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

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**
- **Over 75% temperature efficiency**
- **Thermal coefficient of efficiency COP_{th} from 1.5**
- **Brine regeneration through the use of solar thermal energy, district heat or existing process heat at a low-temperature level (from 65°C flow)**
- **Energy-saving EC fans**
- **Intelligent air bypass duct**
- **Two-stage supply air filtration**
- **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 thermal 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 building types.

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 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

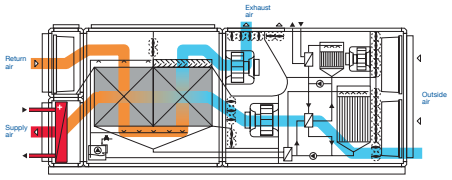
Options

- Recirc air heating damper
- Pumped chilled water cooling coil
- Sound absorber
- Outdoor installation
- Thermal bridge factor TB 1
- Remote maintenance
- And many more

Functional description

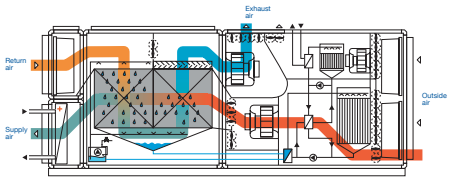
Wintertime conditions

In wintertime conditions, the sensitive heat (and at low outside air temperatures also some of the latent heat) is withdrawn from the return air in the double plate heat exchanger, and is transferred to the outside air. The cooled return air is then discharged as exhaust air, while the prewarmed outside air is further heated to the desired temperature in the pumped hot water heating coil, and is fed into the rooms as supply air. Depending on the application case, the airflow rate can be increased by adding a proportion of recirc air (additional equipment). In recirc mode, the unit can also be operated as an air heating system.



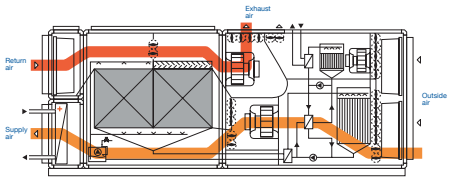
Indirect "adiabatic" evaporative cooling

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 counterflowing 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.



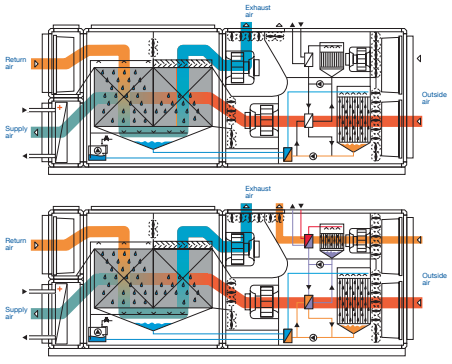
Free cooling in summer

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.



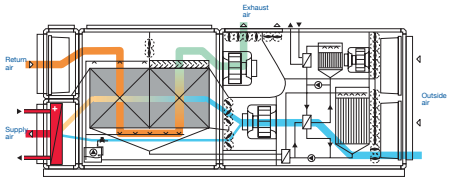
Sorption-based air conditioning

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 here 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 medium, and can be used especially where there is no constant heat supply. Sorption-based air conditioning allows cooling and dehumidification without mechanical refrigerating machines and without peak loads in electricity consumption during the summer.



