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Sorpsolair

Sorption-supported indoor climate control for ventilation-specific installations

Refrigeration by indirect “adiabatic” evaporation andsorption-supported dehumidification

Type: 72/73 .. .. *Sorpsolair*

Menerga-Innovation – Sunlight-powered air conditioning

Shown: Type 72 13 01

Sorpsolair by Menerga – Climate control through regenerative energy sources

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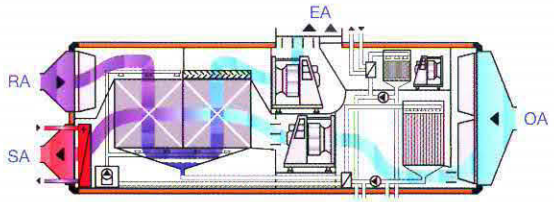
Sorption-supported climate control for ventilation-specific installations, refrigeration by indirect "adiabatic" evaporation and sorption-supported dehumidification

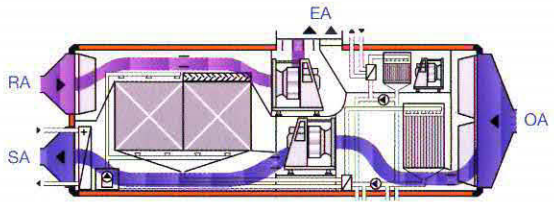
Series type: 72/73 .. .. *Sorpsolair*

Menerga cools with sunlight and revolutionizes cooling/ heating technology with sorption-supported climate control:
Prior to cooling, any humidity is removed by sorption from the outside air. With decreasing humidity, the human body will become less affected by prevailing temperatures. As a bonus, step-by-step climate control enables regenerative energy sources to be freed up.
With our Sorpsolair unit, Menerga has linked the natural process of sorption to equally natural "adiabatic" cooling by evaporation, resulting in an operationally safe and economic climate control system for year-round heating, refrigeration and dehumidification.
Cooling with sunlight does more than exercise climate control at an optimal cost/benefit ratio. Sorption-supported refrigeration also contributes to the climate at large: it protects the ozone-layer and indirectly helps to minimize the green house effect as it cuts down on carbon dioxide emissions. All in all: Your indoor comfort will not harm the climate on the outside.

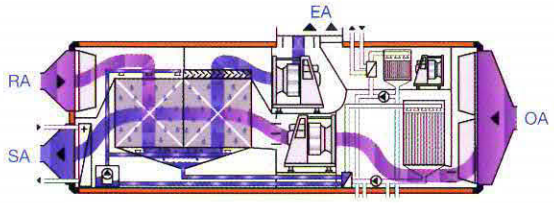
Operating environments



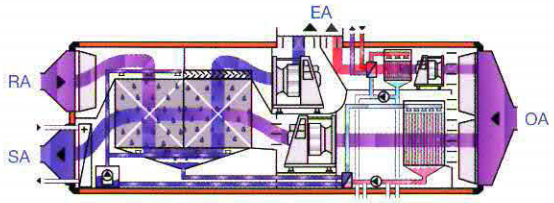
1 **Operations during wintertime**
Supply air during exhaust air/OA operations, including heat recovery from return air.



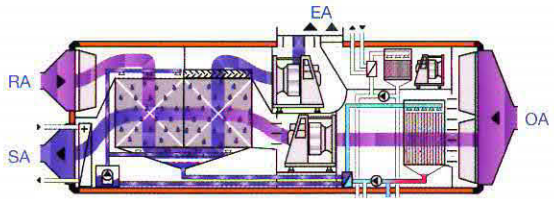
2 **Free cooling**
During summertime or with excess temperatures present, air volume is increased by activation of the bypass circuit. Bingo, free refrigeration without heat recovery.



3 **Operations during summertime**
Ventilation through "adiabatic" cooling by evaporation for summertime operations.



4 **Summertime operations at high levels of outside humidity**
When outside air reaches a state of mugginess, it will be dehumidified in the adsorber. Following dehumidification, SA will be cooled down to the chosen room temperature by means of "adiabatic" evaporation



5 **Summertime operations with brine regeneration**
In order to regenerate the saline solution that had been diluted because of humidity absorbed from outside air, a heated saline solution is circulated in the adsorber. The water vapors eliminated from the saline solution are absorbed by a small, separate flow of outside air and expelled together with the exhaust airflow. The reconstituted brine is now again able to absorb humidity from outside air.

Sorpsolair by Menerga – Climate control through regenerative energy sources

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Indoor-comfort climate control for ventilation-specific installations, refrigeration through indirect "adiabatic" cooling by evaporation and sorption-supported dehumidification

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Description and functionality

Purpose

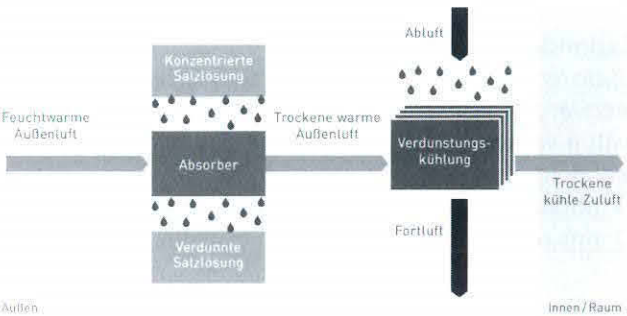
To maintain comfortable climatic conditions indoors, compliance with the parameters for outside air circulation as set forth in DIN 1946 is mandatory. It is of particular importance for environments where great numbers of people will congregate: e.g., meeting halls, theaters, cinemas, conference rooms, cafeterias, sports facilities like gyms and roof-covered arenas, fitness centers, indoor tennis courts, premises exposed to heavy foot traffic, like department stores, museums, restaurants, ticket counters, bowling alleys and others. In addition, many industrial sites require air treatment to comply with clean air standards.

The customary procedure of "airing out", i.e., the exchange of indoor air, pregnant with pollutants and harmful substances, for outside air incurs high energy costs because of additional heating needs. In the summer months, the hot air must be refrigerated to ensure comfortable conditions indoors.

Sorpsolair, the thermally powered and sorption-supported indoor climate system, solves the aforementioned problem in an economically advantageous manner:

- in wintertime through heat recovery from return air for the pre-heating of supply air.
- in summertime through refrigeration of OA/SA by means of "adiabatic" evaporation
- Dehumidification of outside air through liquid sorbents
- thermally activated regeneration (by use of district heating networks, process heat or solar) in a low temperature range of 55 – 70°C

Owing to its double-plated heat transfer feature with two-stage heat recovery and a temperature efficiency level of over 85% in "adiabatic" cooling duty, the Sorpsolair system affords outstanding savings during operation.



How sorption-supported, indoor climate control works

Functionality

Next to the highly efficient double recovery climate system, the initial sorption-supported dehumidification process is the heart of Sorpsolair. A liquid sorption element achieves dehumidification of the outside air. The exceedingly high thermal efficiency level (COP) of up to 1.5 is attained by the double-plated heat transfer unit, through which is forced, in cross flow fashion, the RA/EA (return air/exhaust air) on one side and OA/SA (outside air/supply air) on the other. Regeneration in low temperature ranges (55-70°C) can be achieved by either connecting to a district heating network or by utilization of pre-existing process heat (e.g. gained from industrial production) or, on a time-delay basis, by utilization of solar heat.

Operations during wintertime

In winter, valuable heat (at very low temperatures, also part of latent heat) is drawn away from return air by the double-plated heat transfer unit and transferred to outside air arriving from the outside. The return air, now cooled, is blown away as exhaust air, while the pre-heated outside air is brought up to its chosen temperature in the pump-operated hot water/air heater (PWW) and introduced into the premises as supply air. On a case-by-case basis, a portion of surrounding air may be added to raise the overall air volume (enhancements). When operating with surrounding air, the unit can also be used as space heater.

