PRODUCT BROCHURE

For a good working environment under extreme conditions

Intelligent air treatment with CAIRplus Air Handling Units

DencoHappel®

HIGHEST SAFETY

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.

IF YOU HANDLE AIR, YOU MUST MASTER IT

The experts for air treatment and air cooling

If you need air heating, cooling, filtering, cleaning, humidifying, or dehumidifying, DencoHappel is your reliable and powerful partner – with customized climate control and air treatment for the greatest possible reduction of energy consumption over the entire service life of your equipment. With increasing system responsibilities, our competence center for air treatment solutions covers the entire process chain of air treatment: from the intake of outside air to the transfer of treated air into rooms. The scope of activity comprises concept creation, technical design, and engineering of the air treatment plant. We make use of our world-wide expertise to develop an optimal air treatment system 100 % matched to your requirements. This pays off in euros and cents, comfort, and work efficiency.

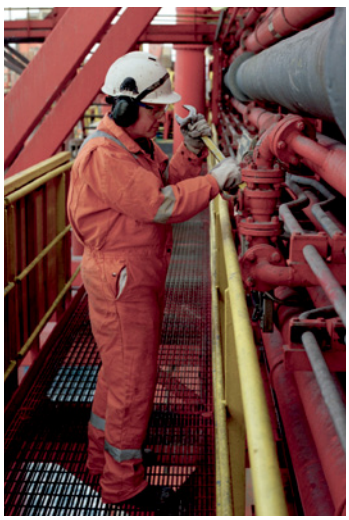
Our air treatment solutions give evidence of our claim to offer our customers comprehensively oriented development that always provide the most efficient option. Our climate-control concepts and equipment are economically and ecologically convincing. They work reliably around the clock and – not least – facilitate your own work. Our products qualify optimally for use in various industries: they offer hotel guests convenient climate control, achieve comfortable and productive working conditions in office and factory buildings, ensure the well-being of visitors, and at the same time protect building substance and exhibits in churches and museums. Precision air conditioning units located in laboratories and data processing centers provide constant indoor climate conditions. Hygienic units are matched to the requirements of the health and industrial sectors. Air filtering and not least clean room systems achieve meticulous production conditions and minimize health risks. In highly sensitive areas of the oil and gas industry, our solutions reliably satisfy all international standards and are among the best in satisfying the demanding classifications of the Eurovent Certification Program for Air Handling Units. They furthermore set new standards for sustainability and superior system integration. Among other benefits, our use of cost-effective motors and heat recovery systems – together with the application of environmentally harmonious heating and refrigeration for our solutions – contributes to the energy efficiency of our systems.

DencoHappel stands for

- Customized air treatment and air cooling
- Healthy, comfortable, and low-noise room climate control
- Maximum energy efficiency with minimal CO_2 emissions
- Precise regulation and control – central as well as decentral
- Many and various adaptation options for a wide range of ambient conditions
- Durability and high availability with low maintenance costs
- Simple system integration

SO YOU CAN TAKE A DEEP BREATH

DencoHappel – your partner in the oil and gas industries



In the oil and gas industries, challenges arise on a routine basis. Working on an extremely high engineering level, cost-effective thinking, and taking action that our customers can trust in: all these are absolutely essential and must be taken for granted. One absolute prerequisite to meet such demands is optimal HVAC systems for buildings on offshore facilities. And it's precisely when the requirements are demanding and the working conditions are difficult – which is often the case with onshore and offshore operations – that powerful and reliable technology is critical. A uniformly high level of quality among our colleagues is even more essential, though – and this is why only experts work for DencoHappel. These are people who have a sharp overview on a large scale, in addition to the details of their assigned area – and who master the language of the oil and gas industries just as well as their own. DencoHappel expert teams also bring along effective ability for constructive collaboration, for application of their experience and expertise. In a well-structured – yet at the same time flexible – process, they develop flawless solutions along with our customers, from the very beginning.

BASED ON COLLABORATIVE COOPERATION

DencoHappel engineers speak your language and drive your project from the beginning to the end.

