Operation, Maintenance and Installation Manual v. 4.1

"Efficiency of air handling unit"

Air Handling Units

Package Type Hygienic Air Handling Units

Package Type Pool Dehumidifying Unit

Ceiling Type Ventilating Unit with Heat Recovery

CLIMACS®
AIR CONDITIONING SYSTEMS

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“Efficiency is possible with the quality of equipment and service. Whereas the highest efficiency depends on your habit of usage.”

ACS Klima

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CLIMACS®
AIR CONDITIONING SYSTEMS

INTRODUCTION

Thank you for choosing ACS / CLIMACS air handling units.

First chapter of this manual, marked with blue strip, provides general information for air handling units.
Second chapter, marked with green strip, provides detailed information on package type hygienic air handling units.
Third chapter, marked with purple strip, provides detailed information on package type pool dehumidifying units.
Fourth chapter, marked with maroon strip, contains operation manual of ventilating units with heat recovery.

Please read the manual carefully before operating your air handling units. Please fill the commissioning form and submit it to ACS Klima to operate your unit for the first time. You can find the commissioning form on the last page of this manual or alternatively the form can be downloaded from ***www.acsklima.com***. Our technical staff will get in touch with you to check if the operation requirements are fulfilled and will arrive to your site within ***7-10 business days***.

If air handling units and cabinet type ventilators excluding outdoor units (condenser unit) to be operated in outdoor environment we recommend to place them under suitable canopies to protect automation instruments from weather conditions, this will also help to increase the efficiency and energy saving.

Our products and systems have certificates listed below, issued by national and international auditing institutions.

TSEK Certificate

TSE Service Compatibility Certificate

CE Certificated

EUROVENT Certificate (certificate no: 06.09.325)

TUV SUD Hygiene Certificate

TUV SUD Hygiene Certificate for Package Type Air Handling Units

ISO 9001: 2008 Quality System Certificate

ISO 14001:2009 Environmental Management System Certificate

OHSAS 18001:2007 Occupational Health and Safety Management System Certificate

GUARANTEE

Our units have ***2 (two) years*** guarantee against material and workmanship faults.

Please do not intervene in any part or setting of your air handling unit other than operation and maintenance operations specified in this manual. When part replacement is necessary original parts should be used. Liabilities of faults resulted by intervention by unauthorized persons or by replacement with non-original parts belong to parties who undertake such interventions. This unit should only be operated under conditions that are suitable to its design purposes and its technical specification.

The conditions below terminate the validity of the guarantee:

- Any installation or repair that violate standards
- Any intervention by unauthorized persons
- Handling of units without written approval of ACS
- Faults resulted by fluctuations of power supply of installation
- Faults resulted by failing to follow the instructions specified in this manual

Important Warning:

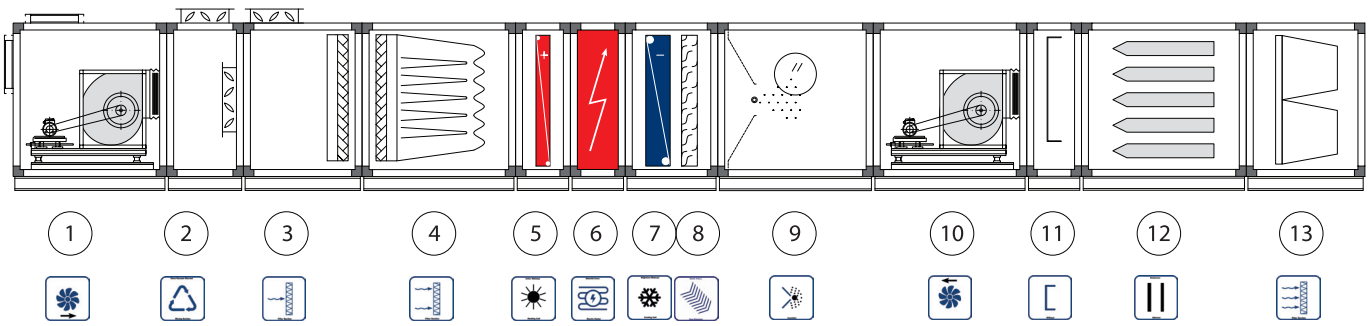
If the units will not be installed following the arrival in site, they should be stored in a dry and closed storage area not affected by outdoor weather conditions.

1- PRODUCT DESCRIPTION

ACS Air Handling Units and Cabinet Type Ventilators have frames composed of specially rolled aluminium/steel profiles and special corner parts. Frames are covered with sandwich panels filled with 30/50 mm polyurethane or rock wool for heat and sound insulation. Outer surface of sandwich is composed of painted steel sheet and inner surface is composed of galvanized steel or chrome sheet. Frame and mullion profiles are connected with special parts to prevent thermal bridge. Seams between panels and frame are fully sealed for impermeability. Fixed panels are connected to frames with outside screws; movable panels are connected with special hinges to allow easy movement. High quality and silent fans are dynamically and statically balanced; when belt and pulley mechanism is necessary, fans are connected to frame with their own seats having special rubber or spring vibration isolators; specially designed skids provide easy adjustment for electric motor belt tensioning.

Highly efficient heating and cooling coils are composed of copper pipes and aluminium fins. Condensing water trays of cooling coils are made of stainless steel and have double slopes; accumulated water is drained by a specially designed drainage valve, which operates with respect to the inner pressure of fan. Specially designed volumetric dampers have flaps with gaskets on edges to provide sealing when closed; gear mechanism allows easy operation of dampers by servomotor.

2 - TECHNICAL SPECIFICATIONS



Note: Unit configuration in above picture is a sample.

1- RETURN FAN SECTION
2- EXHAUST AND MIXTURE SECTION
3- PRE-FILTER SECTION
4- BAG FILTER SECTION
5- HEATING COIL SECTION
6- ELECTRIC HEATER SECTION
7- COOLING COIL SECTION
8- SEPERATOR
9- HUMIDIFYING SECTION
10- SUPPLY FAN SECTION
11- DIFFUSOR SECTION
12- SILENCER SECTION
13- FINAL FILTER SECTION

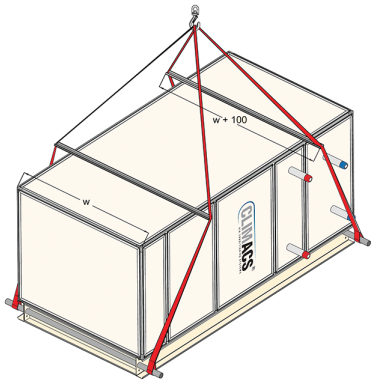
	Type	Air Flow Rate	Width	Height	1	2	3	4	5	6	7 + 8	9	10	11	12	13	IGK
1	ACS 71	1,235	550	550													
2	ACS 72	1,623	660	550	800	350	600	700	330	330	440 + 110	900	800	330	880 / 1430	500	730
3	ACS 73	2,011	770	550													
4	ACS 91	2,133	660	660													
5	ACS 92	2,643	770	660	850	450	700	700	330	330	440 + 110	900	850	330	880 / 1430	500	730
6	ACS 93	3,153	880	660													
7	ACS 101	3,275	770	770													
8	ACS 102	3,907	880	770	900	450	700	700	330	330	440 + 110	900	900	330	880 / 1430	500	900
9	ACS 103	4,539	990	770													
10	ACS 121	4,661	880	880													
11	ACS 122	6,169	1.100	880	1.000	450	700	700	330	330	440 + 110	1.000	1.000	330	880 / 1430	500	900
12	ACS 123	6,923	1.210	880													
13	ACS 151	7,167	1.100	990													
14	ACS 152	8,043	1.210	990	1.050	550	800	700	330	330	440 + 110	1.000	1.050	440	880 / 1430	500	1.150
15	ACS 153	8,919	1.320	990													
16	ACS 181	10,283	1.210	1.210													
17	ACS 182	11,402	1.320	1.210	1.250	650	900	700	330	330	440 + 110	1.300	1.250	440	880 / 1430	500	1.370
18	ACS 183	12,522	1.430	1.210													
19	ACS 451	12,644	1.320	1.320													
20	ACS 452	13,886	1.430	1.320	1.300	650	900	700	330	330	440 + 110	1.300	1.350	440	880 / 1430	500	1.370
21	ACS 453	15,128	1.540	1.320													
22	ACS 501	15,250	1.430	1.430													
23	ACS 502	17,978	1.650	1.430	1.450	750	1.000	700	330	330	440 + 110	1.500	1.500	440	880 / 1430	500	1.450
24	ACS 503	19,342	1.760	1.430													
25	ACS 561	19,585	1.650	1.540													
26	ACS 562	22,557	1.870	1.540	1.550	850	1.100	700	330	330	440 + 110	1.600	1.650	550	880 / 1430	500	1.720
27	ACS 563	25,529	2.090	1.540													
28	ACS 631	26,260	1.870	1.760													
29	ACS 632	29,720	2.090	1.760	1.700	850	1.100	700	330	330	440 + 110	1.700	1.850	550	880 / 1430	500	2.000
30	ACS 633	31,450	2.200	1.760													
31	ACS 711	33,911	2.090	1.980													
32	ACS 712	37,858	2.310	1.980	1.900	950	1.200	700	330	330	440 + 110	1.900	2.050	550	880 / 1430	500	2.000
33	ACS 713	39,832	2.420	1.980													
34	ACS 801	42,538	2.310	2.200													
35	ACS 802	46,973	2.530	2.200	2.100	950	1.200	700	330	330	440 + 110	2.100	2.300	660	880 / 1430	500	2.450
36	ACS 803	51,408	2.750	2.200													
37	ACS 901	51,896	2.640	2.310													
38	ACS 902	58,915	2.970	2.310	2.250	1.050	1.300	700	330	330	440 + 110	2.100	2.500	660	880 / 1430	500	2.450
39	ACS 903	63,594	3.190	2.310													
40	ACS 1001	64,447	3.080	2.420													
41	ACS 1002	74,729	3.520	2.420	2.500	1.150	1.400	700	330	330	440 + 110	2.100	2.750	660	880 / 1430	500	3.150
42	ACS 1003	84,140	3.960	2.420													

3- HANDLING

Air Handling units, which are produced by ACS KLİMA İMALAT SAN. TİC. LTD. ŞTİ., are freighted from the factory following a careful final inspection to ensure perfect condition. It is buyer's responsibility to unload and move the unit to the installation area. **Careful handling, loading, unloading and positioning is very important to prevent damages** (please do not forget that these kind of damages terminate the unit's guarantee)**.** These operations should be carried out by trained operators using suitable equipment such as forklift, winch and transpalet. Suitable lifting methods should be used to prevent possible damages. Forklift and transpalet can be used to lift small equipment. Large equipment should be loaded or unloaded using suitable lifting devices and winches. When lifting with winches, lifting robes should be selected to suit unit's weight and dimensions to prevent damages and to provide safety; slings and steel pipes should be used as seen in the picture below to prevent straining of unit's body. Hooks of the winch should not directly be attached to the lifting eyes of unit otherwise the unit can be strained, this kind of lifting is risky. The weight should be distributed evenly on the four corners and necessary safety precautions should be taken to prevent tipping over or slipping.

Important Warning:

Do not stand under or in the area where the unit is being lifted and moved. Any person in charge must wear protective equipment such as helmet and steel toe work boots.

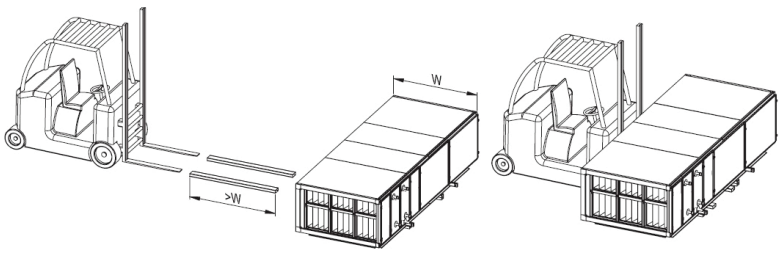


Important Warning:

Do not use worn out or unreliable ropes and slings.

Utmost care should be taken for life safety during lifting and lowering operations.

Typical Lifting Device (with winch)



Important Warning:

If forklift's forks are shorter than depth of the unit, the unit may fall or bottom lids may be damaged.

Typical Lifting Device (with forklift)

3.1 - ACCEPTANCE ON SITE UPON ARRIVAL OF SHIPMENT

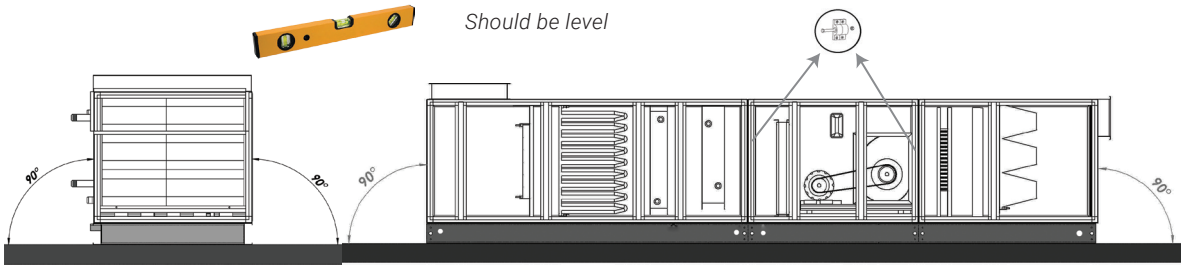
All units are specially packaged to avoid damages during shipment, transfer and positioning.

Please follow the steps below to verify the unit is not damaged during shipment:

- ☑ Please make sure there is not any abnormal condition, obvious damage on package in any of the units and please check the box edges and corners are in good condition.
- ☑ If there is obvious damage on package please open the package and check whether unit is damaged, too. If there is damage please note it down on the invoice and do not accept the product. Please also check the enclosed units
- ☑ Please check for damages that cannot be easily seen.
- ☑ If you find a damage that is not easily seen do not move the product. Buyer must prove that such a damage was not occurred after shipment. Please stop unloading and take a photograph of the damage for reference.
- ☑ If damage is found, inform the forwarder and ask forwarder to inspect the unit jointly.
- ☑ Following the verification of damages, please contact to responsible persons for the new parts.

4- INSTALLATION

The floor or base surfaces, where the feet of the air handling unit will sit on, should be flat, clean and level. Sections should be placed straight and level in order to provide adequate sealing and prevent strain on the unit. Section connections can be made easily following straight and aligned placement of all sections. Before making connections, gasket supplied by the producer should be attached to the joint connection surfaces in order to provide sealing. Section connections should be made using connection fittings (nuts, bolts, washers and fittings) supplied with the unit.

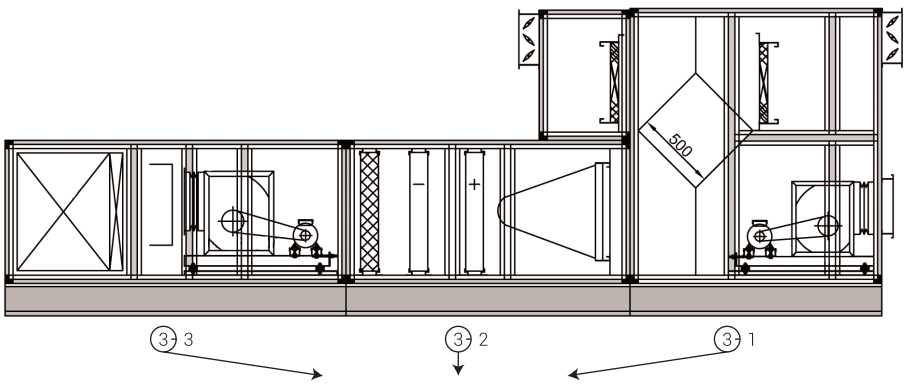


Fittings

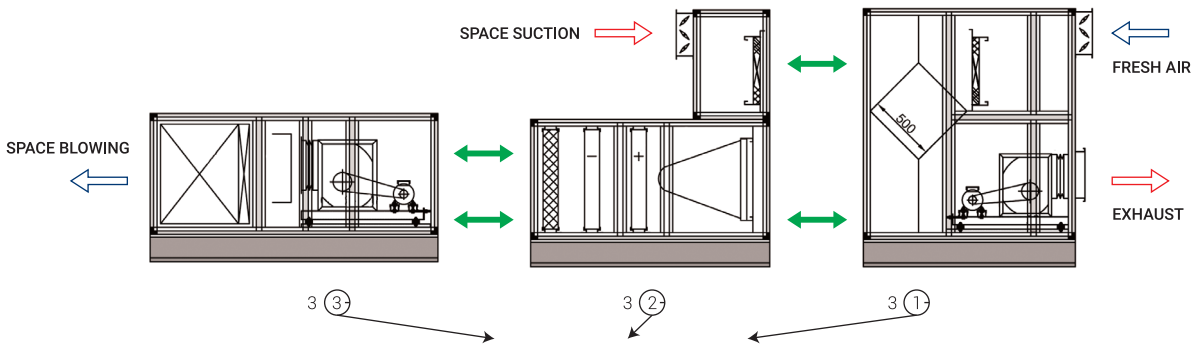
Cooling coils are equipped with condensing water trays, where condensing water is accumulated and drained. Level installation of these parts is especially necessary. Sufficient space should be left on servicing side of the unit in order to allow easy access for servicing of fans, air handling unit motors, heating and cooling coils, filters and humidifying cells. The space should be as large as the width of the air handling unit. If your air handling unit will be operated in outdoor weather conditions, covering it with a canopy will extend its service life and raise the efficiency. If this is not possible please inform ACS when purchasing. The unit should be connected to fresh air duct so that the duct is shaped as a "camel neck" or as an "elbow" and is placed away from chimneys and polluted air sources.

4.1 - Installation of cells

Air handling units are mostly shipped as separate cells. In such a case, the cells are numbered among themselves (different than serial number) as seen in the example below to help installation personnel.



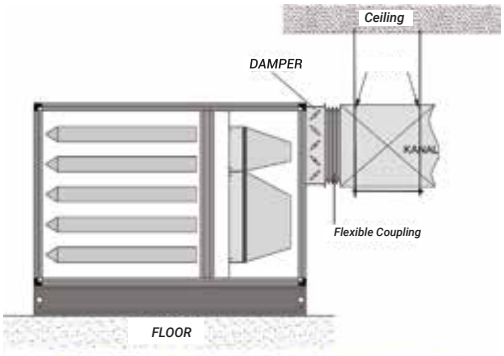
The first number indicates the total number of cells



Second number indicates the position of the cell in air handling unit (Fresh air inlet cell always takes the number 1)
Air handling unit is joined with respect to the cell numbers

5- CONNECTIONS

5.1- CONNECTIONS

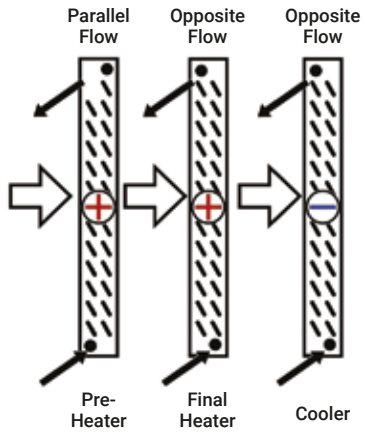


Ducts should be connected by using ceiling suspension rods to avoid loading on unit's dampers, as seen in the example above. Connection between ducts and units should always be made by flexible couplings (with bellow).

Duct Connection Diagram

Ducts of space return air, fresh air, exhaust air and supply (suction) air should always be connected to the unit via flexible couplings. Adequate sealing should be provided to achieve desired air flow rate. Bad connections between unit and ducts, incorrect dimensions and shapes and duct pieces at the connection may change the air flow rate. Air ducts and cables should not contact to the unit to avoid transmission of vibration especially to cooling and heating coils. For this reason, air suction and exhaust mouths should be connected to ducts using flexible duct coupling. When installing flexible duct coupling ensure that the axes of connection flanges on unit and duct are aligned.

Installed length of the flexible duct coupling should be approximately 75% of its unfolded length.



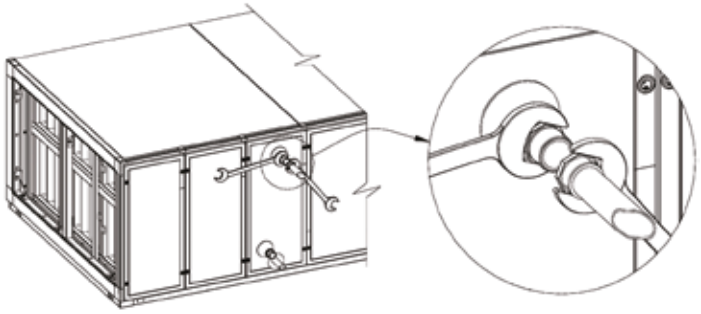
Connection diagram of heating and cooling coils

5.2- PIPPING

Water supply should be positioned at the bottom considering the ventilation of heating and cooling coils. Please pay attention to the direction of air flow and direction of water passing through heating and cooling coils. Cooling coils should always be installed to have opposite flow while heating coils are installed to have either opposite or parallel flow.

Installation pipes, heating and cooling coils should be connected according to the diagram.

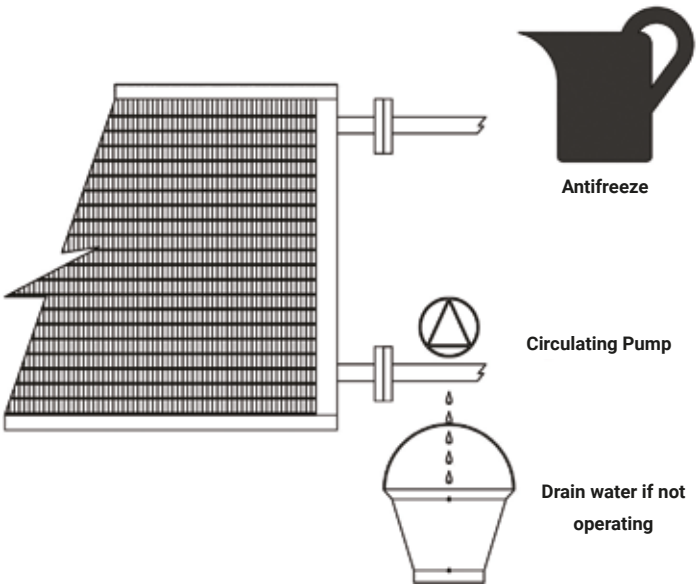
During connection of heating and cooling coils be careful to avoid straining or bending inlet and outlet pipes in order to protect small-diameter thin-copper pipes.



Connection diagram of heating and cooling coils

Important Warning:

Please warn the plumber to use two wrenches. Inexperienced plumbers damage softer copper pipes of coils as a result of using one wrench. In such a case, your unit may be severely damaged.



Preventing Freezing

All installation and coil connection pipes should be insulated. If water direction in heating and cooling coils is downwards, an air vent valve should be installed at the highest point.

Drainage ball valves should be connected to condensing water drains of cooling coils and humidifying sections. If there is a heating steam supply, drain pipe should be selected so that it prevents condensing of steam retaining in the heater.

Please take precautions for winter time to avoid freezing of water inside coils and steam humidifiers. Draining the water alone cannot be a sufficient measure because a small amount water can be still retained.