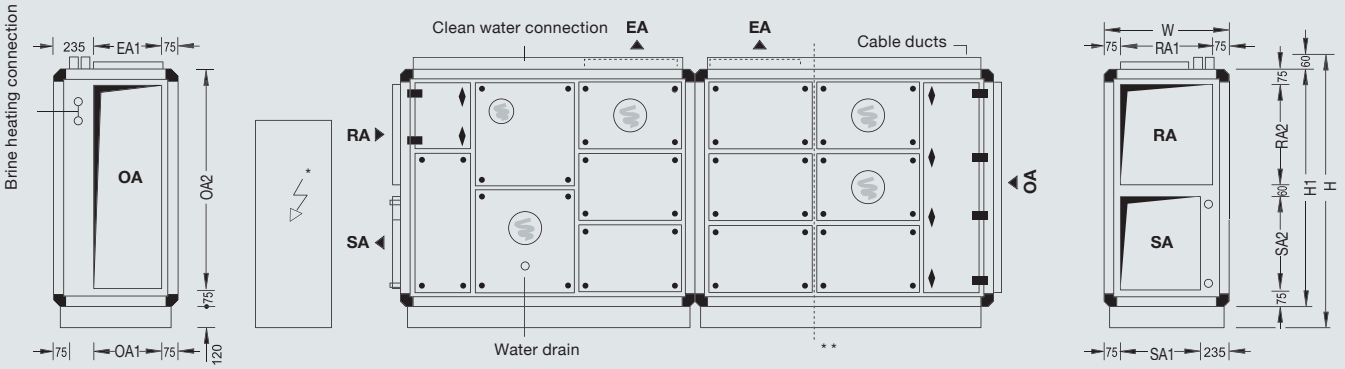
Defrosting Circuit

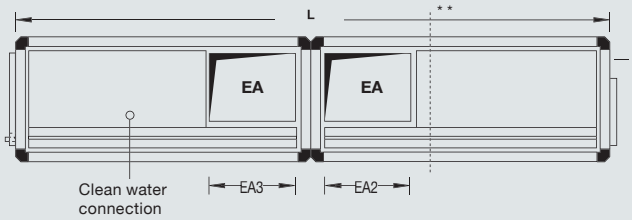
All recuperative heat exchangers tend to ice over in the exhaust air section in the case of low outside temperatures. In defrost operation, the OA-SA bypass opens, reducing the outside air flow rate going through the recuperator. The heat contained in the return air melts any ice in the heat exchanger,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



Sorpsolair Type 72

System dimensions and weights





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

* separate switching cabinet

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

Unit Type	L	W	H[1]	RA1	RA2	OA1	OA2	EA1	EA2	EA3	SA1	SA2	H1	Weight	Operating weight
72 04 01	6,580	890	2,190	740	580	530	1,880	370	380	690	580	580	2,010	2,300	2,800
72 05 01	6,580	1,050	2,190	900	580	850	1,880	690	380	690	740	580	2,010	2,500	3,000
72 06 01	6,580	1,370	2,190	1,220	580	1,170	1,880	1,010	380	690	1,060	580	2,010	2,800	3,300
72 10 01	8,430	1,050	2,510	900	900	530	2,180	370	380	690	740	900	2,330	3,600	4,400
72 13 01	8,430	1,370	2,510	1,220	900	850	2,180	690	380	690	1,060	900	2,330	4,000	4,900
72 16 01	8,430	1,690	2,510	1,540	900	1,170	2,180	1,010	380	690	1,380	900	2,330	4,500	5,500
72 19 01	8,590	2,010	2,510	1,860	900	1,490	2,180	1,330	380	690	1,700	900	2,330	5,000	6,150
72 22 01	8,590	2,330	2,510	2,180	900	1,810	2,180	1,650	380	690	2,020	900	2,330	5,800	7,300

Largest transport unit*

Unit Type	L	W	H[1]	Weight
72 04 01	3,610	890	2,190	1,400
72 05 01	3,610	1,050	2,190	1,600
72 06 01	3,770	1,370	2,190	2,050
72 10 01	3,770	1,050	2,510	1,200
72 13 01	3,770	1,370	2,510	1,300
72 16 01	3,770	1,690	2,510	1,500
72 19 01	3,770	2,010	2,510	1,800
72 22 01	3,770	2,330	2,510	2,400

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. 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.

1 incl. 120 mm base frame, plus 60 mm cable duct

* Further divisions for smaller installation units are possible (additional order required!)

