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you're looking for...



KLIMAKAR  
Produces  
Ventilation Systems

# Four Season Air Handling Unit



Every part works in harmony...

## General specifications

FOUR SEASON air handling units are manufactured in 28 different models. The air-flow range is 900 m<sup>3</sup>/h - 133.000 m<sup>3</sup>/h for air handling units intended for cooling and heating whereas it is 900-177.000 m<sup>3</sup>/h for air handling units intended for only heating.



FOUR SEASON air handling units have a modular structure and double-skin panels. They can be produced using panels having 50 mm or 60 mm thickness and as rock-wool, glass-wool or polyurethane insulated depending on the demand and application. The external surface is steel plate painted in standard RAL 9002 color whereas galvanized, painted or stainless steel plates can be used for internal surface depending on the demand and application. The smooth internal surface allows for easy cleaning and prevents accumulation of dust.

The carcass of FOUR SEASON air handling units is a durable structure formed by aluminum profiles coated with specifically-designed electrostatic oven paints and plastic corner connectors. EPDM-based seals are used to ensure impermeability.

The filters are selected considering the environment where the unit will be operated and the requirements of the process. Special designs allow for the prevention of possible air leaks during airflow and high efficiency of coils and filters.

Depending on demand, plate, rotor or coil type heat recovery units are used to ensure energy efficiency which is an important matter today.

Fan-motor group is selected considering the air volume and total static pressure to ensure maximum efficiency. The fans can be forward curved, backward curved, airfoil or plug type depending on the intended use and the desired design criteria. Only the fans with certified performance tests are used. The motors are included in class IP55 as a standard and compliant with CE norms.

The dampers used in air handling units are made from aluminum profile, aluminum wings and plastic-based gears. The gears are located outside the airflow. The special-design plastic seals ensure tightness between damper wings.

## Air Handling Unit selection program

The selection and design of Four Season brand air handling units and the organization of the technical report including the performance data can be easily accomplished via KLİMAKAR KSSP air handling unit selection program.

Using the air handling unit selection program:

You can determine the optimum model after seeing the air velocities on the coil surface and unit cross-section for different unit models depending on the air flow desired. You can lay together the components you select and form the unit you prefer. You can define the accessories for each component. When choosing the components, you can see the brand and model alternatives, if any, along with their price ratio, and you can choose the most suitable components in terms of efficiency, price, etc. You can decide the number of components of your unit and define the maximum cell length. You can see the dimensions and weights of the unit components.

You can see the technical report including the price, designed picture and required information on the unit you choose.

### Four Season Air Handling Unit Sections and Output ranges

MODEL	Air Handling Unit Internal Section			Heating / Cooling / Ventilation		Heating / Ventilation
	W	x	H	Output m <sup>3</sup> / h		Output m <sup>3</sup> / h
	(mm)		(mm)	Minimum	Maximum	Maximum
KKS-S 062 - 046	620	x	465	926	1.852	2.469
KKS-S 062 - 062	620	x	620	1.296	2.592	3.456
KKS-S 093 - 062	930	x	620	2.160	4.321	5.761
KKS-S 124 - 062	1240	x	620	3.024	6.049	8.065
KKS-S 093 - 093	930	x	930	3.395	6.789	9.053
KKS-S 124 - 093	1240	x	930	4.753	9.505	12.674
KKS-S 155 - 093	1550	x	930	6.110	12.221	16.295
KKS-S 124 - 124	1240	x	1240	6.481	12.962	17.282
KKS-S 155 - 124	1550	x	1240	8.332	16.665	22.220
KKS-S 186 - 124	1860	x	1240	10.184	20.368	27.158
KKS-S 155 - 155	1550	x	1550	10.554	21.109	28.145
KKS-S 186 - 155	1860	x	1550	12.900	25.800	34.400
KKS-S 217 - 155	2170	x	1550	15.245	30.491	40.654
KKS-S 186 - 186	1860	x	1860	15.610	31.221	41.628
KKS-S 217 - 186	2170	x	1860	18.449	36.897	49.196
KKS-S 248 - 186	2480	x	1860	21.287	42.574	56.765
KKS-S 217 - 217	2170	x	2170	21.671	43.341	57.789
KKS-S 248 - 217	2480	x	2170	25.005	50.009	66.679
KKS-S 279 - 217	2790	x	2170	28.339	56.677	75.570
KKS-S 310 - 217	3100	x	2170	31.673	63.345	84.460
KKS-S 248 - 248	2480	x	2480	27.775	55.550	74.066
KKS-S 279 - 248	2790	x	2480	31.478	62.956	83.942
KKS-S 310 - 248	3100	x	2480	35.182	70.363	93.817
KKS-S 341 - 248	3410	x	2480	38.885	77.770	103.693
KKS-S 403 - 248	4030	x	2480	44.440	88.880	118.506
KKS-S 465 - 248	4650	x	2480	51.846	103.693	138.257
KKS-S 527 - 248	5270	x	2480	59.253	118.506	158.008
KKS-S 589 - 248	5890	x	2480	66.660	133.320	177.759