Especially In the presence of large internal heat-generating sources, there is a risk of overheating while supply air is in a transition stage. The Sorpsolair system obviates the problem with a coordinated heat recovery process. A partial flow of both the RA/EA and OA/SA is steered into the bypass [circuit] above and/or below, past the double-plated heat transfer unit.

Operations during summertime

In season, outside air is refrigerated via "adiabatic" cooling through the evaporation installation and introduced into the premises as supply air.

Should the outside air's temperature be below that of the return air, the Sorpsolair indoor climate control system can be used for "free refrigeration".

For this to occur, the volumes of exhaust airflow and supply airflow are steered in the bypass [circuit] unit above and below, past the double-plated heat transfer unit.

Sorption-supported indoor climate control

In this instance, heat serves as a power source for indoor climate control: Heat causes cooling.

Sorption-supported indoor climate control takes place in two steps: Dehumidification and air conditioning.

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For dehumidification purposes, warm outside air is funneled through a water-absorbent element, the so-called sorbent, a highly concentrated saline solution (brine). The dehumidified outside air then flows through a combined heat transfer unit (effecting indirect cooling by evaporation) where it will be refrigerated. The diluted brine is restored by heat for re-use and is ready for the next dehumidification cycle. As heat sources figure solar installations, district heating networks or waste heat from cogeneration plants or industrial production. Dehumidification and regeneration of the brine proceeds in separate circuits (at type 73) at successive times. Hence, the heat can be stored in a liquid medium nearly without time constraints or loss, and may be used as backup in times of spotty heat availability, e.g. in the event of insufficient sunshine when not enough solar heat can be generated. Moreover, the combination of sorption-supported indoor climate control in Sorpsolair makes possible cooling without a mechanical refrigeration aggregate and without peak loads in power consumption during summer, reaching a thermal efficiency level (COP) of up to 1.5.

"Adiabatic" air cooling by evaporation

The cooling of air – next to mechanical air conditioning– is also possible by water evaporation ("adiabatic" evaporation cooling). In premium air conditioning systems, refrigeration of supply air by humidification is not an option, though, since the resultant humidity level would not meet criteria of comfort.
The Menerga adiabatics solution offers an ingenious process by taking advantage of the convenience "adiabatic" cooling by evaporation has to offer (cost-efficient and environmentally compatible air conditioning) without having to contend with the drawbacks the humidification of supply air imposes. A crucial component of the "adiabatic" solution is the double-plated heat transfer unit, which cools return air "adiabatically". On its heels, the exhaust air, now moist-cold, will cool the outside air without imparting its humidity content. The adiabatics solution's high degree of efficiency derives from the fact that both processes ("adiabatic" cooling by evaporation of the return air + cooling of outside air) take place simultaneously in the double-plated heat transfer unit. With direct injection of the return air in the double-plated heat exchanger, the water there will evaporate while cooling down the heat exchanger and return air at the same time. A pump suctions the water from the catch basin and injects it in the double-plated heat transfer unit at the return air's input point. Injection proceeds in the direction of airflow, while at the middle of the double-plated transfer unit, injection proceeds along or counter to the airflow's direction. Because of the multiple nozzle arrangement, maximum humidification and – depending on the return air's state – a high degree of cooling of the exhaust air is attained. Due to the high temperature efficiency of the double-plated heat transfer unit, substantial cooling of OA/SA of up to 12 K is attained. A water filter prevents soiling or plugging up of the nozzles; regular change of water makes the need for special water treatment unnecessary.

Air filtering

The air is filtered during all operational steps. As the filter's soiling increases, the rpm of the fan is adjusted so as to keep in balance a constant volume of return air and supply air.

Controls

The integrated, freely programmable control unit offers extensive flexibility in the system's use. Nominal and instantaneous values can be set on, and/or read off, the display screen. The individual processes (heat/refrigerated air recovery, fixed heat recovery, free "adiabatic" refrigeration) are set in conformity with nominal/instantaneous value comparisons (and/or any other standard) and in accordance with other units of metering.
Air processing by the fans can be quickly adjusted with re-setting the nominal value on the display screen (setting at "m^3h").
The integrated web server allows remote control and maintenance via a network or phone hookup. By plotting various metering data, trends can be depicted in graphical form and temporary disturbances easily pinpointed. As a result, service and maintenance work is simplified and of greater accuracy.

Expanded functionality

Upon request Sorpsolair, as a system facilitating double recovery in indoor climate control, can be equipped with a variety of accessories found in air conditioning technology:

- ❍ addition of cold water-air cooler
- ❍ rinsing device for plated heat transfer unit

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Tender – Description of system

The system's structure

The Menerga indoor climate control system is compactly built and contains all components indispensable for effective cooling and heating, including all respective control and operating appliances. Prior to shipment, the system will have passed a test run and undergone exhaustive performance checks on the test bench. During testing, all its output capacities were thoroughly checked in order to ensure economical operation of the system. For convenience of transport, the system type 72/73 is broken up into several components. Reassembly on site requires only a few hours.

Apparatus housing

Fully enclosed frame construction consisting of machined and galvanized stainless steel components with full interior insulation. Sturdy mounting pedestal (1200mm height) consists of galvanized, machined stainless steel; cover (22 mm height) of galvanized, comprehensively plastics-coated (ca.50µ) sheet metal with protective foil; 1A Color oriented to RAL 2004; double-shelled (sandwich-type) finish with interior insulation; free of thermal leakage; equipped on the inside with a highly durable double-lip sealer; and thermally leakage-free quick-release latches.

Filter doors in all filter areas, double-pane viewing window including interior lighting for the monitoring of fans. 5 air conduit connections with screw-attached adapter base. The housing consists of three units to be assembled. Mechanical solidity of the housing meets classification D1 (M), housing's thermal leakage classification L3(M), heat transfer classification T4, heat transfer factor classification TB4. Classification pursuant to DIN EN 1886, verified by TüVNORD.

Air flap system

7 air control flaps. Two each for exhaust air and outside air and one each for exhaust air and outside air to bypass the plated heat transfer unit. Outside air and one adsorber bypass flap, in positive-locking finish with counter-directional, rigidly hollow lamellas, featuring embedded sealer and frictionless suspended gearwheels of ABS plastics material. All air flaps equipped with separate actuators for precision control of air volume. The actuators are equipped with a feedback potentiometer of the drive and a storage chip for C-Bus technology. Intermediate settings of the airflow control can be individually executed; and with the system closed, via DDC.

Fan unit for OA/EA (outside air, exhaust air) and regenerated air – SolVent system

High performance, pulverized material-coated fan with unilateral suction made feasible by backward-curved blades, and overhung on the motor shaft.
High-performance AC asynchronous motor with integrated frequency converter from 1.1 kW to 7.5 kW nominal output, series model B3, safety class IP 55, insulation class F; upwards of 7.5 kW nominal output, high-performance AC asynchronous motor series model B3, safety class IP 55, insulation class F, compatible with separate frequency converter. Fan and motor includes intake nozzle mounted on a rigid base, with vibration-cushioned installation inside the unit. Following assembly, motor and fan are statically and dynamically balanced pursuant to DIN OSO 1940 part 1 G 2.5. Unit is monitored by a vibration sensor and controller with advance alarm feature and safety shutoff feature.

Frequency converter

Three frequency converters for motors are installed inside the system to control outside air, exhaust air and regenerated air. Activation of frequency converter by controller occurs via analog signal, with separate motors for outside air, exhaust air and regenerated air. Frequency converter is optimally tuned and referenced to fan motors and their various levels of efficiency.

