Creating a good climate.

Indoor swimming pool air conditioning | Comfort air conditioning | Process air conditioning

2016

menerga
a systemair company

Every innovation begins with a vision.

Our vision is "Minimal ENERGy Application".
Since 1980.

1980
Menerga company founded
Market launch of the unit series ThermoCond (intelligent swimming pool technology) and AquaCond (heat recovery from waste water)

1983
Market launch of the automatic heat exchanger cleaning system for the AquaCond unit series

1985
Market launch of the Resolair unit series, regenerative heat recovery with over 90% coefficient of performance (COP)

1987
Market launch of the Drysolair unit series (energy-saving air drying)

1988
Replacement of the recuperative aluminium heat exchanger with plastic heat exchangers developed in-house

1991
Market launch of the Dosolair unit series (two-stage recuperative energy recovery) and the Adsolair unit series (cooling without power by means of adiabatic evaporative cooling)

1996
Market launch of the Trisolair unit series (three-stage recuperative energy recovery)

1999
Market launch of the Hybritemp hybrid compact chilled water unit, with integrated recooling system

2000
Menerga Designer: Design of complete air conditioning systems using software developed in-house as cloud solution

2003
Solar sorption-based air conditioning, initial pilot systems

2004
Market launch of energy-efficient compressors with integrated power modulation

2007
New generation of web-enabled control and regulation of ventilation and air conditioning systems

2008
Introduction of the remote control for the ThermoCond 29 unit series using smart phone

2009
Sorpsolair market launch (sorption-based air conditioning – cooling with the sun)

2011
Market launch of the Adcoolair unit series (Green IT) for rooms with high thermal loads

2012
Market launch of Adconair and ThermoCond with counterflow plate heat exchanger. Market launch of energy-efficient plastic regenerators for the Resolair unit series

2013
Menerga becomes part of the Systemair Group. Market launch of fresh water heater without energy from a circulator or heat pump circuit for ThermoCond 38

2014
Market launch of Adiabatic and AdiabaticPro for Adconair 76

Dear Customers and Partners,

We are delighted to be able to present you some of our possible sample configurations within our product range in this catalog. We invite you to get to know our apllications and technical solutions and our special energy philsophy. We have been implementing our philosophy, "Creating a good indoor climate – through Minimal ENERGy Application", on an everyday basis for over 35 years. Through continuous ongoing development, we are furthermore steadily redefining the state of the art.
Get to know a remarkable company with special technology. Join us in creating a good climate – we look forward to it!

Ralf Eichentopf and Frank Ernst
Managing Directors of Menerga

menerga
a systemair company

ADDITIONAL INFORMATION

Swimming pool hall air conditioning

Comfort air conditioning

Heat recovery from waste water / process climate control / chilled water

About Menerga

Minimal Energy Application

We supply air conditioning systems individually designed for your requirements. Our philosophy, „Creating a good indoor climate – through Minimal ENERGy Application", is something we have succeeded in every single day, since the company was founded over 35 years ago. We are proud to be part of the international successful Systemair group since 2013.

Our systems are first-class, intelligent works of engineering and handcraft. They remain reliable in operation for many, many years, significantly reducing operating costs. How is this possible? In the basic design stages we already integrate all the components for air conditioning, such as the ventilation, heating and refrigeration systems, and equip everything with an intelligent control and regulation system. Every system is fully tested before delivery within the framework of a test run. The compact units are always delivered „ready for connection". At the building site, they are connected up and made operational in just a few work stages. With over 40,000 systems installed worldwide, we cover almost every area of application. We do not only sell the units, but also offer you our many years of experience. When looking for the best solution, we jointly analyse the specific conditions at the location together with you. for the optimal solution we ask a lot of questions. Might it also be possible to use an alternative source of energy in order

Convincing arguments for Menerga

- Intelligent Technology = lastingly low operating costs
- Utilisation of regenerative energy sources
- Very compact design
- Integrated control and regulation systems
- Factory test run as standard
- Ready-for-connection delivery
- Excellent maintenance concepts

to reduce the operating costs even further? In this manner, we and our partners have jointly implemented countless projects which have received many awards for beeing energy efficient. We are proud of this. But what we really like about this is the know-how from jointly developed solutions, which allows operators and investors to save hard earned money – day after day, month after month, and year after year. The investment costs are amortised within a short period. We will be happy to produce reference lists for the building types in which you are interested in. And in the event that you surprise us with a totally new project: We are convinced to find the right solution for you. With our eyes sharpened by countless special projects, e.g. the „ALMA" telescope facility in the Atacama desert or the „Princess Elisabeth Station" at the South Pole, we will be happy to accept the challenge.

Associations and guidelines

Menerga is active and certified!

Eurovent

Most of our ventilation units are as standard version Eurovent certified. This means the following series of the Menerga Air range with 50 mm panels and filter classes up to F7/F9: ThermoCond 38/39, Drysolair 11, Adcoolair 75, Trisolair 52/59, Dosolair 54, Adsolair 56/58, Resolair 62/64/66/68, Sorpsolair 72/73 and Adconair 76

Menerga participates in the Eurovent Certified Performance programm for Menerga Air range. Check ongoing validity of certificate: www.eurovent-certification.com or www.certiflash.com

Certification Diploma N° : 14.11.003

Eurovent Certita Certification certifies that

Air Handling Units

from

MENERGA GmbH

Located at

Alexanderstrasse 69
45472 Mülheim an der Ruhr, Germany

Range

Menerga Air

Software for calculation of performances

Menerga Designer 2.4.1

Trade name

Menerga

have been assessed according the requirements of following standard

OM-5-2015

The list of certified products is displayed at :

http://www.eurovent-certification.com

Manufacturing places

Mülheim an der ruhr, Germany

MENERGA GmbH

is authorised to use the EUROVENT CERTIFIED PERFORMANCE mark in accordance with the rules specified in the Operational Manual

OM-5-2015

Erick MELQUIOND
President

Approval date : 2014/11/26
Re-checked on : 2015/09/22
Valid until : 2016/03/31

Passive House Institute

The complete Resolair 64 series and Adconair up to 76 16 01 are officially certified components of the Passive House Institute. They are ideally suitable for passive houses and all other low energy buildings.

Certificate

Certified Passive House Component

For cool, temperate climates, valid until 31 December 2015

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
GERMANY

Category: Heat recovery unit

Manufacturer: Menerga GmbH
45473 Mülheim an der Ruhr,
GERMANY

Product name: Adconair 76 10 01

This certificate was awarded based on the following criteria:

Thermal comfort	$\Theta_{supply\ air} \geq 16.5$ °C at $\theta_{outdoor\ air} = -10$ °C
Effective heat recovery rate	$\eta_{ht,eff} \geq 75\%$
Electric power consumption	$P_{el} \leq 0.45$ Wh/m³
Performance number	≥ 10
Airtightness	Interior and exterior air leakage rates less than 3% of nominal air flow rate
Balancing and adjustability	Air flow balancing possible: yes Automated air flow balancing: yes
Sound insulation	It is assumed that large ventilation units are installed in a separate building services room. Sound levels are documented in the appendix of this certificate.
Indoor air quality	Outdoor air filter F7 Extract air filter G4
Frostprotection	Frost protection required Different strategies are mentioned in the appendix of this certificate

1) Available pressure difference with installed filter: 264 Pa.
Additional components (e.g. heater coil) decrease the available pressure difference accordingly.

Further information can be found in the appendix of this certificate.

www.passivehouse.com 0502vl03

Certified for air flow rates of 3000 – 4500 m³/h

At an external pressure of 316 Pa 1)

Requirements non residential buildings

(Therewith device also applicable for residential building)

$\eta_{ht,eff}$ 92% (4500 m³/h)

$\eta_{ht,eff}$ 94% (3000 m³/h)

Electric power consumption 0.42 Wh/m³

Performance number 11

Ecodesign directive 2016/2018

We are ready!

fulfills ECODESIGN DIRECTIVE 2009/125/EC 2016 + 2018

ATEX

The ATEX directive currently includes two directives in the field of explosion protection, the ATEX Directive 94/9/EC and the ATEX Workplace Directive 1999/92/EC. On request we produce your unit according the ATEX regulations for explosion-hazardous areas.

Manufacturers Association "RLT Hersteller Verband"

Menerga is a member of the german Manufacturers Association for AHU "Herstellerverband Raumlufttechnische Geräte e.V.". Aim of this Association is to develop air handling units at the highest technical level as well as standardization work and technical recommendations.

More...

Of course we also have all common other certificates such as TÜV type examinations, hygiene certificates, ISO 9001 and more.

Please contact us - we are happy to send you an overview or copies of the certificates you might require.

With the new regulation (EU) No. 1253/2014 coming into entry in December 2014 the implementation of the Ecodesign Directive 2009/125/EC is set and with this the requirements for the environmentally friendly design of AHUs.
In addition to basic requirements for the design of AHUs the Ecodesign Directive defines in two stages (01.01.2016 and 01.01.2018) the minimum values for the efficiency of the heat recovery system and maximum power consumption of the fans. Aim is to reduce the energy consumption of the AHU's during their lifespan. Ecodesign Guideline aims for reducing the primary energy consumption of the whole product group for more than 60% until 2025 compared to the stage of 2010.

Due to our strict energy efficiency focus we are not only ready for this - we are prepared for this step since 1980! Most of our units fulfill the requirements of the directive from January 2018 already. With Menerga you can now already plan the projects for the year 2018.

Menerga core competencies

Our areas of application

© Stadt Rijeka

INDOOR SWIMMING POOL AIR CONDITIONING

Private swimming pools, public swimming pool halls, adventure pools, sports pools, saline baths, hotel pools, school pools, therapeutic pools and many more.
Last not least: heat recovery from waste water.

The air conditioning of swimming pool halls is one of the most challenging areas for air conditioning. Here we started 30 years ago, this is where we grew up, and we are now market leaders and innovation pioneers. Our special competency lies in the high heat recovery efficiency lowering operating costs, while robust system design overcomes adverse conditions.

COMFORT AIR CONDITIONING

Low-energy buildings, offices, museums, sports facilities, schools, clinics, hotels, banks, historical buildings and many more.

With comfort air conditioning, the focus is on people. Our technology is based on the respective requirements of a project, but simultaneously always looks for the most efficient method with the lowest consumption of energy. For example, we cool with water in order to save electrical energy, or make use of sorption-based air conditioning, with which you can carry out dehumidification by means of heat, e.g. from solar thermal energy or process waste heat. It is even possible to store excess solar heat for an indefinite period without any losses for the purposes of dehumidification.

PROCESS AIR CONDITIONING AND CHILLED WATER

Air conditioning of data centres, industrial drying, process cooling, air conditioning for warehouses, cold water generation and much more.
Last not least: heat recovery from waste water.

The process air conditioning system must ensure that defined air conditions prevail in a defined situation. Menerga systems guarantee reliable drying, cooling or heating. In the field of chilled water, our systems reliably provide the desired water conditions. Saving energy through the use of intelligent technology is our top priority in this sector as well.

© polarfoundation.org

SPECIAL SOLUTIONS

Research projects, special applications

Challenges and unusual projects are the milestones of Menerga's company history. Since the foundation of our company, we have designed individual solutions for many of our customers. We enjoy taking on challenging projects, knowing that these are the projects that bring valuable experience and which also improve the quality of our "standard" systems.

Insight:
Technology in detail

1 **Quality:** Menerga systems are developed in Germany and focus on highest quality.

2 **Profiles and frames:** the equipment design is based on a long-lasting, robust AU steel frame. Housing designs are available up to the highest thermal bridge class TB1.

3 **Control and regulation:** our systems are ready to connect upon delivery. The intelligent control and regulation equipment guarantees that the system always performs optimally.

4 **Filters:** all HVAC systems are equipped with an optimised filtration system, to protect both persons and technology.

5 **Heating or cooling coils:** for covering the transmission heating or cooling requirement.

6 **Fans:** energy-efficient EC fan motor units.

7 **Indirect adiabatic evaporative cooling:** for cooling purposes, we use natural processes wherever possible, e.g. cooling with water.

8 **Heat exchangers:** we use polypropylene instead of aluminium without any reduction in efficiency and thus minimise both the weight of the system and CO_2 emissions during production.

9 **Droplet eliminator:** efficient mist collectors reliably eliminate aerosols from the air, and prevent moisture from being carried into the air ducts.

10 **Air damper systems:** for precise distribution of the air flow.

11 **Air distribution:** intelligent bypass designs for efficient operation all year round.

12 **Compressor refrigeration system / heat pump:** corresponds to the regulations of DIN EN 378 and is type-tested and certified in accordance with the pressure equipment directive. An individual acceptance is not required.

Always the right solution

Intelligent modular system

In over 30 years of experience in air conditioning and with over 40,000 systems installed worldwide, we have learned a lot. We have adapted our system series to the requirements of the projects. This process has resulted in the creation of a modular system, that allows you to have your system individually adapted to your project.

1st

Selecting a system series allows you to choose the basic orientation of the air conditioning system. Systems in the Adsolair series, for example, are equipped with adiabatic evaporative cooling. If you want to use solar thermal energy for dehumidification, the right choice would be the Sorpsolair series. And in swimming pool halls, systems from the Thermo-Cond series create a good climate.

2nd

After the basic selection process of choosing a series, you can adapt each unit to your individual requirements. This allows you to choose, e.g. air connection fitting positions or the position of the controls cabinet. In this step, the unit is specifically adapted already to the requirements of the plant room, and the particular circumstances onsite.

3rd

And even more is possible, of course. For systems with heating coils the number of pipe rows and hence the heating capacity can be varied for example. Or you can select different filter quality categories, depending on intended use. Additional unit components can be integrated and further adaptations can be implemented, too.

An overview of the most important options can be found on the pages 104 - 105. The fact that we are still using our regular product range, even where there are profound variations, shows you that we have intelligently combined the right modules from the very start.

When it comes to special requirements, we are pros

If necessary, we can build them round

We will find the perfect solution for any project. And if the requirements are ever too special, then we just make our systems even more special. We are the professionals for highly specialised systems and adapt our units faster than anyone else to meet special requirements. An example of this is the world-famous Anna Amalia library in Weimar, an UNESCO World Cultural Heritage Site. The air conditioning for the historically unique collection of books utilises Menerga systems. One of the Resolair units was installed in the cellar vaults, below the book tower. The round tower is approximately 15 metres high, has a wooden spiral staircase and is one of the highlights in the library's ensemble. The cellar vaults below are likewise round, and can only be reached via a single, narrow corridor. The special challenge was sensibly fitting the system into the round cellar. In cooperation with the installer, the air conditioning unit was divided into compact transportation units, carried in through a narrow hatch at the rear of the tower and installed. The special feature is the semi-round design of the system, which is certainly unique. A nice reference project for the performance of Menerga, but only one example of the many possibilities. We are capable of reacting quickly and flexibly to meet your very specific requirements and onsite circumstances. In addition to the many options presented to you by our product range, we can also develop entirely new unit concepts for your special requirements. As, for example, we did for the Felsland Dahn leisure pool. The intention was to wisely make use of the excess heat from a combined heat and power system – and so our engineers developed the first sorption-based swimming pool dehumidification system in Germany. The result is a high-performance, reliable system that reduces the operating costs by approx. 40,000 euros per year. We have countless examples of such special systems. Just ask us! We develop and manufacture these special systems for you. Because we can. For over 30 years now.

MB 50 unit housing

For all units in the Menerga Air range

Measured values according to DIN EN 1886	
Casing stability	D1 (M)
Air tightness -400 Pa	L1 (M)
Air tightness +700 Pa	L1 (M)
Filter bypass leakage	F7 (M), optional F9 (M)
Heat transfer	T2
Thermal bridge factor	TB1

Eurovent 2014

Use of the MB 50 housing	Unit standard	Menerga Air
ThermoCond 19	-	●
ThermoCond 23	-	●
ThermoCond 29	-	●
ThermoCond 38	●	●
ThermoCond 39	●	●
Drysolair 11	-	●
Adcoolair 75	-	●
Trisolair 52/59	-	●
Dosolair 54	●	●
Adsolair 56/58	●	●
Resolair 62/66		●
Resolair 64/68	●	●
Sorpsolair 72/73		●
Adconair 76	●	●

Thermal insulation shell

The PUR thermal insulation shell reduces heat losses and hence energy expenditure. This means the best possible avoidance of thermal bridges, and virtually no condensation on the outside of the unit.

Thermal bridge factor TB1

Unit cover

Unit cover as a dual-shell sandwich element with a frame profile around the edge. Panel thickness 50 mm. Inside and outside sheet panels galvanised with a polyester coating. Corrosion category III. Colour RAL 2004 or RAL 7035. Sheet thickness 0.75 mm, optionally 1.5 mm. Inspection glasses as required. All unit covers that can be opened have integrated, replaceable seals. Above a clear unit height of 1.3 m, this is designed as a door.

Maximum leakproofness, Heat transfer T2

Hinges/fasteners

In areas requiring maintenance on the operating side, 180° 2D hinges with door fasteners are used. Door fastener with handle, in areas of overpressure with additional pressure relief and safety restraint to prevent bursting open. The door fasteners on doors with dangerous components can be locked (box spanner).

Simple to use, highest safety level

EUROVENT CERTIFIED PERFORMANCE
AHU No.: 14.11.003
Range: Menerga Air
www.eurovent-certification.com

Relates to the Menerga Air design.
Check the validity of the certificate:
www.eurovent-certification.com or
www.certiflash.com

Cover locks

In areas not requiring maintenance on the operating side, covers are secured with plastic clamp fasteners, which are applied to the exterior of the unit and do not penetrate the unit casing. Additional handles make handling easier.

Lower leakage, simple to use

Profile design

Housing profile design made from galvanised steel, guaranteeing the highest stability.

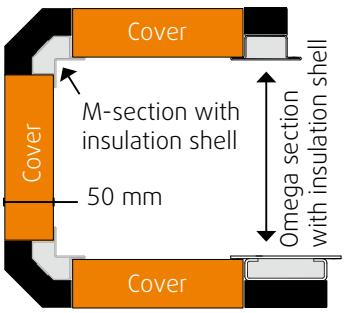
Robust, durable design

Base

Circumferential base frame made from galvanised steel, standard height 120 mm. Other sizes also available. In the weatherproof design, welded base in a single piece or a few sections.

Extremely durable

Design of the housing, view from above:



"On the Top" since 35 years!

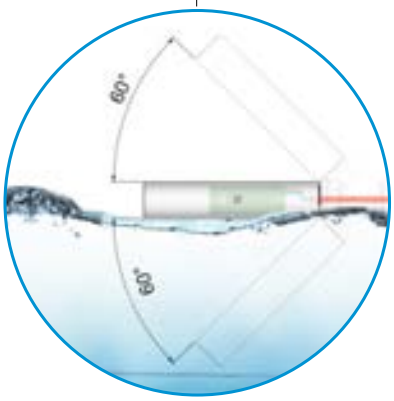
The Menerga quality pledge.

Control and regulation have always been an integral part of our units and ensure an optimum of operation with a focus on highest energy efficiency.

Bus connection of sensors and actuators create a failure-free connection, reliable measurements and thanks to integrated LED's they even bring light into the unit.

Outside air temperature sensor including GSM-router wirelessly transfers unit values and assures a connection in real-time.

Level detector including a gyro sensor in the water tank of the adiabatic evaporative cooling system is constantly monitoring the water level. Extremely low-maintenance!



CNC-bended pipework for all compression cooling plants. That means significantly less solder connections and thus fewer weak spots.

Smartphone solutions for remote control, worldwide energy and fault monitoring.

Solid and thermal bridge free housing with a steel frame, thermal cladding and for all outdoor units a weatherproof steel roof.

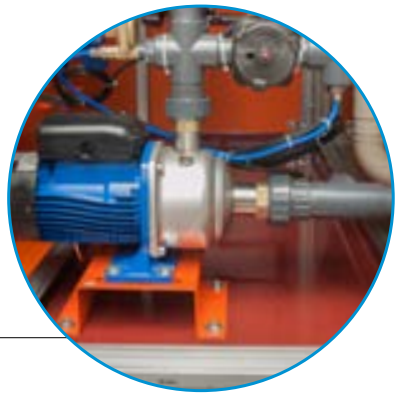
Indirect adiabatic evaporative cooling inside the heat exchanger. Hollow cone nozzles guarantee an extremely fine, homogeneous distribution of the water in the return air.

Microchannel condensers reduce the CO2-emmission due to a reduced refrigerant volume of ⅔ and a halved airside pressure drop.

Unit housing MB 50

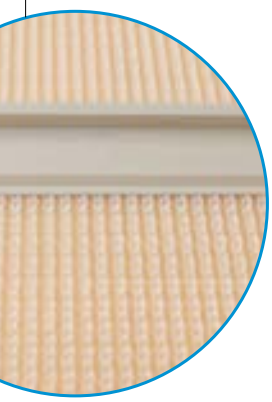
as per DIN EN 1886:

Thermal transmittance:	T2
Thermal bridge factor:	TB1
Mechanical rigidity:	D1
Air tightness class:	L1
Filter bypass leakage class:	up to F9



Coated surface in "wet zones" of the unit.

Ultra durable heat exchangers, that are air- as well as water-tight in all areas. We use corrosion-free polypropylene and first class processing.



Fan walls with IE4 class motors for better performance and safety and compact units at the same time.

Recuperation tank, easy access to the tank of the adiabatic cooling system facilitates service and ensure a complete draining of the system after operation.

Indoor and outdoor units

Always appropriately equipped

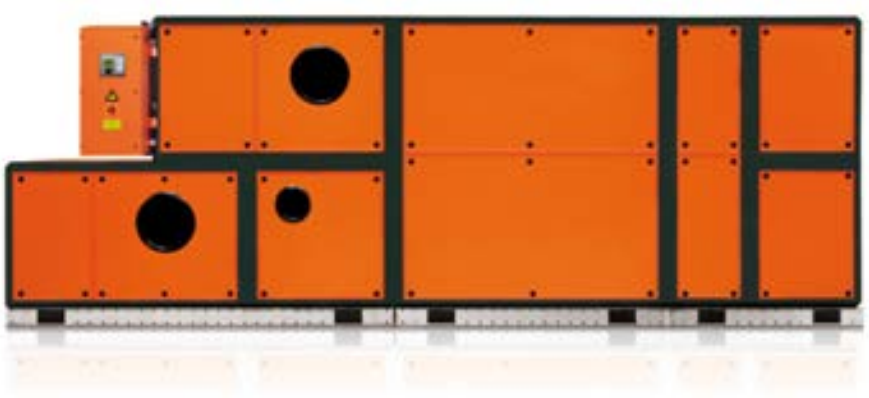
Outdoor installation

- Panel colour according to RAL 7035 light grey
- Galvanised steel base, welded
- Weather-resistant unit roof with drip edge
- Delivery in smallest possible numer of transportation units for simple installation
- Controls cabinet in the building, terminal box in the unit
- Condensate drainage with trace heating system
- Delivery complete with maintenance switch in the unit

Outdoor and indoor units are ideally equipped for their respective purposes. All outdoor units for example are equipped so that pipelines containing water cannot freeze during winter. A welded base frame increases stability. The maintenance switch mounted directly in the unit simplifies maintenance work, as it is possible to switch off fan motors directly at the unit location. Sor, for units with integrated control and regulation system, this function is fully integrated into the unit before it leaves the factory, whereas usually the installer would have to take care about this onsite. For indoor units on the other hand the focus is on the simplest possible installation of the units into the plant room. Depending on the space available and the size of the unit, the controls cabinet may be mounted directly on the unit, or can be installed onto a wall. Of course you decide on the details and features of your indoor or outdoor unit. We will be happy to advise you.

Indoor installation

- Panel colour according to RAL 2004 pure orange
- Galvanised steel base, bolted, 120 mm or unit feet
- Delivery in compact transportation units for simple installation into the building
- Controls cabinet mounted on the unit or on a wall
- Delivery with main switch/ maintenance switch on controls cabinet



Experts at your service

Technical Customer Service

Experts at your service, anytime, anywhere. With a comprehensive range of services and an extensive service network throughout Europe, the Menerga Technical Service guarantees the most economical and advanced services over the entire life cycle of your system, from the day of commissioning onwards.

More than 120 service technicians at various service centres, and 40 service engineers at the Menerga locations, provide a professional all-inclusive service with the objective of achieving high availability of the systems and a maximum of efficiency. The range of services offered by the Menerga Technical Service covers everything from the test run at the factory and on-site commissioning, through periodic servicing, repairs, remote maintenance and remote diagnosis by means of direct dial-up options, to the refurbishment and optimisation of the systems. And this all not only for Menerga units!

We supply you with the right service concept, customer-specific and application-specific. In the event of an emergency, you can reach us 24 hours a day on the following telephone number:
+49 208 9981-199

Foto: ThermoCond 37 at Westfalenbad Hagen

Air conditioning unit with cross-counterflow heat exchanger for private swimming pool halls

ThermoCond 19 20 01 and 29 20 01 - simplified illustration

Automatically selects the most economical operating mode!

ThermoCond 19 and 29

AIR VOLUME FLOW: 1,100 - 3,500 m³/h

At a glance:

- **Dehumidifies, ventilates and heats**
- **Corrosion-free heat exchanger made from polypropylene**
- **Two-stage recuperative heat recovery**
- **Energy-saving EC fans**
- **Integrated heat pump (ThermoCond 29)**
- **Constantly regulated recirculation air heating damper**
- **Variable air duct connections**
- **Compact design for minimal space requirements**
- **Integrated control and regulation system, compatible with all conventional building management systems**
- **Optional: operation via smartphone or tablet**

Devices of the series 19 and 29 dehumidify and heat the swimming pool hall and they reduce a possible concentration of harmful substances in the air. The devices are multifunctional compact systems with integrated control and regulation. ThermoCond 19 is suitable for swimming halls with lower heating requirements. ThermoCond 29 is equipped with an integrated heat pump. This increases the overall efficiency of the system and enables the dehumidification of the pool hall air in recirculation mode. The design ensures the cleanability according to VDI 6022.

Further performance parameters and options:

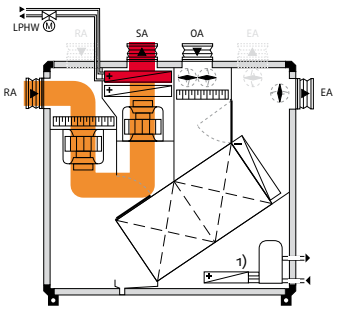
- Filtering the air in any operating mode
- pumped hot water air heater
- sound-optimised plastic impellers for even quieter operation (from 19 20 01)
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for air conditioning swimming pool hall air, including all control and regulation fittings
- Intensive quality inspection with factory test run

Options

- bypass damper
- water/air temperature interconnection
- design complies with VDI 6022
- Pool water condenser (ThermoCond 29)
- Domestic heat pump coupling (ThermoCond 29)
- remote maintenance
- and many more

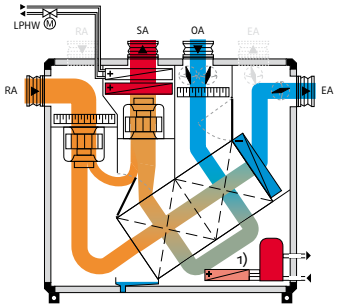
Functional description

Recirculating Air Operation (heating)
If no requirements are placed on temperature regulation or dehumidification when the device is in standby mode, the system operates only in recirculation mode with reduced air volume flow. The air circulation in the swimming pool hall is guaranteed. If heating is required, the return air is heated up using the heating coil to achieve the supply air temperature set-point.



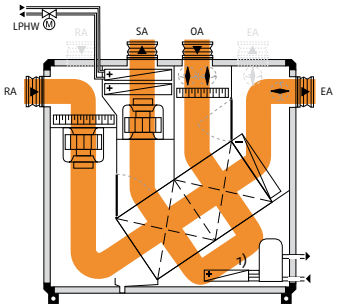
Dehumidification using outside air in winter
ThermoCond19: The swimming pool hall is dehumidified through the addition of outside air to the recirculated air volume flow. The proportion of outside air is continuously and automatically adjusted, depending on the current evaporation of water (occupancy level of the swimming pool hall), as well as the outside air humidity. This If the waste heat recovery is not sufficient for achieving the desired supply air temperature, the supply air is reheated in the heating coil.

ThermoCond29: A large proportion of the sensitive and latent heat is recovered from the return air, and is transferred to the supply air in the cross-counterflow heat exchanger and evaporator. If the heat output of the heat pump is not sufficient, the supply air will be reheated using the heating coil. Excess heat can be transferred to the optionally available pool water condenser for heating the pool water.

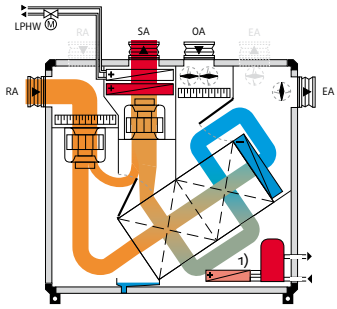


All images show ThermoCond 29 with heat pump.

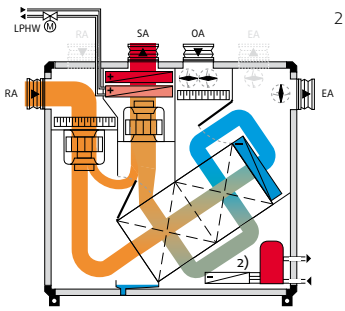
Dehumidification using outside air in summer
In case of rising outside air humidity, the recirculation air damper is continuously closing as required. When the outside air humidity is high, the damper closes completely. The system works at 100% outside air / exhaust air operation through the heat exchanger.



Recirculating air dehumidification (ThermoCond 29)
The air is dehumidified in the evaporator of the heat pump, this process is boosted by the pre-cooling effect in the heat exchanger. The air that has already cooled down and been dried is preheated in the heat exchanger by the return air from the swimming pool hall. On the other side of the heat exchanger, the transmission of heat produces a precooling effect, lowering the temperature of the drawn-in humid and warm air from the swimming pool hall near to its dew point. The preheated, dehumidified air is then mixed with a proportion of untreated recirculation air, is reheated at the condenser of the heat pump using the heat extracted during the dehumidification process, and is returned to the swimming pool hall as supply air. The heat pump is optimally designed, with a dehumidification energy requirement < 0.25 kWh/kg. If required, the supply air will be reheated using the heating coil.



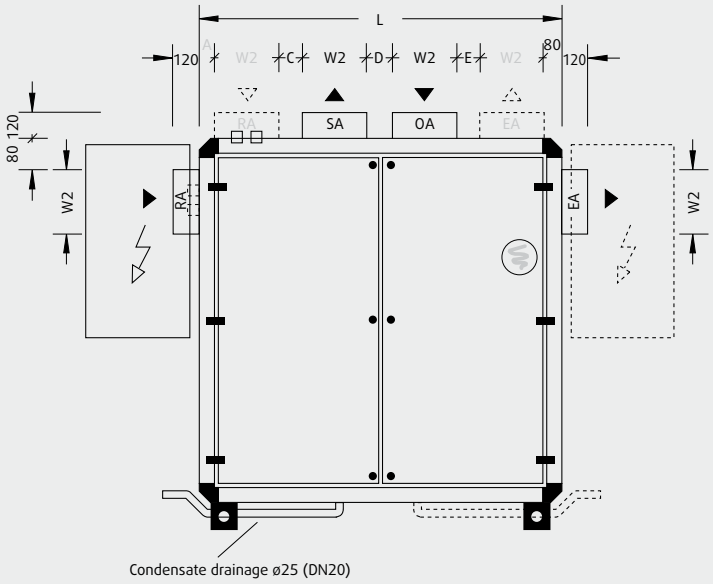
Domestic heat pump operation (ThermoCond 29)
An existing domestic heat pump can be used for energy-efficient heating of the swimming pool hall air. The domestic heat pump is connected to the heating coil. Typically, the low flow temperatures of the domestic heat pump are not sufficient for heating the swimming pool hall air – the heating coil is therefore installed upstream of the air condenser of the integrated heat pump. The domestic heat pump can so be operated with an optimal COP without a change in the low flow temperatures. In combination, the two systems heat the supply air to the desired temperature level.

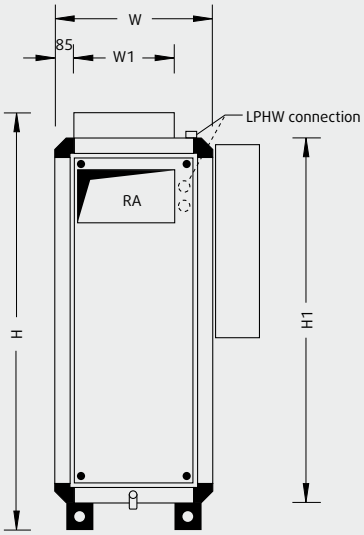


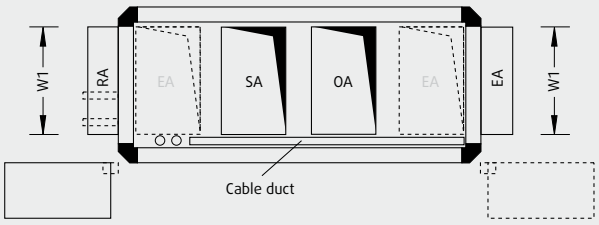
1 Option: pool water condenser
2 Option: domestic heat pump operation

ThermoCond Type 19 and 29

System dimensions and weights







Unit feet 100 mm
Optional: adjustable feet from 100 to 120 mm

In the case of controls cabinet, folding on device: cabinet is folded on the front end for transportation. This reduces the transportation length by approx. 250 mm.

Return and exhaust air duct connection possible on top of unit.
Mirror-image design possible.

Unit type	L	W [1]	H [2]	W1	W2	H1	A	C	D	E	Weight Type 19	Weight Type 29
19 11 01	1,530	570	1,590	350	200	1,370	215	150	150	135	410	460
19 15 01	1,530	730	1,590	500	200	1,370	215	150	150	135	440	500
19 20 01	1,690	730	1,910	500	300	1,690	80	105	120	105	540	600
19 25 01	1,690	890	1,910	600	300	1,690	80	105	120	105	610	680
19 35 01	1,690	1,210	1,910	920	300	1,690	80	105	120	105	720	830

Controls cabinet

Unit Type	H x W x D	Position at unit
19 11 01	600 x 600 x 200	SA/RA side
19 15 01	600 x 600 x 200	SA/RA side
19 20 01	600 x 600 x 200	SA/RA side
19 25 01	600 x 600 x 200	SA/RA side
19 35 01	600 x 600 x 200	SA/RA side

For service work, a clearance corresponding to dimension B is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre.

Please comply with the dimensions for body size, air duct connections and electrical controls cabinet.

Partitioning of unit for smaller apertures possible (at extra cost).

All lengths are given in mm, weights in kg.

1 Door fitting assembly increase unit width by 25 mm each operating side
2 incl. 100 mm unit feet, incl. 120 mm duct connection

Technical specifications and services ThermoCond 19

Unit Type		19 11 01	19 15 01	19 20 01	19 25 01	19 35 01
Optimum flow rate	m^3/h	1,100	1,500	2,000	2,500	3,500
Dehumidification capacity according to VDI 2089	kg/h	7.1	9.7	12.9	16.2	22.6
Total electrical power rating [1]	kW	0.94	1.05	1.45	1.65	2.66
Max. current consumption [1]	A	3.3	3.3	3.8	3.8	7.6
Operating voltage		3 / N / PE 400 V 50 Hz				
Ext. pressure losses						
Supply and fresh air channel	Pa	300	300	300	300	300
Return and exhaust air channel	Pa	300	300	300	300	300
Sound power level [2]						
Supply air vent	dB(A)	79	78	68	66	73
RA connection	dB(A)	69	67	59	60	61
Outside air vent	dB(A)	65	63	54	54	59
EA connection	dB(A)	71	65	58	58	61
Acoustic pressure at a distance of 1 m from the device [2]	dB(A)	63	59	49	48	54
Fan units						
Rated motor input for supply air [3]	kW	0.55	0.60	0.81	0.92	1.54
Rated motor input for return air [3]	kW	0.39	0.45	0.64	0.73	1.12
Rated motor input for supply air recirc mode [3]	kW	0.22	0.26	0.36	0.48	0.64
Rated motor input for return air recirc mode [3]	kW	0.22	0.26	0.36	0.48	0.64
SFP category (supply air | return air) recirc mode		2 | 2	2 | 2	2 | 2	2 | 2	2 | 2
Nominal rating supply air | return air	kW	1.0 | 1.0	1.0 | 1.0	1.2 | 1.2	1.2 | 1.2	2.4 | 2.4
Filtration according to DIN EN 779						
Outside air		M5				
Return air		M5				
LPHW						
Heating capacity [4] recirc mode	kW	8.5	12.1	14.6	18.9	26.6
Heating capacity [4] OA-EA operation	kW	10.4	14.9	17.9	23.2	32.3
Water flow rates and pressure losses						
LPHW	m^3/h | kPa	0.46 | 3.9	0.65 | 8.6	0.78 | 4.2	1.01 | 7.7	1.41 | 7.1
LPHW valve	m^3/h | kPa	0.46 | 8.1	0.65 | 16.6	0.78 | 9.8	1.01 | 16.5	1.41 | 12.5
Connections						
LPHW connection	DN	15	15	20	20	20
LPHW control valve connection	DN	10	10	15	15	20
Condensate drainage	DN	20	20	20	20	20
Floor drain	DN	20	20	20	20	20

Specifications of technical data relate to the optimum flow rate and return air condition 30° C / 54% r.h., outside air condition 15° C / 84% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 depends on configuration of measurement and control system/unit
2 at 250 Hz mid-band frequency
3 with average filter contamination
5 FL/RL = 70/50° C, SA ≈ 50° C

Please seek approval of technical data and specifications prior to start of the planning process.

Technical specifications and services ThermoCond 29

Unit Type		29 11 01	29 15 01	29 20 01	29 25 01	29 35 01
Optimum flow rate	m^3/h	1,100	1,500	2,000	2,500	3,500
Dehumidification capacity according to VDI 2089	kg/h	7.1	9.7	12.9	16.2	22.6
Dehumidification capacity in recirc mode	kg/h	4.6	5.2	6.9	8.5	12.0
Heating capacity of heat pump [1]	COP	5.14	6.42	5.82	6.61	6.14
Total electrical power rating [2]	kW	1.07	1.18	1.64	1.84	3.04
Max. current consumption [2]	A	7.5	7.5	8.9	10.1	17.6
Operating voltage		3 / N / PE 400 V 50 Hz				
Ext. pressure losses						
Supply and fresh air channel	Pa	300	300	300	300	300
Return and exhaust air channel	Pa	300	300	300	300	300
Sound power level [3]						
Supply air vent	dB(A)	76	77	66	64	71
RA connection	dB(A)	71	70	61	61	64
Outside air vent	dB(A)	66	64	56	55	60
EA connection	dB(A)	69	66	58	56	61
Acoustic pressure at a distance of 1 m from the device [3]	dB(A)	62	61	51	49	56
Fan units						
Rated motor input for supply air [4]	kW	0.60	0.65	0.89	1.00	1.70
Rated motor input for return air [4]	kW	0.47	0.53	0.75	0.84	1.34
Rated motor input for supply air recirc dehumidification [4]	kW	0.29	0.33	0.47	0.58	0.86
Rated motor input for return air recirc dehumidification [4]	kW	0.35	0.40	0.57	0.68	1.06
SFP category (supply air | return air) recirc dehumidification		2 | 2	1 | 2	1 | 2	1 | 2	2 | 2
Nominal rating supply air | return air	kW	1.0 | 1.0	1.0 | 1.0	1.2 | 1.2	1.2 | 1.2	2.4 | 2.4
Integrated heat pump						
Filling volume of refrigerant type R407C [5] (without | with PWC)	kg	2.0 | 3.0	2.0 | 4.0	3.0 | 4.0	3.0 | 4.0	4.0 | 5.0
Heating capacity heat pump	kW	7.2	7.7	9.9	11.9	17.2
Rated compressor input for recirc air dehumidification	kW	1.4	1.3	1.7	1.9	2.9
Rated compressor input for OA-EA operation [7]	kW	1.4	1.2	1.7	1.8	2.8
Filtration according to DIN EN 779						
Outside air		M5				
Return air		M5				
LPHW						
Heating capacity [6] recirc mode	kW	6.7	9.1	11.7	14.6	21.3
Heating capacity [6] OA-EA operation	kW	2.9	5.7	7.4	9.7	13.7
Water flow rate and pressure losses						
LPHW	m^3/h | kPa	0.13 | 1.6	0.25 | 2.2	0.32 | 3.9	0.42 | 3.7	0.60 | 8.4
LPHW (pump warm water) valve	m^3/h | kPa	0.13 | 1.6	0.25 | 2.5	0.32 | 4.1	0.42 | 7.0	0.60 | 14.0
Pool water condenser [7] (supplementary equipment)						
Heating power [8]	kW	6.4	7.0	9.0	11.0	15.5
Spread of pool water temperature	K	7.8	6.7	7.0	6.8	6.7
Pool water volume flow rate	m^3/h	0.7	0.9	1.1	1.4	2.0
water side pressure loss	kPa	12.3	14.1	12.0	12.5	15.2
Connections						
LPHW connection	DN	15	15	15	15	15
LPHW control valve connection	DN	10	10	10	10	15
Condensate drainage	DN	20	20	20	20	20
Floor drain	DN	20	20	20	20	20
PWC connection [9]	DN	20	20	25	25	25

Specifications of technical data relate to the optimum flow rate and return air condition 30° C / 54% r.h., outside air condition 15° C / 84% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 dehumidifying in recirc mode without PWC
2 depends on configuration of measurement and control system/unit
3 at 250 Hz mid-band frequency
4 with average filter contamination
5 where domestic heat pump coupling: Refrigerant type = R134a; filling volumes vary
6 FL/RL = 70/50° C, SA ≈ 50° C
7 heat emission full and proportional; when water inlet temp. 28° C
8 dehumidifying in recirc mode with PWC
9 for units with pool water condensers

Please seek approval of technical data and specifications prior to start of the planning process.

ThermoCond private

Air conditioning unit with cross-counterflow-cross heat exchanger for private swimming pool halls

Automatically selects the most economical operating mode!

ThermoCond 23

AIR VOLUME FLOW: 1,600 – 5,000 m³/h

At a glance:

- **Dehumidifies, ventilates and heats**
- **Corrosion-free heat exchanger made from polypropylene**
- **Over 80% temperature efficiency through three-stage recuperative heat recovery**
- **Energy-saving EC fans**
- **Constantly regulated recirculation air heating damper**
- **Flat design, ideal for integration into pool periphery**
- **Integrated control and regulation system, compatible with all conventional building management systems**
- **Optional: operation via smartphone or tablet**

Devices of the series 23 dehumidify and heat the swimming pool hall and they reduce a possible concentration of harmful substances in the air. The devices are multifunctional compact systems with integrated control and regulation. ThermoCond 23 achieves a very high heat recovery rate based on a special heat exchanger. The design ensures the cleanability according to VDI 6022.