# Four Season Air Handling Unit



Functionality and Quality  
in Every Detail...



## Casing Structure

Specially drawn aluminum profiles, intermediate profiles and panels are used in the “Four Season” air handling unit. Aluminum profiles are painted electrostatic oven paints. The profiles are connected with specially-designed plastic corners.

The panels are produced in standard dimensions and as two walls. Rock-wool, glass-wool or polyurethane is used between such walls as insulation material. The thickness of the panel is 50 mm or 60 mm. The outer skin of the panels is painted in standard RAL 9002 color that is coated with protective poly-film whereas the internal surface is made from galvanized, stainless or painted steel plates. The thickness of the plate is 0,8 to 1,2 mm. The panels can be dismantled outside the unit. The unit is designed to have a completely smooth internal surface. The panels are directly connected to the profiles with self-drilling screws. EPDM-based sealing gaskets are attached between the panels and profiles. Intermediate profiles are used between panels. The main profiles are filled with insulation material.



Air tight service doors are mounted where necessary on the unit. Service covers can be produced to have observation glass depending on demand and intended use (hygienic, etc.).



The base of the unit can be produced as a single part or to have multiple cell-based parts according to the size of the unit. Air handling units are placed on 141 mm base in low pressure conditions and 200 mm base in high pressure conditions. There are holes on the base for lifting intended for easy transport.

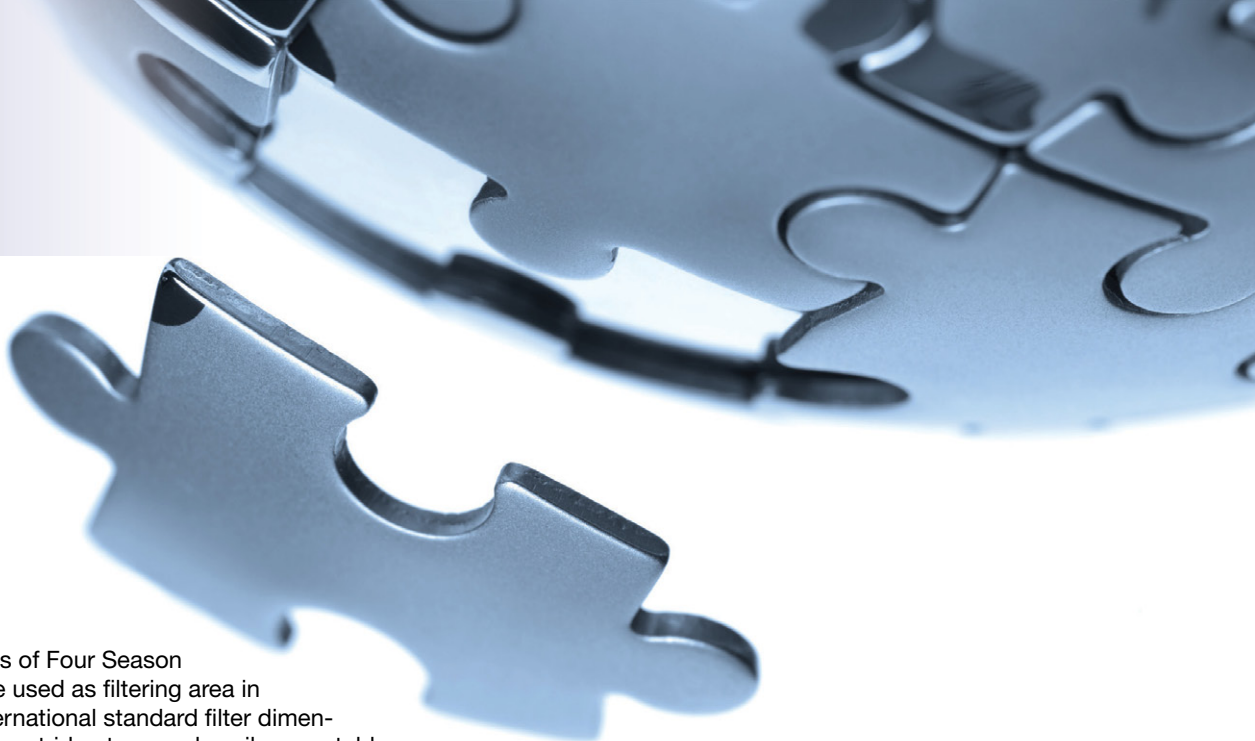
For the outdoor units, there are special roofs designed to protect the unit from outdoor weather conditions.