Mains power surge and transient current protection pursuant to VDE 0160.
Mains protective throttle in intermediate circuit for suppression of harmonics according to VDE 0160, control connections separated by galvanizing process from output component pursuant to VDE 0160; interference suppressor as per EN standards

- Interference emission as per EN 55011 class B, group 1m
- Interference sensitivity as per EN 50082-2
  Serial interface RS 485 (8600 Baud)

Volume flow device

For load-dependent volume flow control, the unit has a pressure gauge and static pressure release duct in the fan's suction space. Pressure build-up takes place via a pressure transmitter integrated in the device, determination of volume flow via effective pressure metering, and evaluation in the controller. The entire unit has been pre-programmed by way of DDC standards.

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Safety monitoring
Continuous monitoring through vibration sensor for out-of-balance instances in the fan motor, monitoring of motor current, and fan rpms in addition to the monitoring of maximum pressure on the fan's pressure side. Safety chain, consisting of a vibration sensor and Menerga controller. Device will shut down when becoming unbalanced. Monitoring of motor rpm and motor current, upper limit of permissible rpm and maximum flow intake.

Differential pressure transmitter
Fans for outside air, exhaust air, and regenerated air, equalizer smoothing out filter pressure differentials between return air and outside air. Transmission and evaluation of the analog signal in the Menerga controller. Parallel pressure release ducts on device with connecting option for a U-tubular pressure gauge to test pressure differentials during commissioning and maintenance. Pressure release ducts for determination of extreme pressure loss near channel connections and pressure differentials via WRG.

Air filter
Pocket filter as high performance filter for return air pursuant to quality level F5, for outside air, pursuant to quality level F7.
Filter plane has self-sealing rubber lips, fully protected from extraneous air. Monitoring of pressure losses in filter by pressure transmitter. Filter can be ergonomically cremated.

Filter monitoring
2 electronic filter monitors with display of instantaneous pressure loss in Pa, shown on controller's readout.

Sorption-supported dehumidification system
Sorption-induced dehumidification by diluted saline solution. Dehumidification and regeneration of the brine in separate circuits (at type 73), sequentially timed.
Attainment of a temperature efficiency level in "adiabatic" cooling operations in excess of 85% COPthermal, up to 1.5, is feasible.
Sorption-supported dehumidification system, comprising one PP cross-flow adsorber, PP cross-flow desorber, 2 pumps for brine transport, one exhaust air fan, sorption ingredients, sorption ingredient storage (with type 73) and a heater/refrigerator for sorption ingredients. Sorption will be automatically released from humidity control. Control of desorption takes place automatically in dependence of the brine solution's saturation point. Metering and monitoring of brine concentrate.

Adsorber for dehumidification
Cross-flow adsorber of polypropylene, stands up to acid and lye, corrosion-free and wear-and-tear resistant, fire classification B1 pursuant to DIN 4102. Fully effective along the device's entire depth, sustains smallest possible pressure losses. Adsorber consists of distributor for PP sorption ingredients, PP filling material package for uniform distribution of sorption ingredients in airflow and enlargement of internal surface. PP collection basin for sorption ingredient with viewing window, continuous monitoring of filling level of sorption ingredient together with swimmer switch for monitoring maximum filling level. Controllable adsorber bypass for reduction of air-adjacent pressure levels in partial load mode and/or without dehumidification. With standardized use of integrated brine, cooling dehumidification output of > 4g/kg is feasible.
With application of external brine cooling for choice, utilization of a natural source like well water, geothermal probe or evaporative cooling tower with temperature levels of 20°C, dehumidification output of > 8g/kg is feasible.

Adsorber pump
For transport of the brine, a single-stage, magnet-coupled, plastics centrifugal pump of diffusion-proof finish is used. Containment shell separates fluid pumped from atmosphere. The design, without floating ring seal, ensures proper operation without leakage of the transported medium. The adsorber pump is put to work as needed and whenever activated by adsorber pump controls.

Desorber for regeneration of sorption ingredients
Cross-flow desorber of polypropylene, stands up to acid and lye, corrosion-free and wear-and-tear resistant, fire classification B1 pursuant to DIN 4102. Fully effective along the device's entire depth, sustains smallest possible pressure losses. Desorber consists of PP sorption ingredients distributor, PP filling material package for uniform distribution of sorption ingredients in airflow and enlargement of internal surface. PP collection basin for sorption ingredient with viewing window, continuous monitoring of filling level of sorption ingredients and swimmer switch for monitoring maximum filling level. Regeneration of saturated saline solution through utilization of external heat as power agent. Heated saline solution is turned over in desorber. Process of regeneration within temperature range of 55-70°C, (with Type 73), independent sequential timing.

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Desorber pump
For transport of the brine, single-stage, magnet-coupled plastics centrifugal pump in diffusion-proof finish. Containment shell separates fluid pumped from atmosphere. The design, without floating ring seal ensures operation without leakage of the transported medium. The desorber pump is put to work when activated by the desorber pump controls.

Fan for process of regeneration
Fan for regenerated air is started with activation of brine's heating. Vapors released in the desorber through heating of the brine are forwarded to exhaust air by means of the fan for regenerated air.

Sorption ingredients
Diluted saline solution of 40% lithium chloride, low dynamic viscosity and long-term stability of the sorption ingredient, storage in plastics tank possible.

Type 72:
Brine storage in 1 unit-integrated PE-storage containers of high-molecular and low pressure polyethelene, following "III Polyethylene" recommendation by BGA, with equalizer vessel, filling pump adsorber, sorption ingredient heater/cooler, and dosing valves.

or

Type 73:
Brine storage in 2 external PE storage containers of high-molecular and low pressure polyethelene following "III Polyethylene" recommendation by BGA. The containers should be placed near the unit. With equalizer vessel, filling pump adsorber, sorption ingredient heater/cooler, and dosing valves for complete processing.

Sorption ingredient heater/cooler
as plate heat transfer instruments with plates and seals in screw-assembly finish. Heat transfer plates of titanium, incl. 3-way mixer valve with drive and freezer protection thermostat.

Twin recuperator unit
2 cross-flow plate heat transfer instruments of polypropelene in series, fully effective along the entire unit's depth. Sustaining smallest possible pressure loss and optimum efficiency levels across the entire range of outside temperatures. Stand up to acid and lye, corrosion-free and wear-and-tear resistant, fire classification B1 pursuant to DIN 4102.
1 air deflector and condensation catch basin of polypropelene with drainage line for condensation and hydaulic seal.

Heat transfer bypass
Two-way heat transfer bypass through arrangement of bypass flaps on the EA and OA sides. Prevents pressure loss by twin recuperator unit during bypass operations. Includes control and metering functions during summertime.
When in "free" mode (temperature settable on DDC), heat recovery in bypass mode is redundant. Simultaneous increase of air output during summer is possible.

"Adiabatic" cooling system
Enables indirect cooling of outside air by humidification and consequent cooling of the return air, along the entire air route through the recuperative heat transmitter. No humidity transfer from return air to supply air due to hermetic separation of air routes.
Cooling system comprises vapor distributor nozzles, water level regulator, fresh and return water valve, hydraulic pump with drainage facility and dry run protection, hydraulic precision filter. Consumption-dependent, automatic water replacement through complete emptying-out of basin; hydraulic meter for civic water supply, with contact output for diagnosis of water volume in controller. Commencement of de-sludging schedule predicated on fresh water quality, refrigeration system completely incorporated and wired inside the unit, fully compatible with controller. Integrated process cooler for sorptive dehumidification is part of the hydraulic circuit of "adiabatic" evaporative refrigeration.