- Experience in the relevant markets
- Familiarity with laws and regulations
- Technological expertise
- Sensitivity to health, safety, and environmental concerns
- Personal commitment

- The development of engineering studies follows an intensive planning phase. Plans, ideas, and specifications are firmed up and coordinated in kickoff meetings and regular follow-up sessions.
- Once all major problems have been dealt with, and all unexpected eventualities have been cleared up, production starts. Regular monitoring in the factory guarantees the desired progress of the project.
- Personal presence on site and effective support in the startup phase assure a maximum of transparency and reliability.

All DencoHappel staff are involved in the above-sketched process. As a result, communication takes place just as smoothly as implementation of the HX solutions developed later: individual, customized, and coordinated exactly with the requirements on site. This comprehensive commitment, from the first contact on – and up to commissioning and start-up – is a powerful guarantee for greater efficiency. And, above all, for a high level of customer satisfaction.

Configurable in modules – and ATEX-compliant

CAIR*plus*: intelligent and adaptable

- Wide selection of sizes
- Profile-section shapes (square or rectangular)
- Air inlet/outlet sizes, shapes and positions
- Material (various grades of stainless steel, galvanized steel, etc.)
- Finishes (raw material or painting)
- Delivery mode (as mono-blocks or multiblocks)
- Design according to weather conditions (extremely low temperatures, high relative humidity, etc.)
- Choice of integrated components (cooling coils, electric heaters, hot-water coils, humidifiers, plug fans, belt-driven fans, air filters, heat exchangers, etc.)

CAIR*plus* air handling units: unlimited possibilities

Continuous supply of fresh air is one key to staff vitality and good performance. But room climate is influenced by many factors, and requirements for air state differ widely depending on the type of room and its particular use. CAIR*plus* air handling units satisfy these tasks and ensure that a defined state of the air is provided and maintained.

The CAIR*plus* range (CAIR stands for "customized air") is configurable as modules, which opens up practically unlimited possibilities. Whether as indoor or outdoor equipment, vertical or horizontal installation, double-deck, or single or side-by-side units – practically every installation variant is available.

Just what you are looking for

While some applications call for simple and reliable exchange of air, others demand specific quality with respect to temperature, humidity, and purity of the air.

DencoHappel satisfies every requirement for climate and air handling technology with individually designed product lines. Our modular units permit the free selection of components and functions, and all details can be adapted to the precise application. Our compact units are suitable for all areas of application in the oil and gas industry.

CAIR*plus* technology – the best in connections

The enclosures of CAIR*plus* air handling units are made of a combination of aluminum profiles and panels. All panels and doors can be mounted and dismantled from the outside. CAIR*plus* structural design optimally combines stability and functionality. Panels are directly screwed to the stable frame profiles. Assembly joints make it possible to connect the delivered units with only limited manual operations. In order to facilitate transport and installation on site, the unit can be delivered in several modules. Connections can be made inside or outside. The separation joints have no effect on overall unit length. Cover strips for the outside screws simultaneously serve as a seal for weatherproofing. No panel screws are used inside.

Beginning on page 12 you will find more information and technical data on your options regarding materials and components.
Please check pages 8 to 11 for more details on our certifications, documentation, and services.

A matter of cleanliness – always

High hygiene standards are ensured by completely smooth interior surfaces and good accessibility. In addition, no frame components protrude. Compliance with all relevant requirements is regularly monitored. Flexible in construction, the design permits a high insulation class with minimal leakage and great stability.

Absolute safety in explosive environments

In many areas of the oil and gas industry, atmospheres are potentially explosive owing to the presence of mixtures of air and combustible gas, mist, fumes, or dust.

European Directive 94/9/EC, otherwise known as ATEX 95, contains stipulations for "equipment and protective systems for the designated employment in areas subject to explosion hazards." DencoHappel delivers CAIR*plus* units for such designated use in areas subject to explosion hazards according to the Directive 94/9/EC (ATEX 95).