The air handling unit can be transported cell by cell or as dismantled for easy transportation and it can be assembled on the site. Special connectors allow for the assembly of cells. Special EPDM seals are used to provide tightness in the connection interface.



## Accessories

Four Season air handling units are composed of optional lightning, observation glass, manometer, flexible connection at discharge and suction openings, siphon, maintenance switch, damper motor and rain protection.



## Filters

Whole cross sections of Four Season air handling units are used as filtering area in compliance with international standard filter dimensions. The filters are cartridge type and easily mountable and dismountable. Air leakage is prevented thanks to optimal design. There is a service door located on the filter cells for maintenance and replacement. There are optional manometer, illumination and observation glass.

Considering indoor air quality in air handling units, there are different types of filters coming in different efficiency levels. Typically, these are panel filter, bag filter, metal filter, active carbon-filter, compact filter and hepa filter.

Panel filters are used as pre-filters. The material of the filter is synthetic or metallic. Metal filters can retain oil. The classes of the filters we use are G2, G3 and G4 for synthetic filters and G2 and G3 for metallic filters.

Bag filters are used for highly-efficient air filtration. Their dust retention capacity is quite high. They should be used together with a pre-filter to extend their shelf life. The bag size range is 305 mm, 508 mm and 635 mm depending on the air volume. The classes of the filters we use are G4, F5, F6, F7 and F8.

Compact filters are highly-efficient filters. They should be used together with a pre-filter. Since their depth is 292 mm, these filters occupy a little space in the unit. It is possible to equally distribute the air on the whole surface of the filter due to the structure of the filter. The classes of the filters we use are F6, F7, F8 and F9.

Hepa filters should be preferred for hygienic environments. They are highly efficient. These filters are assembled after the ventilator and should absolutely be used along with a pre-filter. The classes of the filters we use are H10, H12, H13 and H14.

Active carbon-filters are used to suction the molecules of foul gasses or vapors in the air (exhaust fumes, rubber odor, alcohol, hydrocarbon, chlorine and other odors dispersed from chemical production processes). There is an alternative model designed for the suction of odors such as hydrogen sulfite and sulfur dioxide dispersed from other industrial processes. They should be used along with a pre-filter to extend their shelf life.



## Suction – Mixture – Blowing Cells

### Dampers

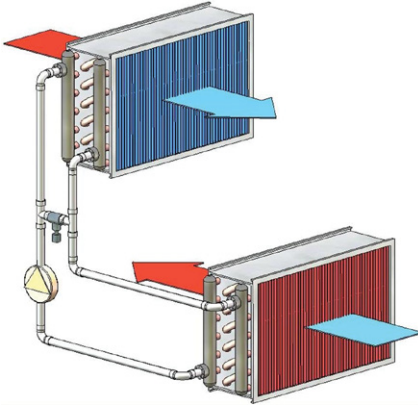
The damper sections are sized according to the air velocity. As a standard, dampers in aerofoil structure and having opposed blade are used. The casing and blades of the damper are aluminum. Air leakage is minimized by means of the seals at the edges of blades. Dampers are produced to be for manual use or with servomotor.

Servomotor, rain hood and flexible connectors can be included optionally.

Damper sizes are standard as per the type of the air handling unit and designed to allow for the passage of 100% air volume.



