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BREATHE THE FINEST

## حلول التكييف والطاقة HVAC & Power Solutions

REVOLUTIONARY COOLING AND REFRIGERATION  
SOLUTION FOR A HEALTHY FUTURE

Innovative Green Air Conditioning  
HVAC & Power Solutions

# AHU-FAHU

## Fresh Air Handling Unit



شركة مصنع ويندماسون العربية للصناعة  
WINDMASON ARABIA for industry

APPLICATIONS :



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## INTRODUCTION

This catalogue is meant to serve as a guideline for consulting and design engineers for the selection of Windmason Air Handling Units. Please contact your local Windmason office for assistance with any technical clarification, selection, consultancies related to the air handling units product capabilities, features or applications.



Front view



Back view

## QUALITY

The quality and reliability of any Windmason Air Handling Unit depends on the quality of the components, therefore in line with our rigorous quality management and selection of the best suppliers, we offer you the highest quality Units.

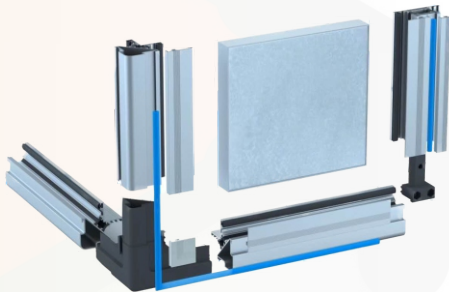
Each unit can have designed-in flexibility to adapt to your exact requirements. This capability provides you the best overall total value based upon life-expectancy, functionality, energy efficiency and serviceability. Windmason air handling unit designs incorporate many engineering and performance features which maximized equipment up-time and the additional benefit of reduced equipment energy and maintenance costs.

## UNIT FRAME

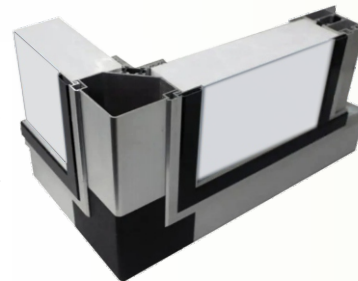
The Windmason WM-series air handling unit is constructed from framed modules manufactured from extruded anodized aluminum profiles joined by means of 3D injected molded and reinforced PE corners to form the “Penta-post” construction. This method has demonstrated superior mechanical characteristics and gives the unit its rigidity and design flexibility.

The unique profiles with their unique cross sections designed to give extra strength and rigidity to the unit frame and to prevent any buckling or deformation.

For the best thermal and acoustical performance, the internal cavities of the Penta-Post frames are insulated with fiberglass that conforms to HH-1-545B type 1, SMACNA standard for duct liners and ASTM-C-423 and NFPA90A and 90B standards for fire resistance.



**30mm Profile  
Penta-Post**



**50mm Profile  
Penta-Post**

Middle webs of the same material as the profiles are used to recess the panels and stiffen the case assembly.

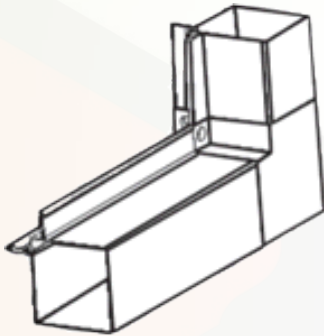
The frame construction makes it possible to disassemble and reassemble the unit sections at site in case of access or lifting difficulties.



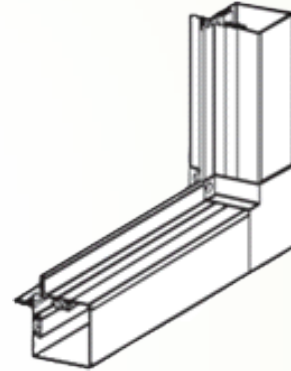
**Unit Frame**

## Unit Frame Options:

- 30mm, 50mm & 100mm hot dip galvanized steel profile.
- Special corrosion resistant profile, thermal contact free which provides perfect isolation between the inside and outside airs, (only for 50mm units).



**100mm galvanized profile**



**50mm thermal bridge profile**

## For Stander Panel:

the outer skin of the sandwich panel is zinc coated galvanized steel sheet metal of 24-gauge thickness thoroughly de-greased and then phosphated before the application of an average 80 micron electrostatic polyester powder paint oven baked in RAL 9002 color scheme, this finishing pass 1500 hr in 5% salt path at 95oF and 100% relative humidity. It complies to ASTM B 117 standard.

The inner skin of the panel are supplied in a zinc coated galvanized finish of 18 gauge thickness.

Stiffeners inside the panel are provided to enhance the rigidity of the casing and to secure the inside insulation.

All panels are thermally and acoustically insulated for best unit performance, and are internally insulated with fiberglass insulation of 48 kg/m<sup>3</sup> density, the insulation confirms to HH-1-545B type 1, SMACNA standard for duct liners and ASTM-C-423 and NFPA 90A and 90B standards for fire resistance.