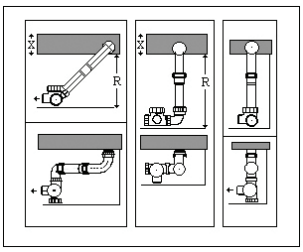
Important Warning:

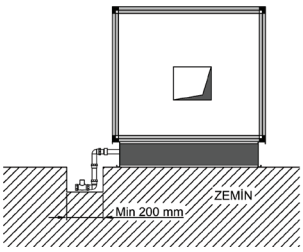
1. In order to prevent freezing of water in the system:
2. Antifreeze can be added to the system
3. Circulating Pump can be operated continuously.
4. Ensure the water is drained completely. If there's a doubt, the steps above can be followed.

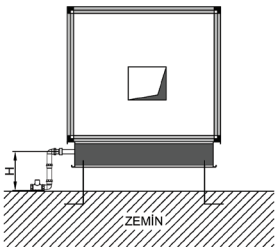
Note: If the system has automation a freeze thermostat must be installed. Besides, ensure that the circulating pump does not stop due to a power failure (for example it can be connected to a generator).

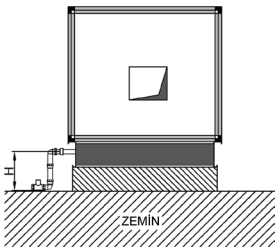
5.3 - DRAINAGE VALVE CONNECTION

Drainage valve drains water accumulated in condensing trays and humidifying sections while preventing ingress of air, dust and dirt.









Important Warning:

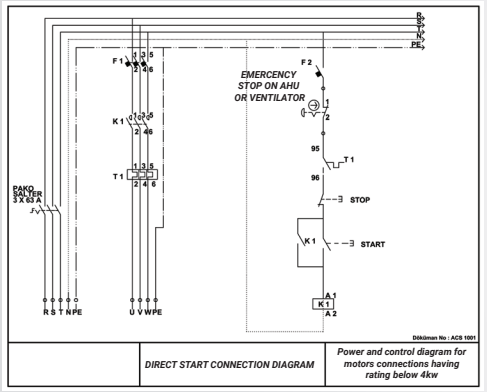
Please connect drainage valves correctly with required slope. If the water inside cannot be drained it can spread the other sections and cause severe problems.

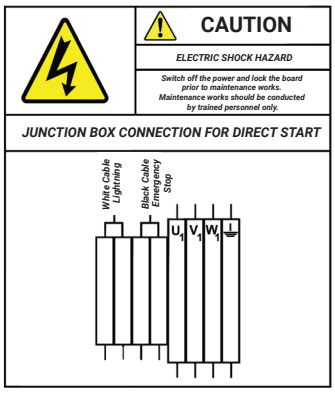
5.4 - ELECTRICAL CONNECTIONS

All connections must be designed and installed according to standards and requirements of National Electricity Administration. Switching elements, cables and all related supervision and control equipment should be designed and selected to match technical specification and requirements of the unit. Some fans in the air handling unit are driven by belt and pulley mechanism. In normal applications, single revolution motors are started directly. **For the motors having rating above 4kW, star-triangle connection should be made to decrease the starting current of motor.** All electrical connections and cabling should be installed by technicians having suitable training, experience and authorization. (If needed, ACS can provide the information for cross-sectional area of the cables to be installed).

Thermal relay connection should be installed as seen below:

a) Direct Start: Thermal relay should be adjusted to full load current value indicated on the label of the motor.

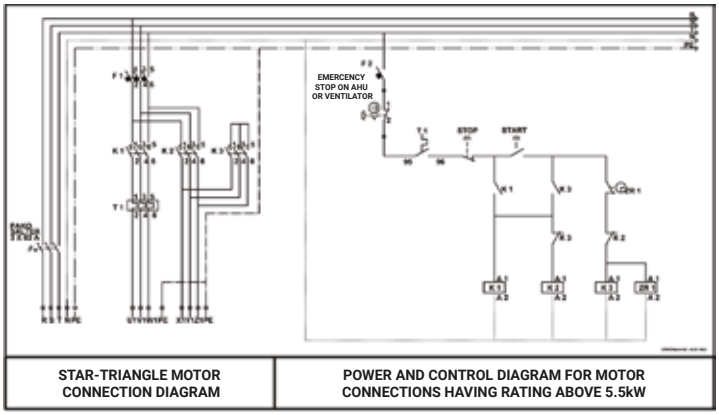




Important Warning:

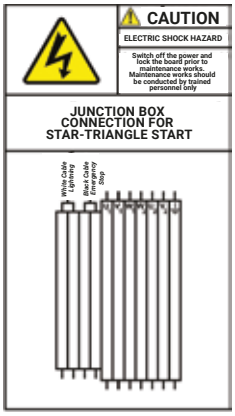
All electrical connections should be made by trained personnel observing the rules. During all electrical installation works the power should be switch off at the main supply board and necessary precautions should be taken to preven accidental swtihing on.

d) Star-Triangle Start: Thermal relay should be adjusted to 58% of full load current value indicated on the label of the motor



STAR-TRIANGLE MOTOR CONNECTION DIAGRAM

POWER AND CONTROL DIAGRAM FOR MOTOR CONNECTIONS HAVING RATING ABOVE 5.5kW



Following the adjustment of thermal relay, motor should be operated in two phases to check the operation of thermal relay. Check if the voltage value on ratings label is compatible to mains voltage. If the units will be operated with frequency invertor, please have your electrician to make required connection for the frequency invertor. Emergency stop and switch contacts cannot endure to high voltage therefore these should be connected to control side of the electric circuit.

Important Warning:

If an electrical heater will be used with the unit, electrical connections should be made as per the information on the heater. When power supply cables of heaters exit the unit, cabling should be done by silicone cables covered by a fire-resistant heat shrink tubing and should be routed to junction boxes. Electric heaters must be equipped with "**THERMAL PROTECTION**" and "**LIMITING THERMOSTAT**" and should be connected to the board.

All electrical connections are in the junction box. There is a circuit diagram on the junction box

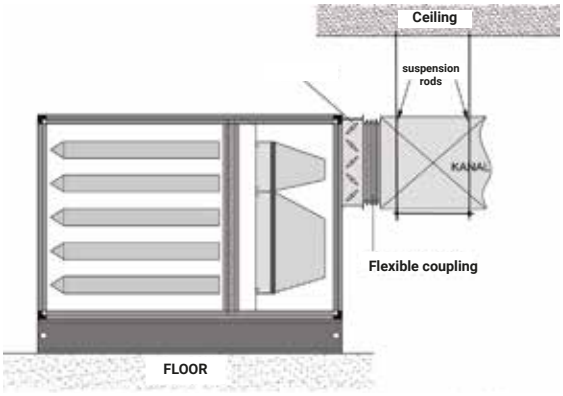
Important Warning:

Connection terminals of emergency stop buttons and safety switches on your units have been tested and routed up to the motor junction box. Please warn your technician to make the connection so that emergency stop button and safety switch operates properly for life safety.

6 - SETTINGS AND CHECKS BEFORE OPERATION

6.1 - DAMPERS

The arm of damper should be fixed when desired adjustment is set. Motor dampers are supplied with the damper rod that connects damper to the motor. Please pay attention that damper motor does not force dampers beyond fully open and closed positions.
Please check that all flaps of damper move freely.



DUCTS SHOULD BE CONNECTED BY USING CEILING SUSPENSION RODS TO AVOID LOAD ON UNIT'S DAMPERS, AS SEEN IN THE EXAMPLE ABOVE. CONNECTION BETWEEN DUCTS AND UNITS SHOULD ALWAYS BE MADE BY "FLEXIBLE" COUPLINGS (WITH BELLOW).

Important Warning:

For unobstructed and proper operation of dampers:

1. Duct connections must be made by flexible couplings.
2. Duct weight on the dampers must be avoided
3. No screws around damper gears when attaching ducts and automation elements.

6.1 - DAMPERS

Panel filters are installed on units before shipment. **Bag Filters and Compact Filters** are shipped in closed boxes to prevent accumulation of dust and loss of efficiency before commissioning. Each filter are placed in a frame equipped with a **filter pressing mechanism** to provide adequate sealing.

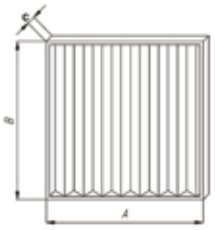
Filter pressing mechanism, presses down on the edge surfaces of the filter to provide sealing.

HEPA filters are shipped in cartoon boxes with insulation. During installation, each filter should be installed carefully in respective boxes **(HEPA filter box)** in a way that no air leakage will take place; please pay attention not to touch to filter section during installation.

The other filters such as carbon filters and sand filters are supplied with the unit; user manuals of filter producers are included.

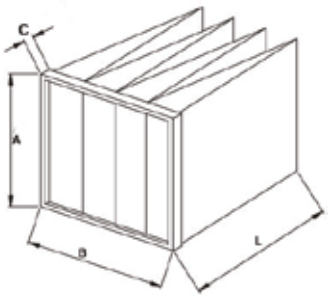
EU-4 Filtre

SIRA NO	A (mm)	B (mm)	C (mm)
1	490	592	48
2	592	592	48
3	287	592	48
4	287	490	48
5	490	490	48
6	287	287	48



Bag Filter

SIRA NO	A (mm)	B (mm)	C (mm)	L (mm)
1	592	592	25	600
2	490	592	25	600
3	287	592	25	600
4	592	592	25	300
5	490	592	25	300
6	287	592	25	300

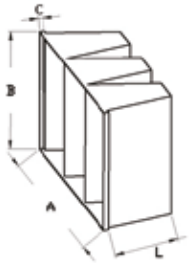


Important Warning:

BAG – MPACK and HEPA filters are not cleanable type filters!
These filters must be replaced when their operation time expire.

Compact Filter

SIRA NO	A (mm)	B (mm)	C (mm)	L (mm)
1	592	592	25	292
2	490	592	25	292
3	287	592	25	292



6.3 - HEAT EXCHANGERS

All heat exchangers are subjected to leakage test before installing in units. Fins are checked against damage. Fins should be checked again following handling and installation and should be rectified by special fin combs if deformation is seen. Plastic taps on exchanger outlets should not be removed until unit pipes are ready for connection. Please take into account that removal of heat exchangers may be necessary for installation works such as placement of unit, piping, other connections etc.

In order to avoid freezing risk it is recommended that control system either stops the water circulation when fan stops or stops the fan when water temperature (in heating coils) drops below 5oC.
Direct expansion Freon coils (dx coils) are equipped with a refrigerant fluid distributor that is suitable for welded connection. Refrigerant fluid circuit should include required circuit breakers, dryers, solenoid valves, oil separators etc. Selection, installation and setting of the expansion valve should be made according to the recommendations of the producer of condenser unit.

In dx coil systems; air flow inside the unit should be supervised carefully to prevent arise of conditions, such as filter pollution etc., that can lead to loss of efficiency or even compressor damage. This is also true for condensers (outside units).

Steam Heat Exchangers: Please pay attention to accumulation and drainage of condensing water to prevent ingress of water to the heat exchanger. Condensing water connection in steam trap (condenstop) should be the same with the connections on heat exchanger outlet. Heat exchangers should not be operated beyond maximum temperature and pressure indicated on their capacity label.

6.4 - HUMIDIFIERS

Electronic steam humidifiers are the package type humidifiers that are produced by other producers. Steam distribution pipe installations **should be longer than 2 meters to prevent re-condensing of steam**; please observe the instructions of the producer for operation and setting of the humidifier. Your electrician should select and make the connection of the power supply cable with proper cross-section according to the capacity of your humidifying unit. Your plumber should make water supply and drainage connections according to capacity of your humidifying unit.

Steam humidifiers are sensitive and expensive devices; they must be protected against outdoor weather conditions by cabinets, canopies etc. Besides, in winter season, precautions should be taken to prevent freezing of water inside the unit and hoses.

Important Warning:

Please read the manual supplied with your humidifying unit and follow the instructions carefully.

BLOWING AND SUCTION FANS

If fan and motor group is equipped with a spring isolator it should be fixed before shipment to prevent damage during transportation. Following the installation of the unit and completion of duct connections the parts locking the isolator must be removed.

Cabling should be made as per the National Standards. Start mode (direct or star-triangle) should conform to national electricity standards. Necessary power control and protection devices should be supplied and installed.

7 - SAFETY

Our Air Handling Units are produced as per **TS 2000, EN 60335-1, EN 60204-1** Standards and conforms to the requirements of European Directives **LVD 2006/95, EMC 2005/108** and **MD 2006/42**; the units have CE mark. However, the operation of the unit can be hazardous unless it is operated by trained and experienced personnel, the unit is serviced properly and indicated safety measures are followed. Therefore, user must be informed about safety rules, possible hazards and related precautions in the operation of Air Handling Units.

The sections of the unit containing moving parts (fans, motor, pump, etc.), the parts carrying electric current and hot parts (hot water and steam coils, pipes and control elements etc.) are regarded as hazardous. Suitable equipment and protective gears must be used for the works on this type of sections.

Hazards are categorized under three groups:

- Hazards relating to operator's safety
- Hazards relating to equipment damage
- Hazards relating to operation efficiency

Important Warning:

Safety measures cannot be neglected. If you have any doubt about the units or about the infrastructure for the operation of the units, ACS Klima engineers will help you by all means.

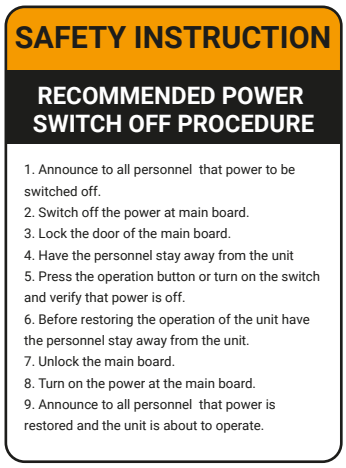
7.1 - OPERATION OF THE UNIT

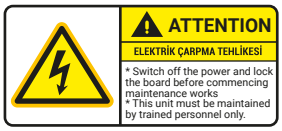
- Air Handling Units are used for heating, cooling and ventilation purposes. Any usage other than these purposes is regarded as irregular usage. In such a case, the producer cannot be kept liable for the damages occurred; it will be totally user's liability.
- Standard units cannot be used for the evacuation of flammable and explosive gasses. In such applications, movable parts such as fans and motors must be flameproof type. This information should be submitted in writing to the producer at unit selection stage.
- In order to operate the unit according to its designed purpose, producer's instructions for handling, installation and operation must be followed carefully.
- Installation and commissioning processes must conform to the current standards of the country where the unit is located.
- It is user's liability to fulfill the requirements of the laws and standards. Besides, the user must avoid any kind of work that can lead to a hazard.
- It is strictly forbidden to make any modification on the unit by either the user or the operator. Any damage that is resulted by this kind of modification will be out of the scope of the guarantee.
- The units must be operated by only authorized personnel following the implementation of the required safety measures.
- Installation personnel must observe installation plans and instructions.
- In order to foresee the possible damages that can arise during operation and put safety in danger, maintenance instructions must be strictly observed.
- Operator or user must never dismount or switch off the safety devices. In case these devices are dismounted for maintenance they must be re-installed and checked upon completion of maintenance.
- Power supply of the unit must be switched off during all maintenance works.

7.2 - WARNING SIGNS

Warning labels for the user and maintenance personnel have been attached on the unit.

During commissioning, please check that the labels below are attached on the unit at a visible location and are legible.





7.3 - TRAINING OF PERSONNEL

Installation, commissioning and maintenance works shall be conducted by authorized and trained personnel only.
The personnel concerned must be informed by the owner or the user about the hazards that can be encountered in stages listed below. This manual must be given to the personnel concerned.

- Electrical connections
- Piping
- Duct connections
- Commissioning
- Maintenance

In order to keep the guarantee valid, control and maintenance liabilities must be accepted and followed.

7.4 - PREVENTION OF GENERAL HAZARDS

Air Handling Units are equipped with locking door handles. Access of unauthorized persons to hazardous sections must be prevented. The unit door equipped with a control switch which turns the fan off when the door is opened.

The hazards threatening life and health are described below. The units have been produced as per 89/392/EEC machine directive. If the user prefers to take more precautions to prevent hazards, below descriptions will help user to recognize hazard.

HAZARDOUS ACTION	HAZARD SOURCE	HAZARD
Touching to moving parts	Fans, electric motors, pumps	Risk of injury
Touching to parts carrying electric current	Electrically live parts, power cables	Risk of death
Touching to hot surfaces	Hot water and steam coils, steam humidifiers	Risk of burn

7.5 - RECOMMENDED SAFETY PRACTICES

This document has been prepared to warn the user and the maintenance personnel about the hazards that can be encountered during installation and operation. In addition to THE instructions and warnings of the producer, regulations and standards must also be followed.

The fans in Air Handling Unit are placed in a closed section. Because an intervention to fans is needed rarely, protection devices are installed optionally. Nevertheless, safety rules for the moving machine parts are still valid here.

The unit is equipped with the protection devices below:

1) **"Emergency stop button "**, used in case of a fault or when an intervention to unit is needed.

2) When fan outlets in Air Handling Unit will be connected to duct directly, **"Fan inlet an outlet guards"** must be installed to prevent access to moving parts. Fan inlet guard must also be used to protect fan inlets. If fan outlets are in the open space, protective grills must be used.

3) The lids, which provide access to moving or electrical parts, are equipped with a stopping **switch;** when the lid is opened, the unit's power is automatically switched off.

7.6 - NOT DIRECTLY VISIBLE CONCEALED HAZARDS

In addition to hazards related to moving machines, the fans can suck various free standing material and this is regarded as a potential danger. If hard objects pass through fans they can be thrown by fans at a high speed and this may lead to a hazard. Besides, hard objects damage the blades of fans. Please ensure that the guard grills at the suction opening of fans have required attributes to prevent entry of hard objects.

Air Handling Unit's or ductwork's doors should not be opened when fans are operating or before come to a complete stop. The power must be switched off before entering to fan section or ductwork region. When combined with the speed of fan rotation, stereoscopic effects of some lights may show fans as unmoving. Keep in mind that fans will continue to rotate for some time even after the power is switched off , therefore ensure that the fans come to complete stop. Fans should be secured to limit their rotation.

Please be careful when opening the door on the positive pressure side (pressure line) of the Air Handling Unit; the door may hit. In the same way, free standing objects or garments can be sucked by fans when the doors on the negative pressure (suction line) side are opened.

Noise: During normal operating conditions the noise emitted by Air Handling Units should not exceed 70 dB(A) (when duct connections are installed and service door is closed).

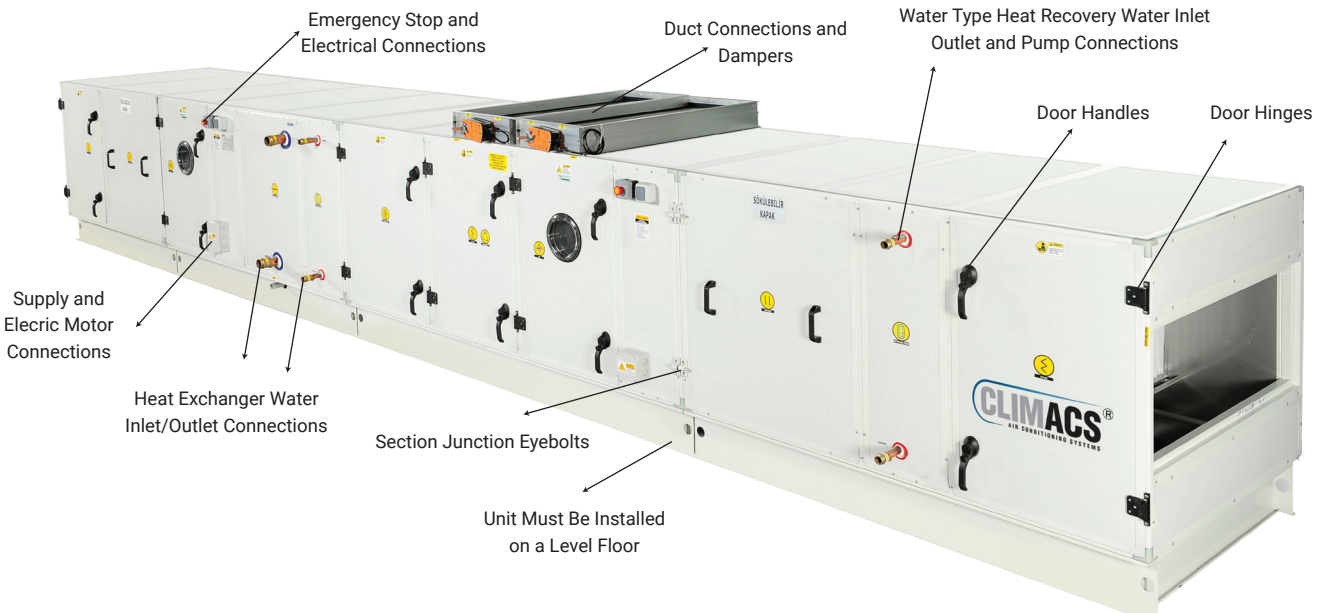
In extreme cases, depending on the room acoustics, noise level can adversely affect human health. **If exposure to noise levels of 85 dB(A) or higher will take place for long periods, ear plugs should be used.**

8 - MAINTENANCE AND CLEANING

Before operating the unit for the first time (or after annual cleaning) instructions of the producer should be followed.

Additionally, checks below should be conducted:

- ☑ Ventilating equipment and all motor switches should be switched off.
- ☑ Ensure that all sections are cleaned completely and no foreign object is left inside the unit. Duct isolation materials, tapes, bolts, tools may be forgotten.
- ☑ Check all handles and hinges of access doors and panels.
- ☑ When the unit is installed outdoor check if the unit is protected by a canopy and check sealing of connections.



8.1 - AIR FILTERS

The air delivered by the air handling units are cleaned by the filters as the air passes through the filter. Failing to check the filters as instructed, may cause health risks and faults in the unit; it also may cause to severe energy loss. Filter checks should be registered on the filter check card located on the door of filter section, after every check.

8.1.1 - PANEL FILTERS (PRE FILTER)

Depending on the level of pollution, weekly checking and cleaning of filters is necessary. A drop in the pressure level is an indication of the filter pollution. **The time that a filter takes to get polluted depends on the operation duration of the unit as well as the ambient weather condition and pollution where the unit is located, eg., city and industrial regions. An optionally available automation system can be used to detect and notify the pollution level of the filters. Fundamental function of the panel filters is to remove coarse particles from the air that is sucked from the room. This way, panel filters protect other sensitive filters and coils inside the unit.**

PANEL FILTERS ARE CLEANED BY THE METHODS BELOW:

- ☑ Shaking and vacuum cleaning
- ☑ Blowing with compressed air
- ☑ Washing with warm water (not pressurized)

If the unit is operated intensively, change the pre-filters at least once per three to six months depending on the pollution level of the ambient environment. Please take care to insert the new filter correctly and check also the gaskets on filter skids; if worn out change the gaskets and finally fix the filters in position by using clamping lever to provide air tightness.

8.1.2 - BAG FILTERS

Service life of bag filters are relatively long as a result of their shape and structure. Check one per every month, if there is any pressure drop and inspect the condition of the gaskets on the skids. The most significant indication of a filter pollution is the pressure drop.