Technical specifications and services

Unit Type		720401	720501	720601	721001	721301	721601	721901	722201
Nominal flow rate	m³/h	2,900	3,500	4,700	6,100	8,300	10,500	12,700	14,900
Total electrical power rating [1, 2]	kW	3.9	4.3	6.1	7.6	9.7	12.0	13.7	17.1
Coefficient of power efficiency according to EN 13053:2012	%	66	66	68	70	70	70	70	70
Current consumption[2]	A	11.2	11.7	17.4	15.6	20.7	29.1	29.9	39.3
Operating voltage		3 / N / PE 400 V 50 Hz							
Sorption									
dehumidification capacity	kg/h	15.0	19.3	24.5	29.9	40.6	51.4	62.1	72.8
Regeneration flow rate	m³/h	600	700	900	1.400	2.000	2.500	3.000	3.500
Heating capacity brine regeneration[3]	kW	16.0	17.8	26.0	32.8	44.6	56.4	68.1	79.9
Rated pump input absorber I desorber	kW	0.4 | 0.4	0.4 | 0.4	0.8 | 0.8	0.8 | 0.8	0.8 | 0.8	0.8 | 0.8	0.8 | 0.8	1.5 | 1.5
Water flow rate in regeneration heat exchanger	m³/h	3.96	4.82	6.55	4.82	6.54	8.26	9.98	11.71
Ext. pressure loss									
Supply and fresh air channel	Pa	300	300	300	400	400	400	400	400
Return and exhaust air channel	Pa	300	300	300	400	400	400	400	400
Outside air and exhaust air channel (regeneration)	Pa	200	200	200	200	200	200	200	200
Sound power level [4]									
Supply air vent	dB(A)	79	75	71	70	71	73	72	72
RA connection	dB(A)	59	57	62	65	72	70	68	73
Outside air vent	dB(A)	82	83	80	83	82	79	80	81
EA connection	dB(A)	72	70	75	76	78	86	80	80
Acoustic pressure at a distance of 1 m from the device[4]	dB(A)	59	65	61	63	62	63	62	63
Fan units									
Rated motor input for outside air [5]	kW	1.03	1.11	1.52	1.96	2.72	2x1.72	2x1.99	2x2.42
Rated motor input for exhaust air [5]	kW	0.82	0.94	1.47	1.95	2.72	3.35	2x2.03	2x2.33
Rated motor input for regeneration [5, 6]	kW	0.23	0.24	0.27	0.50	0.62	0.72	0.81	1.01
SFP category outside air I exhaust air I regeneration		3 | 2 | 3	2 | 2 | 2	2 | 2 | 2	2 | 2 | 3	3 | 3 | 2	2 | 2 | 2	2 | 2 | 2	2 | 2 | 2
Evaporative cooling [7]									
Cooling capacity of "adiabatic" evaporative cooling system[8]	kW	18.3	22.1	29.9	38.0	51.7	65.4	79.1	63.8
proportion of this which is sensible cooling capacity	kW	8.2	9.2	12.5	16.8	22.9	29.0	35.1	41.2
Rated pump input for evaporative cooling	kW	0.23	0.29	0.29	0.23	0.29	0.35	0.40	0.40
Efficiency classes according to EN 13053:2012									
Heat recovery class		H2	H2	H2	H2	H2	H2	H2	H2
Power consumption of the fans OA I EA I Reg.		P3 | P1 | P1	P2 | P1 | P1	P1 | P1 | P1	P1 | P1 | P1	P1 | P2 | P1	P1 | P1 | P1	P1 | P1 | P1	P1 | P1 | P1
Air velocity class		V1	V1	V1	V2	V2	V2	V3	V3
Filtration									
Outside air		F7							
Return Air		M5							
PHW									
Heating capacity SA=22°C [3]	kW	8.4	10.1	12.2	15.0	20.3	25.8	31.3	36.5
Heating capacity SA=30°C [3]	kW	16.1	19.4	24.7	31.2	42.4	53.6	64.9	76.2
Heating capacity Defrost [3, 9]	kW	6.5	7.9	12.4	15.2	20.7	26.2	31.7	37.3
Water flow rate and pressure losses									
PHW	m³/h | kPa	2.79 | 3.2	2.75 | 3.4	0.89 | 4.8	1.38 | 4.3	2.13 | 3.5	2.15 | 4.2	2.16 | 4.9	6.50 | 4.4
PWW (pump warm water) valve	m³/h | kPa	0.41 | 6.6	0.49 | 3.8	0.76 | 9.3	0.88 | 4.8	1.22 | 3.7	1.43 | 5.2	1.64 | 6.8	1.63 | 6.7
Connections									
PHW connection	DN	25	25	32	32	40	40	40	50
PHW control valve connection	DN	15	15	15	15	20	20	20	20
Clean water connection [10]	DN	15	15	15	15	15	20	20	20
Condensate / slurry drain	DN	25	32	32	40	40	40	40	40
Floor drain	DN	40	40	40	40	40	40	40	40
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