## Access Panel and Doors:

The access panels and doors of the air handling unit have exactly the same configuration of the fixed panels described previously with same variety of choices.

The access panel type is determined based on the unit size and the section which to be served.



### Five types of access Panels and doors can be provided:

- A. Screwed panel is fixed with external screws for easy service access.
- B. Removable access panel with latches and handle.
- C. Hinged door with turn bolt.
- D. Hinged door with turn-lever.
- E. Hinged door with double lever lock.

STANDER ASSCEE TYPE				
UNIT SIZE	Unit Section			
	Fan	Coil	Filters	Other
WM2 - WM11	B	A	B	B
WM14 - WM22	C	A	B	B
WM26 - WM120	D	A	D	D

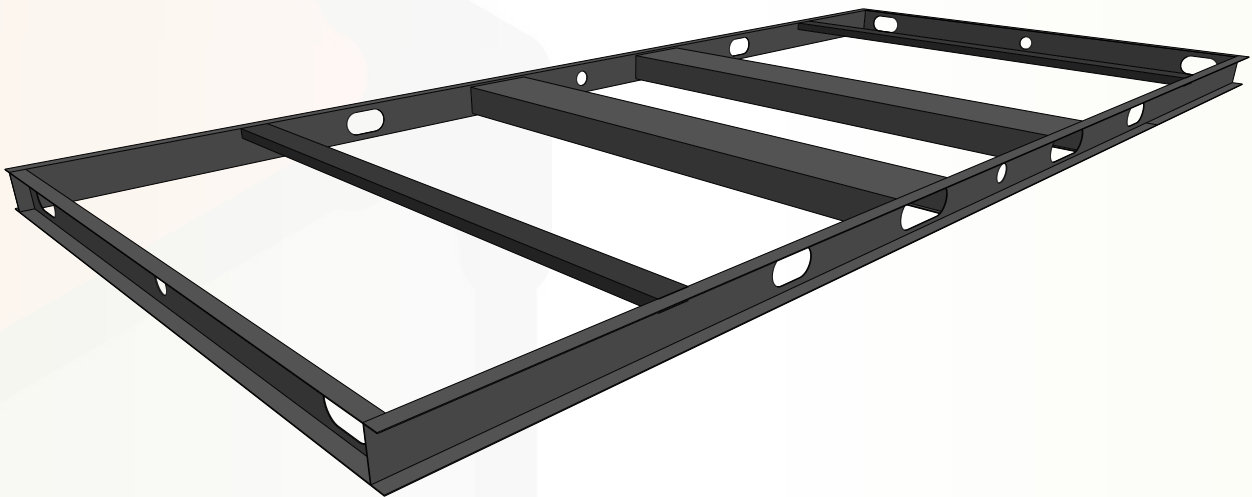
Table shows the default selection of access panels and doors in the WM series AHU's, however, the type of the access can be changed among the alternatives upon the customer request.

## Unit Base:

The unit base is a fabricated, welded galvanized sheet metal base of high gauge along the perimeter of the unit. Supports extend across the length and width of the unit to support the internal components. The unit base construction is well painted to withstand the most difficult weather conditions.

For the units TW2 – TW14 the unit base height as default is 80mm, the base rail can be fabricated with 100, 120, 150 & 200mm heights as well.

For the units TW17 – TW120 the unit base height as default is 120mm, the base rail can be fabricated with 150 & 200mm heights.



**Air handling unit base**

# 1- FANS:

## Centrifugal Fans

The standard fans used in WM-series are high performance Double Width Double Inlet (DWDI) centrifugal fans, optimally engineered for HVAC application, with high quality, and fully tested performance in accordance with DIN-24166 accuracy class-1, ISO 5801, BS 848 Part-1 and AMCA-210 standards.

All fans are optimally selected for best performance and sound characteristics based on maximum fan efficiency.

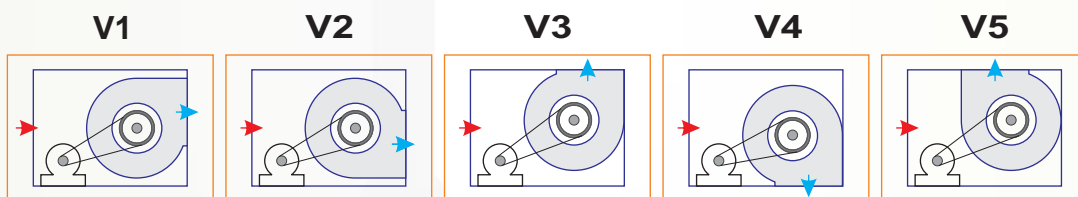
The impellers can have forward curved, backward inclined or airfoil profile blades depending on the customer requirements and the system static pressure.

The impeller is galvanized finished for forward curve blade, glass reinforced polyimide or welded heavy gauge steel painted with epoxy for backward and airfoil blade. All fans are statically and dynamically balanced for stable non-surging operation.

