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İKLİMLENDİRME | HVAC SYSTEMS

PHKS

Package Hygienic Air Handling Unit

fourSEASON

Venues Breathe with Dogu HVAC Systems!

Dogu HVAC Systems which had started to produce ventilation and air-conditioning equipments in İzmir in 1999, produce two main segments as air outlet equipments and air handling units in accordance with European norms (DIN,EN). Dogu puts the devices on the market with "Four Season" brand.

Dogu HVAC Systems which is in business within 45.000m² open area with 2 factory, has 120 different types of products. It brings new products to the sector producing Make-up Kitchen Hoods, Laminar Flow Ceiling, One Piece Square Ceiling Diffuser.

Our R&D journey started in 2004 with the first project of producing Make-up Kitchen Hood is followed by producing dozens of other new products that were designed by special software like Ansys Fluent® and Solidworks® today.

Venues
Breathe With Us.

Contents

1. General Specifications
2. Technical Specifications
   2.1.Casing Structure
   2.2 .Accessories
   2.3 .Sound Attenuators
   2.4.Filters
   2.5.Suction – Mixing – Blowing Cells
   2.6.Electric Heater
   2.7.Steam Humidifiers
   2.8.Heating – Cooling Equipment
   2.9.Fans and Motors
   2.10.Heat Recovery
3. Capacities and Device Dimensions Chart
4. Internal Equipment Layout
5. Electrical Panel and Automation

1.General Specifications

Four Season package hygienic air handling units are used in applications such as medical, food, drug and chemistry industries which have strict hygiene requirements. The use of this type of units ensures removal of particles, bacteria and viruses that disrupt the sterilization of the environment, provides intake of fresh air from the outer environment, purifies it of all included contaminants and outputs this fresh air in the desired flow rate, temperature and humidity.

Four Season package hygienic air handling units are produced within a capacity range of 2400 m3/h – 12000 m3/h using double-walled panels with a thickness of 50 mm and fire-resistant rock-wool insulation. The exterior surface of the panels is made of galvanized sheets painted in standard RAL 9002 color whereas the interior surfaces were made of AISI 304 quality stainless sheets. The smooth interior surface as well as the quality of the production material make it easy to clean, prevent dust accumulation and provide the hygiene requirements of the units.

Four Season package hygienic air handling units form up a strong structure with plastic corner connection components and electrostatic oven painted aluminum profiles that have been designed to meet the hygiene requirements of DIN 1946/4. EPDM-based sealing gaskets are used to ensure air tightness. Special design of coils and filters prevent air by pass and ensures high efficiency.

Why Package Type?

Package type devices are one of the most remarkable products of the air- conditioning industry. Features such as being able to meet the comfort and hygiene requirements of the sterile area by itself, high-efficiency, taking up so little space as well as fast and easy operation are the main factors for the preference of this product.

General specifications of package type devices:

- All components are made compatible in factory.
- The area/volume that they take up is small when compared to other air handling units.
- They have a compact structure and hold all components within minimum space.
- Include compatible built-in automation system.
- Performances are set in factory.
- Assembled in factory.

2.1. Casing Structure

Specially drawn aluminum profiles, intermediate profiles and panels produced with painted galvanized sheets are in Four Season package hygienic air handling units. Aluminum profiles are painted with corrosion-resistant electrostatic oven paints. The profiles are connected with specially-designed plastic corners.

Panels are produced in standard dimensions as double-walled and rock-wool is used as the insulation material between the panels. The thickness of the panel is 50 mm. The outer skin of the panels is painted in standard RAL 9002 color coated with protective poly-film whereas the internal surfaces are made from AISI 304 quality stainless sheet. The thickness of the sheets used is 1 mm. The panels can be dismounted outside the unit. The construction of the units is designed to allow easy cleaning of the internal surfaces. The panels are directly connected to the profiles with special self-drilling screws. EPDM-based sealing gaskets are attached between the panels and profiles. Intermediate profiles are used between panels.

Service doors with sealing gaskets are mounted wherever required on the unit. Cells where equipment such as fans, filters, etc. which require visual control are located include an observation glass as standard.

