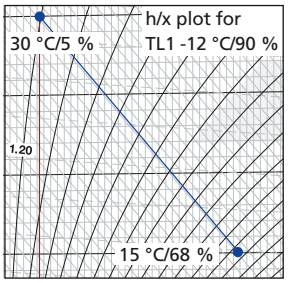


Evaporative humidifier
Maximum efficiency: approx. 65 % or 85 % (two models)

Area of application: humidification via fresh or recirculated water, by dripping over humidification cassettes

Picture shows recirculated-water operation

- Incoming water feed from user's own network
- Operation with completely demineralized (distilled) water not possible
- Water-distribution hood and float valve for water feed
- Water catch tray and sheet-metal parts made of stainless steel, material no. 1.4301
- Non-inflammable humidification cassettes made of GLASDek-TM.

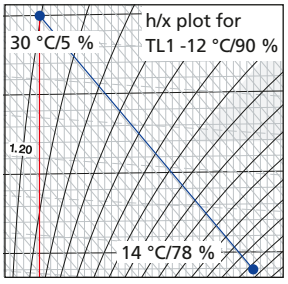


Spray humidifier (air scrubber)
Maximum efficiency: approx. 88 %, 92 %, or 95 % (3 model lengths)

Area of application: humidification with fresh or recirculated water, by spray mist from high-performance aerosol nozzles

Picture: with optional accessories

- Incoming water feed from user's own network via an installed float valve
- Operation with completely demineralized (distilled) water is possible
- Enclosure made of glass fiber-reinforced plastic (GRP)
- Nozzle block with threaded nozzle-pipe distributors
- High-performance aerosol nozzles, self-cleaning and non-clogging
- Block pump with 3-phase AC motor
- Air rectifier and PPTV droplet separator; temperature durability up to 130 °C



Sound-absorber unit
Sound-absorption splitters with upper material made of glass-fiber fabric or fleece made of filament glass yarn

Sound-attenuation at	lengths (mm) of	600	920	1200	1520	1720	2000	2320
● 63 Hz	dB	5	6	7	8	9	9	10
● 125 Hz	dB	10	13	17	21	24	28	31
● 250 Hz	dB	14	20	27	33	39	45	50
● 500 Hz	dB	17	24	32	40	48	50	50
● 1000 Hz	dB	17	25	33	41	49	50	50
● 2000 Hz	dB	14	20	26	32	38	43	49
● 4000 Hz	dB	9	13	16	20	23	27	30
● 8000 Hz	dB	8	11	13	16	19	21	24

Empty units / air-inlet units / maintenance units / service units / multi-functional units
With or without louver flaps
Access as desired: with or without access doors or service cassettes

Lengths of the units in modular grid, as per selection or according to minimum requirements

Door lock

Door hinge

- With louver flaps installed on the inside or outside
- With clamping frame for sensors or thermostats
- With baffle-plate diffuser downstream of the fan units
- Lockable access doors; available with crank handles or T-handles

Louver flaps for outdoor air, recirculated air, extracted air, exhaust air, mixed air
With plastic gears for counter-rotating operation of the louver blades

Louvers/ sealing lips in EPDM quality	Material	Leakage as per DIN EN 1751	Class
● Without sealing lips	Galvanized sheet steel	60 m³/h / m² / 100 Pa	> 1
● Without sealing lips	Stainless steel 1.4301	60 m³/h / m² / 100 Pa	> 1
● With sealing lips	Aluminum	20 m³/h / m² / 100 Pa	> 2
● With sealing lips, airtight as per DIN 1946, Part 4	Galvanized sheet steel	10 m³/h / m² / 100 Pa	> 3
● With sealing lips, airtight as per DIN 1946, Part 4	Aluminum	10 m³/h / m² / 100 Pa	> 3
● With sealing lips, airtight as per DIN 1946, Part 4	Stainless steel, 1.4301	10 m³/h / m² / 100 Pa	> 3
● Special louver flaps as per DIN EN 1751, Class 4	Upon request	5 m³/h / m² / 100 Pa	4

Duct connectors for supply air, outside air, extracted air, exhaust air

Material properties of the 4-hole profile sections as selected: galvanized sheet steel, galvanized and coated sheet steel, stainless steel

- Flexible (sailcloth) connections, for sound absorption (PVC fittings)
- Hygiene-connection fittings, rigid, for airborne and structure-borne noise attenuation
- Both versions are without fixed metal links between the equipment units and the duct connections

Model sizes	Free unit cross-section width x height	Approx. airflow 1.0 m/s	2.5 m/s	General unit properties	Fans V-belt drive	Fans direct drive
Type	mm x mm	m³/h	m³/h	1 3	1 3	1 3
064 • 040	640 x 400	1,000	2,300	1 3	1 3	1 3
096 • 040	960 x 400	1,400	3,500	1 3	1 3	1 3
128 • 040	1280 x 400	1,800	4,600	1 3	1 3	