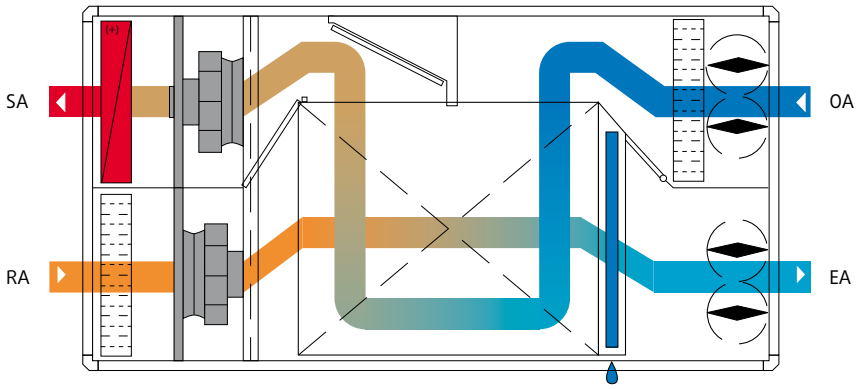
Further performance parameters and options:

- Filtering the air in any operating mode
- Pumped hot water air heater
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for air conditioning swimming pool hall air, including all control and regulation fittings
- Bypass damper
- Intensive quality inspection with factory test run

Options

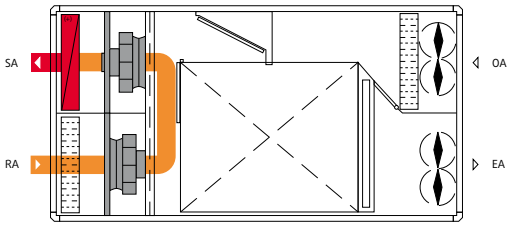
- Water/air temperature interconnection
- Remote maintenance
- And many more

Functional description

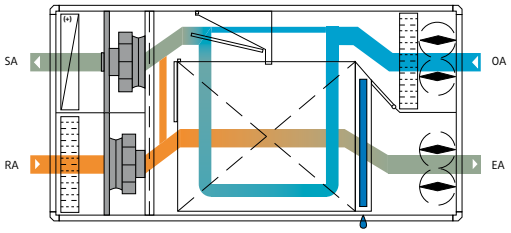


Dehumidification using outside air in winter
A large proportion of the sensitive and latent heat is recovered from the return air and is transferred to the supply air in the heat exchanger. The cross-counter-flow-cross heat exchanger enables the recovery of up to 80% of the heat contained in the return air. The ventilation heat losses that have to be covered by the pumped hot water heating coil are thus kept to a minimum.

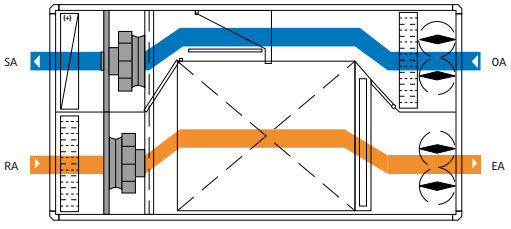
Recirculating Air Operation (heating)
If no requirements are placed on temperature regulation or dehumidification when the device is in standby mode, the system operates only in recirculating mode with reduced air volume flow. The air circulation in the swimming pool hall is guaranteed. If heating is required, the return air is heated to the supply air temperature as required using the heating coil.



Dehumidification in the transitional period
When outside air temperatures rise, the output of the heating coil can be reduced. The heat recovered can be regulated by means of the controllable bypass damper. A proportion of the outside air is by-passed the plate heat exchanger.

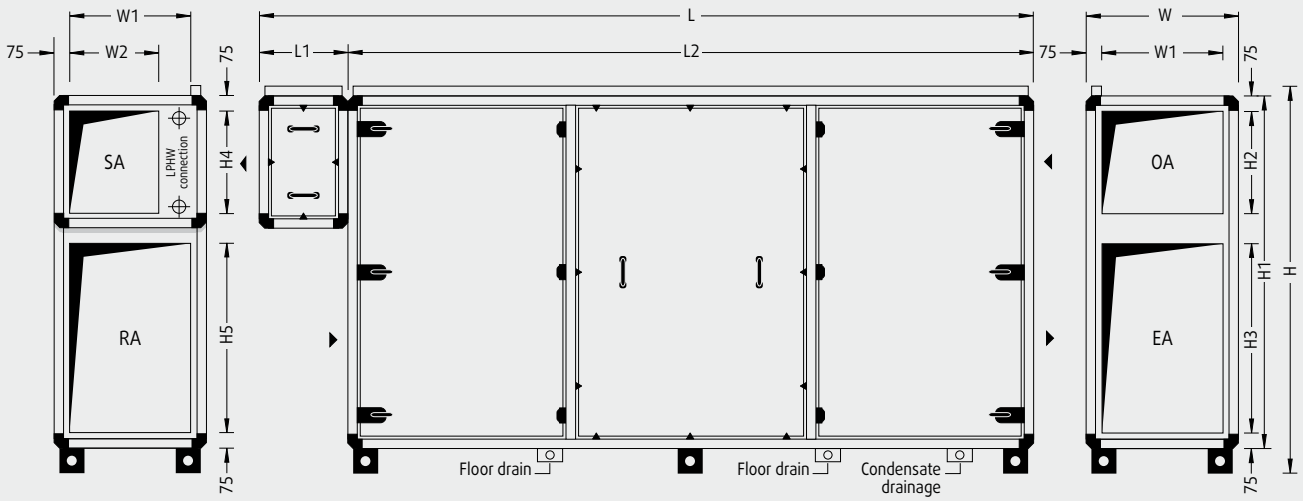


Summertime conditions
In the case of rising outside air humidity, the recirculation air damper is continuously closing as required. When the outside air humidity is high, the damper closes completely. The system works at 100% outside air / exhaust air operation through the heat exchanger. Heat recovery is not required.



ThermoCond Type 23

System dimensions and weights



Unit feet 100mm
Optionally: adjustable feet from 100 to 120 mm

Unit type	L	W [1]	H [2]	L1	L2	W1	W2	H1	H2	H3	H4	H5	Weight
23 12 01	2,580	570	1,210	410	2,170	420	350	1,050	325	420	420	325	450
23 18 01	3,060	730	1,530	410	2,650	580	505	1,370	485	580	580	485	600
23 26 01	3,700	730	1,850	410	3,290	580	505	1,690	485	900	580	580	870
23 36 01	3,700	1,050	1,850	410	3,290	900	825	1,690	485	900	580	580	1,100

Controls cabinet

Unit Type	H x W x D	Position at unit
23 12 01	600 x 600 x 200	OA/EA side
23 18 01	600 x 600 x 200	OA/EA side
23 26 01	600 x 600 x 200	OA/EA side
23 36 01	600 x 600 x 200	OA/EA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

Partitioning of unit for smaller apertures possible (at extra cost).

All lengths are given in mm, weights in kg,
weight incl. controls cabinet.

1 Door fitting assembly increase unit width by 25 mm each operating side
2 incl. 100 mm unit feet and 60 mm cable duct

Technical specifications and services

Unit Type		23 12 01	23 18 01	23 26 01	23 36 01
Optimum flow rate	m^3/h	1,600	2,500	3,200	5,000
Dehumidification capacity according to VDI 2089	kg/h	10.3	16.2	20.7	30.2
Total electrical power rating [1]	kW	1.08	1.78	2.39	3.24
Max. current consumption [1]	A	6.6	13.8	8.0	6.6
Operating voltage		1 / N / PE 230 V 50 Hz		3 / N / PE 400 V 50 Hz	
Ext. pressure losses					
Supply and fresh air channel	Pa	300	300	300	300
Return and exhaust air channel	Pa	300	300	300	300
Sound power level [2]					
Supply air vent	dB(A)	60	67	68	70
RA connection	dB(A)	58	65	65	67
Outside air vent	dB(A)	50	55	59	57
EA connection	dB(A)	54	62	62	65
Acoustic pressure at a distance of 1 m from the device [2]	dB(A)	43	51	51	54
Fan units					
Rated motor input for supply air [3]	kW	0.52	0.82	1.11	1.48
Rated motor input for return air [3]	kW	0.56	0.96	1.28	1.76
Rated motor input for supply air recirc mode [3]	kW	0.29	0.45	0.57	0.79
Rated motor input for return air recirc mode [3]	kW	0.29	0.45	0.57	0.79
SFP category (supply air | return air) recirc mode		1 | 1	1 | 1	1 | 1	1 | 1
Nominal rating supply air | return air	kW	0.8 | 0.8	1.4 | 1.4	2.5 | 2.5	2.0 |2.0
Filtration according to DIN EN 779					
Outside air		M5			
Return air		M5			
LPHW					
Heating capacity recirc mode [4]	kW	9.2	14.8	17.6	28.8
Heating capacity OA-EA operation [4]	kW	10.9	17.7	20.1	33.7
Water flow rate and pressure losses					
LPHW	m^3/h | kPa	0.48 | 7.4	0.78 | 4.4	0.88 | 5.4	1.47 | 9.8
LPHW valve	m^3/h | kPa	0.48 | 9.0	0.78 | 9.6	0.88 | 12.4	1.47 | 13.6
Connections					
LPHW connection	DN	32	32	32	32
LPHW control valve connection	DN	10	15	15	20
Condensate drainage	DN	20	20	20	20
Floor drain	DN	20	20	20	20

Specifications of technical data relate to the optimum flow rate and return air condition 30° C / 54% r.h., outside air condition 15° C / 84% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

2 depends on configuration of measurement and control system/unit
3 at 250 Hz mid-band frequency
4 with average filter contamination
5 FL/RL = 70/50° C, SA ≈ 50° C

Please seek approval of technical data and specifications prior to start of the planning process.

ThermoCond public

Air conditioning unit with counterflow plate heat exchanger for medium-sized and large public swimming pool halls

Automatically selects the most economical operating mode!

ThermoCond 38

AIR VOLUME FLOW: 2,600 – 35,100 m^3/h

Eurovent seal refers to range Menerga Air, more information on page 6. Check ongoing validity of certificate: www.eurovent-certification.com or www.certiflash.com

At a glance:

- **Heat recovery rate of more than 95% with just 150 Pa pressure drop**
- **Designed for the requirements of the highest energy efficiency classes**
- **HRC class H1, even at high air velocities**
- **Energy-saving EC fans**
- **Optionally: Clean water heater**
- **Integrated defrosting function**
- **Thermal bridge factor k_b = 0.78 - class TB1**
- **Two-stage supply air filtration**
- **Freely configurable HVAC system**
- **Load-dependent variable volume flow rate adjustment**
- **Fulfils the requirements of VDI 6022**

Devices of the series 38 achieve a very high energy efficiency, since the integrated program only adds as much air as is required for dehumidification of the pool hall air. ThermoCond 38 dehumidifies exclusively with outside air. The design ensures the cleanability according to VDI 6022. The integrated counterflow plate heat exchanger reaches a real counter flow share of 80% with highest heat recovery rates. Optionally the device can be equipped with a fresh water heater for an even more efficient use of the heat energy contained in the exhaust air.

Further performance parameters and options:

- Corrosion-free counterflow plate heat exchanger made from polypropylene
- Pumped hot water heating coil
- Air filtration in all operating conditions, with filters in return air, outside air supply air
- Constantly regulated recirc air heating damper
- Recirculation air defrost damper
- Integrated freely programmable control and regulation unit
- Complete unit, contains all structural elements for heating, dehumidification and ventilation
- Intensive quality inspection with factory test run
- Cleaning of the heat exchanger possible in mounted position

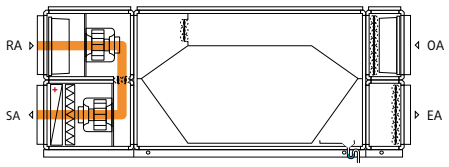
Options:

- Integrated heat recovery bypass by means of RA/EA and OA/SA dampers
- Recuperator in short version
- Sound absorber
- Outdoor installation
- Remote maintenance
- Clean water heater
- And many more

Functional description

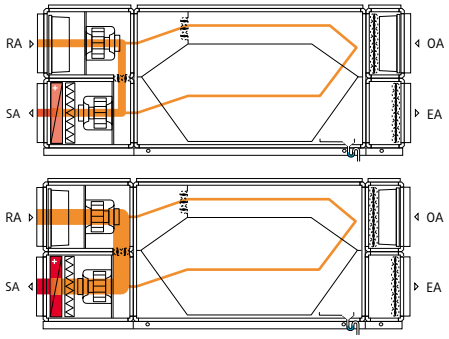
Standby mode

If no requirements are specified regarding temperature regulation or dehumidification when the swimming pool hall is in standby mode, the system operates only in recirculation mode. The air circulation in the swimming pool hall is guaranteed, with the fans working at a lower capacity.



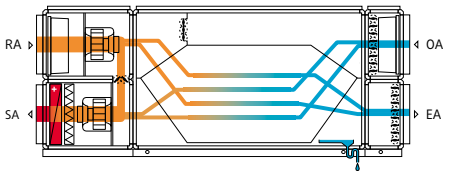
Recirculation Air Operation (heating)

The heating coil heats the swimming pool hall as required in recirculation mode. In order to reduce the internal pressure losses, the recirculation air defrost damper is also opened. The outside air and exhaust air dampers are closed.



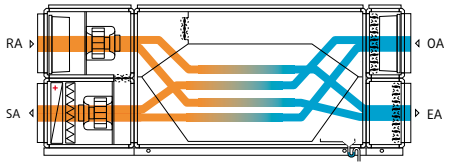
Bathing Mode and Standby mode with Dehumidification Requirement

The swimming pool hall is dehumidified through the addition of outside air to the recirculation air volume flow. In swimming pool mode the minimum required amount of outside air is added to the recirculation air for hygienic reasons (VDI 2089). The proportion of outside air depends on the current evaporation of water (and therefore the occupancy level of the swimming pool hall), as well as the outside air humidity. This is continuously and automatically adjusted. If the waste heat recovery is not sufficient for achieving the desired supply air temperature, the supply air is reheated in the heating coil.



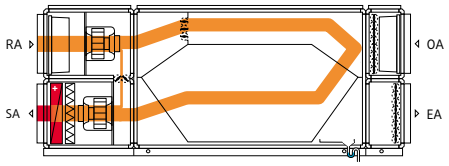
Outside Air / Exhaust Air Mode

In the case of rising outside air humidity, the recirculation air damper is continuously closing as required. When the outside air humidity is high, the damper closes completely. The system works at 100% outside air / exhaust air operation through the counterflow plate heat exchanger.

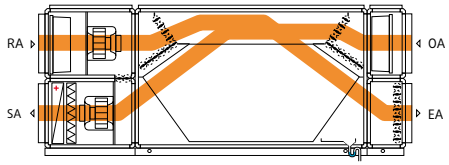


Defrost Operation

All recuperative heat exchangers tend to ice over in the case of low outside temperatures. Through the integrated recirculation air defrost damper, the heat exchanger is quickly and efficiently defrosted. The warm return air passes right through the counterflow plate heat exchanger and melts any possible ice. During the defrosting process, the technical design prevent re-evaporation in the supply air.



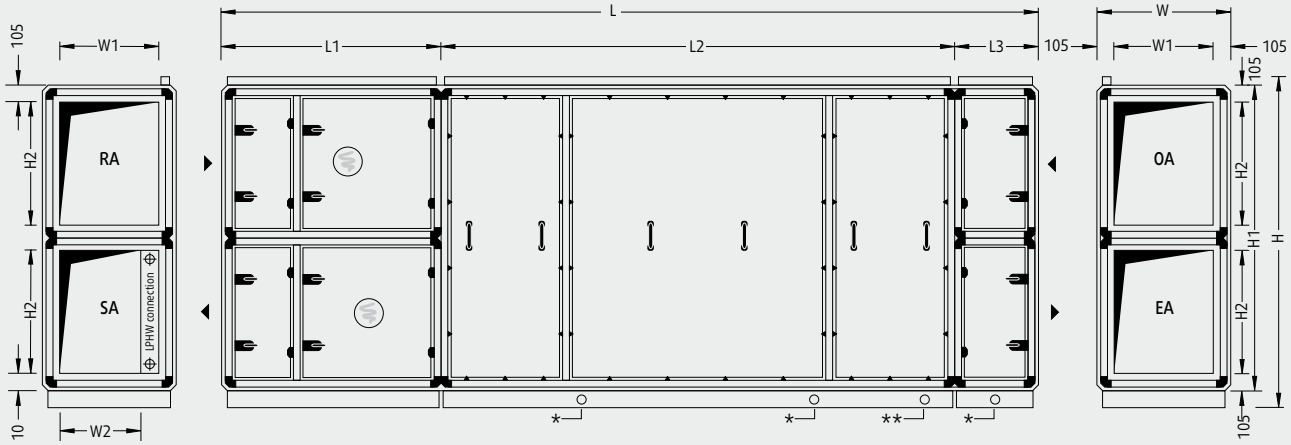
As an option the device unit be equipped with the heat exchanger bypass. The proportion of the air guided through the heat exchanger and the bypass can be regulated as required up to free ventilation.



ThermoCond public

ThermoCond Type 38

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

* Floor drain
** Condensate drainage

Unit type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	W2	H1	H2	Weight[1]
38 03 01	4,810	790	1,700	1,240	2,970	600	580	510	1,520	580	1,190
38 05 01	4,970	1,110	1,700	1,400	2,970	600	900	830	1,520	580	1,460
38 06 01	5,610	790	2,340	1,400	3,610	600	580	420	2,160	900	1,600
38 10 01	5,610	1,110	2,340	1,400	3,610	600	900	740	2,160	900	1,900
38 13 01	5,770	1,430	2,340	1,560	3,610	600	1,220	1,060	2,160	900	2,350
38 16 01	5,770	1,750	2,340	1,560	3,610	600	1,540	1,380	2,160	900	2,650
38 19 01	5,770	2,070	2,340	1,560	3,610	600	1,860	1,700	2,160	900	3,000
38 25 01	6,250	2,070	2,980	1,560	4,090	600	1,860	1,700	2,800	1,220	3,900
38 29 01	6,250	2,390	2,980	1,560	4,090	600	2,180	2,020	2,800	1,220	4,300
38 37 01	6,250	3,030	2,980	1,560	4,090	600	2,820	2,660	2,800	1,220	5,700

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct. For service work at unit type 38 37 01 a clearance at the rear of at least 1.500 mm is required.

Please comply with the dimensions for body size, air duct connections and electrical controls cabinet.

All length dimensions in mm, weight in kg,, weight incl. controls cabinet.

1 May change depending on choosen option, e.g. recuperator in short version (- 960 mm)
2 Door fitting assembly increase unit width by 65 mm each operating side
3 incl. 120 mm base frame, incl. 60 mm cable duct

3 transportation units are supplied, including controls cabinet until unit type 38 29 01. Unit type 38 37 01 is delivered in 4 transportation units including controls cabinet. Further partitioning for smaller apertures possible (at extra cost).

Largest transport unit

Unit Type	L[1]	W	H[3]	Weight[1]
38 03 01	2,970	790	1,700	620
38 05 01	2,970	1,110	1,700	760
38 06 01	3,610	790	2,340	900
38 10 01	3,610	1,110	2,340	1,100
38 13 01	3,610	1,430	2,340	1,300
38 16 01	3,610	1,750	2,340	1,500
38 19 01	3,610	2,070	2,340	1,720
38 25 01	4,090	2,070	2,980	2,300
38 29 01	4,090	2,390	2,980	2,600
38 37 01	4,090	1,515	2,980	1,750

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
38 03 01	1,120 x 640 x 210	SA/RA side
38 05 01	1,120 x 640 x 210	SA/RA side
38 06 01	1,120 x 640 x 210	SA/RA side
38 10 01	1,120 x 640 x 210	SA/RA side
38 13 01	1,120 x 640 x 210	SA/RA side
38 16 01	1,120 x 640 x 210	SA/RA side
38 19 01	1,120 x 640 x 210	SA/RA side
38 25 01	1,280 x 640 x 210	SA/RA side
38 29 01	1,280 x 640 x 210	SA/RA side
38 37 01	1,280 x 640 x 210	SA/RA side

Technical specifications and services

Unit Type		38 03 01	38 05 01	38 06 01	38 10 01	38 13 01	38 16 01	38 19 01	38 25 01	38 29 01	38 37 01
Optimum flow rate	m^3/h	2,600	3,900	4,000	6,000	7,900	9,800	11,800	15,800	18,400	23,600
Max. volume flow rate[1]	m^3/h	3,500	5,300	6,000	9,500	10,500	14,000	18,000	22,500	25,900	35,100
Heat recovery efficiency [2]	%	over 95									
Heat recovery efficiency acc. EN 308	%	76	76	78	78	78	78	78	80	80	80
Dehumidification capacity acc. VDI 2089 at V_{opt}	kg/h	16.8	25.2	25.8	38.8	51.0	63.3	76.2	102.1	118.9	152.5
Dehumidification capacity acc.VDI 2089 at V_{max}	kg/h	22.6	34.2	38.8	61.4	67.8	90.4	116.3	145.4	167.3	214.3
Total electrical power rating[3]	kW	1.97	2.80	2.98	4.49	5.45	6.54	9.37	12.74	16.38	21.45
Max. current consumption [3]	A	5.2	7.2	7.2	9.2	14.6	14.6	23.9	29.2	31.4	47.1
Operating voltage		3 / N / PE 400 V 50 Hz									
Ext. pressure losses											
Supply and fresh air channel	Pa	300	300	300	300	300	300	400	400	500	500
Return and exhaust air channel	Pa	300	300	300	300	300	300	400	400	500	500
Sound power level [4]											
Supply air vent	dB(A)	78	79	72	72	77	71	76	84	77	80
RA connection	dB(A)	72	66	66	72	68	70	73	75	74	80
Outside air vent	dB(A)	68	69	69	66	66	62	74	72	75	80
EA connection	dB(A)	72	63	63	69	69	67	70	77	76	82
Acoustic pressure in 1 m distance from device [4]	dB(A)	64	63	63	59	62	58	61	69	63	72
Fan units											
Rated motor input for supply air [5] 100%, 60% flow rate	kW	1.12 0.69	1.60 0.95	1.71 0.99	2.46 1.25	3.06 1.73	3.62 1.94	5.22 3.06	7.02 4.18	9.04 4.96	11.67 6.81
Rated motor input for return air [5] 100%, 60% flow rate	kW	0.85 0.54	1.20 0.67	1.27 0.69	2.03 0.99	2.39 1.34	2.92 1.54	4.15 2.14	5.72 3.34	7.34 4.26	9.78 5.97
SFP category supply air | return air (60% V_{opt})		2 | 2	2 | 2	2 | 2	2 | 3	2 | 2	2 | 2	2 | 3	3 | 3	3 | 3	3 | 3
Nominal rating supply air | return air	kW	1.7 | 1.7	3.0 | 1.7	3.0 | 1.7	3.0 | 3.0	4.7 | 4.7	4.7 | 4.7	6.0 | 4.7	9.4 | 9.4	11.0 | 9.4	16.5 | 14.1
Efficiency classes according to EN 13053:2012											
Heat recovery class		H1	H1	H1	H1	H1	H1	H1	H1	H1	H1
Power consumption of fan motors SA | RA		P2 | P2	P2 | P1	P2 | P1	P1 | P1	P2 | P1	P1 | P1	P1 | P1	P1 | P1	P2 | P2	P2 | P2
Air velocity class		V1	V1	V2	V2	V2	V2	V2	V2	V2	V2
Filtration according to DIN EN 779											
Supply air | Outside air		F7 | M5									
Return Air		M5									
LPHW											
Heating capacity max. [6]	kW	17.4	26.1	26.1	40.1	58.7	71.9	89.5	112.6	139.1	185.9
Water flow rate and pressure losses											
LPHW	m^3/h | kPa	0.76 | 4.3	1.38 | 3.6	1.25 | 4.1	2.14 | 3.5	2.57 | 5.9	3.24 | 4.2	3.91 | 6.7	5.66 | 3.3	6.08 | 4.1	8.13 | 8.3
LPHW (pump warm water) valve	m^3/h | kPa	0.76 | 9.3	1.38 | 4.8	1.25 | 6.3	2.14 | 4.6	2.57 | 6.6	3.24 | 6.7	3.91 | 9.8	5.66 | 5.1	6.08 | 5.9	8.13 | 10.6
Clean water heater (optional)											
Capacity [7]	kW	1.53	2.71	2.68	3.78	5.40	7.05	8.84	11.01	12.58	16.28
Clean water volume flow rate	m^3/h	0.07	0.12	0.12	0.18	0.25	0.33	0.38	0.51	0.58	0.75
Connections											
LPHW connection	DN	32	32	32	32	40	40	40	50	65	65
LPHW control valve connection	DN	15	20	20	25	25	32	32	40	40	40
Condensate drainage	DN	40	40	40	40	40	40	40	40	40	40
Floor drain	DN	20	20	20	20	20	20	20	20	20	20
Clean water heater (optional)	DN	15	15	15	15	15	15	15	15	15	15

Specifications of technical data relate to the optimum flow rate and return air condition 30° C / 54% r.h., outside air condition 15° C / 84% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 With regard to return air condition; May require alteration of the technical equipment

2 RA = 30° C / 54% r.h.; OA = -12° C / 90% r.h.; 1/3 OA rate

3 Depends on configuration of measurement and control system/unit

4 at 250 Hz mid-band frequency

5 with average filter contamination

6 FL = 70° C; SA ≈ 50° C

7 Water inlet temp = 10° C, Water outgoing temperature ≈ 28° C

Please seek approval of technical data and specifications prior to start of the planning process.

ThermoCond public

Air conditioning unit with asymmetrical high-capacity heat exchanger and integrated output-regulated heat pump and efficient volume flow control for medium-sized and large public swimming pool halls

ThermoCond 39 13 01 - simplified illustration

Automatically selects the most economical operating mode!

ThermoCond 39

AIR VOLUME FLOW: 2,600 – 33,500 m³/h

EUROVENT CERTIFIED PERFORMANCE
AHU No.: 14.11.003
Range: Menerga Air
www.eurovent-certification.com

Eurovent seal refers to range Menerga Air, more information on page 6. Check ongoing validity of certificate: www.eurovent-certification.com or www.certiflash.com

At a glance:

- **Dehumidifies, ventilates and heats**
- **Corrosion-free heat exchanger made from polypropylene**
- **Integrated output-regulated heat pump**
- **Average heating capacity value COP up to 7.2**
- **Energy-saving EC fans/EffiVent**
- **Demand-oriented volume flow rate reduction for supply and return air**
- **Two-stage supply air filtration**
- **Precise measurement and regulation of the outside air volume**
- **Fulfils the requirements of VDI 6022**

Devices of the series 39 achieve a very high energy efficiency, since the integrated program only adds as much air as is required for dehumidification of the pool hall air. The overall efficiency of the system is further enhanced by the integrated heat pump. Due to the structural design of the unit the cleanability according to VDI 6022 is ensured.

Further performance parameters and options:

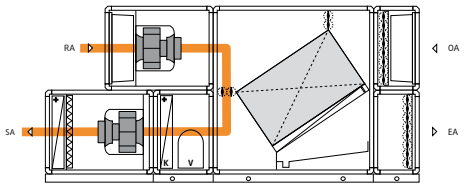
- Modular design with high variability
- Filtering the air in any operating mode
- Pumped hot water air heater
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for air conditioning swimming pool hall air, including all control and regulation fittings
- Thermal bridge factor TB1
- Intensive quality inspection with factory test run

Options
- Pool water condenser
- HRC bypass function
- Dehumidification in recirculation mode
- Dehumidifying the outside air using additional outside and exhaust air connection pieces
- Reinforced compressor refrigeration system
- Fresh water heater
- Attenuator
- Outdoor installation
- Remote maintenance
- And many more

Functional Description

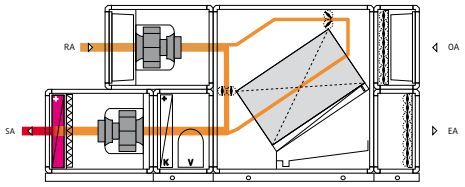
Standby mode

If no requirements are specified regarding temperature regulation or dehumidification when the swimming pool hall is in standby mode, the system operates only in recirculation mode. The air circulation in the swimming pool hall is guaranteed, with the fans working at a lower capacity.



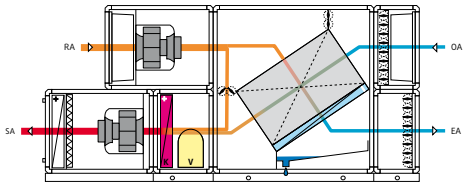
Recirculation Air Operation (heating)

The pumped hot water heating coil heats the swimming pool hall as required in recirculation mode. In order to reduce the internal pressure losses, the recirculation air defrost damper is also opened. The outside air and exhaust air dampers are closed.



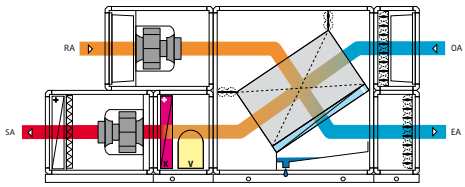
Swimming pool mode with dehumidification requirements

Return air is cooled and dehumidified in the evaporator of the continuously adjustable heat pump, reinforced by the upstream heat exchanger. The outside air, with its low moisture content, is preheated in the heat exchanger, and is subsequently mixed with a proportion of untreated recirculated air, heated in the condenser using the heat energy from the dehumidification process, and fed into the swimming pool hall as supply air. If the heating capacity is not sufficient, the supply air is reheated with the heating coil. The use of the freely controllable heat pump allows the demand-oriented regulation of the volume flow rate. This guarantees a consistent humidity level in the swimming pool hall while consuming minimal energy. For hygiene reasons, a minimum of outside air is fed into the swimming pool hall during swimming pool mode. The proportion of outside air is determined based on the current evaporation of water (and therefore the occupancy level of the swimming pool hall) and is continuously adjusted.



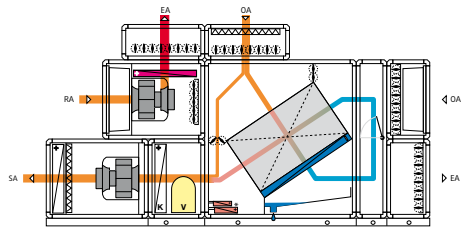
Outside Air Exhaust Air Mode

In the case of rising outside air humidity, the recirculation air damper is continuously closing as required. If the outside air moisture is high, the damper closes completely, the system works exclusively in outside air-exhaust air mode via the heat exchanger. The demand-oriented flow rate control reduces energy consumption to a minimum.



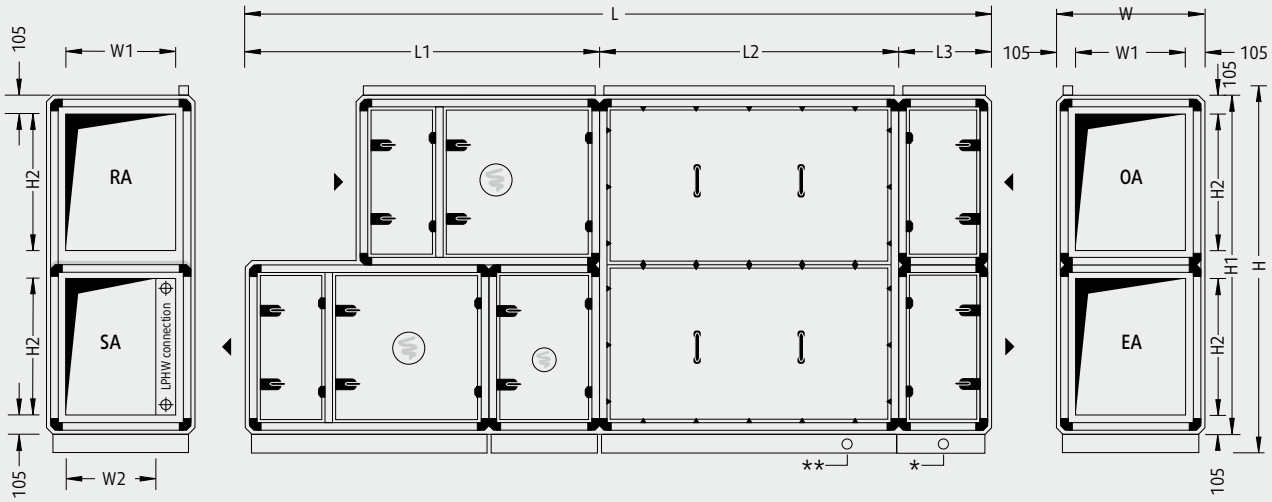
Optionally

In order to achieve the hall humidity levels required by VDI 2089 in summertime conditions, it may be necessary and more economical to use an additional damper system. A second outside air duct is used to take in outside air. Some of the outside air is precooled via the recuperator, and then cooled below dew point in the evaporator. The air is then reheated in the recuperator, and then dried and cooled with some of the untreated outside air, before being introduced into the hall as supply air. If no heating of the swimming pool hall is required, the heat of condensation is discharged directly into the return air flow.



ThermoCond Type 39

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

* Floor drain
** Condensate drain

Unit type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	W2	H1	H2	Weight[1]
39 03 01	3,940	790	1,700	1,970	1,370	600	580	510	1,520	580	1,050
39 05 01	4,100	1,110	1,700	2,130	1,370	600	900	830	1,520	580	1,300
39 06 01	4,740	790	2,340	2,130	2,010	600	580	420	2,160	900	1,350
39 10 01	4,740	1,110	2,340	2,130	2,010	600	900	740	2,160	900	1,650
39 13 01	4,900	1,430	2,340	2,290	2,010	600	1,220	1,060	2,160	900	2,050
39 16 01	4,900	1,750	2,340	2,290	2,010	600	1,540	1,380	2,160	900	2,250
39 19 01	4,900	2,070	2,340	2,290	2,010	600	1,860	1,700	2,160	900	2,500
39 25 01	5,700	2,070	2,980	2,450	2,650	600	1,860	1,700	2,800	1,220	3,250
39 32 01	6,180	2,070	3,620	2,450	3,130	600	1,860	1,700	3,440	1,540	3,950
39 36 01	6,180	2,390	3,620	2,450	3,130	600	2,180	2,020	3,440	1,540	4,650

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical controls cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 65 mm each operating side
2 incl. 120 mm base frame, incl. 60 mm cable duct

3 transportation units are supplied, including controls cabinet. Further partitioning for smaller apertures possible (at extra cost).

Largest transport unit

Unit Type	L[1]	W	H[3]	Weight[1]
39 03 01	1,970	790	1,700	510
39 05 01	2,130	1,110	1,700	660
39 06 01	2,130	790	2,340	630
39 10 01	2,130	1,110	2,340	750
39 13 01	2,290	1,430	2,340	980
39 16 01	2,290	1,750	2,340	1,130
39 19 01	2,290	2,070	2,340	1,270
39 25 01	2,650	2,070	2,980	1,210
39 32 01	3,130	2,070	3,620	1,700
39 36 01	3,130	2,390	3,620	2,050

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
39 03 01	1,120 x 640 x 210	SA/RA side
39 05 01	1,120 x 640 x 210	SA/RA side
39 06 01	1,280 x 640 x 210	SA/RA side
39 10 01	1,280 x 640 x 210	SA/RA side
39 13 01	1,280 x 640 x 210	SA/RA side
39 16 01	1,280 x 640 x 210	SA/RA side
39 19 01	1,280 x 640 x 210	SA/RA side
39 25 01	1,280 x 640 x 210	SA/RA side
39 32 01	1,600 x 640 x 250	SA/RA side
39 36 01	1,600 x 640 x 250	SA/RA side

Technical specifications and services

Unit Type		39 03 01	39 05 01	39 06 01	39 10 01	39 13 01	39 16 01
Optimum flow rate	m^3/h	2,600	3,900	4,000	6,000	7,900	9,800
Max. volume flow rate [1]	m^3/h	3,500	5,300	6,300	9,500	12,600	15,800
Heat recovery efficiency [2]	%	83	83	83	83	84	84
Heat recovery efficiency acc. EN 308	%	53	53	63	63	63	63
Dehumidification capacity according to VDI 2089 V_{opt}	kg/h	17.1	25.2	25.8	38.8	51.0	63.3
Dehumidification capacity according to VDI 2089 V_{max} [1]	kg/h	22.6	34.2	40.7	61.4	81.4	102.1
Heating capacity of heat pump	COP	6.0	7.5	7.4	6.8	7.0	7.1
Total electrical power rating [3]	kW	4.2	3.5	3.4	5.3	7.0	7.9
Max. current consumption [3]	A	12.1	12.1	12.1	20.2	29.6	30.5
Operating voltage		3 / N / PE 400 V 50 Hz					
Ext. pressure losses							
Supply and fresh air channel	Pa	300	300	300	300	300	300
Return and exhaust air channel	Pa	300	300	300	300	300	300
Sound power level [4]							
Supply air vent	dB(A)	78	67	66	71	75	70
RA connection	dB(A)	71	64	65	72	67	68
Outside air vent	dB(A)	68	59	59	65	65	64
EA connection	dB(A)	71	62	62	69	65	66
Acoustic pressure at a distance of 1 m from the device [4]	dB(A)	63	53	52	58	60	56
Fan units							
Rated motor input for supply air (100% | 60% volume flow rate) [5]	kW	1.07 | 0.68	1.39 | 0.82	1.39 | 0.81	2.16 | 1.14	2.61 | 1.57	3.12 | 1.76
Rated motor input for return air (100% | 60% volume flow rate) [5]	kW	0.78 | 0.51	1.10 | 0.63	1.11 | 0.62	1.78 | 0.88	2.01 | 1.17	2.49 | 1.37
SFP category supply air | return air (60% V_{opt})		2 | 2	1 | 2	1 | 2	1 | 2	1 | 1	1 | 2
Nominal rating supply air | return air	kW	1.7 | 1.7	1.7 | 1.7	1.7 | 1.7	3.0 | 3.0	4.7 | 4.7	4.7 | 4.7
Integrated heat pump							
Filling volume refrigerant type R407C (without PWC | with PWC)	kg	4.0 | 5.0	5.0 | 6.0	6.0 | 6.0	7.0 | 9.0	10.0 | 11.0	12.0 | 14.0
Rated compressor input for OA operation (60% V_{opt})	kW	2.3	2.0	2.0	3.3	4.3	4.8
Heating capacity of heat pump for OA operation (60% V_{opt})	kW	13.9	15.0	14.7	22.5	30.0	34.1
Efficiency classes according to EN 13053:2012							
Heat recovery class		H1	H1	H1	H1	H1	H1
Power consumption of fan motors SA | RA		P2 | P2	P1 | P1	P1 | P1	P3 | P3	P1 | P1	P1 | P1
Air velocity class		V1	V1	V2	V2	V2	V2
Filtration according to DIN EN 779							
Supply air | Outside air		F7 | M5					
Return air		M5					
LPHW							
Max. heating power [6]	kW	14.9	22.8	23.2	35.2	54.0	63.7
Water flow rate and pressure losses							
LPHW	m^3/h | kPa	0.85 | 5.2	1.39 | 3.6	1.28 | 4.3	2.23 | 3.8	2.36 | 5.1	3.31 | 4.4
LPHW valve	m^3/h | kPa	0.85 | 11.5	1.39 | 4.7	1.28 | 6.6	2.23 | 5.0	2.36 | 5.6	3.31 | 7.0
Pool water condenser [7,8]							
Heating capacity	kW	14.1	15.0	14.6	22.2	29.4	33.0
Spread of pool water temperature	K	8.1	8.1	7.8	8.0	8.2	7.5
Pool water volume flow rate	m^3/h	1.5	1.6	1.6	2.4	3.1	3.8
Water side pressure loss	kPa	6.0	6.8	6.8	6.7	10.9	16.1
Connections							
LPHW connection	DN	32	32	32	32	40	40
LPHW control valve connection	DN	15	20	20	25	25	32
Condensate drainage	DN	40	40	40	40	40	40
Floor drain	DN	20 | 40	20 | 40	20 | 40	20 | 40	20 | 40	20 | 40
PWC connection [7]	DN	25	25	25	40	40	40

Specifications of technical data relate to the optimum flow rate and return air condition 30° C / 54% r.h., outside air condition 15° C / 84% r.h. and standard density (1.204 kg/m³), unless otherwise specified.

1 May require alteration of the technical equipment
2 RA = 30° C / 54% r.h.; OA = -12° C / 90% r.h.; 1/3 OA rate
3 Depends on configuration of measurement and control system/unit
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 FL = 70° C; SA ≈ 50° C
7 Pool water condenser (supplementary equipment)
8 Heat emission full and proportional; when water enters 28° C

Please seek approval of technical data and specifications prior to start of the planning process.