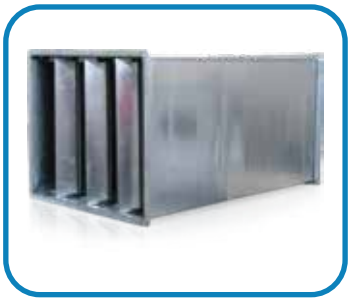
Package hygienic air handling units are mounted on a base of 200mm height. There are holes on the base for lifting easily with crane. There are also additional holes on the base which allow for forklift lifting.

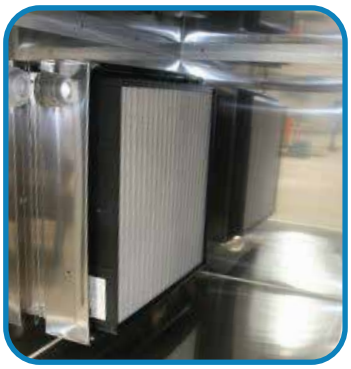
2.2 Accessories

Four Season package hygienic air handling units inculude lighting, observation glassdamper motor and drainage trap as standart. Manımeter, flexible connection at discharge and suction openings and duct type sound attenuators are also available optionally.

2.Technical Specifications

Special Design Providing Easy Transportation





2.3. Sound Attenuators

Noise level which is a significant factor in ventilation systems is reduced to an acceptable level with the aid of attenuators. Sound absorption coefficient of the sound attenuators varies depending on the size. Sound attenuators consist of slots in which rock wool is placed within the stainless sheet panels. The components of the attenuators are designed to be able to resist deformation at an air speed of 20 m/s. 6 different sizes of sound attenuators are offered with Four Season air handling units. Sound absorption capacities for Sound Attenuator sizes are shown in the following charts:

Sound Absorption capacities for Sound Attenuator Sizes

ATTENUATOR 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

2.4.Filters

Whole cross sections of Four Season package hygienic air handling units are used as filtering area in compliance with international standards. The filters are cartridge type and easily mountable and dismountable. Air leakage is prevented through optimal design. There is a service door located on the filter cells for maintenance and replacement. Lighting and observation glass are used on the service door as standard. Filter pollution status is tracked through the automation system on the device the system indicates an alarm when filter maintenance/replacement is required.

3 levels of filters are used in package hygienic air handling units which are in accordance with the standards of EN 1822 for keeping in particles such as bacteria and virus and preventing them from passing into the inner environment.

1st stage filter: G4 Panel filter

2nd stage filter: F7 Rigid filter

3rd stage filter: F9 Compact filter

F7 class rigid filters are used for a high-efficiency air filtration. These filters have an efficiency ratio of 82 %. Their dust holding capacity is quite high. They should be used together with a pre-filter to extend their life. Filter types that are used as 2nd level filters are F6, F7 (Standard), F8 and F9.

Compact filters are high efficiency filters. Their extended surface areas provide low loss of pressure on the system. These filters take up a little space in the unit since their depth is 292 mm. These filters have an efficiency ratio of 96 %, thus extend the life of the hepa filters. It is possible to equally distribute the air on the whole surface due to the structure of the filter. Filter classes we use are F9 (Standard), heap filter.

Additionally, hepa filters are used in accordance with the expert report. They are highly efficient. These filters are assembled after the ventilator and should definitely be used along with a pre-filter. Filter classes we use are H10, H12, H13 and H14.

2.5. Suction – Mixture – Blowing Cells

Four Season package hygienic air handling units are produced with mixed air optionally. Between 30 and 60 % of the environment air is recirculated and mixed with fresh air. This allows obtaining the required temperature and humidity conditions using less energy.

Damper sections are sized according to the air velocity. Dampers in aerofoil structure with opposite blades are used as standard. Damper casing and blades are specially drawn aluminum profile. Air leakage is minimized by means of sealing gaskets at the edges of blades. Dampers are produced compatible with servo-motor use.

2.6. Electric Heater

Electric heater can be used optionally with Four Season package type hygienic air handling units. It is used on handling unit inlet areas with high risk of freezing. It is also used handling unit outlets of sensitive systems which require instant heating or a dehumidification feature.

Electric heater casing is made of AISI 304 quality stainless sheets. Heating elements are made of stainless material. Protection class is IP43. It holds CE and TSE certifications. The heaters are equipped with an automatic-reset limit thermostat which circuit brakes at 70o temperature and a manual-reset safety thermostat as standard.