Temperature as per WRG System
Targeted discharge temperature under the WRG system, without mechanical cooling /PKW 22°C (at RA 26°C; 55% r. h. and OA 32°C; maximum 40% and even mass flows) r. F.

Free cooling
Integrated circuit for reduction of heat recovery during rising temperatures, affecting plated heat transmitter bypass for EA/OA.

Cold air recovery
Integrated variable temperature controls for switching to cold air recovery.

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Water quality
Cooling medium: untreated civic water in the categories SOFT and MEDIUM without additional water treatment. In category HARD, a water de-hardening agent and additional cut-down to 5° dH should be envisaged. Alternative/supplementary use of mechanically cleansed rainwater.

Air quality standard module
Integrated in hx-sensor. Module for calculation of air quality standard as set forth in the Mollier hx diagram for humid air.
Registration of sensor data from combination sensor for temperature and humidity. Determination of air quality data re absolute humidity (g/kg), enthalpy (kJ/kg), dew point temperature (°C), wet bulb temperature (°C), saturation pressure (Pa), water vapor pressure (Pa) and air density (kg/m³) in relation to geodesic height.

The release of "adiabatic" cooling follows upon comparison of wet bulb temperature of return air with outside air temperature.

Heating sector
1 PWW- pullout air heater, made of copper pipes with affixed aluminum lamellas incl. 3-way mixer valve with drive and frost protection thermostat. Valve and connecting pipes are delivered individually for onsite assembly.

Air direction
Standard finish for return air and supply air left side.
PWW-Pump activation
PWW-mixer pump with output component and display in DDC

Switching and control facility
Readily wired switching cabinet with wiring extending to all control, switching and drive components mounted inside the unit. Cabinet is attached to unit, foldable for transport, terminals for mains power hookup, motor and controls leads, override/repair switch for shutoff of power, fuses and all essential components for motor activation, like trip guards, circuit breakers and marshalling panel for registration of external metering and control signals.

All components are in compliance with
EN 60730-1: Automatic, EN 61000-6-2,
EN 61000-6-4.

Electronic switching facility
Freely programmable control/switching facility

Hardware
- Service and display unit with input and function key display
- LCD display for instantaneous/nominal value, flap positions, operating hours, and
- Text messages, plus multi-color LED's for operational interference alarms.

Freely programmable micro-controller
with watchdog performance monitoring,
real time clock with automatic
- summer / winter switchover, digital and analog

input and output ports, RS 485 intersect for programming, networking and monitoring. Program and clock channel fully secured in the event of power failure. Sensors for measurement of outside air, supply air and return air as well as humidity measuring of supply air and return air will be installed and fully wired inside the unit.

Software
Control and switching functions
- SA/RA temperature cascade control:
  Return air and supply air sensor inside unit.
  Upper and lower limits for supply air temperature
- SA/RA humidity cascade control through sorptive dehumidification. Upper limit range for supply air monitored.
- Separate volume flow controls for SA/RA and regenerated air fan.

Nominal values can be set as standard value. Continual activation of PWW valve.
- Interference reports: Divided into A-alarm and B-alarm, displayed by LED's and/or as text message on panel
  For remote messaging, consolidated interference report is kept floated on marshalling panel.
- Manual operations mode: Three levels, two of them accessible via code no. only. Operating states can be positively set for test run, commissioning, maintenenace and emergency operations.

Summertime operations during severe outside humidity levels
When OA reaches mugginess level, it will be dehumidified in the adsorber. Cooling of outside air is effected by subsequent "adiabatic" evaporative refrigeration.

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Summertime operations with brine generation
In order to regenerate the saline solution, diluted due to absorption of humidity from the outside air, the heated saline solution is turned over in the desorber. The water vapors released from the saline solution are picked up by a small, separate outside airflow and carried off with the exhaust airflow. The regenerated saline solution is now again able to draw away humidity from the outside air.

Free air conditioning at night
"Free cooling at night" as periodic operation, with its efficacy contingent on temperatures present at the unit's return air and outside air sensors.

Volume flow regulation
Continuous metering of effective pressure differential via pressure transmitter, calculation of volume flow in dependence of temperature, effective pressure differential and base line of fan's intake nozzle. Standardization and display of volume flow at flow 20°C.

CE-designation and safety test of the ventilation device
CE-designation and compliance statement as set forth in the effective EG machinery directive.

Test confirmation
Test run at factory: verification of unit's functionality Technical design of unit and wiring connection with switching cabinet to be within test range. Visual and insulation check of all parts. Test run and setting of all safety-specific parameters. Check of software operability and all control and metering components. Calibration and balancing protocol as proof of balance quality level G=2.5 pursuant to DIN 1940, part 1.
Confirmation of factory test run prior to shipment.

TÜV (Regulatory Agency for Technical Standards) CERT ZERTIFIKAT pursuant to DIN EN ISO 9001: 2000
Devices are assembled in compliance with quality manufacturing standards
DIN EN ISO 9001 : 2000

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Indoor-comfort climate control for ventilation-specific installations, refrigeration through indirect "adiabatic" cooling by evaporation and sorption-supported dehumidification

Type: 72/73 . . . . *Sorpsolair*

Technical and performance data / *accessories*

Note:
Dimensioning data with assembly height of above _____ m NN and air pressure of: _____ mbar.
Full air capacity must be documented for all listed external [Hertzian] pressures during all stages of operation, up to the tendered, ultimate filter pressure. (Proof mandatory for design data relative to assembly height and air pressure).

Technical data and performance:

Nominal air output SA/RA	m^3/h.....
Air output OA/RA incl. regenerated air	m^3/h.....
External pressure loss at design point:	.....
In entire SA-/OA-channel system	Pa.....
In entire RA-/EA-channel system	Pa.....
$COP_{thermally}$	.....
Total temperature efficiency level	%.....
WRG output - Winter	
tOA= -16°C; tRA= 22°C, 40% RH	kW .....
Supply air pursuant to WRG	°C .....
PWW-retroheater at htg. VL	°C .....
Air's entry temp	°C .....
Air's exit temp	°C .....
Heating output	kW .....
Summertime operations	
Outside air temp	°C .....
Outside air/humidity	% RH.....
Return air temp	°C .....
Return air/humidity	% RH.....
Sorptive dehumidification	g/kg .....
Heating output regenerat.-htg. VL 75°C	kW .....
Refrigeration brine coolg. ext. (18/24°C)	kW.....
Exit temperature sorption	°C .....
Relat. humidity following sorption	%.....
Absolute humidity following sorption	g/kg .....

Series 73:
Dehumidification without regeneration Hrs. .....
(at an avg. dehumidification spread of ..... g/kg
-> Basis: totally regenerated brine storage)

"adiabatic" evaporative refrigeration

at tab = _____°C; _____	% RH .....
Cooling output	kW.....
OA-entry temperature adiabatics	°C .....
SA-exit temperature adiabatics	°C .....
Absol. humidity at exit after adiabatics	g/kg .....
PKW refrigeration register at VL/RL	°C .....
Air's entry temp	°C .....
Air's exit temp	°C .....
Supply air's humidity	g/kg .....
Refrigeration output	kW .....

External pressure loss at design point: In complete

supply air/outside air duct system	Pa.....
return air/exhaust air duct system	Pa.....

Electrical input power

Pump ("adiabatic" evaporative coolg.)	kW .....
Adsorber pump	kW.....
Desorber pump	kW.....
OA fan adiabatics operation	kW.....
EA-fan adiabatics operation	kW.....
EA-fan - Regeneration	kW.....
Operative voltage (50 Hz)	V.....

V 3/N/PE 400

Dimensions of unit/appr.:

Length	(L)	mm.....
Width	(B)	mm.....
Height	(H) incl. pedestal	mm.....
Weight:	Total ca.	kg .....

