SWIMMING POOL AIR-HANDLING UNITS

KU-DB Series

ME20

proKLIMA

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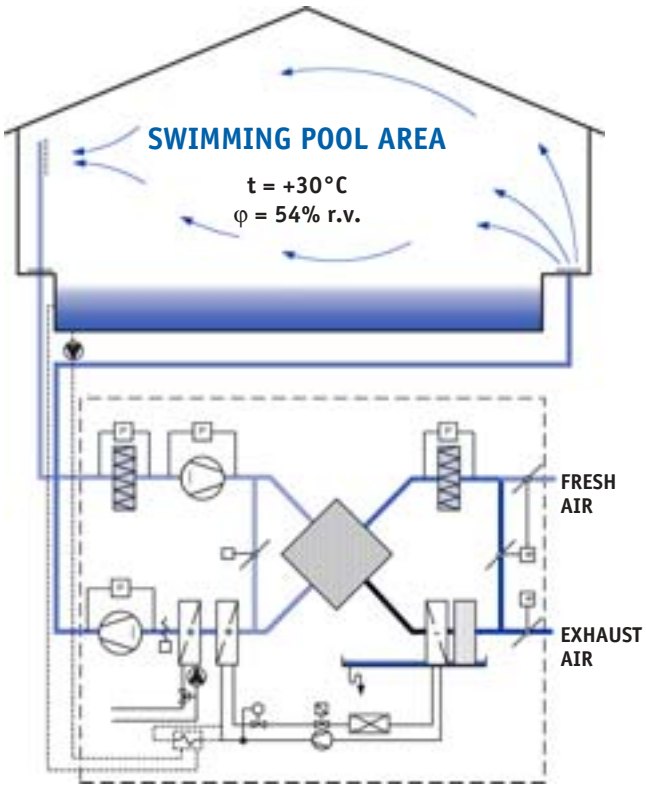


Schematic presentation of swimming pool area air handling

INTRODUCTION 1

Climatic conditions within the area of indoor swimming pools are highly demanding.

Apart from the fulfilment of determined temperature requirements, a special problem of the swimming pool area lies in a high content of water vapour evaporating from the surface of the swimming pool water.

Pursuant to VDI 2089 the condition of air maintained within the swimming pool area must be fit both for the visitors and the building structure.

A high water vapour content results in a high relative humidity of air. As a consequence of differing partial pressures on the external and internal side of the wall, water vapour penetrates through the structure. Another reason for deterioration of the structure is the condensation of water vapour from the air on cold wall surfaces. Besides a high quality of building works free from heat bridges and the application of adequate materials, the swimming pool area must be conditioned in the manner that reduces the temperature and air humidity to the values prescribed.

This is possible by means of standard units for saturated warm air exhaust and fresh dry air supply, which is accompanied by a considerable energy consumption despite the use of a recuperator.

It is only the units containing a heat pump that will achieve maximum energy savings, because the heat pump evaporator makes it possible to use the latent heat of water vapour from the air too.

The heat assumed, which was released at condensation of water vapour contained in the air, returns on the heat pump evaporator again to the system in the process of supply air heating that precedes the injection of air or heating of the swimming pool water.

The air-handling units of the KU-DB series, equipped with a plate recuperator with an exhaust air heat utilization exceeding 60% and a heat pump complete with the accessories and controls, guarantee the achievement of microclimatic conditions fit for man and the building structure. The unit operating costs are returned several times through the reduction of the building maintenance costs.

Due to various conditions resulting from a varying intensity of using the swimming pool, a varying condition of the outdoor air during the day and various seasons of the year the design of the air-handling unit enables five different modes of operation at minimum operating costs.

2 FEATURES

The compact design of air-handling units of the KU-DB series makes the transportation and installation very simple. It contains all elements required for an automatic operation and a control box mounted on the unit or detached.

The casing is made of aluminium sections free from heat bridges and galvanized double steel plate lining stuffed with a 25mm thick thermal insulation, non-combustible according to DIN 4102 (A1 category material). For the additional protection the external and internal side of the unit are coated by a plastic layer. The design allows a simple handling and maintenance, including the replacement of components. On a special request the unit may be manufactured with a 50mm thick thermal insulation.

The unit comprises a 85 mm high platform made of galvanized steel profiles and rubber washers to prevent transmission of vibrations from the unit to the building.

SUPPLY AND EXHAUST AIR FAN

Centrifugal fans containing blades bent backwards and protected by a special varnish are statically and dynamically balanced. The sizes selected ensure a high degree of efficiency and allow a carefree and quiet operation. They are placed on a common platform together with the electric motor and contain shock absorbers and a flexible connection to the casing for vibration damping purposes.