# Four Season Air Handling Unit



## Heat Recovery System

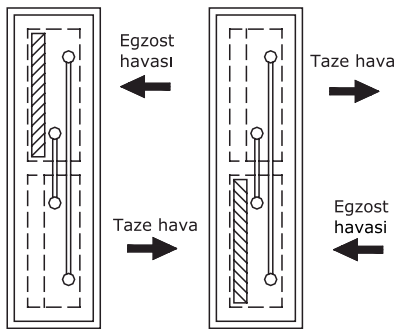
Today, energy efficiency is an important matter. Therefore, the use of heat recovery systems in air handling units is gradually increasing.

There are coil, plate and rotor type heat recovery systems used in Four Season air handling units.

The efficiency generally ranges between 30-50% for coil type, 40-60% for plate type and 60-80% for rotor type.

## Coil Type Heat Recovery

The heat transfer with double-coil type heat recovery is performed by the fluid circulating in the coils of the supply and exhaust units in a closed cycle. The heat is first transferred from air to water and then from water to air. Ethylene glycol is used in the areas where there is a risk of freezing. There is a need of circulation pump and balance tank for the system. There is a condensation pan used by the exhaust.



## Plate Type Heat Recovery

Cross-flow plate type heat recovery units allow for the heat transfer between the fresh air and the exhaust air without moving parts. It can allow for complete tightness even in high pressure differences. It can operate at temperatures ranging between  $-30^{\circ}\text{C}$  and  $90^{\circ}\text{C}$ . The plates are made of aluminum, epoxy-coated aluminum or stainless steel. They are manufactured to have by-pass dampers to prevent freezing in low temperatures. A condensation pan is mounted in the exhaust section to drain the condensed water.

## Rotor Type Heat Recovery

They are compact and have high thermal efficiency. The heat transfer is actualized via the aluminum plates in wavy plate form. The rotation of the rotor is performed by the electric motor with a vee belt drive.

They can generally be categorized in 3 types:

1- Condensing heat wheels:

Standard condensation heat exchanger for transfer of sensible energy. It is a cost effective solution for heat recovery.

2- Sorption heat wheels:

They transfer humidity with their special surface in ideal temperatures in standard comfort ventilation.

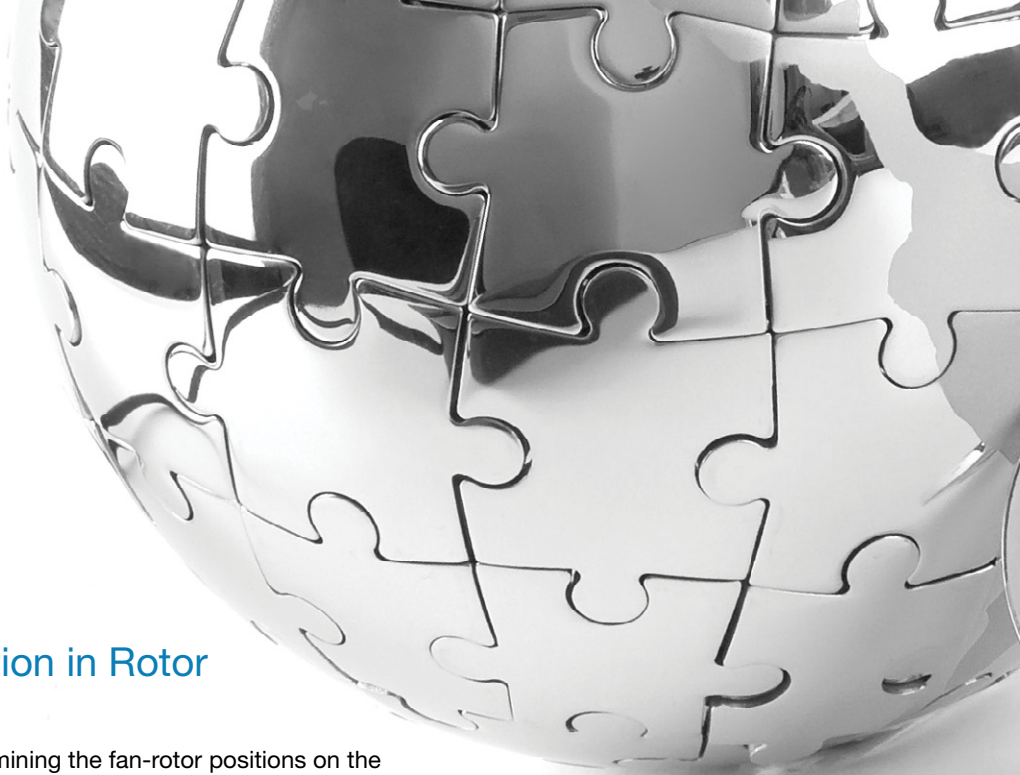
3- Enthalpy heat wheels :