Fans are securely fixed to hardened steel shafts with high safety factor and precisely ground and polished, shafts are coated with protective paint for added protection, the shaft ends are grooved and keyed.

Depends on fan class and size, WM-series fans equipped with self-aligned ball bearings that are greased for life or pillow block bearings with re-greasing nipples.

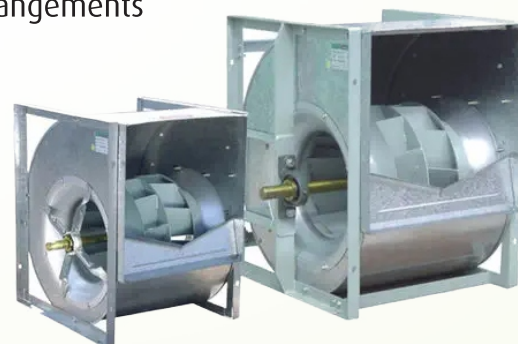
The complete fan-motor assembly mounted on a common base frame entirely isolated from the unit by rubber vibration eliminators or open type anti-vibration spring isolators. As standard the fan discharge also isolated from the casing by use a flexible connection which will minimize the vibration and accordingly the sound level.



Centrifugal Fan-Motor  
Possible arrangements



**Forward Fan**



**Backward Fan**

## 2- PLUG FAN:

Most of the energy consumed by an air handling unit is the electricity used to run the fan motor, whilst only a small percentage of the energy goes to heat generation, so high fan efficiency means power saving, this is why the plug fans which are high fan efficiency significantly reduces the consumption of electricity, and therefore the operation cost.

Direct Drive simplicity converts to less operating expenses also as there are no fan shafts, bearing, belts or guards to maintain.

Noise emission level of air handling units is also one of the most important environmental factors which we fine-tuned our product to reduce it, the choice of using plug fan will be ideal to achieve this goal. Plug fans are extremely quiet efficiency and quiet operation make an exceptional combination for your air handling unit.



Plug Fan

## Blower Motors:

Fan motors are Totally Enclosed Fan Cooled (TEFC) squirrel cage type with class "F" insulation at 50 °C ambient temperature and continuous duty. Motors are of IP55 and protect the motor from dust and water. It is mounted on an adjustable base of special design so that the belt tension can be easily adjusted.

With a voltage tolerance  $\pm 10\%$  and frequency tolerance  $\pm 5\%$ , motor can operate in an ambient -16 to +50 °C according to IEC60034-1 standard.

For motor sizing the mechanical losses incurred in transmitting the load from motor shaft to the fan shaft are taken into consideration along with a reasonable safety factor.



## Variable Frequency Drives:

Variable Frequency Drives or Frequency Inverters as they are sometimes called are installed on Fan motors to vary the fan speed in applications where the supply CFM is not constant and must be varied. In applications where Variable Air Volume boxes (VAV's), for example, are installed throughout the occupied space, the total CFM discharged by the Air Handling Unit will depend on the demand requested by the VAV boxes. When the space is satisfied and the VAV box closes its damper, the total required CFM will be reduced. To avoid over pressurizing the ducting, a Variable Frequency Drive is installed to reduce the speed of the fan and hence reduce the total CFM discharged by the unit.

A full range of Variable Frequency Drives from 0.25 kW up to 132 kW in voltage ratings of (220V-1phase, 220V-3Phase, 380/480V-3phase) with an operating ambient temperature rating up to 50°C are available.

The drives are easy to configure and operate with built-in Proportional, Integral, Derivative (PID) control based on flow or temperature. Equipped with Dynamic Brake Control, Torque Control, Dual Motor Control and Threshold Comparator. Intelligent Thermal Management functionality to reduce tripping and motor noise. Complies with EN61800-3 and EN50082-2 for Electromagnetic Immunity as well as EN61800-3 for Electromagnetic Emissions.

EMC filters can be installed for more stringent requirements. Also equipped with protection for under voltage, over voltage, phase loss, drive overload, over current, over temperature, ground fault, and short circuit.



## Drives:

Transmission of power from the motor to the fan is provided by means of a set of pulleys and matching V-belts. The pulleys are taper locked to the fan and motor shaft. WM-series air handling units are equipped with the optimized pulleys and belts, which are sized and pre-installed by factory. Optimal selection of drives and proper installation will ensure that the fan re-stats at the required designed speed and at same time help to optimize fan and motor bearing life.



Transmission Assembly  
Fan Pulley, Motor Pulley, Belt and Bushe

## Vibration Eliminator:

In order to reduce the transmission of noise and vibration, the complete fan motor subbase assembly is mounted on set of anti-vibration mounts.

