

Manufactured in accordance with TU 4862-001-64600223-2011

CVM Manufacturing Works brings to your attention series of central air-conditioners KKLQM (KKTsM) (Framed Modular Central Air-Conditioner).

We are ready to provide our customers with professional advice on selection of central air-conditioners considering all structural and design features as well as optimal price/quality ratio. Engineering companies and our dealers in different regions of Russia are offered with KKLМ (KKTsM) central air-conditioners computer selection software

with prior training. KKLQM (KKTsM) central air-conditioners are composed of constructional and functional modules.

Functional modules serve for air handling processes. Thus, our equipment is capable to solve all possible tasks of air-conditioning system: heating and cooling, drying and humidification and filtration to any degree of air purity. Our air conditioners may be used in all spheres of technology: office buildings and trade centers, microelectronics and medicine, petroleum chemistry, clean room facilities, etc.

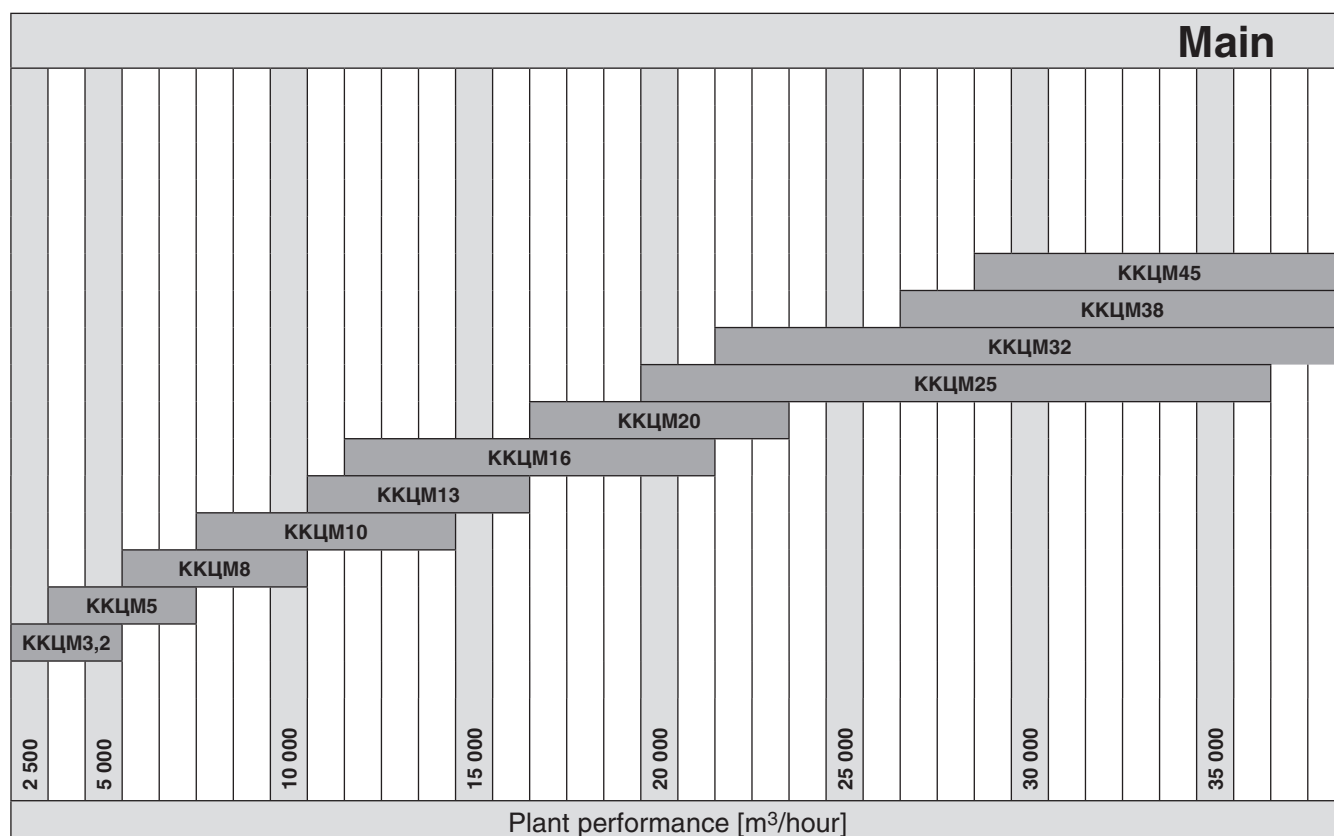
15 nominal sizes of KKTQM (KKTsM) central air-conditioners with rated capacity ranging from 3,200 m³/hour to 100,000 m³/hour and total pressure of up to 2,500Pa are currently available for supply. Wide range of standard sizes allows performing optimal selection of air velocity and plant cross-section. There are options of air handling units capable of operation with air flow and pressure outside working range.