1 Lying, one behind the other ⇦ ⇦

2 Lying, one over the other ⇨ ⇦

3 Lying, next to each other ⇦ ⇨

4 Standing, one above the other ⇧

Model sizes	Unit cross-section width x height	Approx. airflow 1.0 m/s	2.5 m/s	General unit properties	Fans V-belt drive	Fans B5 direct drive
Type	mm x mm	m³/h	m³/h	1 2 3 4	1 2 3 4	1 2 3
064 • 052	640 x 520	1,200	3,000	1 2 3 4	1 2 3 4	1 2 3
064 • 064	640 x 640	1,500	3,700	1 2 3 4	1 2 3 4	1 2 3
096 • 052	960 x 520	1,800	4,500	1 2 3 4	1 2 3 4	1 2 3
064 • 096	640 x 960	2,200	5,500	1 2 3	1 2 3	1 2 3
096 • 064	960 x 640	2,200	5,500	1 2 3 4	1 2 3 4	1 2 3
128 • 064	1,280 x 640	3,000	7,500	1 2 4	1 2 4	1 2
096 • 096	960 x 960	3,300	8,200	1 2 3 4	1 2 3 4	1 2 3
096 • 128	960 x 1,280	4,500	11,200	1 3	1 3	1 3
128 • 096	1,280 x 960	4,500	11,200	1 2 3 4	1 2 3 4	1 2 3
160 • 096	1,600 x 960	5,500	13,700	1 2 3	1 2 3	1 2 3
128 • 128	1,280 x 1,280	6,000	15,000	1 2 3 4	1 2 3 4	1 2 3
188 • 096	1,880 x 960	6,500	16,200	1 2	1 2	1 2
160 • 128	1,600 x 1,280	7,500	18,700	1 2 3	1 2 3	1 2 3
188 • 128	1,880 x 1,280	8,500	21,200	1 2 3	1 2 3	1 2 3
160 • 160	1,600 x 1,600	9,000	22,500	1 2 3	1 2 3	1 2 3
220 • 128	2,200 x 1,280	10,000	25,000	1 2	1 2	1 2
188 • 160	1,880 x 1,600	11,000	27,500	1 2 3	1 2 3	1 2 3
252 • 128	2,520 x 1,280	11,500	28,700	1 2	1 2	1 2
220 • 160	2,200 x 1,600	12,500	31,200	1 2 3	1 2 3	1 2 3
188 • 188	1,880 x 1,880	12,500	31,200	1 2 3	1 2 3	1 2 3
220 • 188	2,200 x 1,880	15,000	37,500	1 2 3	1 2 3	1 2 3
280 • 160	2,800 x 1,600	16,000	40,000	1 2	1 2	1 2
252 • 188	2,520 x 1,880	17,000	42,500	1 2 3	1 2 3	1 2 3
220 • 220	2,200 x 2,200	17,500	43,700	1 2 3	1 2 3	1 2 3
280 • 188	2,800 x 1,880	19,000	47,500	1 2	1 2	1 2
220 • 252	2,200 x 2,520	20,000	50,000	1 3	1 3	1 3
312 • 188	3,120 x 1,880	21,100	52,700	1 2	1 2	1 2
280 • 220	2,800 x 2,200	22,200	55,500	1 2 3	1 2 3	1 2 3
252 • 252	2,520 x 2,520	23,000	57,500	1 3	1 3	1 3
312 • 220	3,120 x 2,200	24,500	61,300	1 2	1 2	1 2
280 • 252	2,800 x 2,520	25,500	63,700	1 3	1 3	1 3
280 • 280	2,800 x 2,800	28,000	70,000	1 3	1 3	1 3
312 • 252	3,120 x 2,520	28,000	70,000	1 3	1 3	1 3
312 • 280	3,120 x 2,800	31,500	78,700	1 3	1 3	
312 • 312	3,120 x 3,120	35,000	87,500	1 3	1 3	

Model sizes	ECOFLOW	ECOSTAT	ECOPLAT	ECOTWIN	ECOROT	ECOROT DUO
	1 3	3	3	–	–	–
064 • 040	1 3	3	3			
096 • 040	1 3	3	3	–	–	–
128 • 040	1 3	3	3			

1 Lying, one behind the other ⇦ ⇦

2 Lying, one over the other ⇨ ⇦

3 Lying, next to each other ⇦ ⇨

4 Standing, one above the other ⇧

Model sizes	ECOFLOW	ECOSTAT	ECOPLAT	ECOPLAT TWIN	ECOROT	ECOROT DUO
	1 2 3 4	2 3	2 3	2	2 3	1
064 • 052	1 2 3 4	2 3	2 3	2	2 3	
064 • 064	1 2 3 4	2 3	2 3	2	2 3	–
096 • 052	1 2 3 4	2 3	2 3	2	2 3	
064 • 096	1 2 3	2 3	2 3	2	2 3	
096 • 064	1 2 3 4	2 3	2 3	2	2 3	
128 • 064	1 2 4	2	2	2	2	
096 • 096	1 2 3 4	2 3	2 3	2	2 3	–
096 • 128	1 3	3	3		3	
128 • 096	1 2 3 4	2 3	2 3	2	2 3	
160 • 096	1 2 3	2 3	2 3	2	2 3	
128 • 128	1 2 3 4	2 3	2 3	2	2 3	
188 • 096	1 2	2	2	2	2	–
160 • 128	1 2 3	2 3	2 3	2	2 3	
188 • 128	1 2 3	2	2	2	2 3	
160 • 160	1 2 3	2 3	2 3	2	2 3	1
220 • 128	1 2	2	2	2	2	
188 • 160	1 2 3	2	2	2	2 3	1
252 • 128	1 2	2	2	2	2	
220 • 160	1 2 3	2	2	2	2 3	
188 • 188	1 2 3				2 3	1
220 • 188	1 2 3				2 3	1
280 • 160	1 2	2	2	2	2	
252 • 188	1 2 3				2 3	
220 • 220	1 2 3				2 3	1
280 • 188	1 2				2	
220 • 252	1 3				3	1
312 • 188	1 2	–	–	–	2	
280 • 220	1 2 3					
252 • 252	1 3					1
312 • 220	1 2				2	
280 • 252	1 3					1
280 • 280	1 3					1
312 • 252	1 3	–	–	–	–	
312 • 280	1 3					1
312 • 312	1 3					1