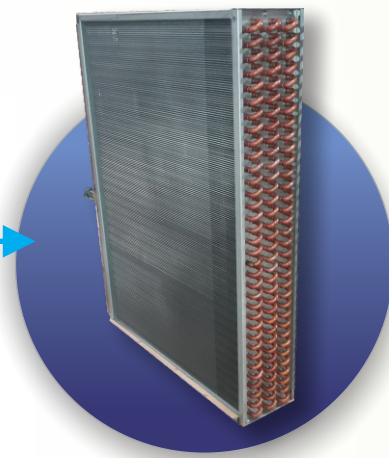
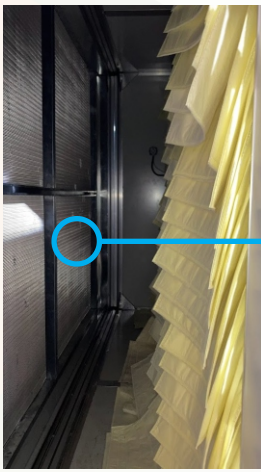
As standard for WM2 - WM35, the fan assembly is a common base frame entirely isolated from the unit by rubber in shear while as standard in units TW47 - TW120, the frame isolated by 1" deflection open type spring isolators.



## Heat Exchanger Coils:

It is an air to water heat exchanger system, it is used to recover sensible heat only, it consists of two coils, one located in the exhaust air stream and the other in the supply air stream, both of them are connected with a pump in a closed circuit (pump and piping by others), the heat transfer medium is water.

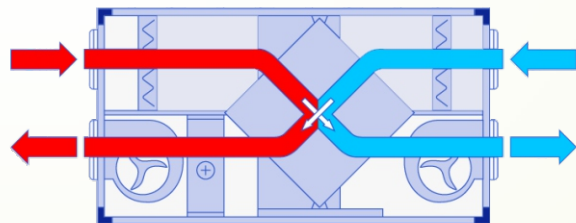
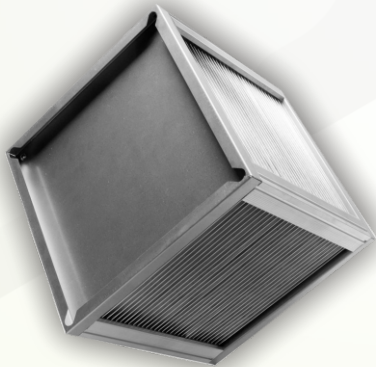
When the cold air passes through the first coil of the run around system which is located in the cold air stream, it cools down the water inside the coil, after the water loses heat, the pump passes this cold water to the coil in the hot air stream, heat exchange happened thus cooling the air and warming the water, warm water returns to the coil in the cold stream and the cycle is repeated.



## Plate Heat Exchanger:

This type of heat recovery systems depends on the thermal conduction propriety to recover sensible heat only.

The plate heat exchanger is specially thermoformed plates, connected together via folded edges permanently bonded and sealed. The supply and exhaust airflow pass crossways through the heat exchanger alternate aluminum layers of the plate heat exchanger. The two air streams are totally separated by the nature of the heat exchanger construction, so to use this type of heat exchangers, the unit shall be a double deck unit.



## Coils:

Windmason WM Air Handling units offer a variety of chilled water coils, direct expansion coils (R-22, R-407c, R-134a), hot water coils and steam coils which confirms to ARI 410 standard and comply with Eurovent standards.

All coils designed to deliver their respective duties at optimum performance at all design conditions and to meet a wide range of applications and requirements.

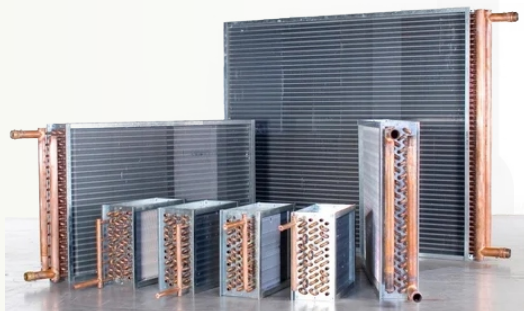
As a standard, coils are manufactured from seamless copper tubes of ½" OD, mechanically expanded into collar continuous corrugated aluminum fins to provide a continuous compression bond over the entire finned length for maximum heat transfer rates.

The standard number of fins per inch is 12 FPI; however, 10 and 14 FPI coils are available as an option upon the client request or to achieve the determined indoor conditions. Extensive cleaning is done after manufacturing each coil for optimum system cleanliness and all coils are factory tested at 300 psig air pressure under water.

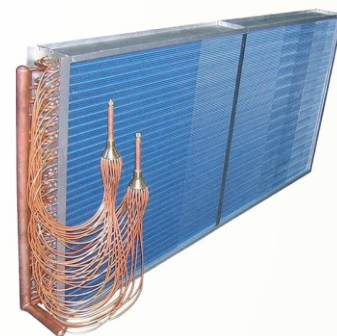
Coils can be manufactured from 1 to 12 rows for both chilled water and direct expansion coils, and up to 4 rows for heating coils.

Due to the huge variety of coil input conditions, the coils calculation and selection is optimally done based on a fully wetted coil by selection software integrated in the unit selection software to match the required conditions.