Technical specifications and services

Unit Type		39 19 01	39 25 01	39 32 01	39 36 01
Optimum flow rate	m^3/h	11,800	15,800	19,900	23,100
Max. volume flow rate [1]	m^3/h	19,000	25,000	30,000	33,500
Heat recovery efficiency [2]	%	84	84	84	84
Heat recovery efficiency acc. EN 308	%	63	65	64	64
Dehumidification capacity according to VDI 2089 V_{opt}	kg/h	76.2	102.1	128.6	149.2
Dehumidification capacity according to VDI 2089 V_{max} [1]	kg/h	122.7	161.5	193.8	216.4
Heating capacity of heat pump	COP	7.0	7.2	7.4	7.3
Total electrical power rating [3]	kW	11.2	14.0	17.0	19.8
Max. current consumption [3]	A	36.1	54.7	61.4	75.3
Operating voltage		3 / N / PE 400 V 50 Hz			
Ext. pressure losses					
Supply and fresh air channel	Pa	400	400	500	500
Return and exhaust air channel	Pa	400	400	500	500
Sound power level [4]					
Supply air vent	dB(A)	75	82	77	78
RA connection	dB(A)	73	71	75	75
Outside air vent	dB(A)	69	71	73	79
EA connection	dB(A)	70	71	72	73
Acoustic pressure at a distance of 1 m from the device [4]	dB(A)	60	67	62	70
Fan units					
Rated motor input for supply air (100% | 60% volume flow rate) [5]	kW	4.66 | 2.60	6.02 | 3.78	8.66 | 4.84	9.96 | 6.18
Rated motor input for return air (100% | 60% volume flow rate) [5]	kW	3.66 | 1.90	4.98 | 2.92	7.02 | 3.96	8.24 | 2.22
SFP category supply air | return air (60% V_{opt})		2 | 2	2 | 2	3 | 3	2 | 3
Nominal rating supply air | return air	kW	6.0 | 4.7	9.4 | 9.4	11.0 | 9.4	16.5 | 9.4
Integrated heat pump					
Filling volume refrigerant type R407C (without PWC | with PWC)	kg	16.0 | 20.0	23.0 | 25.0	29.0 | 31.0	31.0 | 35.0
Rated compressor input for OA operation (60% V_{opt})	kW	6.7	7.3	8.2	11.4
Heating capacity of heat pump for OA operation (60% V_{opt})	kW	46.8	52.4	60.7	83.1
Efficiency classes according to EN 13053:2012					
Heat recovery class		H1	H1	H1	H1
Power consumption of fan motors SA | RA		P3 | P2	P3 | P2	P3 | P1	P3 | P2
Air velocity class		V2	V2	V2	V2
Flitration according to DIN EN 779					
Supply air | Outside air		F7 | M5			
Return air		M5			
LPHW					
Max. heating capacity [6]	kW	81.9	103.0	127.7	158.7
Water flow rate and pressure losses					
LPHW [8]	m^3/h | kPa	3.58 | 5.7	5.63 | 3.2	7.25 | 2.9	7.38 | 3.3
LPHW valve [8]	m^3/h | kPa	3.58 | 8.2	5.63 | 5.1	7.25 | 3.3	7.38 | 3.4
Pool water condenser [7,8]					
Heating capacity	kW	48.6	53.2	60.1	84.5
Spread of pool water temperature	K	8.5	8.3	8.3	8.5
Pool water volume flow rate	m^3/h	4.9	5.5	6.2	8.6
Water side pressure loss	kPa	8.6	10.7	13.4	8.3
Connections					
LPHW connection	DN	40	50	50	65
LPHW control valve connection	DN	32	40	40	40
Condensate drainage	DN	40	40	40	40
Floor drain	DN	20 | 40	20 | 40	20 | 40	20 | 40
PWC connection [7]	DN	50	50	50	50

Specifications of technical data relate to the optimum flow rate and return air condition 30° C / 54% r.h., outside air condition 15° C / 84% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 May require alteration of the technical equipment
2 RA = 30° C / 54% r.h.; OA = -12° C / 90% r.h.; 1/3 OA rate
3 Depends on configuration of measurement and control system/unit
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 FL = 70° C; SA ≈ 50° C
7 Pool water condenser (supplementary equipment)
8 Heat emission full and proportional; when water enters 28° C

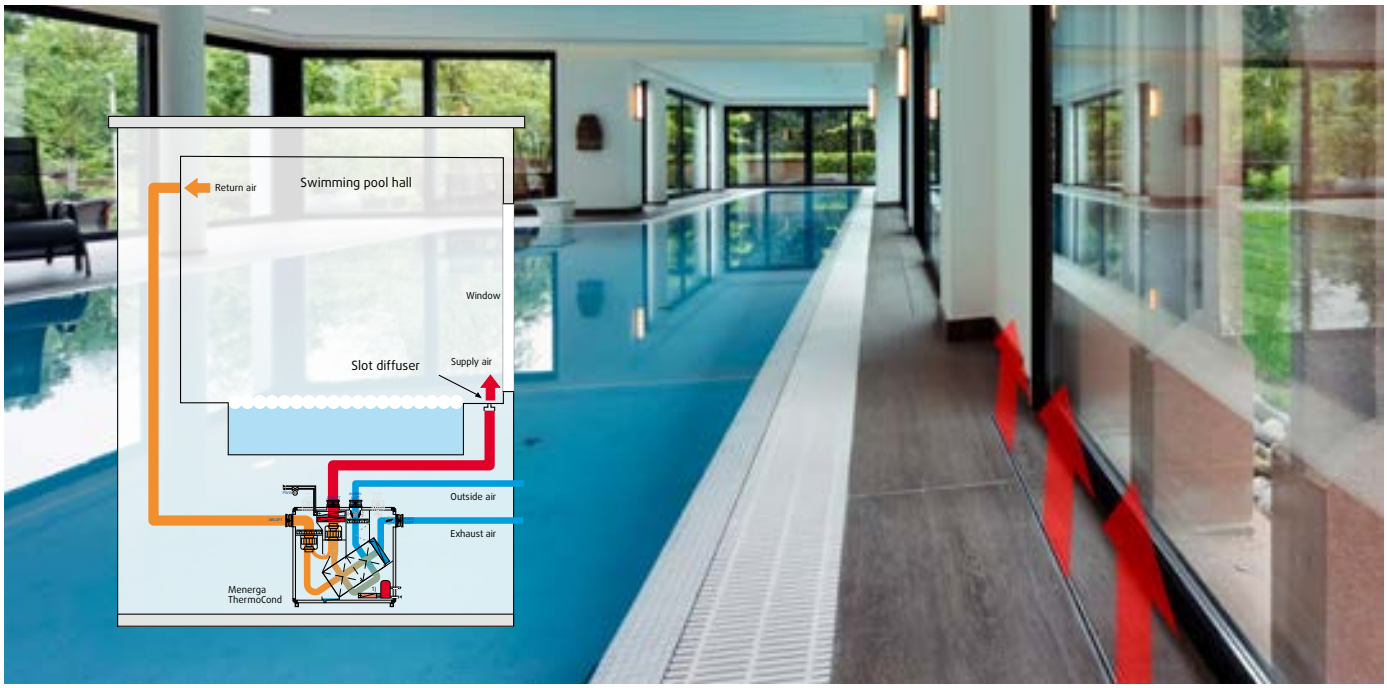
Please seek approval of technical data and specifications prior to start of the planning process.

LASKO THERMAL BATHS, SLOVENIA
Wellness Park with 2,200 m² of water area.

WE ARE EXPERTS FOR
- Private swimming pools,
- Public swimming pool halls,
- AquaParks,
- Adventure pools,
- Sports pools,
- Saline baths,
- Hotel pools,
- School pools,
- Therapeutic pools

and many more.

Just get in Contact – we find the solution for dehumidification, comfort air conditioning and many more applications.

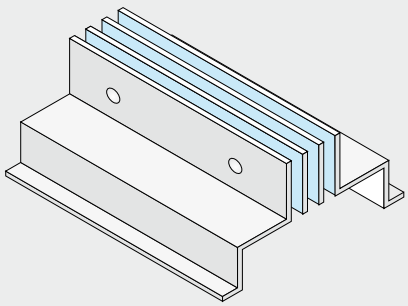


Accessories: Slot diffuser

AVAILABLE IN LENGTHS OF 500 TO 6,000 MM

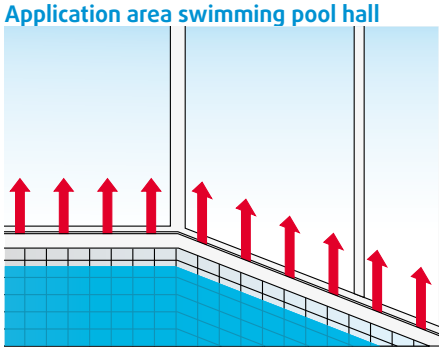
At a glance:

- Simple installation using screws offset on the inside
- Corrosion-resistant aluminium anoded AlMgSi0F22, 3 or 4 mm
- Available lengths 500 to 6,000 mm, precise to 10 mm
- With fixed or removable centre piece for ease of cleaning
- End cover supplied mounted or loose
- With hygiene certificate

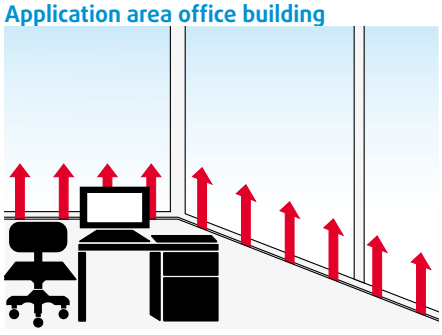


Menerga slot diffusers allow steady and effective distribution of air and heat in a room. They are only minimal visible and easy to install. They are mounted on window fronts in swimming pool halls in order to keep the windows mist-free and can also be used in every othe building type. The introduction of the air via slot diffusers prevents draughts at floor level. Build-up of heat is also avoided in the event of strong sunlight.

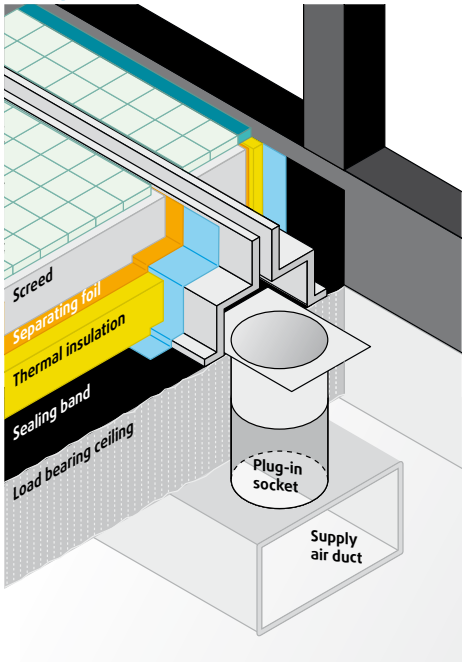
Application area swimming pool hall

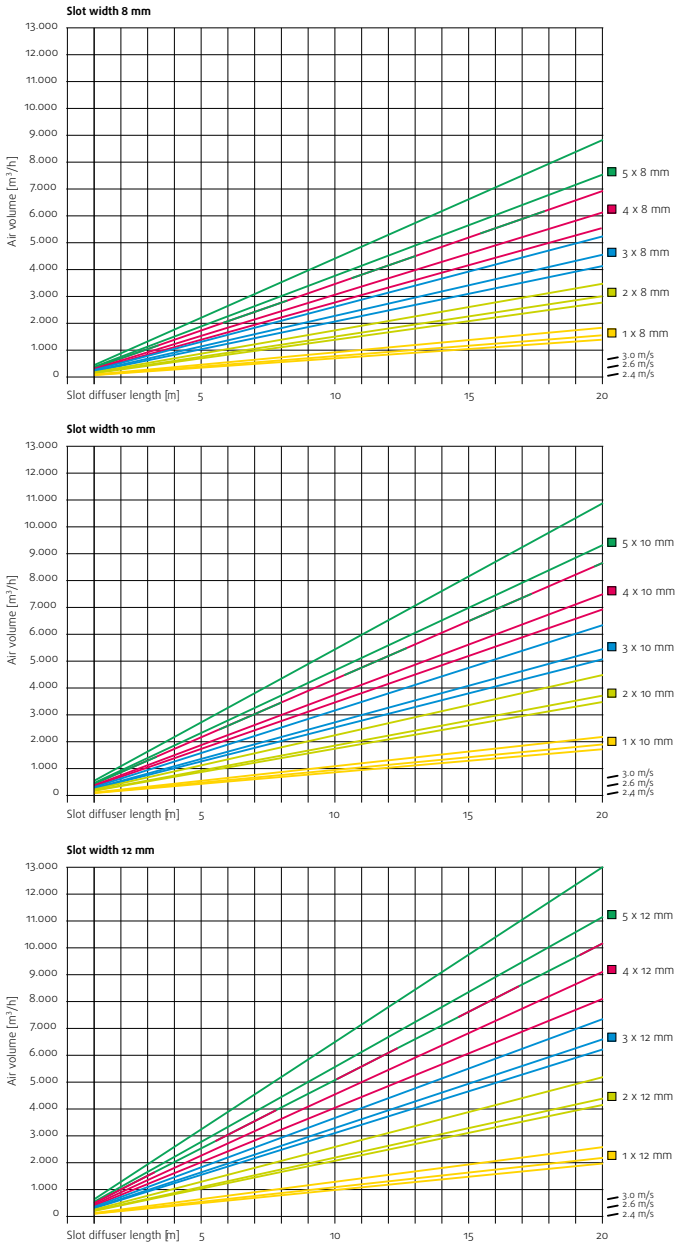


Application area office building

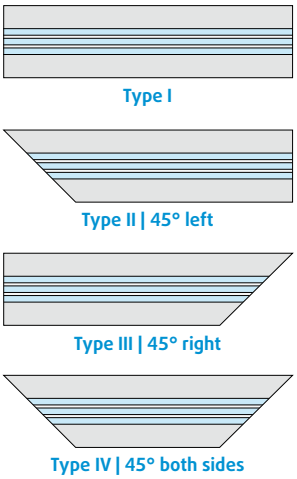


Example of installation

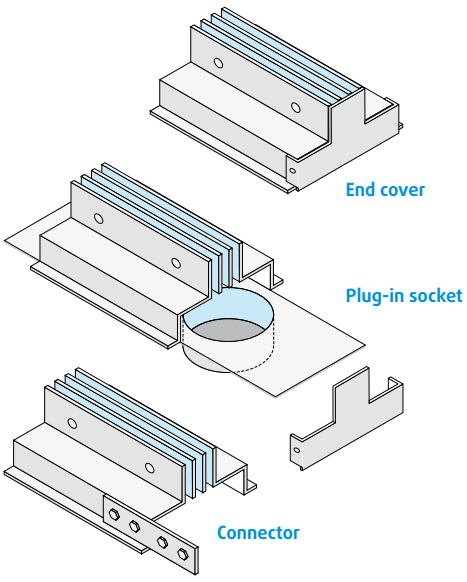




Optional miter cuts



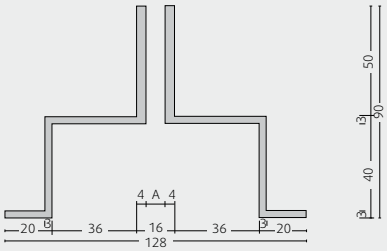
Accessories



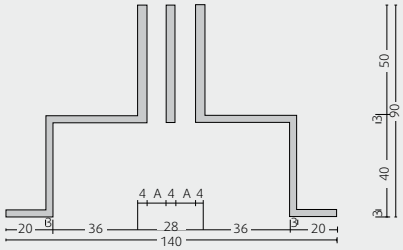
Available lengths and Cross-sections

Length 500-6000mm can be orderd up to 10 mm precisely. Consider linear expansion during assembly! In floor range of public swimming pool halls exclusively type A is permitted!

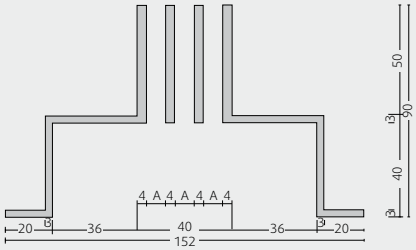
Type A = Slot width 8 mm
Type B = Slot width 10 mm
Type C = Slot width 12 mm



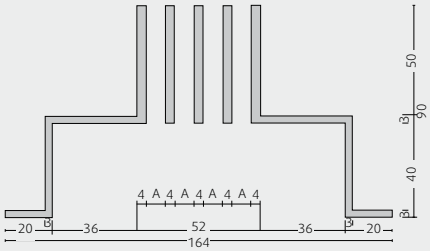
Type A1=1x8 | Type B1=1x10 | Type C1=1x12



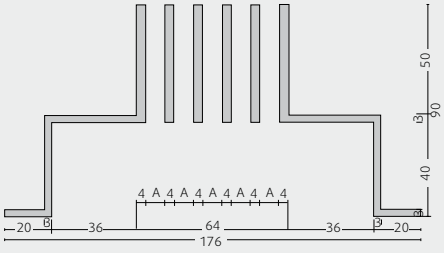
Type A2=2x8 | Type B2=2x10 | Type C2=2x12



Type A3=3x8 | Type B3=3x10 | Type C3=3x12



Type A4=4x8 | Type B4=4x10 | Type C4=4x12



Type A5=5x8 | Type B5=5x10 | Type C5=5x12

ETRIUM, COLOGNE
Office building in passive house standard, with DGNB quality seal in gold, equiped with Menerga Resolair.

Comfort air conditioning unit with cross-counterflow-cross heat exchanger

Trisolair 59 26 01 - simplified illustration

Automatically selects the most economical operating mode!

fulfills ECODESIGN DIRECTIVE 2009/125/EC 2016 + 2018

Trisolair 52 and Trisolair 59

AIR VOLUME FLOW: 1,200 – 5,000 m³/h

At a glance:

- **Over 80% temperature efficiency through three-stage recuperative heat recovery**
- **Energy efficiency class H1 according to EN 13053:2012**
- **Energy-saving EC fans**
- **Integrated compressor refrigeration system (59 series)**
- **Compact design**
- **Integrated defrosting function**
- **Integrated control and regulation system, compatible with all conventional building management systems**
- **Fulfils the requirements of VDI 6022**

Units in the Trisolair 52 and 59 series combine the highest heat recovery efficiency, low pressure drops and compact design. The units already meet the requirements of the second step of ErP 2009/125/EC. Ideal application areas are refurbishments at low to medium air volumes.

A compressor refrigeration system integrated into the 59 series increases the cooling capacity of the overall system at high temperatures and additionally allows dehumidification of the outside air.

Further performance parameters and options:

- Filtering the air in any operating mode
- Corrosion-free heat exchanger made from polypropylene
- Pumped hot water heating coil
- Bypass damper
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for comfort air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory test run

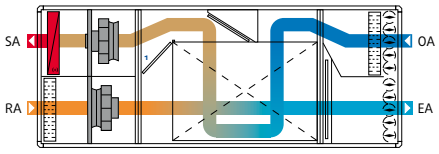
Options

- Recirculation air heating damper
- Pumped chilled water cooling coil
- Reversible compressor refrigeration system (series 59)
- Outdoor installation
- Thermal bridge factor TB1
- Remote maintenance
- And many more

Functional description

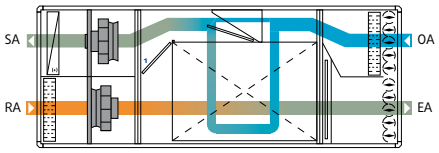
Heat recovery

In case of low outside temperatures the system operates completely in heat recovery mode. The cross-counterflow-cross plate heat exchanger enables the recovery of up to 80% of the heat contained in the return air. The standard integrated heating coil compensates for ventilation and transmission heat losses of the building as required.



Reduced heat recovery

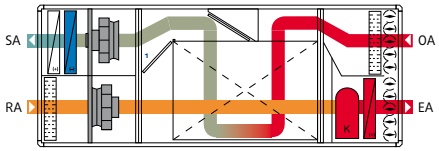
If the outside air temperatures rise, the heat recovery requirement is reduced. The bypass dampers, which run along the entire depth of the device, are continuously regulated in order to achieve the desired supply air temperature. If the outside temperatures continue to rise, the heat recovery is completely bypassed. The design of the bypass reduces the internal pressure drop on the OA-SA path and hence also significantly reduces the power consumption of the fan motor as it is effective over the entire depth of the unit.



Summertime conditions

If the outside temperature rises above the return temperature, the highly efficient heat exchanger is used as a "cooling recovery system". The warm outside air is cooled by the return air.

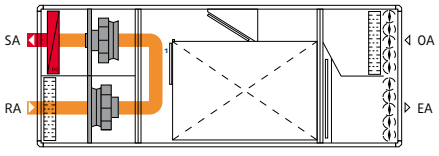
Cooling operation type 59:
Where outside air temperatures are sufficiently high, the heat exchanger is used for precooling the outside air (cold recovery). This minimises the electrical capacity required by the integrated compressor refrigeration system, which cools the supply air to the desired temperature and dehumidifies it if required. If unfavourable temperature conditions mean that precooling is not practical, the heat exchanger is bypassed.



Recirculation Air Heating Operation*

In recirculation air mode, the outdoor and exhaust air dampers are closed. The air is heated via the heating coil. Rooms which are not used all of the time, such as lecture halls or sports halls, can therefore be quickly heated before being used.

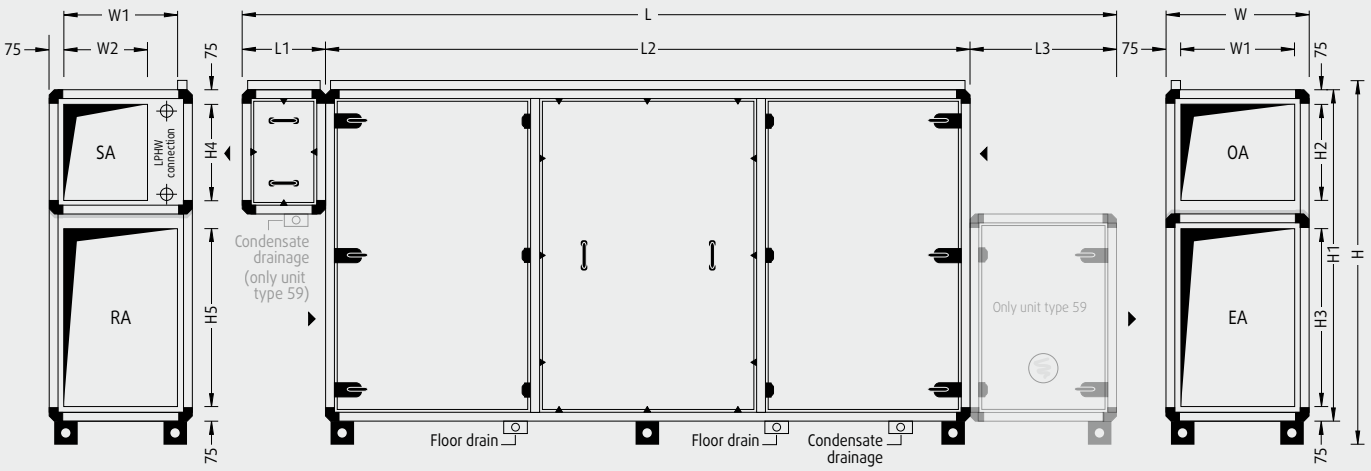
* only possible with optional recirculation air heating damper



1 Recirculation air heating damper (additional equipment)

Trisolair Type 52 and Type 59

System dimensions and weights



Unit feet 100 mm
Optional: adjustable feet from 100 to 120 mm

Mirror-image design possible.

Trisolair Type 52

Unit Type	L[1]	W[2]	H[3]	L1[1]	L2[1]	W1	W2	H1	H2	H3	H4	H5	Weight[1]
52 12 01	2,580	570	1,210*	410	2,170	420	350	1,050	325	420	420	325	420
52 18 01	3,060	730	1,530*	410	2,650	580	505	1,370	485	580	580	485	560
52 26 01	3,700	730	1,850	410	3,290	580	505	1,690	485	900	580	580	830
52 36 01	3,700	1,050	1,850	410	3,290	900	825	1,690	485	900	580	580	1,050

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
52 12 01	480 x 640 x 210	On top of unit
52 18 01	480 x 640 x 210	On top of unit
52 26 01	900 x 480 x 210	OA/EA side
52 36 01	900 x 480 x 210	OA/EA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

Partitioning of unit for smaller apertures possible (at extra cost).

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 25 mm each operating side
3 Height incl. 100 mm unit feet and 60 mm cable duct
* Controls cabinet arranged on top of unit, please add controls cabinet height (480 mm).

Trisolair Type 59 with compressor refrigeration system

Unit Type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	W2	H1	H2	H3	H4	H5	Weight[1]
59 18 01	4,110	730	1,530	730	2,650	730	580	505	1,370	485	580	580	485	770
59 26 01	4,750	730	1,850	730	3,290	730	580	505	1,690	485	900	580	580	1,050
59 36 01	4,750	1,050	1,850	730	3,290	730	900	825	1,690	485	900	580	580	1,280

Controls cabinet

Unit Type	H x W x D[1]	Position
59 18 01	1,120 x 640 x 210	Wall mounting
59 26 01	1,120 x 640 x 210	Wall mounting
59 36 01	1,120 x 640 x 210	Wall mounting

Technical specifications and services

Unit Type		52 12 01	52 18 01	52 26 01	52 36 01
Optimum flow rate	m^3/h	1,200	1,800	2,600	3,600
Max. volume flow rate [1]	m^3/h	1,600	2,500	3,200	5,000
Coefficient of power efficiency according to EN 13053:2012	%	73	73	76	75
Heat recovery rate according to EN 308	%	75	75	79	77
Total electrical power rating [2]	kW	0.69	1.13	1.64	1.91
Max. current consumption [2]	A	6.6	13.8	8.0	6.6
Operating voltage		1 / N / PE 230 V 50 Hz		3 / N / PE 400 V 50 Hz	
Ext. pressure loss					
Supply and fresh air channel	Pa	300	300	300	300
Return and exhaust air channel	Pa	300	300	300	300
Sound power level [3]					
Supply air vent	dB(A)	65	65	67	65
RA connection	dB(A)	58	60	61	60
Outside air vent	dB(A)	56	54	56	53
EA connection	dB(A)	53	57	59	59
Acoustic pressure at a distance of 1 m from the device [3]	dB(A)	46	47	49	48
Fan units					
Rated motor input for supply air [4]	kW	0.37	0.58	0.87	0.96
Rated motor input for return air [4]	kW	0.32	0.55	0.77	0.95
SFP category supply air | return air		2 | 2	2 | 2	3 | 2	1 | 2
Nominal rating supply air | return air	kW	0.8 | 0.8	1.4 | 1.4	2.5 | 2.5	3.3 | 3.3
Inner specific fan power (SFP_{int}) [5]	Ws/m^3	645	772	937	620
Efficiency classes according to EN 13053:2012					
Heat recovery class		H1	H1	H1	H1
Power consumption of fan motors SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1
Air velocity class		V1	V1	V1	V1
Filtration according to DIN EN 779					
Outside air		F7			
Return Air		M5			
LPHW [6]					
Heating capacity SA=22° C	kW	2.5	3.5	4.1	6.5
Heating capacity SA=30° C	kW	5.7	8.4	11.1	16.2
Heating capacity Defrost	kW	2.7	3.8	4.4	6.9
Water flow rate and pressure losses					
LPHW	m^3/h | kPa	0.25 | 4.8	0.51 | 4.9	0.50 | 4.8	0.88 | 5.4
LPHW (pump warm water) valve	m^3/h | kPa	0.15 | 5.9	0.22 | 4.9	0.31 | 9.3	0.42 | 6.9
Connections					
LPHW connection	DN	32	32	32	32
LPHW control valve connection	DN	10	10	10	10
Floor drains	DN	20	20	20	20
LPCW (optional) [7]					
Cooling capacity SA ≒ 18° C	kW	5.5	7.6	10.7	15.8
Additional power consumption for supply air	W	60	50	120	170
LPCW connection	DN	32	32	32	32
LPCW control valve-connection	DN	15	20	25	25
Water flow rate and pressure losses					
LPCW	m^3/h | kPa	0.68 | 3.2	1.03 | 0.9	1.37 | 1.1	1.62 | 2.3
LPCW valve	m^3/h | kPa	0.68 | 7.3	1.03 | 17.0	1.37 | 11.7	1.62 | 16.3

Specifications of technical data relate to the optimum flow rate and return air condition 30° C / 54% r.h., outside air condition 15° C / 84% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 May require alteration of the technical equipment
2 Depends on configuration of measurement and control system/unit
3 at 250 Hz mid-band frequency
4 with average filter contamination
5 According EU guideline No. 1253/2014 [Ecodesign guideline]
6 FL = 50° C
7 note additional power consumption for supply air
8 FL = 6° C

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Technical specifications and services

Unit Type		59 18 01	59 26 01	59 36 01
Optimum flow rate	m^3/h	1,800	2,600	3,600
Max. volume flow rate [1]	m^3/h	2,500	3,200	5,000
Coefficient of power efficiency according to EN 13053:2012	%	73	76	75
Heat recovery rate according to EN 308	%	75	79	77
Total electrical power rating [2]	kW	3.77	5.96	7.45
Max. current consumption [2]	A	20.8	18.0	21.6
Operating voltage		3 / N / PE 400 V 50 Hz		
Ext. pressure loss				
Supply and fresh air channel	Pa	300	300	300
Return and exhaust air channel	Pa	300	300	300
Sound power level [3]				
Supply air vent	dB(A)	63	66	63
RA connection	dB(A)	60	61	60
Outside air vent	dB(A)	55	58	54
EA connection	dB(A)	57	59	59
Acoustic pressure at a distance of 1 m from the device [3]	dB(A)	48	51	49
Fan units				
Rated motor input for supply air [4]	kW	0.62	0.97	1.07
Rated motor input for return air [4]	kW	0.55	0.79	0.98
SFP category supply air | return air		3 | 2	3 | 2	2 | 2
Nominal rating supply air | return air	kW	1.4 | 1.4	2.5 | 2.5	2.0 | 2.0
Inner specific fan power (SFP_{int}) [5]	Ws/m^3	772	939	621
Compressor refrigeration system [6]				
Filling volume for refrigerant type R410A	kg	3.0	3.0	4.0
Rated compressor input	kW	2.6	4.2	5.4
Mechanical cooling capacity	kW	8.7	12.8	17.9
Refrigeration capacity	EER	3.3	3.0	3.3
Efficiency classes according to EN 13053:2012				
Heat recovery class		H1	H1	H1
Power consumption of fan motors SA | RA		P1 | P1	P1 | P1	P1 | P1
Air velocity class		V1	V1	V1
Filtration according to DIN EN 779				
Outside air			F7	
Return Air			M5	
LPHW [7]				
Heating capacity SA=22° C	kW	3.5	4.0	6.5
Heating capacity SA=30° C	kW	8.4	11.1	16.1
Heating capacity Defrost	kW	3.6	5.1	7.3
Water flow rate and pressure losses				
LPHW	m^3/h | kPa	0.51 | 4.9	0.50 | 4.8	0.50 | 6.5
LPHW (pump warm water) valve	m^3/h | kPa	0.22 | 12.3	0.30 | 9.2	0.38 | 14.1
Connections				
LPHW connection	DN	32	32	32
LPHW control valve connection	DN	10	10	10
Floor drains	DN	20	20	20

Specifications of technical data relate to the optimum flow rate and return air condition 30° C / 54% r.h., outside air condition 15° C / 84% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 May require alteration of the technical equipment
2 Depends on configuration of measurement and control system/unit
3 at 250 Hz mid-band frequency
4 with average filter contamination
5 According EU guideline No. 1253/2014 [Ecodesign guideline]
6 At RA = 26° C/55 % r.h., OA = 32° C/40% r.h. and standard density, SA ≈ 17° C
7 FL = 70° C

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Double recuperative air conditioning unit with two-stage heat recovery

Dosolair 54 13 01 - simplified illustration

Automatically selects the most economical operating mode!

Dosolair 54

AIR VOLUME FLOW: 4,000 – 23,100 m³/h

Eurovent seal refers to range Menerga Air, more information on page 6. Check ongoing validity of certificate: www.eurovent-certification.com or www.certiflash.com

At a glance:

- **For heat and cooling recovery**
- **Energy-saving EC fans**
- **Intelligent air bypass duct**
- **Two-stage supply air filtration**
- **Integrated defrosting function**
- **Compact design**
- **Integrated control and regulation system, compatible with all conventional building management systems**
- **Freely configurable HVAC system**
- **Fulfils the requirements of VDI 6022**

Units in the Dosolair 54 series are ideally suited for return air from processes. The structural design allows a complete cleaning of the heat recovery system very easily. The recuperator of polypropylene is pollutant resistant, microbially not metabolisable and allows the use in many different areas, for example in industrial and kitchen applications.

Further performance parameters and options:

- Filtering the air in any operating mode
- Corrosion-free heat exchanger made from polypropylene
- Pumped hot water heating coil
- Thermal bridge factor TB1
- Individually controllable perforance parameters
- Complete unit, ready to connect, contains all structural elements for comfort air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory test run

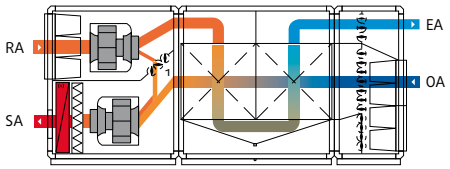
Options

- Recirculation air heating damper
- Pumped chilled water cooling coil
- Pressure reversal
- Attenuator
- Outdoor installation
- Remote maintenance
- And many more

Functional description

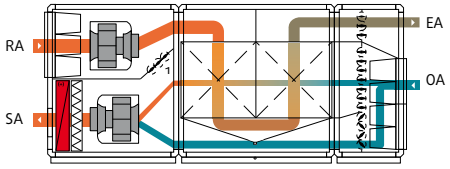
Wintertime conditions

In case of low outside temperatures the system operates completely in heat recovery mode. The standard heating coil compensates for ventilation and transmission heat losses of the building as required.



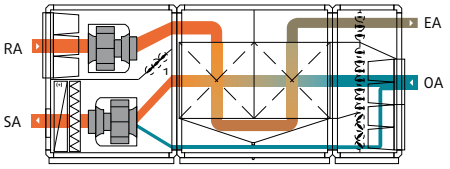
Defrosting Circuit

All recuperative heat exchangers tend to ice over in the exhaust air section in case of low outside temperatures. In defrost operation, the OA-SA bypass opens, reducing the outside air flow rate going through the recuperator. The heat contained in the return air melts any ice in the heat exchanger, while the airflow rate routed past the recuperator is precisely regulated.



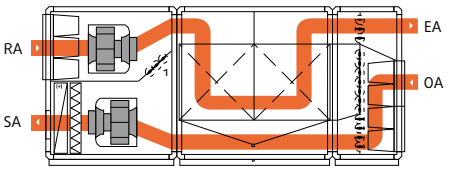
Transitional Period

As the outside air temperatures rise, the heat recovery requirement is reduced. The OA/SA bypass damper, which runs along the entire depth of the device, is continuously regulated in order to achieve the desired supply air temperature.



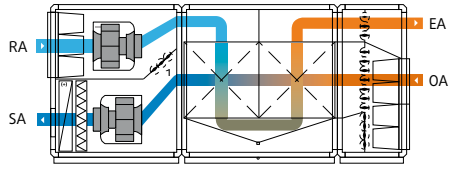
Free cooling

If the outside temperatures continue to rise, the heat recovery is bypassed. The structural design of the OA/SA bypass ensures that the pressure losses within the unit are low and that the power consumption of both fans in bypass mode is also low.



Summertime conditions

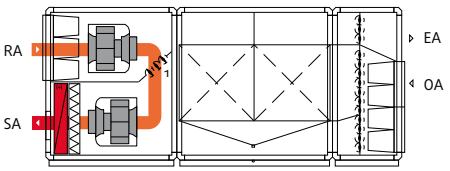
If the outside temperature rises above the return temperature, the highly efficient heat exchanger is used as a "cooling recovery system". The warm outside air is cooled by the return air.



Recirculation Air Operation (heating)*

In recirculation air mode, the outdoor and exhaust air dampers are closed. The air is heated via the heating coil. Rooms which are not used all of the time, such as lecture halls or sports halls, can therefore be quickly heated before being used.

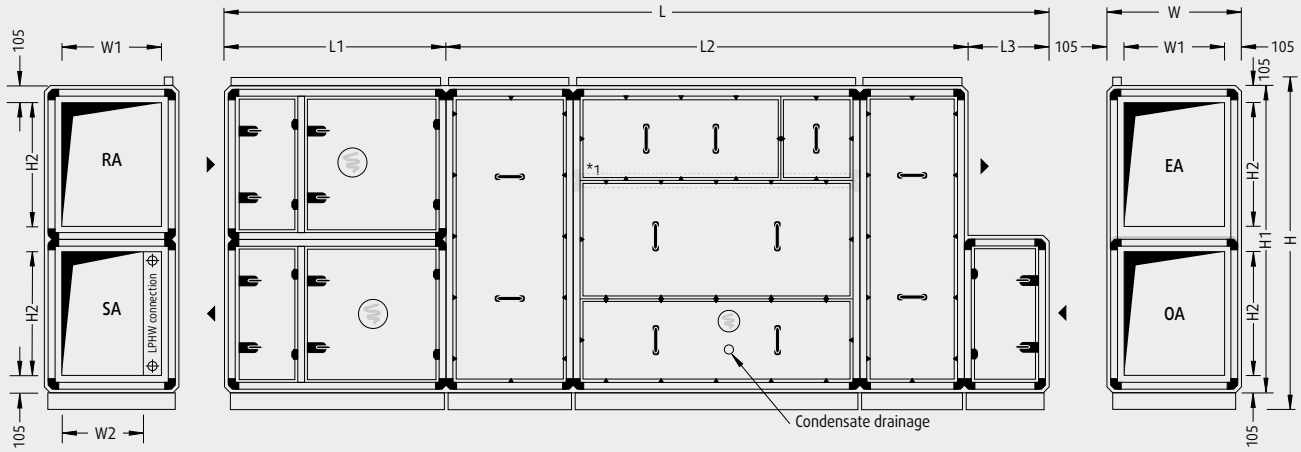
* only possible with optional recirculation air heating damper



1 Recirculation air heating damper (additional equipment)

Dosolair Type 54

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

Unit type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	W2	H1	H2	Weight[1]
54 06 01	5,630	790	2,340	1,400	3,630	600	580	420	2,160	900	1,500
54 10 01	5,630	1,110	2,340	1,400	3,630	600	900	740	2,160	900	1,800
54 13 01	5,790	1,430	2,340	1,560	3,630	600	1,220	1,060	2,160	900	2,150
54 16 01	5,790	1,750	2,340	1,560	3,630	600	1,540	1,380	2,160	900	2,450
54 19 01	5,790	2,070	2,340	1,560	3,630	600	1,860	1,700	2,160	900	2,750
54 25 01	6,430	2,070	2,980	1,560	4,270	600	1,860	1,700	2,800	1,220	3,650
54 32 01	7,230	2,070	3,620	1,560	5,070	600	1,860	1,700	3,440	1,540	4,500
54 36 01	7,230	2,390	3,620	1,560	5,070	600	2,180	2,020	3,440	1,540	5,400

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 65 mm each operating side
2 Height incl. 120 mm base frame and 60 mm cable duct

3 transportation units are supplied, including controls cabinet. Further partitioning for smaller apertures possible (at extra cost).

Largest transport unit

Unit type	L[1]	W	H[3]	Weight[1]
54 06 01	3,630	790	2,340	900
54 10 01	3,630	1,110	2,340	1,070
54 13 01	3,630	1,430	2,340	1,250
54 16 01	3,630	1,750	2,340	1,450
54 19 01	3,630	2,070	2,340	1,630
54 25 01	4,270	2,070	2,980	2,250
54 32 01	5,070	2,070	3,620	3,000
54 36 01	5,070	2,390	3,620	3,400

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
54 06 01	1,120 x 640 x 210	SA/RA side
54 10 01	1,120 x 640 x 210	SA/RA side
54 13 01	1,120 x 640 x 210	SA/RA side
54 16 01	1,120 x 640 x 210	SA/RA side
54 19 01	1,120 x 640 x 210	SA/RA side
54 25 01	1,120 x 640 x 210	SA/RA side
54 32 01	1,120 x 640 x 210	SA/RA side
54 36 01	1,280 x 640 x 210	SA/RA side

Technical specifications and services

Unit Type		54 06 01	54 10 01	54 13 01	54 16 01	54 19 01	54 25 01	54 32 01	54 36 01	54 xx xx
Optimum flow rate	m^3/h	4,000	6,000	7,900	9,800	11,800	15,800	19,900	23,100	< 40,800
Coefficient of power efficiency acc. to EN 13053:2012	%	67	67	68	68	68	68	70	70	
Heat recovery rate according to EN 308	%	70	70	70	71	71	70	73	73	
Total electrical power rating [1]	kW	2.55	3.59	4.50	5.79	8.05	10.42	15.28	17.46	
Max. current consumption [1]	A	8.0	9.6	16.0	16.0	17.4	32.0	32.0	37.6	
Operating voltage		3 / N / PE 400 V 50 Hz								
Ext. pressure loss										
Supply and fresh air channel	Pa	300	300	300	300	400	400	500	500	
Return and exhaust air channel	Pa	300	300	300	300	400	400	500	500	
Sound power level [2]										
Supply air vent	dB(A)	66	71	67	72	80	71	78	80	
RA connection	dB(A)	64	68	64	67	73	67	74	78	
Outside air vent	dB(A)	57	62	57	61	66	61	66	70	
EA connection	dB(A)	61	66	62	66	73	66	75	79	
Acoustic pressure at distance of 1 m from device [2]	dB(A)	52	57	53	58	65	57	65	69	
Fan units										
Rated motor input for supply air [3]	kW	1.34	2.00	2.49	3.04	4.17	5.48	7.94	9.04	
Rated motor input for return air [3]	kW	1.21	1.59	2.01	2.75	3.88	4.94	7.34	8.42	
SFP category supply air | return air		1 | 2	1 | 2	1 | 1	1 | 2	1| 3	1 | 2	2 | 3	2 | 3	
Nominal rating supply air | return air	kW	2.5 | 2.5	2.9 | 2.9	5.0 | 5.0	5.0 | 5.0	6.0 | 5.0	10.0 | 10.0	10.0 | 10.0	12.0 | 12.0	
Inner specific fan power (SFP_{int}) [4]	Ws/m^3	777	753	693	678	691	572	672	666	
Efficiency classes according to EN 13053:2012										
heat recovery class		H2	H2	H2	H2	H2	H2	H2	H2	
Power consumption of fan motors SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P2 | P1	
Air velocity class		V2	V2	V2	V2	V2	V2	V2	V2	
Filtration according to DIN EN 779										
Supply air | Outside air		F7 | M5								
Return Air		M5								
LPHW										
Heating capacity SA=22° C [5]	kW	11.0	16.2	21.2	26.0	31.1	43.5	46.2	53.5	
Heating capacity SA=30° C [5]	kW	21.7	32.4	42.7	52.5	62.8	86.0	99.6	115.7	
Heating capacity Defrost [5,6]	kW	10.9	16.3	21.3	26.6	31.9	41.3	52.2	60.8	
Water flow rate and pressure losses at heating capacity SA=22° C										
LPHW	m^3/h | kPa	0.89 | 4.4	1.39 | 4.0	2.14 | 3.3	2.13 | 3.8	2.14 | 4.4	3.87 | 3.6	4.76 | 3.3	4.79 | 3.6	
LPHW (pump warm water) valve	m^3/h | kPa	0.65 | 6.8	0.92 | 5.3	1.23 | 3.8	1.40 | 5.0	1.58 | 6.3	2.31 | 5.3	2.61 | 4.4	2.93 | 5.5	
Connections										
LPHW connection	DN	32	32	40	40	40	50	50	65	
LPHW control valve connection	DN	15	15	15	15	20	25	25	25	
Condensate drainage	DN	40	40	40	40	40	40	40	40	
LPCW (optional) [7]										
Cooling capacity SA ≒ 18° C [8]	kW	17.3	31.5	42.3	53.2	64.0	84.0	108.7	130.2	
LPCW connection	DN	40	50	50	65	80	80	80	100	
Water flow rate and pressure losses										
LPCW	m^3/h | kPa	2.48 | 6.1	4.51 | 20.0	6.05 | 23.3	7.61 | 22.3	9.15 | 21.9	12.01 | 27.5	15.55 | 23.1	18.62 | 35.0	
LPCW valve	m^3/h | kPa	2.48 | 6.1	4.51 | 20.3	6.05 | 23.4	7.61 | 22.6	9.15| 32.7	12.01 | 36.1	15.55 | 24.4	18.62 | 55.5	

Technical details upon request.

Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 depends on configuration of measurement and control system/unit
2 at 250 Hz mid-band frequency
3 with average filter contamination
4 according EU guideline No. 1253/2014 [Ecodesign guideline]
5 FL= 70° C
6 at OA=-15° C, SA=18° C, 66% optimum flow rate and active defrost function
7 note additional power consumption for supply air
8 FL = 6° C, RA = 26° C; 55 % r.h. and OA = 32° C; 40% r.h.