Cases in which there is an electrical heater on the package hygienic air handling units and the fan does not work or works at very low speeds (below 1,5 m/s, protective measure has been taken to automatically deactivate the electric heater.

2.7. Steam Humidifiers

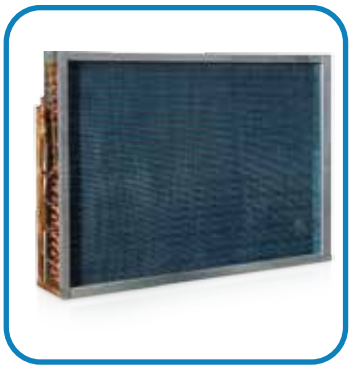
Steam humidifiers that can produce steam from tap water using electrical energy are used in Four Season package type hygienic air handling units. These devices are microprocessor controlled. Steam received from the humidifier unit humidifies the air using the steam distribution pipes within the handling unit and obtains the desired humidity levels. They can operate with On-Off or proportional controls.

2.Technical Specifications

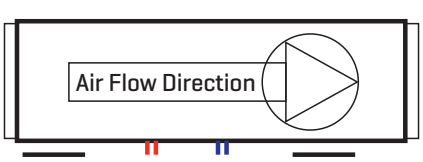
2.8. Heating and Cooling Equipment

Heating processes are carried out using hot-water coils. Coil pipes are made of copper with epoxy coated aluminum fins. Direct expansion coils are produced in copper epoxy coated fins form with copper collectors.

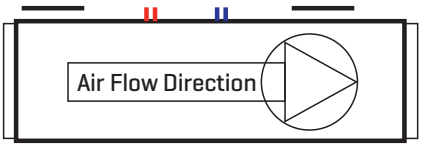
Coil casing is made of AISI 304 quality stainless steel sheets. Test pressure for the coils is 20 bars. Pipe inlet-outlet connections on hot and cold water coils are threaded, pipe inlet-outlet connections on boiling water and steam coils are flanged. It is designed to be taken out easily for maintenance purposes. The air passes only through the coil surface with the special by-pass plates. Air and water are designed to counter flow to obtain high efficiency.



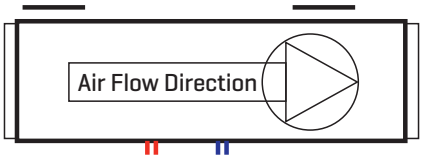
Coil and Service Directions



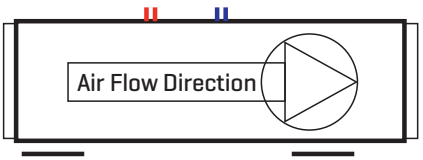
Coil Depending on the Air Direction Right
Service Depending on the Air Direction Right



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



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



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

Cooling processes carried out using direct-expansion coils. They are optionally produced as cold-water battery operated.

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 AISI 304 quality stainless sheets and produced as double-pitched. This pitch prevents water from being spread around.

Hermetic scroll compressors are used in cooling systems. Compressors are operated with capacity-control, resulting in a longer operation life of the compressors. Tests determining the operational life of the compressors in startup works are also implemented.

2.9. Fans and Motors

EC plug fans which are directly coupled to the motor that are thin with backward-curved blades are used in Four Season package type hygienic air handling units in accordance with the international standards
(ISO/DIN 1940) and G level 6.3.

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. Furthermore:

· Equipped with Direct Drive technology,
· IE4 efficiency class bearings which do not require maintenance and long lasting greasing.
· Maintenance free ball bearings and permanent lubrication, nominal operating life 40,000 hours
· Equipped with optimized motor technology,
· Soft-start operation feature and
· Integrated current limitation.

It is also equipped with features such as

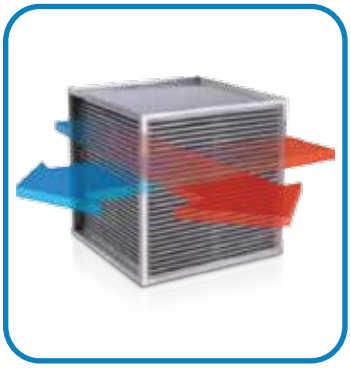
· Compact electronic system,
· Adjustable PID control system,
· 100 % speed control,
· Input voltages of 3≈380-480 V, 50/60 HZ as well as the electronic unit integrated on the high-performance radial fan.
· It has a secured service door with illumination and observation glass in the fan cell for service and maintenance purposes.