Direct expansion coils are equipped with a properly - sized expansion valve and distributor to ensure equal refrigerant fed to all circuits. The number of circuits is chosen to provide optimum heat transfer and reasonable refrigerant velocity and pressure drop so as not to trap any oil in the coil tubing.



**Chilled Water Coil**



**Direct Expansion Coil**

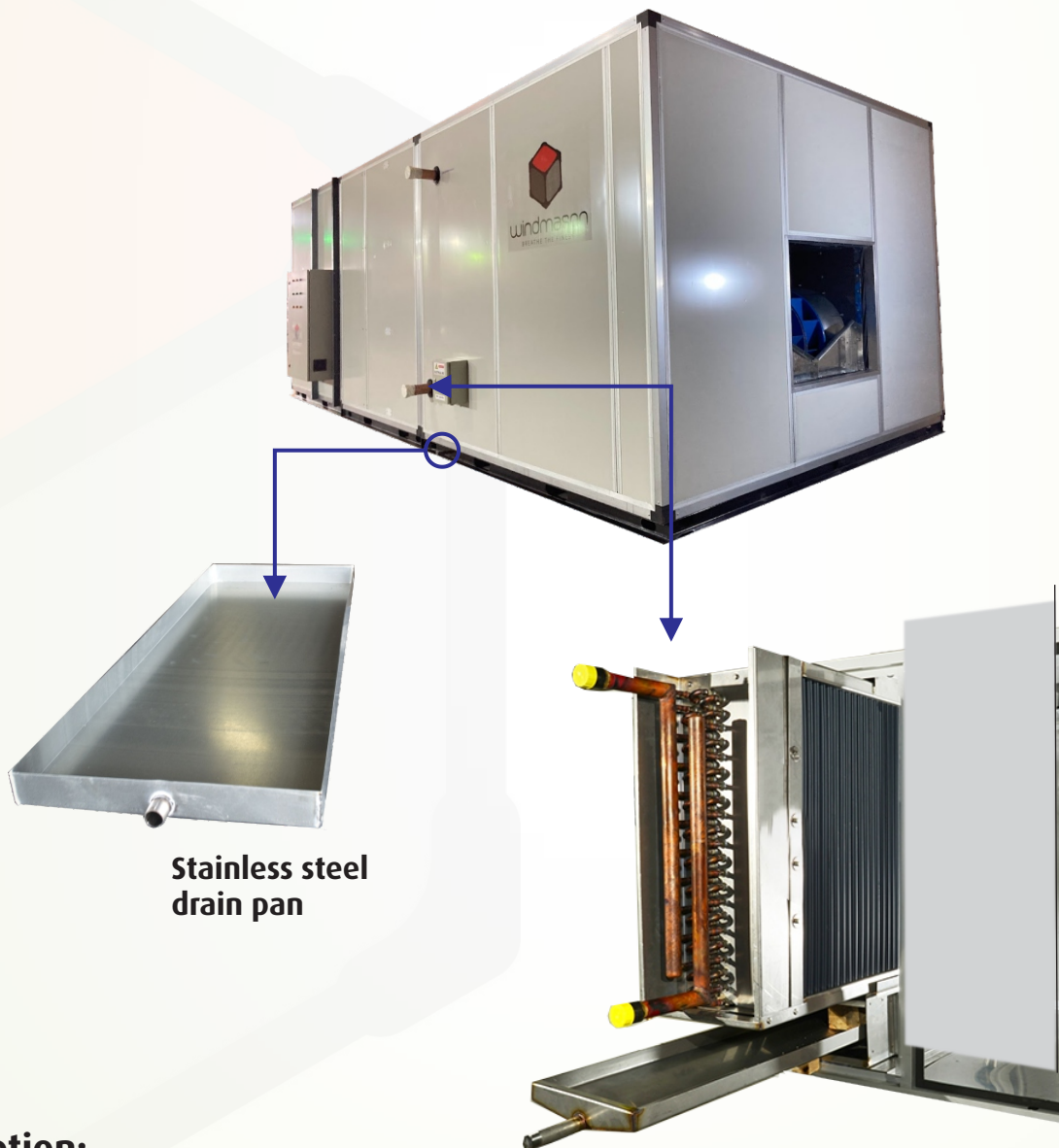
Headers and connections for water coils and DX-coils are made of seamless copper pipes and inlet & outlet connections are sealed against unit panels by rubber gaskets as standard wherever coil connections protrude through the casing.

Utilizing the full available unit cross section area, coils are mounted in the unit casing on non-corrosive slide rails to allow for easy coil slide in - slide out when required. All water coils are fitted with plugged drain and vent tapping to facilitate draining and venting.

### Drain Pan:

In order to remove the condensate formed during de-humidification, drain pan is supplied as standard under the cooling coil, the drain pan is fabricated from stainless steel gauge 16 sheets which covers the whole cooling coil section not only under the coil slap.

For best drainage, drainage connection is given from one side for AHU, and from both sides where the units contain big coils, the drain pan bottom is sloped properly to ensure complete and positive drainage of condensate. The drain pan's outer surface is insulated with (1/8") closed-cell foam insulation to prevent condensation.