The standard supply includes double-speed electric motors of a B3 form and IP54 protection based on a belt transmission to the fan (a regulating belt pulley facilitates a fine adjustment of the fan working point). On request the electric motors may be equipped with frequency converters.

The fan units are equipped with internal lighting and an excess pressure protector for control of operation.

AIR FILTER

Easily replaceable G4 category bag filters are mounted on the supply and exhaust air side. The degree of filter contamination is checked by means of an excess pressure protector.

DAMPERS

The system of dampers allows the change of the mode of operation. They are made of counterflow-connected aluminium blades equipped with rubber seals. The automatic operation of dampers is servomotor-controlled.

PLATE RECUPERATOR

It is made of aluminium fins additionally protected by an epoxy layer. The efficiency exceeding 60% brings the exhaust air to the limit of saturation and the inclined position of the plate recuperator allows the drainage of the condensate produced into a stainless steel drain pan.

The recuperator is protected against freezing.

The unit is normally produced with a plate recuperator without a by-pass. On request it can contain a by-pass, which will eliminate negative effects of the recuperator in the transitional period (operation mode 4).

HEAT PUMP

A set showing uniform features consists of a condenser, an evaporator, a compressor and the accessories (thermal expansion valve, filter, solenoid valve, gasholder, suction pressure switch and high-pressure controller,...) connected, tested and ready for automatic operation. In case of larger units components are disassembled into modules for transportation purposes and the connecting is carried out on site by the manufacturer's service technicians.

The evaporator and the condenser are made of copper tubes and aluminium fins and protected by an epoxy coating.

The evaporator and the drip tube are placed into a stainless steel drain pan, with the condensate discharge going through a siphon on the service side.

The internal lighting and inspection glass on the unit shell enable a constant control of the heat pump operation.

WATER HEATER

It is made of copper tubes and aluminium fins and also additionally protected by an epoxy coating against aggressive compounds to be found in the swimming pool water. Pipe connections are placed laterally and the scope of delivery includes an antifreeze thermostat and a three-way electric motor operated valve. The heat capacity of the exchanger is not designed to compensate for the heat transmission losses.

TECHNICAL SPECIFICATION 3

Description	Unit	Unit type KU ...-DB						
		3	4	5	6	7	8	9
Nominal volume flow of air	m^3/h	3750	5800	8000	11000	15000	18500	22000
Dehumidification capacity (1)	kg/h	11	17	24	33	45	56	66
Dehumidification capacity (2)	kg/h	19	31	42	61	79	96	118
Dehumidification capacity (3)	kg/h	24	37	51	70	95.4	118	140
Mixture ratio fresh-return air in winter below +5°C	%	0-30						
Mixture ratio fresh-return air in summer	%	0-100						
External fresh/supply air pressure drop (4)	Pa	300	350			400		
External return/exhaust air pressure drop (4)	Pa	300				350		
Air supply fan electric motor rating	kW	0.8/3.0	1.1/4.0	1.1/4.0	2.5/7.5	3.3/11	3.3/11	3.3/11
Sound pressure level Lp(A) - supply (5)	dB	79	75	77	77	80	80	80
Air exhaust fan electric motor rating	kW	0.8/3.0	0.8/3.0	1.1/4.0	1.7/5.5	2.5/7.5	3.3/11	3.3/11
Sound pressure level Lp(A) - exhaust (5)	dB	75	73	75	74	78	78	80
Compressor rating	kW	5.2	7.3	10.6	14.6	21.2	24.1	28.8
Air-handling unit rating total	kW	11.2	14.3	18.6	27.6	39.7	46.1	50.8
Connection voltage	V/f/Hz	400 / 3 / 50						
Water heater capacity at tw=80/60°C	kW	32	47	70	95	130	158	190
Heater connection	DN	25	25	32	32	40	50	50
Water flow through heater	m^3/h	1.37	2	2.9	4	5.5	6.73	8.03
Pressure drop at water side - heater	kPa	3.2	8.6	8.3	9.9	8.8	10.1	9.3
Valve connection	DN	20	25	25	32	40	40	50
Pressure drop through valve	kPa	4.8	6.2	8.6	11	7.4	7.2	7.1
Air-handling unit length	mm	3850	4150	4800	5000	5900	6050	6500
Air-handling unit width	mm	665	970	970	1275	1275	1580	1580
Air-handling unit height	mm	1430	1430	2080	2080	2730	2730	3340
Height of platform with rubber washers	mm	110				120		
Air-handling unit total weight	kg	920	1280	1760	2110	2630	3080	3560
Greatest module length (for transportation)	mm	2400	2650	2200	2200	2800	2800	3200
Greatest module width (for transportation)	mm	665	970	970	1275	1275	1580	1580
Greatest module height (for transportation)	mm	1540	1540	2190	2190	2850	2850	3460
Maximum weight	kg	560	770	720	915	1150	1245	1525

(1) Applies to a standstill period and the ambient air features t = 30°C, j = 54% r.h.