Max Pressure Drop = 1.6 x Initial Pressure Drop + 40 Pa

When the max pressure drop is reached remove and renew the filter. Make sure that the filter frame firmly sits on the outer cassette and check that there is a good contact between doors and filters. Correct positioning and good sealing affect the filter performance.

➔ Providing sealing to filters

Washing with warm water (not pressurized)

FILTER CLASS	INITIAL PRESSURE DIFFERENCE	RECOMMENDED MAX PRESSURE DIFFERENCE
EU-2	25 Pa	100 Pa
EU-3	40 Pa	140 Pa
EU-4	50 Pa	140 Pa

Table 2: Pressure differences for panel filters

FILTER CLASS	INITIAL PRESSURE DIFFERENCE	RECOMMENDED MAX PRESSURE DIFFERENCE
EU-4	65 Pa	150 Pa
EU-5	55 Pa	180 Pa
EU-6	60 Pa	180 Pa
EU-7	115 Pa	200 Pa
EU-9	165 Pa	200 Pa

Table 3: Pressure differences for bag filters

8.2 - AIR DAMPERS

Check that the rotation of the flaps is not obstructed.

Do not touch the body or flexible connections.

Remove the accumulated dust by compressed air.

If you observe any problem in opening or closing of the flaps call an authorized service

8.3 - STEAM TYPE HUMIDIFIERS

- ☑ In each season, clean the strainer in the steam feed of control valve.
- ☑ Annually check the control valve, condensed water discharge system and distribution pipe.
- ☑ Humidifier boiler and electrodes should be checked at least once per year. If the water used in the system is not distilled water, the frequency of checks should be increased depending on the chemical composition of the water used. Please note that not using distilled water will shorten service life of your unit.

Following the periodic checks of humidifier section, the operation of the humidifier can be checked by observing operation of other compartments which the humidifier precedes. Looking towards air flow direction, no steam increase should be observed.

8.1 - AIR FILTERS

Cleaning of air inlet side should be checked at least once per year. Surrounding weather and environmental conditions may require more frequent checks. Remove the parts and clean them applying pressurized water in the opposite direction of air flow. If the pollution is severe please check the position of the filters. Check coils against leakage.

Every month, check the dirt strainers in your installation; if their condition is similar to the ones shown in the picture, it means all heating and cooling effort is wasted.

Please follow the steps below when it is necessary to remove the coil for cleaning and maintenance:

- ☑ Discharge the water inside the coils
- ☑ Dismantle the coil from piping connections
- ☑ Remove the side panel
- ☑ Dismount the nuts fixing the coil
- ☑ Remove the coil

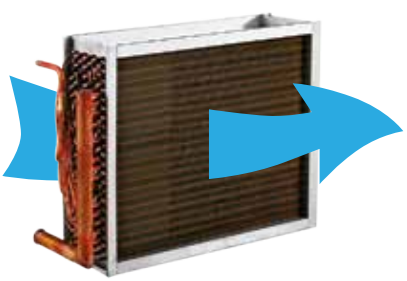
Please follow the steps below to locate leakage in coils:

- ☑ Clean the surface and the fins of the coil
- ☑ Fill the coil with water
- ☑ Locate the leakage
- ☑ Discharge the water
- ☑ Using oxy-acetylene welding repair the small cracks or holes located on copper pipes

Fill the coil with water again to check welding is successful.

Prevent water in coils from freezing. If the water inside the pipes of coils freezes, this will severely damage the pipes. For this reason, antifreeze should be added to circulating water if there is a risk of freezing. If the coil will not be operated for a short period coil, ensure that the water inside the coil is partially circulated. It is recommended to discharge the water in the coil, if it will not be operated for longer periods. Some condensed water might be seen in the return compartments of cooling or heat recovery coils. Please check condensing water drainage.

AIR FLOW DIRECTION



Please clean by using either compressed air or water in the opposite direction to air flow.
You can also use a very soft brush.
Straighten the bent fins by using a special fin comb

COIL CLEANING METHOD

8.5 - FANS

Fans driven by belt and pulley mechanism:

- Make sure that the pulley is fixed on the motor shaft tightly (for belt and pulley mechanism)
- Check tension of belts
- Check if fan and motor rotate freely.
- Check direction of fan rotation. To do that, momentarily switch on and off the power then observe the rotation direction of fan.
- Check that motor pulley and fan axes are aligned.
- Check the setting of thermal overload relay is correct.
- The reason of frequently encountered faults in fans with forward curved blades: Excessive air flow rate caused by lower system resistance (when the system resistance is lower than expected). In order to overcome this type of fault, main system damper should be partially closed during first start up and must be opened by the system when correct proportion of air flow rate is reached.

ACS Klima After Sales Services should be contacted for an exact information about air flow rates:

Plug Fans:

- Ensure that electric motors of fans are controlled by a frequency convertor (invertor).
- Check the clearance between fan rim and rotor; ensure that there is no contact or excessive gap.

Generally For All Fans:

- Check fan and motor connections
- Check that flexible couplings are secured tightly and not damaged and duct connections are designed according to the recommendations of the manufacturer as per acceptable engineering applications.
- Check that there is no foreign object at the inlet of the fan.
- Switch on the power and let the fan to reach to its full speed.

And Check Points Below Carefully:

- Excessive vibration
- Abnormal noise
- Pulley and belt axes alignment
- Proper lubrication
- Motor current and voltage values

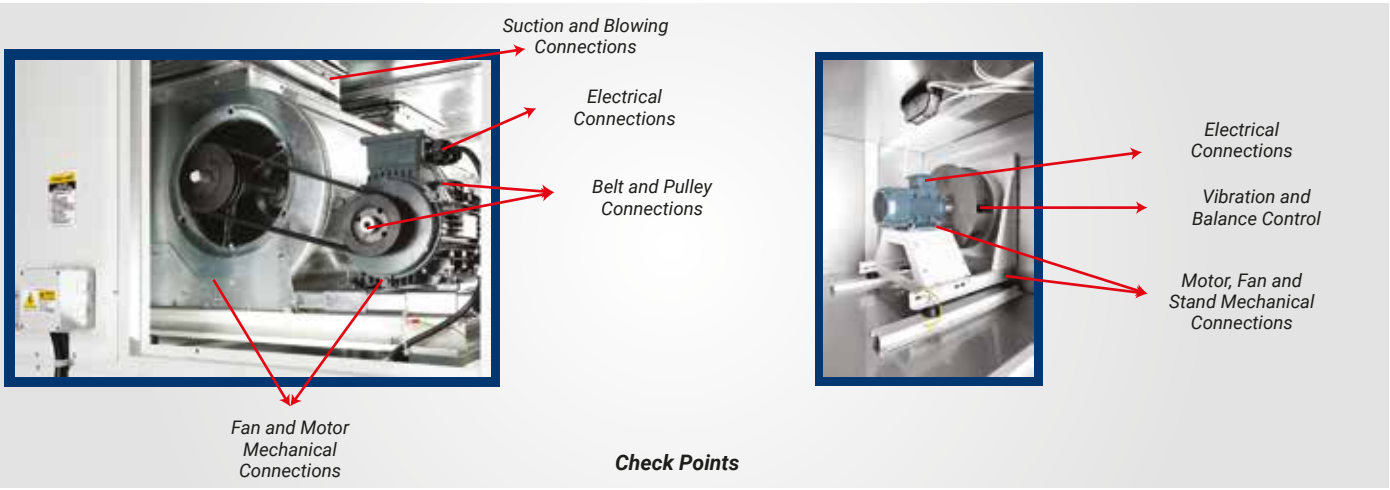
If you see a problem, stop the unit immediately. Switch off the power. Secure the fan to prevent unintentional rotation. Inspect the source of problem carefully and rectify it if necessary.

Operation of the fan should be observed periodically for the first eight hours of the operation. During this observation, pay attention to excessive vibration and sound. Motor input current and temperature of bearings should be checked to ensure that they are within the limits specified by the manufacturer.

Next, if necessary, fan should be switched off to make the adjustments below:

- ☑ Belt axis and tension adjustment
- ☑ Bearing temperature
- ☑ Fan and motor fixing bolts

Note that belt tension should not be too much in order to avoid overload on bearings. Depending on cross-section of pulleys and distance between the centres of pulleys, **V belts can be pressed down by 2.5 cm approximately.** Fan speed should not be changed unless consulting to the firm. If higher rotation speed is required, motor power rating should be checked whether it is compatible to that speed. The load on bearings and fan must be re-calculated by the manufacturer. Vibration absorbing isolators should be checked once per year for damage.



Check Points

Check the balance of fan once per year. Clean dust on suction nozzle and rotor. Accumulation of dirt on the rotor can impair the balance. If the pollution is severe check the operation of the filters and upgrade them if necessary. If the fans are equipped with a suction damper, check the proper operation of the suction damper flaps once per every three months. During this check, first switch off the fan and operate the suction damper to check the operation of servo motor, joints and flaps.

8.6 - SILENCERS

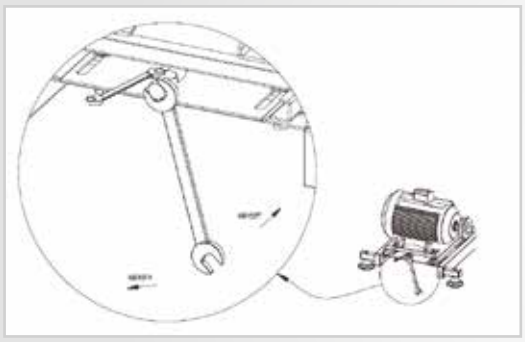
Normally maintenance is not necessary for silencer chamber. Nevertheless, it is a good practice to check the sound absorbing material is intact once per year. This way it is ensured that the installation is not clogged by this material.

Important Warning:

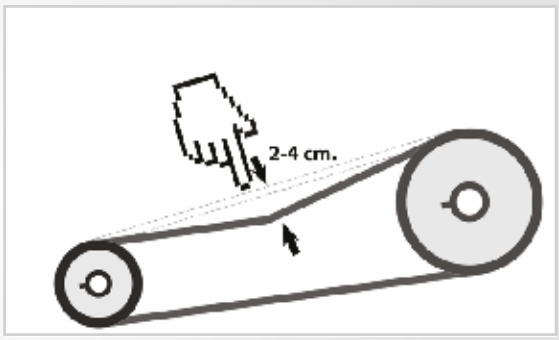
Silencer chambers should be inspected carefully to check that the surface of the silencer chambers are not damaged; The glass wool inside may be caught by the air flow and carried away towards the filters. This may damage the filters and pollute the ambient air.
(ACS, wraps the glass wool by a special fabric in order to minimize the risk.)

8.7 - PULLEY AND BELTS

Belt tension check by hand is shown in the figure below.



Belt tension adjustment



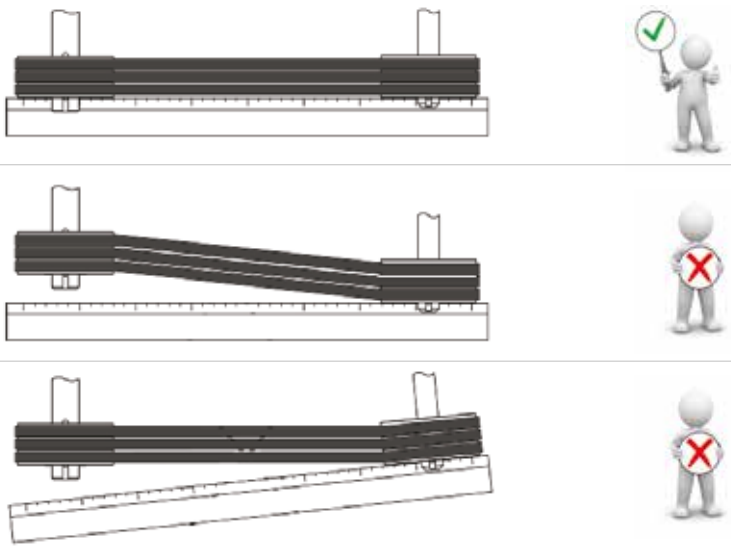
Belt tension check

The belt can be stretched by 2-4 cm when pressed down by hand as shown in the figure.

If the belt stretches too much it means the tension is not sufficient. If this is not corrected, the belt slips in its groove and this can lead to decreased fan speed or excessive wear and tear of belt.
If the amount of stretch is too small it means the tension is excessive. If this is not corrected it leads to excessive vibration and noise and shortens the life cycle of bearings and belt.

The efficiency is another reason for correct belt tension . When the tension is too much, the motor operates as if it is overloaded, however, the same motor can be sufficient with the proper belt tension.
The belt should be tight enough to prevent slipping.

Before fixing the motor into its position ensure that pulley axis are perfectly parallel and grooves in pulleys are on the same axis (or pulley faces are on the same plane). To do that, a straight ruler can be used as seen in the figure below. Aligning the pulleys increases the belt's life and prevents noise.



Pulley Axis Alignment Check

Mounting the pulley:

- ☑ Clean and lubricate the bushing, pulley and machined surfaces of the shaft.
- ☑ Align the half threaded hole and mount the bushing, attach the bolts but do not tighten them.
- ☑ Insert the wedge in the shaft. Slide the pulley slowly and keep the bolts outside and tighten them equally. Never apply excessive tighten torque.

Dismounting the pulley:

- ☑ Remove the fixing bolts.
- ☑ Insert one bolt in the threaded hole and tighten in until the shaft and bushing is released.

Do not use hammer or puller to remove the pulley. Do not exchange larger and smaller pulleys without written permission of the producer. Otherwise the producer will not be liable for the consequences.

8.8 - MAINTENANCE PROGRAM

A protective maintenance program is an important part of an active safety program. Maintenance works should be conducted by trained and experienced personnel. Do not attempt to conduct any maintenance unless the power is switched off and the fan is secured. Generally air handling units do not require a special maintenance other than routine cleaning and maintenance. Recommended maintenance program is given below. Maintenance period should be adjusted according to the environmental conditions and climate.

8.8.1 - Once per week

- ☑ Check the condition of filters. Clean, wash or change if necessary.

8.8.2 - Once per month

- ☑ Check belt and pulley mechanism and tension of the belt.
- ☑ Check the injection nozzles and the valve of humidifier float.
- ☑ Check water flow in the drainage pipe.
- ☑ Check the condition of hinges and gaskets of the entrance door.
- ☑ Check the condition of internal and external heat-exchangers (coils) and wash if polluted.

8.8.3 - Once per every six months:

- ☑ Check the operating current of the motor
- ☑ Check the bearing of fan and motor against overheating and noise
- ☑ Check the operation of control instruments
- ☑ Check condensed water tray, drainage and drainage pipe
- ☑ Check circulation pump and motor of the humidifier

- ☑ Check the condition of the strainer of the humidifier
- ☑ Check the condition of cold / hot water or steam pipe system.
- ☑ Change synthetic wool in the panel filters.

8.8.4 - Once per year:

- ☑ Check the isolation of the filter frame.
- ☑ Change the synthetic wool in panel filters.
- ☑ Check the heat exchangers and fins. Straighten the bent fins by using a special fin comb and wash by water jet if necessary.
- ☑ Check the heat exchangers for leakage.
- ☑ Bleed the water heat-exchangers to remove air.
- ☑ Change the belts.
- ☑ Check the tightness of fixing bolts of the fan and motor.
- ☑ Check lubrication of motor and fan bearings.
- ☑ Check the operation of the dampers.
- ☑ Check the doors of the air handling unit for easy opening and closing.
- ☑ Check the conditions of the fittings and valves in piping system.
- ☑ Check all cabling, control and isolating apparatus and terminal connections etc.

In case a part is changed during a maintenance consult the relating section of the manual and follow the instructions to restart the unit.

Follow the steps below if it is necessary to dismount the water heat exchangers for cleaning and maintenance:

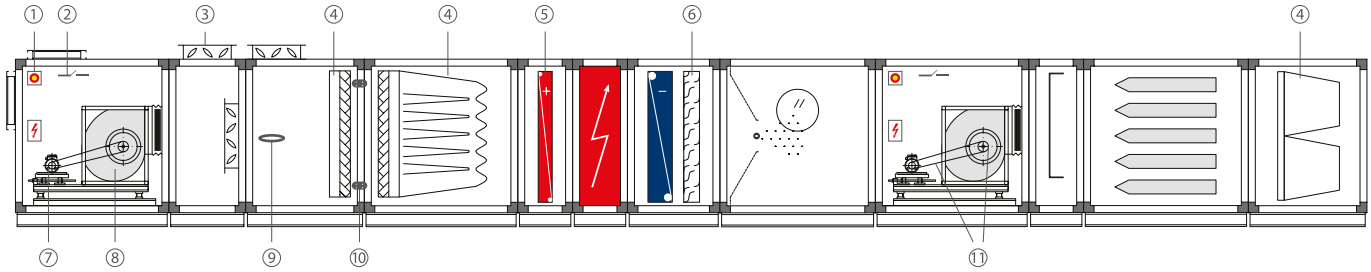
- ☑ Discharge the water inside the heat-exchangers
- ☑ Dismantle piping connections of the heat-exchanger
- ☑ Remove the side panel
- ☑ Dismount the nuts fixing the heat-exchanger
- ☑ Remove the heat-exchanger

Follow the Steps Below To Locate Leakage In Water Heat Exchangers:

- ☑ Clean the surface and the fins of the heat exchanger
- ☑ Fill the heat-exchanger with water
- ☑ Locate the leakage
- ☑ Discharge the water
- ☑ Using oxy-acetylene welding repair the small cracks or holes located on copper pipes

Fill the heat-exchanger with water again to check if welding is successful.

9 - SPARE PART



1) EMERGENCY STOP BUTTON
2) DOOR SWITCH
3) DAMPER BELT – PULLEY
4) FILTERS
5) HEAT EXCHANGER
6) SEPARATOR
7) MOTOR
8) FAN
9) DOOR LOCK AND HANDLE
10) HINGE
11) BELT AND PULLEYS

10 - TROUBLESHOOTING

It is necessary to switch off the unit before checking the fan and system. During maintenance, unit's power connection must be completely switched off. All switches and breakers must be turned and locked to "OFF" position. Besides, "DO NOT OPERATE" sign should be kept on the control panel during the maintenance. Locating the fault is an important step to rectify it. Faults should be located by following the procedures given in this section.

Fault finding method:

a) In order to find a fault, use the fault finding chart. Check possible causes.
b) If you cannot find the cause, continue with the "System Check List".
c) If you still cannot solve the problem get in touch with the producer.

System Check List:

A systematic check of the points below will help to identify the problem.

a) Direction of fan rotation
b) Axis of pulleys are correct
c) Belts are not either too tight or loose
d) Belts and/or pulleys are not worn
e) Air passing surfaces on the fan (fan blades, body and fan inlet) are clean
f) Fan blades and body are not damaged
g) Heat exchangers, filters and ducts are clean.
h) Fan outlet connections were designed and installed correctly.
i) Fan flow rate adjustment flaps do not operate synchronized. If the flaps do not operate synchronized this creates an unbalanced flow which causes performance drop and overload on the bearings.
j) Flaps are positioned according to the design conditions.
k) There is no leakage in the unit or in ducts.

If the cause of the problem is still unknown, get in touch with the producer of the air handling unit. Please prepare the information below which the producer may require.

a) Location of the unit, duct details, serial number, mode and type of the unit

b) Measured values and design values of performance

c) System design calculations

d) Measured values of fan performance: fan static pressure, air flow rate, fan speed, current drawn, temperature of ambient air etc.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Air Handling Unit Operates Noisy	High air speed	Air flow rate is too high	Measure air flow rate and adjust it to correct rate
		Cross-sectional area of duct is too small for the purpose	Check the dimensions of ducts and revise if necessary
		Fan is too small for the purpose	Check the capacity of fan and change if necessary
		Coil's front surface is insufficient	
		Air grilles are too small for the purpose	
	Impeller hits to suction frame	Damaged impeller	Rectify or change the impeller
		Damaged suction frame	Rectify or change the frame
		Rotor is not centered on the shaft	Center the rotor
		Shaft sits loose in the bearing	Tighten the shaft
		Rotor sits loose on the shaft	Tighten the rotor
	Noisy belt-pulley drive	Belts are too loose	Adjust belt tension
		Belts are too tight	Adjust belt tension
		Cross-sectional area of belt is incorrect	Choose a belt with correct-cross sectional area
		Belts are worn	Replace belts
		Belts are greasy or dirty	Clean belts
		Different length of belts (in multi belt systems)	Install correct belts
		Fixing bolts of either fan, motor or motor stand are loose	Tighten bolts
		Pulleys are not aligned on axes	Adjust the axis of pulleys
		Seat diameters of adjustable pulleys are not adjusted equally	Make sure that pulley diameters are the same.
		Fan shaft is bent	Replace or rectify the shaft
		Motor bearings are damaged	Replace bearings
	Noisy bearing	Bearing-stand connection is loose	Tighten the bearings
		Shaft – bearing connection is loose	Tighten the shaft
		Bearings are worn or damaged	Replace the bearings
		Bearings needs lubrication	Lubricate the bearings
		Foreign material in bearing	Clean the bearing
		Corrosion between shaft and rotor	Remove the corrosion, if worn change the shaft
	Noisy rotor	Worn or damaged rotor	Replace rotor
		Unbalanced rotor	Adjust balance
		Foreign substance In the unit or in the fan	Clean interior of the unit and fan
	Vibration	Vibrating ducts	Fix the ducts
		Vibrating body parts	Fix the parts causing vibration or isolate them properly
		No vibration isolators between building and vibrating parts	
	Ting / Whistle Sound	Clogged dampers and air grilles	Check and remove accumulation
		Leakage in body and ducts	Prevent leakage
		Tight angle elbows	Remove tight elbows and install proper diameter elbows with direction flaps
		Sudden expansion or shrinkage in ducts	Replace expansion/shrinkage compartments with the ones having proper angles.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
No Air Flow in Air Handling Unit / Motor Is Not Working	There is no supply voltage to the motor	Power failure	Find and rectify the fault
		Thermal protection is tripped	Motor supply cables are faulty
			Terminals and contactors are loose
			Check that thermal protection settings are ok
		Control panel fault	Check system connections
		Door is open	Close the door
		Safety switch is faulty	Check connections or replace switch
		Breaker switch is turned off	Turn on the breaker switch
	There is supply voltage to the motor	Motor bearing stuck	Lubricate the bearings
		Wrong terminal connection	Correct the connections
		Faulty motor coil	Overheating or overload Wrong power supply

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
No Air Flow in Air Handling Unit / Motor Is Working	Fan is not working	Rotor-shaft connection is loose	Tighten rotor, check belts
	Fan is working	Duct is clogged	Open the duct
		Fan rotates in reverse direction	Correct rotation direction of fan
		Damper is closed for either suction or blowing	Check the position of damper