**Stainless steel  
drain pan**

**The drain pan covers the  
whole coil section**

### Option:

- ✦ Double wall drain pan assembly.
- ✦ Intermediate drain pan for small units.

## ELECTRIC HEATER:

Electrical heaters with wide range of capacities and steps are available to be supplied built-in Windmason WM-series Air handling units.

The standard electric heater is the open wire type which is provided in a stand-alone section, it consists of a heavy gauge corrosion resistant steel frame and control compartment which contains the basic electrical components. The heating wire is a composition of 80% Nickel and 20% Chrome, via anti-thermal shock, moisture resistant steatite free floating holding ceramics.



**Open Type Heater**

All heating elements are supported by corrosion resistant heavy gauge wire rack construction designed to allow for free flow of air with lowest possible pressure drop.

### Options:

- Heaters with UL control panel.
- Finned tubular heater type.



**Finned Type Heater (Option)**

## Dampers:

Windmason WM series air handling units are equipped with multiple-blade, low leakage dampers to modulate and control the air flow.



Dampers can be provided with opposed blades or parallel blades. Dampers are prepared for either manual or motorized operation (motor can be provided as an option).

As standard, the damper frame is constructed from 1.5mm galvanized steel, non-welded oppose single skin galvanized steel blades fitted to the case with close gap, shafts made from chrome plated steel, self-lubricating hard nylon shaft bushes and galvanized steel linkage and brackets. To ensure low leakage, the dampers are equipped with side-edge seals.



### The following damper alternatives can be provided:

- Galvanized steel dampers with airfoil blades.
- Stainless steel dampers with single skin blades.
- Stainless steel dampers with airfoil blades.
- Gear type dampers with Aluminum airfoil blades.

For easy installation, the damper frame is designed and fabricated to serve as a flange for ductwork connection.

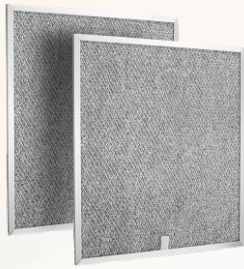
## Filters

A wide variety of filter types are available to meet any filtration requirements, including flat filters, low-velocity filters, bag filters, HEPA filters, carbon filters and many other types of filters

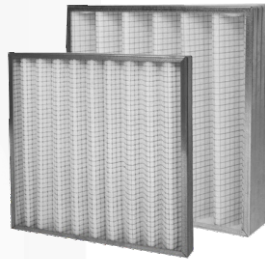
### 1- Flat filters

In Windmason WM-series Air handling units, the following types of flat filters can be provided:

- a. 2" flat filters, with aluminum washable media, used as standard in Windmason WM-series air handling units.
- b. 2" flat filters, with synthetic non-woven media, either disposable or cleanable can be provided upon request.
- c. 4" flat filters with Aluminum or synthetic media, can be also provided upon request.



**Aluminum filters**



**Synthetic filters**



**Pleated filters**

### 2- Low Velocity Filters (V-Filters):

This can be provided as an option to increase the filtration area. Filters arranged in a vee bank, filters media options are same as flat filters.

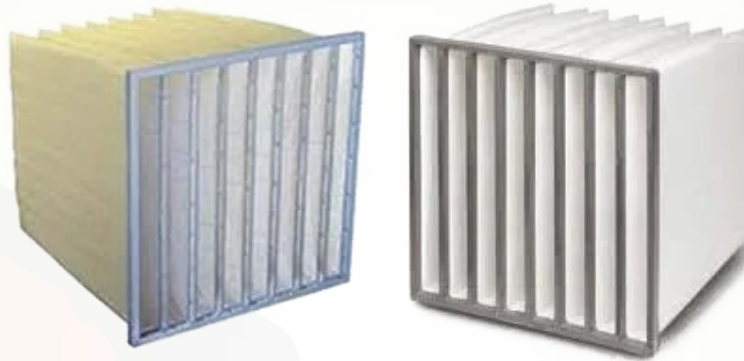


**V - Filters Section**



### 3-Bag Filters:

For a higher level of filtration than flat filters, bag filters with 95% filtration efficiency can be used, the bag filters are made from ultra fine non-woven synthetic fibers, formed into pockets and then attached to a rigid header. Short bag filters with 15" deep or long bag filters with 22" deep are available.



### 4-HEPA Filters:

For critical air cleaning applications such as clean rooms, food factories, operation theaters or pharmaceutical applications where a very high degree of filtration is required and the efficiency needed to be in excess of 99.997%. HEPA filters can be provided as an option.



For all WM-series air handling units, a combination of three internationally common sizes from the above types of filters are used

### 5-Carbon Filter:

Activated carbon is the most common material used in HVAC systems for the removal of gaseous contaminations by means of adsorption, absorption and chemical reaction. Based on the application, the surrounding environment carbon filters can be carefully selected and integrated in Windmason TW-series air handling units as an option.