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Comfort air conditioning unit with double plate heat exchanger and adiabatic evaporative cooling system

Adsolair 58 13 01 - simplified illustration

Automatically selects the most economical operating mode!

Adsolair 56/58

AIR VOLUME FLOW: 2,600 – 23,100 m³/h

Eurovent seal refers to range Menerga Air, more information on page 6. Check ongoing validity of certificate: www.eurovent-certification.com or www.certiflash.com

At a glance:

- **For heat and cooling recovery**
- **Energy-saving EC fans**
- **Integrated compressor refrigeration system (58 series)**
- **Intelligent air bypass duct**
- **Two-stage supply air filtration**
- **Adiabatic evaporative cooling – Cooling without electricity**
- **Integrated defrosting function**
- **Compact design**
- **Freely configurable HVAC system**
- **Fulfils the requirements of VDI 6022**

Requirements with high thermal loads can be ideally met with the different cooling options of the units in series Adsolair. Series 56 uses adiabatic evaporative cooling an achieves to cool up to 12 K* with water. At series 58 the total cooling capacity is further enhanced with an integrated compression refrigeration system.

Further performance parameters and options:

- Filtering the air in any operating mode
- Corrosion-free heat exchanger made from polypropylene
- Pumped hot water heating coil
- Thermal bridge factor TB1
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for comfort air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory trial run

Options

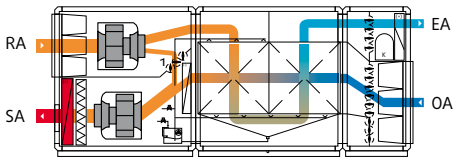
- Recirculation air heating damper
- Pumped chilled water cooling coil (56 series)
- Pressure reversal
- Sound absorber
- Reversible refrigeration system (58 series)
- Outdoor installation
- Hot water extraction, to use waste heat for heating purposes (58 series)
- Increased cooling capacity
- Remote maintenance
- And many more

* at OA = 34° C / 40% r.h.

Functional description

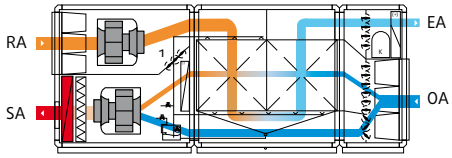
Wintertime conditions

In case of low outside temperatures the system operates completely in heat recovery mode. The standard heating coil (LPHW) compensates for ventilation and transmission heat losses of the building as required.



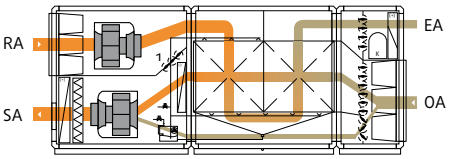
Defrosting Circuit

All recuperative heat exchangers tend to ice over in the exhaust air section in case of low outside temperatures. In defrost operation, the OA-SA bypass opens, reducing the outside air flow rate going through the recuperator. The heat contained in the return air melts any ice in the heat exchanger, while the airflow rate routed past the recuperator is regulated as required.



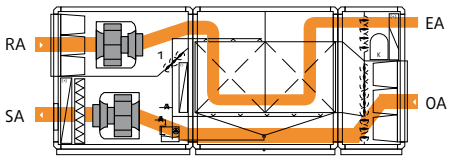
Transitional Period

As the outside air temperatures rise, the heat recovery requirement is reduced. The OA/SA bypass damper, which runs along the entire depth of the device, is continuously regulated in order to achieve the desired supply air temperature.



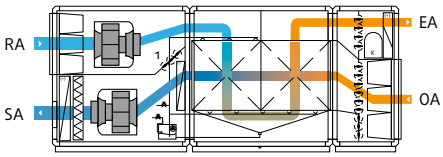
Free cooling

If the outside temperatures continue to rise, the heat recovery is bypassed. The structural design of the OA/SA bypass ensures that the pressure losses within the unit are low and that the power consumption of both fans in bypass mode is also low.



Summertime conditions

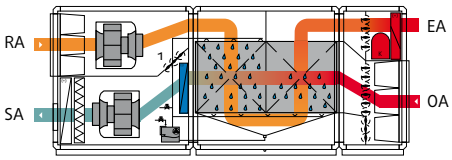
If the outside temperature rises above the return temperature, the highly efficient heat exchanger is used as a "cooling recovery system". The warm outside air is cooled by the return air.



Indirect adiabatic evaporative cooling

The Menerga Adsolair principle uses the advantages of indirect adiabatic evaporative cooling without the disadvantages of supply air humidification. A major component of the Adsolair principle is the double plate heat exchanger, in which the return air is "adiabatically" cooled. In return, the outside air is cooled by the humid, cold exhaust air, without being humidified.

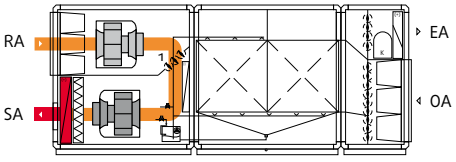
The high efficiency rate lies in the fact that both processes (adiabatic evaporative cooling of the return air + cooling of the outside air) take place simultaneously in the heat exchanger. The high degree of temperature efficiency of the double plate heat exchanger allows significant cooling of the OA-SA by over 12 K*. If required, the compressor refrigeration system will switch on and cool the supply air even further.



* at OA = 34° C / 40% r.h.

Recirculation Air Operation (heating)*

In recirculation air mode, the outdoor and exhaust air dampers are closed. The air is heated via the heating coil. Rooms which are not used all of the time, such as lecture halls or sports halls, can therefore be quickly heated before being used.

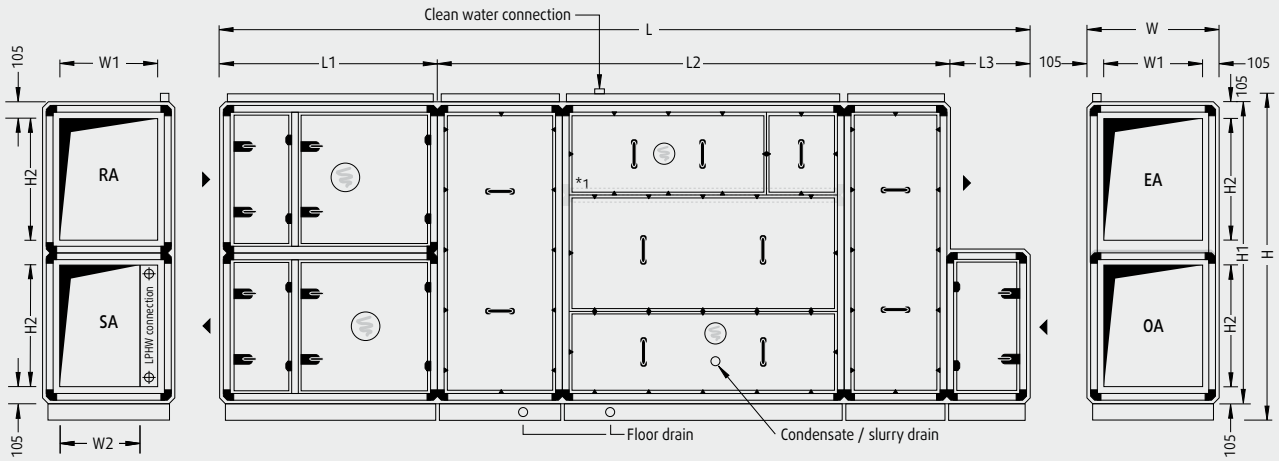


* only possible with optional recirculation air heating damper

1 Recirculation air heating damper (additional equipment)

Adsolair Type 56

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Proportions/details vary depending on system size.

Mirror-image design possible.

Unit type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	W2	H1	H2	Weight[1]
56 03 01	4,350	790	1,700	1,240	2,510	600	580	510	1,520	580	1,100
56 05 01	4,510	1,110	1,700	1,400	2,510	600	900	830	1,520	580	1,350
56 06 01	5,630	790	2,340	1,400	3,630	600	580	420	2,160	900	1,550
56 10 01	5,630	1,110	2,340	1,400	3,630	600	900	740	2,160	900	1,850
56 13 01	5,790	1,430	2,340	1,560	3,630	600	1,220	1,060	2,160	900	2,200
56 16 01	5,790	1,750	2,340	1,560	3,630	600	1,540	1,380	2,160	900	2,520
56 19 01	5,790	2,070	2,340	1,560	3,630	600	1,860	1,700	2,160	900	2,800
56 25 01	6,430	2,070	2,980	1,560	4,270	600	1,860	1,700	2,800	1,220	3,800
56 32 01	7,230	2,070	3,620	1,560	5,070	600	1,860	1,700	3,440	1,540	4,650
56 36 01	7,230	2,390	3,620	1,560	5,070	600	2,180	2,020	3,440	1,540	5,500

Largest transport unit *

Unit Type	L[1]	W[2]	H[3]	Weight[1]
56 03 01	2,510	790	1,700	600
56 05 01	2,510	1,110	1,700	750
56 06 01	3,630	790	2,340	950
56 10 01	3,630	1,110	2,340	1,120
56 13 01	3,630	1,430	2,340	1,300
56 16 01	3,630	1,750	2,340	1,500
56 19 01	3,630	2,070	2,340	1,680
56 25 01	4,270	2,070	2,980	2,400
56 32 01	5,070	2,070	3,620	3,150
56 36 01	5,070	2,390	3,620	3,500

Operating weight

Unit Type	Weight[1]
56 03 01	1,140
56 05 01	1,390
56 06 01	1,600
56 10 01	1,920
56 13 01	2,290
56 16 01	2,630
56 19 01	2,940
56 25 01	3,990
56 32 01	4,880
56 36 01	5,790

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
56 03 01	1,120 x 640 x 210	SA/RA side
56 05 01	1,120 x 640 x 210	SA/RA side
56 06 01	1,120 x 640 x 210	SA/RA side
56 10 01	1,120 x 640 x 210	SA/RA side
56 13 01	1,120 x 640 x 210	SA/RA side
56 16 01	1,120 x 640 x 210	SA/RA side
56 19 01	1,120 x 640 x 210	SA/RA side
56 25 01	1,120 x 640 x 210	SA/RA side
56 32 01	1,280 x 640 x 210	SA/RA side
56 36 01	1,280 x 640 x 210	SA/RA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 65 mm each operating side
3 incl. 120 mm base frame, plus 60 mm cable duct

* Partitioning of unit for smaller apertures possible (at extra cost).

Technical specifications and services

Unit Type		56 03 01	56 05 01	56 06 01	56 10 01	56 13 01	56 16 01
Optimum flow rate	m^3/h	2,600	3,900	4,000	6,000	7,900	9,800
Coefficient of power efficiency according to EN 13053:2012	%	69	69	67	67	68	68
Heat recovery rate according to EN 308	%	72	72	70	70	70	71
Total electrical power rating [1]	kW	2.09	2.83	2.87	4.12	5.14	6.21
Max. current consumption [1]	A	9.1	9.1	9.1	10.7	17.4	17.4
Operating voltage		3 / N / PE 400 V 50 Hz					
Ext. pressure loss							
Supply and fresh air channel	Pa	300	300	300	300	300	300
Return and exhaust air channel	Pa	300	300	300	300	300	300
Sound power level [2]							
Supply air vent	dB(A)	68	65	65	73	67	72
RA connection	dB(A)	62	65	64	69	64	68
Outside air vent	dB(A)	58	57	57	62	57	60
EA connection	dB(A)	61	61	62	67	63	67
Acoustic pressure at a distance of 1 m from the device [2]	dB(A)	54	52	52	57	54	58
Fan units							
Rated motor input for supply air [3]	kW	0.97	1.36	1.34	2.00	2.49	3.04
Rated motor input for return air [3]	kW	0.82	1.17	1.23	1.82	2.25	2.77
SFP category supply air | return air		1 | 2	1 | 2	1 | 2	1 | 2	1 | 2	1 | 2
Nominal rating supply air | return air	kW	2.5 | 2.5	2.5 | 2.5	2.5 | 2.5	2.9 | 2.9	5.0 | 5.0	5.0 | 5.0
Inner specific fan power (SFP_{int}) [4]	Ws/m^3	863	824	775	752	693	677
Evaporative cooling [5]							
Cooling capacity of adiabatic evaporative cooling system [6]	kW	9.1	13.7	13.6	20.5	27.2	33.9
Rated pump input for evaporative cooling	kW	0.3	0.3	0.3	0.3	0.4	0.4
Efficiency classes according to EN 13053:2012							
Heat recovery class		H2	H2	H2	H2	H2	H2
Power consumption of fan motors SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1
Air velocity class		V1	V1	V2	V2	V2	V2
Filtration according to DIN EN 779							
Supply air | Outside air		F7 | M5					
Return Air		M5					
LPHW							
Heating capacity SA=22° C [7]	kW	6.4	9.6	11.0	16.2	21.1	26.0
Heating capacity SA=30° C [7]	kW	13.4	20.1	21.7	32.4	42.6	52.5
Heating capacity Defrost [7,8]	kW	6.8	10.4	10.9	16.3	21.3	26.6
Water flow rate and pressure losses at heating capacity SA=22° C							
LPHW	m^3/h | kPa	0.50 | 5.2	0.88 | 4.2	0.88 | 4.7	1.38 | 4.3	2.13 | 3.5	2.16 | 4.2
LPHW valve	m^3/h | kPa	0.39 | 5.9	0.57 | 5.2	0.65 | 6.8	0.92 | 5.3	1.23 | 3.8	1.40 | 5.0
Connections							
LPHW connection	DN	32	32	32	32	40	40
LPHW control valve connection	DN	15	15	15	15	15	15
Clean water connection [9]	DN	15	15	15	15	15	20
Condensate / slurry drain	DN	40	40	40	40	40	40
Floor drains	DN	40	40	40	40	40	40
LPCW (optional) [10]							
Cooling capacity SA ≒ 17° C [11]	kW	8.7	13.3	14.1	21.6	29.0	36.6
LPCW connection	DN	32	40	40	50	50	65
LPCW control valve-connection	DN	15	20	20	25	32	40
Water flow rate and pressure losses							
LPCW	m^3/h | kPa	1.24 | 8.9	1.91 | 8.4	2.02 | 10.7	3.08 | 10.2	4.14 | 11.9	5.23 | 11.5
LPCW valve	m^3/h | kPa	1.24 | 9.6	1.91 | 9.2	2.02 | 16.3	3.08 | 14.9	4.14 | 17.2	5.23 | 17.5

Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 dependent on configuration of measurement and control system/unit
2 at 250 Hz mid-band frequency
3 with average filter contamination
4 according EU guideline No. 1253/2014 [Ecodesign guideline]
5 water quality of make-up water corresponds to VDI 3803 table B3 with a bacteria count < 100 CFU/ml, water hardness range "middle".
6 for RA 26° C; 55 % r.h. and OA 32° C; 40% r.h.
7 FL = 70° C
8 At OA=-15° C, SA=18° C, 66% optimum flow rate and active defrost function
9 2 bar system pressure required at 25 l/min flow rate.
10 may require of alteration of technical equipment
11 Note higher power consumption of SA fan units
12 FL = 6° C, return air condition 26° C / 55% r.h., outside air condition 32° C / 40% r.h

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Technical specifications and services

Unit Type		56 19 01	56 25 01	56 32 01	56 36 01	56 xx xx
Optimum flow rate	m^3/h	11,800	15,800	19,900	23,100	< 40,800
Coefficient of power efficiency according to EN 13053:2012	%	68	68	70	70	
Heat recovery rate according to EN 308	%	71	70	73	73	
Total electrical power rating [1]	kW	8.58	10.92	15.78	18.62	
Max. current consumption [1]	A	19.0	33.6	36.4	39.7	
Operating voltage		3 / N / PE 400 V 50 Hz				
Ext. pressure loss						
Supply and fresh air channel	Pa	400	400	500	500	
Return and exhaust air channel	Pa	400	400	500	500	
Sound power level [2]						
Supply air vent	dB(A)	80	71	78	80	
RA connection	dB(A)	73	68	74	77	
Outside air vent	dB(A)	66	60	66	69	
EA connection	dB(A)	74	67	75	79	
Acoustic pressure at a distance of 1 m from the device [2]	dB(A)	65	57	70	69	
Fan units						
Rated motor input for supply air [3]	kW	4.17	5.44	7.88	9.04	
Rated motor input for return air [3]	kW	3.91	4.98	7.40	8.48	
SFP category supply air | return air		1 | 3	1 | 2	2 | 3	2 | 3	
Nominal rating supply air | return air	kW	6.0 | 5.0	10.0 | 10.0	10.0 | 10.0	12.0 | 12.0	
Inner specific fan power (SFP_{int})	Ws/m^3	690	566	665	665	
Evaporative cooling [4]						
Cooling capacity of adiabatic evaporative cooling system [5]	kW	40.7	53.9	70.8	82.4	
Rated pump input for evaporative cooling	kW	0.50	0.50	0.50	1.1	
Efficiency classes according to EN 13053:2012						
Heat recovery class		H2	H2	H2	H2	
Power consumption of fan motors SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1	
Air velocity class		V2	V2	V2	V2	
Filtration according to DIN EN 779						
Supply air | Outside air		F7 | M5				
Return Air		M5				
LPHW						
Heating capacity SA=22° C [6]	kW	31.1	43.5	46.2	53.5	
Heating capacity SA=30° C [6]	kW	62.8	86.0	99.6	115.7	
Heating capacity Defrost [6,7]	kW	31.9	41.3	52.2	60.8	
Water flow rate and pressure losses at heating capacity SA=22° C						
LPHW	m^3/h | kPa	2.14 | 4.8	3.86 | 3.9	4.77 | 3.5	4.77 | 3.9	
LPHW (pump warm water) valve	m^3/h | kPa	1.58 | 6.3	2.31 | 5.3	2.61 | 4.4	2.93 | 5.5	
Connections						
LPHW connection	DN	40	50	50	65	
LPHW control valve connection	DN	20	25	25	25	
Clean water connection [8]	DN	20	20	20	20	
Condensate / slurry drain	DN	40	40	40	40	
Floor drains	DN	40	40	40	40	
LPCW (optional) [9,10]						
Cooling capacity SA ≏ 17° C [11]	kW	43.7	57.8	72.7	88.5	
LPCW connection	DN	80	80	80	100	
LPCW control valve-connection	DN	40	50	50	50	
Water flow rate and pressure losses						
LPCW	m^3/h | kPa	6.24 | 11.1	8.26 | 14.0	10.40 | 11.3	12.66 | 17.6	
LPCW valve	m^3/h | kPa	6.24 | 15.2	8.26 | 17.1	10.40 | 17.3	12.66 | 25.7	

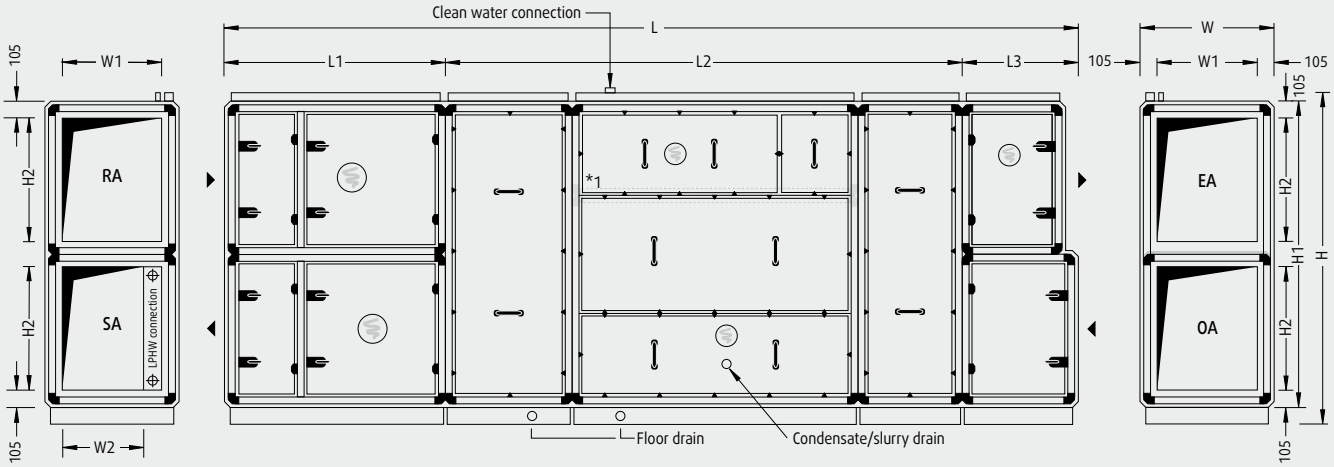
Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 dependent on configuration of measurement and control system/unit
2 at 250 Hz mid-band frequency
3 with average filter contamination
4 according EU guideline No. 1253/2014 [Ecodesign guideline]
5 water quality of make-up water corresponds to VDI 3803 table B3 with a bacteria count < 100 CFU/ml, water hardness range "middle".
6 for RA 26° C; 55 % r.h. and OA 32° C; 40% r.h.
7 FL = 70° C
8 At OA=-15° C, SA=18° C, 66% optimum flow rate and active defrost function
9 2 bar system pressure required at 25 l/min flow rate.
10 may require of alteration of technical equipment
11 Note higher power consumption of SA fan units
12 FL = 6° C, return air condition 26° C / 55% r.h., outside air condition 32° C / 40% r.h

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Adsolair Type 58

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

Proportions/details vary depending on system size.

Unit Type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	W2	H1	H2	Weight[1]
58 03 01	4,670	790	1,700	1,240	2,510	920	580	510	1,520	580	1,300
58 05 01	4,830	1,110	1,700	1,400	2,510	920	900	830	1,520	580	1,600
58 06 01	5,950	790	2,340	1,400	3,630	920	580	420	2,160	900	1,780
58 10 01	5,950	1,110	2,340	1,400	3,630	920	900	740	2,160	900	2,100
58 13 01	6,110	1,430	2,340	1,560	3,630	920	1,220	1,060	2,160	900	2,550
58 16 01	6,110	1,750	2,340	1,560	3,630	920	1,540	1,380	2,160	900	2,830
58 19 01	6,110	2,070	2,340	1,560	3,630	920	1,860	1,700	2,160	900	3,300
58 25 01	6,750	2,070	2,980	1,560	4,270	920	1,860	1,700	2,800	1,220	4,400
58 32 01	7,550	2,070	3,620	1,560	5,070	920	1,860	1,700	3,440	1,540	5,350
58 36 01	7,550	2,390	3,620	1,560	5,070	920	2,180	2,020	3,440	1,540	6,350

Largest transport unit *

Unit Type	L[1]	W[2]	H[3]	Weight[1]
58 03 01	2,510	790	1,700	620
58 05 01	2,510	1,110	1,700	770
58 06 01	3,630	790	2,340	980
58 10 01	3,630	1,110	2,340	1,170
58 13 01	3,630	1,430	2,340	1,370
58 16 01	3,630	1,750	2,340	1,580
58 19 01	3,630	2,070	2,340	1,770
58 25 01	4,270	2,070	2,980	2,530
58 32 01	5,070	2,070	3,620	3,350
58 36 01	5,070	2,390	3,620	3,750

Operating weight

Unit Type	Weight[1]
58 03 01	1,340
58 05 01	1,640
58 06 01	1,830
58 10 01	2,170
58 13 01	2,640
58 16 01	2,940
58 19 01	3,440
58 25 01	4,590
58 32 01	5,580
58 36 01	6,990

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
58 03 01	1,280 x 640 x 210	SA/RA side
58 05 01	1,280 x 640 x 210	SA/RA side
58 06 01	1,280 x 640 x 210	SA/RA side
58 10 01	1,280 x 640 x 210	SA/RA side
58 13 01	1,280 x 640 x 210	SA/RA side
58 16 01	1,280 x 640 x 210	SA/RA side
58 19 01	1,280 x 640 x 210	SA/RA side
58 25 01	1,280 x 640 x 210	SA/RA side
58 32 01	1,280 x 640 x 210	SA/RA side
58 36 01	1,600 x 640 x 250	SA/RA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 65 mm each operating side
3 incl. 120 mm base frame, plus 60 mm cable duct

* Partitioning of unit for smaller apertures possible (at extra cost).

Technical specifications and services

Unit Type		58 03 01	58 05 01	58 06 01	58 10 01	58 13 01	58 16 01
Optimum flow rate	m^3/h	2,600	3,900	4,000	6,000	7,900	9,800
Total cooling capacity[1]	kW	18.0	25.8	23.9	36.8	46.6	59.2
Energy Efficiency Ratio [1,2]	EER	7.8	9.6	10.4	11.2	12.3	10.4
Coefficient of power efficiency according to EN 13053:2012	%	69	69	67	67	68	68
Heat recovery rate according to EN 308	%	72	72	70	70	70	71
Total electrical power rating[3]	kW	4.26	5.43	5.08	7.42	8.92	11.97
Max. current consumption[3]	A	16.1	17.3	16.4	21.2	29.4	34.6
Operating voltage		3 / N / PE 400 V 50 Hz					
Ext. pressure loss							
Supply and fresh air channel	Pa	300	300	300	300	300	300
Return and exhaust air channel	Pa	300	300	300	300	300	300
Sound power level [4]							
Supply air vent	dB(A)	70	67	67	72	68	75
RA connection	dB(A)	63	64	65	70	65	68
Outside air vent	dB(A)	57	56	56	60	55	60
EA connection	dB(A)	63	62	62	68	64	69
Acoustic pressure at a distance of 1 m from the device[4]	dB(A)	55	53	53	58	55	60
Fan units							
Rated fan input for supply air [5]	kW	1.09	1.50	1.49	2.21	2.75	3.34
Rated fan input for return air [5]	kW	0.87	1.23	1.29	1.91	2.37	2.93
SFP category supply air | return air		2 | 3	2 | 2	2 | 2	1 | 2	1 | 2	1 | 2
Nominal rating supply air | return air	kW	2.5 | 2.5	2.5 | 2.5	2.5 | 2.5	2.9 | 2.9	5.0 | 5.0	5.0 | 5.0
Inner specific fan power (SFP_{int}) [6]	Ws/m	865	815	765	747	692	672
Evaporative cooling [1,7]							
Cooling capacity of adiabatic evaporative cooling system	kW	9.1	13.7	13.6	20.5	27.2	33.9
Rated pump input for evaporative cooling	kW	0.3	0.4	0.4	0.5	0.5	1.1
Compressor refrigeration system							
Filling volume for refrigerant type R410A	kg	3.0	4.0	4.0	5.0	7.0	8.0
Rated compressor input	kW	2.0	2.3	1.9	2.8	3.3	4.6
Mechanical cooling capacity [1,8]	kW	8.9	12.1	10.3	16.3	19.4	25.3
Efficiency classes according to EN 13053:2012							
Heat recovery class		H2	H2	H2	H2	H2	H2
Power consumption of fans SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1
Air velocity class		V1	V1	V2	V2	V2	V2
Filtration according to DIN EN 779							
Supply air | Outside air		F7 | M5					
Return Air		M5					
LPHW							
Heating capacity SA=22° C [9]	kW	6.3	9.4	10.9	16.1	21.0	25.9
Heating capacity SA=30° C [9]	kW	13.3	20.0	21.7	32.3	42.5	52.4
Heating capacity Defrost [9,10]	kW	6.8	10.4	10.6	16.3	21.3	26.5
Water flow rate and pressure losses at heating capacity SA=22° C							
LPHW	m^3/h | kPa	0.50 | 5.2	0.88 | 4.2	0.88 | 4.8	1.38 | 4.43	2.13 | 3.5	2.16 | 4.2
LPHW (pump warm water) valve	m^3/h | kPa	0.38 | 5.8	0.57 | 5.1	0.56 | 5.0	0.92 | 5.3	1.23 | 3.8	1.40 | 4.9
Connections							
LPHW connection	DN	32	32	32	32	40	40
LPHW control valve connection	DN	15	15	15	15	15	15
Clean water connection [11]	DN	15	15	15	15	15	20
Condensate / slurry drain	DN	40	40	40	40	40	40
Floor drains	DN	40	40	40	40	40	40

Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m³), unless otherwise specified.

1 for RA 26° C; 55 % r.h. and OA 32° C; 40% r.h.
2 incl. evaporative cooling capacity taking into account power consumption for adiabatic pump(s)
3 dependent on configuration of measurement and control system/unit
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 according EU guideline No. 1253/2014 [Ecodesign guideline]
7 water quality of make-up water corresponds to VDI 3803 table B3 with a bacteria count < 100 CFU/ml, water hardness range "middle".
8 at supply air ≈ 17° C
9 FL = 70° C
10 At OA=-15° C, SA=18° C, 66% of optimum flow rate and active defrost function
11 2 bar system pressure required at 25 l/min flow rate

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Technical specifications and services

Unit Type		58 19 01	58 25 01	58 32 01	58 36 01	58 xx xx
Optimum flow rate	m^3/h	11,800	15,800	19,900	23,100	< 40,800
Total cooling capacity[1]	kW	72.3	92.3	118.9	132.4	
Energy Efficiency Ratio [1, 2]	EER	11	12.6	12.6	14.2	
Coefficient of power efficiency according to EN 13053:2012	%	68	68	70	70	
Heat recovery rate according to EN 308	%	71	70	73	73	
Total electrical power rating[3]	kW	15.14	18.54	25.50	27.80	
Max. current consumption[3]	A	41.9	56.3	69.0	71.8	
Operating voltage		3 / N / PE 400 V 50 Hz				
Ext. pressure loss						
Supply and fresh air channel	Pa	400	400	500	500	
Return and exhaust air channel	Pa	400	400	500	500	
Sound power level [4]						
Supply air vent	dB(A)	77	73	80	80	
RA connection	dB(A)	74	68	74	77	
Outside air vent	dB(A)	64	59	65	67	
EA connection	dB(A)	76	68	75	77	
Acoustic pressure at a distance of 1 m from the device[4]	dB(A)	66	59	66	68	
Fan units						
Rated fan input for supply air [5]	kW	4.48	5.98	8.36	9.66	
Rated fan input for return air [5]	kW	4.06	5.26	7.74	8.84	
SFP category supply air | return air		2 | 2	2 | 3	2 | 3	2 | 3	
Nominal rating supply air | return air	kW	6.0 | 6.0	10.0 | 10.0	12.0 | 10.0	12.0 | 12.0	
Inner specific fan power (SFP_{int}) [6]	Ws/m	681	572	666	660	
Evaporative cooling [1,7]						
Cooling capacity of adiabatic evaporative cooling system	kW	40.7	53.9	70.8	82.4	
Rated pump input for evaporative cooling	kW	1.1	1.1	1.5	1.5	
Compressor refrigeration system						
Filling volume for refrigerant type R410A	kg	12.0	18.0	21.0	22.0	
Rated compressor input	kW	5.5	6.2	7.9	7.8	
Mechanical cooling capacity [1, 8]	kW	31.6	38.4	48.1	50.0	
Efficiency classes according to EN 13053:2012						
Heat recovery class		H2	H2	H2	H2	
Power consumption of fans SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1	
Air velocity class		V2	V2	V2	V2	
Filtration according to DIN EN 779						
Supply air | Outside air		F7 | M5				
Return Air		M5				
LPHW						
Heating capacity SA=22° C [9]	kW	31.0	43.2	46.1	53.3	
Heating capacity SA=30° C [9]	kW	62.7	85.5	99.6	115.4	
Heating capacity Defrost [9,10]	kW	31.9	41.1	52.1	60.6	
Water flow rate and pressure losses at heating capacity SA=22° C						
LPHW	m^3/h | kPa	2.13 | 4.8	3.86 | 3.9	4.77 | 3.5	4.77 | 3.9	
LPHW (pump warm water) valve	m^3/h | kPa	1.58 | 6.3	2.30 | 5.3	2.61 | 4.4	2.92 | 5.4	
Connections						
LPHW connection	DN	40	50	50	65	
LPHW control valve connection	DN	20	25	25	25	
Clean water connection [11]	DN	20	20	20	20	
Condensate / slurry drain	DN	40	40	40	40	
Floor drains	DN	40	40	40	40	

Technical details upon request.

Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 for RA 26° C; 55 % r.h. and OA 32° C; 40% r.h.
2 incl. evaporative cooling capacity taking into account power consumption for adiabatic pump(s)
3 dependent on configuration of measurement and control system/unit
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 water quality of make-up water corresponds to VDI 3803 table B3 with a bacteria count < 100 CFU/ml, water hardness range "middle".
7 at supply air ≈ 17° C
8 FL = 70° C
9 At OA=-15° C, SA=18° C, 66% of optimum flow rate and active defrost function
10 2 bar system pressure required at 25 l/min flow rate

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Comfort air conditioning unit with highly efficient regenerative heat storage packages

Resolair 62 26 01 - simplified illustration

Automatically selects the most economical operating mode!

Resolair 62 and 66

AIR VOLUME FLOW: 1,200 – 4,300 m³/h

At a glance:

- **For heat and cooling recovery**
- **Over 90% temperature efficiency**
- **Energy efficiency class H1 according to EN 13053:2012**
- **Corrosion-free heat storage packages made from polypropylene for more compact and lighter units**
- **Energy-saving EC fans**
- **Integrated compressor refrigeration system (66 series)**
- **Compact design**
- **Humidity recovery up to 70%**
- **Integrated control and regulation system, compatible with all conventional building management systems**
- **Fulfils the requirements of VDI 6022**

Units of the Resolair 62 and 66 series achieve a very high heat recovery efficiency up to 90% and at the same time a moisture recovery up to 70% thanks to the regenerative heat recovery system. The result is a comfortable climate at lowest energy costs. The integrated compression refrigeration system of Series 66 increases the cooling capacity of the entire system at high temperatures.

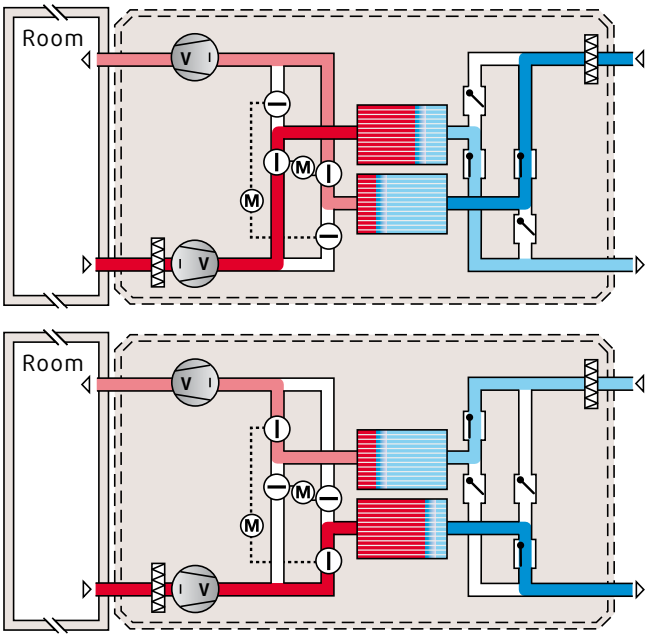
Further performance parameters and options:

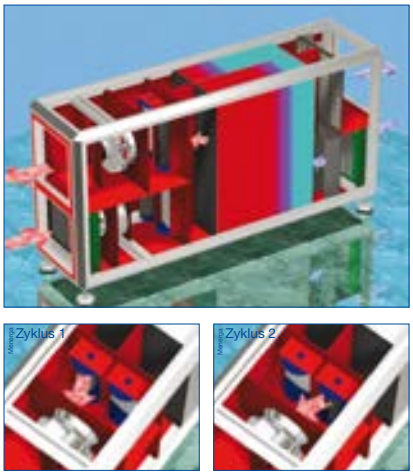
- Filtering the air in any operating mode
- Cycle time adjustment for by-passing the heat recovery up to free cooling
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for comfort air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory test run

Options

- Recirculation air heating damper
- Pumped hot water heating coil
- Pumped chilled water cooling coil (62 series)
- Reversible compressor refrigeration system (66 series)
- Outdoor installation
- Thermal bridge factor TB1
- Remote maintenance
- And many more

Functional description





The unit contains two heat storgae packets with highly sensitive accumulator mass, through which the outside and return air are transported alternately. The accumulator mass is able to capture heat from a warm air flow very rapidly and transferring this just as rapidly to the cold air flow.

There is a damper system installed upstream and downstream of the packets. The damper system at RA/SA side is actuated by electric motors, while the damper system at OA/EA side operates dynamically.

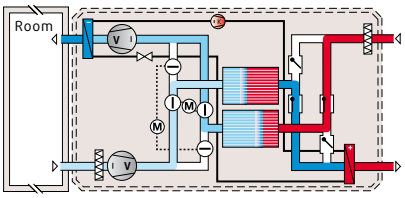
The fans in the return air and supply air sections simultaneously supply cold outside air through one packet and warm return air through the other. One packet stores the heat from the return air, which the other packet simultaneously discharges stored heat into the outside air.
The temperature efficiency of the regenerative energy exchanger is over 90%. Thus the unit obtains virtually all the heat energy back from the return air. This means that an additional supply air heating coil is not needed and the internal heat load covers the transmission heat loss. Despite the very high heat recovery efficiency of the Resolair series, the regenerative heat recovery system used requires no defrost mode. The heating capacity normally needed is not required in this case.

In wintertime conditions, the humidity recovery of the regenerative heat recovery system is up to 70%, which in most applications makes an additional humidification system obsolete in winter.

Where outside air temperatures are rising, variable alteration of the switching cycles allows heat recovery to be reduced all the way down to free cooling.

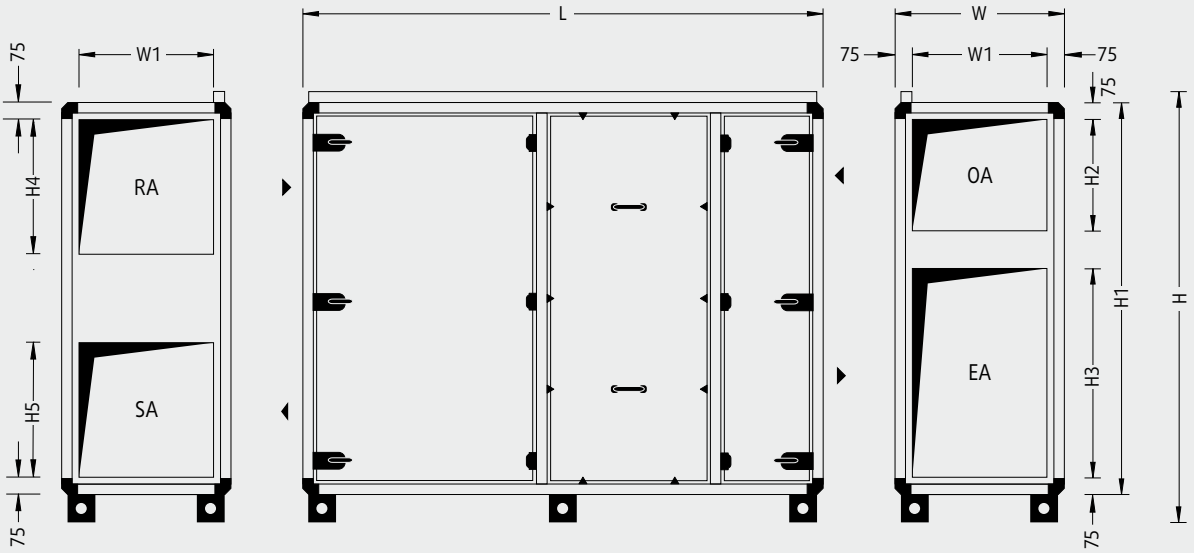
If the outside temperatures exceed the indoor temperature, the unit switches back into the basic cycle and then operates in "cooling recovery mode" with the same high degree of efficiency as for heat recovery.

For the removal of higher internal heat loads at high outside air temperatures the integrated compressior refrigeration



Resolair Type 62

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.
Mirror-image design possible.

Unit feet 100 mm
Optional: adjustable feet from 100 to 120 mm

Unit Type	L[1]	W[2]	H[3]	W1	H1	H2	H3	H4	H5	Weight[1]
62 12 01	2,010	570	1,210*	420	1,050	325	420	325	420	410
62 18 01	2,170	730	1,530*	580	1,370	485	580	485	580	550
62 26 01	2,330	730	1,850	580	1,690	485	900	580	580	600
62 36 01	2,330	1,050	1,850	900	1,690	485	900	580	580	810

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
62 12 01	480 x 640 x 210	on top of unit
62 18 01	480 x 640 x 210	on top of unit
62 26 01	900 x 480 x 210	OA/EA side
62 36 01	900 x 480 x 210	OA/EA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

Partitioning of unit for smaller apertures possible (at extra cost).

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
1 Door fitting assembly increase unit width by 25 mm each operating side
2 Height incl. 100 mm unit feet and 60 mm cable duct
* Controls cabinet arranged on top of unit, please add controls cabinet height (480 mm).