Preferred for climate conditions with high temperatures and humidity. It transfers higher levels of humidity through the filling surfaces coated with desiccant materials. Reduces the energy consumed for cooling with its pre-cooling and dehumidifying functions, therefore provides significant amounts of energy savings since low capacity cooling groups are used.

Rotor diameter is between 250-5000 mm. It takes little space due to its compact structure. Heat efficiency of the heat wheels has been optimized for 12 rotation speed per minute. Rotation control can be performed with a frequency convertor if capacity control for varying climate conditions is desired. Capacity control request has to be pointed out when placing the order. There is no risk of freezing.

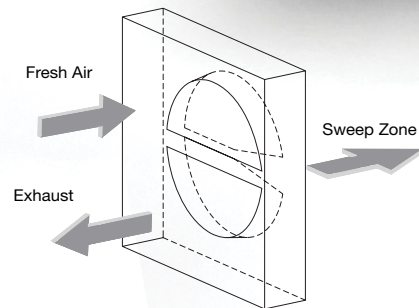






## Determining the Fan Position in Rotor Air Handling Units

The sweep zone which occurs when determining the fan-rotor positions on the heat wheel must be paid attention to. According to EN308 and ARI 1060 is 3 %. Leakage amount on a properly configured, pressurized heat wheel which is produced with a standard sweep zone is 0,5 % and below. Sweep zone angle for fan positions and pressure difference is indicated on the chart.

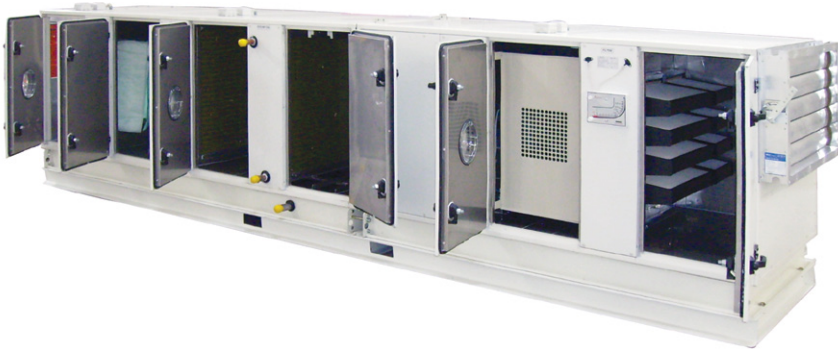


## Fan Position, Pressure Difference and Sweep Zone

Fan Position	$\Delta P < 200 \text{ Pa}$	$\Delta P 200\sim 500 \text{ Pa}$	$\Delta P 500\sim 800 \text{ Pa}$	$800 \text{ Pa} < \Delta P$
	Sweep Zone Not Required	Sweep Zone Standard 5°	2.5°	Sweep Zone Not Recommended
	Sweep Zone Not Required	Sweep Zone Standard 5°	2.5°	Sweep Zone Not Recommended
	Sweep Zone Not Required	Sweep Zone Standard 5°	2.5°	Sweep Zone Not Recommended
	Not Recommended			

$\Delta P = P1 - P3$  (Fresh Air and Return Air Pressure Difference)

# Four Season Air Handling Unit



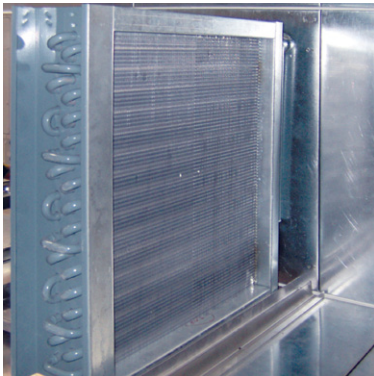
## Electric Heater

Electric Heater is used optionally on Four Season Air Handling Units. Additionally, it is also used on handling unit inlets in areas with high risk of freezing. It is also used on handling unit outlets of systems which need instant heating.