Model sizes	Humidifier empty chambers	Elec. steam humidifiers	Saturated-steam humidifiers for outside steam networks	Evaporative humidifiers	Spray humidifiers (air scrubbers)
Type	1 3	–	–	–	–
064 • 040	1 3				
096 • 040	1 3	–	–	–	–
128 • 040	1 3				

1 Lying, one behind the other ⇦ ⇦

2 Lying, one over the other ⇨ ⇦

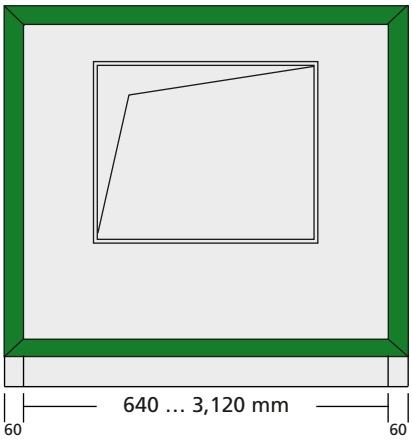
3 Lying, next to each other ⇦ ⇨

Model sizes	Humidifier empty chambers	Elec. steam humidifiers	Saturated-steam humidifiers for outside steam networks	Evaporative humidifiers	Spray humidifiers (air scrubbers)
Type	1 2 3	1 2 3	1 2 3	1 2 3	1 3
064 • 052	1 2 3	1 2 3	1 2 3	1 2 3	1 3
064 • 064	1 2 3	1 2 3	1 2 3	1 2 3	1 3
096 • 052	1 2 3	1 2 3	1 2 3	1 2 3	1 3
064 • 096	1 2 3	1 2 3	1 2 3	1 2 3	1 3
096 • 064	1 2 3	1 2 3	1 2 3	1 2 3	1 3
128 • 064	1 2	1 2	1 2	1 2	1
096 • 096	1 2 3	1 2 3	1 2 3	1 2 3	1 3
096 • 128	1 3	1 3	1 3	1 3	1 3
128 • 096	1 2 3	1 2 3	1 2 3	1 2 3	1 3
160 • 096	1 2 3	1 2 3	1 2 3	1 2 3	1 3
128 • 128	1 2 3	1 2 3	1 2 3	1 2 3	1 3
188 • 096	1 2	1 2	1 2	1 2	1
160 • 128	1 2 3	1 2 3	1 2 3	1 2 3	1 3
188 • 128	1 2 3	1 2 3	1 2 3	1 2 3	1 3
160 • 160	1 2 3	1 2 3	1 2 3	1 2 3	1 3
220 • 128	1 2	1 2	1 2	1 2	1
188 • 160	1 2 3	1 2 3	1 2 3	1 2 3	1 3
252 • 128	1 2	1 2	1 2	1 2	1
220 • 160	1 2 3	1 2 3	1 2 3	1 2 3	1 3
188 • 188	1 2 3	1 2 3	1 2 3	1 2 3	1 3
220 • 188	1 2 3	1 2 3	1 2 3	1 2 3	1 3
280 • 160	1 2	1 2	1 2	1 2	1
252 • 188	1 2 3	1 2 3	1 2 3	1 2 3	1 3
220 • 220	1 2 3	1 2 3	1 2 3	1 2 3	1 3
280 • 188	1 2	1 2	1 2	1 2	1
220 • 252	1 3	1 3	1 3	1 3	1 3
312 • 188	1 2	1 2	1 2	1 2	1
280 • 220	1 2 3	1 2 3	1 2 3	1 2 3	1 3
252 • 252	1 3	1 3	1 3	1 3	1 3
312 • 220	1 2	1 2	1 2	1 2	1
280 • 252	1 3	1 3	1 3	1 3	1 3
280 • 280	1 3	1 3	1 3	1 3	1 3
312 • 252	1 3	1 3	1 3	1 3	1 3
312 • 280	1 3	1 3	1 3	1 3	1 3
312 • 312	1 3	1 3	1 3	1 3	1 3