Largest transportable part:

Length	(L)	mm.....
Width	(B)	mm.....
Height	(H) incl. pedestal	mm.....
Weight:	Total ca.	kg .....

Largest assembly part:

Length	(L)	mm.....
Width	(B)	mm.....
Height	(H) incl. pedestal	mm.....
Weight:	Total ca.	kg .....

at Type 73: Dimensions of brine storage facility:

Length	(L)	mm.....
Width	(B)	mm.....
Height	(H) incl. pedestal	mm.....
Weight:	Total ca.	kg .....

Make: Menerga Sorpsolair
Unit type: .....
Marketing branch office: .....
Price of unit: .....

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Type: 72/73 . . . . *Sorpsolair*

Permanent monitoring of fan's balance:
Function: Vibration sensor analog, 0-10.....mm/s

Alternative, as per choice of bidder
Make: .....
Unit type: .....
Price of unit: .....

The bid document must include: description of unit, technical data, picture of unit, description of functions, references, proof of economic performance by citing installations currently operating.

Accessories

Connector extensions
1 set flexible, heat-resistant flanged connections for supply/return/fresh and exhaust air.
Price: ....

Remote control panel console
Outside remote control panel console with designation, suitable for mounting in a central distributor.
Price: ....

Communications and service module for remote monitoring
Interface (analog) of remote data transmission for installation's control and monitoring.
Price: ....

Transport
Freight portion of shipment to construction site (curbside delivery) without unloading.
Pay rate: ....

Assembly
Setup and assembly of aforementioned climate control installation including applicable hoisting and transport tools. In case of individual parts: Cabling of the internal, designated electric lines in the switching cabinet.
Pay rate: ....

Initial commissioning
Hookup to switching cabinet of internal electric lines reinstalled in the unit after shipment. In disassembled devices, the manufacturer's technical services dept. will carry out the work on-site.

Pay rate: ....

Commissioning
Commissioning and breaking-in of the system commences at time of conveyance and acceptance, including support by manufacturer's technical representatives.
Pay rate: ....

Follow-up adjustments
Follow-up adjustments to the system carried out by manufacturer's technical representatives. Fine-tuning of the switching and control unit after 3 months operation of the installation, in consideration of particular circumstances. Re-training of operating staff on request.
Pay rate: ....

Maintenance contract
Annual maintenance pursuant to maintenance directives of manufacturer by technical field representatives.
Pay rate: ....

All prices plus VAT.

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Type: 72/73 . . . . *Sorpsolair*

Technical data and performance standards

Unit type		72 04 01	72 05 01	72 06 01	72 10 01	72 13 01	72 16 01	72 19 01	72 22 01
Nominal volume flow SA/RA[1) 2)]	m^3/h	2.900	3.500	4.700	6.100	8.300	10.500	12.700	14.900
Regenerative air volume flow OA-EA	m^3/h	1.000	1.150	1.550	2.050	2.800	3.500	4.250	5.000
Refrigeration output for "adiabatic" evaporative refrig.[3)]	kW	20,2	24,4	32,8	42,6	57,9	73,2	88,6	103,9
thereof share of sensible refrigeration output	kW	11,1	13,5	18,1	23,4	31,9	40,4	48,8	57,3
Dehumidification output	kg/h	12,8	15,4	20,7	26,9	36,6	46,3	56	65,7
Heat output Brine generation[6)]	kW	14,7	17,7	23,8	30,9	42	53,1	64,3	75,4
External pressure loss									
Supply air and outside air channel[4)]	Pa	300	300	300	400	400	400	400	400
Return air and exhaust air channel[4)]	Pa	300	300	300	400	400	400	400	400
Outside air and exhaust air channel[4)]	Pa	200	200	200	200	200	200	200	200
Acoustic capacity[5)] Supply air flanged connection	dB(A)	69	70	81	83	83	82	82	69
Acoustic capacity[5)] Return air flanged connection	dB(A)	73	75	77	75	78	79	72	74
Acoustic capacity[5)] Outside air flanged connection	dB(A)	65	66	77	79	81	80	73	69
Acoustic capacity[5)] Exhaust air flanged connection	dB(A)	79	80	81	80	84	85	79	81
Electric input power									
Total input power/Supply air fan	kW	1,4	1,7	2,2	3,2	4,2	5,5	6,5	7,4
Total input power/Return air fan	kW	1,0	1,2	1,6	2,3	3,0	3,7	4,5	5,3
Total input power/Regenerated air fan	kW	0,5	0,5	0,6	0,8	1,0	1,2	1,4	1,7
Total input power/"adiabatic" evaporative refrig. pump	kW	0,4	0,4	0,4	0,6	0,6	0,8	1,1	1,0
Total input power/adsorber pump	kW	0,4	0,4	0,8	0,8	0,8	0,8	0,8	1,5
Total input power/desorber pump	kW	0,4	0,4	0,8	0,8	0,8	0,8	0,8	1,5
Total input power	kW	4,0	4,5	6,3	8,4	10,3	12,7	15,0	18,4
Nominal current									
Supply air fan/Motor unit	A	3,5	4,8	6,4	8,5	11,1	11,6	15,3	15,3
Return air fan/Motor unit	A	3,5	3,5	4,8	6,4	6,3	8,3	11,6	11,6
Regenerated air fan/Motor unit it	A	3,5	3,5	3,5	3,5	3,5	3,5	3,5	4,8
„Adiabatic" evaporative refrigeration pump	A	1,4	1,4	1,4	1,7	1,7	2,5	2,8	2,8
Adsorber Pump	A	1,0	1,0	3,5	3,5	3,5	3,5	3,5	1,0
Desorber Pump	A	1,0	1,0	3,5	3,5	3,5	3,5	3,5	1,0
Input power of flow max.	**A**	**13,9**	**15,2**	**23,0**	**27,0**	**29,5**	**32,8**	**40,1**	**36,5**
Operating voltage 3 / N / PE 50 Hz	V	400	400	400	400	400	400	400	400
Output of PWW-retro heater 70/50°C tLE 15°C[7)]	kW	26	32	46	74	98	125	152	180
Flow resistance upstream in PWW-retro heater	kPa	3,0	3,1	3,5	5,5	3,8	3,5	3,6	5,4
Flow resistance upstream in PWW-control valve	kPa	7,5	7,6	7,6	10,6	7,5	11,8	7,1	10
Heater and Water connection sizes									
PWW-connection	DN	25	25	32	32	40	50	50	50
PWW-control valve connection	DN	25	25	25	25	32	32	40	40
Fresh water connection for "adiabatic" evapor. cooling	DN	15	15	15	15	15	20	20	20
Condensate/de-sludging process	DN	25	32	32	40	40	40	40	40
Floor drainage	DN	40	40	40	40	40	40	40	40
Flow resistance upstream of brine heater	kPa	2	2	2	5	5	6	6	7
Flow resistance upstream of brine heater/control valve	kPa	3	4	4	6	7	7	7	9
Brine heater connection	DN	50	50	50	50	50	50	50	50
Brine heater control valve connection	DN	32	32	40	40	40	50	50	50

[1)] Surrounding air flap with servo motor = accessories
[2)] Variable air output on request
[3)] at RA 26 °C, 45 % RH und OA 32 °C, 40 % RH
[4)] variable pressure loss on request
[5)] 250 Hz center frequency at open bypass flaps

[6)] VL/RL = 70/60°C
[7)] VL/RL = 70/50°C RA 22°C, 40% RH; OA -10°C, 90% RH

[11)] OA/SA-route for summertime operations
Please have technical data and dimensions confirmed prior to planning