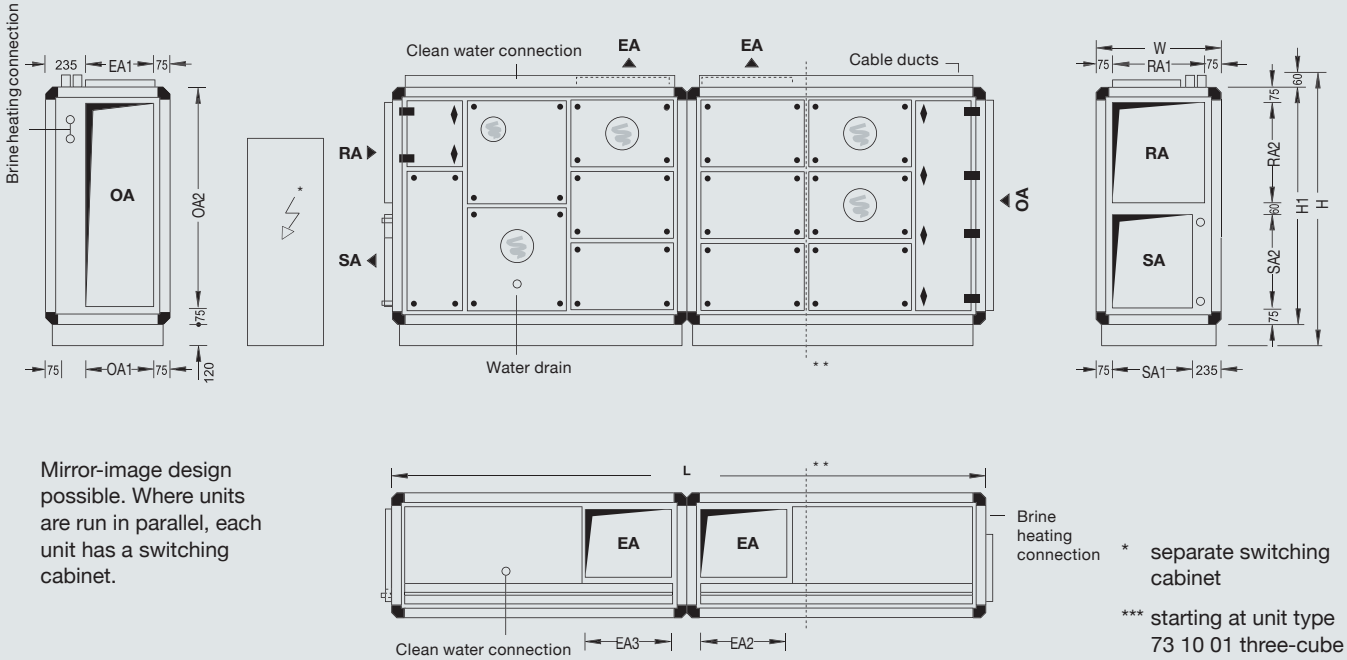
Specifications of technical data relate to the nominal flow rate and return air condition 22°C / 40% r.h., outside air condition -12°C / 90% r.h., unless otherwise specified

1 at nominal flow rate in sorption mode
2 dependent on configuration of measurement and control system/unit
3 FL = 70°C
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 in sorption mode, at OA = 32°C, 40% r.h.; RA = 26°C, 45% r.h.
7 water quality of make-up water corresponds to VDI 3803 table B2 with a bacteria count < 100 CFU/ml, water hardness range "soft".
8 at OA = 32°C, 40% r.h.; RA = 26°C, 45% r.h.
9 At OA=-15°C, SA=18°C, 66% of nominal air volume and active defrost function
10 2 bar system pressure required at 25 l/min flow rate

Arrange confirmation of technical data and specifications before start of planning.