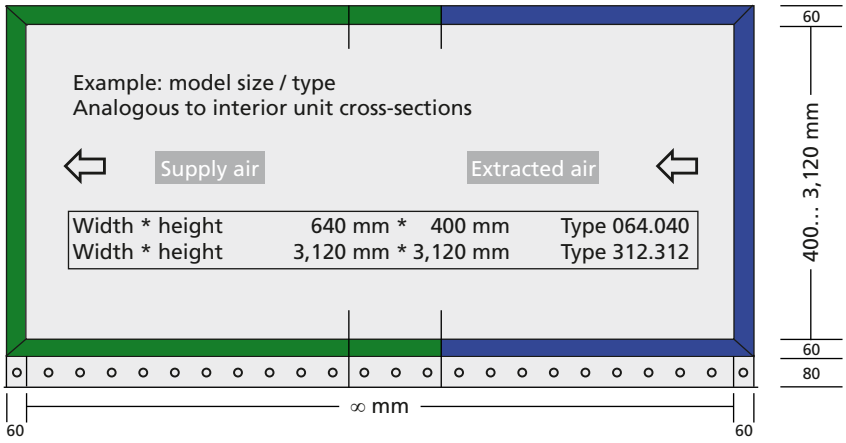
Lying, one behind the other

Model size 064.040 ... Type 312.312

View of front side, supply air



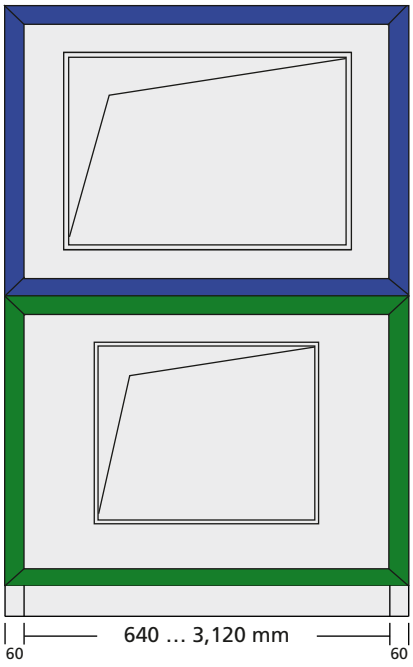
View of operator side



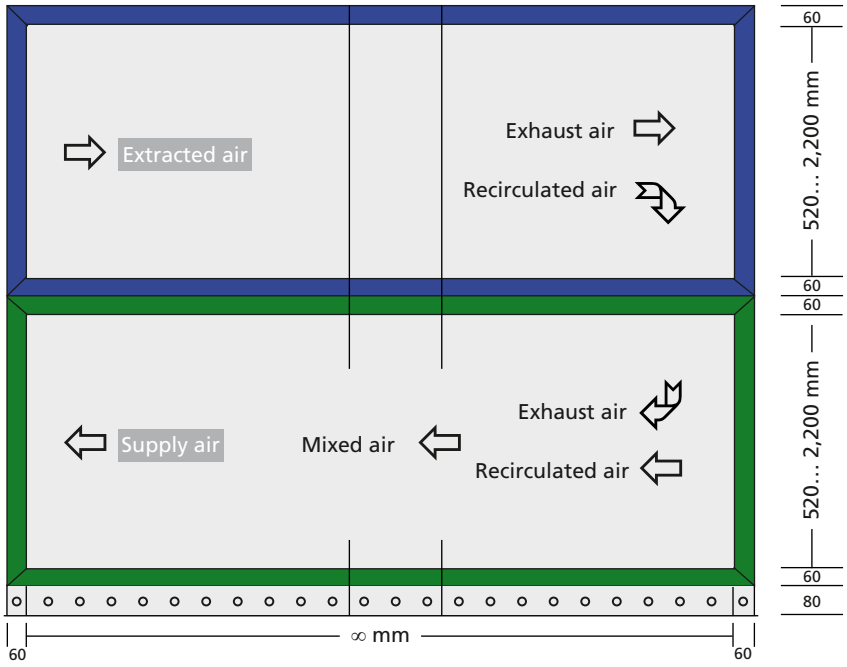
Lying, one above the other

Model size 064.040 ... Type 312.312

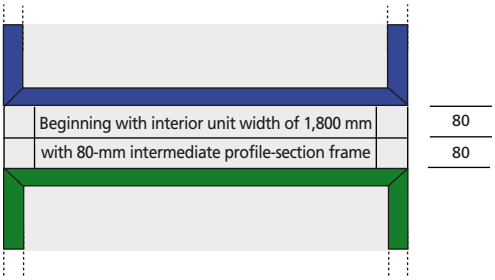
View of the front side



View of operator side

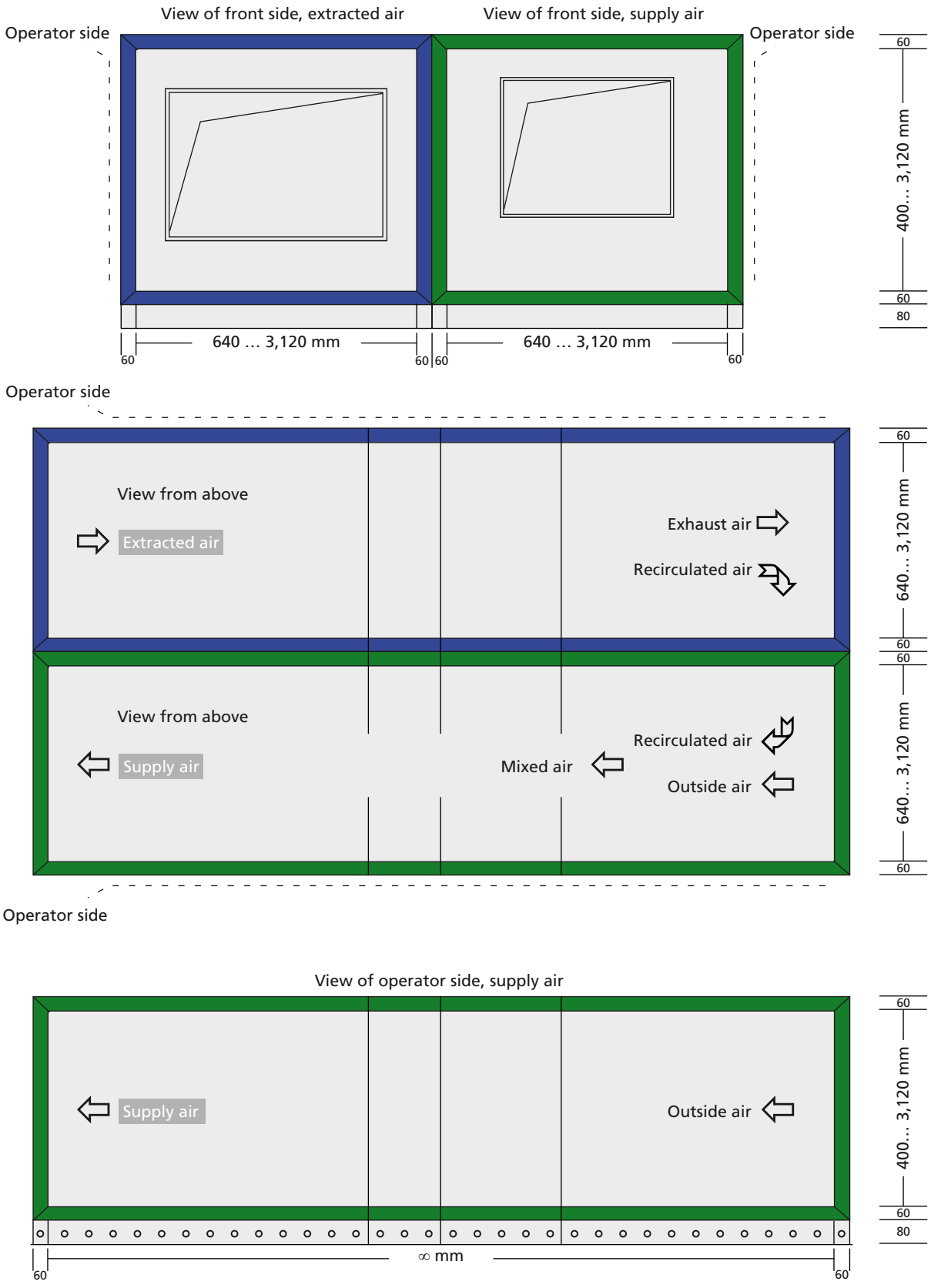


Beginning with model size 188.XXX



Lying, next to each other

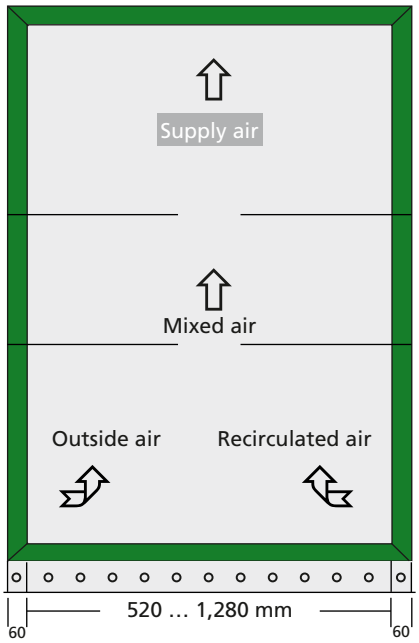
Model size 064.040 ... Type 312.312