2.10. Recovery

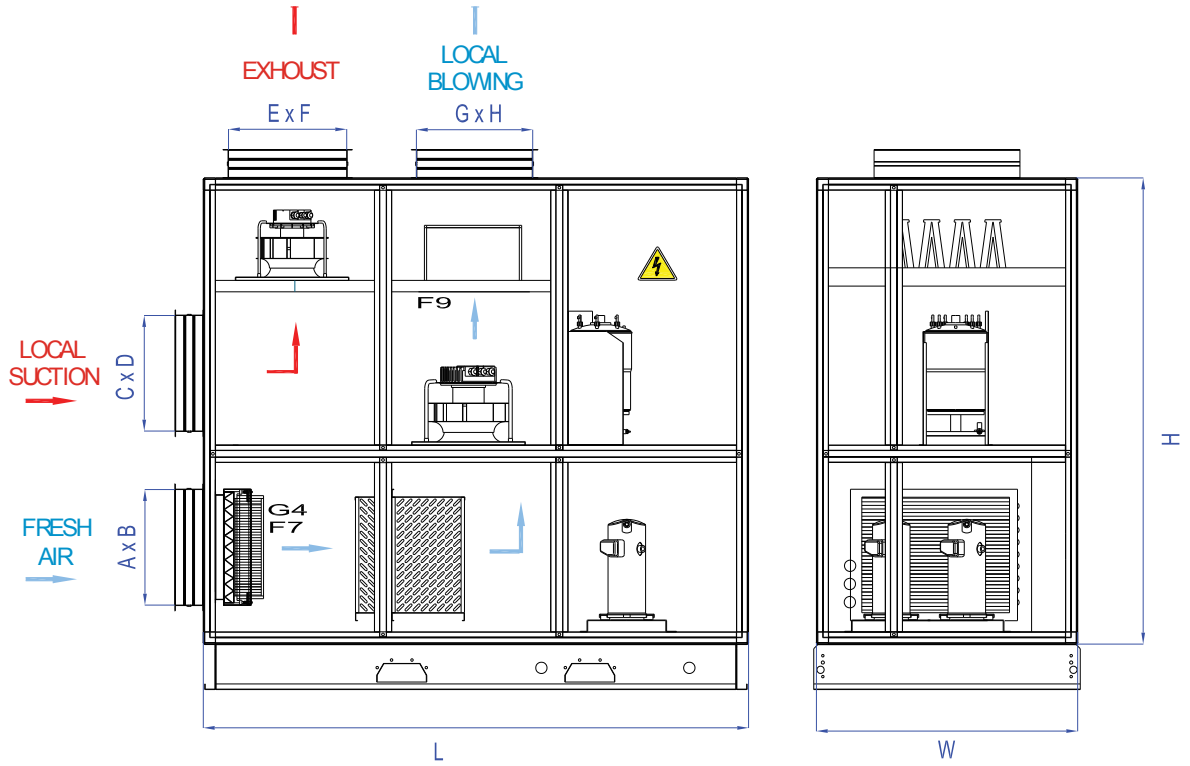
Four Season Package Hygienic Air Handling Units are also optionally produced with heat recovery equipped. The efficiency generally ranges between 30 – 40 %.

Cross-flow plate type heat recovery units allow for the heat transfer between the fresh air and the exhaust air without moving parts. It provides complete impermeability even high pressure differences. It can operate at temperatures ranging between -30o C and 90o 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 prevent possible condensation.