CAIR*plus* is designed for

- Highly corrosive atmospheres
- Explosive atmospheres (ATEX)
- Great reliability, safety, and long service life
- Movement of the equipment (e.g., ring towing mode)

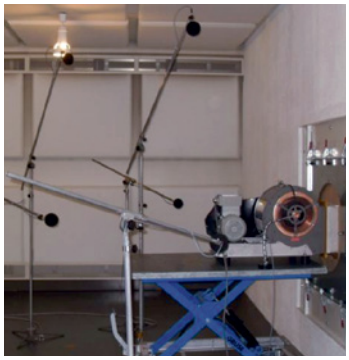
Classification of explosion proof areas

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

Breakdown into temperature classes		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

Please see the available ATEX class for DencoHappel AHUs on page 9.

From research and development to production



Test of fan acoustics

Test of electrical continuity

Quality made in Germany: The principal manufacturing complex of CAIR*plus* has its home office in Wurzen, Germany. Order processing, design, production, and logistics are closely meshed here. The factory in Wurzen is the Competence Center for CAIR air handling units.

DencoHappel has become well established as a premium brand in a variety of areas – because they have proven their value in rugged daily applications, and since they treat the environment gently. Their future-oriented, resource-conserving technology has two solid bases: continuous research and development, as well as ongoing testing of all products and services. This verification also takes place in collaboration with the independent Institute for Air Handling Technology in Herne, Germany.

Measurable perfect performance

For example: before every delivery of an air handling unit, DencoHappel specialists conduct a series of tests in our in-house laboratory and at our suppliers' laboratory. The regular checks and tests of CAIR*plus* air handling units are numerous and in-depth: e.g., tests for air leakage, electrical continuity, fan performance, fan vibration, fan acoustics, coil pressure, etc. This is an intensive yet transparent process. We cordially invite our customers to visit us during such tests to learn what we are doing.

Because each detail counts

Our tests are conducted according to pertinent test criteria and Directives EN 13053, EN 1886, EN 60204, etc. Tested attributes include housing characteristics, enclosure leakage, and performance characteristics (air flow, pressure, etc.).

R&D continuous improvement

The Institute for Air Handling Technology in Herne, Germany, offers a measuring and test bench and a climate chamber for optimization and development tests.

Certified and reliable safety

Model Box Test – enclosure characteristics according to EN 1886

An enclosure unit is sent to an independent testing institute every six years and tested for the following characteristics: mechanical stability, enclosure leakage, filter bypass leakage, thermal insulation, heat bridge factor, and sound absorption.

Real Unit Test – performance characteristics according to EN 13053

A device is selected every three years in the manufacturer's plant by independent experts. This device in actual form is exactly measured at a testing institute, and the results are compared with the software data. The manufacturer's software is certified only if all performance characteristics have been confirmed. Performance data such as the following are measured: air flow, prevailing static pressure, power consumption, noise emitted from the housing, noise transferred in the air line, heating and cooling capacity, heat recovery coefficient, and waterside pressure loss.

Hygiene award and ATEX Certificate of Conformity

The enclosure of the CAIR*plus* air handling units is completely smooth inside and has no edges or screw connectors that could impede complete surface cleaning of the device. This creates optimal conditions for hygienic operation. In addition, CAIR*plus* air handling units are effective for the designated use in areas subjected to explosion hazards according to ATEX Directive 94/9/EC (ATEX 95).

Annual inspection of the production plant

An expert visits the production plant of the certified manufacturer annually. The conformity of the produced equipment is thereby verified by means of configuration software.

CAIR*plus* Certificates

- ISO 9001:2008
- Hygienic operation according to VDI 6022, VDI 3803 and DIN EN 13779

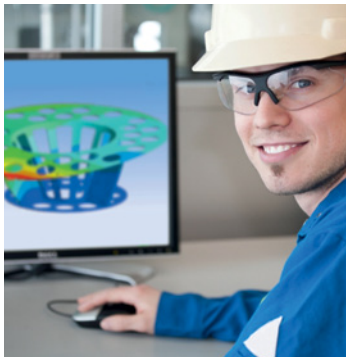
ATEX 94/9/EC (ATEX 95)