Central air-conditioners are denoted as follows:

KKЦМ13L-50F-68-20-30-10-O-Y3

- Climatic version;
- Design variant:
 - O — General purpose industrial grade;
- Fan unit;
- Water-type air cooler unit;
- Water-type air heater unit;
- Filter unit;
- Enter section with valve (F, L, R, U, D);
- Operation side: R-right, L-left (in special cases operation side may be located on top (U) or bottom (D));
- Nominal size;
- Framed Modular Central Air-Conditioner



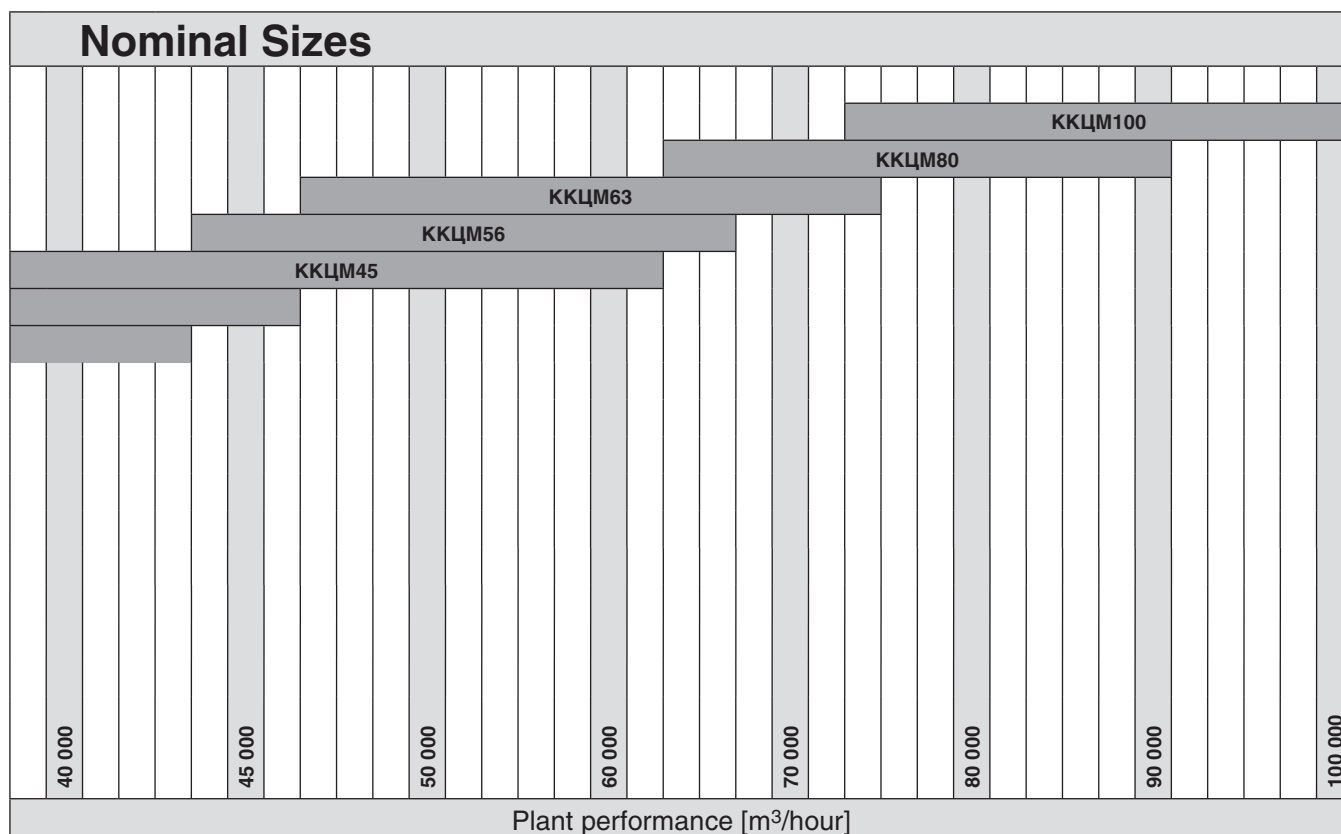
Maximum overall dimensions of conditioner composite modules do not exceed size of shipping container. Modules with large nominal sizes (starting from KKЦМ45 (KKTsM45) and higher) are supplied knocked-down at customer's request.

Automatic Control System see p.184.

CVM Manufacturing Works reserves the right to change the design of ventilation equipment as a part of continuous improvement process.

Plant Dimensions

Type	Capacity Rate [m³/hour]	Front Dimensions		Module Height with Frame H [mm]	Frame Height [mm]	Sandwich Thickness [mm]
		Module Width B [mm]	Module Height h [mm]			
KKЦМ3,2	3200	905	700	820	120	45
KKЦМ5	5000	1010	865	985	120	45
KKЦМ8	8000	1305	860	980	120	45
KKЦМ10	10000	1250	1100	1220	120	45
KKЦМ13	13000	1315	1165	1285	120	45
KKЦМ16	16000	1315	1460	1580	120	45
KKЦМ20	20000	1620	1465	1585	120	45
KKЦМ25	25000	1915	1490	1610	120	45
KKЦМ32	32000	1915	1810	1930	120	45
KKЦМ38	38000	1925	2080	2200	120	45
KKЦМ45	45000	2230	2060	2180	120	45
KKЦМ56	56000	2700	2180	2300	120	45
KKЦМ63	63000	2700	2580	2700	120	45
KKЦМ80	80000	3200	2580	2700	120	45
KKЦМ100	100000	3700	2580	2700	120	45

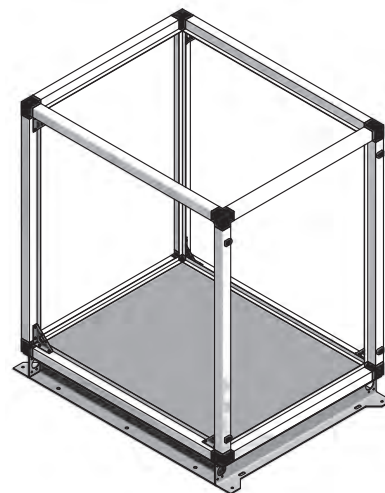
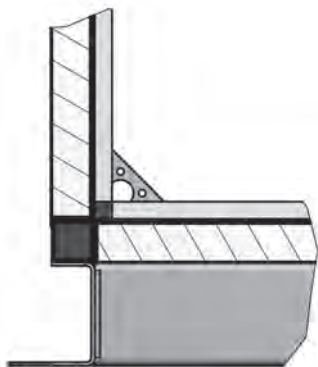


Housing consists of aluminum frame and sandwich panels of 45 mm thick.