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Insufficient Air Flow in Air Handling Unit	Insufficient air flow	Filters are clogged or dirty	Replace or clean the filters
		Coils are either dirty or clogged	Clean coils
		Fan rotation direction is incorrect or rotor is installed in wrong direction	Correct rotation direction of fan and rotor
		Duct resistance exceeds design criteria. Insufficient duct design	Check duct pressure losses and duct design
		Dampers / air grilles are closed	Adjust dampers / air grilles for required air condition
		Belt – pulley mechanism was selected incorrectly Fan speed is low	Get in touch with the producer to check if the belt-pulley mechanism was selected correctly
	Belts are slipping	Belts are either not tight or greasy	Increase tension of the belts and clean grease and dirt
	Excessive leakage on pressure side of the system	Doors are loose. Duct connections are not isolated. Duct outlet is not complete	Check doors and duct connections. Isolate the leakages. Complete the ductwork.
		Fire damper might be closed	Check and act accordingly
		Valves are either closed, not adjusted or selected incorrectly	Open the valves, check the adjustment, replace if selected incorrectly
		Duct outlet might be closed or clogged	Check the ducts, either open them or remove the congestion

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Excessive Air Flow in Air Handling Unit	High Air Speed	Dimensions of ducts are either too large or duct resistance exceeds far beyond the prescribed resistance	Adjust the dampers accurately or slow down the fan by replacing pulleys
	Excessive leakage on pressure side of the system	Doors are loose. Duct connections are not isolated. Duct outlet is not complete	Check doors and duct connections. Isolate the leakages. Complete the ductwork.
	High Air Speed	Belt – pulley mechanism was selected incorrectly Fan speed is high	Get in touch with the producer to check if the belt-pulley mechanism was selected correctly
	Excessive motor current	Supply voltage is low	Regulate the voltage according to motor operation rating
		Air grilles were not installed	Installed the air grilles
		Filters were not installed	Install the filters
		Filters are clean therefore the initial pressure difference is small	Adjust the operation frequency of motor or adjust pulleys. Check VAV, CAV or fire dampers.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
No Heating in Heating Coil of Air Handling Unit	Burner or boiler is faulty	There is no pump, thermostat or fuel or fuel supply pipe is clogged	Check energy and fuel supply. Check fuel supply connections.
		Ignition system is faulty	Check ignition sparks. Adjust sparks.
	No Heating Fluid is Supplied to the Heat-Exchanger	Air in the system	Congestion in heat-exchanger or in pipes
		3-way or 2-way valve is closed	Check if valve motors are faulty of if control system is faulty.
		Mechanically adjusted valves are closed	Open the valves
	Heating heat-exchanger is cold	Boiler temperature is low	Check the setting point. If it doesn't change, increase the boiler temperature.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Insufficient Heating in Heating Coil of Air Handling Unit	Heating fluid flow rate is low	3-way or 2-way valve is closed	Check if valve motors are faulty of if control system is faulty.
		Pump capacity is insufficient	Check pump capacity, replace if necessary
		Pipe dimensions are insufficient	Check pipe dimensions, replace if necessary
		Coil is clogged	Clean the coil
		Dirt retainers are full	Clean or replace the dirt retainers

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Insufficient Cooling in Cooling Coil of Air Handling Unit	Cooling fluid temperature is high	Cooling circuit switches on and off continuously	Cooler capacity is insufficient. Circulating pump or compressor is faulty. Excessive heat gain in pipework.
	Cooling fluid flow rate is insufficient	Valves are partially closed or system is clogged	Circulating pump or compressor is faulty
		Dirt retainers are full	Clean or replace the dirt retainers
	Cooling coil is partially frozen	Low load	Refer to the section "No cooling, safety element stopped the compressor."
		Low suction temperature	
		Air flow rate is low	Refer to the section "Low air flow rate"
		Inlet air temperature is too low	Apply pre-heating
		Air flow in cooling coil is not homogenous	Irregular air speed. Bad duct connections.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
No Cooling in Cooling Coil of Air Handling Unit	Cold water cut off valves are closed	2-way or 3-way valves are closed	Thermostat fault. Circulation pump fault. Valve and valve motors are faulty. Incorrect set value.
	No air flow		Refer to section "No air flow"
	Incorrect thermostat setting	Cooling thermostat setting is high	Locate and correct the fault
	Safety element stops the compressor	High pressure switch cuts the connection	Condenser if faulty. Fans or pumps are stopped. Condenser is clogged. Heat cannot be repelled.
	Safety element stops the compressor	Solenoid valve is closed. Low pressure switch cuts the connection.	Suction temperature is low. Low air flow. Inlet air temperature is too low. Coils or compressor is huge.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Steam humidifier – No humidifying	No power	Elements or control valve does not receive power	Check power supply
	Heater is faulty	Electrodes are faulty	Replace the electrodes
		No water in the boiler	Check water supply installation
		Solenoid valve is faulty	Replace the solenoid valve
	Humidity sensor is faulty	Humidity sensor is oxidized, electronic circuit board is damaged.	Replace
		No supply	Check installation and transformer
	No water inside cylinder		Check the valve. Check dirt retainer. Check solenoid valve.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Electronic Steam Humidifier – Insufficient Humidifying	Insufficient humidifying	Water level sensor is faulty	Check and replace
		Water level board is faulty	Check settings, replace if faulty
		Spray nozzles and/or strainer is clogged	Clean the nozzles and strainer
		Air flow rate is high	Refer to the section "High air flow rate"
	Heater is faulty	Safety breaker did not work smoothly	Supply water is cut or insufficient water level in tank. Water treatment is necessary to prevent scale.
	Scale on steam cylinder and heating elements	Insufficient water treatment	Maintain or replace
	Thermostat setting is incorrect	Humidistat calibration is incorrect	Control valves are not opened fully
	Steam supply rate is low	Steam tank is faulty	Hand valves are either partially or fully closed.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Electric heater – No heating	Controller does not receive power	Power failure	Locate and rectify the fault
		Faulty contactor	Replace with a new one
		Safety thermostat has shut down the system	Check the safety thermostat. Make sure that there's an air flow. Make necessary adjustments.
	Controller receives power	Resistance might be faulty	Replace the resistance
		Heat set value is too low	Adjust the heat setting

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Electric heater – Insufficient heating	Heating element is faulty	Current leak or earthing in element	Heater connection is broken / Cable connection is incorrect / Dropped voltage
	Thermostat setting is too low	Thermostat potentiometer is stuck	Potentiometer shaft is faulty/ Cabling is incorrect / equipment is faulty

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Water Leakage in the Air Handling Unit	Water leaks from various points of the Air Handling Unit	Drainage pipe in the air handling unit might be clogged	Remove the object or dirt which cause clogging from the drainage tray and ensure that the pipe is open
		Water coils in the air handling unit may be leaking	In this case, close the water inlet and outlet valves and if possible repair the coil in situ if not dismount to repair. Or call an authorized service.
		Drainage does not function	Inspect the drainage, clean if clogged or renew it
		Drainage pipe outside the air handling unit may be clogged	Have your plumber to open clogging in the pipe
	Water leakage at hot and cold water coils pipe of the Air Handling Unit	In this case, the sleeves can be loosen / cracked or leaking at welded seams	Call your plumber
	FROZEN	Freezing is the common cause of leaks in cold seasons. If you think freezing is the cause of leaks consult ACS for solution.	

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
High Pressure Fault in Cooling Units	"High Pressure" notification in the control panel; if the unit is not equipped with a control panel, notification can be made by lamp indication.	Air Flow is absent or insufficient	Read "No Air Flow" points in other sections
			Read the points below about filters, condenser and evaporator
		Filters can be dirty or clogged	Clean pre-filters or renew if expired. Replace 2nd and 3rd stage filters
		Condenser can be dirty or clogged	Please clean according to the instructions given in the user manual
		Evaporator can be dirty or clogged	
		Condenser fan might be faulty	Check the fans and replace if faulty
		Fan control process switch might be faulty	If fan control process switch is faulty it should be replaced

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Low Pressure Fault in Cooling Units	"Low Pressure" notification in the control panel; if the unit is not equipped with a control panel, notification can be made by lamp indication.	Air Handling Unit 's air flow rate is insufficient	Check the air flow rate of your air handling unit. If the flow rate is insufficient please refer to the related sections for a solution.
		Expansion valve is faulty or it needs maintenance	A technician can solve the problem by either maintaining or if faulty by replacing the expansion valve
		Dryer might be clogged	A technician can solve the problem by replacing the dryer or its cartridge
		Refrigerant leakage somewhere in the system	A technician will locate the leakage and repair the leaking part then top up refrigerant to compensate leaked amount
		There can be a problem in solenoid valve	Solenoid valve should be inspected. (Especially the coil should be checked if it attracts). If faulty it should be repaired or replaced

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Motor Protection Switch (MPS – Thermal) Fault in Cooling Units	Motor protection switch (thermal) trips continuously	Compressor coils might be faulty	A technician will measure current values and decide if replacement of compressor is necessary
		Condenser fans might be faulty or function insufficiently	Fans are inspected, repaired or replaced if faulty
		The switch might be faulty	Replace the switch
		Excessive amount of refrigerant in the system	Your technician will adjust refrigerant amount
	Motor protection switch trips occasionally	Voltage drop	Wait for the mains to be restored or if it is permanent adjust voltage from the building transformer
		Polluted condenser	Consender should be cleaned according to the maintenance instructions

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Operation of cooling unit's compressor is noisy	Compressor started to sound abnormally according to its usual operation	Condenser fans do not operate	Check if the fans receive power. If there is power fan might be faulty and replacement may be necessary.
		If condenser fans operate, expansion valve might be insufficient or clogged.	A technician should maintain or replace it
		If condenser fans operate, dryer might be clogged	A technician can replace the dryer
		Condenser coil is polluted and blocks the air passage	Let the air flow by cleaning the condenser with pressurised water and a brush; use a type of brush that will not damage the coil.
		If condenser coil is clean, expansion valve might be insufficient or clogged.	A technician should maintain or replace it
		If condenser coil is clean, dryer might be clogged	A technician can replace the dryer
		Compressor may be working in reverse direction	Check the power cables and phase direction of compressor
		Moving parts of compressor might be worn	Have an expert technician to check the status of compressor. He will consult you if repair or replacement is needed.

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Operation of cooling unit's compressor is noisy	Compressor started to sound abnormally according to its usual operation	Oil is low due to oil leakage etc.	Check the oil level via the eye sight and rectify the problem causing oil loss. Top up the oil level with proper type of oil.
		Oil level is normal however, oil is polluted and clogged the oil process switch	Change the oil and replace the process switch
		Carter heating element might be faulty	Restore function of the heating element
		Oil separator is either faulty or clogged	Oil separator must be renewed

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
Cooling unit is not functioning	Cooling unit does not operate at all	It does not receive power	Have your electrician to inspect the problem
		Others	

FAULT DESCRIPTION	SYMPTOM	POSSIBLE CAUSE	SOLUTION
System pressure does not raise in the cooling units	Pressure does not raise even when the compressor operates	Compressor operates reversely	Check the power input connections and ensure that the compressor operates correctly
		Cooling refrigerant in the system is insufficient or was leaked completely	First, a technician should find and eliminate the reason of the problem, then top up refrigerant to compensate leaked amount and re-commission the system.

11 - AFTERSALES SERVICES

The user, except for conducting maintenance, cleaning and visual inspection, should not attempt to intervene in the unit without getting in touch with an authorized service.

11.1 - CONTACT

For your needs and question, you can use support center in our website or reach us via the contact information below.

12 - PRODUCT LABEL SAMPLE

ACS KLİMA İMALAT SAN. VE TİC. LTD. ŞTİ.

Mimar sinan cd. No: 81 Karakuyu - Torbalı / İzmir

Tel : 0 (232) 866 20 50(Pbx) | Fax : 0 (232) 866 22 23

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FOR YOUR INQUIRIES
PLEASE USE CONTACT INFORMATION BELOW

To get in touch with us;
You can either visit our website and fill the related form in the web page: https://www.acsklima.com/en/support-center/
or e-mail to: servis@acsklima.com / info@acsklima.com / fbmd@acsklima.com
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CLIMACS®
AIR CONDITIONING SYSTEMS

Package Type Hygienic Air Handling Units

Thank you for choosing
ACS and CLIMACS brand Package Type Hygienic Air Handling Units

In addition to **"Air Handling Units Installation, Operation and Maintenance Manual"** supplied with each unit, this manual contains instructions for the first installation, operation and maintenance of the the units which are equipped with a specially designed automation software.

ALL THE BEST

INTRODUCTION

All instructions and information given in general user manual (Air Handling Units Installation, Operation and Maintenance Manual) are also valid for this package type hygienic air handling unit. You can access all our manuals from the products menus in our web site www.acsklima.com

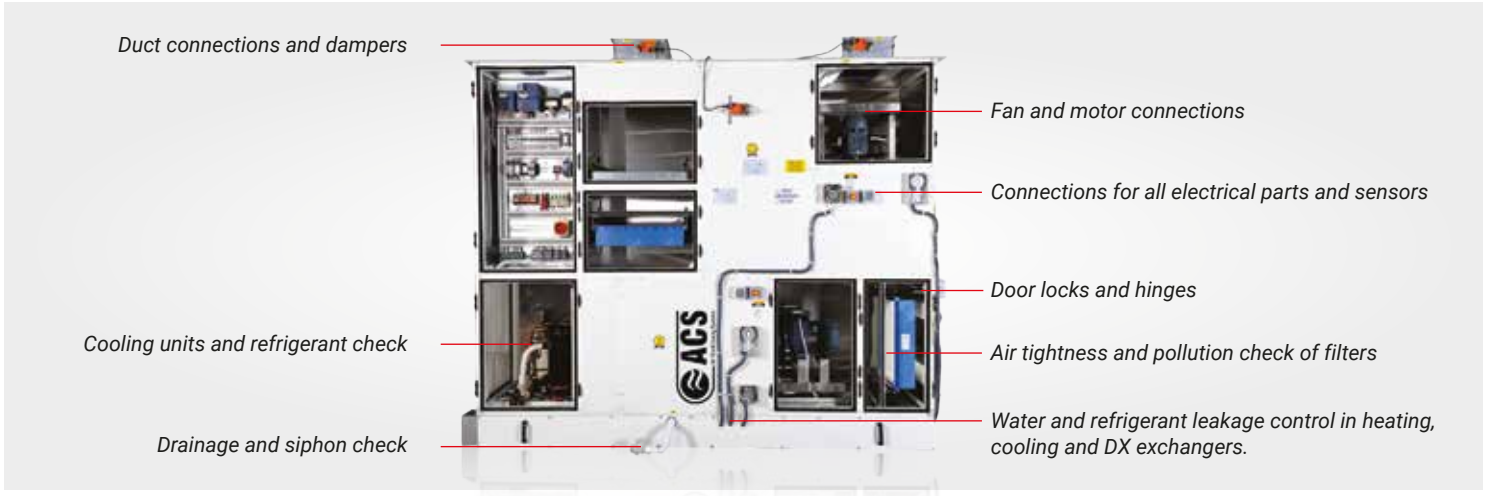
Besides providing heating, ventilation and air conditioning, Package Type Hygienic Air Handling Units are capable of regulating the air pressure of the hygienic area both positively and negatively. Therefore, air handling units should not be shut down except for the periods of maintenance, cleaning or fault conditions. Please keep in mind that shutting down the air handling unit may lead to contamination risk in hygienic spaces.

Due to hygienic and package type design of the unit, it should be installed on a level floor with sufficient strength to carry the load of the unit; the installation method should allow easy cleaning and good drainage of condensed water. The installation location must be free of contamination sources such as chimney, dump, etc.

Package type units are generally produced with outside unit (condensing unit). The outside units should be located carefully to provide sufficient clearance for fresh air suction and condenser blowing directions (condenser should not be covered by walls, dividers etc.). Moreover, condenser blowing space should not coincide to other unit's suction space.

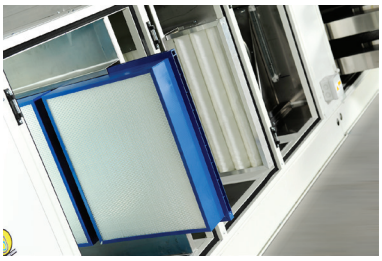
MAINTENANCE AND CLEANING

Before operating the unit for the first time (or after annual cleaning) instructions of the producer should be followed.
Additionally, checks below should be conducted:
For the annual maintenance, ventilating equipment and all motor switches should be switched off.
Ensure that all sections are cleaned completely and no foreign object is left inside the unit. Duct isolation materials, tapes, bolts, tools may be forgotten.
Check all handles and hinges of access doors and panels.
When the unit is installed outdoor check if the unit is protected by a canopy and check sealing of connections.



In addition to check of connections,
all notifications shown on the control panel must be carefully inspected and intervened.

AIR FILTERS



The air delivered by the air handling units are cleaned by the filters as the air passes through.

Failing to check the filters as instructed, may cause health risks and faults in the unit; it also may cause to severe energy loss.

Filter checks should be registered on the filter check card located on the door of filter section, after every check

PANEL FILTERS (FRONT FILTER)

When the units are started operation, weekly checking and cleaning of filters is necessary. A drop in the pressure level is an indication of the filter pollution, depending on the level of pollution. The time that a filter takes to get polluted depends on the operation duration of the unit as well as the ambient weather condition and pollution where the unit is located, eg., city and industrial regions. An optionally available automation system can be used to detect and notify the pollution level of the filters.

Panel filters are cleaned by the methods below:

- Shaking and vacuum cleaning,
- Blowing with compressed air
- Washing with warm water (not pressurized)

If the unit is operated intensively, change the pre-filters at least once per three to six months depending on the pollution level of the ambient environment. Please take care to insert the new filter correctly and check also the gaskets on filter skids; if worn out change the gaskets and finally, fix the filters in position by using clamping lever to provide air tightness.

Clear Filter

Device maintenance is very important

If you use your filter on the right side as if it were contaminated, it is dangerous to human health.

Unserviced devices are not covered by the warranty.

Dirty Filter

2nd AND 3rd STAGE FILTERS

Check if there is any pressure drop and inspect the condition of the gaskets on the skids.

The most significant indication of a filter pollution is the pressure drop.

Max Pressure Difference = 1.6 x Initial Pressure Difference + 40 Pa

When the max pressure drop is reached remove and renew the filter.

Make sure that the filter frame firmly sits on the outer cassette and check that the contact between doors and filters is good.

Correct positioning and good sealing affect the filter performance.

Providing Sealing for Filters

Important Warning:

BAG, MPACK AND HEPA type filters cannot be cleaned and reused. These should be changed upon completion of life cycle.

"Please contact to ACS engineers to get information on special filters "

Table 1: Pressure differentials for Panel filters (pre-filters)

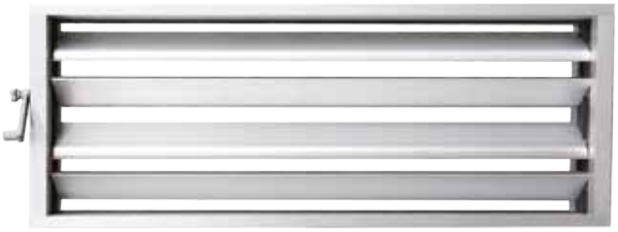
FILTER CLASS	INITIAL PRESSURE DIFFERENCE	RECOMMENDED MAX PRESSURE DIFFERENCE
EU - 2	35 Pa	150 Pa
EU - 3	35 Pa	150 Pa
EU - 4	45 Pa	150 Pa

Table 2: Pressure differentials for 2nd and 3rd stage filters

FILTER CLASS	INITIAL PRESSURE DIFFERENCE	RECOMMENDED MAX PRESSURE DIFFERENCE
EU - 4	45 Pa	150 Pa
EU - 5	80 Pa	200 Pa
EU - 6	80 Pa	200 Pa
EU - 7	80 Pa	200 Pa
EU - 8	95 Pa	300 Pa
EU - 9	95 Pa	300 Pa

Note: ACS package type hygienic air handling units are supplied with automation system by which you can easily monitor the filters on touch sensitive panel screen.

AIR DAMPERS



Check that the rotation of the flaps is not obstructed.
Do not touch the body or flexible couplings.
Remove the accumulated dust by compressed air.
If you observe any problem in opening or closing of flaps call an authorized service.

Important Warning:

Silencer chambers should be inspected carefully to check that the surface of the silencer chambers are not damaged; The glass wool inside may be caught by the air flow and carried away towards the filters. This may damage the filters and pollute the ambient air.
(ACS Klima, wraps the glass wool by a special fabric in order to minimize the risk.)

STEAM TYPE HUMIDIFIERS

In each season, clean the strainer in the steam feed of control valve.
Annually check the control valve, condensed water discharge system and distribution pipe.
Humidifier boiler and electrodes should be checked at least once per year. If the water used in the system is not distilled water, the frequency of checks should be increased depending on the chemical composition of the water used. Please note that not using distilled water will shorten service life of your unit.
Following the periodic checks of humidifier section, the operation of the humidifier can be checked by observing operation of other compartments which the humidifier precedes. Looking towards air flow direction, no steam increase should be observed.

HEATERS, COOLERS AND HEAT RECOVERY COILS

Cleaning of air inlet side should be checked at least once per year. Surrounding weather and environmental conditions may require more frequent checks. Remove the parts and clean them applying pressurized water in the opposite direction of air flow. If the pollution is severe please check the position of the filters.

Check coils against leakage.

Please follow the steps below when it is necessary to remove Water Coils for cleaning and maintenance

- ☑ Discharge the water inside the coils
- ☑ Dismantle the coil from piping connections
- ☑ Remove the side panel
- ☑ Dismount the nuts fixing the coil
- ☑ Remove the coil

Please follow the steps below to locate leakage in Water Coils

- ☑ Clean the surface and the fins of the coil
- ☑ Fill the coil with water
- ☑ Locate the leakage
- ☑ Discharge the water
- ☑ Using oxy-acetylene welding repair the small cracks or holes located on copper pipes
- ☑ It may not be possible to repair the coil if the reason of leakage is cracks caused by freezing, or if the leakage is located between fins
- ☑ Fill the coil with pressurized water to check if the welding is successful

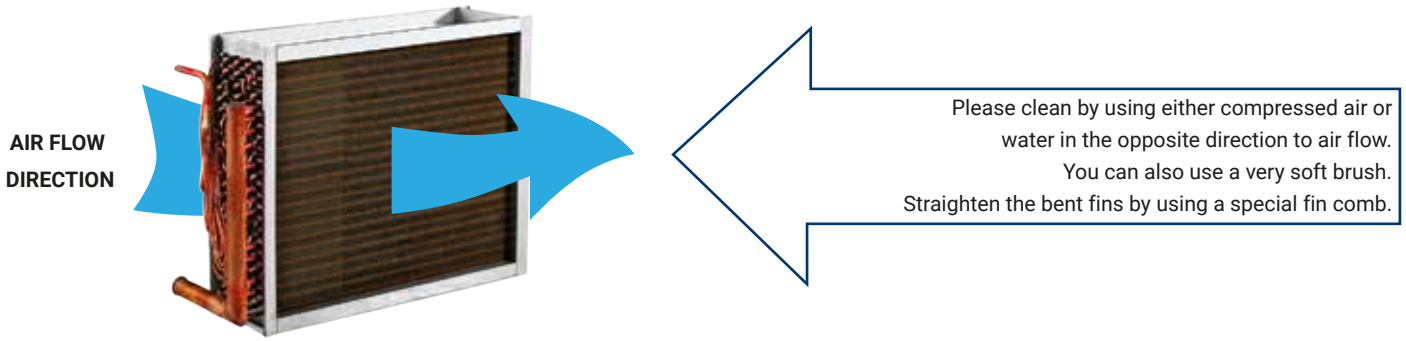
AIR DAMPERS

- ☑ After shutting down the unit and switching off the power, clean surface and fins of the coil by compressed air or water.
- ☑ Use a fin comb to straighten bent fins
- ☑ If ice is observed during operation let the ice melt down naturally and inform the technical service.
- ☑ If you doubt that there is a refrigerant leakage in the system please inform technical service.