- For gas/vapour in surroundings:
  II 2 G, IIB, T3, or T4
  II 3 G, IIB, T3, or T4 inside
- For gas/dust in surroundings:
  II 3 IIB + H2
- For dust in surroundings:
  II 2 D, T135 °C
  II 3 D, T200 °C inside

Further certifications

- Machinery Directive: 2006/42/EC
- Electromagnetic Compatibility Directive: 2004/108/EC
- Pressure Equipment Directive: 97/23/EC
- Gas Appliances Directive: 90/396/EEC
- GOST Certification
- Further certificates on request

From comprehensive documentation and on-site assistance up to after-sales support



Service first

Transparency is essential in the oil and gas industries. Official stipulations must be satisfied, and procedures must be verified. As a good partner, this is work that we gladly take off the shoulders of our customers. We document everything for you from our field of activity and provide all results that you need in black and white: reports, certificates, technical data, drawings, and lists of features.

Certificates

- Material Inspection Certificates
- Conformity Certificates
- Hazardous Area Certificates (ATEX)

Technical documents

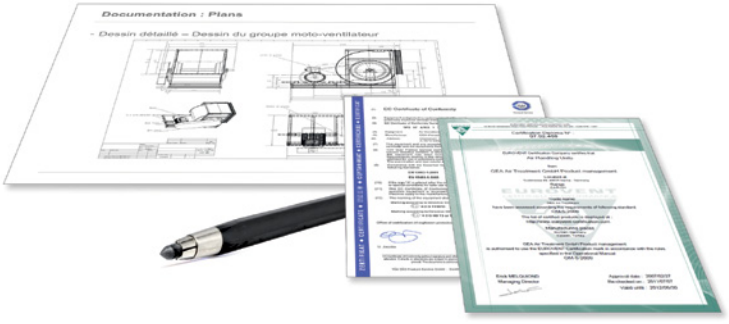
- Equipment data sheets
- General arrangement drawings
- Equipment lists
- Wiring diagrams
- Design calculation notes
- Spare parts lists

Test reports

- Weight Certificates
- Dimensional Control Reports
- Coil-Pressure Test Reports
- Fan Functional Test Reports
- Air-Leakage Test Reports
- Electrical Continuity Test Reports

Procedures

- Handling, transportation, storage
- Installation, assembly
- Operation
- Maintenance



SERVICE IS A VERY PERSONAL MATTER FOR US

Always at your side and down to the smallest detail: DencoHappel engineers are personally concerned that your plant remains in optimal condition.

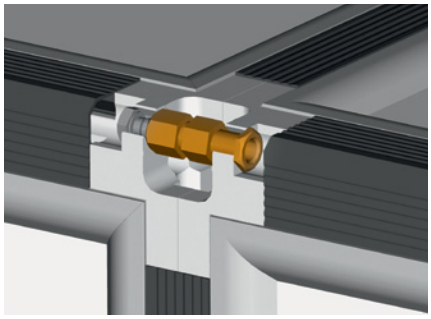
Support, premium grade – with engineering, consulting, and after-sales service

For us, business partnership means: accompanying the customer through every phase of the project. In planning and development onsite – and for assembly and installation, if requested. We are also ready at all times after commissioning and startup, with the right spare parts and the right man onsite: experienced English-speaking engineers with valuable hands-on support and consulting. For example: in the assembly of multiblock units, roof installation in case of outdoor air handling units, etc.

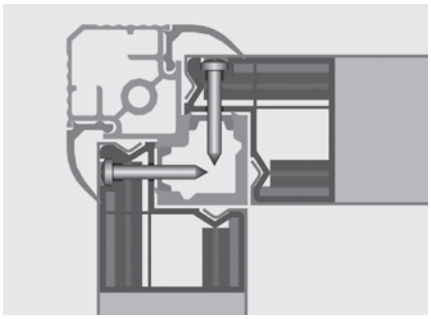
4Service at a glance

- Consulting and sales
- Installation and commissioning
- Service and maintenance contracts
- Spare-part services
- Modifications, enlargements, and extensions
- Survey of existing conditions: e.g., of energy efficiency
- Certification and record logs
- Safety training
- Master plans for air treatment systems

System design – developed to last



The intelligent solution for unit connections: the DencoHappel partition joint connector which disappears behind a protective cover.