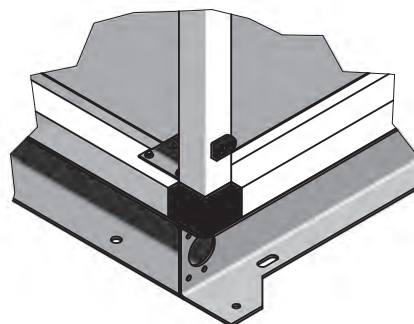
Frame-panel structure has the following advantages:

- ◆ Absolutely smooth inside surface of module
- ◆ Screws aren't seen on the inside of panels
- ◆ There are no heat channels

Three-way angle joint is made of strengthened nylon



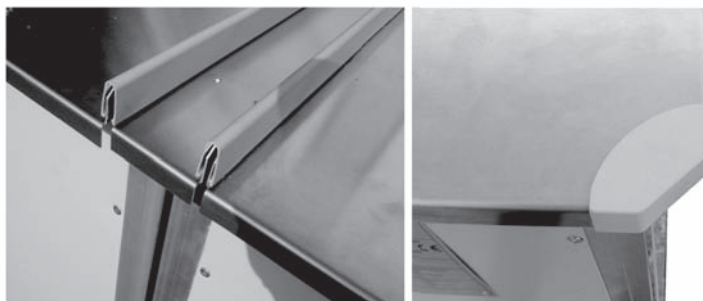
Main frame is made of steel coated with high-duty powder polymeric spattering. Reinforced frame is used for large sections.



Main frame has lift openings.

Galvanized painted cover fastened to the module supporting frame is used for outdoor installation. Cover dimensions exceed module dimensions by 30mm from each side. Angles are smoothed-out and covered with plastic inserts.

Separate modules cover joints are covered with U-shaped protective enclosures providing water and dust resistance.



Equipment is fitted with protective devices in accordance with safety regulations.

- ◆ Safety loop (grounding) is provided on access doors to all fan sections.
- ◆ Copper cable is used for grounding between fan frame and plant frame.
- ◆ All sections are grounded against each other.

Supplementary sections of outdoor mounted modules, which are to be installed next to the plant as a matter of module maintenance convenience, are optionally available.

Supplementary section depth depends on heat exchanger headers diameter and extra space for pilot-operated valves.

Supplementary section is made of the same material as central air-conditioner.

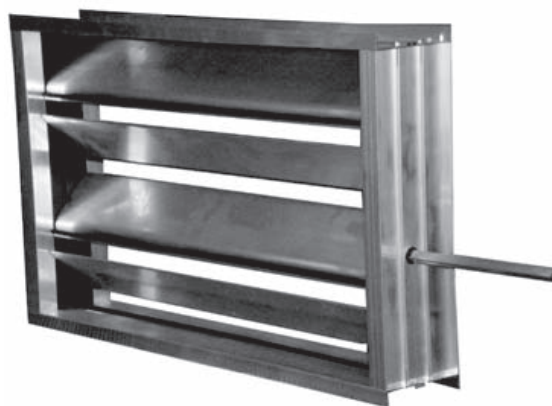
All inspection doors are mounted on 2 or 3 hinges and completed with 1-3 handles depending on the door height.

Doors may be equipped with double inspection windows and lights at additional order.

Sections with air valves (inlet, mixing, outlet, etc.) may be fabricated with any number and position of valves. Valves of various types are available.

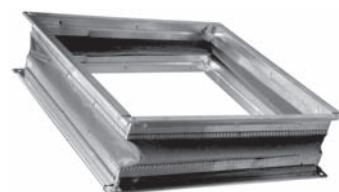
Valves

Standard valves are made of aluminum with nylon mechanical gears. Levers instead of nylon mechanical gears are available to the customer at additional request. Valves are supplied with expanded shaft for using with valve electric drive or manual drive (at additional order).



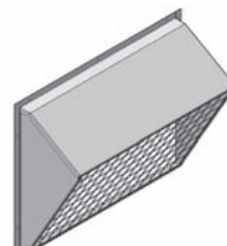
Flexible Inserts

Flexible inserts may be installed at the module inlet and outlet to avoid vibration transmission. Inserts consist of two galvanized steel flanged frames with damping insert between them. Inserts are fitted with grounding wire for potentials equalizing.



Protective Canopy

Optionally fresh air intake sections may be equipped with a canopy with safety mesh.



Filtering section may be completed with different types of filters providing required filtering degree and meeting all necessary requirements.

Average Efficiency Panel Filters

Synthetic filters for coarse particles are equipped with galvanized steel frame with double supporting welded mesh and plaited synthetic fibre in the core. Washable.

Class: G3 and G4

Mounting: on guiding rails.

Removal: from the service side.