(2) Applies to the period of swimming pool operation in winter with a 30% share of fresh air. Fresh air features t = = 5°C, j = 85% r.h.

(3) In conformity with VDI 2089.

(4) External air pressure drops to be determined by the project engineer. The fan electric motor ratings are fixed on the basis of external pressures specified in the table.

(5) Sound pressure level L_p(A) at 250 Hz measured in the duct at a distance of 2 m from the fan.

- Parallel operation of two identical units (mirror design) provides double capacity.
- Features of an air-handling unit equipped with a plate recuperator with a by-pass (on request).

Subject to technical alterations!

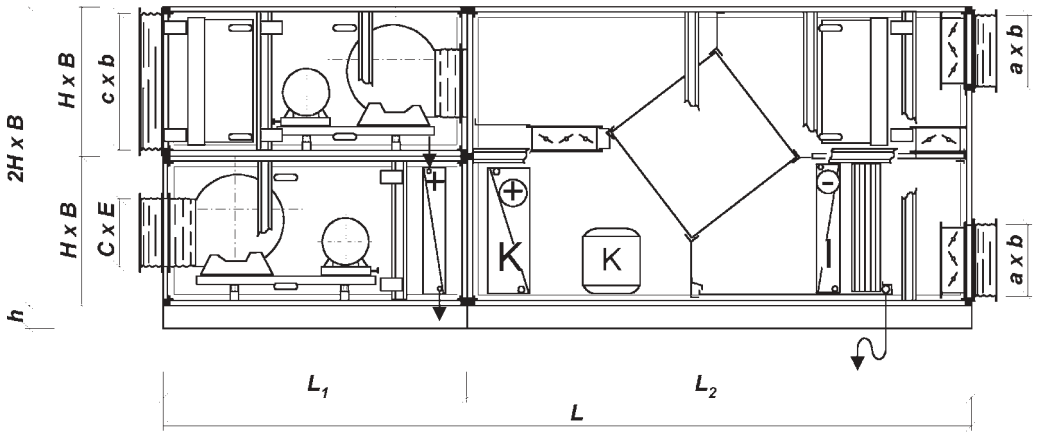
4

The DDC automatic controls used for the unit operation and control provide all air-handling unit functions:

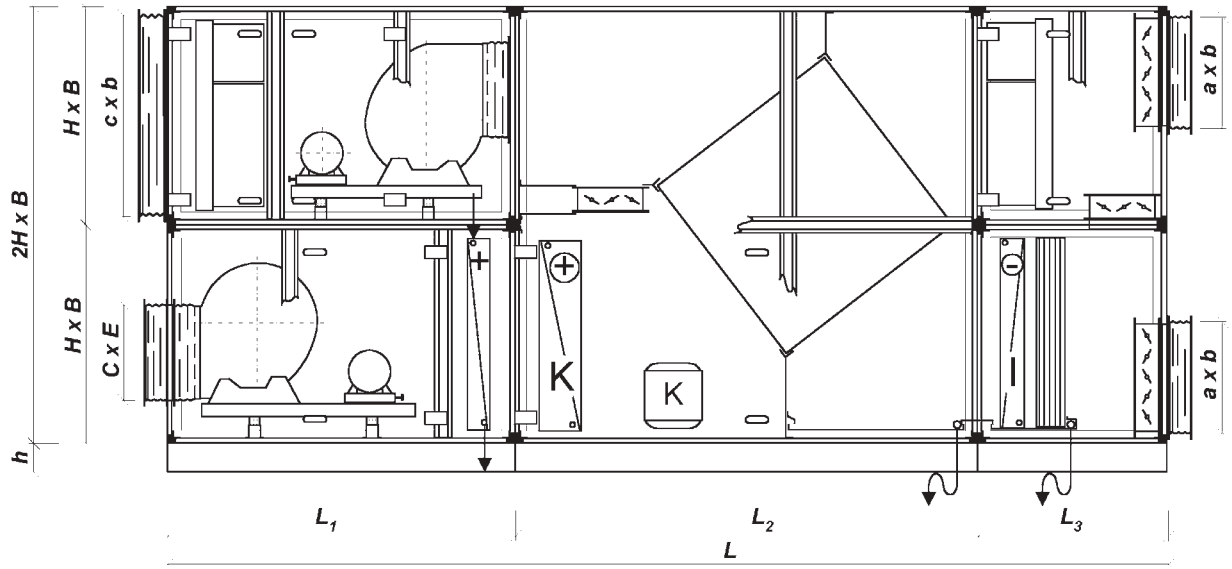
- ambient temperature and air humidity control;
- supply and exhaust fan operation management;
- heat pump operation control;
- monitoring of pressure drop due to filter impurities;
- damper operation management;
- water heater operation control and antifreeze protection;
- possibility of connecting to the central control or building management system (BAS);
- modem connection for the purpose of remote control.