The enclosure has a completely smooth interior, which makes it easy to clean. This creates optimal conditions for hygienic operation.

Enclosure structure and material quality

DencoHappel offers top-quality material such as stainless steel 316L (AISI)/1.4404 (EN10027) for base frames, enclosures, doors, and internal components – in accordance with the client's requirements.

All parts can be coated for better protection (Duplex or Triplex coatings, from 60 to 180 µm). The panels and doors are made of a minimum of 50 mm double-skin stainless steel plates with non-hygroscopic insulation (from 80 to 140 kg/m³). The coils can be protected by various types of coatings, such as Heresite Sakaphen, Blygold, etc.

Special maintenance devices can be integrated into the air handling unit to ease the handling of heavy components such as coils, droplet separators, motor-fan sets, etc.

Heavy-duty reinforced floors in stainless steel tear plate or grating to assure secure maintenance areas inside the air handling unit. Each component of CAIR*plus* SX can be labeled with engraved stainless steel plate.

In case of ATEX units, earthing of each component is provided. A door limit switch can be provided to stop the unit in case of intrusion into the air handling unit. The doors are fitted with door-blocking devices, and warning labels and pictograms are affixed. Deep condensate trays especially designed for the offshore industry allow optimum evacuation of condensate in spite of inclination and movement of the structure.

Frame profile sections

- Frame profile sections, 60 mm, are available in coated aluminum. Standard coating color is RAL 9002.

Panels

- Minimum 50 mm wall thickness
- Inner and outer shell in stainless steel (1.4301, 1.4571, 1.4404 or other grades), aluminum-zinc AZ 185 with anti-fingerprint coating in accordance with DIN EN 55928, Part 8; Corrosion Protection Class III, or sheet steel, galvanized with powder coating or raw material
- RAL color 9002 standard

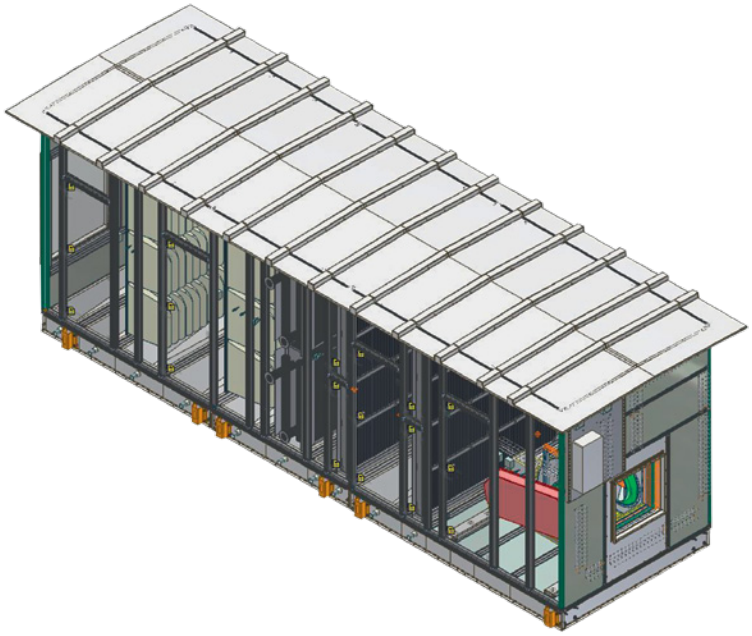
System components – as flexible as requested

Inside and out, technically and spatially, in form and function

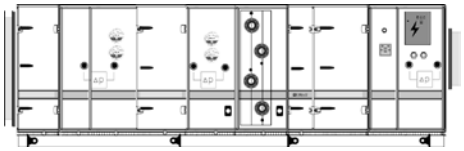
DencoHappel air handling units can be customized, in every respect, exactly to the needs and customer requests encountered in the oil and gas industries. The modular configuration, the frame design, as well as the technical components enable flawless solutions in every single case – for simple or highly complex applications.