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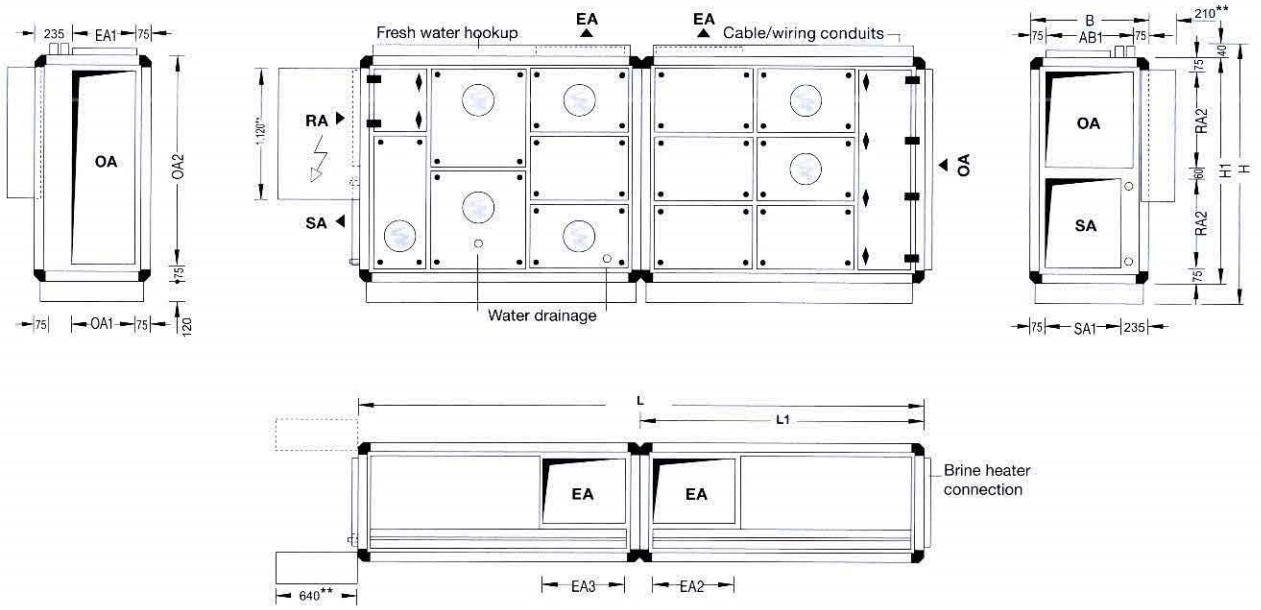
Type: 72/73 . . . . *Sorpsolair*

Unit dimensions and weights / Exhaust air release on top of unit



Mirror-image construction possible / Switching cabinet dimensions as guidelines only
**Separate switching cabinets for each parallel running unit

Unit type	L	B	H[2]	RA1	RA2	OA1	OA2	EA1	EA2	EA3	SA1	SA2	H1	Weight A[1]	Weight B[1,4]
72 04 01	6.260	890	2.170	740	600	370	1.880	580	380	600	580	600	2.010	2.000	2.200
72 05 01	6.260	1.050	2.170	900	600	530	1.880	740	380	600	740	600	2.010	2.300	2.550
72 06 01	6.420	1.370	2.170	1.220	600	880	1.880	1.080	380	600	1.080	600	2.010	3.100	3.400

Largest dimensions for shipment[3]

Unit type	L1	B	H	Weight
72 04 01	3.450	890	2.170	1.250
72 05 01	3.450	1.050	2.170	1.350
72 06 01	3.450	1.370	2.170	1.550

[1] All weights in kg with switching cabinet included
[2] incl. 120 mm pedestal frame
[3] Additional disassembly into smaller components possible (requires additional order!)
[4] Weight B = operating weight

For service work, a clearance corresponding to measurement B, but no less than 1.00 m is needed. Service space in back is ca. 0.8 m.

For dimensions, please take note of body size, air channel connections and switching cabinet.

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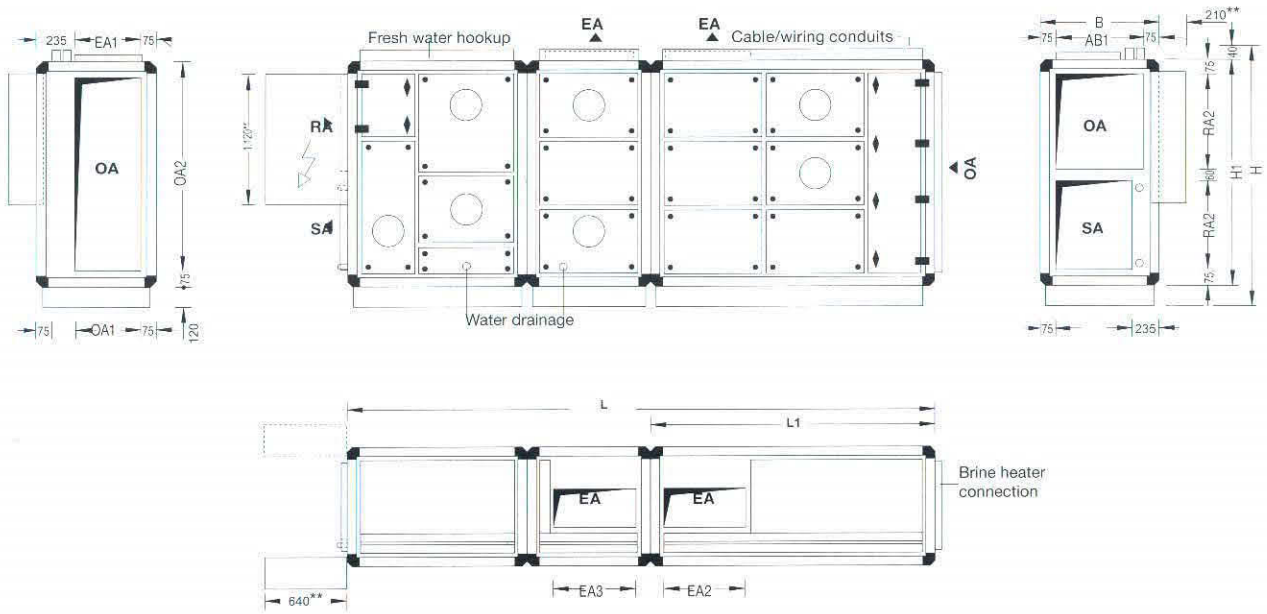
Type: 72/73 . . . . *Sorpsolair*

Unit dimensions and weights / Exhaust air release on top of unit



Mirror-image construction possible / Switching cabinet dimensions as guidelines only
**Separate switching cabinets for each parallel running unit

Unit type	L	B	H[2]	RA1	RA2	OA1	OA2	EA1	EA2	EA3	SA1	SA2	H1	Weight A[1]	Weight B[1][4]
72 10 01	7.470	1.050	2.490	900	900	530	2.180	740	370	700	740	900	2.330	4.000	4.250
72 13 01	7.470	1.370	2.490	1.220	900	850	2.180	680	370	700	1.060	900	2.330	4.300	4.600
72 16 01	7.790	1.690	2.490	1.540	900	1.170	2.180	1.000	370	700	1.380	900	2.330	4.700	5.100
72 19 01	8.110	2.010	2.490	1.860	900	1.490	2.180	1.320	370	700	1.700	900	2.330	5.100	5.550
72 22 01	8.430	2.330	2.490	2.180	900	1.810	2.180	1.640	370	700	2.020	900	2.330	5.500	6.050

Largest dimensions for shipment[3]

Unit type	L1	B	H	Weight
72 10 01	3.210	1.050	2.490	1.400
72 13 01	3.210	1.370	2.490	1.600
72 16 01	3.370	1.690	2.490	2.050
72 19 01	3.530	2.010	2.490	2.200
72 22 01	3.690	2.330	2.490	2.400

[1] All weights in kg with switching cabinet included
[2] incl. 120 mm pedestal frame
[3] Additional disassembly into smaller components possible (requires additional order!)
[4] Weight B = operating weight

For service work, a clearance corresponding to measurement B, but no less than 1.00 m is needed. Service space in back is ca. 0.8 m.