Technical specifications and services

Unit Type		62 12 01	62 18 01	62 26 01	62 36 01
Optimum flow rate	m^3/h	1,200	1,800	2,600	3,600
Max, volume flow rate [1]	m^3/h	1,400	2,100	3,100	4,300
"Cooling recovery system" [2]	kW	2.0	3.0	4.3	6.1
Coefficient of power efficiency according to EN 13053:2012	%	90	90	90	90
Heat recovery rate according to EN 308	%	91	91	91	91
Recovery of humidity	%	up to 70			
Total electrical power rating[3]	kW	0.75	1.09	1.56	1.96
Max. current consumption [3]	A	6.6	13.8	8.0	6.6
Operating voltage		1 / N / PE 230 V 50 Hz		3 / N / PE 400 V 50 Hz	
Ext, pressure loss					
Supply and fresh air channel	Pa	300	300	300	300
Return and exhaust air channel	Pa	300	300	300	300
Sound power level [4]					
Supply air vent	dB(A)	66	65	67	67
RA connection	dB(A)	63	60	61	60
Outside air vent	dB(A)	56	53	54	53
EA connection	dB(A)	58	58	60	60
Acoustic pressure at a distance of 1 m from the device[4]	dB(A)	47	46	48	48
Fan units					
Rated fan input for supply air [5]	kW	0.37	0.54	0.77	0.97
Rated fan input for return air [5]	kW	0.38	0.55	0.79	0.99
SFP category supply air | return air		2 | 2	2 | 2	2 | 2	2 | 2
Nominal rating supply air | return air	kW	0.8 | 0.8	1.4 | 1.4	2.5 | 2.5	2.0 | 2.0
Inner specific fan power (SFP_{int}) [6]	Ws/m^3	851	747	886	689
Efficiency classes according to EN 13053:2012					
Heat recovery class		H1	H1	H1	H1
Power consumption of fans SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1
Air velocity class		V1	V1	V1	V1
Filtration according to DIN EN 779					
Outside air		F7			
Return Air		F7			
LPHW (optional) [7,8]					
Heating capacity SA=22° C	kW	0.9	1.4	2.0	3.0
Heating capacity SA=30° C	kW	4.1	6.3	9.1	12.7
Additional power consumption for supply air	W	20	20	50	50
Water flow rate and pressure losses at SA = 22° C					
LPHW	m^3/h | kPa	0.25 | 5.5	0.50 | 5.3	0.50 | 5.4	0.50 | 7.3
LPHW (pump warm water) valve	m^3/h | kPa	0.10 | 6.8	0.16 | 6.2	0.24 | 5.7	0.29 | 8.6
Connections					
LPHW connection	DN	32	32	32	32
LPHW control valve connection	DN	10	10	10	10
LPCW (optional) [7,9]					
Cooling capacity SA ≈ 20° C [2]	kW	4.6	6.7	9.1	16.4
Additional power consumption for supply air [5]	W	70	40	110	120
Water flow rate and pressure losses					
LPCW	m^3/h | kPa	0.65 | 4.7	0.95 | 1.6	1.31 | 2.8	2.35 | 9.6
LPCW valve	m^3/h | kPa	0.65 | 6.8	0.95 | 14.6	1.31 | 6.8	2.35 | 13.9
Connections					
LPCW connection	DN	32	32	32	32
LPCW control valve-connection	DN	15	20	25	25

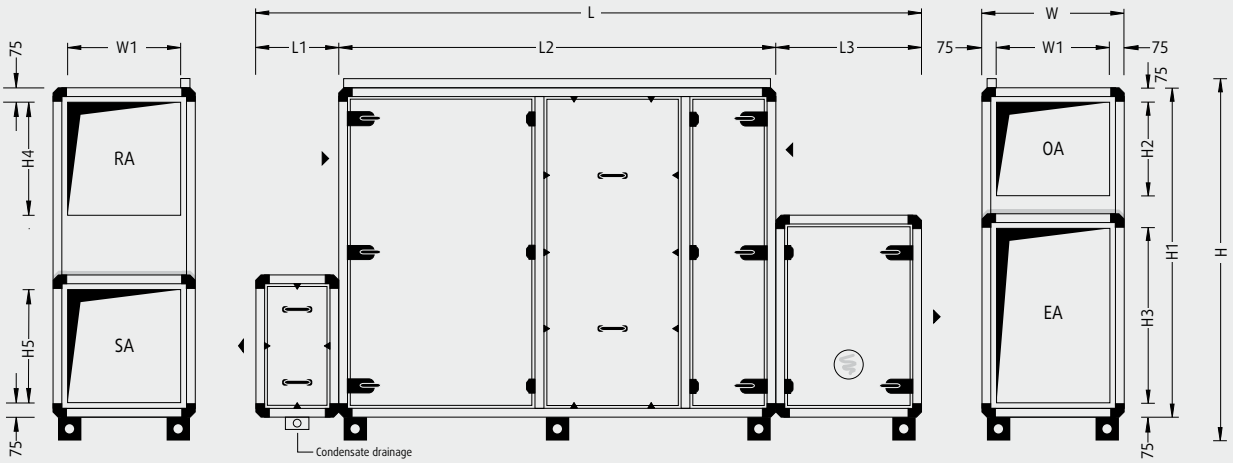
Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 May require alteration of the technical equipment
2 at OA = 26° C / 55% r.h., RA = 32° C / 40% r.h. and standard density
3 Depends on configuration of measurement and control system/unit
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 According EU guideline No. 1253/2014 [Ecodesign guideline]
7 Supplementary equipment, device length extend at least 410 mm. Note higher power consumption of SA fan units
8 FL = 70° C
9 FL = 6° C

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Resolair Type 66

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible

Unit feet 100 mm
Optional: adjustable feet from 100 to 120 mm

Unit Type	L[1]	W[2]	H[3]	L1	L2	L3	W1	H1	H2	H3	H4	H5	Weight[1]
66 18 01	3,310	730	1,530	410	2,170	730	580	1,370	485	580	485	580	790
66 26 01	3,470	730	1,850	410	2,330	730	580	1,690	485	900	580	580	850
66 36 01	3,470	1,050	1,850	410	2,330	730	900	1,690	485	900	580	580	1,100

Controls cabinet

Unit Type	H x W x D[1]	Position
66 18 01	1,120 x 640 x 210	Wall mouniting
66 26 01	1,120 x 640 x 210	Wall mouniting
66 36 01	1,120 x 640 x 210	Wall mouniting

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

Partitioning of unit for smaller apertures possible (at extra cost).

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 25 mm each operating side. Refrigerant pipe duct on backside of the unit increases unit widht by 80 mm.
3 Height incl. 100 mm unit feet and 60 mm cable duct

Technical specifications and services

Unit Type		66 18 01	66 26 01	66 36 01
Optimum flow rate	m^3/h	1,800	2,600	3,600
Max. volume flow rate [1]	m^3/h	2,100	3,100	4,300
"Cooling recovery system" [2]	kW	3.0	4.3	6.1
Coefficient of power efficiency according to EN 13053:2012	%	90	90	90
Heat recovery rate according to EN 308	%	91	91	91
Recovery of humidity	%		up to 70	
Total electrical power rating [3]	kW	3.8	5.9	7.6
Max. current consumption [3]	A	20.8	18.0	21.6
Operating voltage			3 / N / PE 400 V 50 Hz	
Ext. pressure loss				
Supply and fresh air channel	Pa	300	300	300
Return and exhaust air channel	Pa	300	300	300
Sound power level [4]				
Supply air vent	dB(A)	64	66	65
RA connection	dB(A)	61	62	61
Outside air vent	dB(A)	55	57	55
EA connection	dB(A)	59	60	60
Acoustic pressure at distance of 1 m from device [4]	dB(A)	47	50	49
Fan units				
Rated fan input for supply air [5]	kW	0.59	0.88	1.08
Rated fan input for return air [5]	kW	0.57	0.82	1.02
SFP category supply air | return air		2 | 2	3 | 2	2 | 2
Nominal rating supply air | return air	kW	1.4 | 1.4	2.5 | 2.5	2.0 | 2.0
Inner specific fan power (SFP_{int})	Ws/m^3	747	884	690
Compressor refrigeration system [2,7]				
Filling volume for refrigerant type R410A	kg	3.0	3.0	4.0
Rated compressor input	kW	2.6	4.2	5.5
Mechanical cooling capacity	kW	8.6	12.7	17.7
Energy Efficiency Ratio [8]	EER	4.5	4.0	4.3
Efficiency classes according to EN 13053:2012				
Heat recovery class		H1	H1	H1
Power consumption of fans SA | RA		P1 | P1	P1 | P1	P1 | P1
Air velocity class		V1	V1	V1
Filtration according to DIN EN 779				
Outside air			F7	
Return Air			F7	
LPHW (optional) [9,10]				
Heating capacity SA=22° C	kW	1.3	2.0	2.9
Heating capacity SA=30° C	kW	6.2	9.0	12.7
Additional power consumption supply air	W	20	50	50
Water flow rate and pressure losses at SA = 22° C				
LPHW	m^3/h | kPa	0.50 | 5.4	0.50 | 5.3	0.50 | 7.2
LPHW (pump warm water) valve	m^3/h | kPa	0.16 | 6.1	0.24 | 5.6	0.29 | 8.6
Connections				
LPHW connection	DN	32	32	32
LPHW control valve connection	DN	10	10	10

Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 May require alteration of the technical equipment
2 at OA = 26° C / 55% r.h., RA = 32° C / 40% r.h. and standard density
3 Depends on configuration of measurement and control system/unit
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 According EU guideline No. 1253/2014 [Ecodesign guideline]
7 SA ≈ 17° C
8 Incl. „coolimg recovery"
9 Supplementary equipment, device length extend at least 320 mm. Note higher power consumption of SA fan units
8 FL = 70° C

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Comfort air conditioning unit with highly efficient regenerative heat storage packages

Resolair 68 10 01 - simplified illustration

Automatically selects the most economical operating mode!

Resolair 64 and 68

AIR VOLUME FLOW: 3,900 – 23,100 m³/h

Eurovent seal refers to range Menerga Air, more information on page 6. Check ongoing validity of certificate: www.eurovent-certification.com or www.certiflash.com
Passive House seal refers to series 64

At a glance:

- **For heat and cooling recovery**
- **Over 90% temperature efficiency**
- **Energy efficiency class H1 according to EN 13053:2012**
- **Corrosion-free heat storage packages made from polypropylene for more compact and lighter units**
- **Energy-saving EC fans**
- **Integrated compressor refrigeration system (68 series)**
- **Two-stage supply air filtration**
- **Humidity recovery up to 70%**
- **Fulfils the requirements of VDI 6022**

Units of the Resolair 64 and 68 series combine medium and large air volumes with the advantages of regenerative heat recovery: up to over 90% heat recovery and up to 70% humidity recovery allow a comfortable climate with minimal energy costs. The devices are built in a modular construction and offer a very high flexibility with regards to design and optional features.

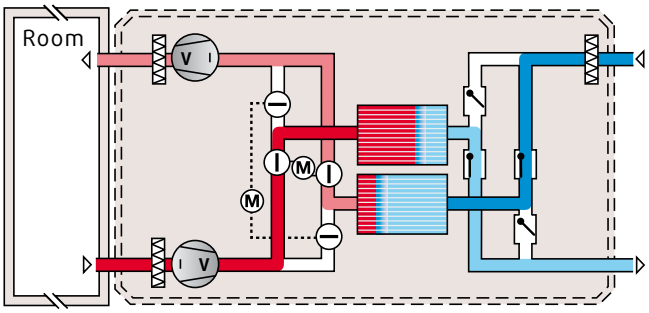
Further performance parameters and options:

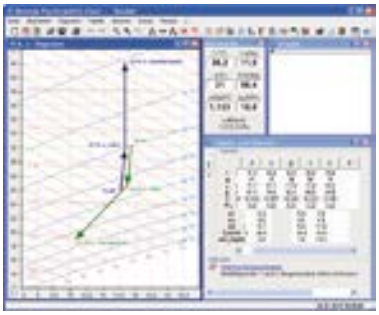
- Filtering the air in any operating mode
- Cycle time adjustment for by-passing the heat recovery up to free cooling
- Integrated bypass function
- Thermal bridge factor TB1
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for comfort air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory test run

Options

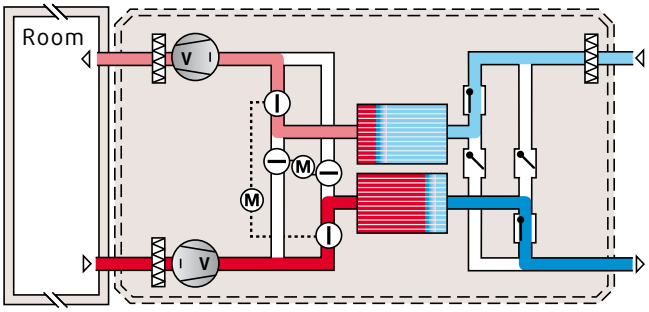
- Recirculation air heating damper
- Pumped hot water heating coil
- Pumped chilled water cooling coil (64 series)
- Reversible compressor refrigeration system (68 series)
- Supply air / return air airflow path exchanged (64 series)
- Attenuator
- Outdoor installation
- Hot water extraction, to use waste heat for heating purposes (68 series)
- Remote maintenance
- And many more

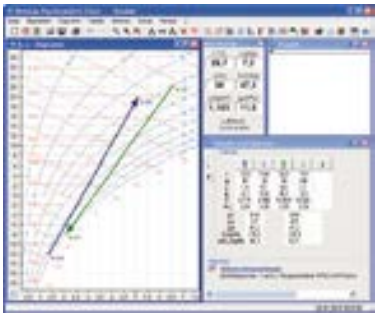
Functional description





Summertime conditions





Wintertime conditions

The unit contains two heat packets with highly sensitive accumulator mass, through which the outside and return air are transported alternately. The accumulator mass is able to capture heat from a warm air flow very rapidly and transferring this just as rapidly to the cold air flow.

A damper system is installed upstream and downstream of the packets. The damper system at RA/SA side is actuated by electric motors, while the damper system at OA/EA side operates dynamically (at series 68 also mechanical). The fans in the return air and supply air sections simultaneously supply cold outside air through one packet and warm return air through the other. One packet stores the heat from the return air, which the other packet simultaneously discharges stored heat into the outside air.

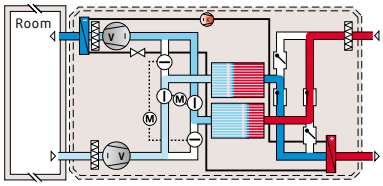
The temperature efficiency of the regenerative energy exchanger is over 90%. The unit thus obtains virtually all the heat energy back from the return air. This means that an additional supply air heating coil is not required and the internal heat load covers the transmission heat loss. Despite the very high heat recovery efficiency of the Resolair series, the regenerative heat recovery system used requires no defrost mode. The heating capacity normally needed is not required in this case.

In wintertime conditions, the humidity recovery of the regenerative heat recovery system is up to 70%, which in most applications makes an additional humidification system unnecessary in wintertime.

Where outside air temperatures are rising, variable alteration of the switching cycles allows heat recovery to be reduced all the way down to free cooling.

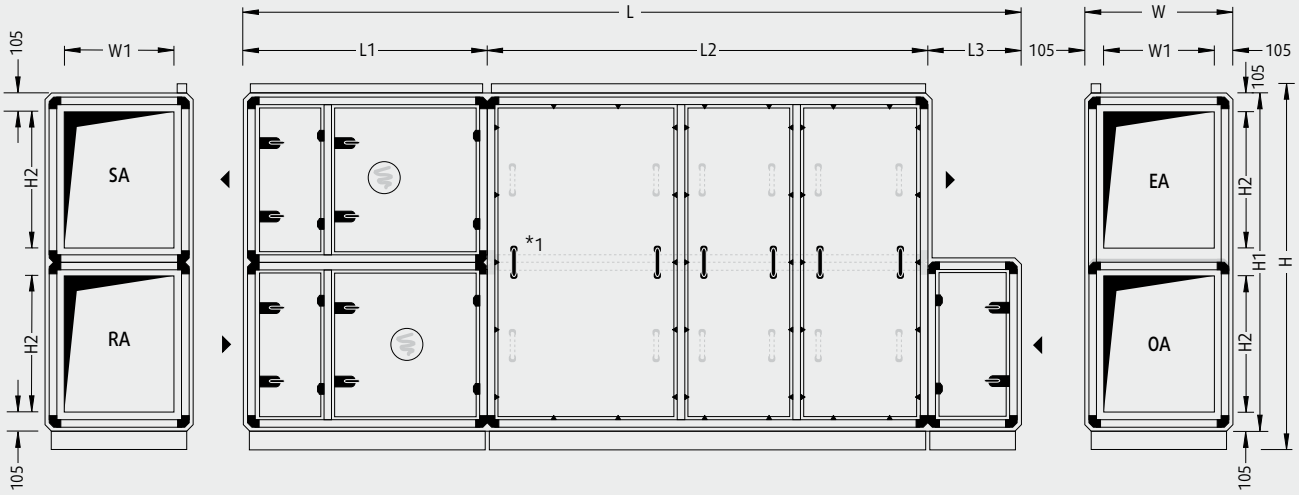
If the outside temperatures exceed the indoor temperature, the unit switched back into the basic cycle and then operates in "cooling recovery mode" with the same high degree of efficiency as for heat recovery.

For the removal of higher internal heat loads at high outside air temperatures the integrated compression refrigeration system is switched on (68 series).



Resolair Type 64

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.
Supply air / return air airflow path exchanged optionally possible

*1 starting at unit type 64 21 01
horizontal cube partition

Unit type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	H1	H2	Weight[1]
64 05 01	4,330	1,110	1,700	1,400	2,330	600	900	1,520	580	1,300
64 07 01	4,650	1,110	2,340	1,400	2,650	600	900	2,160	900	1,650
64 10 01	4,810	1,430	2,340	1,560	2,650	600	1,220	2,160	900	2,050
64 12 01	4,810	1,750	2,340	1,560	2,650	600	1,540	2,160	900	2,350
64 15 01	4,970	2,070	2,340	1,560	2,810	600	1,860	2,160	900	2,600
64 21 01	5,610	2,070	2,980	1,560	3,450	600	1,860	2,800	1,220	3,550
64 26 01	5,930	2,070	3,620	1,560	3,770	600	1,860	3,440	1,540	4,000
64 32 01	5,930	2,390	3,620	1,560	3,770	600	2,180	3,440	1,540	4,400

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 65 mm each operating side
3 incl. 120 mm base frame, incl. 60 mm cable duct
* Further partitioning for smaller apertures possible (at extra cost).

Largest transport unit*

Unit type	L[1]	W[2]	H[3]	Weight[1]
64 05 01	2,330	1,110	1,700	700
64 07 01	2,650	1,110	2,340	960
64 10 01	2,650	1,430	2,340	1,220
64 12 01	2,650	1,750	2,340	1,370
64 15 01	2,810	2,070	2,340	1,550
64 21 01	3,450	2,070	2,980	2,200
64 26 01	3,770	2,070	3,620	2,600
64 32 01	3,770	2,390	3,620	2,800

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
64 05 01	1,120 x 640 x 210	SA/RA side
64 07 01	1,120 x 640 x 210	SA/RA side
64 10 01	1,120 x 640 x 210	SA/RA side
64 12 01	1,120 x 640 x 210	SA/RA side
64 15 01	1,120 x 640 x 210	SA/RA side
64 21 01	1,120 x 640 x 210	SA/RA side
64 26 01	1,120 x 640 x 210	SA/RA side
64 32 01	1,280 x 640 x 210	SA/RA side

Technical specifications and services

Unit Type		64 05 01	64 07 01	64 10 01	64 12 01	64 15 01	64 21 01	64 26 01	64 32 01	64 xx xx
Optimum flow rate	m^3/h	3,900	6,000	7,900	9,800	11,800	15,800	19,900	23,100	up to 51,000
Max. volume flow rate [1]	m^3/h	5,000	7,500	10,000	12,500	15,000	21,000	26,000	32,000	
"Cooling recovery system" [2]	kW	6.6	10.2	13.5	16.7	19.9	26.7	33.4	38.8	
Coefficient of power efficiency according to EN 13053:2012	%	90	90	90	90	90	90	90	90	
Heat recovery rate according to EN 308	%	91	91	91	91	91	91	91	91	
Recovery of humidity	%	bis zu 70								
Total electrical power rating [3]	kW	2.25	3.42	4.27	5.36	7.58	10.12	14.34	16.44	
Max. current consumption [3]	A	8.0	9.6	16.0	16.0	17.4	32.0	32.0	37.6	
Operating voltage		3 / N / PE 400 V 50 Hz								
Ext. pressure loss										
Supply and fresh air channel	Pa	300	300	300	300	400	400	500	500	
Return and exhaust air channel	Pa	300	300	300	300	400	400	500	500	
Sound power level [4]										
Supply air vent	dB(A)	66	72	68	72	81	73	80	83	
RA connection	dB(A)	65	68	63	67	74	67	72	76	
Outside air vent	dB(A)	57	62	57	61	67	61	67	70	
EA connection	dB(A)	62	67	62	67	76	67	74	79	
Acoustic pressure at a distance of 1 m from the device [4]	dB(A)	51	56	52	57	66	57	64	68	
Fan units										
Rated fan input for supply air [5]	kW	1.22	1.87	2.35	2.93	4.06	5.50	7.72	8.76	
Rated fan input for return air [5]	kW	1.03	1.55	1.92	2.43	3.52	4.62	6.62	7.68	
SFP category supply air | return air		1 | 2	1 | 1	1 | 1	1 | 1	1 | 2	1 | 2	2 | 3	2 | 3	
Nominal rating supply air | return air	kW	2.5 | 2.5	2.9 | 2.9	5.0 | 5.0	5.0 | 5.0	6.0 | 5.0	10.0 | 10.0	10.0 | 10.0	12.0 | 12.0	
Inner specific fan power (SFP_{int}) [6]	Ws/m^3	531	504	474	501	508	518	509	497	
Efficiency classes according to EN 13053:2012										
Heat recovery class		H1	H1	H1	H1	H1	H1	H1	H1	
Power consumption of fans SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P2	
Air velocity class		V1	V2	V2	V2	V2	V2	V2	V2	
Filtration according to DIN EN 779										
Supply air | Outside air		F7 | M5								
Return Air		M5								
LPHW (optional) [7]										
Heating capacity SA=22° C	kW	3.2	4.9	6.6	8.3	9.7	12.8	15.7	18.3	
Heating capacity SA=30° C	kW	13.8	21.9	28.2	34.9	41.7	55.7	69.6	81.2	
Additional power consumption for supply air	W	50	90	100	110	120	220	240	280	
Water flow rate and pressure losses										
LPHW	m^3/h | kPa	0.88 | 4.4	1.38 | 4.4	2.15 | 3.7	2.16 | 4.4	2.14 | 5.0	3.88 | 4.0	4.73 | 3.6	4.75 | 4.0	
LPHW (pump warm water) valve	m^3/h | kPa	0.36 | 5.0	0.55 | 4.8	0.73 | 8.6	0.87 | 4.7	1.00 | 6.2	1.38 | 4.8	1.72 | 4.6	1.96 | 3.9	
Connections										
LPHW connection	DN	32	32	40	40	40	50	50	65	
LPHW control valve connection	DN	15	15	15	15	20	25	25	25	
LPCW (optional)										
Cooling capacity SA ≈ 18° C [2,8]	kW	17.3	26.4	34.3	42.5	55.6	75.7	96.3	117.1	
Additional power consumption for supply air	W	190	260	500	400	340	520	420	640	
Water flow rate and pressure losses at SA = 22° C										
LPCW	m^3/h | kPa	2.47 | 10.5	3.77 | 7.1	4.91 | 5.6	6.08 | 4.0	7.95 | 7.2	10.83 | 7.1	13.77 | 7.2	16.75 | 11.0	
LPCW valve	m^3/h | kPa	2.47 | 15.4	3.77 | 9.1	4.91 | 6.0	6.08 | 4.0	7.95 | 10.1	10.83 | 7.3	13.77 | 11.9	16.75 | 17.5	
Connections										
LPCW connection	DN	40	50	50	65	80	80	80	100	
LPCW control valve-connection	DN	20	25	32	40	40	50	50	50	

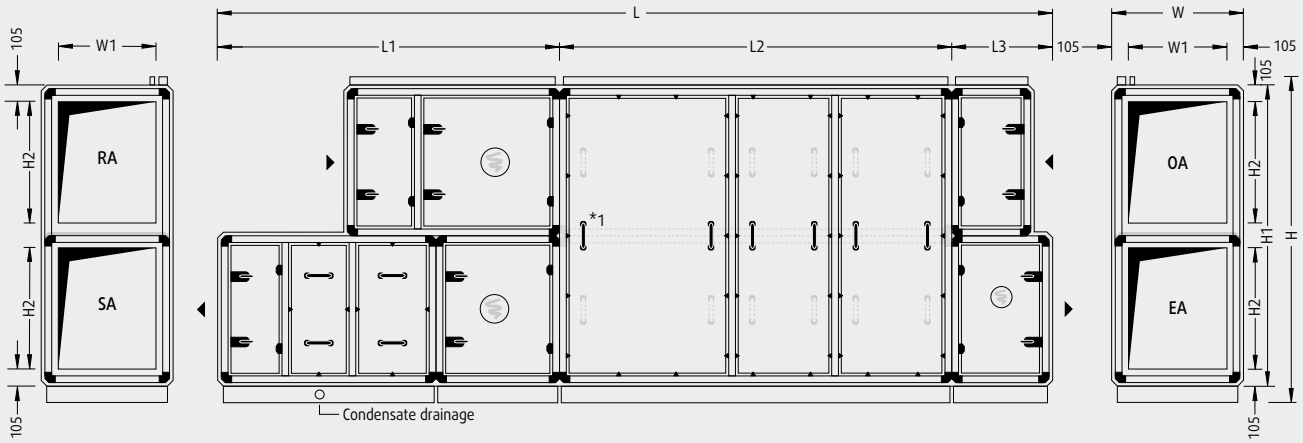
Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 May require alteration of the technical equipment
2 at OA = 26° C / 55% r.h., RA = 32° C / 40% r.h. and
3 Depends on configuration of measurement and control system/unit
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 According EU guideline No. 1253/2014 [Ecodesign guideline]
7 FL = 70° C
8 FL = 6° C

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Resolair Type 68

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

*1 starting at unit type 68 21 01 horizontal cube partition

Unit Type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	H1	H2	Weight[1]
68 05 01	5,380	1,110	1,700	2,290	2,330	760	900	1,520	580	1,750
68 07 01	5,700	1,110	2,340	2,290	2,650	760	900	2,160	900	2,150
68 10 01	5,860	1,400	2,340	2,450	2,650	760	1,220	2,160	900	2,700
68 12 01	6,020	1,750	2,340	2,610	2,650	760	1,540	2,160	900	3,050
68 15 01	6,180	2,070	2,340	2,610	2,810	760	1,860	2,160	900	3,500
68 21 01	6,980	2,070	2,980	2,610	3,450	920	1,860	2,800	1,220	4,450
68 26 01	7,300	2,070	3,620	2,610	3,770	920	1,860	3,440	1,540	5,100
68 32 01	7,300	2,390	3,620	2,610	3,770	920	2,180	3,440	1,540	5,500

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm,
weights in kg,
weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 65 mm each operating side
3 incl. cable duct, cold air duct and base frame
* Further partitioning for smaller apertures possible (at extra cost).

Largest transport unit*

Unit Type	L[1]	W[2]	H[3]	Weight[1]
68 05 01	2,330	1,110	1,700	720
68 07 01	2,650	1,110	2,340	980
68 10 01	2,650	1,400	2,340	1,250
68 12 01	2,650	1,750	2,340	1,400
68 15 01	2,810	2,070	2,340	1,570
68 21 01	3,450	2,070	2,980	2,220
68 26 01	3,770	2,070	3,620	2,620
68 32 01	3,770	2,390	3,620	2,820

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
68 05 01	1,120 x 640 x 210	SA/RA side
68 07 01	1,120 x 640 x 210	SA/RA side
68 10 01	1,120 x 640 x 210	SA/RA side
68 12 01	1,120 x 640 x 210	SA/RA side
68 15 01	1,280 x 640 x 210	SA/RA side
68 21 01	1,280 x 640 x 210	SA/RA side
68 26 01	1,600 x 640 x 250	SA/RA side
68 32 01	1,600 x 640 x 250	SA/RA side

Technical specifications and services

Unit Type		68 05 01	68 07 01	68 10 01	68 12 01	68 15 01	68 21 01	68 26 01	68 32 01	68 xx xx
Optimum flow rate	m^3/h	3,900	6,000	7,900	9,800	11,800	15,800	19,900	23,100	up to 51,000
Max. volume flow rate [1]	m^3/h	5,000	7,500	10,000	12,500	15,000	21,000	26,000	32,000	
"Cooling recovery system"[2]	kW	6.6	10.1	13.5	16.7	19.9	26.6	33.3	38.7	
Coefficient of power efficiency according to EN 13053:2012	%	90	90	90	90	90	90	90	90	
Heat recovery rate according to EN 308	%	91	91	91	91	91	91	91	91	
Recovery of humidity	%	up to 70								
Total electrical power rating [3]	kW	8.12	11.35	16.20	16.75	23.10	27.78	36.88	43.06	
Max. current consumption [3]	A	23.0	30.6	47.0	47.0	60.8	76.0	92.8	105.6	
Operating voltage		3 / N / PE 400 V 50 Hz								
Ext. pressure loss										
Supply and fresh air channel	Pa	300	300	300	300	400	400	500	500	
Return and exhaust air channel	Pa	300	300	300	300	400	400	500	500	
Sound power level [4]										
Supply air vent	dB(A)	64	70	66	72	78	72	79	79	
RA connection	dB(A)	65	68	63	68	73	68	73	77	
Outside air vent	dB(A)	58	67	58	63	67	63	69	71	
EA connection	dB(A)	63	64	63	67	76	67	76	81	
Acoustic pressure at distance of 1 m from device [4]	dB(A)	52	57	53	59	65	59	66	69	
Fan units										
Rated fan input for supply air [5]	kW	1.34	2.11	2.57	3.19	4.33	5.92	8.06	9.26	
Rated fan input for return air [5]	kW	1.08	1.64	2.03	2.56	3.67	4.86	6.92	8.00	
SFP category supply air | return air		1 | 2	1 | 2	1 | 2	1 | 2	2 | 2	2 | 2	2 | 3	1 | 2	
Nominal rating supply air | return air	kW	2.5 | 2.5	2.9 | 2.9	5.0 | 5.0	5.0 | 5.0	6.0 | 6.0	10.0 | 10.0	12.0 | 10.0	12.0 | 12.0	
Inner specific fan power (SFP_{int}) [6]	Ws/m^3	540	508	475	505	518	517	505	491	
Compressor refrigeration system										
Filling volume for refrigerant type R410A	kg	4.0	6.0	10.0	11.0	14.0	20.0	22.0	26.0	
Rated compressor input [2]	kW	5.7	7.6	11.6	11.0	15.1	17.0	21.9	25.8	
Mechanical cooling capacity [7]	kW	17.4	26.8	37.9	41.4	53.0	66.8	84.2	98.5	
Energy Efficiency Ratio [8]	EER	4.2	4.9	4.4	5.3	4.8	5.5	5.4	5.3	
Efficiency classes according to EN 13053:2012										
Heat recovery class		H1	H1	H1	H1	H1	H1	H1	H1	
Power consumption of fans SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	
Air velocity class		V1	V2	V2	V2	V2	V2	V2	V2	
Filtration according to DIN EN 779										
Supply air | Outside air		F7 | M5								
Return Air		M5								
LPHW (optional) [9]										
Heating capacity SA=22° C	kW	3.1	4.8	6.6	8.1	9.5	12.6	15.5	18.1	
Heating capacity SA=30° C	kW	13.7	21.2	28.1	34.8	41.5	55.4	69.5	81.0	
Additional power consumption for supply air	W	60	30	100	120	120	220	260	280	
Water flow rate and pressure losses at SA = 22° C										
LPHW	m^3/h | kPa	0.88 | 4.4	1.39 | 4.5	2.14 | 3.7	2.1 | 4.4	2.14 | 5.0	3.86 | 4.0	4.72 | 3.6	4.73 | 4.0	
LPHW (pump warm water) valve	m^3/h | kPa	0.36 | 5.0	0.55 | 4.8	0.73 | 8.5	0.87 | 4.7	1.00 | 6.2	1.38 | 4.8	1.72 | 4.6	1.96 | 3.8	
Connections										
LPHW connection	DN	32	32	40	40	40	50	50	65	
LPHW control valve connection	DN	15	15	15	15	15	20	20	20	

Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 May require alteration of the technical equipment
2 at OA = 26° C / 55% r.h., RA = 32° C / 40% r.h. and standard density
3 Depends on configuration of measurement and control system/unit
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 According EU guideline No. 1253/2014 [Ecodesign guideline]
7 at SA ≈ 17° C
8 incl. „cooling recovery"
9 FL = 70° C

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Ventilation technology
for industry and trade

Resolair 65 26 01 - simplified illustration

Automatically selects the most economical operating mode!

Resolair 65

AIR VOLUME FLOW: 10,000 – 40,000 m³/h

At a glance:

- **For heat and cooling recovery**
- **Over 90% temperature efficiency thanks to highly sensitive heat storage packages**
- **Energy efficiency class H1 according to EN 13053:2012**
- **Energy-saving EC fans**
- **Compact design**
- **Humidity recovery up to 70%**
- **Integrated control and regulation system, compatible with all conventional building management systems**
- **Ideal for retrofitting**

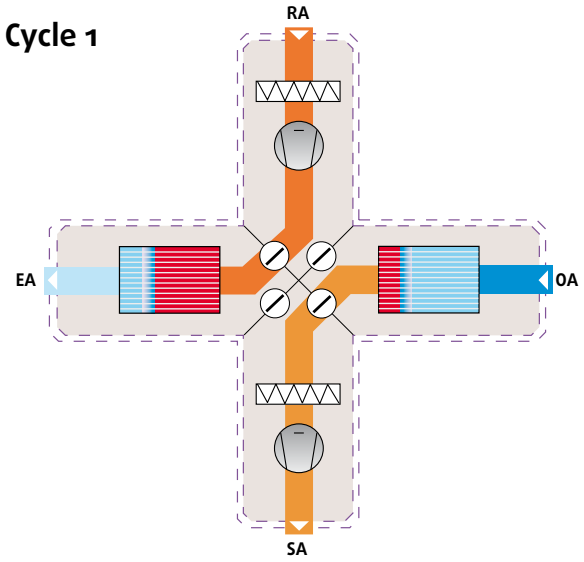
Units in the 65 series use a regenerative heat recovery system to achieve the highest heat recovery efficiency with low internal pressure losses. The system was specially developed for industrial purposes, for outdoor installation. Its unique construction makes it ideal for retrofitting, as the effort for installation is reduced to the supply of electrical power to the unit and the generally very short supply and return air ducts. The combination of first-class components with precise control and regulation systems guarantees economical operation at all times.

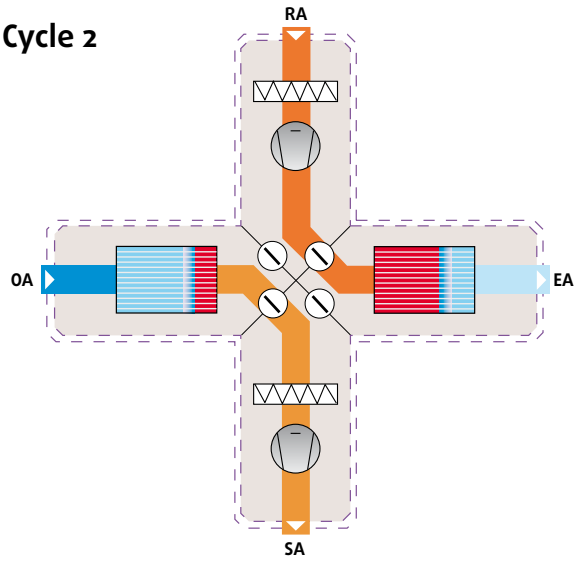
Further performance parameters and options:

- Filtering the air in any operating mode
- Cycle time adjustment for by-passing the heat recovery up to free cooling
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory test run
- Outdoor installation

Options
- Pumped hot water heating coil
- Pumped chilled water cooling coil
- Attenuator
- Remote maintenance
- And many more

Functional description





The unit contains two heat storage packets with highly sensitive accumulator mass, through which the outside and return air are transported alternately. The accumulator mass is capable of capturing heat from a warm air flow very rapidly and transferring this just as rapidly to the cold air flow.

In the middle of the unit there is a cross-shaped damper system which allows alternating loading of the heat accumulators. The fans in the return air and supply air sections simultaneously supply cold outside air through one packet and warm return air through the other. One packet stores the heat from the return air, which the other packet simultaneously discharges stored heat into the outside air.

The temperature efficiency of the Menerga regenerative energy exchanger is over 90%. Thus the unit obtains virtually all the heat energy back from the return air. This means that an additional supply air heating coil is not needed and the internal heat load covers the transmission heat loss.

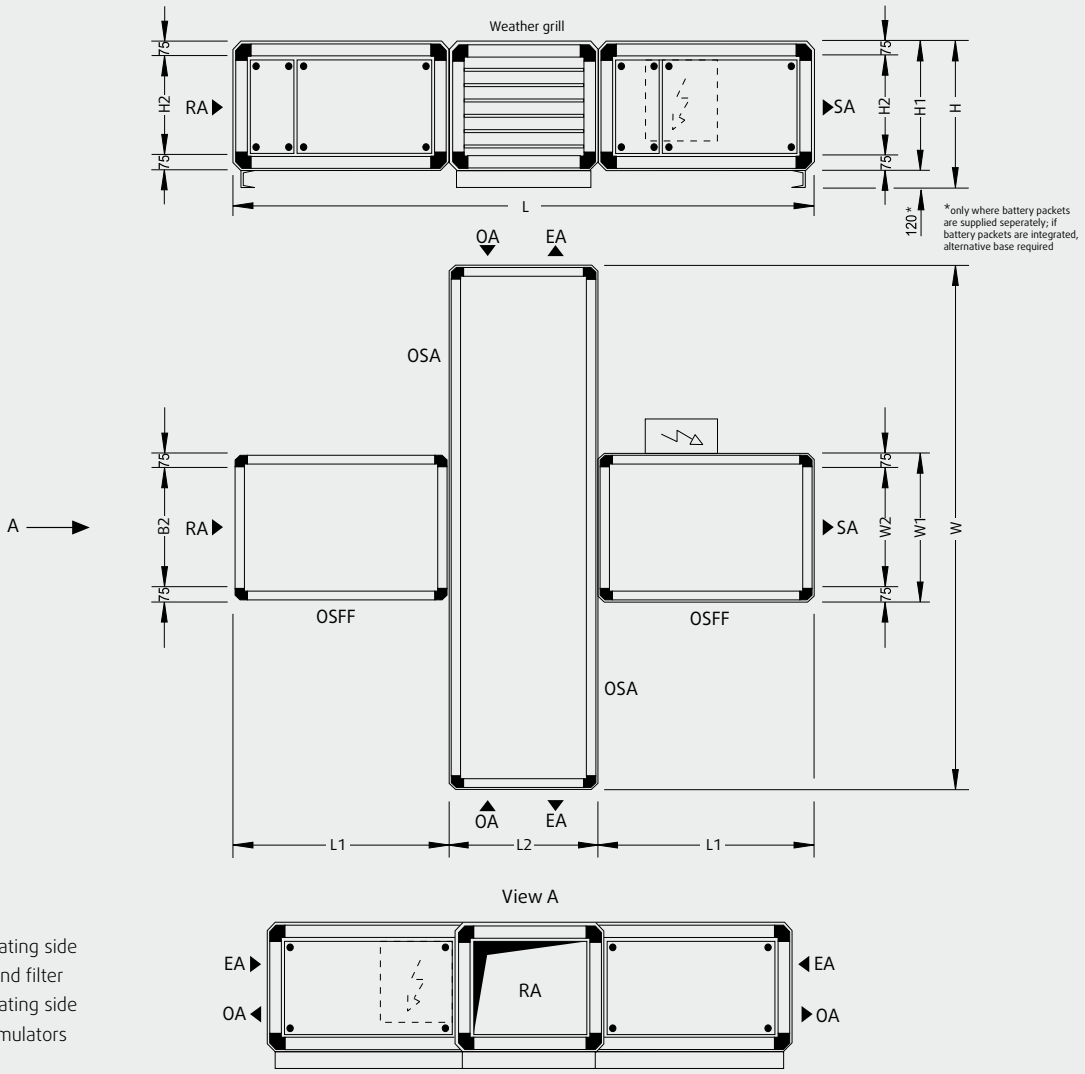
Despite the very high heat recovery efficiency of the Resolair series, the regenerative heat recovery system used requires no defrost mode. The heating capacity normally needed is not required in this case.

In wintertime conditions, the humidity recovery of the regenerative heat recovery system is up to 70%, which in most applications makes an additional humidification of the supply air obsolete in wintertimes.

Where OA temperatures are rising, variable alteration of the switching cycles allows heat recovery to be reduced all the way down to free cooling. If the outside temperatures exceed the indoor temperature, the unit switched back into the basic cycle and then operates in “cooling recovery mode” with the same high degree of efficiency as for heat recovery.

Resolair Type 65

System dimensions and weights



OSFF = Operating side fan and filter
OSA = Operating side accumulators

Unit type	L[1]	W[2]	H	L1[1]	L2[1]	B1	B2	H1	H2	Weight[1]	Weight battery packets[1]	Weight fan cube[1]
65 07 91	4,110	3,700	1,170	1,530	1,050	1,050	900	1,050	900	2,300	700	480
65 17 91	5,390	4,340	1,490	1,850	1,690	1,690	1,540	1,370	1,220	4,550	1,600	660
65 26 91	6,030	4,660	1,810	2,010	2,010	2,010	1,860	1,690	1,540	6,100	2,000	1,000
65 36 91	6,030	4,980	2,130	1,850	2,330	2,330	2,180	2,010	1,860	8,050	4,700	1,200

Largest transportation unit (accumulator/ damper cube)

Unit Type	L[1]	W	H	Weight[1]
65 07 91	1,050	3,700	1,170	1,540
65 17 91	1,690	4,340	1,490	3,160
65 26 91	2,010	4,660	1,810	3,900
65 36 91	2,330	4,980	2,130	5,560

Controls cabinet

Unit Type	H x W x D[1]	Position
65 07 91	760 x 760 x 300	At unit
65 17 91	760 x 760 x 300	At unit
65 26 91	760 x 760 x 300	At unit
65 36 91	1,000 x 800 x 300	At unit

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 25 mm each operating side

Technical specifications and services

Unit Type		65 07 91	65 17 91	65 26 91	65 36 91
Max. flow rate	m^3/h	10,000	20,000	30,000	40,000
"Cooling recovery system" [1]	kW	16.3	33.0	50.3	66.1
Coefficient of power efficiency according to EN 13053:2012	%	88	89	89	89
Heat recovery rate according to EN 308	%	91	91	91	91
Recovery of humidity	%	up to 70			
Total electrical power rating [2]	kW	7.65	13.22	18.57	25.36
Max. current consumption [2]	A	16.8	33.6	43.8	67.2
Operating voltage		3 / N / PE 400 V 50 Hz			
Ext. pressure loss					
Supply air	Pa	200	150	190	160
Return Air	Pa	200	150	190	160
Sound power level [3]					
Supply air vent	dB(A)	76	78	79	81
RA connection	dB(A)	77	80	77	83
Outside air vent	dB(A)	77	80	77	83
EA connection	dB(A)	79	81	82	84
Acoustic pressure at a distance of 1 m from the device [3]	dB(A)	60	62	63	65
Fan units					
Rated fan input for supply air [4]	kW	3.77	6.52	9.15	12.52
Rated fan input for return air [4]	kW	3.88	6.70	9.42	12.84
SFP category supply air | return air		3 | 3	2 | 3	2 | 2	2 | 2
Nominal rating supply air | return air	kW	5.5 | 5.5	11.0 | 11.0	14.1 | 14.1	22.0 | 22.0
Inner specific fan power (SFP_{int}) [5]	Ws/m^3	1.260	1.174	1.050	1.085
Efficiency classes according to EN 13053:2012					
Heat recovery class		H1	H1	H1	H1
Power consumption of fans SA | RA		P1 | P1	P2 | P2	P1 | P1	P3 | P3
Air velocity class		V6	V6	V6	V5
Filtration according to DIN EN 779					
Outside air		G4			
Return Air		G4			
LPHW (optional) [6,7]					
Heating capacity SA=22° C	kW	7.3	15.1	24.3	30.5
Heating capacity SA=30° C	kW	34.3	69.6	105.7	139.5
Additional power consumption supply air	W	540	560	930	1,120
Water flow rate and pressure losses					
LPHW	m^3/h | kPa	2.74 | 4.8	5.50 | 3.9	7.33 | 3.9	8.88 | 4.1
LPHW (pump warm water) valve	m^3/h | kPa	0.75 | 9.1	1.62 | 4.1	2.41 | 3.7	3.11 | 6.2
Connections					
LPHW connection	DN	32	50	65	65
LPHW control valve connection	DN	15	20	25	32
LPCW (optional) [6,8]					
Cooling capacity SA ≈ 20° C	kW	30.7	74.3	110.0	157.6
Additional power consumption supply air	W	1,440	2,520	3,510	4,240
Water flow rate and pressure losses at SA = 22° C					
LPCW	m^3/h | kPa	4.40 | 4.9	10.63 | 5.9	15.73 | 4.8	18.77 | 2.7
LPCW valve	m^3/h | kPa	4.40 | 7.6	10.63 | 7.1	15.73 | 6.2	18.77 | 8.9
Connections					
LPCW connection	DN	40	65	80	80
LPCW control valve-connection	DN	25	50	50	50

Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 at OA = 26° C / 55% r.h., RA = 32° C / 40% r.h. and standard density
2 Depends on configuration of measurement and control system/unit
3 at 250 Hz mid-band frequency
4 with average filter contamination
5 According EU guideline No. 1253/2014 [Ecodesign guideline]
6 Supplimentary equipment, device length extends; may require alteration of technical equipment. Note higher power consumption of SA fan units
7 FL = 70° C
8 FL = 12° C

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Comfort air conditioning unit with double plate heat exchanger, adiabatic evaporative cooling system, and sorption-based dehumidification system

Automatically selects the most economical operating mode!