Electric heater casing is made of galvanised or stainless steel optionally. All components are rustproof material. Protection class is IP43. It can be step or proportional controlled. It holds CE certification. The heaters have automatic-reset limit thermostat and manual-reset safety thermostat as standard.

If the heater is above 30 Kw, the handling unit's fan is recommended to be kept running for 2-3 more minutes after the power is cut off.

If the air handling unit is equipped with an electric heater, it is a requirement to take precautions to cut-out the electric heater in situations where the fan does not run or runs at very low speeds (below 1,5 m/s).



## Heater and Cooler Coils

Heating and cooling is executed by coils. Coil pipes can be copper or steel while the fins can be aluminum, copper, steel, epoxy coated aluminum or epoxy coated copper. Direct expansion coils are manufactured as copper pipe- aluminum wings while the collectors are copper.

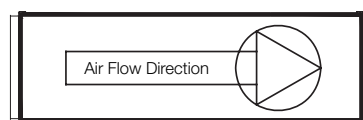
Coil casing is made of galvanized steel plate. Test pressure for the coils is 20 bars. Pipe inlet-outlet openings on hot and cold water coils are threaded, pipe inlet-outlet openings on boiling water and steam coils are flanged. It is designed to be taken out easily for maintenance purposes. The air passes only through the coil surface with the special by-pass plates.

Air and water is designed as counter flow to obtain high efficiency. Water input goes through the bottom while the water output goes through the top on hot and cold water coils.

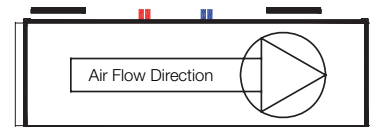
Coil surface can be used efficiently on cooling coils thanks to the condensation pan which is built-in on the panel. Condensation pan is made of stainless double- plate. Following the cooler coil, a separator is used to hold the condensed water in the air.



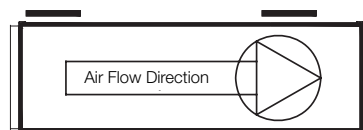
## Coil and Service Directions



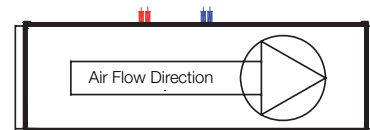
Coil Depending on the Air Flow Direction Right  
Service Depending on the Air Flow Direction Right



Coil Depending on the Air Flow Direction Left  
Service Depending on the Air Flow Direction Left



Coil Depending on the Air Flow Direction Right  
Service Depending on the Air Flow Direction Left



Coil Depending on the Air Flow Direction Left  
Service Depending on the Air Flow Direction Right

## Steam Humidifier

The humidifier produces steam from tap water using electrical energy. It is microprocessor controlled.

Steam received from the humidifier unit humidifies the air using the steam distribution pipes within the handling unit. There are many models ranging from 1,5 – 130 kg/h that operate with On-off or proportional controls.



## Fill Type Humidifiers

Performs evaporative humidification in which air is put through over moist filling. The filling is moistened using a circulation pump system. The efficiency of the humidifiers that are used are 65 %, 85 % and 95 %. Separators are installed on the humidifier cells at air speeds above 3,5 m/s.

## Isothermal Gas Consuming Humidifiers

Isothermal Gas consuming humidifiers can produce isothermal steam by consuming gas dues to their compact structure. They can burn natural gas (G20 or G25), propane (G30) or butane (G30) without having to replace any parts during the installation. Isothermal steam humidifiers are installed on the outside of the air handling unit, steam produced is forwarded through the steam distribution pipes and inside the handling unit.



## Atomizer Humidifiers

Atomize humidifiers are appliances which produce high quantities of steam by consuming very low amounts of energy. There are models ranging from 100-600 kg/h. These appliances which can operate proportionally can be connected to more than one air handling units. The modifier operates with demineralized water. Atomizer humidifier sprays the water with a pressure of up to 75 bars and pulverizes it to ensure complete mixture in the air. It consumes approximately 4 watts of energy for beaker liter/hour humidification. The system is in compliance with the standards of DIN 1946 hygiene standards. System equipments are:

- One frequency controlled pump
- Control Unit
- Distribution pipes
- Automatic colon valves
- Discharge valves
- Stainless steel sprinklers
- Drift eliminator.