### Filter Frame:

The pre-filters and bag filters are fixed in a specially - designed galvanized steel frames, with locks to secure the filters in their places during operation. For TW2 - TW26 models, the filter frames are fixed together and installed on a channel to enable sliding them out complete with the filter cells for service or replacement, while for the models TW35-TW120 the filter frames are fixed inside the filter section and service or replacement to be done inside the unit. The arrangement of filter frames designed to minimize air bypass and allow for filter access and replacement from the access side of the air handling unit

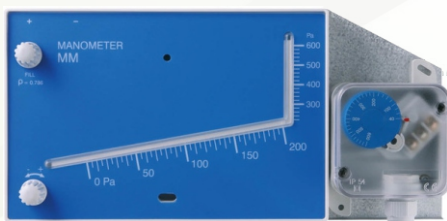


**Fixed Filter Frame**

For the calculation of internal pressure drop "Mid-life" resistance is considered in the calculations for the selection of the blower motor.

### Options:

- \* Stainless steel filter frames.
- \* Differential pressure switch (Loose delivery).
- \* Auto roll filters.
- \* Sand Inertia filters.
- \* Gas phase filters.
- \* Cartridge filters.
- \* For visual indication of the filter conditions, an inclined manometer for indoor applications can be provided or alternatively, a Magnehelic manometer can be provided specially for the outdoor applications (loose delivery).



**Inclined Manometer**



**Magnehelic Pressure Gauge**

## Energy Recovery Wheel:

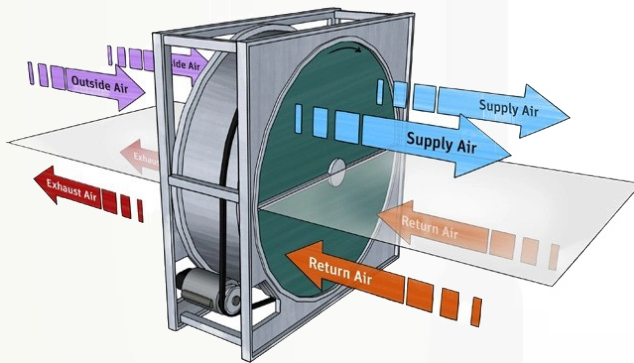
The heat wheel is a rotating wheel consisting of an air permeable aluminum matrix with a large interior surface, the wheel consists of two half-moon sections, and it should be installed in a double deck or side by side units where the supply air flows through one half of the rotary wheel while the exhaust air flows in counter flow through the other half, the wheel is rotating with low speed simultaneously.

Energy wheels designed to recover either sensible heat only or both sensible and latent to meet the requirements of the indoor air quality. The recovery of sensible heat achieved when the sensible heat is transferred as the metallic substrate gain and stores heat from the warmer air stream and gives it up to the cooler stream while the rotation of the wheel.

Latent heat is transferred as the metallic substrate which is coated by a hygroscopic coating condenses moisture from the air stream that has the higher humidity ratio through absorption and releases moisture through evaporation into the air stream that has a lower humidity ratio.

The WM-series selection software optimizes the selection of the energy wheel to achieve the needed indoor conditions.

Heat wheels are ideal for applications that demand high percentage of fresh air intake like in hospitals, labs, universities and pharmaceutical applications.



**Energy Recovery Wheel**

In order to recover energy and conserve its consumption by exchanging the energy between the supply and exhaust air streams, different types of heat recovery systems can be provided built-in Windmason WM-series units. This will assure the economical running costs of the units.

## Heat Pipe System:

This type of heat recovery system utilizes the refrigerant phase change property. It consists of two coils connected to each other circuit independently; each circuit is filled with a refrigerant.

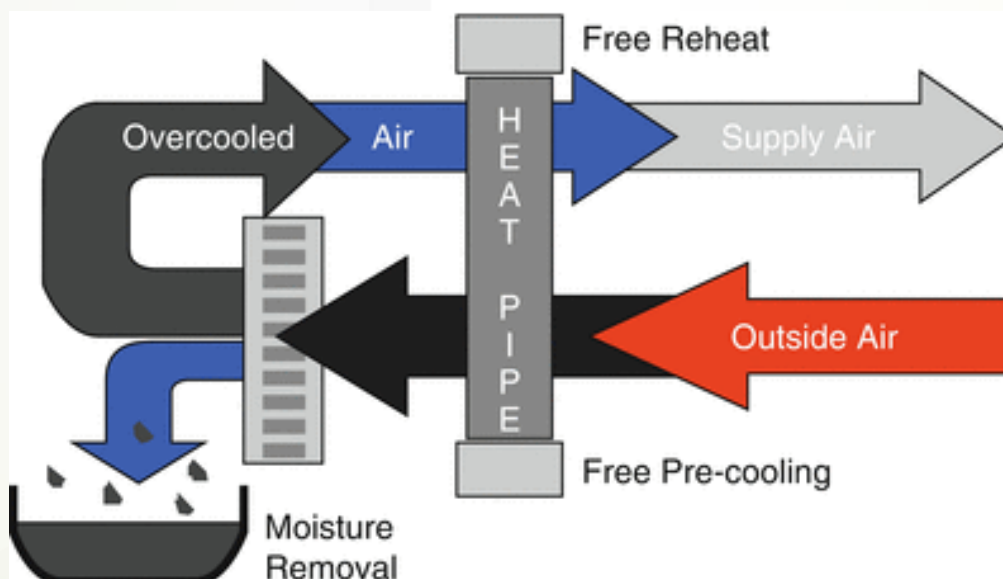
Two main functions can be done using this system; it can be used for dehumidification or for heat recovery, according to the arrangement of the heat pipe coils with respect to other components.