Sorpsolair 73 22 01 - simplified illustration image shows additional equipment

Sorpsolair 72 and 73

AIR VOLUME FLOW: 2,900 – 14,900 m³/h

Sorpsolair

At a glance:

- **Sorption-based air conditioning – dehumidifying without electricity**
- **Adiabatic evaporative cooling – Cooling without electricity**
- **Thermal coefficient of efficiency COP_{th} from 1.5**
- **Brine regeneration through the use of solar energy, district heat or excess process heat at a low-temperature level (from 65° C flow)**
- **Energy-saving EC fans**
- **Intelligent air bypass duct**
- **Integrated defrosting function**

Units in the Sorpsolair 72 and 73 series were developed especially to utilise regenerative energy. The innovative air conditioning concept combines sorption-based dehumidification, adiabatic evaporative cooling and an efficient heat recovery system in a compact comfort air conditioning unit. The 72 series, without a brine accumulator, is suitable for directly utilising the waste heat e.g. from combined heat and power system (CHPS), while the brine accumulator integrated into the 73 series allows the storage of e.g. solar energy and hence increases the total efficiency of your installations. The combination of first-class components with precise control and regulation systems guarantees economical operation at all times, while ensuring the highest degree of comfort air conditioning. Sorpsolair systems are designed for all office and business buildings, as well as many other forms of application.

Further performance parameters and options:

- Integrated absorber and desorber
- Brine accumulator (73 series) for long-lasting storage of e.g. solar heat allows discontinuous dehumidification operation
- Filtering the air in any operating mode
- Corrosion-free heat exchanger made from polypropylene
- Pumped hot water heating coil
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for comfort air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory test run

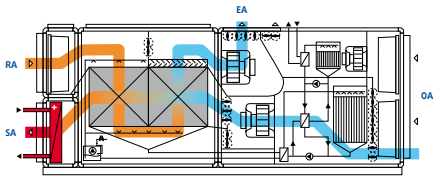
Options

- Pumped chilled water cooling coil
- Attenuator
- Outdoor installation
- Thermal bridge factor TB1
- Remote maintenance
- And many more

Functional description

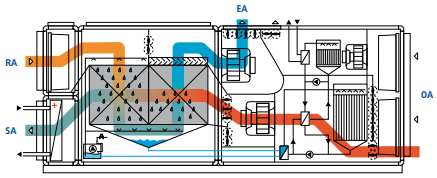
Wintertime conditions

In case of low outside temperatures the system operates completely in heat recovery mode. The standard heating coil (LPHW) compensates for ventilation and transmission heat losses of the building as required.



Indirect adiabatic evaporative cooling

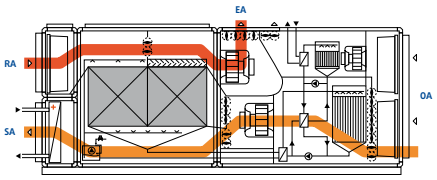
If during summertime conditions the outside air temperature is higher than the return air temperature, the outside air will be cooled by means of adiabatic evaporative cooling. A major component of this is the double plate heat exchanger, in which the return air is "adiabatically" cooled. The outside air is cooled by the counter-flowing humid, cold exhaust air, without itself being humidified. The high efficiency rate of the principle lies in the fact that both processes (adiabatic evaporative cooling of the return air + cooling of the outside air) take place simultaneously in the heat exchanger. The high degree of temperature efficiency of the double plate heat exchanger allows significant cooling of the OA-SA, by over 12 K.



* at RA = 26° C / 45 r.H; OA = 34° C / 40% rh.

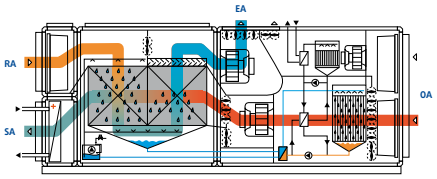
Free cooling in summer

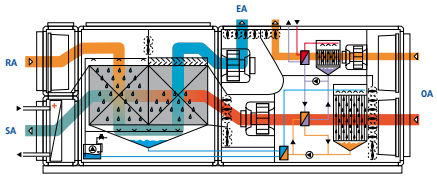
If during summertime conditions the outside air temperature is lower than the return air temperature, the unit can be used for free cooling. The return air/exhaust air volume flow and the outside air/supply air volume flow are fed through the bypass above and below the heat exchanger and the lower pressure loss reduces the power consumption of the fan units.



Sorption-based air conditioning

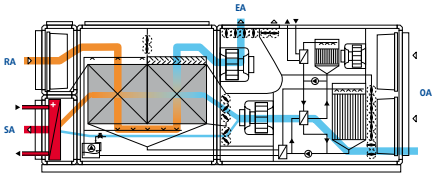
Sorption-based air conditioning takes place in two stages: air dehumidification and air cooling. For dehumidification, warm outside air is passed through a water-absorbing material (the sorbent, a highly concentrated salt solution). The dried outside air then flows through the double plate heat exchanger with indirect evaporative cooling and is significantly cooled in the process. The diluted brine is regenerated for reuse using heat. The heat sources that might be used are solar thermal plants, district heat networks or waste heat e.g. from combined heat and power plants or industrial processes. The air dehumidification and the regeneration of the brine take place in separate circuits. The heat can thus be stored almost indefinitely and without loss in a liquid form and can be used especially where there is no constant heat supply. Sorption-based air conditioning allows cooling and dehumidification without mechanical refrigerating systems and without peak loads in electricity consumption during the summer.





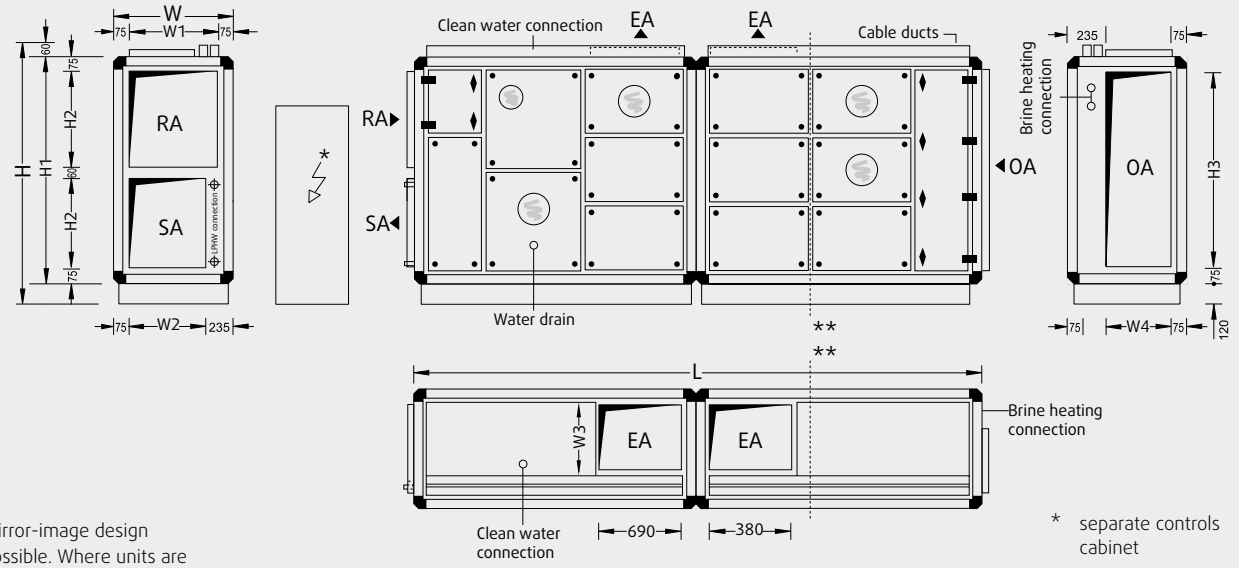
Defrosting Circuit

All recuperative heat exchangers tend to ice over in the exhaust air section in the case of low outside temperatures. In defrost operation, the OA-SA bypass opens, reducing the outside air flow rate going through the recuperator. The heat contained in the return air melts any ice in the heat exchanger, while the airflow is routed past the recuperator is precisely regulated.



Sorpsolair Type 72 and 73 (with brine tank)

System dimensions and weights



Mirror-image design possible. Where units are run in parallel, each unit has a controls cabinet.

* separate controls cabinet

** starting at unit type 72 10 01 three-cube construction

Unit type	L[1]	W[2]	H[3]	W1	W2	W3	W4	H1	H2	H3	Weight[1]	Operating weight[1]
72 04 01	6,580	890	2,190	740	580	370	380	2,010	580	2,040	2,300	2,800
72 05 01	6,580	1,050	2,190	900	740	530	540	2,010	580	2,040	2,500	3,000
72 06 01	6,580	1,370	2,190	1,220	1,060	850	860	2,010	580	2,040	2,800	3,300
72 10 01	8,430	1,050	2,510	900	740	370	530	2,330	900	2,360	3,600	4,400
72 13 01	8,430	1,370	2,510	1,220	1,060	690	850	2,330	900	2,360	4,000	4,900
72 16 01	8,430	1,690	2,510	1,540	1,380	1,010	1,170	2,330	900	2,360	4,500	5,500
72 19 01	8,590	2,010	2,510	1,860	1,700	1,330	1,490	2,330	900	2,360	5,000	6,150
72 22 01	8,590	2,330	2,510	2,180	2,020	1,650	1,810	2,330	900	2,360	5,800	7,300

Largest transport unit *

Unit Type	L[1]	W	H[3]	Weight[1]
73 04 01	3,610	890	2,190	1,400
73 05 01	3,610	1,050	2,190	1,600
73 06 01	3,770	1,370	2,190	2,050
73 10 01	3,770	1,050	2,510	1,200
73 13 01	3,770	1,370	2,510	1,300
73 16 01	3,770	1,690	2,510	1,500
73 19 01	3,770	2,010	2,510	1,800
73 22 01	3,770	2,330	2,510	2,400

Brine accumulator (separate)

Unit Type	L	W	H	Weight
73 04 01	4,180	1,050	2,010	430
73 05 01	4,180	1,050	2,010	430
73 06 01	4,180	1,050	2,010	430
73 10 01	4,180	1,050	2,010	430
73 13 01	4,500	1,050	2,330	535
73 16 01	4,500	1,050	2,330	535
73 19 01	5,460	1,050	2,330	650
73 22 01	5,460	1,050	2,330	650

Controls cabinet

Unit Type	H x W x D[1]	Design
73 04 01	2,000 x 1,000 x 400	Floor standing cabinet
73 05 01	2,000 x 1,000 x 400	Floor standing cabinet
73 06 01	2,000 x 1,000 x 400	Floor standing cabinet
73 10 01	2,000 x 1,000 x 400	Floor standing cabinet
73 13 01	2,000 x 1,000 x 400	Floor standing cabinet
73 16 01	2,000 x 1,000 x 400	Floor standing cabinet
73 19 01	2,000 x 1,000 x 400	Floor standing cabinet
73 22 01	2,000 x 1,000 x 400	Floor standing cabinet

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. At least one metre of clearance is required at the rear. For service work above the unit, please allow 50 mm working height clearance above the cable duct.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option
2 Door fitting assembly increase unit width by 25 mm each operating side
3 incl. 120 mm base frame, plus 60 mm cable duct
4 incl. 200 mm base frame
* Further partitioning for smaller apertures possible (at extra cost).

Technical data for Sorpsolair 72 and 73 on request

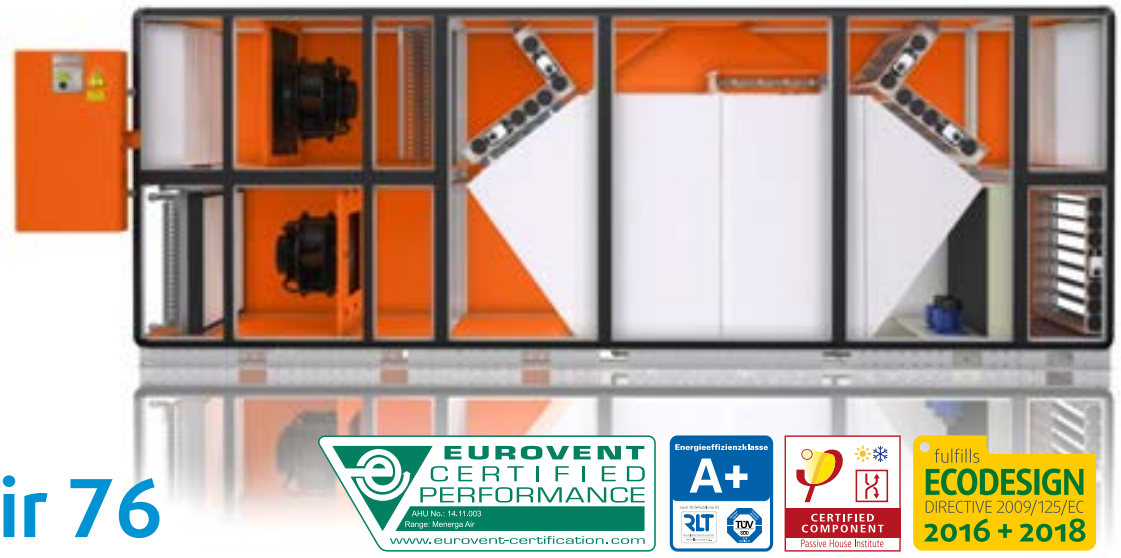
AIRPORT MUNICH, GERMANY
Air conditioning of the freigth staff canteen via Sorpsolair, regeneration of the brine with solarthermics.

POSSIBLE REGENERATION SOURCES FOR THE BRINE BY INSTALLED SYSTEMS

- Solarthermics
- Solarthermics and waste heat from refrigeration
- Solarthermics and grid gas
- Solarthermics and waste heat from cogeneration
- Solarthermics and heat pump
- Solarthermics and district heating
- Waste heat from cogeneration
- District heat

Comfort air conditioning unit with counterflow plate heat exchanger

Automatically selects the most economical operating mode!



Adconair 76 13 01 with Adiabatic Pro - simplified illustration

Adconair 76

AIR VOLUME FLOW: 2,600 – 23,600 m³/h

Eurovent seal refers to range Menerga Air, more information on page 6. Check ongoing validity of certificate: www.eurovent-certification.com or www.certiflash.com

At a glance:

- **Suitable for all building types**
- **Designed for the requirements of the highest energy efficiency classes**
- **Heat recovery rate of more than 90% with just 150 Pa pressure loss**
- **HRC class H1, even at high air velocities**
- **Integrated defrosting function**
- **Thermal bridge factor k_b = 0.78 - class TB1**
- **Two-stage supply air filtration**
- **Fulfils the requirements of the German Energy Saving Ordinance (EnEV) and the German Renewable Energies Heat Act (EEWärmeG) and the VDI 6022**
- **Summer bypass of the heat recovery system for both air flow paths**

With its counterflow plate heat exchanger, the Adconair 76 series is setting new standards in the ventilation industry. The new heat exchanger works with a real counterflow proportion of over 80%. The internal pressure losses of the heat recovery system measure just 150 Pa. Adconair units are optimally adapted for use in comfort air conditioning. The unit series is designed to comply with the requirements of the highest energy efficiency classes. Ideal areas of application include all residential and non-residential buildings. Thanks to its high capacity and intelligent regulation system, the units always create an excellent indoor climate.

Further performance parameters and options:

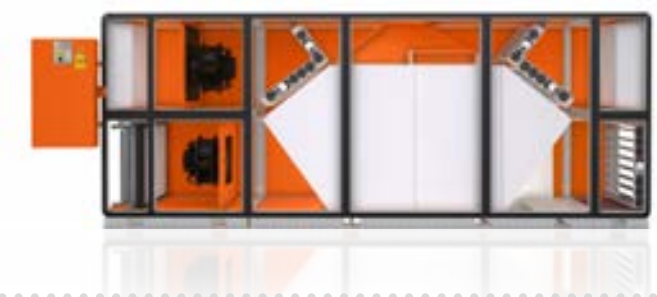
- Corrosion-free counterflow plate heat exchanger made from polypropylene
- EC fans/EffiVent
- Pumped hot water air heater
- Integrated heat recovery bypass for "free cooling"
- Integrated freely programmable control and regulation unit
- Complete unit – the unit is delivered ready to install
- Intensive quality inspection with factory test run
- Complete cleaning of the heat exchanger possible without dismantling

Options:

- Adiabatic evaporative cooling
- AdiabaticPro
- Integrated compressor refrigeration system (type approved PED97/23/EG with output-regulated heat-pump and microchannel condenser) - also available as reversable system
- Constantly regulated recirculation air heating damper
- Recuperator in short version
- Outdoor installation
- Remote maintenance
- And many more

Sample-configurations

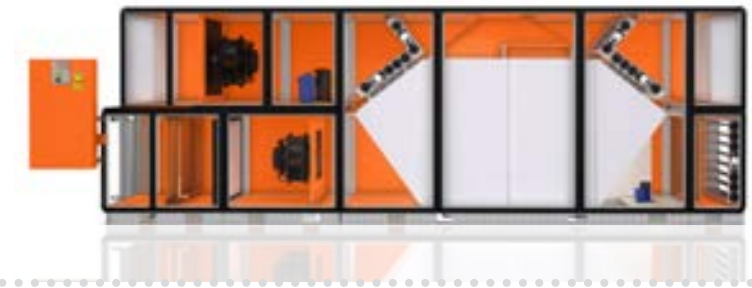
Adconair without optional equipment
Basic unit without additional equipment. The central element is the counter-flow plate heat exchanger. Ideal application areas are applications in which a high heat recovery is in the focus.



Additional equipment adiabatic evaporative cooling
Classic adiabatic evaporative cooling with temperature lowering up to 14 K*. The ideal application area is a high demand for cooling and simultaneously high demands for heat recovery, without the need for dehumidification.

Additional equipment AdiabaticPro
This increases the power of the adiabatic evaporative cooling by additional adiabatic pre-cooling. Temperature reduction up to 15 K*. Ideal application is where a demand for cooling and a high requirement for heat recovery, without demand for dehumidification, is requested.

Additional equipment compressor refrigeration system
To increase the cooling capacity and for dehumidification. This option can be combined with adiabatic evaporation cooling, but not with AdiabaticPro. Ideally suited, if supreme comfort air with minimum energy requirements is in the focus.



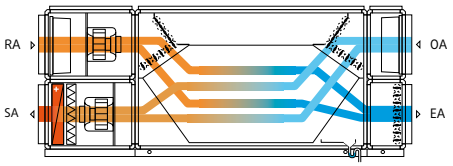
Special design option: shortened recuperator
This variant can be combined with each option /additional equipment mentioned above (except AdiabaticPro). It shortens the length of the unit by 960 mm. Ideally suited, if high heat recovery needs to go into a small plant room.

* for RA=26° C; 55 % r.h., OA=34° C; 40% r.h. and optimum air volume flow and standard density

Functional description

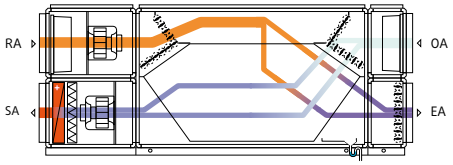
Wintertime conditions

In case of low outside temperatures the system operates completely in heat recovery mode. The counterflow-plate heat exchanger enables the recovery of more than 90% of the heat contained in the return air. The standard heating coil compensates for ventilation and transmission heat losses of the building as required.



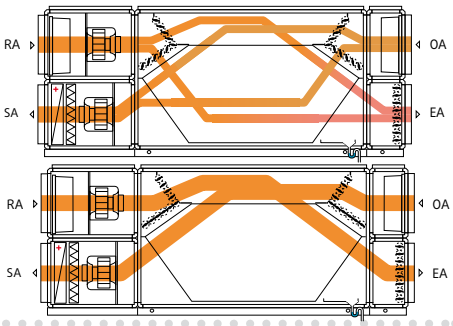
Defrosting Circuit

All recuperative heat exchangers tend to ice over in the exhaust air section in the case of low outside temperatures. The integrated defrosting circuit melts any ice build-up by opening the RA-EA bypass, which directs the return air straight to the area of any possible ice. The intake of fresh air is not interrupted during defrost mode.



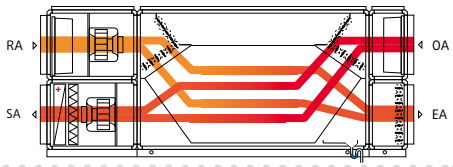
Transitional Period

As the outside air temperatures rise, the heat recovery requirement is reduced. The bypass dampers, which run along the entire depth of the unit, are continuously regulated in order to achieve the desired supply air temperature..
If the outside temperatures continue to rise, the heat recovery is completely bypassed. The structural design of the bypasses over both airflow paths ensures that the pressure losses within the device are low and that the power consumption of both fans in bypass mode is also reduced to a minimum.



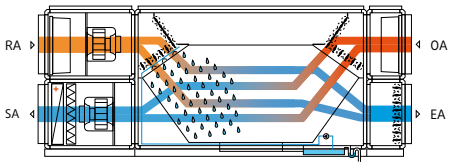
Summertime conditions

If the outside temperature rises above the return air temperature, the highly efficient heat exchanger is used as a "cooling recovery system". The warm outside air is cooled by the return air.



Adiabatic (optional)*

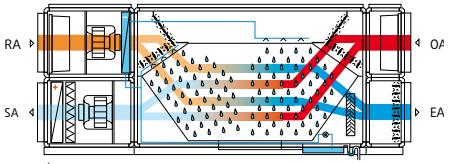
A major component of the indirect adiabatic evaporation cooling is the counterflow plate heat exchanger in which the return air is adiabatically cooled. In turn, the outside air is cooled by the humid, cold exhaust air, without itself being humidified.The high efficiency rate is due to the fact that both processes (adiabatic evaporative cooling of the return air + cooling of the outside air) take place simultaneously in the heat exchanger. The high degree of temperature efficiency of the counterflow plate heat exchanger allows significant cooling of the OA-SA.



* If option Adiabatic is choosen, we recommend optimum flow rate as maximum.

AdiabaticPro (optional)*

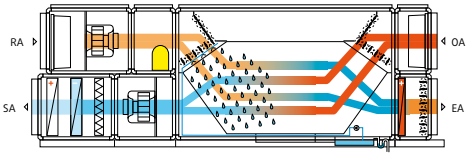
In addition to the humidification at the return air intake of the counterflow plate heat exchanger the return air is precooled lowering the wet bulb temperature by a partial flow of the circulating water. As well an additional precooling of the outside air by humidifying the exhaust air section is provided.



* If option Adiabatic is choosen, optimum flow rate is maximum flow rate.

Compressor refrigeration system (optional)

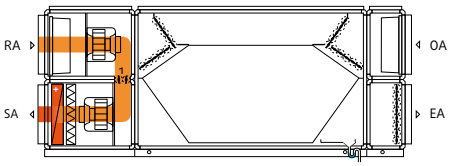
When outside air temperatures are sufficiently high, the integrated compressor refrigeration system cools the supply air to the desired temperature and dehumidifies it if required.



Recirculation Air Operation (heating)*

In recirculation air mode, the outdoor and exhaust air dampers are closed. The air is heated as required via the heating coil. Rooms which are not used all of the time, such as lecture halls or sports halls, can therefore be quickly heated before being used.

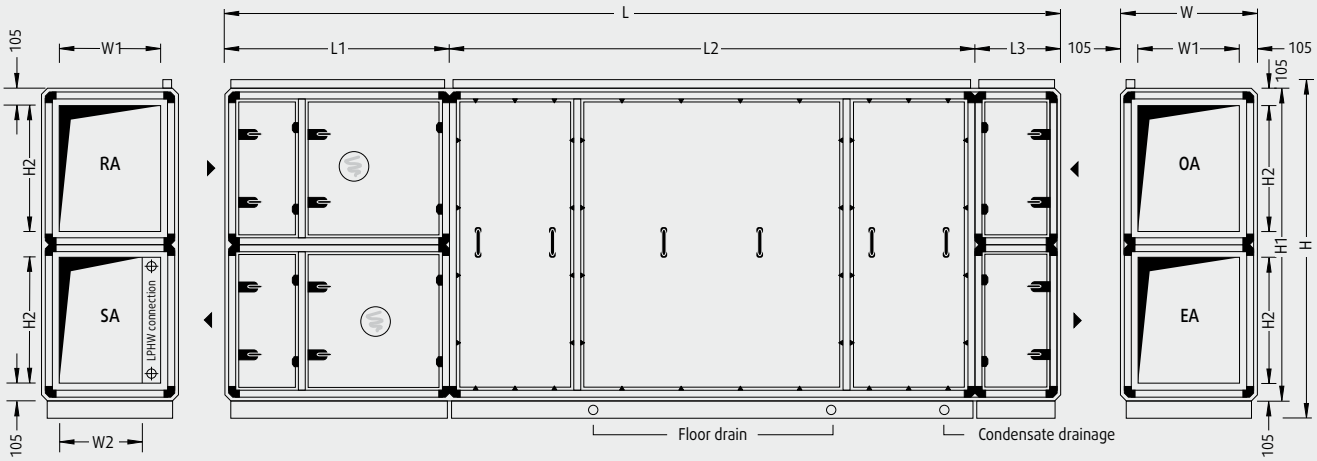
* only possible with optional recirculation air heating damper



1 Recirculation air heating damper (additional equipment)

Adconair Type 76

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

Unit type	L[1]	W[2]	H[3]	L1[1]	L2[1]	L3[1]	W1	W2	H1	H2	Weight[1,4]
76 03 01	4,810	790	1,700	1,240	2,970	600	580	510	1,520	580	1,220
76 05 01	4,970	1,110	1,700	1,400	2,970	600	900	830	1,520	580	1,500
76 06 01	5,610	790	2,340	1,400	3,610	600	580	420	2,160	900	1,650
76 10 01	5,610	1,110	2,340	1,400	3,610	600	900	740	2,160	900	1,900
76 13 01	5,770	1,430	2,340	1,560	3,610	600	1,220	1,060	2,160	900	2,350
76 16 01	5,770	1,750	2,340	1,560	3,610	600	1,540	1,380	2,160	900	2,650
76 19 01	5,770	2,070	2,340	1,560	3,610	600	1,860	1,700	2,160	900	3,000
76 25 01	6,250	2,070	2,980	1,560	4,090	600	1,860	1,700	2,800	1,220	3,900
76 29 01	6,250	2,390	2,980	1,560	4,090	600	2,180	2,020	2,800	1,220	4,300
76 37 01	6,250	3,030	2,980	1,560	4,090	600	2,820	2,660	2,800	1,220	5,700

Largest transport unit

Unit Type	L[1]	W	H[3]	Weight[1,4]
76 03 01	2,970	790	1,700	660
76 05 01	2,970	1,110	1,700	810
76 06 01	3,610	790	2,340	930
76 10 01	3,610	1,110	2,340	1,110
76 13 01	3,610	1,430	2,340	1,300
76 16 01	3,610	1,750	2,340	1,500
76 19 01	3,610	2,070	2,340	1,720
76 25 01	4,090	2,070	2,980	2,330
76 29 01	4,090	2,390	2,980	2,600
76 37 01	4,090	1,515	2,980	1,750

Controls cabinet

Unit Type	H x W x D[1]	Position at unit
76 03 01	1,120 x 640 x 210	SA/RA side
76 05 01	1,120 x 640 x 210	SA/RA side
76 06 01	1,120 x 640 x 210	SA/RA side
76 10 01	1,120 x 640 x 210	SA/RA side
76 13 01	1,120 x 640 x 210	SA/RA side
76 16 01	1,120 x 640 x 210	SA/RA side
76 19 01	1,120 x 640 x 210	SA/RA side
76 25 01	1,280 x 640 x 210	SA/RA side
76 29 01	1,280 x 640 x 210	SA/RA side
76 37 01	1,280 x 640 x 210	SA/RA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work above the unit, please allow 50 mm working height clearance above the cable duct. For service work at unit type 76 37 01 a clearance at the rear of at least 1.500 mm is required.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 May change depending on choosen option, e.g. AdiabaticPro, compressor refrigeration system, recuperator in short version (- 960 mm)
2 Door fitting assembly increase unit width by 65 mm each operating side
3 incl. 120 mm base frame, incl. 60 mm cable duct
4 If option Adiabatic or AdiabaticPro is choosen, please affirm possible additional weight.!

Three transportation units are supplied, including controls cabinet until unit type 38 29 01. Unit type 38 37 01 is delivered in 4 transportation units including controls cabinet. Further partitioning for smaller apertures possible (at extra cost).

Technical specifications and services

Gerätetyp		76 03 01	76 05 01	76 06 01	76 10 01	76 13 01	76 16 01	76 19 01	76 25 01	76 29 01	76 37 01
Optimum flow rate	m^3/h	2,600	3,900	4,000	6,000	7,900	9,800	11,800	15,800	18,400	23,600
Coefficient of power efficiency acc. to EN 13053:2012	%	74	74	76	76	76	76	76	78	78	77
Heat recovery rate according to EN 308	%	76	76	78	78	78	79	78	80	80	80
Total electrical power rating [1]	kW	1.75	2.51	2.69	4.07	5.10	6.25	8.54	11.94	15.22	20.15
Max. current consumption [1]	A	8.0	8.0	8.0	9.6	16.0	16.0	18.8	32.0	34.8	44.0
Operating voltage		3 / N / PE 400 V 50 Hz									
Ext. pressure losses											
Supply and fresh air channel	Pa	300	300	300	300	300	300	400	400	500	500
Return and exhaust air channel	Pa	300	300	300	300	300	300	400	400	500	500
Sound power level [2]											
Supply air vent	dB(A)	67	65	66	71	68	74	78	74	81	84
RA connection	dB(A)	60	65	65	69	64	68	74	68	73	77
Outside air vent	dB(A)	58	57	59	64	58	63	67	64	68	72
EA connection	dB(A)	59	63	62	67	64	67	77	68	75	79
Acoustic pressure in 1 m distance from device [2]	dB(A)	52	52	52	57	53	59	66	60	66	70
Fan units											
Rated motor input for supply air [3]	kW	0.95	1.34	1.44	2.18	2.73	3.34	4.49	6.34	7.94	10.89
Rated motor input for return air [3]	kW	0.80	1.17	1.25	1.89	2.37	2.91	4.05	5.60	7.28	9.26
SFP category supply air | return air		1 | 2	1 | 2	1 | 2	1 | 2	1 | 2	1 | 2	2 | 3	2 | 3	2 | 3	3 | 3
Nominal rating supply air | return air	kW	2.5 | 2.5	2.5 | 2.5	2.5 | 2.5	2.9 | 2.9	5.0 | 5.0	5.0 | 5.0	6.0 | 6.0	10.0 | 10.0	12.0 | 10.0	15.0 | 12.0
Inner specific fan power (SFPint) [4]	Ws/m^3	700	704	776	785	735	731	750	787	774	824
Adiabatic / evaporative cooling (optional) [5] we recommend: optimum flow rate = max. flow rate											
Cooling capacity evaporative cooling [6]	kW	10.1	15.1	15.7	23.5	31.1	38.5	46.3	62.9	73.2	93.7
Rated pump input	kW	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.90
Rated input reverse osmosis system [7]	kW	0.25	0.25	0.25	0.25	0.25	0.38	0.38	0.38	0.38	0.38
AdiabaticPro (optional) [5,8,9] optimum flow rate = max. flow rate											
Cooling capacity evaporative cooling [6]	kW	11.2	16.6	17.3	25.9	34.0	42.3	50.8	69.1	80.3	102.7
Rated pump input	kW	0.90	0.90	0.90	0.90	0.90	0.90	0.90	1.00	1.00	2.00
Rated input reverse osmosis system [7]	kW	0.25	0.25	0.25	0.25	0.38	0.38	0.38	0.38	0.38	0.78
Rated motor input for return air [3]	W	200	250	290	390	480	550	580	920	1,020	1,630
Compressor refrigeration system (optional) [8,9]											
Filling volume for refrigerant type R410A	kg	3.0	4.0	4.0	5.0	7.0	8.0	12.0	18.0	21.0	22.0
Rated compressor input	kW	2.2	2.5	2.0	3.0	3.5	4.9	5.8	6.6	7.4	10.3
Mechanical cooling capacity [6,10]	kW	8.2	11.7	9.9	15.8	18.7	24.5	30.4	37.2	42.3	54.9
Additional motor input for fans [3]	W	120	190	230	400	330	420	440	720	780	910
Efficiency classes according to EN 13053:2012											
Heat recovery class		H1	H1	H1	H1	H1	H1	H1	H1	H1	H1
Power consumption of fan motors SA | RA		P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P1 | P1	P2 | P1
Air velocity class		V1	V1	V2	V2	V2	V2	V2	V2	V2	V2
Filtration according to DIN EN 779											
Supply air | Outside air		F7 | M5									
Return Air		M5									
LPHW [11]											
Heating capacity SA=22° C	kW	4.5	6.9	5.9	9.0	11.9	14.8	17.8	19.2	22.0	28.9
Heating capacity SA=30° C	kW	11.5	17.4	16.7	25.1	33.3	41.4	49.4	62.0	71.9	92.4
Heating capacity Defrost [12]	kW	7.0	10.6	10.9	16.3	21.4	26.6	32.1	42.4	49.1	63.2
Water flow rate and pressure losses											
LPHW	m^3/h | kPa	0.51 | 5.3	0.88 | 4.4	0.88 | 4.8	1.38 | 4.4	2.14 | 3.6	2.16 | 4.3	2.13 | 4.9	3.83 | 3.9	3.89 | 4.5	3.89 | 5.3
LPHW (pump warm water) valve	m^3/h | kPa	0.51 | 10.1	0.88 | 4.9	0.88 | 12.4	1.38 | 4.8	2.14 | 4.6	2.16 | 4.7	2.13 | 7.1	3.83 | 5.7	3.89 | 5.9	3.89 | 5.9
Connections											
LPHW connection	DN	32	32	32	32	40	40	40	50	65	65
LPHW control valve connection	DN	15	15	15	20	25	25	25	32	32	32
Condensate drainage	DN	40	40	40	40	40	40	40	40	40	40
Floor drain	DN	20	20	20	20	20	20	20	20	20	20

Specifications of technical data relate to the optimum flow rate and return air condition 22° C / 40% r.h., outside air condition -12° C / 90% r.h. and standard density (1.204 kg/m^3), unless otherwise specified.

1 dependent on configuration of measurement and control system/unit
2 at 250 Hz mid-band frequency
3 with average filter contamination
4 According EU guideline No. 1253/2014 [Ecodesign guideline]
5 water quality of make-up water corresponds to VDI 3803 table B3 with a bacteria count < 100 CFU/ml, maximum water hardness 15° dH
6 for RA=26° C / 55 % r.h., OA=32° C / 40% r.h. and optimum air volume flow and standard density
7 ddiscontinuous operation, dependend on water consumption
8 may require alteration of the technical equipment.
9 supplementary equipment, device length extends. Note higher power consumption of RA/SA fan units
10 SA ≈ 17° C
11 FL = 70° C
12 at OA=-15° C, SA=18° C, 66% of optimum flow rate and active defrost function

Please seek approval of technical data and specifications prior to start of the planning process. With every single selection we do to your individual requirements our certified selection software automatically checks the Ecodesign compliance level 1 and 2.

Adsolair at TLLV Bad Langensalza in Germany

Heat recovery from waste water with counterflow coaxial recuperator and heat pump

AquaCond 44 08 21 - simplified illustration
Picture shows special equipment heat recovery bypass

Automatically selects the most economical operating mode!

AquaCond 44

QUANTITY OF FLOW: 0.8 – 5.4 m^3/h

At a glance:

- **Heat recovery from clean or contaminated waste water for heating fresh water**
- **Reduction of energy required to heat the fresh water by up to 90%**
- **Automatic heat exchanger cleaning**
- **Flow rate regulation**
- **Integrated control and regulation system, compatible with all conventional building management systems**

AquaCond

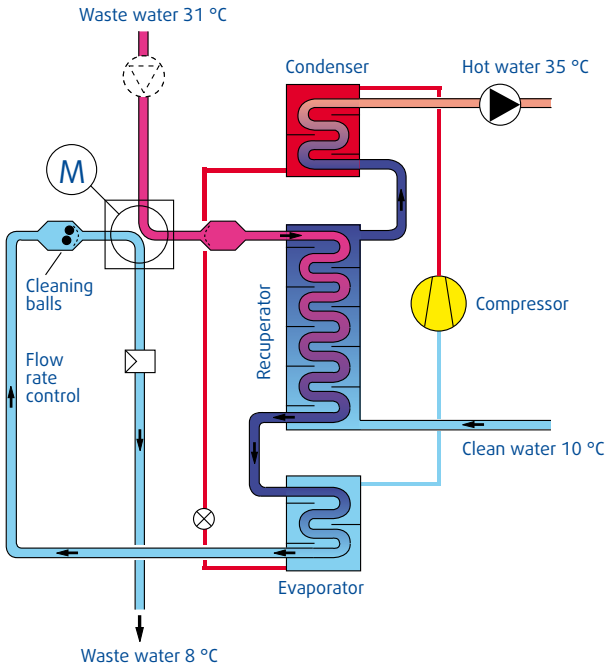
Far too often, warm waste water is discharged into the sewer system, together with all the energy it contains. Units in the AquaCond 44 series recover the majority of this heat energy and transfer it to the fresh water. The combination of recuperator and heat pump means that only approx. 10% of the energy is required that would be needed by a conventional heating system. The heat exchanger cleaning system integrated in this series even allows the units to be used where the waste water is contaminated. Recovering valuable energy – anytime when warm waste water is produced and simultaneously warm fresh water has to be provided, e.g. in the shower areas of swimming pools, hospitals or residential homes, in laundries and in many other industrial processes.

Further performance parameters and options:

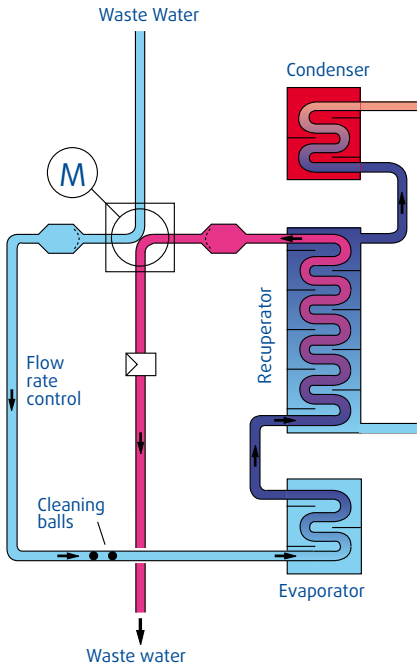
- Uniform pipe cross-sections throughout the waste water ducts for constant flow velocities
- Heat pump system with fully sealed suction gas-cooled coolant compressor, mounted on vibration dampers
- Complete unit, ready to connect, contains all structural elements for heat recovery from waste water, including all control and regulation fittings
- Intensive quality inspection with factory trial run

Options
- Additional pre-filtration of the waste water with coarse filters
- Design of the heat exchanger as a safety heat exchanger, for additional separation of fresh and waste water
- Recuperator bypass
- And many more

Functional description



Cleaning phase



The principle of an AquaCond unit is to heat cold clean water to process water temperature in an energy-efficient manner. The heat source used is energy from warm waste water. The transmission of heat takes place through the combination of a recuperative heat exchanger with a heat pump.

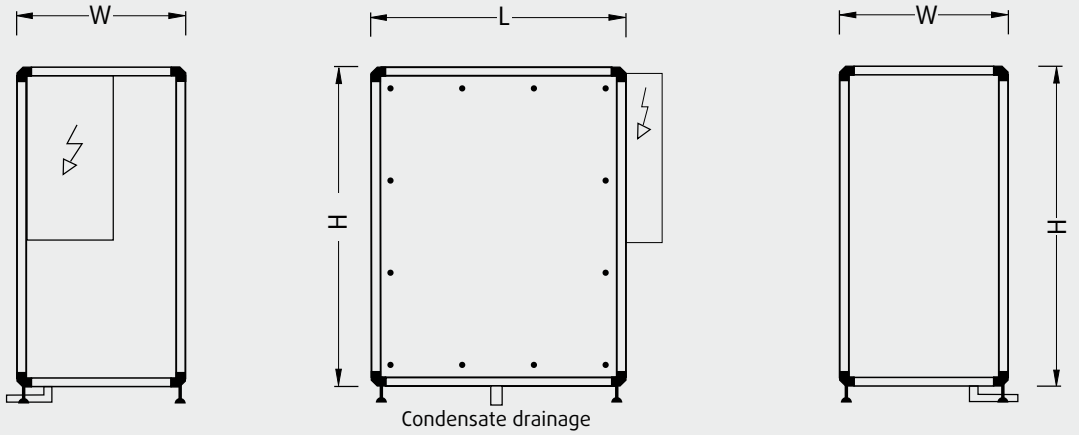
In the first stage, the warm waste water flows through the recuperator and then passes through the evaporator of the heat pump. In counterflow and physically separated, the same volume of fresh water first passes through the recuperator and then through the condenser of the heat pump. In the recuperator, the majority of the heat contained in the waste water is transferred to the cold fresh water. This process takes place by means of the efficient counterflow principle and requires no energy input whatsoever.

In the evaporator of the heat pump, a further part of the heat is utilized from the waste water. In the condenser of the heat pump it is transferred to the already pre-heated fresh water. Thanks to the optimal design of the individual components, a total efficiency score of 11 is achieved.

Uniform pipe cross-sections in the waste water ducts guarantee uniformly high flow velocities. This means that the design reduces deposits of contaminants in the heat exchanger pipes and hence any worsening of the heat exchanger efficiency rating. Despite the uniform flow rates, there is a possibility that soap, grease and other substances dissolved in the warm waste water could be deposited on the exchange surfaces during the cooling phase. If the waste water is organically contaminated, bacteria growth and organic sludge formation will possibly adhere to the surface of the heat exchanger. In order to prevent this, the automatic heat exchanger cleaning system regularly passes cleaning pellets through the waste water ducts. The cleaning pellets loosen the deposits from the pipes and prevent the formation of layers on the surfaces.