2.Technical Specifications



3.Capacities and Device Dimensions Chart



MODEL		PHKS-1	PHKS-2	PHKS-3	PHKS-4	PHKS-5	PHKS-6	PHKS-7	PHKS-8
Parameter	Unit								
Ventilator Flow Rate	m^3/h	2400	3600	4800	6000	7200	8400	10000	12000
Aspirator Flow Rate	m^3/h	2400	3600	4800	6000	7200	8400	10000	12000
Ventilator Pressure	Pa	800	800	800	800	800	800	800	800
Aspirator Pressure	Pa	400	400	400	400	400	400	400	400
Ventilator motor	kW	2,92	2,92	5,37	5,37	5,37	5,37	2x5,37	2x5,37
Aspirator motor	kW	1,3	1,7	3	3	2,73	5,37	2x3	2x3
Filters	-	G4-F7-F9	G4-F7-F9	G4-F7-F9	G4-F7-F9	G4-F7-F9	G4-F7-F9	4-F7-F9	G4-F7-F9
Cooling Capacity	kW	31	48	64	81	96	108	134	168
Heating Capacity	kW	38	44	58	87	97	117	136	161
Humidifier	kg/h	15	30	45	45	60	60	75	90
U	mm	2500	2500	2700	2700	2700	2700	2600	2600
G	mm	1095	1295	1395	1595	1595	1895	2035	2235
Y	mm	2160	2235	2335	2410	2410	2410	2360	2360
AxB	mm x mm	450x512	540x512	720x512	900x512	1100x512	1250x512	1490x512	1780x512
CxD	mm x mm	450x512	540x512	720x512	900x512	1100x512	1250x512	1490x512	1780x512
ExF	mm x mm	450x512	540x512	720x512	900x512	1100x512	1250x512	1490x512	1780x512
GxH	mm x mm	450x512	540x512	720x512	900x512	1100x512	1250x512	1490x512	1780x512

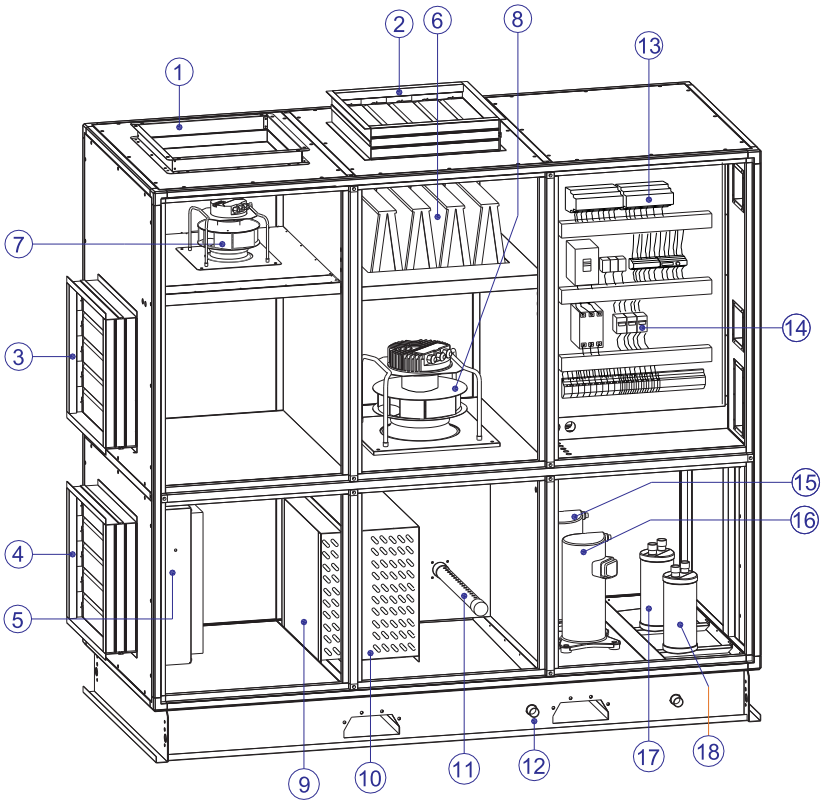
· Heating and cooling capacities have been determined for the following outdoor design conditions. Summer: 37o C – 38,5 % RH, winter: 0o C – 80 % RH]

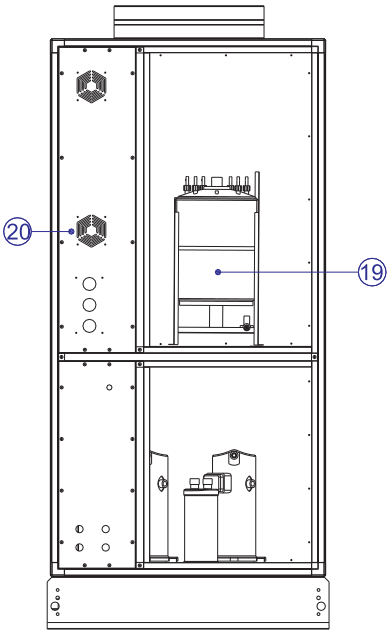
· Steam humidifier capacities are nominal values and it is possible to select a device for different capacities.