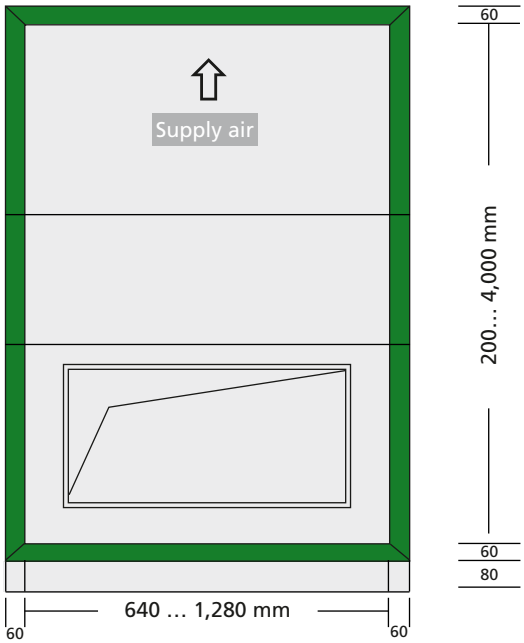
Standing, one above the other

Model size 064.052 ... Type 128.128

View, operator side



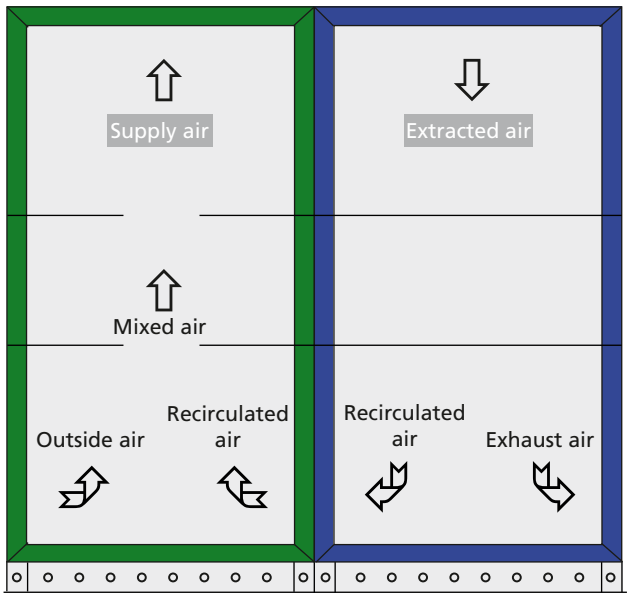
Side view



Standing, one above the other, in U form

Upon request

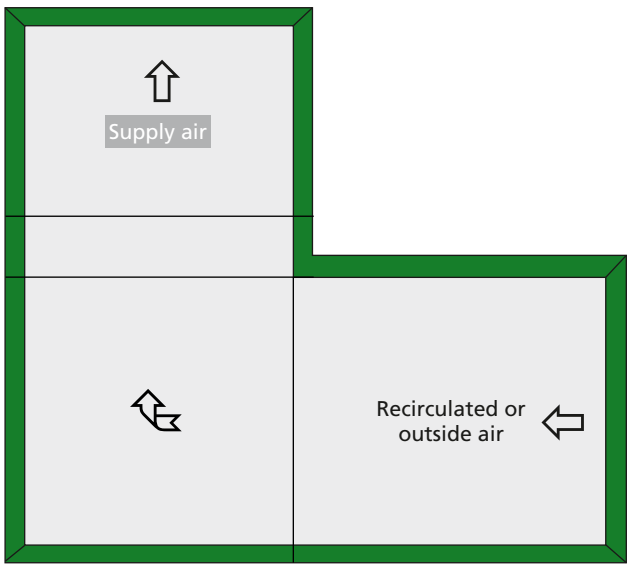
View, operator side



Lying, one behind the other, in L form

Upon request

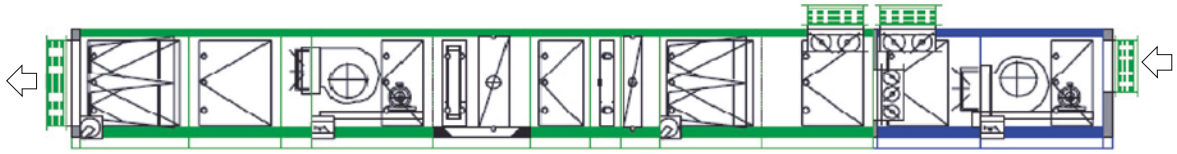
View from above



Examples of unit configurations – without energy recuperation

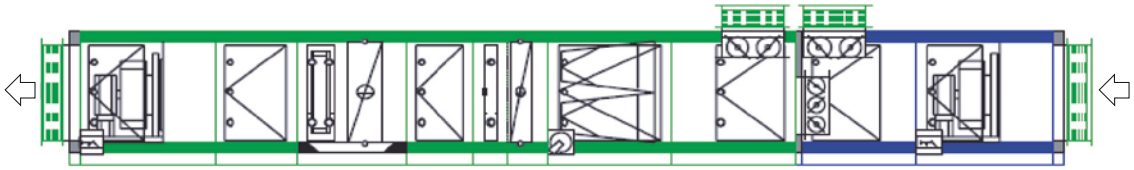
Lying, one unit behind the other, with V-belt drive – 2 filter stages