AquaCond Type 44

System dimensions and weights



Unit feet 100 mm
Optional: adjustable feet from 100 to 120 mm

Unit Type	L	W[1]	H[2]	Weight
44 08 .1	1,050	730	1,370	430
44 12 .1	1,210	890	1,530	450
44 18 .1	1,370	890	1,690	650
44 24 .2	2,420	890	1,530	860
44 36 .2	2,740	890	1,690	1,260
44 54 .3	4,110	890	1,690	1,900

Largest transport unit

Unit Type	L	W	H[2]	Weight
44 08 .1	1,050	730	1,370	430
44 12 .1	1,210	890	1,530	450
44 18 .1	1,370	890	1,690	650
44 24 .2	1,210	890	1,530	460
44 36 .2	1,370	890	1,690	660
44 54 .3	1,370	890	1,690	700

Controls cabinet

Unit Type	H x W x D	Position at unit
44 08 .1	900 x 480 x 210	front side right
44 12 .1	900 x 480 x 210	front side right
44 18 .1	900 x 480 x 210	front side right
44 24 .2	1,120 x 640 x 210	front side right
44 36 .2	1,120 x 640 x 210	front side right
44 54 .3	1,600 x 640 x 250	front side right

Please comply with the dimensions for body size and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 Door fitting assembly increase unit width by 25 mm each operating side
2 plus unit feet

All pipes to be fitted with locking devices onsite.

Technical specifications and services

Unit Type		44 08 .1	44 12 .1	44 18 .1	44 24 .2	44 36 .2	44 54 .3
Max. quantity of flow	m^3/h	0.8	1.2	1.8	2.4	3.6	5.4
Heating capacity	kW	25	37	52	74	104	156
Rated compressor input	kW	1.8	2.6	3.4	2 x 2.6	2 x 3.4	3 x 3.4
Combined COP [1]		10.8	11.4	11.8	11.5	11.6	11.8
Filling volume for refrigerant type R407C	kg	3.0	4.0	5.0	8.0	10.0	15.0
Max. connection capacity	kW	4.0	6.4	9.6	13.0	20.0	29.0
Operating voltage		3 / N / PE 400 V 50 Hz					
Residual delivery head on clean water side	kPa	5	5	5	5	5	5
Pressure loss on waste water side	kPa	80	90	90	95	95	98
Connections							
Waste water	mm	32	32	40	40	50	50
Clean water CU	mm	22	22	28	28	35	35
Clean water PVC	mm	32	32	32	40	50	50

Technical data specified refer to max. volume flow rate and waste water temperature 31° C / clean water temperature 10° C

1 Power consumption including process water pump and external waste water pump

Please seek approval of technical data and specifications prior to start of the planning process.

Material key *

Key	Waste water heat exchanger	Waste water side piping	Clean water heat exchanger	Clean water side piping
44 .. 0.	Cu	PVC	Cu	Cu
44 .. 1st	Cu	PVC	Cu tin-plated	PVC
44 .. 2.	Cu-Ni-10Fe	PVC	Cu	Cu
44 .. 3rd	Cu-Ni-10Fe	PVC	Cu tin-plated	PVC

* Cu-Ni-10Fe for aggressive waste water (e.g. swimming pool waste water)
Cu tin-plated, if the clean water installation downstream of the unit is made of galvanised steel pipe

Air dehumidification unit with cross counterflow plate heat exchanger and heat pump

Drysolair 11 15 01 - simplified illustration

Automatically selects the most economical operating mode!

Drysolair 11

AIR VOLUME FLOW: 1,000 – 6,000 m^3/h

At a glance:

- **For all drying applications**
- **Low connection capacity due to an upstream installation of a recuperator**
- **Corrosion-free cross counterflow plate heat exchanger made from polypropylene**
- **Energy-saving EC fans**
- **Intelligent air bypass duct**
- **Compact design**
- **Integrated control and regulation system, compatible with all conventional building management systems**

Units in the Drysolair 11 series were developed especially for discharging high levels of internal moisture to the atmosphere. Through the pre-cooling in the recuperator of the air to be dried, the unit works with considerably lower compressor performance than a simple heat pump system and creates a consistently good climate in ice rinks, the drying of buildings or industrial drying processes. The combination of first-class components with precise control and regulation guarantees economical operation at all times and adjusts the temperature and humidity to requirements.

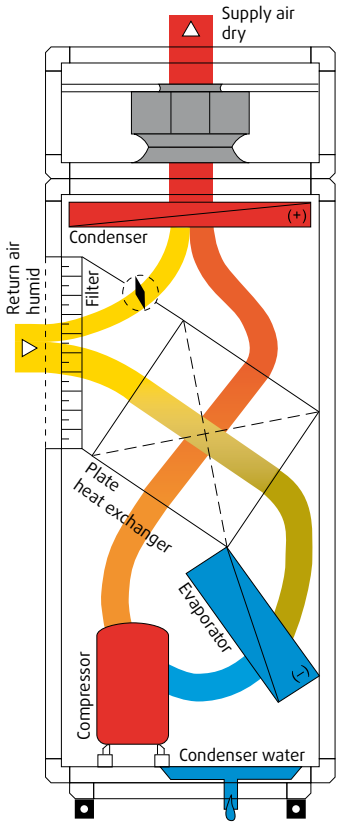
Further performance parameters and options:

- Specific power consumption of less than 500 Wh/kg dehumidification capacity
- Air filtration
- corrosion-free heat exchanger made from polypropylene
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for comfort air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory test run

Options

- Indoor air humidity regulation
- Warm water condenser
- Remote maintenance
- And many more

Functional description



Recirculation mode

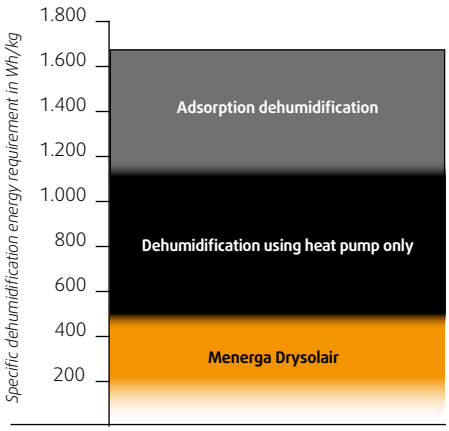
In recirculation mode humid air is dehumidified in two stages and supplied into the room as dry supply air. The return air is pre-cooled and dehumidified in the plate heat exchanger.

The dehumidification to the desired supply air humidity level takes place by means of cooling the air to below its dew point in the evaporator of the heat pump. The air that has been dried in this manner is then warmed back up again in the condenser of the heat pump using its own heat, which was removed during cooling, and is brought to the required condition.

The pre-cooling in the plate heat exchanger of the air to be dried means that the air dehumidification unit operates with a considerably lower compressor performance and hence a significantly lower energy consumption than a simple heat pump solution. The integrated bypass allows fast and precise control and adjustment to the condition of the return air. The cooling capacity is thus continuously adapted to the respective requirements.

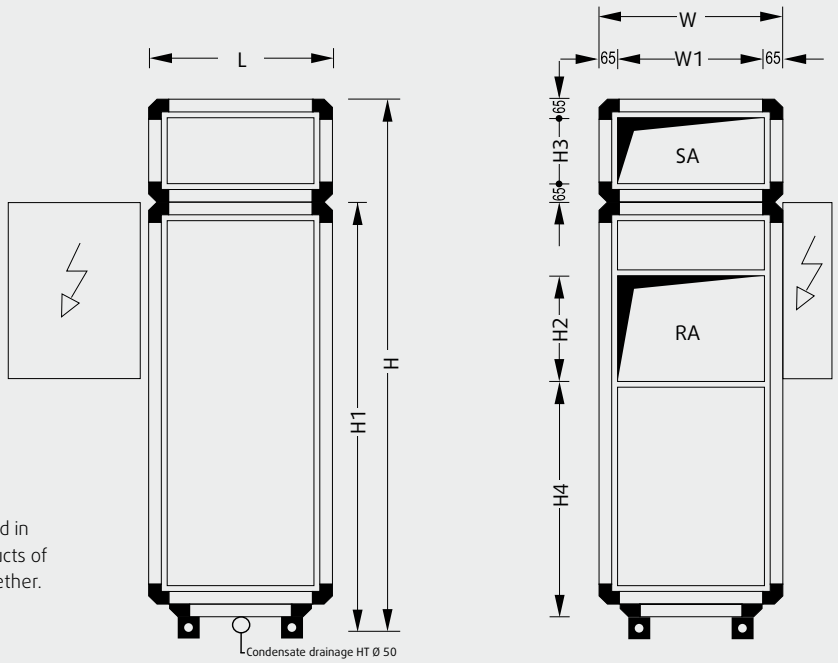
Specific dehumidification energy requirement

Drysolair achieves a specific dehumidification energy requirement of far less than 500 Wh/kg. With one kilowatt hour of electrical energy, it is therefore possible to remove more than 2 kg of humidity from the recirculation air. In contrast, classical solutions without integrated heat recovery systems reach peak values in excess of 1,000 Wh/kg.



Drysolair Type 11

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Mirror-image design possible.

Unit feet 100 mm

Optional: adjustable feet from 100 to 120 mm

Unit type	L	W[1]	H[2]	W1	H1	H2	H3	H4	Weight
11 10 01	730	730	2,245	600	1,755	440	360	910	450
11 15 01	730	730	2,245	600	1,755	440	360	910	450
11 40 01	1,050	1,050	2,725	920	2,155	580	440	1,200	660
11 60 01	1,050	1,050	2,725	920	2,155	580	440	1,200	680

Largest transport unit

Unit Type	L	W	H[2]	Weight
11 10 01	730	730	1,655	300
11 15 01	730	730	1,655	300
11 40 01	1,050	1,050	2,055	500
11 60 01	1,050	1,050	2,055	500

Controls cabinet

Unit Type	H x W x D	Position at unit
11 10 01	900 x 480 x 210	SA/RA side
11 15 01	900 x 480 x 210	SA/RA side
11 40 01	900 x 480 x 210	SA/RA side
11 60 01	900 x 480 x 210	SA/RA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 Door fitting assembly increase unit width by 25 mm each operating side
2 incl. 100 mm unit feet

Technical specifications and services

Unit Type		11 10 01	11 15 01	11 40 01	11 60 01
Optimum flow rate	m^3/h	1,000	1,500	4,000	6,000
Air inlet 20° C / 70% r.h. [1]					
Dehumidification capacity	kg/h	4.5	6.8	17.6	21.6
Heating capacity	kW	4.7	7.5	18.3	23.4
Specific dehumidification energy requirement	Wh/kg	382	443	386	455
Total power rating[2]	kW	1.7	3.0	6.8	9.8
Compressor rated input	kW	1.2	2.3	5.5	7.1
Fan motor power rating [3]	kW	0.5	0.7	1.3	2.7
SFP category		4	4	3	4
Refrigerant type [4]		R407C			
Air inlet 10° C / 85% r.h. [1]					
Dehumidification capacity [5]	kg/h	2.7	4.4	10.6	12.9
Heating capacity	kW	2.8	4.4	10.3	13.4
Specific dehumidification energy requirement	Wh/kg	411	407	370	485
Total power rating	kW	1.1	1.8	3.9	6.3
Compressor rated input	kW	0.6	1.1	2.7	3.6
Fan motor power rating [3]	kW	0.5	0.7	1.2	2.7
SFP category		4	4	3	4
Refrigerant type [4]		R134a			
General specifications					
Max. current consumption[2]	A	9.1	11.9	18.5	24.2
Operating voltage		3 / N / PE 400 V 50 Hz			
External pressure loss					
Supply and return air channel	Pa	300	300	300	300
Sound power level [6]					
Supply air vent	dB(A)	70	67	70	76
RA connection	dB(A)	65	61	62	69
Acoustic pressure at a distance of 1 m from the device [6]	dB(A)	50	47	50	56
Filling volume for refrigerant type	kg	3.5	3.5	9.0	9.0
Connections					
Condensate drainage	DN	25	25	25	25

All technical data relate to optimum flow rate through heat recovery system and the air inlet conditions specified above and at standard density (1,204 kg/m^3).

1 other designs available upon request
2 dependent on configuration of measurement and control system/unit
3 with average filter contamination
4 the refrigerant type used is dependent on the application/return air conditions/design conditions
5 reduction of the dehumidification capacity during defrosting intervals to be taken into account

6 at 250 Hz mid-band frequency

Please seek approval of technical data and specifications prior to start of the planning process.

Ventilation unit with compressor refrigeration system for free cooling of rooms with high thermal loading

Frecolair 14 03 01 with supplementary equipment LPHW and additional unit division - simplified illustration

Automatically selects the most economical operating mode!

Frecolair 14

AIR VOLUME FLOW: 2,600 – 27,000 m^3/h

At a glance:

- **For discharging high heat loads**
- **Advantages of free cooling and recirc mode in a single unit**
- **Energy-saving EC fans**
- **Integrated output-regulated compressor refrigeration system**
- **High electrical efficiency thanks to the lowest possible internal pressure losses**
- **Low space requirement, no additional construction measures for cooling required**
- **Integrated control and regulation system, compatible with all conventional building management systems**

Units in the Frecolair 14 series were developed especially for discharging high internal heat loads into the atmosphere from buildings without humidity requirements. In data processing centres and technical facilities, these units ensure reliable operation and precisely regulate the supply air temperature absolutely spot on. The variability of the operating modes, in combination with first-class components and precise control and regulation systems, guarantees economical operation at all times.

Further performance parameters and options:

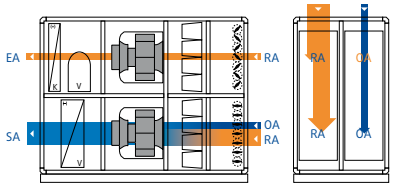
- Focussing on free cooling for maximum savings on operating costs
- Filtering the air in any operating mode
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for comfort air conditioning, including all control and regulation fittings
- Intensive quality inspection with factory test run

Options

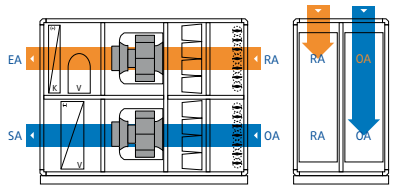
- Two-circuit cooling system to increase redundancy
- Pumped chilled water cooling coil
- Pumped hot water heating coil
- Attenuator
- Outdoor installation
- Remote maintenance
- And many more

Functional description

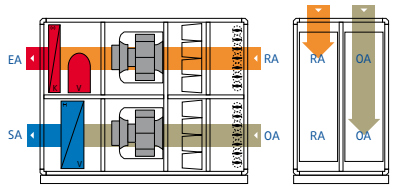
Cooling at low outside temperatures
In order to avoid excessive drops in room temperature at low outside temperatures, a small proportion of the warm return air is added to the cold out-side air during partial recirculation mode. The proportion of outside air is variably controlled.



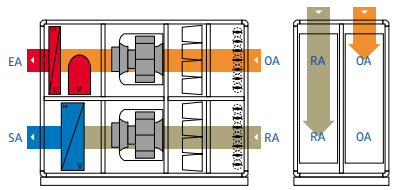
Free cooling at medium outside temperatures
In free cooling mode, the inside heat load is discharged directly via the return air. The cooling takes place exclusively through the continuously controllable proportion of outside air.



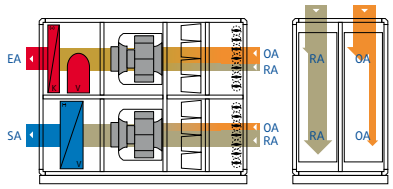
Cooling with outside air at high outside temperatures
The internal heat load is discharged directly with the return air, while in part-load operation the compressor refrigeration system cools the warm outside air to the desired supply air temperature.



Cooling in recirculation mode at very high outside temperatures
If the outside temperature exceeds the return air temperature, the system will automatically switch over into recirculation mode, which is more economical in that case. The return air is cooled to the desired supply air temperature directly by the output-regulated compressor refrigeration system. No addition of warm outside air is necessary.

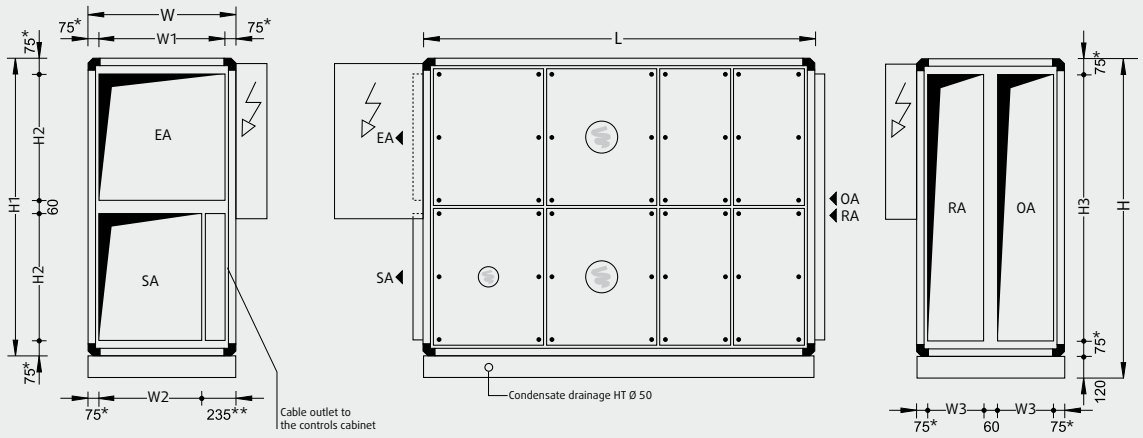


Cooling with a low proportion of air from outside at high outside temperatures
If the outside temperature is higher than the return air temperature and if a proportion of air from outside is required for hygiene reasons, some outside air can be added in a regulated and hence controlled manner during partial recirculation mode. The return air is cooled to the desired supply air temperature directly by the output-regulated compressor refrigeration system.



Frecolair Type 14

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

* up to unit type 14 05 01 = 65 mm
** up to unit type 14 05 01 = 225 mm

Unit Type	L	W[1]	H[2]	W1	W2	W3	H1	H2	H3	Weight
14 03 01	2,330	730	1,490	600	440	280	1,370	600	1,240	660
14 04 01	2,490	890	1,490	760	600	360	1,370	600	1,240	700
14 05 01	2,490	1,050	1,490	920	760	440	1,370	600	1,240	800
14 06 01	2,490	730	2,130	580	420	260	2,010	900	1,860	850
14 10 01	2,650	1,050	2,130	900	740	420	2,010	900	1,860	1,210
14 13 01	2,810	1,370	2,130	1,220	1,060	580	2,010	900	1,860	1,450
14 16 01	2,970	1,690	2,130	1,540	1,380	740	2,010	900	1,860	1,670
14 19 01	2,970	2,010	2,130	1,860	1,700	900	2,010	900	1,860	1,850

Largest transport unit *

Unit Type	L	W	H[2]	Weight
14 03 01	2,330	730	1,370	660
14 04 01	2,490	890	1,370	700
14 05 01	2,490	1,050	1,370	800
14 06 01	2,490	730	2,010	850
14 10 01	2,650	1,050	2,010	1,210
14 13 01	2,810	1,370	2,010	1,450
14 16 01	2,970	1,690	2,010	1,670
14 19 01	2,970	2,010	2,010	1,850

Controls cabinet

Unit Type	H x W x D	Position at unit
14 03 01	1120 x 640 x 210	SA/RA side
14 04 01	1120 x 640 x 210	SA/RA side
14 05 01	1120 x 640 x 210	SA/RA side
14 06 01	1280 x 640 x 210	SA/RA side
14 10 01	1280 x 640 x 210	SA/RA side
14 13 01	1280 x 640 x 210	SA/RA side
14 16 01	1280 x 640 x 210	SA/RA side
14 19 01	1280 x 640 x 210	SA/RA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre.

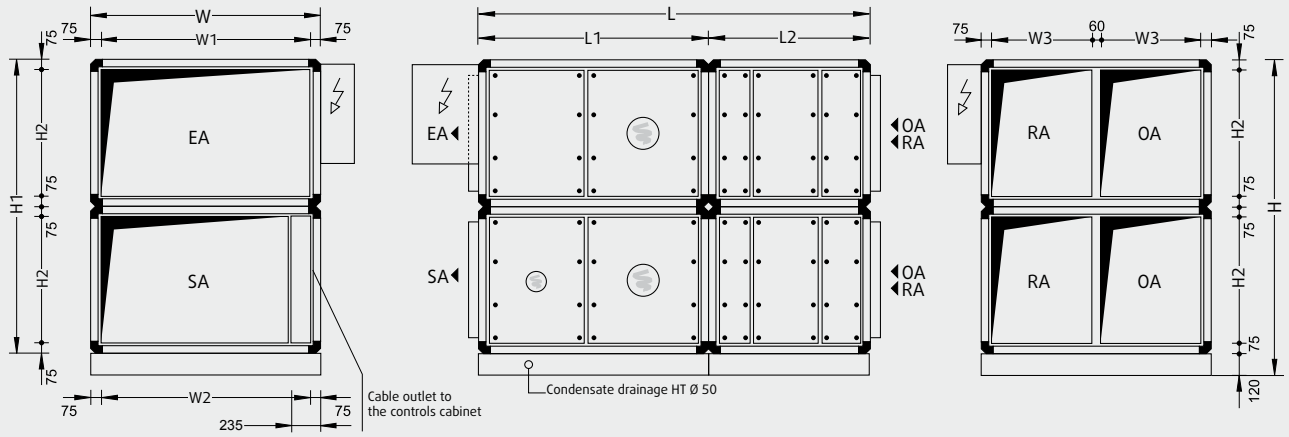
Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 Door fitting assembly increase unit width by 25 mm each operating side
2 incl. 120 mm base frame
* Further partitioning for smaller apertures possible (at extra cost).

Frecolair Type 14

System dimensions and weights



Important! Where a system is operated in parallel, the supply air and return air ducts of the two units have to be brought together.

Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

Unit Type	L	W[1]	H[2]	L1	L2	W1	W2	W3	H1	H2	Weight
14 25 01	3,220	2,010	2,860	2,010	1,210	1,860	1,700	900	2,740	1,220	2,150
14 32 01	3,540	2,010	3,500	2,330	1,210	1,860	1,700	900	3,380	1,540	2,350
14 36 01	3,540	2,330	3,500	2,330	1,210	2,180	2,020	1,060	3,380	1,540	2,550

Largest transport unit *

Unit Type	L	W	H[2]	Weight
14 25 01	2,010	2,010	2,740	1,800
14 32 01	2,330	2,010	3,380	1,950
14 36 01	2,330	2,330	3,380	2,100

Controls cabinet

Unit Type	H x W x D	Position at unit
14 25 01	1,280 x 640 x 210	SA/RA side
14 32 01	1,600 x 640 x 250	SA/RA side
14 36 01	1,600 x 640 x 250	SA/RA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg.

1 Door fitting assembly increase unit width by 25 mm each operating side
2 inkl. 120 mm base frame
* Further partitioning for smaller apertures possible (at extra cost).

Technical specifications and services

Unit Type		14 03 01	14 04 01	14 05 01	14 06 01	14 10 01	14 13 01	14 16 01	14 19 01	14 25 01	14 32 01	14 36 01
Optimum flow rate												
Return air/supply air	m^3/h	2,600	3,300	4,000	4,700	7,100	9,500	11,800	14,200	18,700	24,000	27,000
Outside air/exhaust air	m^3/h	3,500	4,600	5,300	6,300	9,500	12,600	15,800	19,000	25,000	32,000	36,000
Total electrical power rating[1]	kW	4.6	5.7	6.8	8.2	12.9	14.7	19.5	23.2	30.6	37.8	45.6
Max. current consumption [1]	A	12.2	15.2	18.2	19.7	29.8	34.2	39.1	63.2	80.8	84.8	107.5
Operating voltage		3 / N / PE 400 V 50 Hz										
Compressor refrigeration system [2]												
Cooling capacity	kW	11.3	14.2	17.5	19.9	30.8	38.7	47.5	58.1	72.6	85.4	99.0
Effective cooling capacity	kW	10.5	13.1	16.2	18.2	28.1	35.2	43.4	52.7	65.7	76.7	88.8
Compressor	kW	2.6	3.3	4.0	4.7	7.6	8.3	10.4	12.1	16.3	19.5	24.8
Refrigeration capacity	EER	4.3	4.3	4.4	4.2	4.1	4.7	4.6	4.8	4.5	4.4	4.0
External pressure loss												
Outside air/exhaust air duct	Pa	300	300	300	300	300	300	400	400	400	400	400
Return air/supply air duct	Pa	300	300	300	300	300	300	400	400	400	400	400
Sound power level [3]												
RA connection	dB(A)	80	76	76	77	84	80	82	86	84	86	86
EA connection	dB(A)	74	76	79	81	84	81	83	82	86	85	89
Outside air vent	dB(A)	78	73	74	76	83	79	81	82	82	82	83
Supply air vent	dB(A)	77	76	80	82	82	82	84	85	86	86	88
Fan units												
Rated motor input for supply air [4]	kW	0.86	0.99	1.17	1.41	2.31	2.58	3.80	4.80	5.92	7.95	8.61
Rated motor input for exhaust air [4]	kW	1.11	1.39	1.61	2.09	3.03	3.83	5.34	6.26	8.37	10.38	12.16
Nominal rating supply air | return air	kW	1.7 | 1.7	1.7 | 1.7	1.7 | 3.0	1.7 | 3.0	3.0 | 5.5	4.7 | 4.7	4.7 | 11.0	9.4 | 9.4	9.4 | 16.5	14.1 | 14.1	14.1 | 22.0
LPHW (optional) [5]												
Heating capacity [6]	kW	32.1	41.4	50.4	52	78	105	131	158	211	270	309
Pressure loss LPHW	kPa	8.9	12.6	10.7	11	6	5	5	5	5	7	7
Pressure loss LPHW valve	kPa	12.3	20.0	12.2	12	11	8	12	8	5	9	11
LPHW connection	DN	20	20	25	25	32	40	50	50	65	65	65
LPHW control valve connection	DN	15	15	20	20	25	32	32	40	50	50	50

All technical data relate to the optimum flow rate through heat recovery system and outside air conditions 32° C / 40% r.h., return air conditions 28° C / 40% r.h.

1 dependent on configuration of measurement and control system/unit
2 recirc air cooling mode, SA ≈ 17 ° C
3 at 250 Hz mid-band frequency
4 with average filter contamination
5 note higher power consumption of OA fan units
6 FL = 70° C; Air on temperature 15 ° C

Please seek approval of technical data and specifications prior to start of the planning process.

Cooling of rooms with high thermal loading by means of indirect free cooling, adiabatic evaporative cooling, and an output-regulated compressor refrigeration system

Adcoolair 75 13 01 - simplified illustration

Automatically selects the most economical operating mode!

Adcoolair 75

TOTAL COOLING CAPACITY: 11.1 kW – 226.6 kW

At a glance:

- **Efficient cooling through the use of natural resources**
- **Compact dimensions, optimised for installation in plant rooms without an additional cooling tower**
- **Reliable cooling, even when outside temperatures are very high**
- **No contamination of the process airflow with dust or corrosive pollutants**
- **Moisture content of the process air remains unaffected**
- **Low airflow rate required for heat dissipation**
- **Excellent PUE values of up to 1.1**
- **Integrated control and regulation system, compatible with all conventional building management systems**

Thanks to the combination of indirect free cooling, adiabatic evaporative cooling and the integrated output-regulated compressor refrigeration system, each of which supports the effectiveness of the others, the Adcoolair 75 unit series allows heat dissipation in recirculation mode from data processing centres and other rooms with high thermal loads, with minimal space requirements, low air pressure drops within the unit and very little energy consumption. The use of energy-efficient EC fan units, in combination with a demand-based flow rate control system, additionally contributes to the reduction of operating costs. The Adcoolair 75 unit series is optimally adapted to high return air temperatures. The combination of first-class components with precise control and regulation systems guarantees economical operation at all times.

Further performance parameters and options:

- Highest electrical efficiency, as all components are designed for minimal pressure losses
- Energy-saving EC fans
- Corrosion-free cross counterflow plate heat exchanger made from polypropylene
- Oil sump heater that can be switched off
- Use of electronic expansion valves
- Filtering the air in any operating mode
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for recirc air cooling, including all control and regulation fittings
- Intensive quality inspection with factory test run

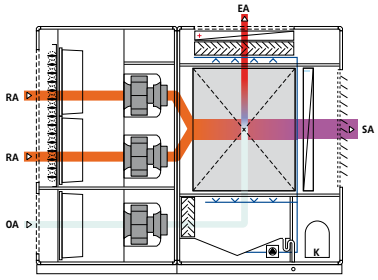
Options

- Integrated exhaust air/outside air bypass to avoid formation of condensate at low outside temperatures
- Hot water extraction, to use waste heat for heating purposes
- Pumped chilled water cooling coil instead of integrated compressor refrigeration system
- Outdoor installation
- Remote maintenance
- And many more

Functional description

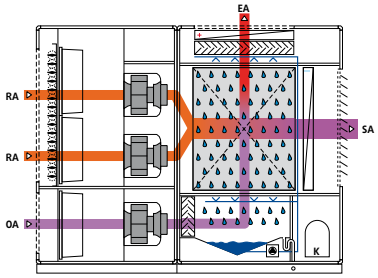
Indirect free cooling at low outside air temperatures

The warm process air from the room with high thermal loads is drawn in via the return air fan and through an asymmetrical cross-counterflow recuperator. In order to extract the heat from the process air. The outside air is passed through the recuperator in a second air flow path, physically separate from the process air. The process air is cooled down in the recuperator through the cooling potential of the outside air. The outside air is variably adjusted, depending on the outside air temperature: with lower outside air temperature, the volume flow rate is reduced. The use of adiabatic evaporative cooling and the compressor refrigeration system is not required at that stage.



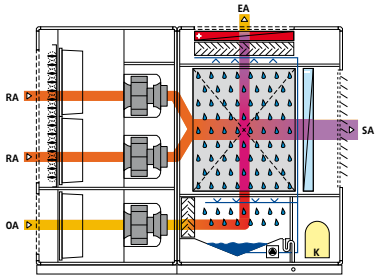
Adiabatic mode at moderate outside air temperatures

The process air is cooled down using indirect adiabatic evaporative cooling. The use of the compressor refrigeration system is not yet required. Even at low outside temperatures, heat exchange can take place using adiabatic humidification. As a result of this, the OA/EA volume flow rate dissipating the heat can be kept low, and this reduces the power consumption of the fan/motor unit.



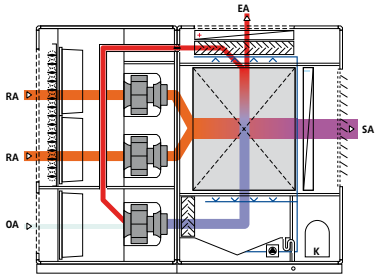
Operation at high outside temperatures

In summertime conditions at very high outside air temperatures and in addition to the adiabatic evaporative cooling, the compressor refrigeration system with output-controlled scroll compressors is activated. In the first stage, the outside air is humidified and then cooled through the evaporation of the water. The cooled outside air indirectly extracts heat from the warm process air in the recuperator. Thus, the process air is significantly cooled, but not humidified. In the second stage, the downstream evaporator is used to cool the process air to the desired supply air temperature. The heat extracted from the process air is transferred to the exhaust air. As the adiabatic evaporative cooling delivers approximately 50% of the required refrigeration capacity, the continuously adjustable compressor refrigeration system is correspondingly dimensioned for approximately 50% of the total cooling capacity. This allows the lowest possible pressure losses to be maintained at the evaporator and condenser.



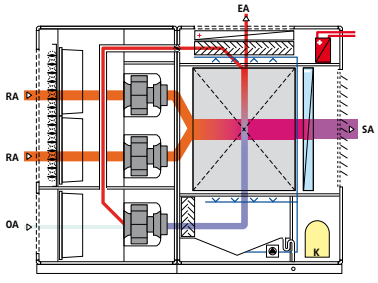
Optional:
EA/OA bypass

In order to prevent dehumidification of the process air, the outside air can be preheated by means of an integrated EA/OA bypass. This prevents condensation of the return air humidity in the recuperator.



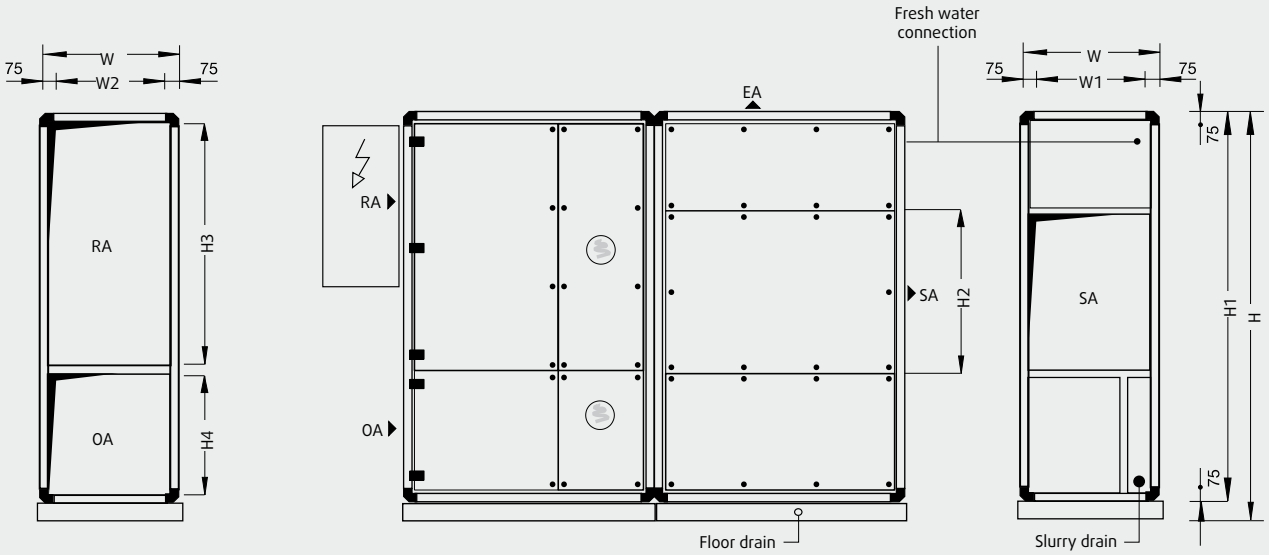
Optional:
Warm water condenser

Via a warm water condenser, the heat extracted from the process air at the evaporator can be used for heating or hot process water. The integrated compressor refrigeration system operates as a heat pump in this mode. The control system ensures that the heat pump is primarily used when heat is required.



Adcoolair Type 75

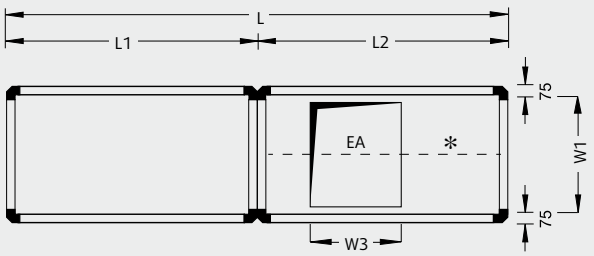
System dimensions and weights



Mirror-image design possible.

Where units are run in parallel, each unit has a controls cabinet.

* starting at 75 32 01, divided lengthways



Unit type	L	W[1]	H[2]	L1	L2	W1	W2	W3	H1	H2	H3	H4	Weight
75 02 01	2,900	730	2,130	1,370	1,530	580	580	580	2,010	740	1,220	580	1,020
75 04 01	2,900	1,050	2,130	1,370	1,530	900	900	580	2,010	740	1,220	580	1,240
75 06 01	2,900	1,370	2,130	1,370	1,530	1,220	1,220	580	2,010	740	1,220	580	1,430
75 08 01	3,380	1,050	2,770	1,690	1,690	900	900	940	2,650	1,220	1,540	900	1,490
75 13 01	3,380	1,370	2,770	1,690	1,690	1,220	1,220	940	2,650	1,220	1,540	900	1,800
75 22 01	3,380	2,650	2,770	1,690	1,690	2,500	2,500	940	2,650	1,220	1,540	900	2,660
75 32 01	4,020	3,060	3,250	1,850	2,170	2 x 1,380	2,910	1,300	3,130	1,540	2,020	900	4,180
75 42 01	4,020	4,020	3,250	1,850	2,170	2 x 1,860	3,870	1,300	3,130	1,540	2,020	900	5,360
75 52 01	4,020	4,660	3,250	1,850	2,170	2 x 2,180	4,510	1,300	3,130	1,540	2,020	900	6,170

Largest transport unit

Unit Type	L	W	H[2]	Weight
75 02 01	1,530	730	2,130	600
75 04 01	1,530	1,050	2,130	720
75 06 01	1,530	1,370	2,130	840
75 08 01	1,690	1,050	2,770	850
75 13 01	1,690	1,370	2,770	1,050
75 22 01	1,690	2,650	2,770	1,500
75 32 01	2,170	3,060	3,250	2,500
75 42 01	2,170	4,020	3,250	3,150
75 52 01	2,170	4,660	3,250	3,630

Controls cabinet

Unit Type	H x W x D	Position at unit
75 02 01	1,120 x 640 x 210	SA/RA side
75 04 01	1,120 x 640 x 210	SA/RA side
75 06 01	1,280 x 640 x 210	SA/RA side
75 08 01	1,280 x 640 x 210	SA/RA side
75 13 01	1,280 x 640 x 210	SA/RA side
75 22 01	1,280 x 640 x 210	SA/RA side
75 32 01	1,280 x 640 x 210	SA/RA side
75 42 01	1,600 x 640 x 210	SA/RA side
75 52 01	1,600 x 640 x 210	SA/RA side

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 Door fitting assembly increase unit width by 25 mm each operating side
2 incl. 120 mm base frame

Technical specifications and services

Unit Type		75 02 01	75 04 01	75 06 01	75 08 01	75 13 01	75 22 01	75 32 01	75 42 01	75 52 01
Total cooling capacity [1]	kW	11.7	22.1	31.1	37.8	54.1	103.5	156.1	201.9	246.5
Air volume flow process air	m^3/h	2,200	4,500	6,300	7,900	11,000	22,000	32,000	42,000	50,000
Air volume flow OA-EA	m^3/h	1,300	2,700	3,800	4,700	6,600	13,200	19,200	25,200	30,000
Energy Efficiency Ratio [2]	EER	5.5	7.5	7.5	8.3	8.2	9.3	9.0	9.1	9.2
Total electrical power rating[3]	kW	3.2	5.1	7.3	8.3	11.7	21.3	31.3	40.3	49.2
Max. current consumption [3]	A	8.9	13.7	21.7	29.3	33.3	62.0	81.3	116.7	127.7
Operating voltage		3 / N / PE 400 V 50 Hz								
Ext. pressure loss										
Process air (Return air and supply air duct)	Pa	250	250	250	250	250	250	250	250	250
Outside air and exhaust air duct	Pa	250	250	250	250	250	250	250	250	250
Sound power level [4]										
Supply air vent	dB(A)	60	64	71	68	69	72	73	74	78
RA connection	dB(A)	61	67	72	72	70	73	75	76	80
Outside air vent	dB(A)	70	66	68	75	68	71	73	73	75
EA connection	dB(A)	74	65	68	74	69	72	71	72	73
Acoustic pressure in 1 m distance from device[4]	dB(A)	58	52	57	59	56	59	59	60	63
Fan units										
Rated motor input for process air [5]	kW	0.56	1.28	1.94	2.21	3.02	6.06	8.40	10.80	13.92
Rated motor input for outside air [5]	kW	0.48	0.88	1.22	1.59	2.05	4.10	5.58	7.20	8.64
SFP category supply air/outside air		3 | 3	3 | 3	3 | 3	3 | 3	3 | 3	3 | 3	3 | 3	3 | 3	3 | 3
Evaporative cooling[6]										
Cooling capacity of adiabatic evaporative cooling system	kW	4.8	9.9	14.0	17.4	24.2	48.4	70.3	92.2	110.5
Rated pump input for evaporative cooling	kW	0.64	0.64	0.64	0.64	0.79	0.79	1.58	1.58	1.58
Compressor refrigeration system										
Filling volume for refrigerant type R407C	kg	5.0	7.0	9.0	11.0	17.0	34.0	46.0	70.0	78.0
Rated compressor input	kW	1.5	2.3	3.5	3.9	5.8	10.3	15.7	20.7	25.1
Mechanical cooling capacity	kW	6.9	12.2	17.1	20.4	29.9	55.1	85.8	109.7	136.0
Number of cooling circuits		1	1	1	1	1	1	2	2	2
Number of compressors		1	1	1	1	1	2	2	2	4
Compressor power modulation		single stage	output-controlled scroll compressor 10 - 100%							
Filtration according to DIN EN 779										
Outside air		M5								
Return Air		M5								
Connections										
Clean water connection [7]	DN	15	15	15	15	15	15	15	15	15
Slurry drain	DN	50	50	50	50	50	50	50	50	50
Floor drain	DN	40	40	40	40	40	40	40	40	40

Specifications of technical data relate to the return air conditions 34° C / 20% r.h., outside air conditions 35° C / 40% r.h., at standard density (1.204 kg/m^3), unless otherwise specified

1 Evaporative cooling + compressor refrigeration system; SA = 20° C
2 Taking into account power consumption for adiabatic pump(s)
3 dependent on configuration of measurement and control system/unit
4 At 250 Hz mid-band frequency and standard unit housing
5 with average filter contamination
6 water quality of make-up water corresponds to VDI 3803 table B3 with a bacteria count < 100 CFU/ml, water hardness range "soft".
7 2 bar system pressure required at 25 l/min flow rate

Please seek approval of technical data and specifications prior to start of the planning process.

Compact chilled water unit for indoor installation with free cooling, adiabatic evaporative cooling and integrated compressor refrigeration system

Hybritemp 98 93 01 - simplified illustration

Automatically selects the most economical operating mode!

Hybritemp 97 and 98

TOTAL COOLING CAPACITY: 33 kW – 455 kW

At a glance:

- **Efficient cooling through the use of natural resources**
- **Very high performance with high EER and ESEER values at the same time**
- **Reliable cooling, even when outside temperatures are very high**
- **Compressor refrigeration system and free cooler optimally adapted to the respective application**
- **Compact design thanks to integrated recooling system, removing the need for cooling system components on the facade or on the roof**
- **Low air volumes required for heat dissipation**
- **Integrated control and regulation system, compatible with all conventional building management systems**

Cooling systems using chilled water can be found in a wide range of areas: For discharging excess heat from rooms with high thermal loads, for cooling industrial manufacturing processes or for comfort air conditioning of buildings. The units of the Hybritemp 97 and 98 series are optimally adapted to these requirements. The "all-in-one" unit offers efficient cooling in a very compact way. It is generally not necessary for cooling system components to be installed at or on the exterior of the building – and this drastically reduces the overall investment costs. Hybritemp has been developed in two design variants: The COP-optimised 97 series is characterised by its very high efficiency, while the development of the 98 series focussed on achieving maximum performance with minimum space requirements. The combination of first-class components with precise control and regulation systems guarantees economical operation at all times.