· Filter classes can be changed optionally. F6, F8 and F9 filters can be used for mid-level whereas H10, H11, H12 and H13 filters can be used for last level.

· Klimakar reserves the right to change and/or modify the dimensions without notice.

4. Equipment Layout





1. Return air
2. Supply damper
3. Exhaust
4. Fresh air damper
5. Fresh air filter
6. Compact filter
7. Return fan
8. Supply fan
9. Heating coil
10. Cooling coil
11. Distribution pipe
12. Drainage pan connection
13. Micro-processor
14. MCC-DDC Control Panel
15. 1st Compressor
16. 2nd Compressor
17. 1st Accumulator
18. 2nd Accumulator
19. Steam humidifier unit
20. Ventilation fan
(for the Board)

5. Electrical Board and Automation

Function – Equipment Automation	Comments	Application
Emergency Stop Button 	Stops the system in case of emergencies.	STANDARD
Electronic control panel and Operator Units 	Micro-processor control panel is included in Four Season package hygienic air handling units with the software system which has been designed to meet the system's requirements.	STANDARD
Canal Type Temperature and Humidity Sensors 	Canal type temperature and humidity sensors are used in Four Season package hygienic air handling units in order to obtain ideal comfort conditions of the station.	STANDARD
Valve servomotors 	Valve servomotors in Four Season package hygienic air handling units are sensitive control equipment that can turn on/off depending on the desired conditions.	STANDARD
Damper servomotors 	Control is obtained within the Four Season package hygienic air handling units is possible through the use of spring reversible and proportional air damper motors.	STANDARD
Freeze Thermostats 	System's connection with the external environment is cut-off or completely stopped upon a freeze warning received from the freeze thermostats in order to prevent freezing of the package hygienic air handling unit coils in winter months. This also helps prevent battery explosions.	STANDARD
Differential Pressure Sensors 	Differential pressure sensor units are used for adjusting the flow rate of EC fans and maintaining the internal pressure balance.	STANDARD
Differential Pressure Switches 	Differential pressure switches in package hygienic air handling units are used in detecting the air filters pollution levels and determining whether the fans operate or not.	STANDARD
Canal Type Air Quality Sensor 	Makes it possible to control the fresh air damper by determining the air quality in mixed air handling units, resulting in energy savings and providing the required comfort conditions.	OPTIONEL

5. Electrical Board and Automation

Four Season package hygienic air handling units are equipped with a micro-processor control system with special software which can provide all comfort, safety and operating requi-rements.

EC Plug fans with built-in invertor are preferred in order to keep the flow rates of the blown and exhausted air stable in any circum-stances. Differential pres-sure between stations are obtained using the most precise methods thanks to the speed and pressure control on the air handling unit.

All MCC and DDC panels can be protected with the phase protec-tion relay module. This relay module constantly checks 3 phases and allows panels to oper-ate. Otherwise switches off.

Four Season package hygienic air handling unit automation system capabilities

· Air flow is controlled as well as the pressure between two stations. It is equipped with an alarm information generator if not able to provide the desired flow rate.
· Desired ventilator flow rate can be adjusted according to operation elevations and temperature.
· Pre-heating, heating and cooling algorithms can be adjusted optionally in accordance with the input, output or pre-heating temperatures. Blowing temperature can be checked for limits.
· Detects the pollution levels of all filters used individually and generates alarm information.
· Obtains efficient operating conditions with the capacity con-trol of the compressors.
· It is possible to view and modify all terminals as well as all parameters.
· All air handling units can communicate within a network.
· Operation and configuration parameters can be encrypted.
· Generates audio and visual alarm information optionally.
· Daily and weekly Intermittent operating times can be adjust-ed.
· Any of the supported languages (Turkish, English, Italian, French and German) can be selected.
· The entire system can optionally be connected and to a cen-tral computer with additional hardware. It can be managed using this method and is accessible online.
· The temperature can be controlled parametrically as propor-tional or proportional + integral.
· Compensation can be adjusted depending on the external air temperature, it can also be adjusted parametrically.
· Fans can be controlled parametrically, gradually or propor-tionally.
· Each piece of equipment is operated and tested individually.
· All alarm information is stored in memory (Filter pollution warnings, thermic, sensor, emergency stop, etc.De-sired ventilator flow rate can be adjusted according to operation elevations and temperature.

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