! Prevent water in coils from freezing!

If the water inside the pipes of coils freezes, this will severely damage the pipes. For this reason, if there is a risk of freezing, ensure that the water inside the coil is partially circulated. It is recommended to discharge the water in the coil, if it will not be operated for longer periods.

Some condensed water might be seen in the return compartments of cooling or heat recovery coils. Please check if condensing water drainage works. Please clean by using either compressed air or water in the opposite direction to air flow. You can also use a very soft brush. Straighten the bent fins by using a special fin comb.



Coil Cleaning Method

AIR DAMPERS

- ☑ Make sure that the impeller is fixed on the motor shaft tightly
- ☑ Check if fan and motor rotate freely.
- ☑ Make sure that there is no foreign object at the inlet of the fan.
- ☑ Check the rotation direction of the fan. To do that, momentarily switch on and off the power then observe the rotation
- ☑ Check that the motor shaft and fan inlet flange are aligned.
- ☑ Check the motor and its connections.
- ☑ Check that flexible connections are secured tightly and not damaged; duct connections are designed according to the recommendations of the manufacturer with acceptable engineering applications.
- ☑ Check the setting of the motor protection switch is correct.
- ☑ Switch on the power and let the fan to reach to its full speed.

Do not forget to pay attention to the following

Excessive vibration

Strange noise

Axial alignment of motor and fan flange

Proper lubrication

Motor current and voltage values

- ☑ If any problem is observed shut down the unit immediately.
- ☑ Switch of the power.
- ☑ Secure the fan to prevent unintended rotation of the impeller.
- ☑ Inspect the source of the problem carefully and rectify it if necessary.
- ☑ The operation of the fan should be observed periodically for the first 8 hours of the operation.
- ☑ Pay attention to excessive vibration or noise during this observation.
- ☑ Check that the input current of motor and temperatures of the bearings are within the limits specified by the manufacturer.
- ☑ Finally, switch off the fan to do below checks.

Axial alignment of motor, fan and rim

Bearing temperature

Fan and motor fixing bolts

Fan speed should not be changed unless consulting to the firm. If higher rotation speed is required, motor power rating should be checked whether it is compatible to that speed. The load on bearings and fan must be re-calculated by the manufacturer. Vibration absorbing isolators should be checked once per year for damage. Check the balance of fan once per year. Clean dust on suction nozzle and rotor. Accumulation of dirt on the rotor can impair the balance. If the pollution is severe, check the operation of the filters and upgrade them if necessary. If the fans are equipped with a suction damper, check the proper operation of the suction damper flaps once per every three months. During this check, first switch off the fan and operate the suction damper to check the operation of servo motor, joints and flaps

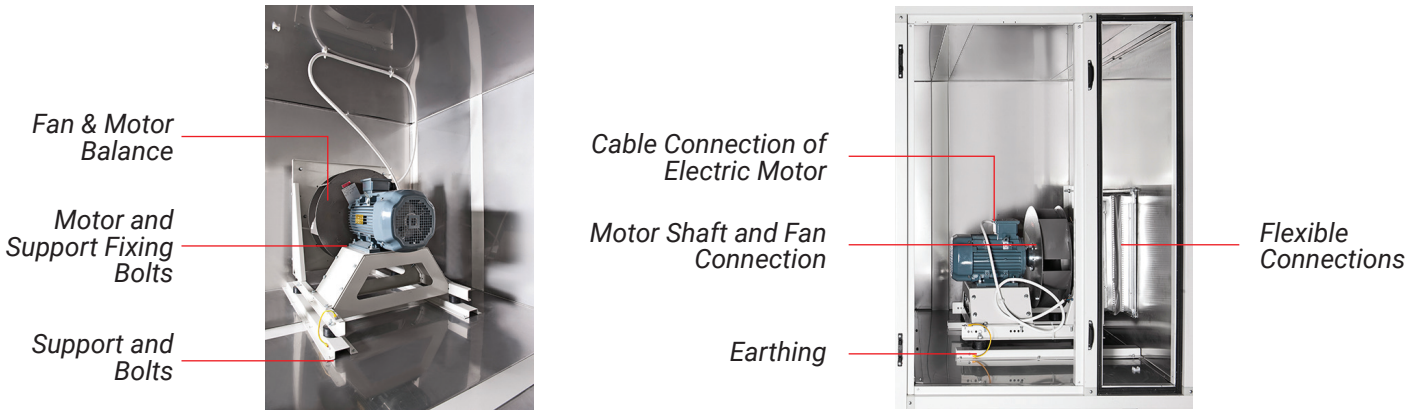


Figure 4. Check Points

MAINTENANCE PROGRAM

A protective maintenance program is an important part of an active safety program. Maintenance works should be carried out by trained and experienced personnel. Do not attempt to start any maintenance work unless the power is switched off and the fan is secured. Package type hygienic air handling units are the kind of devices that directly relate to human health. Therefore, except for routine cleaning and maintenance, the works requiring a special attention must be performed by the trained personnel only. Maintenance period varies depending on the operation conditions. Recommended maintenance program is given below. Warnings about filter pollution etc. will be given automatically and can be followed in the screen of the systems which are equipped with automation. The warning should be followed carefully and necessary precautions must be taken immediately. Ignoring these warnings may lead to an automatic shut down of the unit due to self-protection.

Once per week:

- ☑ Check the condition of filters. Clean, wash or change if necessary.
- ☑ Check the level of pollution in the condenser heat exchangers, and wash if necessary.
- ☑ Please keep in mind that above checks may be required more frequently depending on the climate and environmental conditions.

Once per month:

- ☑ Check the operation of the fan and motor; adjust if necessary.
- ☑ Check the injection nozzles and the humidifier valve.
- ☑ Check water flow in the drainage pipe.
- ☑ Check the condition of the entrance door hinges and the lid gaskets; lubricate the hinges if necessary.

Once per every six months:

- Check the operation current of motor
- Check the fan and motor bearings for high temperature and noise
- Check the operation of control instruments
- Check condensed water tray, drainage and drainage pipe
- Check circulation pump and motor of the humidifier
- Check the condition of the strainer of the humidifier
- Check the condition of cold / hot water or steam pipe system.
- Check lids, duct connections for air leakage (suction and blowing) and if a leakage is located take precautions immediately.

Once per year:

- Check the isolation of the filter frame.
- Change the synthetic wool in panel filters.
- Check the coils and fins. Wash by water jet if necessary.
- Use a fin comb to straighten the bent fins, if any.
- Check the coils for leakage.
- Bleed the water coils to remove air.
- Check the tightness of the bolts fixing the fan and motor.
- Check lubrication of motor and fan bearings.
- Check the operation of the dampers.
- Check the doors of the air handling unit for easy opening and closing.
- Check the conditions of the fittings and valves in piping system.
- Check all cabling, control and isolating apparatus and terminal connections etc.

In case a part is changed during a maintenance consult the relating section of the manual and follow the instructions to restart the unit. Following the checks summarized above, if you still observe some problems such as the air flow rate is excessive or insufficient; or set temperature cannot be reached in the room; or intended pressure values cannot be reached in the room etc., please check outer systems (conditions and air tightness of ducts, VAVs - CAV - duct type heaters, operation of duct dampers, condition of surrounding environment). If you have any difficulty in detecting such problems you may call ACS engineers and technicians for support.

Important Warning:

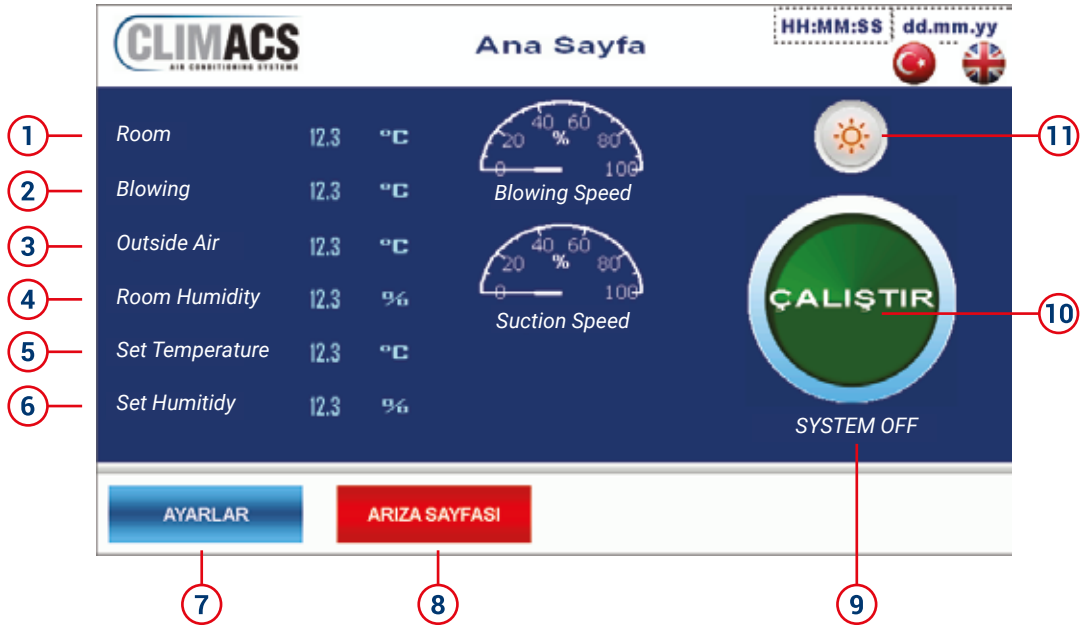
All maintenance instructions and warnings above are essential for smooth operation of the unit. Failing to follow the instructions or ignoring warnings notified on unit's screen *(the units automatically log the warnings)* ***and continuing the operation may lead to severe faults and make the warranty invalid.***

RECOMMENDED MAINTENANCE SPECIFICATION

Upon the end of warranty period, please check points below to have them covered by your maintenance contract when you sign a maintenance contract with a third party. Please do not make a maintenance contract with any person or company who are not qualified.

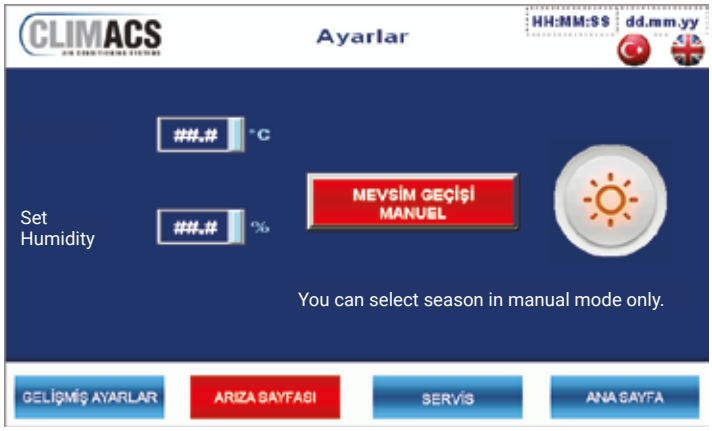
- ☑ Washing hot and cold water coils with chemical agents
- ☑ Cleaning air handling unit compartments with chemical agents
- ☑ Checking, cleaning and if necessary replacement of all filters in the air handling
- ☑ Checking and adjustment of air dampers
- ☑ Cleaning water inlet strainers and nozzles of the steam humidifier
- ☑ If any, checking of re-heater pump flow directions
- ☑ Checking droplet catcher
- ☑ Checking and cleaning DX coils
- ☑ Refrigerant leakage test in cooling system
- ☑ Washing condenser coils with chemical agents and checking fans
- ☑ Checking coils for leakage
- ☑ Measurement of motor and compressor current and voltage values
- ☑ Checking compressor oil
- ☑ Retrieval of overall operation and performance values
- ☑ Cleaning with alcohol for hygiene
- ☑ Re-installation and checking filters for air tightness
- ☑ Checking freeze thermostat setting
- ☑ Checking all site equipment (sensors) operation
- ☑ Checking and if necessary cleaning of water tank of the steam humidifier
- ☑ Checking and if necessary renewal of electrodes of the steam humidifier

USAGE OF CONTROL PANEL TOUCH SCREEN



1	*Air temperature of the air conditioned room*
2	*Temperature of the air blown by the air handling unit*
3	*Temperature of the fresh air taken from outside*
4	*Humidity ratio of the air taken from the air conditioned room*
5	*Desired ambient temperature*
6	*Desired ambient humidity ratio*
7	*Temperature-humidity set values of the air handling unit* *Suction/Blowing speeds* *Fresh air ratio* *Button to go to the setting page for date - time etc.*
8	*Button to go to the page of active or previous alarms*

9	*Indication showing momentarily status of the air handling unit* *System is OFF: Means the air handling unit is not operating.* *Damper opens: Means the air handling unit is on and dampers are open.* *System is ON: Means dampers are open and fans are started and operating normally.* *Heating element is being cooled: If the electric heater is on at the moment when the shut down button is pressed, system fans will continue to operate for 2-3 mins to cool down the heater following shutting off the system.*
10	*Air handling unit start & stop buttons*
11	*Air handling unit operation mode* *Winter mode = Heating* *Summer mode = Cooling*



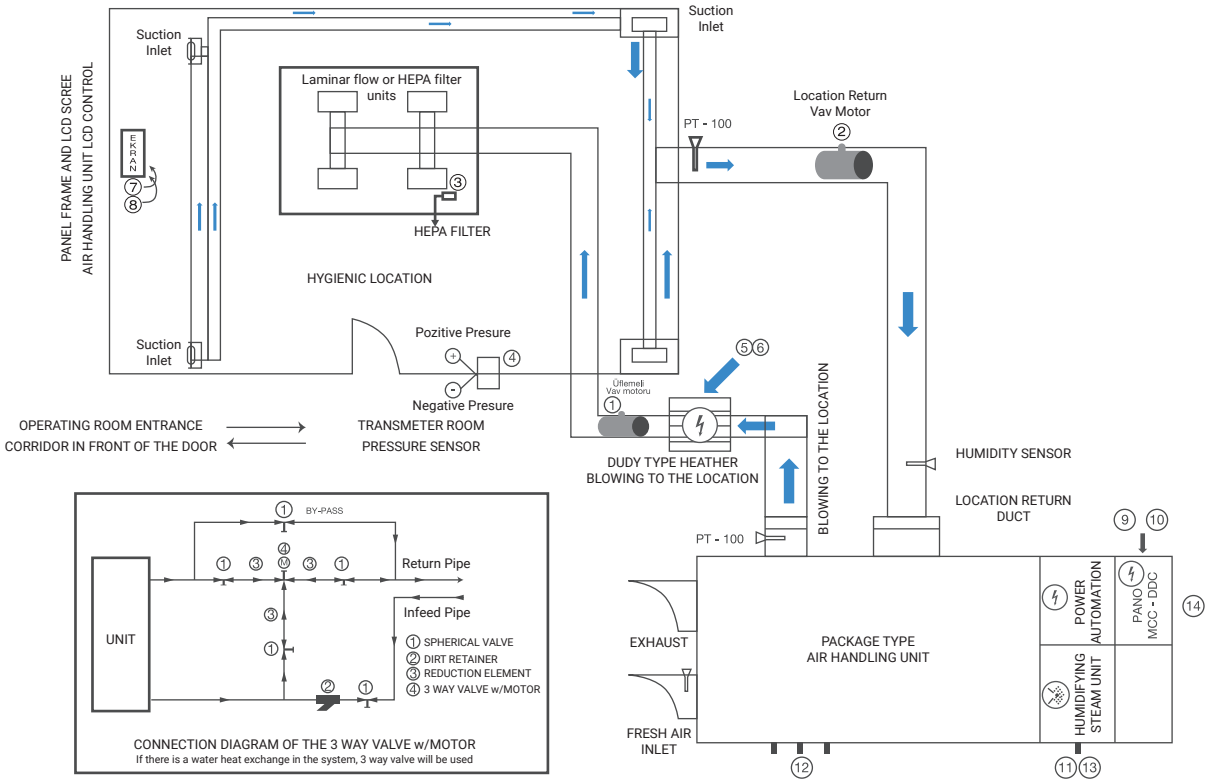
Season Selection	Season Mode can be selected to be AUTOMATIC or MANUAL. When AUTOMATIC mode is selected, system selects heating or cooling operation depending on the difference between Room temperature and Set temperature value. Season mode can be selected manually by pressing SEASON button only when the MANUEL mode is selected.	
Set Temperature	Enter the desired temperature in the room to be air-conditioned	
Set Humidity	Enter the desired humidity ratio in the room to be air-conditioned	In terms of percentage (%)
Ventilator (Suction) Set	Enter ventilator (suction) operating speed	In terms of percentage (%)
Ventilator (Blower) Set	Enter ventilator (blowing) operating speed	In terms of percentage (%)
Auto Restart Selection	If it is on and green, the air handling unit automatically restarts upon power is restored following a power failure	
	f it is off, the air handling unit waits in switched-off mode when the power is restored following a power failure	
Fresh Air Ratio	Enter the fresh air amount that the air handling unit will take. This feature is optional and not provided in all air handling units	In terms of percentage (%)
Date-Time Settings	Set system date and time	
Indicators	Shows instantaneous operating percentages of related equipment	

Touch on the numeric value of the setting you want to change; a numeric keypad will appear.
Using the numeric keypad input the desired value then touch on "ENTER", now the new value is set.

MAINTENANCE PROGRAM

<table>
<tr><td rowspan="4">Phase protection alarm</td><td rowspan="4">If one of or all of the phases;</td><td>Absent</td><td rowspan="4">A measurement should be taken by a reliable instrument. Make sure that system is fed by a reliable voltage (3-phases/380V+N).</td></tr>
<tr><td>Low</td></tr>
<tr><td>High</td></tr>
<tr><td></td></tr>
<tr><td rowspan="2">Emergency stop is pushed or the lid is open</td><td colspan="2" rowspan="2">The air handling unit is equipped with emergency push buttons located next to doors of each suction and blowing ventilators.
Besides, each door is equipped with a safety switch.</td><td>Check that doors blowing and suction ventilators are fully closed.</td></tr>
<tr><td>Check that emergency stops of blowing and suction ventilators are not depressed.</td></tr>
<tr><td rowspan="2">No air flow</td><td colspan="2">Does invertor receive power?</td><td rowspan="2">Check that blowing and suction ventilators run when the air handling unit is started</td></tr>
<tr><td colspan="2">Blowing or suction ventilator invertor protection trip</td></tr>
<tr><td>Air handling unit invertor fault</td><td colspan="2"></td><td>Note down the fault codes from the screens of the invertors and inform the codes to the service</td></tr>
<tr><td rowspan="2">Freezing alarm</td><td colspan="2"></td><td rowspan="2">Check that the water temperature at the inlet of the air handling unit is sufficient (70-90oC)</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Compressor 1 motor protection alarm</td><td colspan="2"></td><td rowspan="2">Prepare your measuring instrument and call the service.</td></tr>
<tr><td>Compressor 2 motor protection alarm</td><td colspan="2"></td></tr>
<tr><td rowspan="5">Low/high pressure alarm</td><td colspan="2"></td><td>Check cleaning of condenser heat exchanger</td></tr>
<tr><td colspan="2"></td><td rowspan="2">If filter and condenser is clean call the service</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2"></td><td rowspan="2"></td></tr>
<tr><td colspan="2"></td></tr>
</table>

CONNECTION DIAGRAM FOR PACKAGE TYPE HYGIENIC AIR HANDLING UNITS



PRELIMINARY WORKS FOR THE COMISSIONING OF THE UNIT, ACCORDING TO THE DIAGRAM ABOVE		Cross Section and Type of Cable	Implementation
1	Cabling for room blowing and VAV motor (ratio adjusted)	3 x 0,75 Halogen Free	By the electrician of your company
2	Cabling for room return and VAV motor (ratio adjusted)	3 x 0,75 Halogen Free	By the electrician of your company
3	Cabling for pressure difference switch for HEPA filter (if any) pollution notification	2 x 0,75 Halogen Free	By the electrician of your company
4	Cabling for room pressure transmitter sensor	3 x 0,75 Halogen Free	By the electrician of your company
5	Cabling for the duct type heater (if any) according to power, stage and voltage (220V or 380V)	_____ Halogen Free	By the electrician of your company
6	Cabling for temperature limit thermostat of the duct type heater (if any)	4 x 0,75 Halogen Free	By the electrician of your company
7	Cabling for control panel screen, 24 V DC to control location of the unit	3 x 0,75 Halogen Free	By the electrician of your company
8	Data cabling for the screen, to the control location of the unit	Cat 6	By the electrician of your company
9	Air handling unit MMC DCC main branch feeder (according to kW rating)	_____x_____ Halogen Free	By the electrician of your company
10	Earthing cabling separate from air handling unit MMC DCC main branch feeder		By the electrician of your company
11	Pipe connection for water (of suitable hardness) supply to steam humidifier		By the electrician of your company
12	Water inlet, outlet and 3-way valve connections if there is a water heat exchanger		By the electrician of your company
13	Drainage connections for humidifier and cooling heat exchanger		By the electrician of your company
14	Ethernet cabling between the air handling unit and the internet connection point of the company for software updates and remote diagnose		By the electrician of your company
	Wall installation of the screen case (supplied by ACS), at the control location of the unit. Screen cases are available for either surface mount or flush mount. Please send your preference previously.		By your company
	Receiving the units at site, transportation of the units to the location specified in the project and making duct connections.		By your company
	Implementation of cable trays to protect all cabling done by either ACS or your electrician		By your company
	All sensor connections between the unit and the control panel		By ACS Klima
	Piping, welding and refrigerant charging works for cooling heat exchanger		By ACS Klima
	Commissioning of the units, delivery of training and handing over to operators		By ACS Klima

Please note that the components in the picture are for illustration purpose only. Actual layout and numbers can be different.

CLIMACS®
AIR CONDITIONING SYSTEMS

Package Type
Pool Dehumidification
Units

Thank you for choosing
CLIMACS brand Pool Dehumidification Units.

In addition to **“Air Handling Units Installation, Operation and Maintenance Manual”** supplied with each unit, this manual contains instructions for the first installation, operation and maintenance of the units which are equipped with a specially designed automation software.