Further performance parameters and options:

- High corrosion prevention through the use of zinc sacrificial anodes, EPD-coated parts and components made from plastic
- Use of electronic expansion valves
- Energy-saving EC fans
- Filtering the air in any operating mode
- Individually controllable performance parameters
- Complete unit, ready to connect, contains all structural elements for chilled water generation, including all control and regulation fittings
- Intensive quality inspection with factory test run

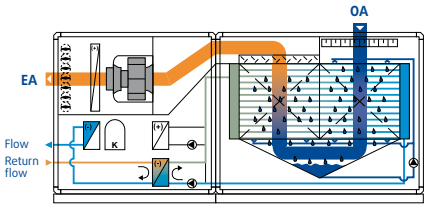
Options

- Conductivity-controlled elutriation control when using softened water
- Hot water extraction, to use waste heat for heating purposes
- Remote maintenance
- And many more

Functional description

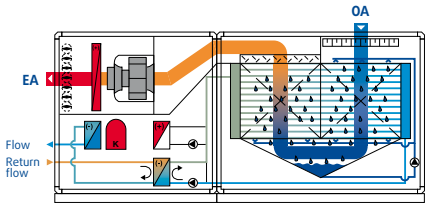
Free and evaporative cooling

At respective low outside air temperatures and humidity, the heat in the process water is dissipated to the outside air. In order to reduce the outside air temperature further and to increase the cooling capacity, evaporative cooling is activated. In an intermediate heat exchanger, the process water is cooled down to the required flow temperature. The cooling capacity is controlled continuously by varying the air volume flow rate.



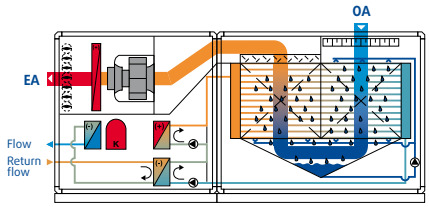
Part-load operation with free and evaporative cooling: Compressor refrigeration system condenses in the exhaust air

When outside air temperature and humidity are rising, the amount of heat that can be dissipated by evaporative cooling will reduce. If the process water in the intermediate heat exchanger can no longer be cooled down to the required flow temperature, after-cooling takes place in the evaporator of the integrated compressor refrigeration system. The heat of condensation from the multi-stage compressor refrigeration system in part-load operation is passed onto the exhaust air.



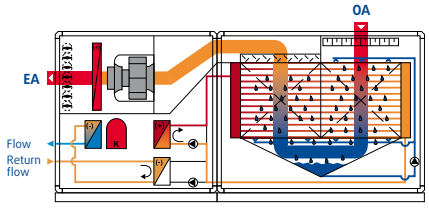
Free and evaporative cooling in operation under load: Compressor refrigeration system condenses in the exhaust air and secondary circuit

When an increasing part of the total cooling performance is carried out by the compressor refrigeration system, the condensation heat can no longer be passed solely onto the exhaust air. A proportion of the water is directed from the secondary circuit downstream of the intermediate heat exchanger to the water-cooled condenser of the compressor refrigeration system in order to discharge the residual heat of condensation. The controller regulates the condensation pressure in order to operate the chilled water with an optimum EER.



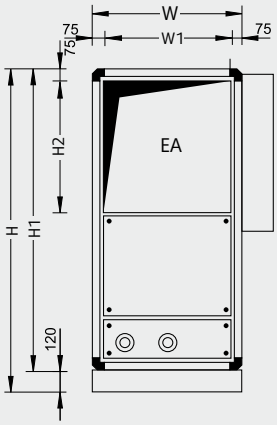
Operation under full load: Cooling by the compressor refrigeration system

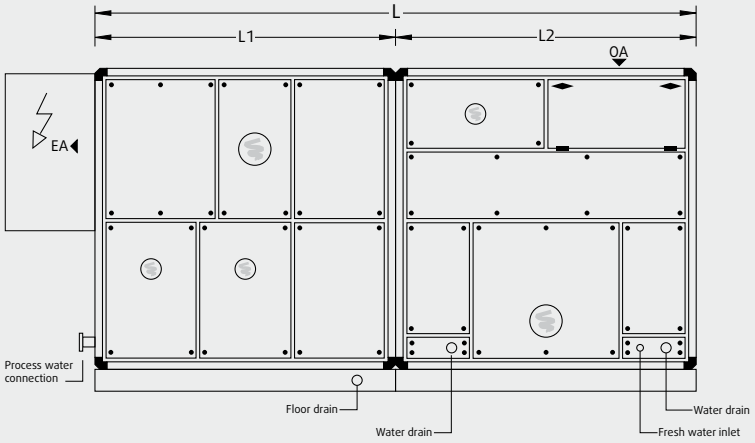
If the water temperature in the secondary circuit is higher than the process water temperature, the total cooling capacity required comes from the compressor refrigeration system. Due to the two-stage condensation heat output in the air condenser (desuperheater) to the exhaust air and in the water condenser to the secondary circuit, only a very low air volume is required. Thanks to the upstream evaporative cooling system, low condensation pressures are achieved, which in return lead to a high EER in the compressor refrigeration system.

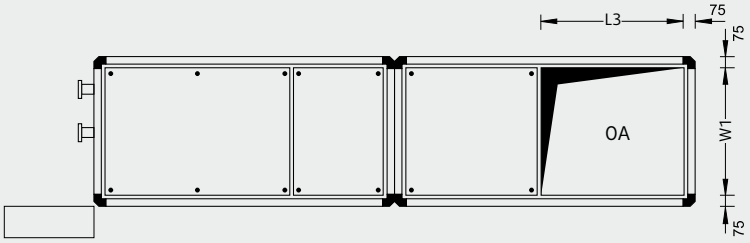


Hybritemp Type 97 and Type 98

System dimensions and weights







Caution! Where units are run in parallel, each unit has a controls cabinet.

Mirror-image design possible.

	Unit Type	L	W[1]	H[2]	L1	L2	L3	W1	H1	H2	Weight	Operating weight
Type 97 efficiency-optimised	97 04 01	3,700	890	1,650	2,010	1,690	900	740	1,530	580	1,300	1,470
	97 05 01	3,700	1,050	1,650	2,010	1,690	900	900	1,530	580	1,500	2,070
	97 06 01	4,340	730	2,310	2,010	2,330	1,220	580	2,190	900	1,800	2,490
	97 10 01	4,500	1,050	2,130	2,170	2,330	1,220	900	2,010	900	2,200	3,250
	97 13 01	4,660	1,370	2,130	2,330	2,330	1,220	1,220	2,010	900	3,000	4,390
	97 16 01	4,820	1,690	2,130	2,490	2,330	1,220	1,540	2,010	900	3,500	5,240
	97 19 01	4,820	2,010	2,130	2,490	2,330	1,220	1,860	2,010	900	4,000	6,110
Type 98 performance-optimised	98 04 01	3,700	890	1,970	2,010	1,690	900	740	1,850	580	1,600	2,070
	98 05 01	3,700	1,050	1,970	2,010	1,690	900	900	1,850	580	1,700	2,270
	98 06 01	4,980	730	2,450	2,650	2,330	1,220	580	2,330	900	2,100	2,800
	98 10 01	4,980	1,050	2,450	2,650	2,330	1,220	900	2,330	900	2,550	3,220
	98 13 01	4,660	1,370	2,450	2,330	2,330	1,220	1,220	2,330	900	3,400	4,830
	98 16 01	4,820	1,690	2,450	2,490	2,330	1,220	1,540	2,330	900	3,900	5,700
	98 19 01	4,820	2,010	2,450	2,490	2,330	1,220	1,860	2,330	900	5,000	7,170

Largest transport unit *

Unit Type	L	W	H[2]	Weight
97 04 01	2,010	890	1,650	770
97 05 01	2,010	1,050	1,650	930
97 06 01	2,330	730	2,310	730
97 10 01	2,330	1,050	2,130	910
97 13 01	2,330	1,370	2,130	1,830
97 16 01	2,490	1,690	2,130	2,140
97 19 01	2,490	2,010	2,130	2,490
98 04 01	2,010	890	1,970	1,030
98 05 01	2,010	1,050	1,970	1,100
98 06 01	2,650	730	2,450	1,300
98 10 01	2,650	1,050	2,450	1,590
98 13 01	2,330	1,370	2,450	2,160
98 16 01	2,490	1,690	2,450	2,500
98 19 01	2,490	2,010	2,450	3,420

Controls cabinet

Unit Type	H x W x D	Position/design
97 04 01	1,600 x 640 x 250	EA side
97 05 01	1,600 x 640 x 250	EA side
97 06 01	1,600 x 640 x 250	EA side
97 10 01	1,600 x 640 x 250	EA side
97 13 01	1,800 x 1,000 x 400	Floor standing cabinet
97 16 01	1,800 x 1,000 x 400	Floor standing cabinet
97 19 01	1,800 x 1,200 x 400	Floor standing cabinet
98 04 01	1,600 x 640 x 250	EA side
98 05 01	1,600 x 640 x 250	EA side
98 06 01	1,800 x 1,000 x 400	Floor standing cabinet
98 10 01	1,800 x 1,000 x 400	Floor standing cabinet
98 13 01	1,800 x 1,000 x 400	Floor standing cabinet
98 16 01	1,800 x 1,200 x 400	Floor standing cabinet
98 19 01	1,800 x 1,200 x 400	Floor standing cabinet

For service work, a clearance corresponding to dimension W is required on the operating side of the unit. If dimension W is smaller than one metre, please leave a clearance of one metre. For service work a clearance at the rear of at least 1.500 mm is required.

Please comply with the dimensions for body size, air duct connections and electrical switch cabinet.

All lengths are given in mm, weights in kg, weight incl. controls cabinet.

1 Door fitting assembly increase unit width by 25 mm each operating side
2 incl. 120 mm base frame
* Further partitioning for smaller apertures possible (at extra cost).

Hybritemp Type 97
efficiency-optimised

Technical specifications and services

Unit Type		97 04 01	97 05 01	97 06 01	97 10 01	97 13 01	97 16 01	97 19 01
Cooling capacity [1, 5]	kW	33 - 48	45 - 64	56 - 81	74 - 106	118 - 168	148 - 217	172 - 247
Refrigeration capacity [2]	ESEER	5.5	5.5	5.5	5.4	5.5	5.5	5.2
Nominal water volume flow rate for process water	m^3/h	5.0	7.0	8.0	11.0	17.0	21.0	25.0
Air volume flow OA-EA	m^3/h	4,400	5,300	6,300	9,500	13,000	16,000	19,000
Rated fan motor input for exhaust air [3]	kW	2.0	2.3	3.3	4.6	6.4	7.6	8.8
Rated pump input	kW	1.3	1.3	1.3	1.3	1.4	1.4	1.6
Filling volume for refrigerant type R407C	kg	10	12	17	22	18	20	23
Number of performance stages		2	2	3	3	4	4	4
Number of cooling circuits		1	1	2	2	2	2	2
Max. current consumption	A	37.6	43.4	61.9	70.8	104.1	150.1	165.0
Operating voltage		3 / N / PE 400 V 50 Hz						
Ext. pressure loss								
Outside air and exhaust air duct	Pa	300	300	300	300	300	300	300
Sound power level [4]								
Outside air vent	dB(A)	66	64	71	67	73	75	71
EA connection	dB(A)	76	74	77	76	79	80	79
Acoustic pressure at a distance of 1 m from the device[4]	dB(A)	58	56	59	58	61	62	61
6° C process water flow								
Total cooling capacity [5]	kW	33.3	45.1	55.7	73.6	117.5	148.3	171.7
Energy Efficiency Ratio	EER	5.0	4.8	4.7	4.9	4.8	4.7	4.5
Rated compressor input	kW	6.7	9.3	11.7	15.1	24.5	31.8	37.9
Alternative process water temperatures								
12° C process water flow								
Total cooling capacity [5]	kW	39.5	53.3	66.5	87.3	139.1	177.5	203.5
Energy Efficiency Ratio	EER	5.6	5.5	5.4	5.5	5.4	5.3	5.1
Rated compressor input	kW	7.0	9.6	12.3	15.8	25.6	33.3	39.8
18° C process water flow								
Total cooling capacity [5]	kW	47.8	64.4	81.4	106.0	168.4	217.2	246.6
Energy Efficiency Ratio	EER	6.5	6.4	6.2	6.3	6.2	6.1	5.8
Rated compressor input	kW	7.4	10.0	13.3	16.9	27.2	35.4	42.6
Connections								
Clean water connection [6, 7]	DN	15	15	20	20	20	20	20
Slurry drain	DN	50	50	80	80	80	80	80
Water drain	DN	25	25	25	32	32	40	40
Floor drains	DN	40	40	40	40	40	40	40
Process water flange	DN	50	50	50	65	80	80	80
Pressure loss process water	kPa	80	80	80	80	80	80	80

Technical data specified refer to nominal volume flow rate at 6° C flow temperature and outside air conditions 32° C 40% r.h., unless otherwise specified

Please seek approval of technical data and specifications prior to start of the planning process.

1 dependent on flow/return temperature and water flow rate
2 at flow = 6° C
3 with average filter contamination
4 at 250 Hz mid-band frequency
5 at OA = 32° C; 40% r.h.
6 2 bar system pressure required at 25 l/min flow rate
7 water quality of make-up water corresponds to VDI 3803 table B2 with a bacteria count < 100 CFU/ml, water hardness range "soft".

Hybritemp Type 98
performance-optimised

Technical specifications and services

Unit Type		98 04 01	98 0501	98 06 01	98 10 01	98 13 01	98 16 01	98 19 01
Cooling capacity [1, 5]	kW	65 - 93	79 - 112	102 - 145	133 - 189	196 - 278	244 - 350	319 - 455
Refrigeration capacity [2]	ESEER	4.7	4.7	4.7	5.0	4.9	5.1	4.9
Nominal water volume flow rate for process water	m^3/h	10.0	12.0	15.0	20.0	29.0	36.0	45.0
Air volume flow OA-EA	m^3/h	4,400	5,300	6,300	9,500	13,000	16,000	19,000
Rated fan motor input for exhaust air [3]	kW	2.0	2.3	3.5	4.8	6.6	7.8	9.2
Rated pump input	kW	1.3	1.3	1.3	1.3	2.2	1.4	1.6
Filling volume for refrigerant type R407C	kg	9	16	25	45	55	60	85
Number of performance stages		2	2	2	2	3	3	4
Number of cooling circuits		1						
Max. current consumption	A	58.6	79.6	97.8	121.0	183.7	213.6	279.0
Operating voltage		3 / N / PE 400 V 50 Hz						
Ext. pressure losses								
Outside air and exhaust air duct	Pa	300	300	300	300	300	300	300
Sound power level [4]								
Outside air vent	dB(A)	66	64	71	68	73	76	72
EA connection	dB(A)	76	74	78	77	80	81	79
Acoustic pressure at a distance of 1 m from the device[4]	dB(A)	58	56	60	59	62	63	61
6° C process water flow								
Total cooling capacity [5]	kW	65.0	78.8	102.4	132.9	195.8	244.4	318.5
Energy Efficiency Ratio	EER	3.5	3.6	3.4	3.8	3.6	3.8	3.6
Rated compressor input	kW	18.6	21.9	29.7	35.0	53.9	64.4	88.9
Alternative process water temperatures								
12° C process water flow								
Total cooling capacity [5]	kW	76.8	93.0	120.4	156.9	231.0	289.3	376.5
Energy Efficiency Ratio	EER	3.9	4.0	3.8	4.2	4.0	4.2	4.0
Rated compressor input	kW	19.5	23.1	31.6	37.1	57.1	68.3	94.3
18° C process water flow								
Total cooling capacity [5]	kW	92.7	111.9	144.7	189.3	278.4	350.4	455.4
Energy Efficiency Ratio	EER	4.5	4.5	4.3	4.8	4.5	4.8	4.5
Rated compressor input	kW	20.6	24.7	34.0	39.8	61.4	73.5	101.6
Connections								
Clean water connection [6, 7]	DN	15	15	15	15	15	20	20
Slurry drain	DN	50	50	80	80	80	80	80
Water drain	DN	25	25	25	32	32	40	40
Floor drains	DN	40	40	40	40	40	40	40
Process water flange	DN	50	50	50	65	80	80	100
Pressure loss process water	kPa	80	80	80	80	80	80	80

Technical data specified refer to nominal volume flow rate at 6° C flow temperature and outside air conditions 32° C 40% r.h., unless otherwise specified

Please seek approval of technical data and specifications prior to start of the planning process.

1 dependent on flow/return temperature and water flow rate
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6 2 bar system pressure required at 25 l/min flow rate
7 water quality of make-up water corresponds to VDI 3803 table B2 with a bacteria count < 100 CFU/ml, water hardness range "soft".

Mini glossary

Heat recovery efficiency
According to VDI 2071, this is defined as the ratio of the temperature difference between the supply air and the outside air to the temperature difference between the return air and the outside air in a ventilation system with heat recovery. This key figure describes the proportion of the theoretically useable energy from the return air that is transferred to the supply air. Sensitive and latent heat are taken into consideration. Described in %. Heat recovery rates of over 100% are theoretically possible.

Temperature efficiency = heat recovery efficiency = heat provision level
Ratio of the transferred temperature in the heat recovery system to the difference of temperature of the inlet media. This key figure describes how much energy can be recovered from the return air and transferred to the outside air to heat the supply air. Caution: waste heat from the fans is taken into consideration! The energy content of humid air (latent heat) is not taken into consideration. On the basis of EN 308, the values must be specified under dry conditions. The heat recovery efficiency is indicated using Φ, and lies between 0 and 1. If balanced volume flows and low internal leakage are assumed, the temperature efficiency fundamentally corresponds to the heat provision level.

Efficiency
Specification of the heat recovery efficiency as a percentage. In a counterflow plate heat exchanger, for example, the heat recovery efficiency relative to the outside air is Φ = 0.8. The efficiency is thus 80%.

Moisture recovery efficiency
Is calculated in a similar manner to the heat recovery efficiency, for the recovery of atmospheric moisture. The moisture recovery efficiency is specified using Ψ, and the absolute moisture content is specified in g/kg using X.

Energy efficiency under DIN EN 13053
Taking into consideration the dry temperature efficiency under EN 308 and the electrical energy requirements for overcoming the pressure loss in the heat recovery system in cirr paths.

SFP classes
The specific fan power defines the ratio of electrical fan power consumed to the air volume flow rate moved. The smaller the SFP value, the less electrical energy is required to move one cubic metre of air.

Air velocity class V according to DIN EN 13053:2012
Measured penetration velocity (m/s) in the clear opening of the housing cross-section relative to the filter unit, or to the fan unit if no filter is present. The greater the value (and correspondingly the V class in the classification, V1 - V9), the higher the velocity.
Classification, see below.

Power input Fan-motor unit P according to DIN EN 13053:2012
Reference values in classes P1 - P7, determined by the air volume flow rate and the static pressure increase of a free-running fan. The power measurement also includes losses from the frequency converter and the fan motor. The lower the class, the higher the efficiency of the fan-motor unit.
Classification, see below.

Energy efficiency H1 according to DIN EN 13053:2012
The energy efficiency is calculated from the temperature transfer rate and the electrical consumption generated by the pressure loss of the air volume flow rate and the motor power for the fans and pump. Classification of values in classes H1 - H6: the lower the class, the higher the efficiency.
Classification, see below.

VDI 2089
Basic planning standard for heating, dehumidification, indoor air-conditioning, sanitary, and electrical systems in indoor swimming pool buildings open to the public. Applies both to new constructions and to the modernisation of existing facilities.

VDI 6022
Basic planning standard for hygiene in ventilation and air conditioning systems and equipment, with the objective of at least having no negative effect on indoor air. Definition of requirements for the planning, installation and operation of HVAC systems, HVAC units, and their components.

VDI 3803 Sheet 3
Directive for air humidification in the supply, return and exhaust air sections of central HVAC systems. It gives an overview of various humidifier systems, and of criteria to take into consideration when selecting. Definition of requirements for the planning, installation, operation and maintenance of air humidifier systems.

Air velocity class V	
Class	Velocity (m/s)
V1	≤ 1.6
V2	> 1.6 - 1.8
V3	> 1.8 - 2.0
V4	> 2.0 - 2.2
V5	> 2.2 - 2.5
V6	> 2.5 - 2.8
V7	> 2.8 - 3.2
V8	> 3.2 - 3.6
V9	> 3.6

Efficiency parameter P	
Class	Energy efficiency η_e 1-1 [%]
P1	≤ $P_{m\,ref}$ * 0.85
P2	≤ $P_{m\,ref}$ * 0.90
P3	≤ $P_{m\,ref}$ * 0.95
P4	≤ $P_{m\,ref}$ * 1.00
P5	≤ $P_{m\,ref}$ * 1.06
P6	≤ $P_{m\,ref}$ * 1.12
P7	> $P_{m\,ref}$ * 1.12

$P_{m\,ref} = (\Delta P_{stat}/450)^{0.925} * (qv + 0.08)^{0.95}$
$P_{m\,ref}$ [kW] electrical power consumption
ΔP_{stat} [Pa] static pressure increase at fan
qv [m^3/s] air volume flow rate

Efficiency parameter H	
Class	Energy efficiency η_e 1-1 [%]
H1	≥ 71
H2	≥ 64
H3	≥ 55
H4	≥ 45
H5	≥ 36
H6	no requirement

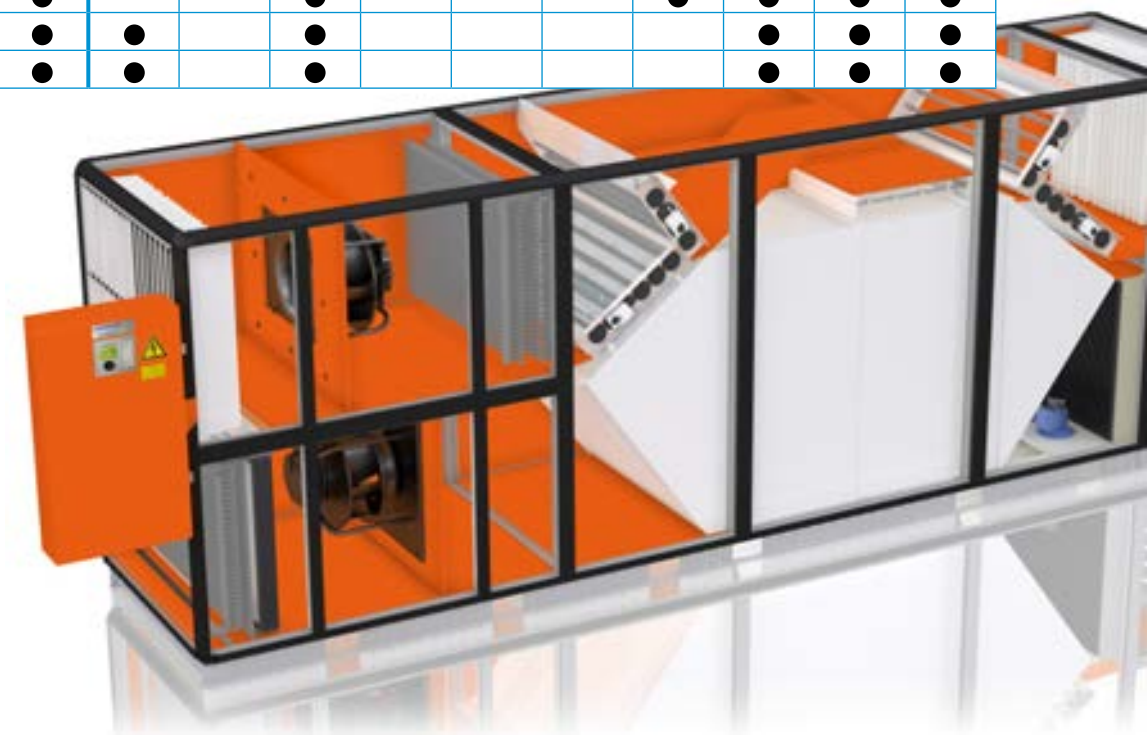
The values apply for balanced mass flow rates.

$\eta_e = \eta_t * (1-1 / \varepsilon)$
η_e [%] Energy efficiency
η_t [%] temperature transfer rate (dry)
ε [-] performance rating

Unit equipment and functions

The functions and unit types shown here are only examples of possible designs. Within the Menerga Air Group, we can build for you any combination you desire.

	Heat exchanger		Equipment and functions									
	Regenerative	Recuperative	Adiabatic	AdiabaticPro	Compressor refrigeration system	Sorption based dehumidification	Dehumidification	Heat pump	Heating	Cooling	Free cooling	Control + regulation
ThermoCond 19		●					●		●		●	●
ThermoCond 23		●					●		●		●	●
ThermoCond 29		●					●	●	●		●	●
ThermoCond 38		●					●		●		●	●
ThermoCond 39		●					●	●	●		●	●
Trisolair 52		●							●	●	●	●
Trisolair 59		●			●		●		●	●	●	●
Dosolair 54		●							●	●	●	●
Adsolair 56		●	●						●	●	●	●
Adsolair 58		●	●		●		●		●	●	●	●
Resolair 62	●								●	●	●	●
Resolair 64	●				●		●		●	●	●	●
Resolair 66	●								●	●	●	●
Resolair 68	●				●		●		●	●	●	●
Resolair 65	●								●	●	●	●
Sorpsolair 72		●	●			●	●		●	●	●	●
Sorpsolair 73		●	●			●	●		●	●	●	●
Adconair 76		●	●	●	●		●		●	●	●	●
Drysolair 11		●					●	●	●			●
Frecolair 14		●			●				●	●	●	●
Adcoolair 75		●	●		●					●	●	●
Hybritemp 97/98		●	●		●					●	●	●



Unit options

The following overview shows a selection of possible unit options for systems in the swimming pool hall and comfort air conditioning ranges. Further options, options for other system types and special requests are possible at any time. Please contact your sales office with any questions.

Included as standard	●
Optional	○
Optional at extra cost	□
Deselectable	◆

	Swimming pool hall air conditioning					Comfort air conditioning									
Unit series	19	23	29	38	39	52	54	56	58	59	62	64	66	68	76
Unit housing															
Gerätedeckel 50 mm / MB 50	□	□	□	●	●	□	●	●	●	□	□	●	□	●	●
Operating side, supply air, left or right	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Panel colour in RAL 7035 (light grey)	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Insulating material mineral wool or PUR foam for housing cover	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Housing cover with reinforced inside sheet panel	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Height-adjustable corner foot	□	□	□			□				□	□		□		
Unit base	□	□	□	●	●	□	●	●	●	□	□	●	□	●	●
Unit delivery in additional partial units [1]		□		□	□	□	□	□	□	□		□	□	□	□
Delivery of the heat recovery system separately on a pallet for customer installation onsite					□						□	□	□	□	
Recuperator section can be separated horizontally				□	□										□
Vertical separation	□	□	□	●	●	□	●	●	●	□	□	●	□	●	●
Additional inspection windows								□	□			□		□	
Switchboard															
Switch cabinet on the device	●	●	●	●	●	●	●	●	●		●	●		●	●
Control panel for wall mounting	□	□	□	□	□	□	□	□	□	●	□	□	●	□	□
connection flange															
Flexible duct connections	●	●	●	□	□	□	□	□	□	□	□	□	□	□	□
Air filter															
Filter categories and sizes optional	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Fan system															
Adaptation of the external pressing	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Handle protection in front of impeller and jet nozzle of the fans	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Air throttle system															
Recirculated air damper	●	●	●	●	●	□	□	□	□	□	□	□	□	□	□
Outside air bypass damper in the unit	□	□	□	□		●	●	●	●	●					●
Exhaust air bypass damper in the unit				□	□		□	□	□						●
Recirculated air dehumidification sector					□										
Servomotor with emergency return and position feedback system	□	□	□	□	□	□	□	□	□	□					□
Motor-actuated outside air/exhaust air dampers instead of dynamic dampers												□		●	
Supply air/return air - air flow path exchanged and motor-actuated outside air/exhaust air dampers												□			
Heat sector															
PHW	●	●	●	●	●	●	●	●	●	●	□	□	□	□	●
Adaptation of LPHW capacity	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
LPHW pump controls for electronic pump	●	●	●	●	●	●	●	●	●	●	□	□	□	□	●
LPHW pump controls with contactor and bi-relay	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
LPHW valve supplied loose for installation by the customer	●	●	●	□	□	□	□	□	□	□	□	□	□	□	□

1 all modules can be packed in separate transport units

Unit options

	Swimming pool hall air conditioning					Comfort air conditioning									
Unit series	19	23	29	38	39	52	54	56	58	59	62	64	66	68	76
Cooling sector															
PCW				□	□	□	□	□	□		□	□		□	□
Adaptation of PCW capacity				□	□	□	□	□	□		□	□		□	□
PCW pump controls for electronic pump				□	□	□	□	□	□		□	□		□	□
PCW pump controls with contactor and bi-relay				□	□	□	□	□	□		□	□		□	□
PCW valve supplied loose for installation by the customer				□	□	□	□	□	□		□	□		□	□
Refrigeration system															
Refrigeration system selectable/deselectable					◆										□
Cooling capacity control					●				●	●			●	●	
Adaptation of the refrigeration capacity									□						
Refrigerant sub-cooler/fresh water heater				□	●				□						
Heat extraction to LPHW with separate WWC changeover valve									□	□			□	□	
Reversible compressor refrigeration system									□	□			□	□	
Building heat pump switch for LPHW [2]			□												
Adiabatic evaporative cooling								●	●						□
AdiabaticPro															□
Installation of zinc sacrificial anode								□	□						
Flushing device for plate heat exchanger							□	□	□						
Control system															
vicomo ready	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Analogue modem for DDC	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Remote control panel	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Supply air temperature constant control programmed and available						●	●	●	●	●	●	●	●	●	●
Supply air duct thermometer probe supplied separate						□	□	□	□	□	□	□	□	□	□
LPHW return flow temperature limitation programmed and available				●	●	●	●	●	●	●	●	●	●	●	●
Contact sensor supplied separately				□	□	□	□	□	□	□	□	□	□	□	□
Supply air pressure control programmed and available						●	●	●	●	●	●	●	●	●	●
Supply air differential pressure socket (C-Bus) supplied separately						□	□	□	□	□	□	□	□	□	□
Return air pressure control programmed and available						●	●	●	●	●	●	●	●	●	●
Return air differential pressure socket (C-Bus) supplied separately						□	□	□	□	□	□	□	□	□	□
Water-guided temperature control programmed and available	●	●	●	●	●										
Immersion sensor L = 55 o. L = 100 (C-Bus) supplied loose	□	□	□	□	□										
Humidity shift in suspend mode	●	●	●	●	●										
Swimming break switch with separate return air combi-sensor IP54, supplied separately	□	□	□	□	□										
ModBus RTU interface for data transmission to BMS	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
BACnet interface for data transmission to BMS	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Interface for Ospa Blue Control	□	□	□	□	□										
Unlocking of WEB server via ethernet in DDC	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Recirculating air control system	●	●	●	●	●	□	□	□	□	□	□	□	□	□	□
CO_2-dependent recirculated air/outside air control system and/or flow rate control						□	□	□	□	□	□	□	□	□	□
Heat extraction to pool water															
Pool water condenser			□		□										
Pool water condenser pump controls			□		□										
Basin water pump			□		□										
Pool water temperature control programmed and available			●		●										
Immersion sensor L = 55 o. L = 100 (C-Bus) supplied loose			□		□										
Plastic cone flow meter supplied loose for installation by the customer			□		□										

2 not in combination with pool water condenser

REFERENCE PROJECTS

RESEARCH // SPECIALS

© ESO/José Francisco Salgado (josefrancisco.org)

Unit type: **customer specific**

ALMA RESEARCH PROJECT, CHILE

60 telescopes in the Atacama desert that collect data on the origins of the universe.

© polarfoundation.org

Unit type: **Resolair**

PRINCESS ELISABETH STATION

Belgian zero-emission research station with passive design. Location: Antarctica.

© ZEH

Unit type: **Adsolair**

ZERO ENERGY HOUSE, SEOUL

Flagship project on the subject of energy efficiency, regenerative energy storage media and sustainability.

MUSEUMS // GALLERIES

Unit type: **Resolair**

GERMAN MUSEUM SCHLEISSHEIM

The airfield displays an important aerospace collection on historic premises.

Unit type: **Adsolair**

URBIS, MANCHESTER

The glass building exhibits a journey of discovery through various world metropolises.

Unit type: **Adsolair**

TRAUTMANNSDORF PALACE, MERAN

Formerly the holiday residence of Empress Elisabeth of Austria, the palace now houses the South Tirolean State Museum for Tourism.

LOW-ENERGY BUILDINGS

Unit type: **Adsolair**

IBEROSTAR, PALMA DE MALLORCA

Modern headquarters with A-grade energy certification.

Unit type: **Resolair**

MENERGA SLOVENIA

Office building of Menerga Slovenia, winner of the Green Building Award 2008.

Unit type: **Resolair**

ETRIUM, COLOGNE

Passive office building with DGNB quality seal in gold.

REFERENCE PROJECTS

THEATRES // CULTURAL VENUES

Unit type: **Adsolair**

GERMAN OPERA, DUESSELDORF

A charming jewel of the 50s at the edge of the old town.

Unit type: **Resolair**

TUSCHINSKI THEATER, AMSTERDAM

Since 1921, the high floral carpets of the luxurious film theatre have enticed visitors into a colourful fairytale world.

Unit type: **Dosolair**

STUTTGART STATE THEATRE

The air conditioning for the choir practice hall required an absolutely "silent" variant.

HISTORICAL BUILDINGS

Unit type: **Resolair, Hybritemp**

HERZOGIN ANNA AMALIA LIBRARY

World-famous building with a stock of over 110,000 books.

Unit type: **Adsolair**

SCHLOSS BAD BERLEBURG

Residence of the princely Sayn-Wittgenstein-Berleburg family.

Unit type: **ThermoCond**

HILTON SA TORRE, MALLORCA

5-star luxury hotel from the 14th century.

SPORTING VENUES // MULTI-FUNCTIONAL HALLS

Unit type: **Resolair**

GROSS-OSTHEIM SPORTS HALL

Winner of the IOC/IAKS AWARD 2003 in silver.

Unit type: **Adsolair, Hybritemp**

OSIJEK MULTI-FUNCTIONAL HALL

One of the venues for the 2009 Handball World Championships, the largest athletics hall in Croatia.

© City of Rijeka

Unit type: **ThermoCond, AquaCond**

KANTRIDA RIJEKA, CROATIA

Olympic swimming stadium with a completely opening roof structure.

REFERENCE PROJECTS

PUBLIC SWIMMING POOL HALLS

Unit Type: **ThermoCond, AquaCond, Dosolair, Adsolair, Resolair**

THERME LASKO, SLOVENIA

Wellness park with 2,200 m² water area.

© Bädergesellschaft Lünen mbH

Unit type: **ThermoCond**

LIPPE POOL IN LÜNEN

First public passive building swimming pool hall in Europe.

Unit type: **ThermoCond, Resolair**

NATIONAL ZWEMCENTRUM DE TONGELREEP, NETHERLANDS

The largest swimming centre in Europe serves amongst other things for hosting national competitions.

PRIVATE // HOTEL POOLS

© T. Philippi

Unit type: **ThermoCond**

PRIVATE SWIMMING POOL

Glorious wellness accommodation in a luxurious atmosphere.

© T. Philippi

Unit type: **ThermoCond**

PRIVATE SWIMMING POOL

The private swimming pool seems to float over the roofs of the city.

Unit type: **ThermoCond**

5-STAR VILLA AM RUHRUFER HOTEL

Spa area of one of the smallest and most exclusive 5-star hotels in North Rhine-Westphalia, Germany.

HOTELS // RESTAURANTS

Unit type: **Sorpsolair**

MUNICH AIRPORT

Freight staff canteen of the second largest aerospace hub in Germany.

Unit type: **Trisolair, ThermoCond**

HOTEL DOLLENBERG

5-star superior hotel at 650 metres elevation, at Dollenberg in the Black Forest.

Unit type: **Trisolair, Dosolair, ThermoCond**

WEISSENHÄUSER BEACH

Holiday and leisure park with adventure playground on the Baltic Sea.

REFERENCE PROJECTS

SCHOOLS // UNIVERSITIES

Unit type: **Resolair**

ANGELASCHULE OSNABRÜCK
Historical school complex with listed facade.

© Schindelbeck

Unit type: **Resolair**

NECKARGMÜND SCHOOL CENTRE
The largest passive school building in Germany has 206 rooms, offering space for 1,250 high school students.

Unit type: **Adsolair, Resolair, Trisolair, Hybritemp**

PASSAU UNIVERSITY
Over 100 Menerga systems create good climate at the youngest University in Bavaria.

CLINICS // LABORATORIES

© Hamburg-Eppendorf University Hospital

Unit type: **Adsolair**

HAMBURG-EPPENDORF HOSPITAL Good climate in lecture theatre, seminar and work rooms.

© Freiburg University Hospital

Unit type: **Sorpsolair**

FREIBURG UNIVERSITY HOSPITAL
Sorption-based air conditioning of the outpatient and emergency room areas.

Unit type: **Dosolair, Adsolair**

TLLV BAD LANGENSALZA
Thuringian State Office for Food Safety and Consumer Protection.

MALLS // SHOPPING CENTRES

Unit type: **Adsolair, Resolair**

MERCATOR PESNICA, SLOVENIA
Shopping centre 5,000m² in size, winner of the Green Building Award 2011.

Unit type: **Resolair**

AUDI TERMINAL IN LUDWIGSBURG
Generously dimensioned vehicle centre of Hahn Automobile.

© Unger-Steel-Group

Unit type: **Sorpsolair**

TOYOTA FREY, SALZBURG
The "greenest" car dealer in the world was recently classified as "excellent" under BREEAM.

REFERENCE PROJECTS

OFFICE BUILDING // ADMINISTRATION

© Otto Group

Unit type: **Adsolair, Resolair**

OTTO GROUP, HAMBURG

This trading and services group is the second largest online trader in the world.

Unit type: **Adsolair**

KÄRCHER CENTER, WINNENDEN

Sales centre and office building of one of the largest cleaning equipment manufacturers in the world.

© USM

Unit type: **Adsolair**

USM, MÜNSINGEN

The corporate office of the Swiss furniture manufacturer has been setting trends for 45 years.

INDUSTRY // PRODUCTION FACILITIES

Unit type: **Adsolair**

MAPAL, AALEN

Headquarters of the manufacturer for precision tools.

Unit type: **Adsolair**

STIHL, WAIBLINGEN

This family company is active in over 160 countries, and is famous for power saws.

Unit type: **Resolair**

TECHNO, BUBSHEIM

Specialist in the sale of turned parts, offices in Bubsheim near Stuttgart.

DATA CENTRES // SERVER ROOMS

Unit type: **Adcoolair**

BANCO SANTANDER, SPAIN

Data processing centre with 16 MW total cooling capacity.

Unit type: **Hybritemp**

FREIBURG DISTRICT OFFICE

Air conditioning for the data processing centre, refrigeration capacity 59.1 kW.

Unit type: **Adcoolair**

COMMUNICODE ESSEN

Communicode specialises in hosting webshops, e.g. of Deichmann.

THE MENERGA UNIT CODE

e.g. Resolair 64 12 01

Resolair	64	12	01
Name	Series	Installation size	Design

Series	Name	Function	Equipment	Design
11	Drysolair	Air drying	Heat pump, recuperator	
14	Frecolair	Ventilation/cooling	Free cooling, compressor refrigeration system	
19	ThermoCond	Indoor swimming pool air conditioning	Cross-counterflow heat exchanger	
23	ThermoCond		Cross-counterflow-cross heat exchanger	01 Indoor installation 91 Outdoor installation
29	ThermoCond		Cross-counterflow heat exchanger, heat pump	
38	ThermoCond		Counterflow plate heat exchanger, volume flow reduction as required	
39	ThermoCond		Asymmetrical high-capacity heat exchanger, output-controlled heat pump, fresh water heater, volume flow reduction as required	
44	AquaCond	Heat recovery from waste water	Heat pump, counterflow coaxial recuperator, heat pump, automatic heat exchanger cleaning	0 WWHE: Cu FWHE: Cu 1 WWHE: Cu FWHE: Cu tin-plated 2 WWHE: Cu-Ni FWHE: Cu 3 WWHE: Cu-Ni FWHE: Cu tin-plated * WWHE=Waste Water Heat Exchanger * FWHE=Fresh Water Heat Exchanger
52	Trisolair	Comfort air conditioning, recuperative heat recovery	Cross-counterflow-cross heat exchanger, air volume flow rate up to 5,000 m^3/h	01 Indoor installation 91 Outdoor installation
54	Dosolair		Double plate heat exchanger, max. flow rates up to 52,200 m^3/h	
56	Adsolair		Double plate heat exchanger, adiabatic evaporative cooling, Optimum flow rates up to 52,200 m^3/h	
58	Adsolair		Double plate heat exchanger, adiabatic evaporative cooling, compressor refrigeration system, max flow rates up to 52,800 m^3/h	
59	Trisolair		Cross-counterflow-cross heat exchanger, compressor refrigeration system, air volume flow rate up to 4,800 m^3/h	
62	Resolair	Comfort and process air conditioning, regenerative heat recovery	Heat accumulator module, max. flow rates up to 4,300 m^3/h	
64	Resolair		Heat accumulator module, max. flow rates up to 51,000 m^3/h	
65	Resolair		Heat accumulator module, air flow rates up to 40,000 m^3/h	
66	Resolair		Heat accumulator module, compressor refrigeration system, max. flow rates up to 4,300 m^3/h	
68	Resolair		Heat accumulator module, compressor refrigeration system, max. flow rates up to 51,000 m^3/h	
72	Sorpsolair	Sorption-based air conditioning	Double plate heat exchanger, adiabatic evaporative cooling, sorptive dehumidification, max. flow rates up to 14,900 m^3/h	
73	Sorpsolair		Double plate heat exchanger, adiabatic evaporative cooling, sorptive dehumidification, brine accumulator, max. flow rates up to 14,900 m^3/h	
75	Adcoolair	Recirculating air cooling	Free cooling, adiabatic evaporative cooling, compressor refrigeration system	
76	Adconair	Comfort air conditioning, recuperative heat recovery	Counterflow-plate heat exchanger, max. air volume flow up to 35,600 m^3/h, with adiabatic evaporative cooling, AdiabaticPro or refrigeration system	
97	Hybritemp	Cold water set	Indirect free cooling, adiabatic evaporative cooling, efficiency-optimised compressor refrigeration system	
98	Hybritemp		Free cooling, adiabatic evaporative cooling, efficiency-optimised compressor refrigeration system	

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