For dimensions, please take note of body size, air channel connections and switching cabinet.

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Type: 72/73 . . . . *Sorpsolair*

Technical data and performance standards

Unit type		73 04 01	73 05 01	73 06 01	73 10 01	73 13 01	73 16 01	73 19 01	73 22 01
Nominal volume flow SA/RA[1) 2)]	m^3/h	2.900	3.500	4.700	6.100	8.300	10.500	12.700	14.900
Regenerative air volume flow OA-EA	m^3/h	1.000	1.150	1.550	2.05	2.800	3.500	4.250	5.000
Refrigeration output for "adiabatic" evapor. refrigeration[3)]	kW	20,2	24,4	32,8	42,6	57,9	73,2	88,6	103,9
thereof share of sensible refrigeration output	kW	11,1	13,5	18,1	23,4	31,9	40,4	48,8	57,3
Dehumidification output	kg/h	12,8	15,4	20,7	26,9	36,6	46,3	56	65,7
Heat output Brine generation[6)]	kW	14,7	17,7	23,8	30,9	42	53,1	64,3	75,4
Volume of brine storage unit	l	750	750	1.000	1.000	1.500	1.500	2.000	2.000
Humidity storage capacity of brine storage unit	kg	150	150	200	200	300	300	400	400
External pressure loss									
Supply air and outside air channel[4)]	Pa	300	300	300	400	400	400	400	400
Return air and exhaust air channel[4)]	Pa	300	300	300	400	400	400	400	400
Outside air and exhaust air channel[4)]	Pa	200	200	200	200	200	200	200	200
Acoustic capacity[5)] Supply air flanged connection	dB(A)	69	70	81	83	83	82	82	69
Acoustic capacity[5)] Return air flanged connection	dB(A)	73	75	77	75	78	79	72	74
Acoustic capacity[5)] Outside air flanged connection	dB(A)	65	66	77	79	81	80	73	69
Acoustic capacity[5)] Exhaust air flanged connection	dB(A)	79	80	81	80	84	85	79	81
Electric input power									
Total input power/Supply air fan	kW	1,4	1,7	2,2	3,2	4,2	5,5	6,5	7,4
Total input power/Return air fan	kW	1,0	1,2	1,6	2,3	3,0	3,7	4,5	5,3
Total input power/Regenerated air fan	kW	0,5	0,5	0,6	0,8	1,0	1,2	1,4	1,7
Total input power/"adiabatic" evapor. refrigeration pump	kW	0,4	0,4	0,4	0,6	0,6	0,8	1,1	1,0
Total input power/adsorber pump	kW	0,4	0,4	0,8	0,8	0,8	0,8	0,8	1,5
Total input power/desorber pump	kW	0,4	0,4	0,8	0,8	0,8	0,8	0,8	1,5
Total input power	kW	4,0	4,5	6,3	8,4	10,3	12,7	15,0	18,4
Nominal current									
Supply air fan/Motor unit	A	3,5	4,8	6,4	8,5	11,1	11,6	15,3	15,3
Return air fan/Motor unit	A	3,5	3,5	4,8	6,4	6,3	8,3	11,6	11,6
Regenerated air fan/Motor unit	A	3,5	3,5	3,5	3,5	3,5	3,5	3,5	4,8
„Adiabatic" evaporative refrigeration pump	A	1,4	1,4	1,4	1,7	1,7	2,5	2,8	2,8
Adsorber Pump	A	1,0	1,0	3,5	3,5	3,5	3,5	3,5	1,0
Desorber Pump	A	1,0	1,0	3,5	3,5	3,5	3,5	3,5	1,0
Input power of flow max.	A	13,9	15,2	23,0	27,0	29,5	32,8	40,1	36,5
Operating voltage 3 / N / PE 50 Hz	V	400	400	400	400	400	400	400	400
Output of PWW-retro heater 70/50°C tLE 15°C[7)]	kW	26	32	46	74	98	125	152	180
Flow resistance upstream in PWW-retro heater	kPa	3,0	3,1	3,5	5,5	3,8	3,5	3,6	5,4
Flow resistance upstream in PWW-control valve	kPa	7,5	7,6	7,6	10,6	7,5	11,8	7,1	10
Heater and Water connection sizes									
PWW-connection	DN	25	25	32	32	40	50	50	50
PWW-control valve connection	DN	25	25	25	25	32	32	40	40
Fresh water connection for "adiabatic" evapor. cooling	DN	15	15	15	15	15	20	20	20
Condensate/de-sludging process	DN	25	32	32	40	40	40	40	40
Floor drainage	DN	40	40	40	40	40	40	40	40
Flow resistance upstream of brine heater	kPa	2	2	2	5	5	6	6	7
Flow resistance upstream of brine heater/control valve	kPa	3	4	4	6	7	7	7	9
Brine heater connection	DN	50	50	50	50	50	50	50	50
Brine heater control valve connection	DN	32	32	40	40	40	50	50	50

[1)] Surrounding air flap with servo motor = accessories
[2)] Variable air output on request
[3)] at RA 26 °C, 45 % RH und OA 32 °C, 40 % RH
[4)] variable pressure loss on request
[5)] 250 Hz center frequency at open bypass flaps
[6)] VL/RL = 70/60°C
[7)] VL/RL = 70/50°C RA 22°C, 40% RH; OA -10°C, 90% RH
[11)] OA/SA-route for summertime operations

Please have technical data and dimensions confirmed prior to planning

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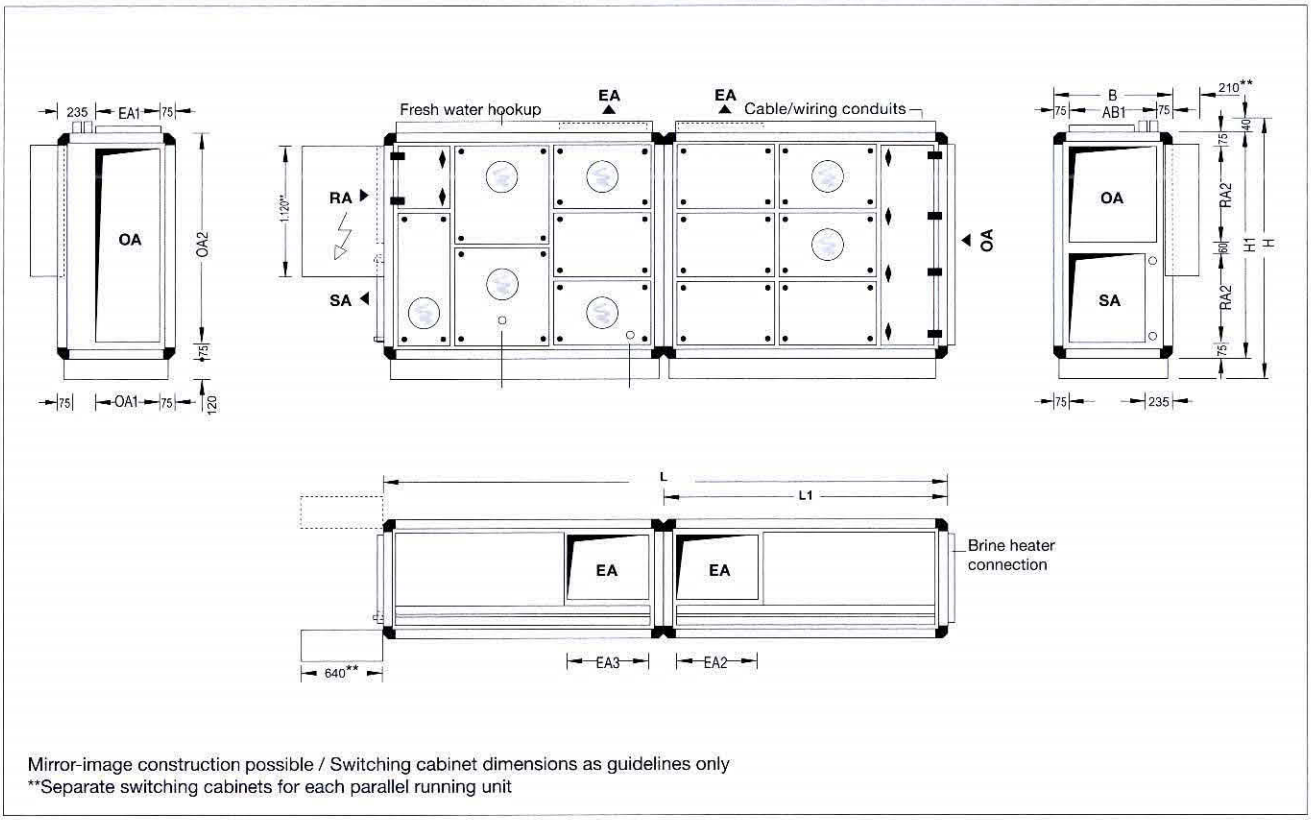
Type: 72/73 . . . . *Sorpsolair*