Metal filters for coarse particles are equipped with galvanized steel frame and reinforced with aluminum wire. Washable.

Class: G1

Mounting: on guiding rails.

Removal: from the service side.

Average Efficiency Pocket Filters

Synthetic pocket filters on a galvanized steel frame.

Class: G4.

Mounting: on guiding rails.

Removal: from the service side.

High Efficiency Pocket Filters

High efficiency pocket filters are equipped with galvanized steel frame; the core is made of synthetic fiber.

Class: F7, F8, F9.

Mounting: on guiding rails.

Removal: from the service side.

Rigid High Efficiency Pocket Filters

High efficiency.

Rigid pocket filters are designed for fine dust. Filters are equipped with plastic frame; the core is made of fiberglass paper with thermoplastic planks; frame is fitted with rubber packing.

Class: F7, F8, F9.

Mounting: on guiding rails.

Removal: from the service side.

The plant may be completed with special filters with higher filtering degree at the special request.



General Information

Central air-conditioners use ribbed heat exchangers.

Each heat exchanger is mounted in sections on guide rails. As a matter of service convenience heat exchanger has removable side panel.

Heat exchangers are supplied completed with manifolds for condensate disposal and air bleeding.



Heat exchangers (heating) are designed for the following maximum heating water parameters:

Coolant parameters:

- ◆ Maximum coolant temperature: 180°C
- ◆ Working pressure: 1.2 mPa
- ◆ Maximum allowable excess pressure: 1.8 mPa for water-type models, and 3.2 mPa for Freon-type models
- ◆ Recommended velocity range for energy carrier in the pipe: 0.4 m/s to 1.75 m/s
- ◆ Recommended air velocity: up to 3.5 m/s.

Water-to-air and freon heat exchangers (cooling) are equipped with tray for condensate discharge to the sewage.



Electric heat exchangers are designed for inside temperature of up to 950°C.

Electric heat exchangers are equipped with safety thermostat.

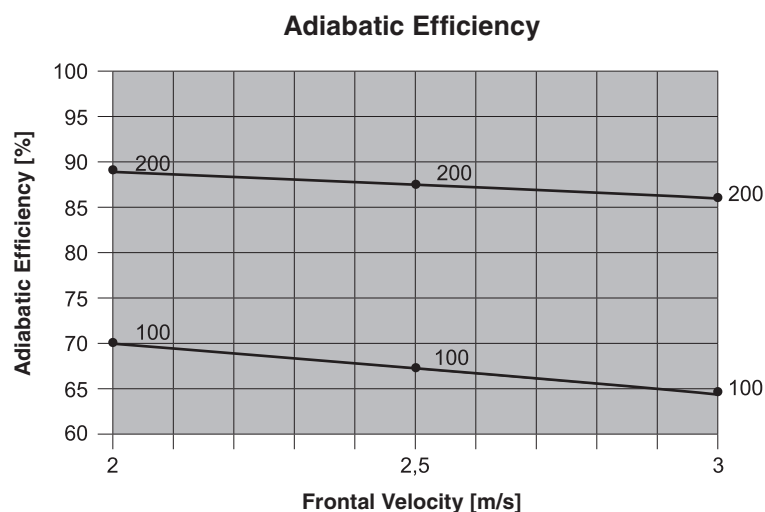


Surface Humidifiers

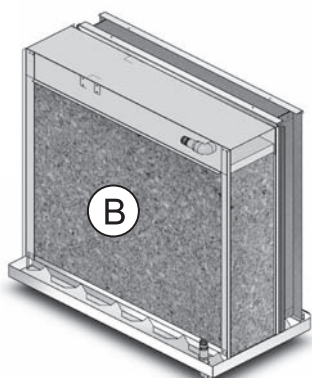
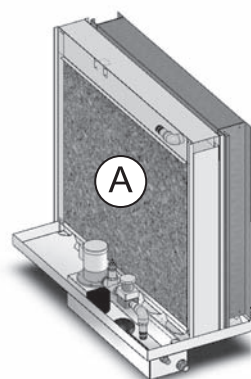
Humidification sections may be completed with two types of surface humidifiers: flowing water humidifiers and humidifiers with recirculation pump. Humidifier's cartridge is made of treated pulp and has a thickness of 100, 200 or 300 mm.

Drain pans collecting condensate are made of stainless steel. Drain connection diameter is 1". Liquid connections diameter is 1/2".

In case of frontal velocity exceeding 2.5 m/s drop catcher is required.



(A) Recirculation water surface humidifiers are supplied with a pump and a bypass valve. Drain pan, pump pocket, stainless steel filter, float valve for water inlet, thread connections for water inlet and drainage are also included. Combination of pan and pocket allows reducing quantity of water drained to the pan. Pump begins flushing water since the moment when the pan is practically empty. Thus, salt content in water is reducing and periodical change of water is provided.



(B) Flowing water surface humidifiers are similar to recirculation water surface humidifiers. Specifically they have the same liquid connections and pulp cartridge. But flowing water humidifiers are supplied without adjusting valves or any other control equipment.

Steam Humidifiers

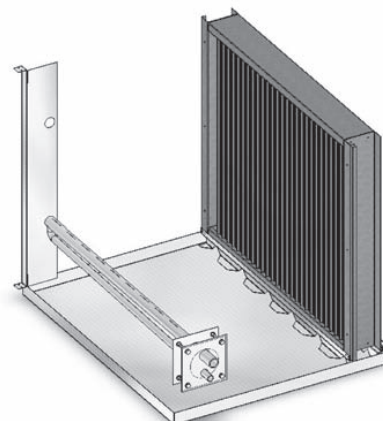
There several solutions for steam humidification sections:

- ◆ Only steam distribution collector connected to steam line. In such a case adjusting valve is required (not included in standard specification).
- ◆ Steam distribution collector and immersed electrode humidifier.