Filtration - supply air - cooling - heating - filtration - mixing - extracted air



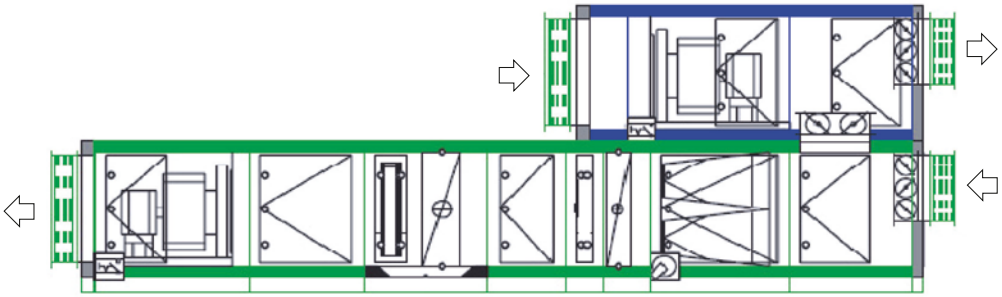
Lying, one unit behind the other, with direct drive – 1 filter stage

Supply air - cooling - heating - filtration - mixing - extracted air



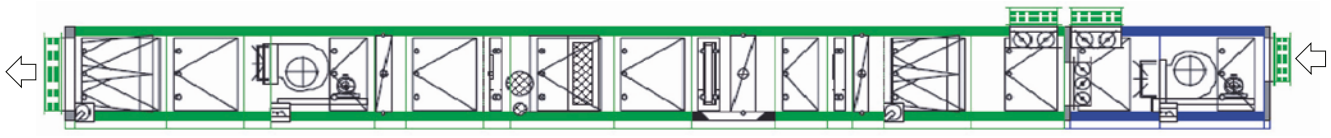
Lying, one unit over the other, with direct drive – 1 filter stage

Supply air - cooling - heating - filtration - heating - mixing - extracted air



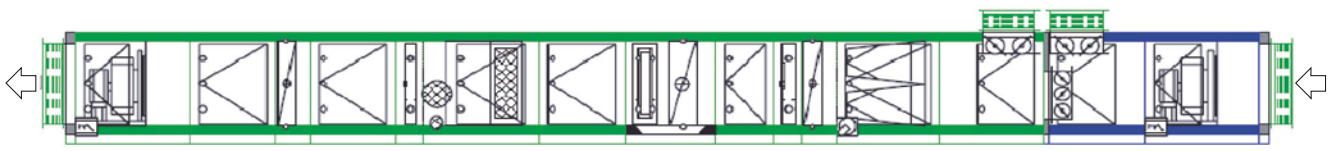
Lying, one unit behind the other, with V-belt drive – 2 filter stages – complete climate-control configuration