An engineering overview of DencoHappel air handling units

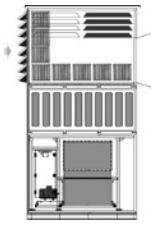
- Mixing boxes (fresh air/recirculation air) with or without dampers
- Filter stages with maintenance enclosure upstream (to allow filter replacements from the "dirty" side) or downstream (for replacement on "clean" side)
- Anti-frost sensor
- Coils: hot water, cold water, DX
- Droplet separators
- Condensate trays
- Electrical heaters and anti-radiation screens
- Humidifiers
- Heat recovery exchangers
- Motor-fan sets
- Roofs
- Cable trays
- Measuring equipment: pressure gauges, measuring nipples, test points, pressure differential switches, pressure-drop sensors ...
- Electrical equipment: isolator switches, impulse push button, emergency push buttons, junction boxes (for control and power), lighting ...
- Etc.



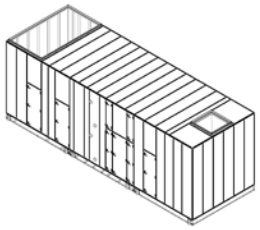
Unit configurations – possibilities



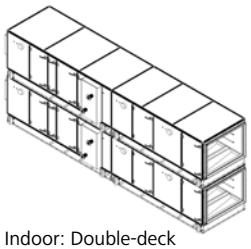
Horizontal air routing



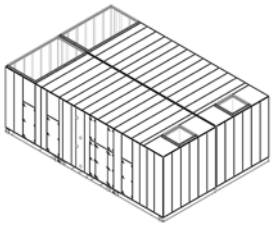
Vertical air routing



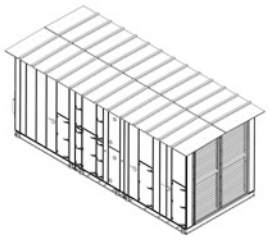
Indoor: Single



Indoor: Double-deck

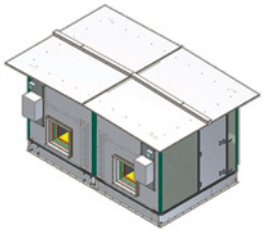


Indoor: Side-by-Side



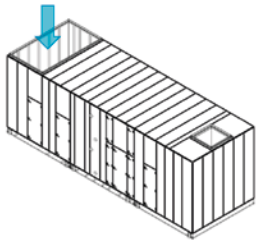
Outdoor: Single

Outdoor: Double-deck

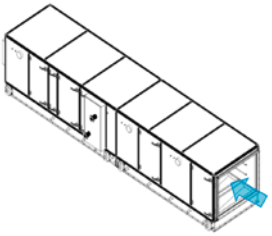


Outdoor: Side-by-Side

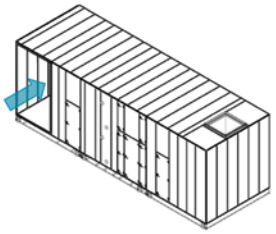
- Single or combined air supply and exhaust units
- Model type: square or rectangular
- Unit width: outer dimensions from 760 to 3,240 mm
- Unit height: outer dimensions from 960 to 3,440 mm
- Height of the unit base frame: 200 mm; other dimensions available on request
- Indoor and outdoor installation for horizontal and vertical air routing
- Special model type and special dimensions available on request