Steam generation plant is mounted separately, next to the central air-conditioner in a place most suitable for installation. Steam generation plant and collector are connected by means of steam line, included in the standard specification. Steam generation plant is completed with electronic control group. The plant can receive 0-10V or 4-20mA control signals from remote control panel (not included in standard specification).

Drain pans for condensate collecting are made of stainless steel. They are mounted with 4° inclination providing complete liquid drainage through the drain connection. Drain connection diameter is 1".

In case of frontal velocity exceeding 2.5 m/s drop catcher is required.



Immersed Electrode Humidifiers

Steam Flow Rate kg/hour	Power kW	Supply Voltage		
		V	Phase	Frequency
1.5	1.12	230	1	50
3	2.25	400	3	50
5	3.75	400	3	50
8	6	400	3	50
10	7.5	400	3	50
15	11.25	400	3	50
25	18.75	400	3	50
35	26.25	400	3	50
45	33.75	400	3	50
65	48.75	400	3	50
90	67.5	400	3	50
130	97.5	400	3	50

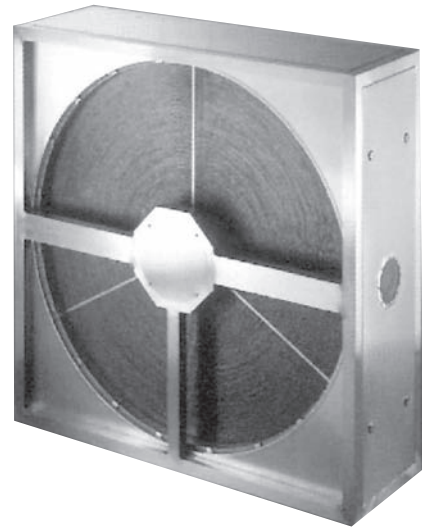
Spray Chamber

Spray chambers are supplied against the following specification:

- ◆ Housing with double walls (made of stainless steel)
- ◆ Stainless steel tray
- ◆ Two spray ramps with nozzles connected with pump outside the plant
- ◆ Water level in a tray is maintained by means of ball float valve
- ◆ Pump
- ◆ Stainless steel filter at the pump inlet
- ◆ Flow leveler at the section inlet
- ◆ Drop catcher at the section outlet.

Rotary recuperator

Rotary recuperator has the highest efficiency comparing with recuperators of other types. Heat is collected from exhaust air and transferred to the cold incoming air through the drum. Recuperation efficiency may reach herewith 75%. Recuperator consists of housing, drum, partition wall, driving belt and electric motor rotating drum at a constant or variable speed depending on requirements. The drum consists of alternating flat and corrugated aluminum plates forming multiple channels parallel to the rotor axis. Latent heat represented by humidity condensed in the discharged air flow is transferred simultaneously with sensible heat transfer. Drum plates may be made of water-absorbing as well as nonhygroscopic material. Maximum efficiency may be reached by means of installation of filters for both air flows. Fan location with respect to the recuperator shall be selected correctly for the purpose of system optimal operation. Percentage of exhaust air ingress to the intake zone may be reduced using blow-off sector cleaning impeller from exhaust air stains before returning to the intake zone.



Maximum Self-Cleaning Level

Fans shall be positioned as demonstrated in Figures A or B (see below). It shall be noted that in case of positioning A there is a possibility of negative pressure in a room during cold season. Such fans allocation is the most common. Pressure may be reduced by means of installation of adjusting valve in exhaust duct before recuperator. If return air is polluted, and air recirculation is contraindicated, then it is required to sustain pressure balance on both recuperator sides. Pressure conditions: $(p_1 > p_4) - (p_2 > p_3)$.

Maximum Efficiency during Summer Season

In case of fan positioning B, all heat from the motor and fan and from supply air will be dissipated in the exhaust air flow. Such installation option maintains constant pressure in a room throughout the whole year. Cooling energy transfer maximum effect is reached, when the fans are installed in such a way that exhaust air heat and heat generated by fan motors are removed by return air. This configuration is applicable in case, when fresh air is required. In case of fan positioning C may cause certain problems during balancing of air pressure in a room.

Maximum Efficiency during Winter Season

If the fans are installed as shown on the Figure D, then all the heat from the exhaust fan motor and almost all heat from supply fan motor will be utilized. This type of installation maintains constant pressure in a room throughout the whole year. Maximum cooling energy transfer is reached, when the fans are installed in such a way that exhaust air heat or heat generated by fan motors is recovered by means of fresh air. In case of implementation of this configuration exhaust air flowing over to supply air is inevitable.