IMPORTANT:

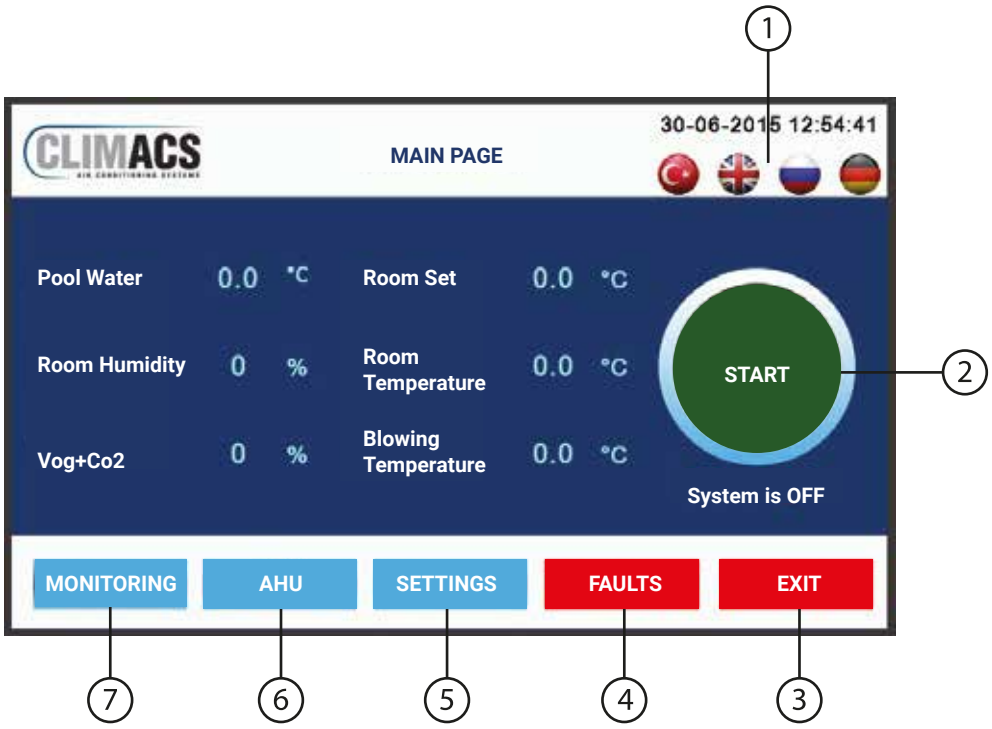
All instructions and information given in the “Air Handling Units Installation, Operation and Maintenance Manual” are also valid for this package type hygienic air handling unit. You can access all our manuals from the products menus in our web site www.acsklima.com

ALL THE BEST

CLIMACS®
AIR CONDITIONING SYSTEMS

SCREENS AND EXPLANATIONS

Screen No.1



1 – You can select language here

2 – Start or stop the unit

3 – By pressing Exit button, you can return to the Main Screen and on the Screen No.5, Pool Users (swimmers etc.) can see the related values about room and pool water.

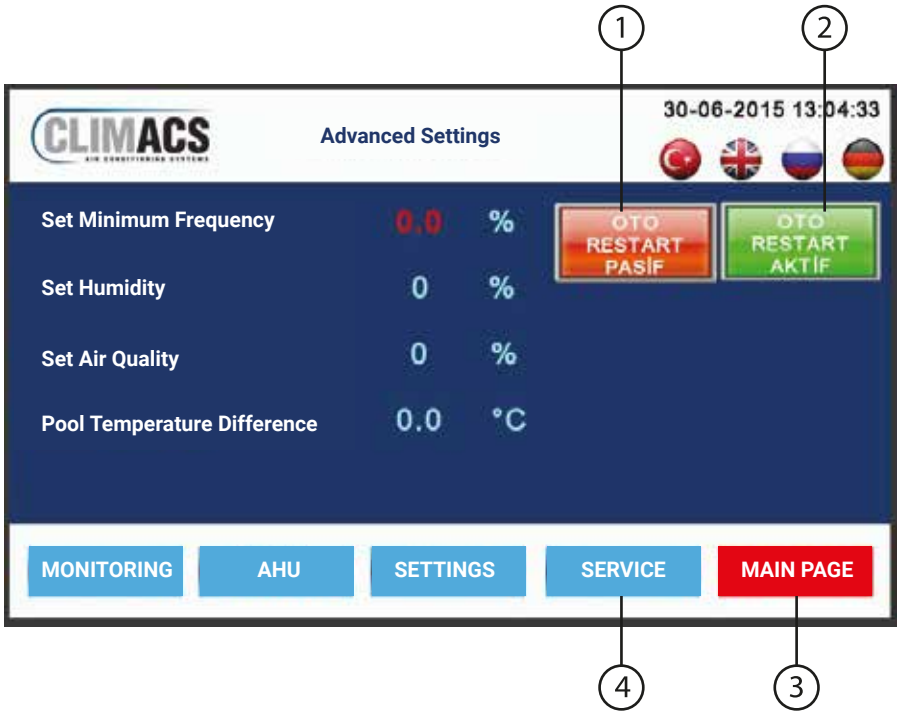
4 – This button shows the faults page where instantaneous and past faults in the unit are listed.

5- This button shows Screen No.3 where the operational values of the unit are set.

6 – This button shows a diagram view of the unit from where instantaneous values can be monitored.

7 – This button shows Screen No.4 where the instantaneous operational values of the unit can be monitored.

Screen No.2



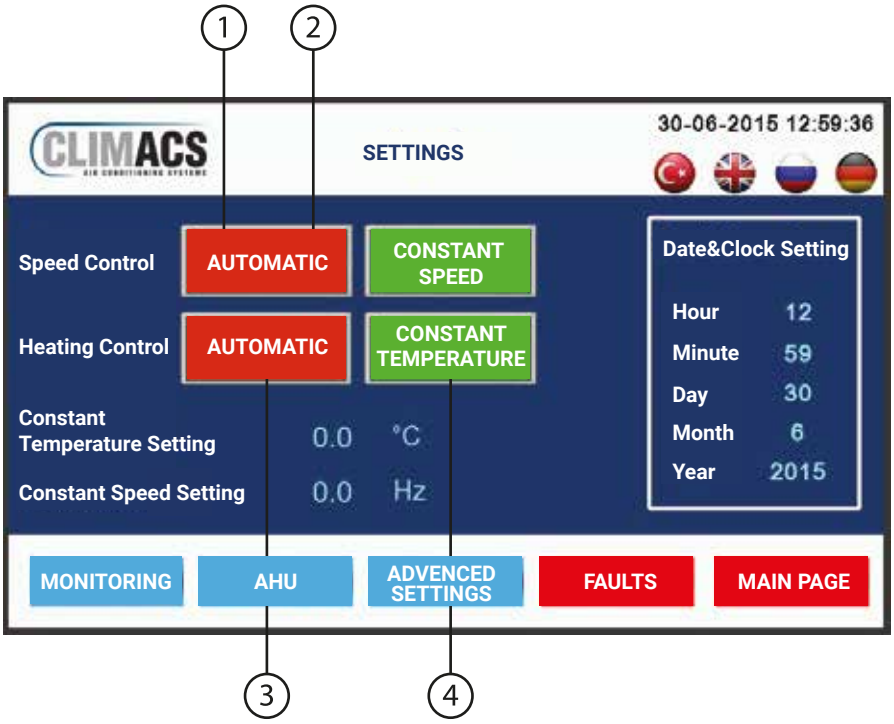
1- Auto restart passive: The unit does not automatically switch on when the power is restored following a power failure

2- Auto restart active: The unit automatically switches on when the power is restored following a power failure

3- Goes to Main Page screen.

4- Service This page is set by ACS KLIMA AUTHORIZED TECHNICIANS.

Screen No.3



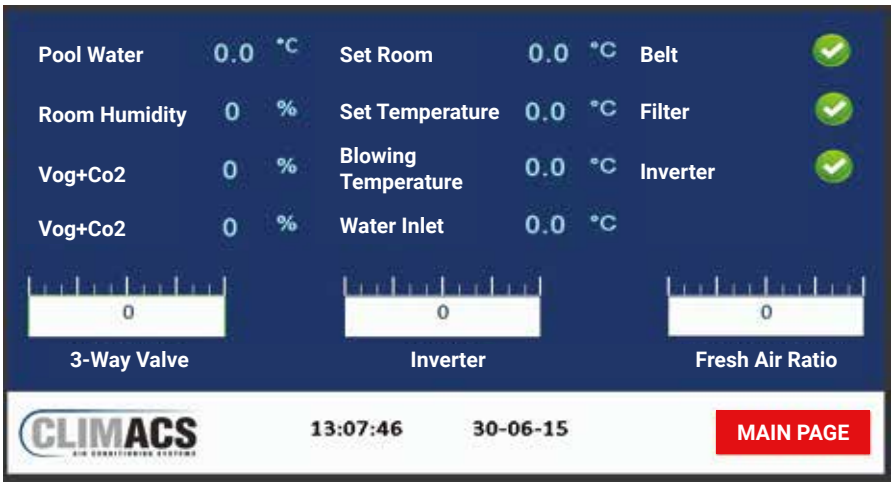
1 – Speed Control is Automatic: The unit selects the air flow rate and adjust the frequency itself according to the entered values

2 - Speed Control is Manual: The unit operates at a constant cycle according to the set frequency

3 – Automatically adjusts the best temperature by evaluating the information retrieved from the sensors

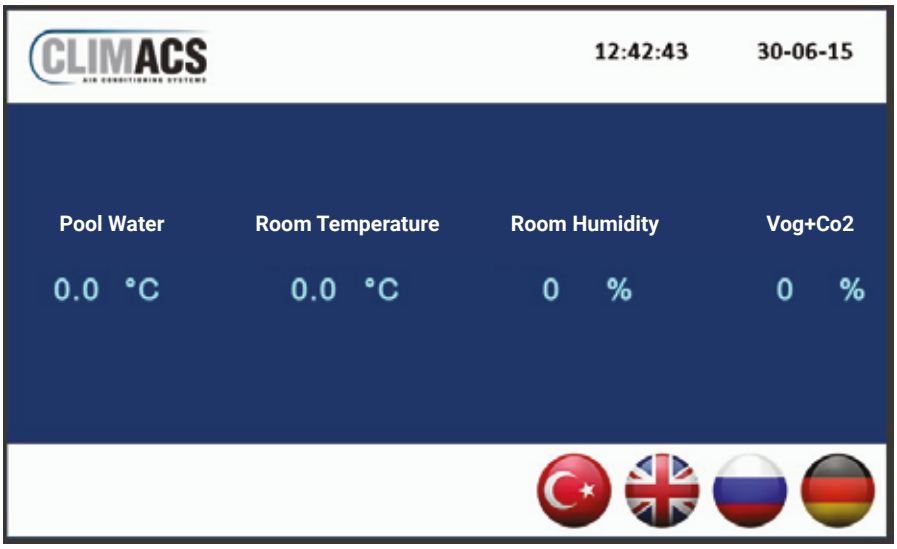
4 – Checks the temperature according to the entered values

Screen No.4



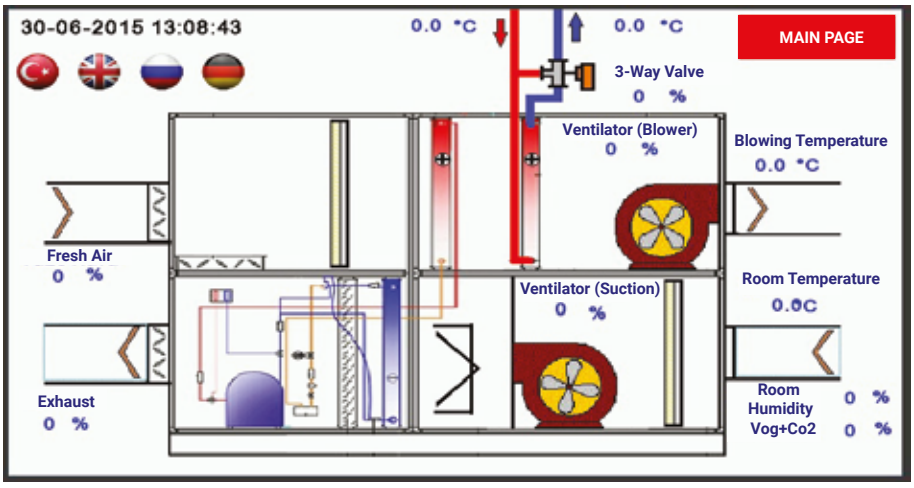
Another screen, where values of the room and status of components can be monitored.

Screen No.5



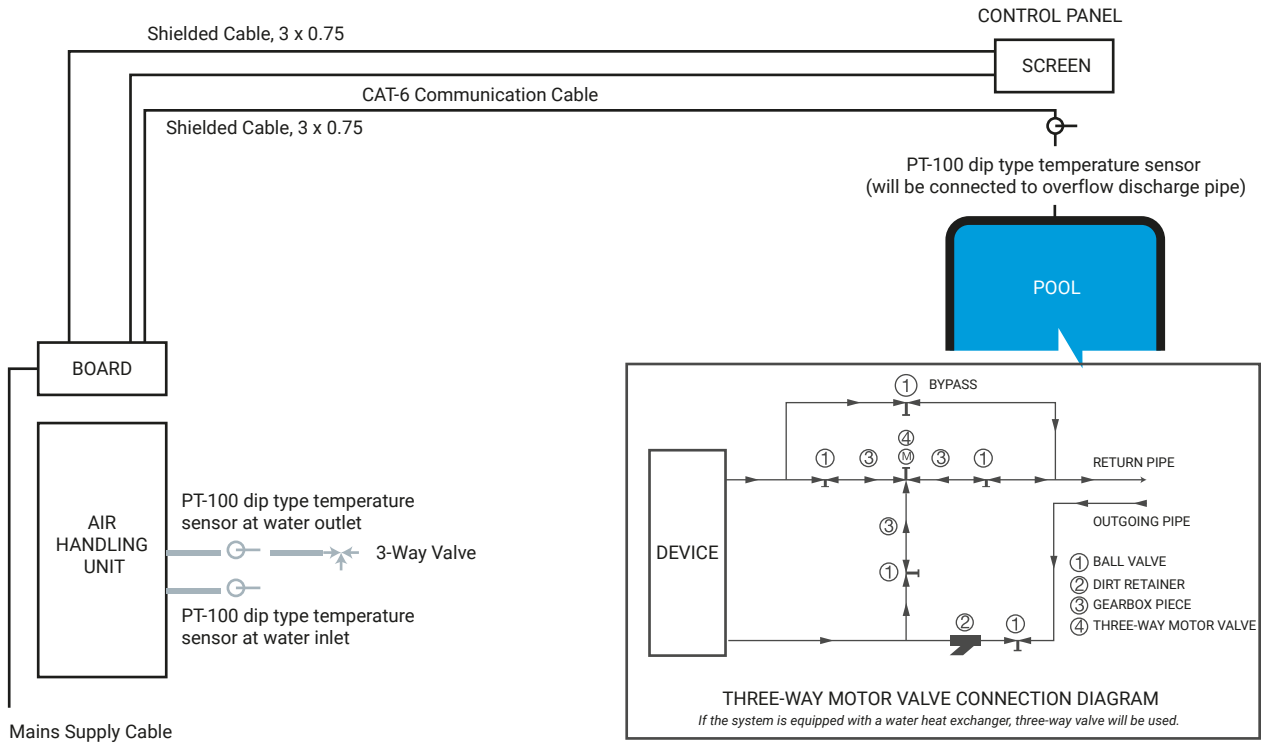
On Screen No.5, pool users (swimmers etc.) can see the values related to pool water and room.

Screen No.6



The screen that represents the operation of the unit graphically.

CONNECTION DIAGRAM FOR POOL DEHUMIDIFICATION UNITS



WORKS TO BE DONE BY YOUR ELECTRICIAN

a - Mains supply power cable will be installed up to the board of the air handling unit (cable cross-section information can be asked from ACS)

b - Flush mounting of screen frame into the agreed location

c - For screen connection, shielded cable (3 x 0.75) will be installed up to the screen frame

d - For screen connection, CAT-6 communication cable will be installed up to the screen frame

e - Installation of shielded cable (3 x 0.75), from the sleeve of PT-100 sensor at pool water outlet to the air handling unit automation board

Note: Screen frame (either flush mounting or wall type) will be supplied by ACS. Please ask the connection diagram.

WORKS TO BE DONE BY YOUR PLUMBER

a - Connection of three-way valve to water return line of air handling unit

b - Installation of PT-100 temperature sensor sleeve in pool water return pipe (for pool water temperature measurement)

c - Installation of PT-100 temperature sensor sleeve in water inlet pipe of air handling unit

d - Installation of PT-100 temperature sensor sleeve in water outlet pipe of air handling unit

Note: PT-100 sleeve and 3-way valve will be supplied by ACS. Please ask the connection diagram.

WORKS TO BE DONE BY ACS

a - Cabling works between board and air handling unit

b - Connection of all site and equipment sensors

c - Inspection and approval of the connections prepared by your electrician and plumber

d - Powering up the air handling unit, commissioning and operation tests of all systems

e - Training of air handling unit users (against signed form)

f - Handover of the operating air handling unit (against form signed by site supervisor or contractor)

Important Warning: ***Because cabling and piping are open installation type, these installations should be protected by galvanized and covered trays provided either by your company or by your contractor.***

ALARMS AND THEIR EXPLANATIONS	
ALARM	**EXPLANATIONS**
EMERGENCY STOP is PRESSED or LID is OPEN	There are 3 emergency stop push buttons, 2 of which are on AHU and 1 button is on the board. First all three push buttons should be checked to see if one of them is pressed and if pressed it should be released.
	Service access lids of suction and blowing ventilator sections of air handling units are equipped with safety switches. These lids should be checked to ensure that they are fully closed. If a lid, which is not fully closed, is found it should be closed fully and should be locked by the lid key.
NO AIR FLOW	One of the ventilator invertors (of suction or blowing) might be tripped"
	Ventilator (suction or blowing) fans might be stuck.
	Ventilator (suction or blowing) section lid might be left open.
BELT BROKEN	One of the air handling unit's dampers for fresh air or exhaust might be closed. The dampers may be operating automatically, however, they should be checked visually to see that they open after the unit is started.
	If the fans of the air handling unit are belt driven fans, the belts should be checked to for good condition.
SUCTION/BLOWING VENTILATOR DRIVER FAULT	One of the speed invertors (of suction or blowing ventilators) switch to a fault condition. If there are any invertor that switched to fault condition, 3 digits fault code blinking on the invertor screen should be noted and informed to a ACS authorized service.
PHASE PROTECTION ALARM	Mains supply voltage should be checked. Each three phase should be measured to check that values are in the allowed limits.
COMPRESSOR 1 MOTOR PROTECTION ALARM	Motor protection switch of related motor is tripped. Motor protection switch should be restored and current values of related compressor should be measured and informed to the service.
COMPRESSOR 2 MOTOR PROTECTION ALARM	
COMPRESSOR 1 LOW-HIGH PRESSURE	The green reset button of related compressor group should be reset by pulling it towards right . The compressor will start within few minutes. If the compressor does not start after reset, get in touch with the authorized service.
COMPRESSOR 2 LOW-HIGH PRESSURE	
ROOM PT100 ALARM	For these faults, get in touch with ACS technical service
POOL WATER PT 100 ALARM	
HUMIDITY SENSOR ALARM	
ODOR SENSOR ALARM	
FILTER 1 POLLUTED	Air handling unit's filters should be checked and cleaned, if cleansable. If not, the filter should be replaced with a new one.
FILTER 2 POLLUTED	
WATER INLET PT100 ALARM	These faults does not impact operation of system. However, ACS authorized service should be informed in case of these faults. .
WATER OUTLET PT100 ALARM	

CLIMACS®
AIR CONDITIONING SYSTEMS

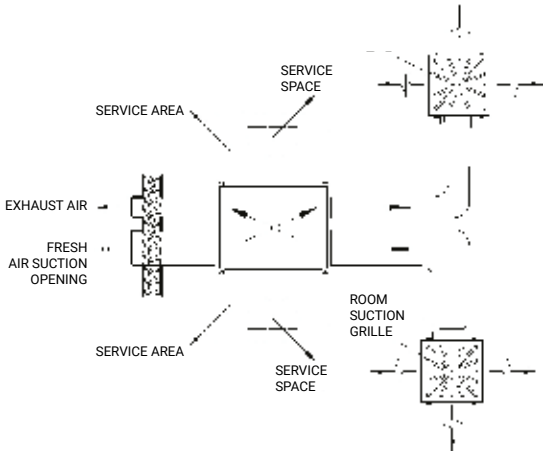
CEILING TYPE
VENTILATION UNITS WITH HEAT RECOVERY

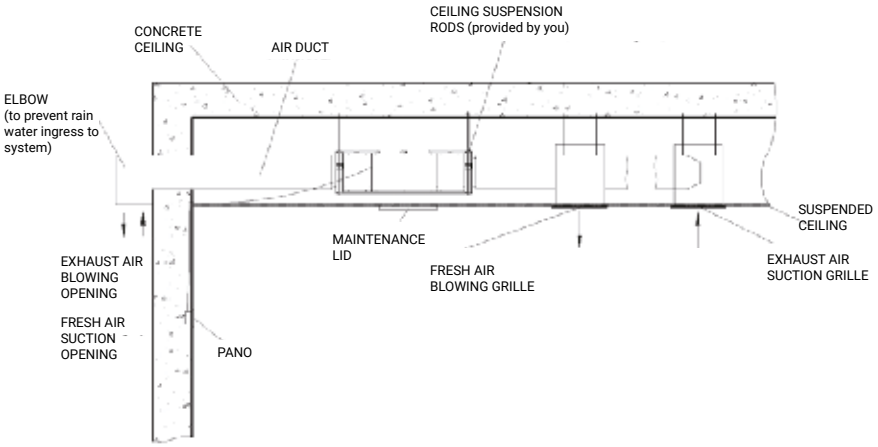
"The Efficient Mode of Air Handling Unit"

GUARANTEE

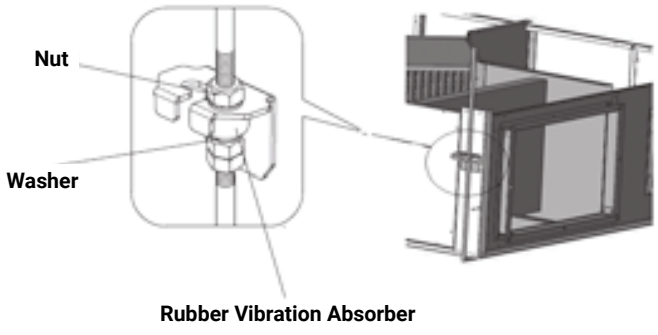
Ventilation Units w/Heat Recovery, have **2 (two) years** guarantee against material and workmanship faults. The faults resulted; by unsuitable installation or repair works that do not complying to standards; by or transportation without written approval of ACS KLIMA; or by improper power supply at the installed locations; or by failing to follow the instructions given in this manual are out of the scope of the guarantee. Please do not intervene in any part or setting of your ventilation unit w/heat recovery other than operation and maintenance operations specified in this manual. When part replacement is necessary original parts should be used. Liabilities of faults resulted by intervention by unauthorized persons or by replacement with non-original parts belong to parties who undertake such interventions. This unit should only be operated under conditions that are suitable to its design purposes and its technical specification.