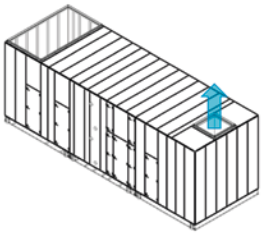
Air inlet on the top



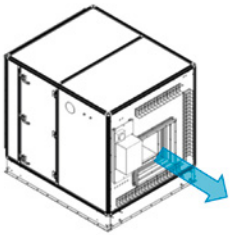
Air inlet on front wall



Air inlet on side wall



Air outlet on the top

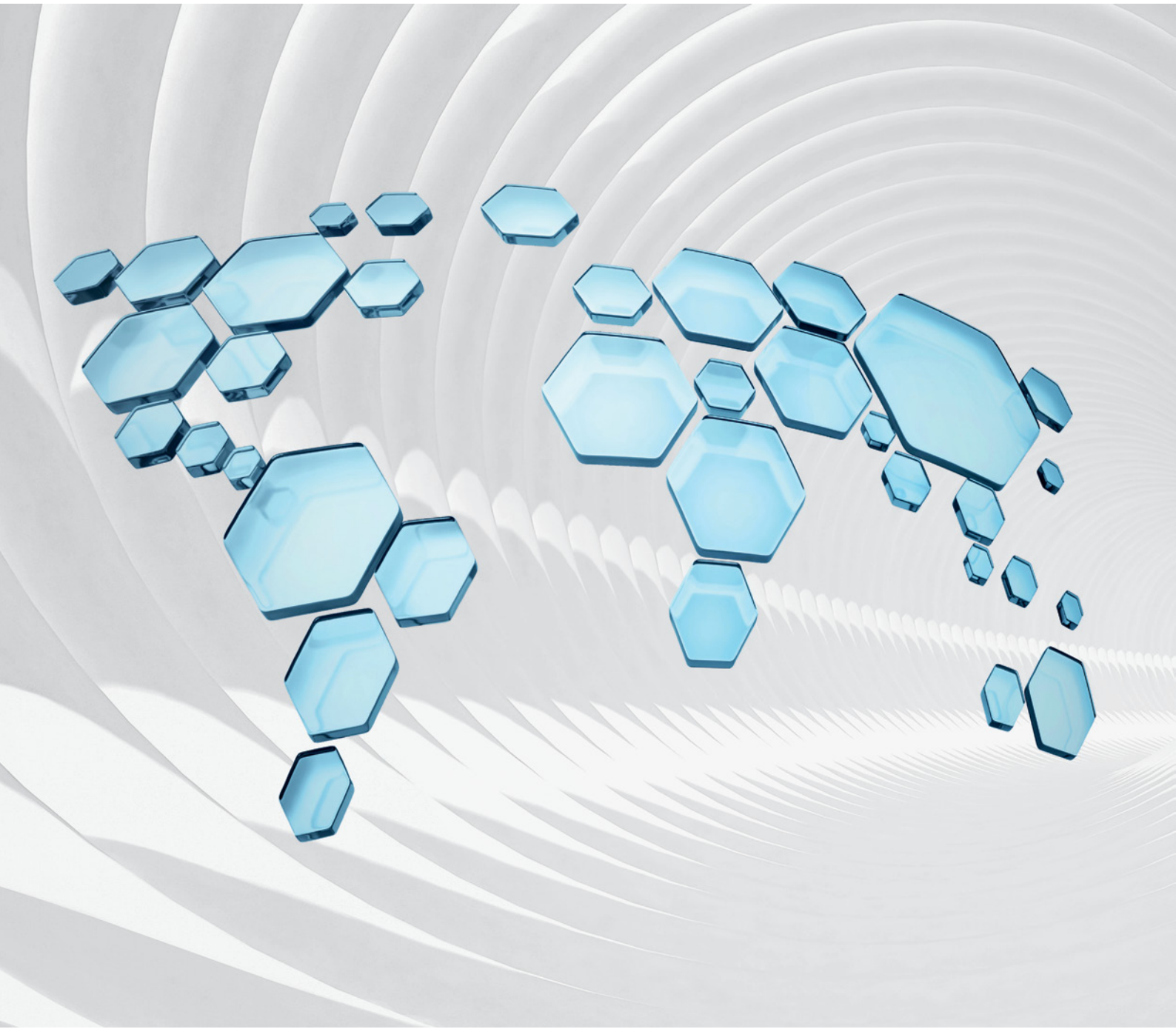


Air outlet on end wall

Fan casing

DencoHappel is a globally operating company with great expertise in air treatment, air conditioning and filtration technology.

Our nearest consulting and service teams will be glad to discuss ideas and develop creative and effective solutions with you.



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