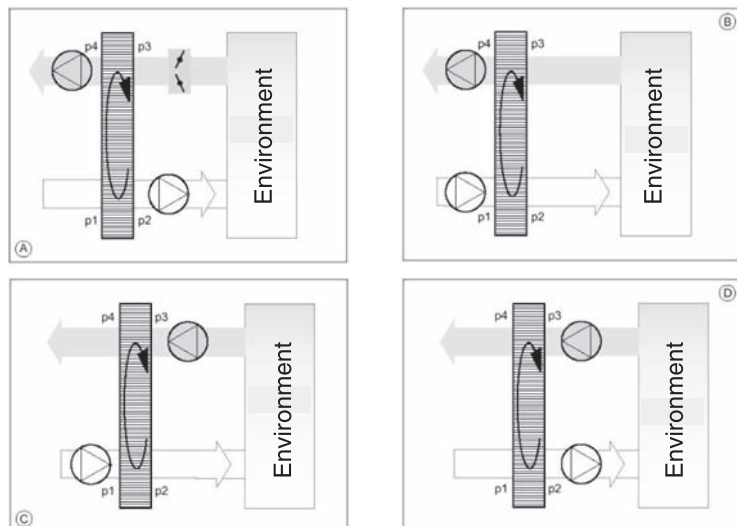
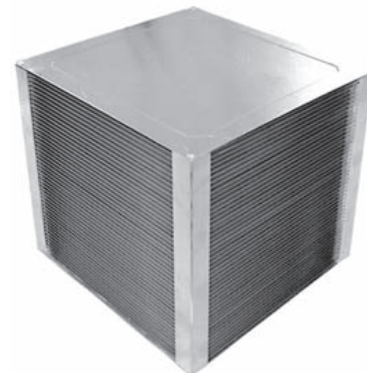


Plate Recuperator

Cross-flow plate recuperators are supplied in the following configurations:

- ◆ Exhaust part is at the top, and supply part is at the bottom («one above the other»);
- ◆ Exhaust and supply parts are placed in line.

Recuperator plates are made of aluminum or aluminum and zinc alloy. In case of recuperator implementation in facilities with aggressive environment, the plates are made of aluminum coated with epoxy resin-based paint. Other corrosion preventive measures are also put in place. Other components may be inserted after recuperator as well. Unlike the others such configuration does not require filter on supply side



- ◆ Exhaust and supply parts of the plant are located next to each other.

Stainless steel drain pan is located in the bottom part of the section. Drain connection diameter is 1".

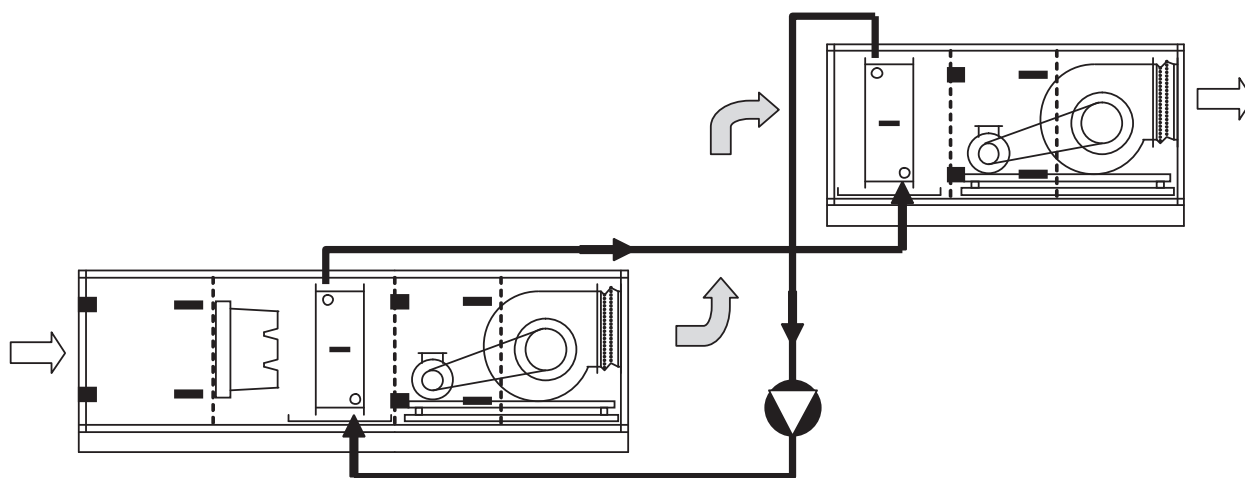
Plate recuperator section may be equipped with one or two (if required) bypass valves.

Recirculation Valve may also be installed in the section.

Recuperator with Intermediate Heat Exchanger

Thus system consists of two heat exchangers (air-to-fluid); one heat exchanger operates in exhaust air flow; another heat exchanger operates in supply air flow. Both exchangers are connected to the closed circuit.

Supply heat exchanger provides air pre-cooling air in summer and air pre-heating on winter. Exhaust heat exchanger is used for liquid (usually mixture of water and glycol) temperature changing in the closed circuit: liquid cooling in summer and heating on winter. Glycol heat recovery unit recuperation efficiency is approximately 30-40% at the normal conditions and upon equal flow rates of supply and exhaust air. Usually glycol heat exchangers have 6-8 rows. The system shall be completed with additional liquid carrying lines, circulation pump, expansion tank (not included in standard specification), and valves, if required.