INSTALLATION INFORMATION





INSTALLATION OF THE DEVICE

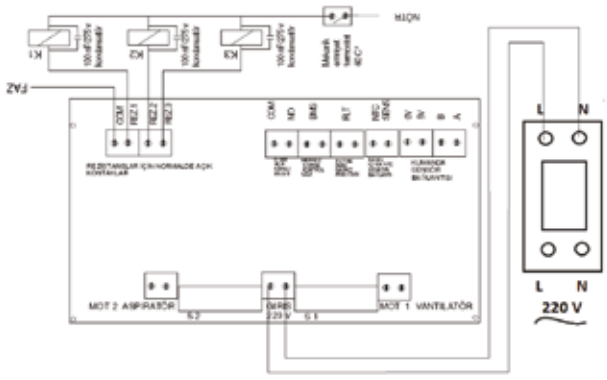


ELECTRICITY INFORMATION

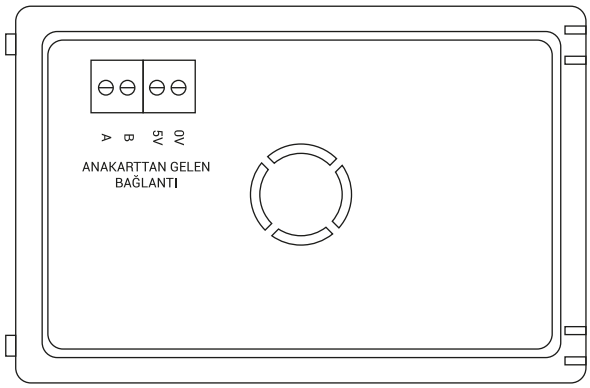
Speed Adjustment Switch Display

Specification of Automatic Speed Control Device

- Screen Language Turkish
- Elegant and simple control unit with LCD screen
- 220V AC supply
- Capable to set temperature between 5o – 35 oC
- Instantaneous monitoring of ambient temperature by means of the control unit
- Direct access to the feature to be used
- 3-stage manual control of ventilator (suction) speed
- 3-stage manual control of ventilator (blower) speed
- 3-stage manual control of heating element (with ventilator speed control)
- Automatic or manual operation.
- Monitoring or fan speed stages or heating element stages when operating manually.
- Building central automation device start/stop (BMS, Building Management System)
- Monitoring of line connection fault on the display.
- Communication capability within 50 meters distance via CAT-6 or shielded cable (4 x 0.50).
- Continuing the last state before power failure when the power is restored (permanent memory)

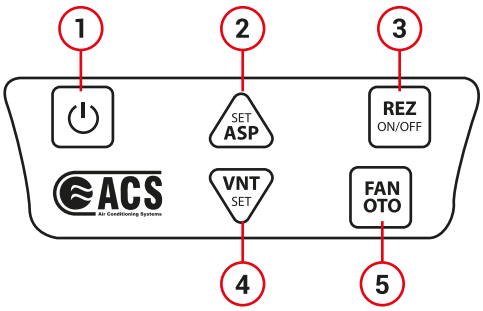


Main Electronics Board



Control Device
Back Side Terminal

Operation of Control Panel



1-)		Unit switch on/off button
2-)	*SET:* *ASP:*	Increase set temperature when the unit is operating in automatic mode Control fan (suction) speed when the unit is operating in fan mode
3-)	*SET:* *ASP:*	Increase set temperature when the unit is operating in automatic mode Control fan (suction) speed when the unit is operating in fan mode
4-)	*VNT:* *REZ ON:* *REZ ON:* *REZ OFF:*	Control fan (blowing) speed when the unit is operating in fan mod Manually switches the heating element on and off provided that the unit is operating in fan mode and fans are operating Switches the heating elements on and off according to the ambient temperature and speed of fans. Provided that the unit is operating in fan mode, the function; Increases fan speeds (suction and blowing) when the ambient temperature is higher than set temperature or; Decreases fan speeds (suction and blowing) when the ambient temperature is lower than set temperature
5-)	*FAN:* *OTO:*	Manually controls the speed of fans (suction and blowing) Controls the speed of fans (suction and blowing) depending on set temperature

COMMISSIONING OF SYSTEM VIA CONTROL PANEL (BMS: Building Management Systems)

BMS: When the unit is to be controlled centrally by central system, BMS terminals is short-circuited by a contact that is controlled at the central system and thus the unit is started. When the unit is to be stopped short-circuit should be opened by the central system.

To activate the BMS follow the steps below orderly:

- ☑ Switch off the unit by its on/off button; the screen should display **"ACS Klima".**
- ☑ **REZ ON / OFF** and **FAN / OTO** buttons should be pressed simultaneously for a short period and **"CENTRAL SYSTEM OFF"** and **"DELAY TIME"** texts should be displayed on the screen.
- ☑ **REN ON / OFF** button is pressed and **CENTRAL SYSTEM ON** text is displayed.
- ☑ Unit's switch on/off button is pressed and **ACS Klima** text is displayed.
- ☑ The unit is started by pressing unit's switch on /off button again.

To deactivate the BMS the same procedure is followed but this time central system should be set as **CENTRAL SYSTEM OFF.**
Note: When the unit is switched off by the central system, the screen displays SWITCHED OFF BY CENTRAL SYSTEM. In this case, if you want to cancel BMS you have to switch on the unit by the central system.

FAN SPEED SWITCH TIME INTERVALS AND ACTIVATION OF RESISTANCES

Switching on and off intervals of heating element can be extended up to 10 seconds by means of fan speed switching time interval. To do that, the procedure to activate **BMS** is followed but this time when **DELAY TIME** message is appeared it is set to a number by means of up or down buttons. For example if the value in front of delay time reads 60, it means delay time is set to 6 seconds. This value is stored in the memory by switching off and on the unit via switch on/off button.

UNIT ON/OFF INFORMATION

It is possible to retrieve unit's operation information from **NO (normally open)** terminals of a relay, which is switches on or off depending on the unit's operation status. Via these contacts, unit's operational status information can be transmitted anywhere including fire dampers, if equipped, and thus fire dampers can be controlled with respect to the status of the system.

NO : This contact is open when the unit is off. The contact will short circuit to the COM terminal upon the unit is switched on.

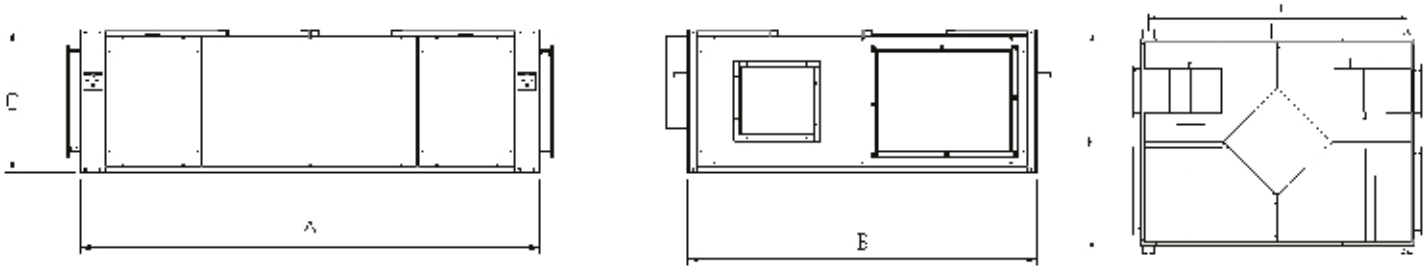
COM : Common input terminal

NC : This contact short-circuits with the COM terminal when the unit is off; and it opens the short-circuit when the unit is turned on.

IMPORTANT WARNINGS

- The relay contacts, which control the heating elements, are for dry contact purpose (switch on and off) and have low current capacity. This contact should be used to control the contactors which are used to operate the heating elements.
- Motor currents
- Ventilator (suction) motor current max 10 amps
- Ventilator (blowing) motor current max 10 amps
- Distance of the cable between main electric board and control device should be at least 50 meters.
- Cross section of the cable between main electronics board and control device should be at least 4 x 0.5mm2. Otherwise some communication problems between main electronics board and control device might be experienced
- Particularly, main electronics boards, should not be installed in locations where is humid and getting direct sunlight.
- Do not touch main electronics boards when the unit receives power.
- A magnetic fuse should be used on the beginning of the line considering the cumulative current value of two motors.

UNIT DIMENSIONS



	Model	A	B	C	D	E	F	G	H
1	AHVR 500	900	750	340	821	785	210 x 210 x 330 (20x30)	DD 185/176	G-4x2 Psc
2	AHVR 1000	1450	1100	450	1371	1135	410 x 410 x 330 (40x30)	DD 7/7-6109ET	G-4x2 Psc
3	AHVR 1500	1450	1100	450	1371	1135	410 x 410 x 330 (40x30)	DDM 7/7	G-4x2 Psc
4	AHVR 2000	1900	1160	510	1821	1195	610 x 610 x 430 (60x40)	DD 9/7-6M0600	G-4x2 Psc
5	AHVR 2500	1900	1160	510	1821	1195	710 x 710 x 480 (70x45)	DD 9/9-6M0642	G-4x2 Psc
6	AHVR 3000	2200	12050	600	2121	1285	810 x 810 x 480 (80x45)	DD 10/10-6M09CU	G-4x2 Psc
7	AHVR 3500	2200	12050	600	2121	1285	810 x 810 x 480 (80x45)	DD 10/10-6M09CU	G-4x2 Psc
8	AHVR 4000	2200	1500	700	2121	1535	610 x 610 x 680 (60x45)	DD 12-12	G-4x2 Psc

WARNINGS

- This unit should not be dismounted arbitrarily. Dismounting or repair works can be made by authorized services only.
- Failing to follow this chapter may lead to fire, electric shock or injuries.

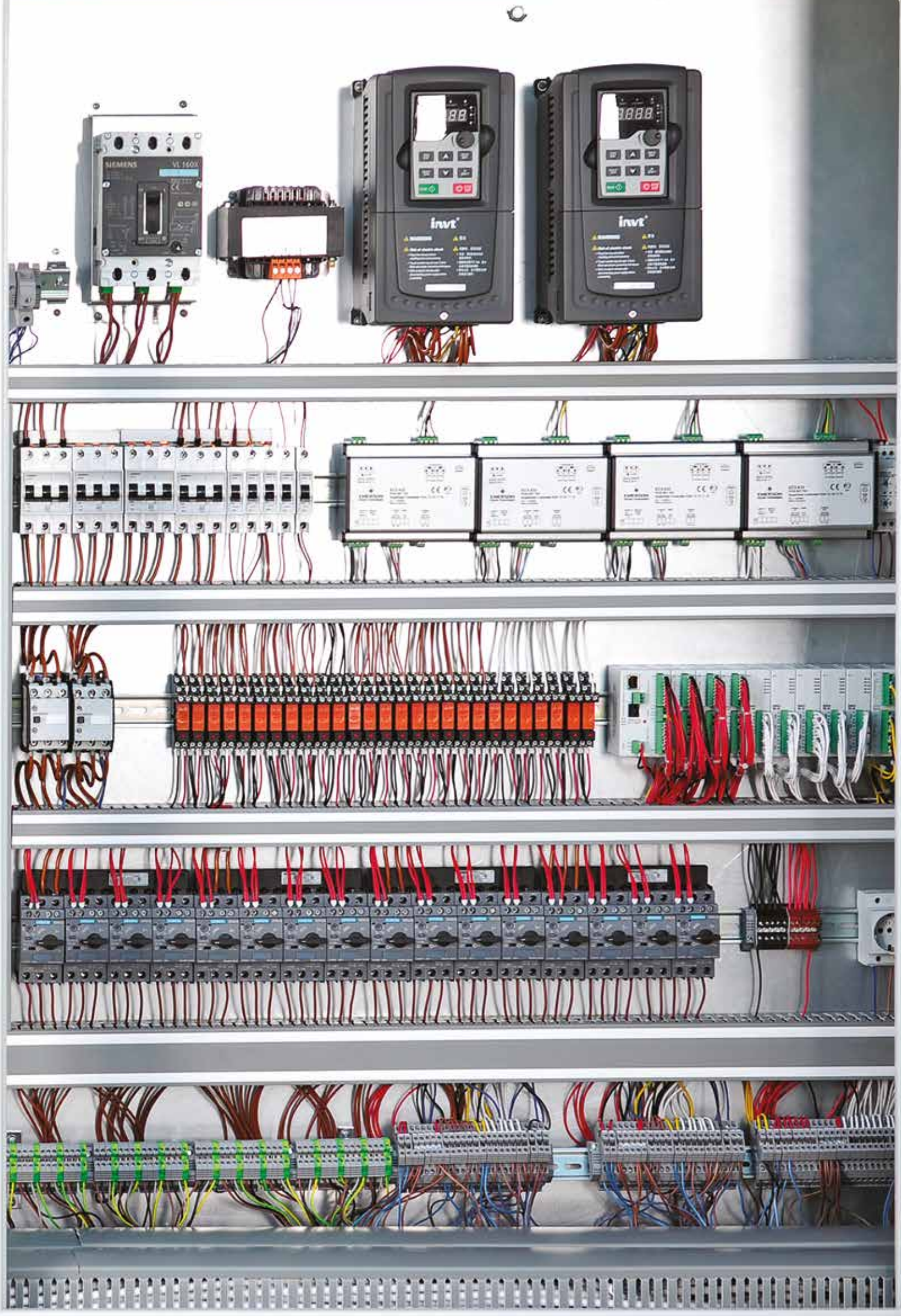
FORBIDDEN

- Do not operate the unit in cold storage warehouses, pools with heating facility or in places where humidity or temperature differences are too high. (Otherwise electric shock hazard or faulty operation risks may arise.)
- Do not use the unit in the areas that is exposed to rainfall (Otherwise electric shock hazard or faulty operation risks may arise.)
- These units are not suitable for industrial purposes; do not use the unit in the environments that contain; vapours of acidic, alkaline or organic solvents; or paint or other poisonous gasses; or corrosive gasses or vapours with intense oil content (When the fresh air intake does not have proper properties, indoor oxygen ratio may drop and correspondingly some health disorders may arise. Failing to follow this warning, does not only affect the operation adversely but also may lead to fire, electric current leakage and electric shock hazards.)
- Do not operate the unit outside the indicated limits.

ATTENTION

- The unit must be used in the environments where the temperature is between -10o and +40oC and relative humidity is below 60%. When a condensing is likely to happen at the points where the unit is interfaced to outside environment, heating fresh air by an electric heater is recommended (When the fresh air intake does not have proper properties, indoor oxygen ratio may drop and some health disorders may arise)
- The unit should be secured firmly and safely (In case the unit falls it may cause injuries).
- In order to install room control board use the electric cables specified in this manual ensure that the connections are secure (Failing to follow this warning may lead to fire hazard.)
- Ensure that ducts does not have an electrical contact to any metal structure where they pass through building structures (Current leaks may lead to fire or explosion hazard).
- The ducts opening to outside environment should have at least 30 degrees downward slope and should be properly isolated. (Rainfall water ingress to the system may cause an electric current leak and it may lead to fire hazard or damage to the equipment)
- Protective installation gloves should be worn during installation (Failing to follow this warning may lead to injuries).
- By all means, the mains supply power of the unit must be equipped with a circuit breaker, which can be locked by a key.

- Connect the earthing lead of the unit to a proper earthing connection. (Failing to follow this warning may lead to electric shock hazard.)
- There must be a breaker element, whose contacts have at least 3mm gap, must be installed between mains supply and the unit.


SIEMENS
VL 160X
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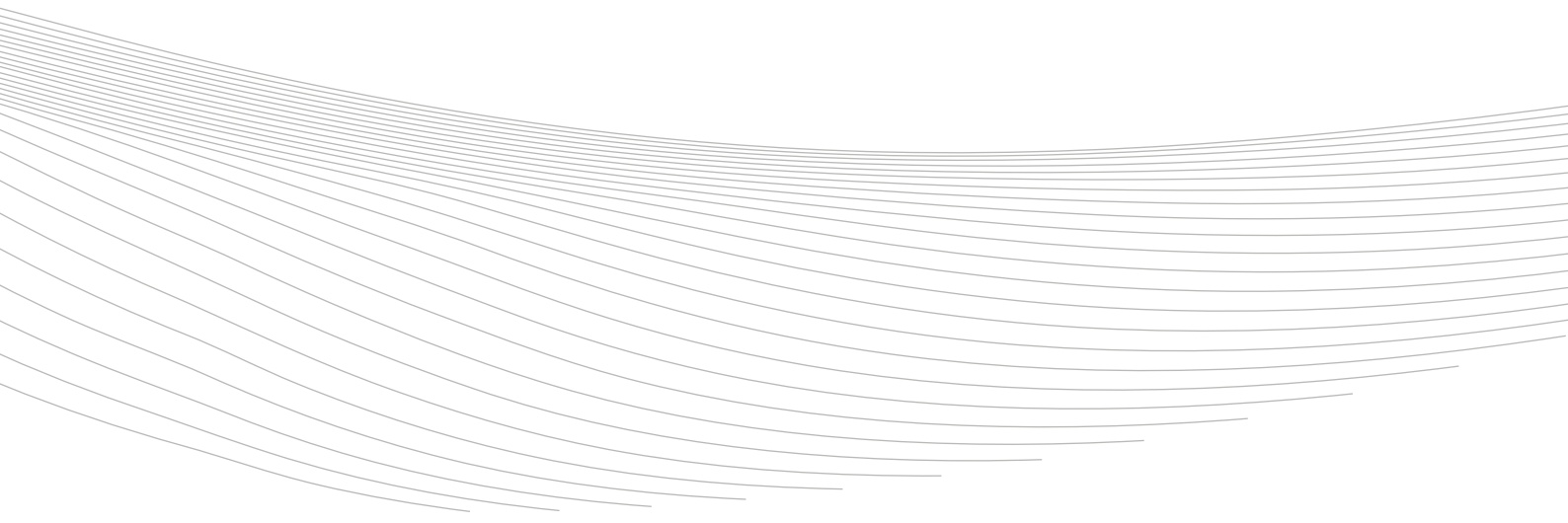
CLIMACS®
AIR CONDITIONING SYSTEMS

General Support
and Information



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TARİH	DÖK. No
..... / ..... / 20....	FRM - 71

COMMISSIONING FORM for Air Handling Units

CUSTOMER			
Name and place of the project			
Project supervisor			
Tel-Fax-Email			

Dear project supervisor, in order to have your unit commissioned timely and properly, please read through the questions below and check appropriate box under "Yes" or "No" and approve the form by signing it. If the unit is to be commissioned together with the automation, please pay attention to the related sections below (under bold text) and have your automation and electric works personnel be ready on site on the day of commissioning. Commissioning process will not be started unless this form is received by ACS technical service. If you need further inquiry about this form or your unit, ACS will be happy to help. We look forward to work with you.

		YES	NO
1	The unit was transported to the project site		
Not:			
2	The sections of the air handling unit were assembled on a perfectly level floor and air tightness between the sections were provided.		
Not:			
3	Mains supply power cable was laid up to the air handling unit's power distribution board and the cable has a sufficient cross-section and the unit was properly earthed.		
Not:			
4	Cables between power distribution boards and component terminals were laid.		
Not:			
5	3-way valve servomotor connections of heating and cooling coils of air handling units are accomplished and the coils are filled with water.		
Not:			
6	Power connections of the humidifiers, if any, are accomplished.		
Not:			
7	Interior sections of the air handling unit were cleaned (no dirt, soil, debris from the site).		
Not:			
8	Drainage connections of air handling units are installed.		
Not:			
9	Power connections, lighting switch and emergency stop button connections are accomplished and ready to operate.		
Not:			
PLEASE ANSWER THE FOLLOWING QUESTIONS IF YOUR UNIT IS EQUIPPED WITH AN AUTOMATION SYSTEM.			
10	Automatic control equipment were installed on the unit.		
Not:			
11	Cables between power distribution boards and unit's automatic control equipment were laid.		
Not:			
12	Automatic control equipment and control panel are programmed and operational.		
Not:			
13	Automation technician has finished the preparation works and ready to cooperate with ACS team during commissioning.		
Not:			

If automation work is contracted to ACS, steps 10-11-12-13 will be conducted by ACS technicians.

Customer Personnel In Charge:	Requested commissioning date:
Signature	..... / ..... / 20

General Support and Information

FILTER MAINTENANCE CARD

SERIAL NUMBER OF UNIT: | **UNIT LOCATION:**

TYPE OF UNIT:

FILTER TYPE:

Date	Polluted Pressure	Clean Pressure	Notes (replaced/cleaned)	Name Signature	Date	Polluted Pressure	Clean Pressure	Notes (replaced/cleaned)	Name Signature

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COMMISSIONING FORM for Air Handling Units

Customer			
Name And Place Of The Project			
Project Supervisor			
Tel-fax-email			

Dear project supervisor, in order to have your unit commissioned timely and properly, please read through the questions below and check appropriate box under "Yes" or "No" and approve the form by signing it. Commissioning process will not be started unless this form is received by ACS technical service. If you need further inquiry about this form or your unit, ACS will be happy to help. We look forward to work with you.

1	The unit was transported to the project site.	YES	NO
Not:			
2	The sections of the transported air handling unit were assembled and the installation of the unit were accomplished.	YES	NO
Not:			
3	Mains supply power cable was laid up to the air handling unit's power distribution board and the cable has a sufficient cross-section and the unit was properly earthed.	YES	NO
Not:			
4	Cables between power distribution boards and unit terminal boxes were laid.	BY ACS	
Not:			
5	Automatic control equipment were installed on the unit.	BY ACS	
Not:			
6	Cables between power distribution boards and unit's automatic control equipment were laid.	BY ACS	
Not:			
7	Cabling for automatic control equipment (including three-way valve and servo motors) and control panel were laid and equipment are programmed and operational.	BY ACS	
Not:			
8	Three way valve connections of heating and cooling coils were installed and the system is filled with water.	YES	NO
Not:			
9	Water supply and drainage connections of the humidifiers were installed.	YES	NO
Not:			
10	Interior sections of the air handling unit were cleaned (no dirt, soil, debris from the site).	YES	NO
Not:			
11	Air handling unit's sections were assembled and air tightness were provided.	BY ACS	
Not:			
12	Power cabling of the VAVs in ducts (if any) are laid up to the automation board if these devices are to be integrated to the automation.	YES	NO
Not:			
13	If there is "DUCT TYPE HEATING ELEMENT", cabling work between heating element and air handling unit automation control panel were accomplished with cables having suitable cross-sectional area.	YES	NO
Not:			
14	If there is "VAV", "electric heater" etc. devices in the ceiling, access lids should be provided for maintenance and installation; dimension of the lids should be at least 60 cm x 60 cm.	YES	NO
Not:			
15	Air handling unit's drainage connections were installed.	YES	NO
Not:			
16	One cable of 2x0.75 and one cable of 3 x 0.75 shielded cables must be laid to the location where the air handling unit's control panel is to be located.	YES	NO
Not:			
17	If pollution information of HEPA filters is to be retrieved, cabling must have been accomplished by 2x0.75 cables for each HEPA; and an access lid is provided of which size is at least 60x60 cm.	YES	NO
Not:			
18	2 x 0.75 cable must be laid between room suction grill and air handling unit automation control panel (in order to control room temperature).	YES	NO
Not:			

Customer Personnel In Charge:	Requested commissioning date:
Signature	..... / ..... / 20

General Support and Information

FILTER MAINTENANCE CARD

SERIAL NUMBER OF UNIT: | **UNIT LOCATION:**

TYPE OF UNIT:

FILTER TYPE:

Date	Polluted Pressure	Clean Pressure	Notes (replaced/cleaned)	Name Signature	Date	Polluted Pressure	Clean Pressure	Notes (replaced/cleaned)	Name Signature

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..... / ..... / 20....	FRM - 71

COMMISSIONING FORM for Air Handling Units

Customer			
Name And Place Of The Project			
Project Supervisor			
Tel-fax-email			

Dear project supervisor, in order to have your unit commissioned timely and properly, please read through the questions below and check appropriate box under "Yes" or "No" and approve the form by signing it. Commissioning process will not be started unless this form is received by ACS technical service. If you need further inquiry about this form or your unit, ACS will be happy to help. We look forward to work with you.