Sorpsolair Type 73 (with brine tank)

System dimensions and weights



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

* separate switching cabinet

*** starting at unit type 73 10 01 three-cube design

Unit Type	L	W	H [1]	RA1	RA2	OA1	OA2	EA1	EA2	EA3	SA1	SA2	H1	Weight	Operating weight
73 04 01	6,580	890	2,190	740	580	530	1,880	370	380	690	580	580	2,010	2,300	2,800
73 05 01	6,580	1,050	2,190	900	580	850	1,880	690	380	690	740	580	2,010	2,500	3,000
73 06 01	6,580	1,370	2,190	1,220	580	1,170	1,880	1,010	380	690	1,060	580	2,010	2,800	3,300
73 10 01	8,430	1,050	2,510	900	900	530	2,180	370	380	690	740	900	2,330	3,600	4,400
73 13 01	8,430	1,370	2,510	1,220	900	850	2,180	690	380	690	1,060	900	2,330	4,000	4,900
73 16 01	8,430	1,690	2,510	1,540	900	1,170	2,180	1,010	380	690	1,380	900	2,330	4,500	5,500
73 19 01	8,590	2,010	2,510	1,860	900	1,490	2,180	1,330	380	690	1,700	900	2,330	5,000	6,150
73 22 01	8,590	2,330	2,510	2,180	900	1,810	2,180	1,650	380	690	2,020	900	2,330	5,800	7,300

Largest transport unit *

Unit Type	L	W	H [1]	Weight
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

Dimensions of brine accumulator (separate)

Unit Type	L	W	H [1]	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

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.

1 incl. 120 mm base frame, plus 60 mm cable duct

* Further divisions for smaller installation units are possible (additional order required!)