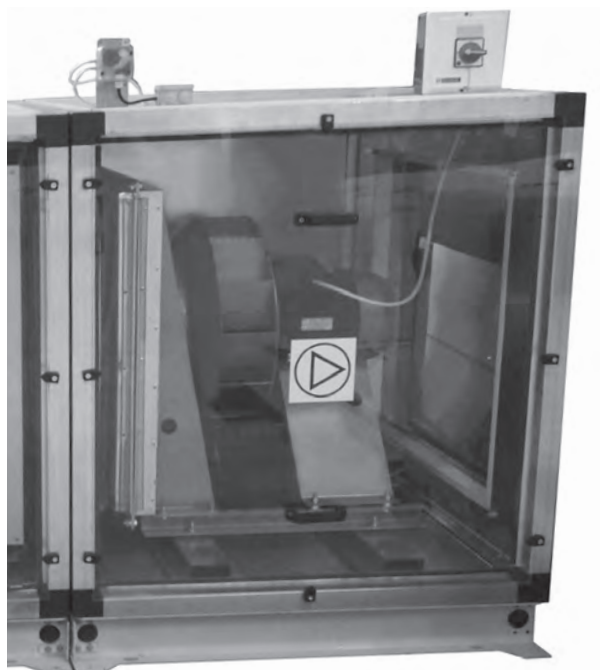
Fan sections are completed with the following components:

- ◆ Fan
- ◆ Electric motor
- ◆ Main frame with antivibration mounts
- ◆ Flexible inserts at the fan outlet
- ◆ Fan and motor grounding cable

Fans

V-belt transmission is not required for directly driven fan, since motor and fan have one common spindle.

There is also an option of stand-by fan and stand-by motor installation. Inlet and outlet of both fans shall be fitted with air valves as well as partition wall between fan sections (to provide operation of one fan during repair of the other fan).



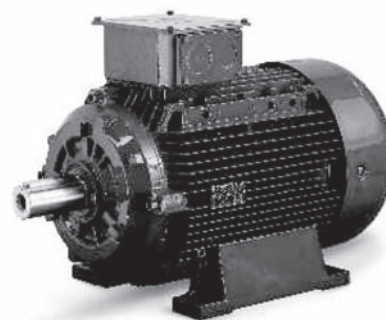
Electric Motors

Standard electric motors may be supplied in the following configurations:

- ◆ three-phase induction motor;
- ◆ closed structure with external fan
- ◆ squirrel-cage rotor
- ◆ B3-type layshaft
- ◆ IP55 protection index, insulation class F.

Motor may be supplied with the following features:

- ◆ Integrated inverter
- ◆ Single-phase
- ◆ Thermoresistant
- ◆ Thermal protection
- ◆ Equipped with heating element.



Antivibration Mounts

Fans are equipped with antivibration mounts.

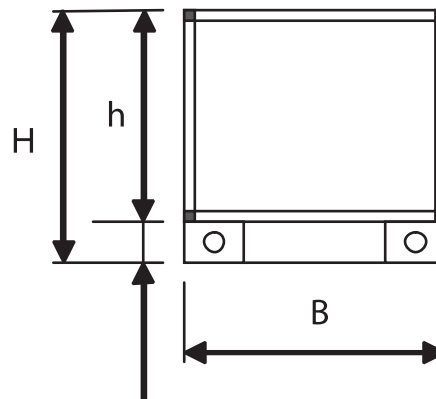
Silencers

Silencers are available in 4 lengths: 500, 1000, 1500, and 2000 mm.

Noise suppressing plates are made of silicate wool with thermoresistant rubber packing and dust and moisture repelling coating.

Module Codes

Notation	Name
KKЦМ **–10	Forward exhaust fan block
KKЦМ **–10U	Overhead exhaust fan block
KKЦМ **–10L	Left exhaust fan block
KKЦМ **–10R	Right exhaust fan block
KKЦМ **–10B	Back exhaust fan block
KKЦМ **–15	Stand-by side fan block
KKЦМ **–18	Stand-by top fan block
KKЦМ **–20	Water-type air heater
KKЦМ **–25	Electric air heater
KKЦМ **–30	Water-type air cooler+drop catcher+tray
KKЦМ **–35	Freon-type air cooler+drop catcher+tray
KKЦМ **–40	Spray chamber
KKЦМ **–45	Wet deck humidifiers
KKЦМ **–48	Steam humidifiers
KKЦМ **–50	Entering section with valve (F, L, R, U, D). Manual or electric drive (see Notes 1)
KKЦМ **–55	Intermediate chamber unit
KKЦМ **–56	Horizontal standby chamber
KKЦМ **–57	Vertical standby chamber
KKЦМ **–58	Exit chamber
KKЦМ **–60	General filter zone
KKЦМ **–65	Bag filter block
KKЦМ **–68	Panel filter block
KKЦМ **–70	Run around coils
KKЦМ **–75	Plate coil block
KKЦМ **–78	Rotor coil block
KKЦМ **–81	Noise attenuator – 500 mm
KKЦМ **–82	Noise attenuator – 1,000 mm
KKЦМ **–83	Noise attenuator – 1,500 mm
KKЦМ **–84	Noise attenuator – 2,000 mm
KKЦМ **–90	Panel with valve and flexible duct



Mounting dimensions see on p.85.