1	The unit was transported to the project site.	YES	NO
Not:			
2	The sections of the transported air handling unit were assembled on a perfectly level floor and the air tightness were provided.	YES	NO
Not:			
3	Mains supply power cable was laid up to the air handling unit's power distribution board and the cable has a sufficient cross-section and the unit was properly earthed.	YES	NO
Not:			
4	Cables between power distribution boards and unit terminal boxes were laid.	BY ACS	
Not:			
5	Automatic control equipment were installed on the unit and they are operational.	BY ACS	
Not:			
6	Cables between power distribution boards and unit's automatic control equipment were laid and are operational.	BY ACS	
Not:			
7	Automatic control equipment and control panel are programmed and operational.	BY ACS	
Not:			
8	Three way valve connections of heating and cooling coils were installed and the system is filled with water.	YES	NO
Not:			
9	Cooling section copper pipes were charged with refrigerant gas (including Heat-Pipe gas, if any).	BY ACS	
Not:			
10	Interior sections of the air handling unit were cleaned (no dirt, soil, debris from the site).	YES	NO
Not:			
11	Power cabling of the VAVs in ducts (if any) are laid up to the automation board if these devices are to be integrated to the automation.	YES	NO
Not:			
12	If there is "DUCT TYPE HEATING ELEMENT", cabling work between heating element and air handling unit automation control panel were accomplished with cables having suitable cross-sectional area.	YES	NO
Not:			
13	. If there is "VAV", "electric heater" etc. devices in the ceiling, access lids should be provided for maintenance and installation; dimension of the lids should be at least 60 cm x 60 cm.	YES	NO
Not:			
14	Air handling unit's drainage connections were installed.	YES	NO
Not:			
15		YES	NO
Not:			
16	Threeway valve – servo motor connection	BY ACS	
Not:			
17		YES	NO
Not:			

Customer Personnel In Charge:	Requested commissioning date:
Signature	..... / ..... / 20

FILTER MAINTENANCE CARD

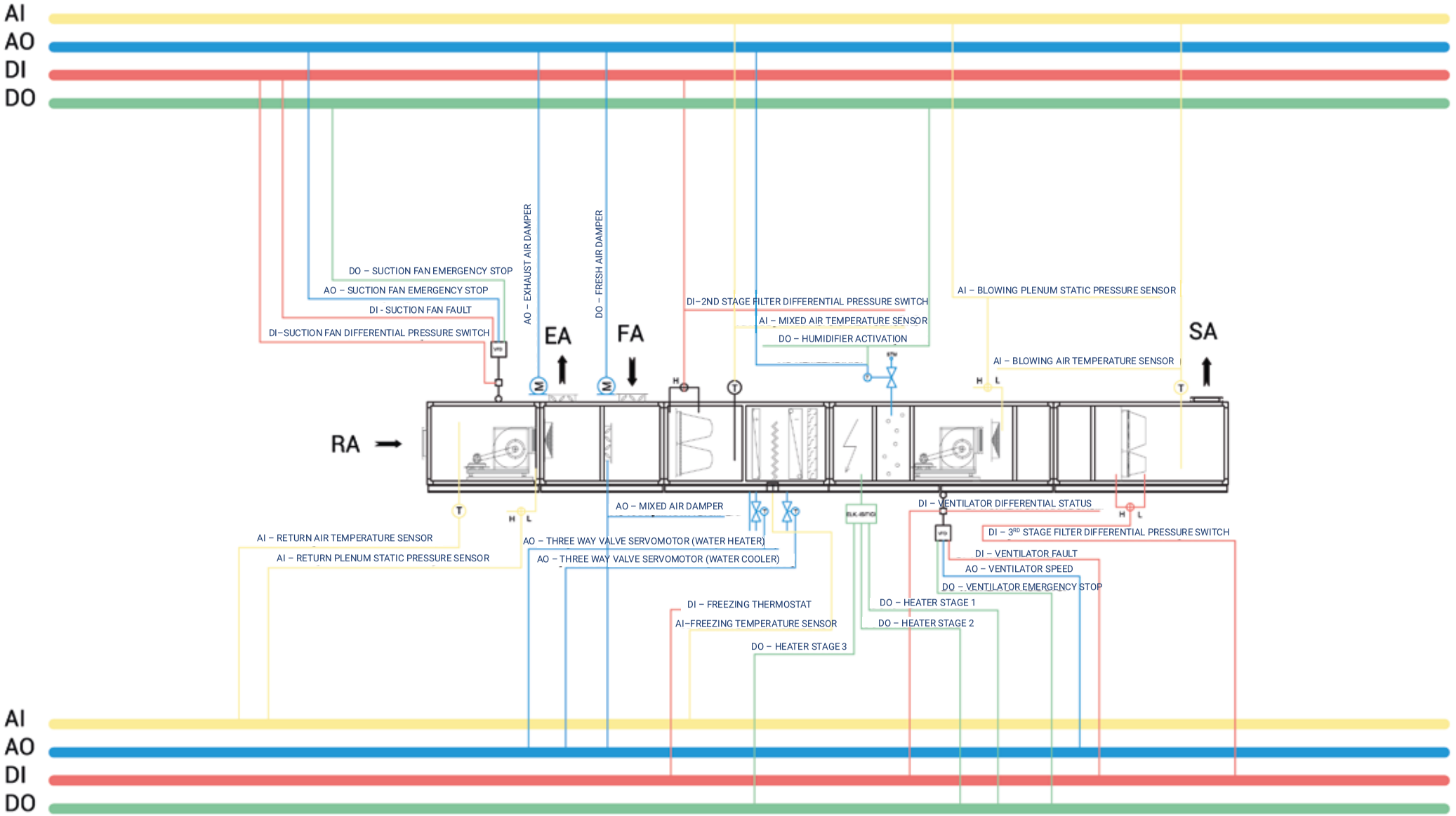
SERIAL NUMBER OF UNIT: | **UNIT LOCATION:**

TYPE OF UNIT:

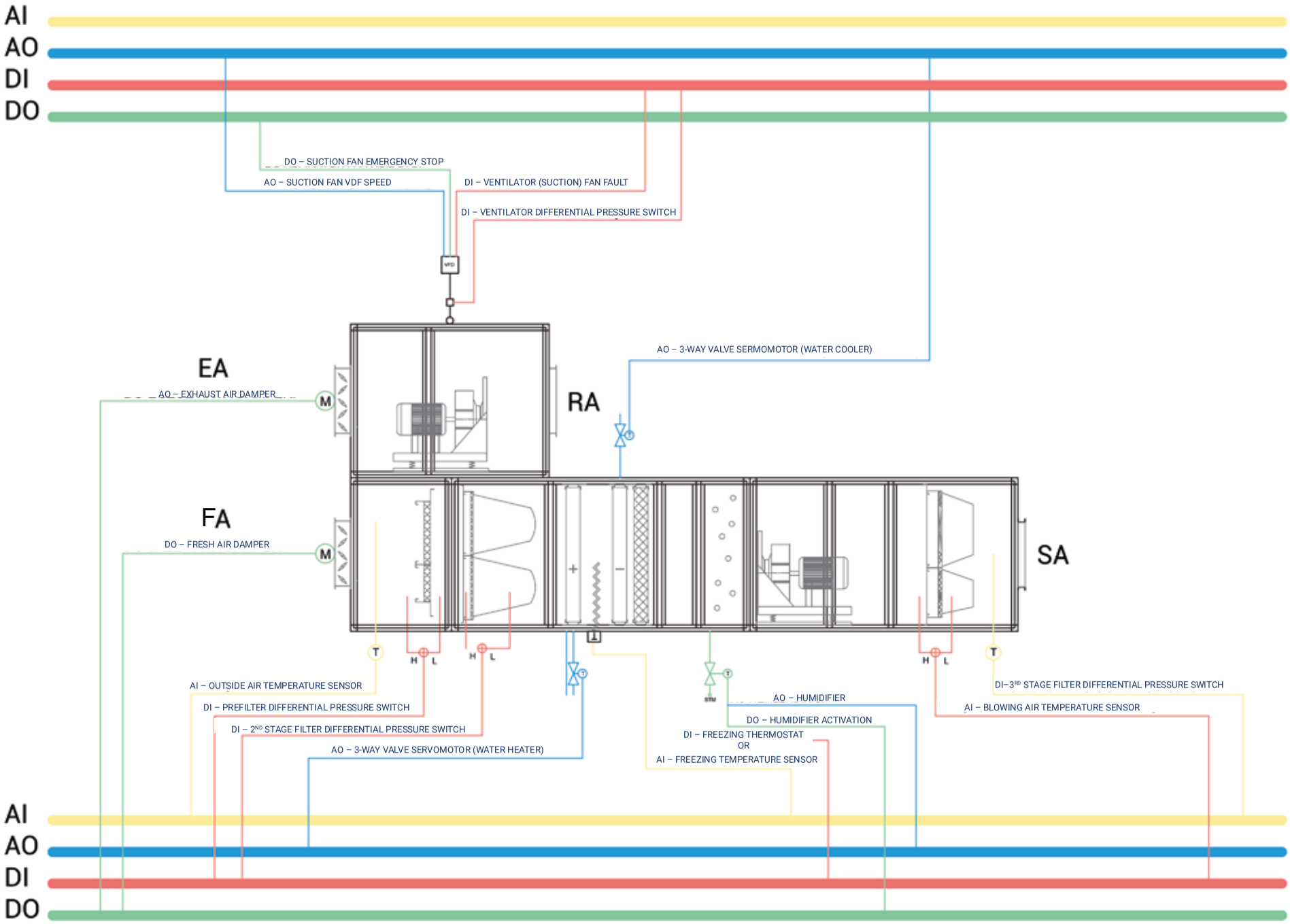
FILTER TYPE:

Date	Polluted Pressure	Clean Pressure	Notes (replaced/cleaned)	Name Signature	Date	Polluted Pressure	Clean Pressure	Notes (replaced/cleaned)	Name Signature

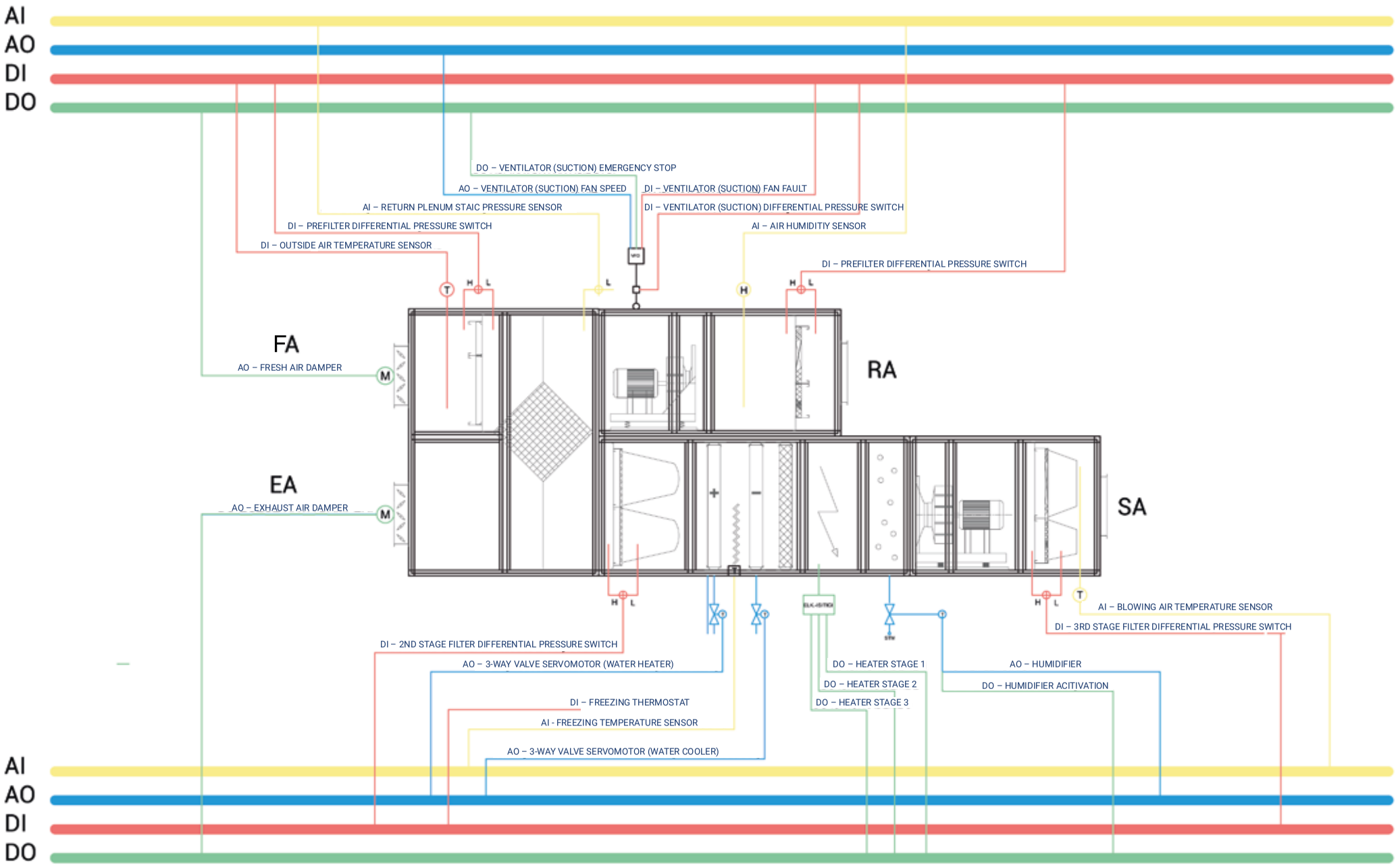
AUTOMATIC CONTROL DIAGRAM - AIR HANDLING UNIT WITH MIXED AIR



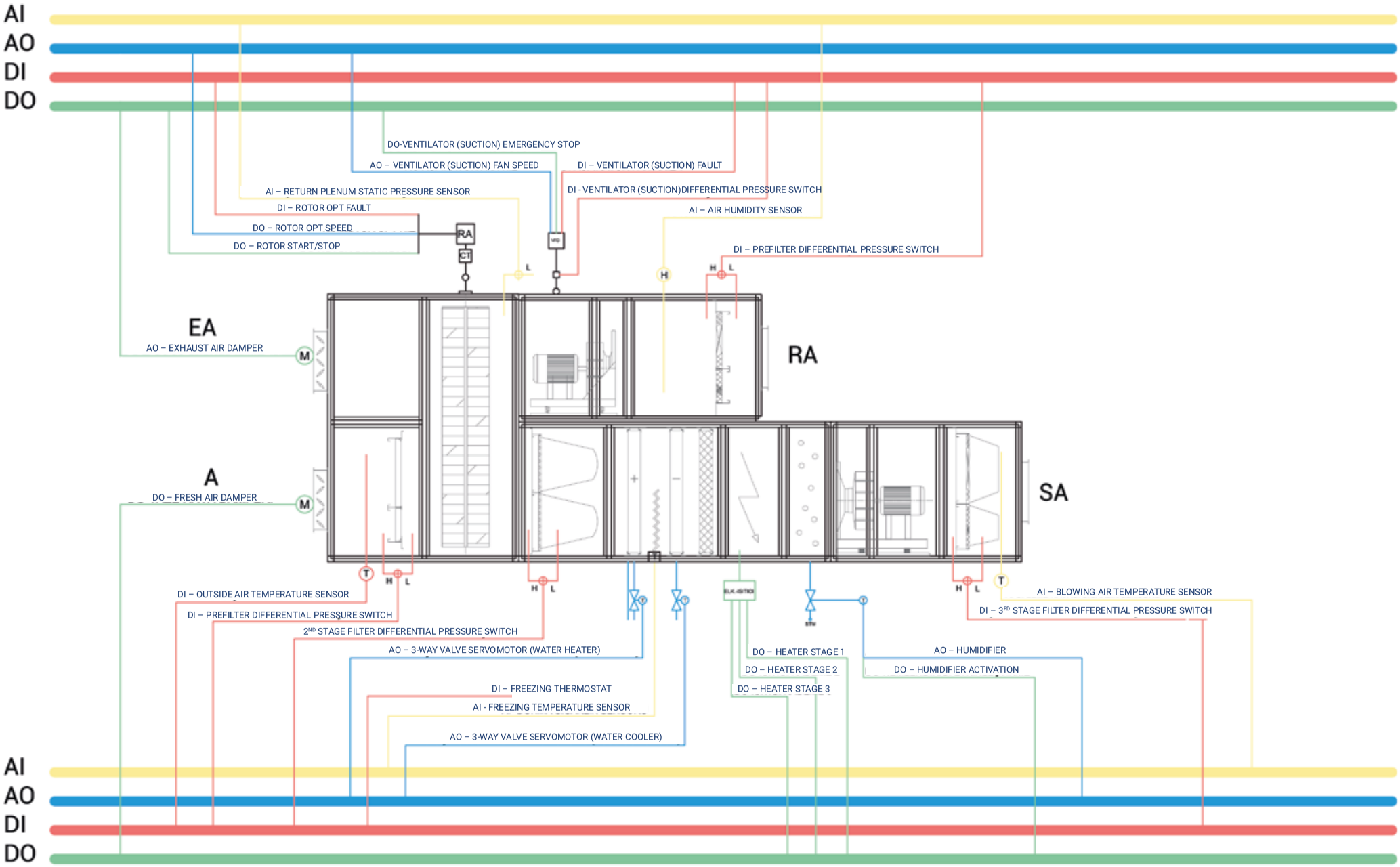
AUTOMATIC CONTROL DIAGRAM - AIR HANDLING UNIT WITH MIXED AIR



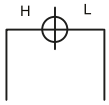
AUTOMATIC CONTROL DIAGRAM - AIR HANDLING UNIT WITH HEAT RECOVERY PLATE



AUTOMATIC CONTROL DIAGRAM - AIR HANDLING UNIT WITH MIXED AIR



SYMBOLS IN AUTOMATION DIAGRAM AND THEIR MEANINGS



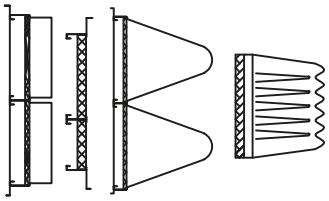
Filter Pollution Switch

Fan Pressure Sensor

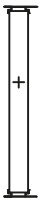
Humidity Sensor

Temperature Sensor

Freezing Thermostat

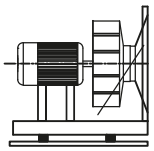


Filter

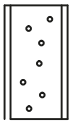


Hot Water Coil

Damper Motor

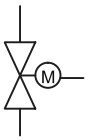


Fan



Humidifier

Electric Heater



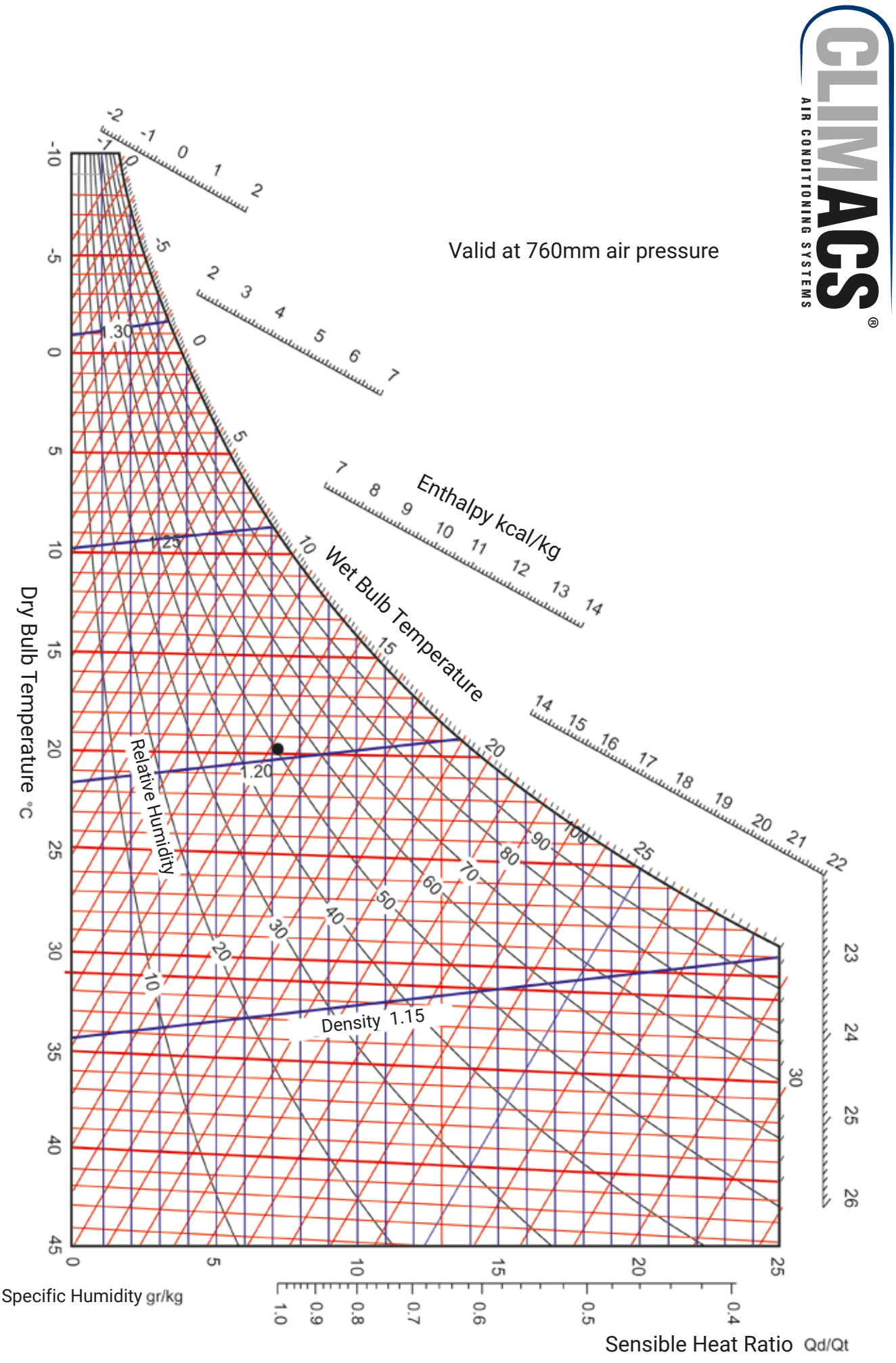
Humidifier Water Valve

Frequency Converter

Cold Water Coil

Damper

AI	Analog Input	QA	Fresh Air Inlet
AO	Analog Output	EA	Exhaust Air Outlet
DI	Digital Input	RA	Return Air
DO	Digital Output	SA	Blowing Air


Valid at 760mm air pressure
Enthalpy kcal/kg
Wet Bulb Temperature
Dry Bulb Temperature °C
Relative Humidity
Density 1.15
Specific Humidity gr/kg
Sensible Heat Ratio Qd/Qt

CLIMACS®
AIR CONDITIONING SYSTEMS

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info@acsklima.com

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