Filtration - supply air - dehumidification - humidification - cooling - heating - filtration - mixing - extracted air



Lying, one unit behind the other, with direct drive – 1 filter stage – complete climate-control configuration

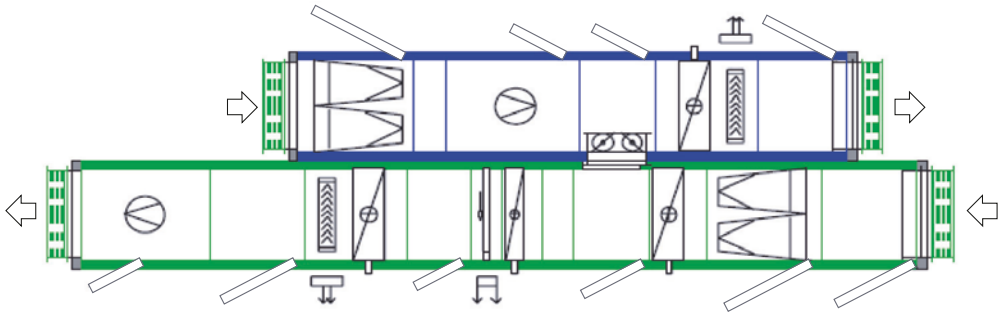
Supply air -- dehumidification - humidification - cooling - heating -filtration - mixing - extracted air



Examples of unit configurations – with energy recuperation

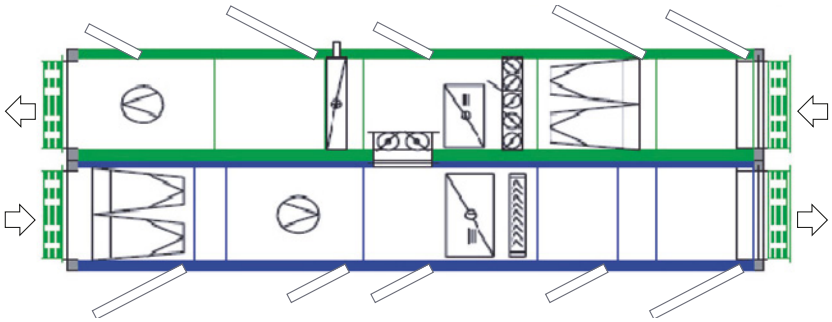
Lying, one unit next to the other, with direct drive – 1 filter stage – ECOFLOW

Supply air - cooling - heating - mixing - ECOFLOW energy recuperation - filtration
Filtration - extracted air - mixing - ECOFLOW energy recuperation



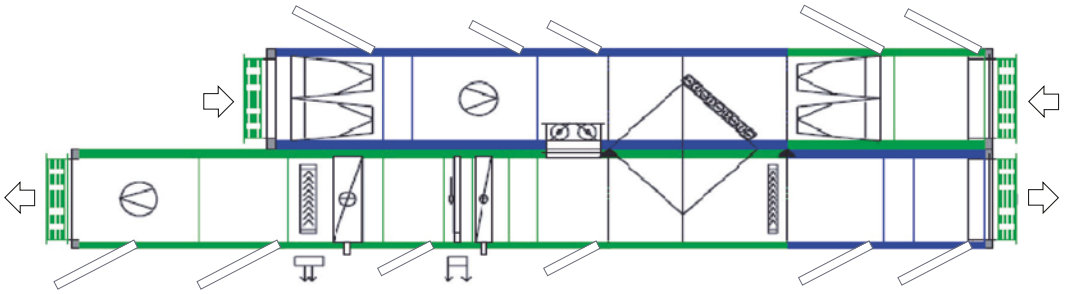
Lying, one unit next to another, with direct drive – 1 filter stage – ECOSTAT

Supply air - heating - mixing - ECOSTAT energy recuperation - filtration
Filtration - extracted air - mixing - ECOSTAT energy recuperation



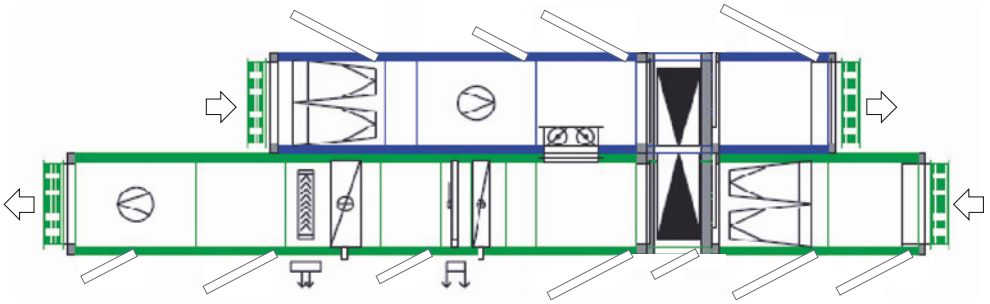
Lying, next to each other, with direct drive – 1 filter stage – ECOPLAT

Supply air - cooling - heating - mixing - ECOPLAT energy recuperation - filtration
Filtration - extracted air - mixing - ECOPLAT energy recuperation