## Sound Attenuators

Noise level which is a significant factor in ventilation systems is reduced to an acceptable level with the aid of silencers. Sound absorption coefficient of the mufflers varies depending on the size of the sound attenuators.

Muffler cells consist of slots in which rock wool is placed within the galvanized or stainless sheet metals. Sound Attenuators components are designed to be able to resist deformation at an air speed of 20 m/s.

6 different Sound Attenuators lengths are offered with the Four Season air handling units. Sound absorption capacities for Sound Attenuators sizes are shown in the following charts:

**Sound absorption capacities for Sound Attenuators length**



Muf- fler size (mm)	Sound absorption capacity (dB)							
	63 hz	125 hz	250 hz	500 hz	1000 hz	2000 hz	4000 hz	8000 hz
600	5	9	15	16	16	11	8	8
900	6	12	21	22	23	16	11	11
1200	7	15	27	28	29	20	12	12
1500	9	19	33	34	36	25	17	17
1800	10	22	39	40	42	29	20	20
2100	11	25	45	46	48	33	23	23

# Four Season Air Handling Unit

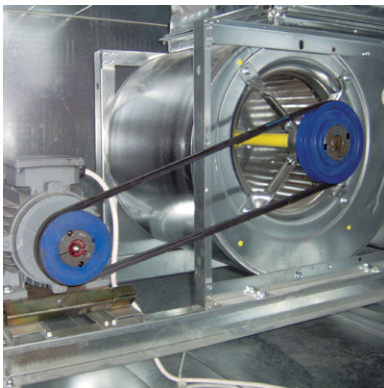


## Fans and Motors

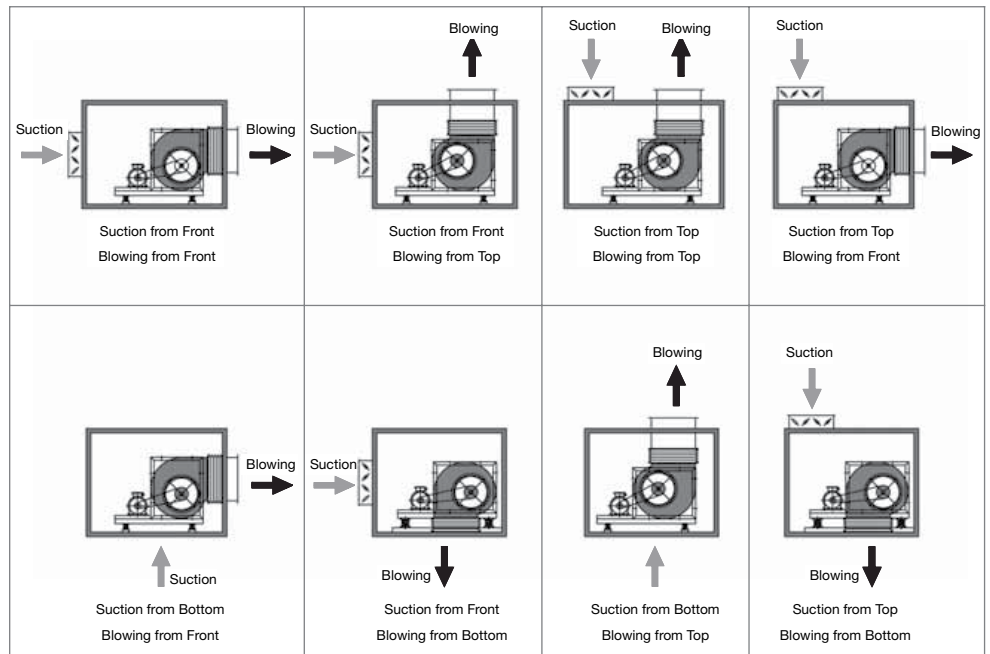
Various fan types are offered in accordance with the air flow and the total static pressure in each section. Fans which are in compliance with the International standards that have been dynamically balanced can be forward curved, curved or airfoil blade depending on the intended use and the customer's preference. Fan-motor group should be selected considering high efficiency depending on the air flow and total static pressure, low noise level and minimum energy consumption. Fan-motor group is connected to the unit with spring insulators to prevent vibration.