Heat pipes for dehumidification function may be described as having two sections: Pre-cool and reheat. The first section is located in the incoming air stream.

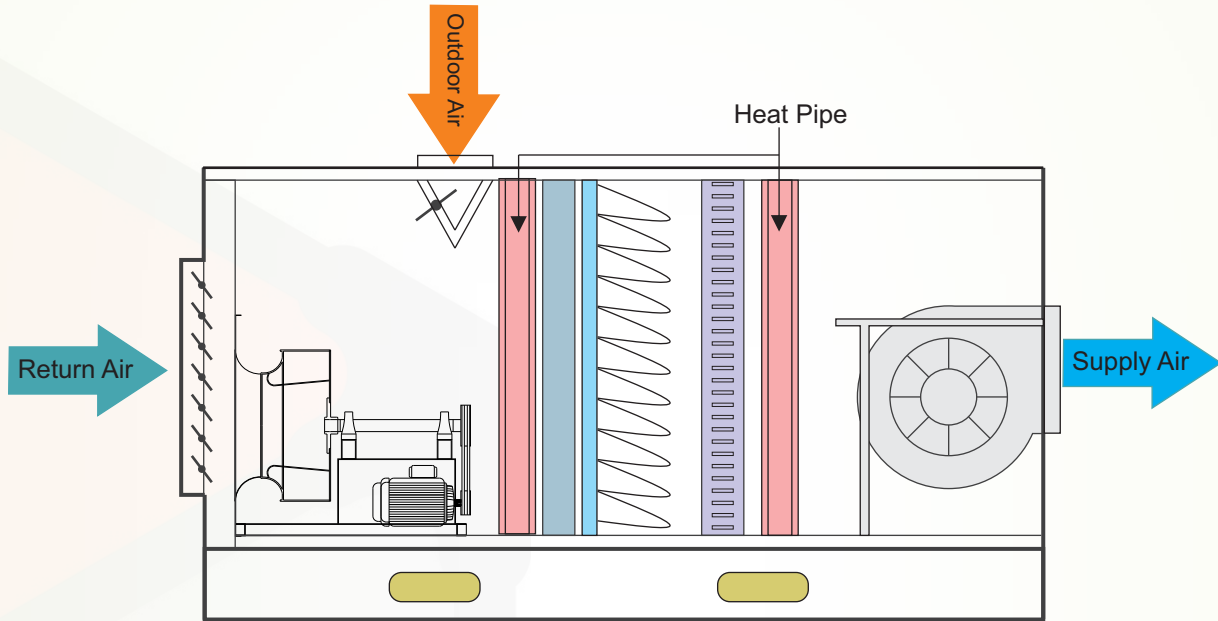
When warm air passes over the heat pipes, the refrigerant vaporizes, carrying heat to the second section of heat pipes, placed downstream. Because some heat has been removed from the air before encountering the evaporator coil, the incoming air stream section is called the pre cool heat pipe.

Air passing through the evaporator coil is assisted to a lower temperature, resulting in greater condensation removal. The «overcooled» air is then reheated to a comfortable temperature by the reheat heat pipe section, using the heat transferred from the pre-cool heat pipe.

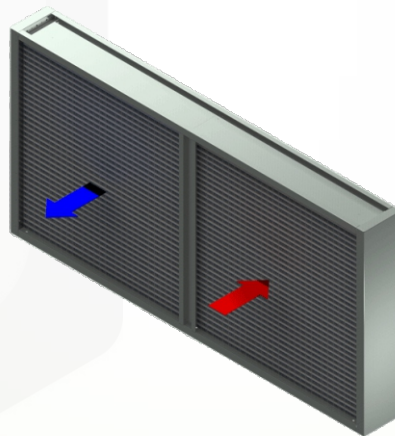
This entire process of pre-cooling and reheating is accomplished with no additional energy use. The result is an air conditioning system with superior ability to remove moisture.



For Heat Recovery function the heat pipe also consists of two sections, each of them installed in an air stream, side by side or stacked depending on the unit arrangement. When warm air passes over the heat pipes, the refrigerant vaporizes; carrying heat to the second section and the warm air will be cooled down while the relatively cold air in the cold air stream will condense the refrigerant which will return back to the first part by gravity, then this cycle repeated.



**Heat pipes for dehumidification**



**Heat pipe for heat recovery**