Technical specifications and services

Unit Type		73401	73501	73601	73101	73131	73161	73191	73221
Nominal flow rate	m³/h	2,900	3,500	4,700	6,100	8,300	10,500	12,700	14,900
Total electrical power rating [1,2]	kW	3.9	4.3	6.1	7.6	9.7	12.0	13.7	17.1
Coefficient of power efficiency according to EN 13053:2012	%	66	66	68	70	70	70	70	70
Current consumption[2]	A	11.2	11.7	17.4	15.6	20.7	29.1	29.9	39.3
Operating voltage		3 / N / PE 400 V 50 Hz							
Sorption									
Dehumidification capacity	kg/h	15.0	19.3	24.5	29.9	40.6	51.4	62.1	72.8
Regeneration flow rate	m³/h	600	700	900	1.400	2.000	2.500	3.000	3.500
Heating capacity brine regeneration[3]	kW	16.0	17.8	26.0	32.8	44.6	56.4	68.1	79.9
Rated pump input absorber I desorber	kW	0.4 | 0.4	0.4 | 0.4	0.8 | 0.8	0.8 | 0.8	0.8 | 0.8	0.8 | 0.8	0.8 | 0.8	1.5 | 1.5
Water flow rate in regeneration heat exchanger	m³/h	3.96	4.82	6.55	4.82	6.54	8.26	9.98	11.71
Ext. pressure loss									
Supply and fresh air channel	Pa	300	300	300	400	400	400	400	400
Return and exhaust air channel	Pa	300	300	300	400	400	400	400	400
Outside air and exhaust air channel (regeneration)	Pa	200	200	200	200	200	200	200	200
Sound power level [4]									
Supply air vent	dB(A)	79	75	71	70	71	73	72	72
RA connection	dB(A)	59	57	62	65	72	70	68	73
Outside air vent	dB(A)	82	83	80	83	82	79	80	81
EA connection	dB(A)	72	70	75	76	78	86	80	80
Acoustic pressure at a distance of 1 m from the device[4]	dB(A)	59	65	61	63	62	63	62	63
Fan units									
Rated motor input for outside air [5]	kW	1.03	1.11	1.52	1.96	2.72	2x1.72	2x1.99	2x2.42
Rated motor input for exhaust air [5]	kW	0.82	0.94	1.47	1.95	2.72	3.35	2x2.03	2x2.33
Rated motor input for regeneration [5,6]	kW	0.23	0.24	0.27	0.50	0.62	0.72	0.81	1.01
SFP category outside air I exhaust air I regeneration		3 | 2 | 3	2 | 2 | 2	2 | 2 | 2	2 | 2 | 3	3 | 3 | 2	2 | 2 | 2	2 | 2 | 2	2 | 2 | 2
Evaporative cooling [7]									
Cooling capacity of "adiabatic" evaporative cooling system[8]	kW	18.3	22.1	29.9	38.0	51.7	65.4	79.1	63.8
Proportion of this which is sensible cooling capacity	kW	8.2	9.2	12.5	16.8	22.9	29.0	35.1	41.2
Rated pump input for evaporative cooling	kW	0.23	0.29	0.29	0.23	0.29	0.35	0.40	0.40
Efficiency classes according to EN 13053:2012									
Heat recovery class		H2	H2	H2	H2	H2	H2	H2	H2
Power consumption of the fans OA I EA I Reg.		P3 | P1 | P1	P2 | P1 | P1	P1 | P1 | P1	P1 | P1 | P1	P2 | P1 | P1	P1 | P1 | P1	P1 | P1 | P1	P1 | P1 | P1
Air velocity class		V1	V1	V1	V2	V2	V2	V3	V3
Filtration									
Outside air		F7							
Return Air		M5							
PHW									
Heating capacity SA=22°C [3]	kW	8.4	10.1	12.2	15.0	20.3	25.8	31.3	36.5
Heating capacity SA=30°C [3]	kW	16.1	19.4	24.7	31.2	42.4	53.6	64.9	76.2
Heating capacity Defrost [3,9]	kW	6.5	7.9	12.4	15.2	20.7	26.2	31.7	37.3
Water flow rate and pressure losses									
PHW	m³/h|kPa	2.79 | 3.2	2.75 | 3.4	0.89 | 4.8	1.38 | 4.3	2.13 | 3.5	2.15 | 4.2	2.16 | 4.9	6.50 | 4.4
PWW (pump warm water) valve	m³/h|kPa	0.41 | 6.6	0.49 | 3.8	0.76 | 9.3	0.88 | 4.8	1.22 | 3.7	1.43 | 5.2	1.64 | 6.8	1.63 | 6.7
Brine tank									
Volumes	l	750	750	1.000	1.000	1.500	1.500	2.000	2.000
Humidity accumulator capacity	kg	150	150	200	200	300	300	400	400
Connections									
PHW connection	DN	25	25	32	32	40	40	40	50
PHW control valve connection	DN	15	15	15	15	20	20	20	20
Clean water connection [10]	DN	15	15	15	15	15	20	20	20
Condensate / slurry drain	DN	25	32	32	40	40	40	40	40
Floor drain	DN	40	40	40	40	40	40	40	40
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

Specifications of technical data relate to the nominal flow rate and return air condition 22°C / 40% r.h., outside air condition -12°C / 90% r.h., unless otherwise specified

1 at nominal flow rate in sorption mode
2 dependent on configuration of measurement and control system/unit
3 FL = 70°C
4 at 250 Hz mid-band frequency
5 with average filter contamination
6 in sorption mode, at OA = 32°C, 40% r.h.; RA = 26°C, 45% r.h.
7 water quality of make-up water corresponds to VDI 3803 table B2 with a bacteria count < 100 CFU/ml, water hardness range "soft".
8 at OA = 32°C, 40% r.h.; RA = 26°C, 45% r.h.
9 At OA=-15°C, SA=18°C, 66% of nominal air volume and active defrost function
10 2 bar system pressure required at 25 l/min flow rate

Arrange confirmation of technical data and specifications before start of planning.