Fixed diameter, bush pulleys are standard in our air handling units while it is possible to use frames of varying diameters optionally. SPZ, SPA, SPB and SPC belt types are available. A special mechanism stretches the belt. There is a service door with a safety guard on the fan cell for service and maintenance purposes. Plug type fans are used for special situation and the motor is direct coupled.

Motors are of IP55 protection class as standard and in compliance with CE norms. They are single speed as standard and can be used with double speed motors optionally. A frequency converter can be provided as accessory for motor speed control.



## Fan Operation Types

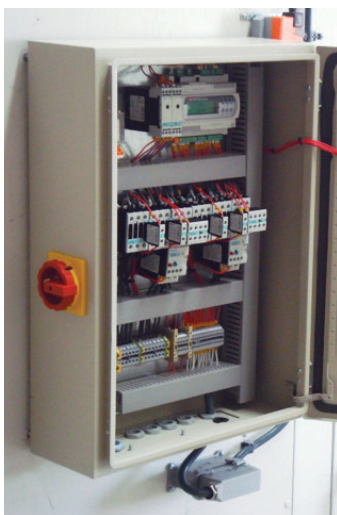
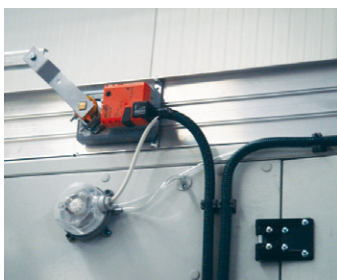


## Diffuser

Diffusers are used after the fan if there are components like filters, coils and sound attenuators in order to allow for the homogenous dispersion of air above these components.

# Controller and Control Functions

Function – Equipment	Definition	Standard – S Optional - OPT
Emergency stop button	Emergency stop button which stops the system in case of an emergency	S
Electric terminal board to establish external connections	Electric terminals of motors are put on a board where it allows for easy access to the external part of the unit.	S
<b>Automatic Control</b>		
Microprocessor	Air temperature control at the spot or spots desired	OPT
Duct type heat sensor	Humidity control at the spot or spots desired	OPT
Duct type humidity sensor	Control of two-way and three-way valves	OPT
Valve servomotors	Control of dampers	OPT
Damper servomotors	Control of air pressure	OPT
Frequency converters		
<b>Microprocessor Control</b>		
Microprocessor	-Air volume is checked. The pressure between two locations can be controlled. In case the desired volume is not attained (blocking, failure, contamination), alarm data is generated.	OPT
Duct type heat sensor	- Adjustment of ventilator volume desired according to the operation altitude and temperature.	
Duct type humidity sensor	- The algorithms of pre-heating, heating and cooling can be performed according to input, output or pre-heating temperatures as desired. The limit of the blowing heat can be controlled.	
Different pressure pressurestats	- Detection of the contamination of all filters used at the same time and generation of alarm data.	
Damper servomotors	- Efficient operation conditions are attained by means of DX batteries control.	
Frequency converters	- It is possible to see and change all parameters via terminal located on the unit.	
	- All units can be communicated as a network.	
	- Operation and configuration parameters can be password-protected.	
	- Audio and visual alarm data can be provided.	
	- Daily, weekly operation-downtime timing can be performed.	
	- Turkish and English language options are available.	
	- All system can be connected to a computer via additional hardware; it can be managed and accessed via internet.	
	- When the configuration of the unit is changed, its parameters can be easily reconfigured (addition of humidifier, replacement of damper, etc.)	
	- Temperature control can be performed parametrically, proportionally, proportional + integral or proportional + integral + differential.	
	- The compensation can be made and parametrically configured according to outdoor temperature.	
	- The control of the fans can be maintained parametrically, thermostatically, continually, gradually or proportionally.	
	- The starting type of fan motors is parametrical (direct, actinoid, and angular).	
	- Each component can be operated and tested one by one.	
	- All kinds of alarm data is kept in the memory (Different pressure keys, thermal, sensor, emergency stop, etc.)	
	- It can be integrated to the building's automation system via all known communication languages (Modbus, Bacnet, Lon-ECHOLON, LAN TCP/IP, SNMP) with an additional hardware.	



\* A power board can be installed along with automation board. It can be located on the unit itself or an external type can be preferred if demanded.





  
**fourSEASON**



CE

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