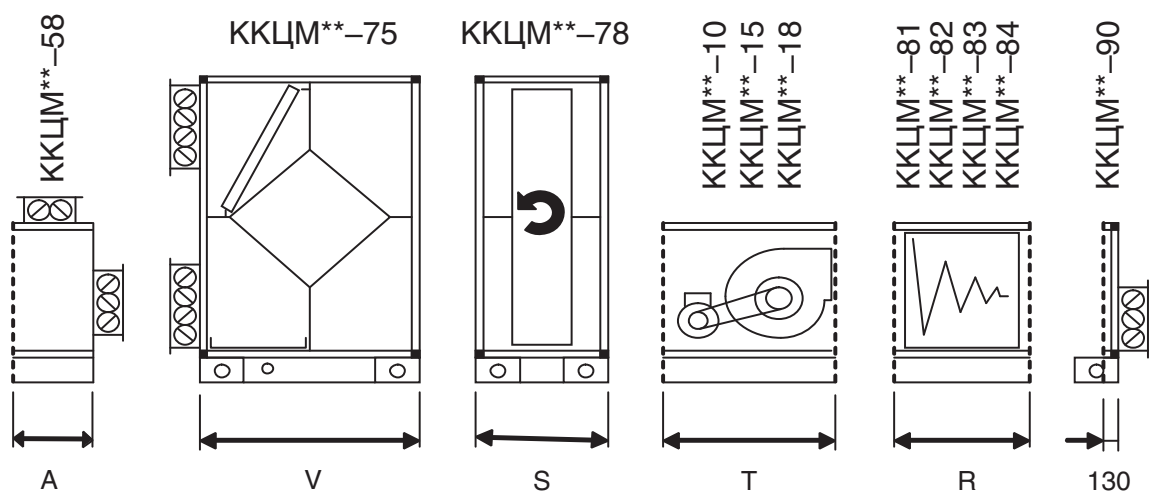
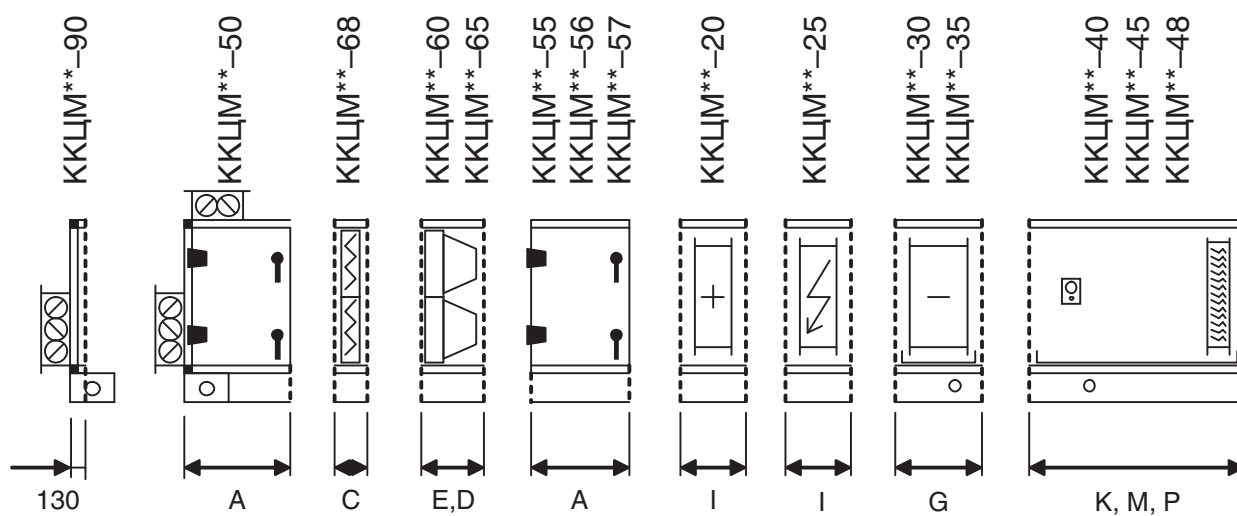
Note:

- 1) Valve heating is described in Automation chapter.
- 2) Operation side: R – right, L – left.
- 3) Valve actuators are described in Automation chapter.

In special cases operation side may be located on top or bottom (U and D correspondingly).

Module Dimensions

Type	KKЦМ **–10 KKЦМ **–15 KKЦМ **–18	KKЦМ **–20 KKЦМ **–25 KKЦМ **–28	KKЦМ **–30 KKЦМ **–35	KKЦМ **–40	KKЦМ **–45	KKЦМ **–48	KKЦМ **–50	KKЦМ **–55 KKЦМ **–56 KKЦМ **–57	KKЦМ **–58	KKЦМ **–60	KKЦМ **–65	KKЦМ **–68	KKЦМ **–70	KKЦМ **–75	KKЦМ **–78	KKЦМ **–81	KKЦМ **–82	KKЦМ **–83	KKЦМ **–84	KKЦМ **–90
	T [mm]	I [mm]	G [mm]	K [mm]	M [mm]	P [mm]	A [mm]	A [mm]	A [mm]	E [mm]	D [mm]	C [mm]	V [mm]	V [mm]	S [mm]	R [mm]	R [mm]	R [mm]	R [mm]	130 [mm]
KKЦМ3,2-	800	350	600	1100	1100	1100	400	600	600	650	650	300	750	1000	600	600	1100	1500	2000	125
KKЦМ5-	800																			
KKЦМ8-	800																			
KKЦМ10-	1100																			
KKЦМ13-	1400																			
KKЦМ16-	1900																			
KKЦМ20-	2000																			
KKЦМ25-	2200	400	750	1600	1600	1600	1100	600	600	650	650	350	850	Индивидуально	600	600	1100	1500	2000	125
KKЦМ32-	2200																			
KKЦМ38-	2200																			
KKЦМ45-	2800																			
KKЦМ56-	2800																			
KKЦМ63-	2800																			
KKЦМ80-	3500																			
KKЦМ100-	3500																			



Example:

KKЦМ(KKTsM)25R-50FU-60-20-30-10-55-82-58B