Lying, next to each other, with direct drive – 1 filter stage – ECOROT

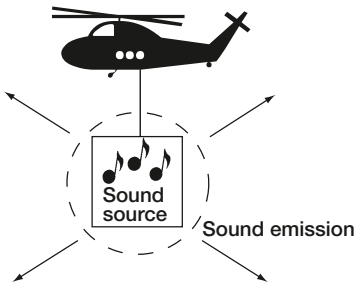
Supply air - cooling - heating - mixing - ECOROT energy recuperation - filtration
Filtration - extracted air - mixing - ECOROT energy recuperation



Full sphere

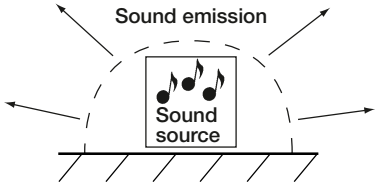
Direction factor 1

Only theoretical variables



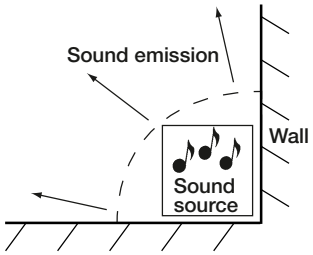
Hemisphere

Direction factor 2



Quadrant

Direction factor 4



Example:

79 dB(A) **sound power level**

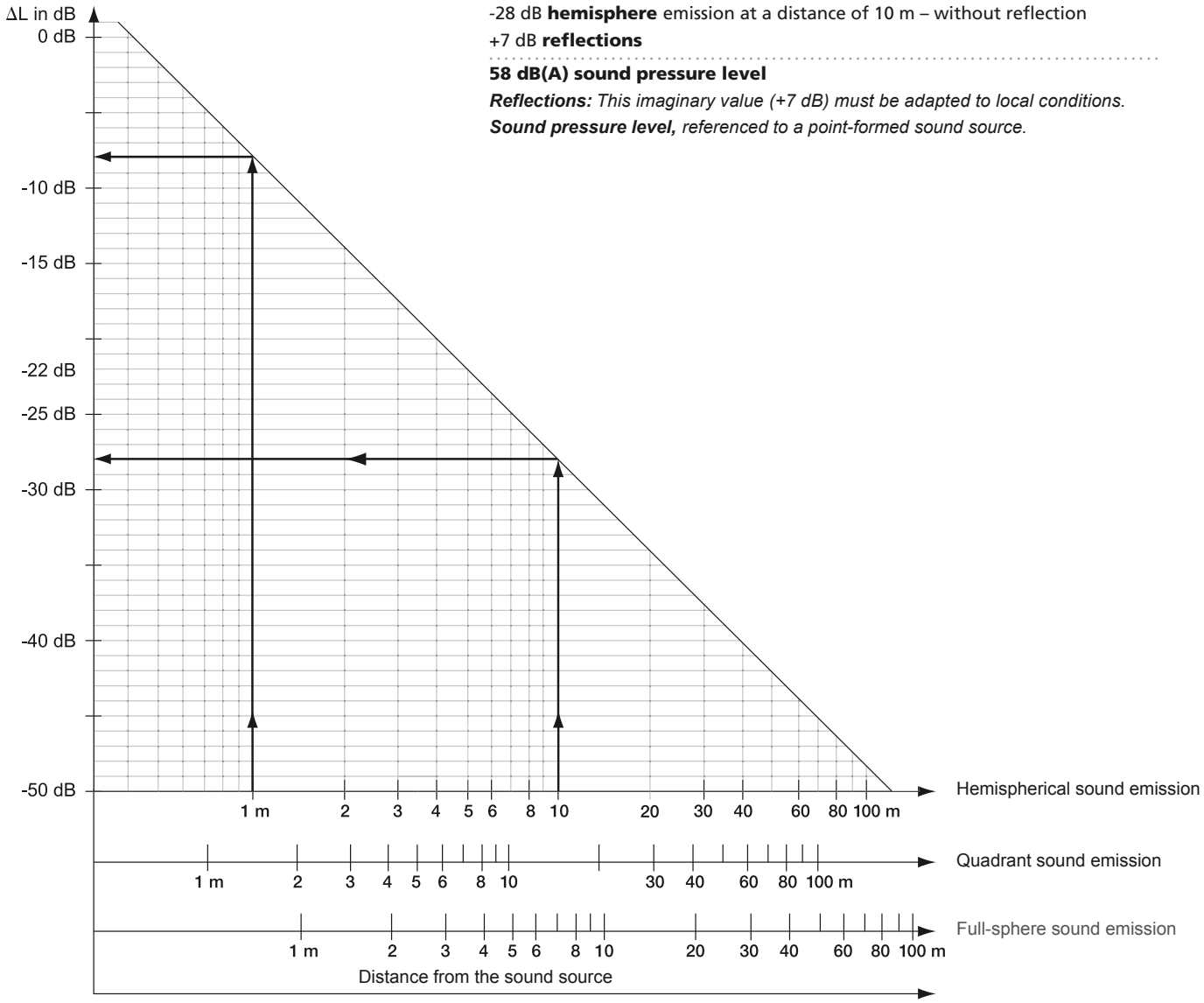
-28 dB **hemisphere** emission at a distance of 10 m – without reflection

+7 dB **reflections**

58 dB(A) sound pressure level

Reflections: *This imaginary value (+7 dB) must be adapted to local conditions.*

Sound pressure level, *referenced to a point-formed sound source.*



79 dB(A) sound power level: measurable, but not perceptible (like the heat output of a radiator).
58 dB(A) sound pressure level: measurable and perceptible (like the increase in room temperature by a radiator).

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