Unit dimensions and weights / Exhaust air release on top of unit



Mirror-image construction possible / Switching cabinet dimensions as guidelines only
**Separate switching cabinets for each parallel running unit

Unit type	L	B	H[2]	RA1	RA2	OA1	OA2	EA1	EA2	EA3	SA1	SA2	H1	Weight A[1]	Weight B[1,4]
73 04 01	6.260	890	2.170	740	600	370	1.880	580	380	600	580	600	2.010	1.570	2.900
73 05 01	6.260	1.050	2.170	900	600	530	1.880	740	380	600	740	600	2.010	1.870	3.200
73 06 01	6.420	1.370	2.170	1.220	600	880	1.880	1.080	380	600	1.080	600	2.010	2.670	4.350

Largest dimensions for shipment[3]

Unit type	L1	B	H	Weight
73 04 01	3.450	890	2.170	1.250
73 05 01	3.450	1.050	2.170	1.350
73 06 01	3.450	1.370	2.170	1.550

Dimensions brine storage unit

L	B	H	Weight
4.180	1.050	2.010	430
4.180	1.050	2.010	430
4.180	1.050	2.010	430

[1] All weights in kg with switching cabinet included
[2] incl. 120 mm pedestal frame
[3] Additional disassembly into smaller components possible (requires additional order!)
[4] Weight B = operating weight

For service work, a clearance corresponding to measurement B, but no less than 1.00 m is needed. Service space in back is ca. 0.8 m.

For dimensions, please take note of body size, air channel connections and switching cabinet.

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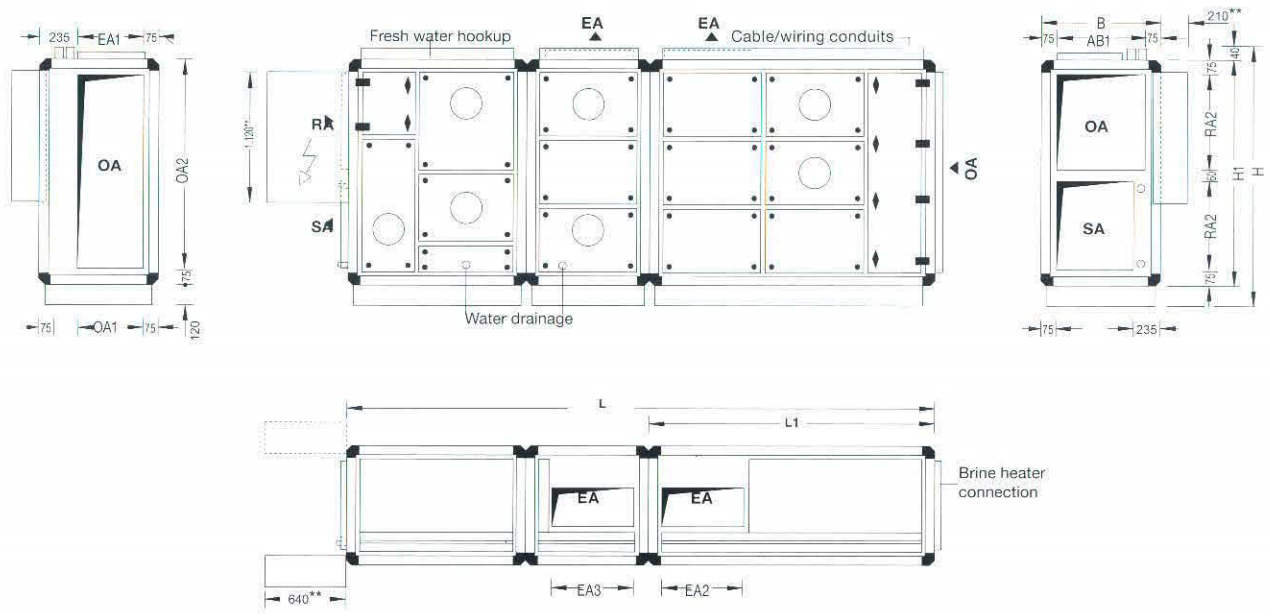
Type: 72/73 . . . *Sorpsolair*

Unit dimensions and weights / Exhaust air release on top of unit



Mirror-image construction possible / Switching cabinet dimensions as guidelines only
**Separate switching cabinets for each parallel running unit

Unit type	L	B	H[2]	RA1	RA2	OA1	OA2	EA1	EA2	EA3	SA1	SA2	H1	Weight A[1]	Weight B[1][4]
73 10 01	7.470	1.050	2.490	900	900	530	2.180	740	370	700	740	900	2.330	3.570	5.250
73 13 01	7.470	1.370	2.490	1.220	900	850	2.180	680	370	700	1.060	900	2.330	3.765	6.150
73 16 01	7.790	1.690	2.490	1.540	900	1.170	2.180	1.000	370	700	1.380	900	2.330	4.165	6.550
73 19 01	8.110	2.010	2.490	1.860	900	1.490	2.180	1.320	370	700	1.700	900	2.330	4.450	7.500
73 22 01	8.430	2.330	2.490	2.180	900	1.810	2.180	1.640	370	700	2.020	900	2.330	4.850	7.900

Largest dimensions for shipment[3]

Unit type	L1	B	H	Weight
73 10 01	3.210	1.050	2.490	1.400
73 13 01	3.210	1.370	2.490	1.600
73 16 01	3.370	1.690	2.490	2.050
73 19 01	3.530	2.010	2.490	2.200
73 22 01	3.690	2.330	2.490	2.400

Dimensions brine storage unit

L	B	H	Weight
4.180	1.050	2.010	430
4.500	1.050	2.330	535
4.500	1.050	2.330	535
5.460	1.050	2.330	650
5.460	1.050	2.330	650

[1] All weights in kg with switching cabinet included
[2] incl. 120 mm pedestal frame
[3] Additional disassembly into smaller components possible (requires additional order!)
[4] Weight B = operating weight

For service work, a clearance corresponding to measurement B, but no less than 1.00 m is needed. Service space in back is ca. 0.8 m.

For dimensions, please take note of body size, air channel connections and switching cabinet.

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