The control box is completely wired and contains all components for operation management, protection, control and signalling or rather troubleshooting.

4 DIMENSIONS



	B	H	2H	L	L_1	L_2	h	a	b	c	e	f
KU 3-DB	665	715	1430	3850	1450	2400	110	335	600	650	322	322
KU 4-DB	970	715	1430	4150	1500	2650	110	335	905	650	361	361



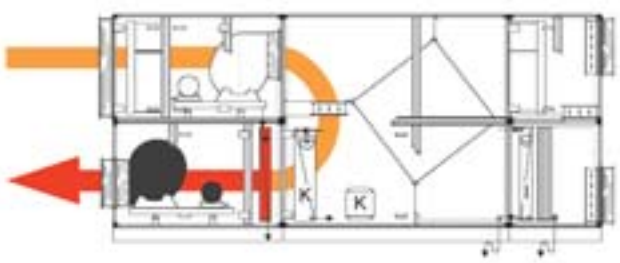
	B	H	2H	L	L_1	L_2	L_3	h	a	b	c	e	f
KU 5-DB	970	1040	2080	4800	1650	2200	950	110	530	890	960	453	453
KU 6-DB	1275	1040	2080	5000	1850	2200	950	110	530	1195	960	569	569
KU 7-DB	1275	1365	2730	5900	1950	2800	1150	120	630	1175	1265	638	638
KU 8-DB	1275	1365	2730	6050	2100	2800	1150	120	630	1480	1265	715	715
KU 9-DB	1580	1670	3340	6500	2100	3200	1200	120	830	1480	1570	715	715

- Other positions of connection orifices possible.
- For maintenance purposes a free space of "B" size is to be provided in front of the unit (on service side).
- If transportation or bringing into the building are impossible, the units are supplied disassembled and are re-assembled on site.

Subject to technical alterations!

MODES OF OPERATION 6

1 INITIAL OPERATION FOR RAPID HEATING OF SPACE IN WINTER



The supply fan is activated and supplies the treated return air (100% recirculation) through open dampers across filters and the water heater.

2 OPERATION IN THE STANDSTILL MODE (no swimmers)

Water vapour is removed from the saturated air by feeding a portion of the exhaust air through the plate recuperator to the heat pump evaporator. The air pre-cooled in the recuperator (sensible heat removal) is evaporator-cooled down to the dew point, which is accompanied by the condensate separation. The cooled and dehumidified air passing the recuperator is preheated (by removing heat from the swimming pool area exhaust air) and afterwards mixed with a portion of the untreated air. The mixture is heated on the heat pump condenser and fed into the space by a supply fan. The energy consumed for the heat pump operation returns to the condenser in form of thermal energy.

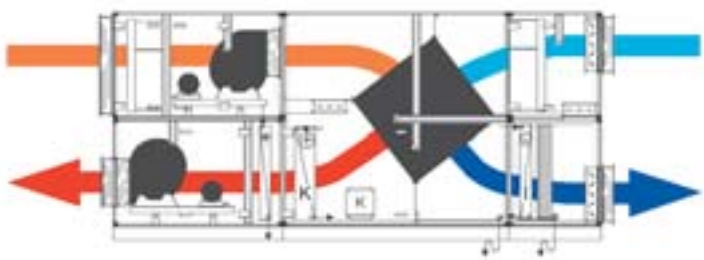
3 OPERATION WHEN USING SWIMMING POOLS IN WINTER

When using swimming pools in winter the evaporation of water from the swimming pool surface is intensified. The sanitary requirements are met by adding a portion of fresh air and the mixture of dehumidified return and fresh air raises the plate recuperator efficiency (removal of sensible and partly of latent heat of saturated air in the swimming pool area) which also contributes to the increase in the total dehumidification capacity.

4 OPERATION WHEN USING SWIMMING POOLS IN TRANSITIONAL PERIODS

The mode of operation in transitional periods at medium and high temperatures allows the use of maximum fresh air volumes, with activation of heat pumps, if required.

5 OPERATION WHEN USING SWIMMING POOLS IN SUMMER



In the summer period the heat pump is out of operation and the 100% fresh air is used.

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