

MAH Modular Air Handling Units

Range 1000 cfm to 46250 cfm
(472 l/s to 21828 l/s)





**Certification Diploma N° :
05.01.286**

EUROVENT Certification Company certifies that

Air Handling Units

from

SKM Air Conditioning Equipment LLC

Located at

Industrial Area 13 - PO Box 6004, Sharjah, United Arab Emirates

Range

MAH

Software for calculation of performances

SKM AHU Select 1.25

Trade name

SKM

have been assessed according the requirements of following standard

OM-5-2011

The list of certified products is displayed at :

<http://www.eurovent-certification.com>

Manufacturing places

Sharjah, United Arab Emirates

SKM Air Conditioning Equipment LLC

is authorised to use the EUROVENT Certification mark in accordance with the rules
specified in the Operational Manual

OM-5-2011

Erick MELQUIOND
Managing Director

Approval date : 2005/05/31

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SKM Modular Air Handling Units MAH Series

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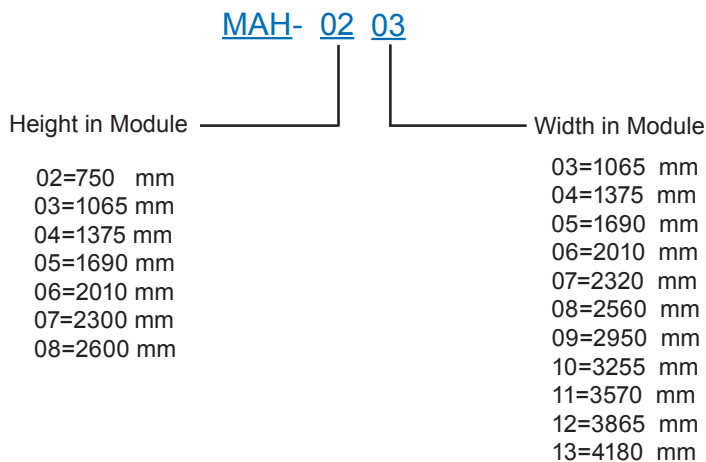
Legend

The following legends are used throughout this manual

Amp	Amperes	lbs	Pounds weight
cfm.....	Cubic feet per minute	l/s	Litres per second
DBT	Dry Bulb Temperature	LWT	Leaving Water Temp.
EAT	Entering Air Temperature	MBh	1000 Btuh
ESP	External Static Pressure	m/s.....	Meters per second
EWT.....	Entering Water Temp.	OD	Outside Diameter
FPI	Fins per inch	Pa	Pascals
fpm.....	Feet per minute	Ph	Phase
gpm.....	Gallons per minute	psig	pounds per sq.inch
inwg	inches of Water Gauge	rpm	revolutions per minute
Hz	Hertz	SST.....	Saturated Suction Temp.
kW	Kilowatts	V	Volts
kg.....	Kilograms	WBT.....	Wet Bulb Temperature
kPa	Kilo Pascals		

Nomenclature

SKM Air Handling Units are based on Standard Module sizes.



Introduction

SKM Modular Air Handling (MAH) Units are designed to a high engineering standard to provide the requirements of ventilation, heating, cooling, de-humidification and air distribution to a conditioned space.

MAH Units are available in 22 models to deliver from 1000 cfm (472 l/s) to 46250 cfm (21828 l/s) nominal air flow rate against total static pressure up to 8.0 inwg (2000 Pa).

MAH units are applicable for indoor and outdoor installation and they are ideal for large halls, schools, offices, banks, workshops, laboratories, restaurants, cinemas, hospitals, departmental stores, mosques and super markets, etc.

SKM Air Handling Units are manufactured in a facility registered to ISO 9001:2008 manufacturing quality standard.

SKM Modular Air Handling units are certified according to EUROVENT (Certification No: 05.01.286) and to EN1886 and EN13053 standards. Coil performance certified in accordance with AHRI standard 410 and the units are designed to meet the Indoor Air Quality requirements as per ASHRAE standard 62.

Modular Air Handling Units are another premium international quality product from SKM, fully justifying Our slogan:

You name it.....We cool it.



SKM Airconditioning Equipment



SKM Modular Air Handling Units MAH Series

General Features

Modular Design

MAH Series air handling units are manufactured in modular sections. Units are normally shipped with each section fully assembled in the factory. The unit is however designed to be supplied in knockdown arrangement for quick site assembly, where shipping or plant room restrictions demand.

Application Flexibility

MAH Series can be provided with a whole range of standard components, in many different configurations. Units can be supplied with a whole range of panel configuration to suit every application. Different sectional arrangements and fan discharge positions are possible depending on the site constraints and requirements.

Simple connection

MAH units are suitable for both duct connection and free discharge applications.

Perfect Thermal Break

MAH Series utilize designed gaskets and profiles to provide an excellent thermal break. Steel penta post profiles are internally insulated and the profile is covered from inside with neoprene tape to provide perfect insulation. Aluminum profiles are with built in PVC inserts, which eliminates contact between the treated air and the profile, thus provides an excellent thermal break. SKM air handling units utilize gasket liner between the panels and frame to ensure an excellent leak tight and thermal and acoustic insulation. A specially designed EPDM gasket is provided between frame and access doors to improve the anti-thermal bridge effect.

Conformity

Conformity with applicable European health and safety standards.

A typical **MAH** Unit consists of a wide choice of a combination but not limited to the following sections, fan, cooling coil, heating coil, humidifier, filter section, mixing box dampers, return air fan, plenums etc.

Main Component Features

Casing & Construction

Penta-Post Frame

MAH series section casings are constructed of framed modules, for maximum rigidity and strength.

MAH unit frames shall be constructed of either extruded aluminum profile or hot dip coated galvanized steel profile. (steel penta post). Both profiles have excellent mechanical characteristics and give the unit its rigidity and design flexibility. The cross-section of profiles is specially designed for this type of application to give extra strength to the unit frame and to prevent any buckling or deformation. Aluminum Profile frames are assembled together using strong nylon corners and steel Penta-Post profiles are connected by means of special corner pieces to produce a very rigid assembly.

Both of these constructions give the possibility of completely dismantling the unit sections and re-assembly at site in case of difficult access.



Figure 1: Galvanized Penta-Post Frame



Figure 2: Aluminum Profile with PVC Insert

Panels

Access and fixed panels are constructed of hot dip galvanized steel conforming to JIS-G 3302 and ASTM-A-653. All panels shall be one piece double skin [DSU] construction with insulation sealed between the inner and outer panels.

All fixed panels are bolted to the frame and provided with special gasket between panels and frames to ensure air tightness.

This bolted construction makes all sections accessible from both

SKM Modular Air Handling Units MAH Series

sides. Access panels are provided with quick release fasteners to facilitate access to all internal components for maintenance and service. Suitable handles are provided for ease of handling. Removal of any panels shall not affect on the structural integrity of the units.

Construction	Outer Skin		Inner Skin		Insulation		Panel Thickness (mm)
	Material	Thickness (mm)	Material	Thickness (mm)	Material	Density (kg/m ³)	
60 mm Aluminium Profile	Galvanized Steel	0.7	Galvanized Steel	0.7	Polyurethane foam	40	48
60 mm Aluminium Profile	Galvanized Steel	0.7	Galvanized Steel	0.7	Polyurethane foam	40	63
70 mm Steel pentapost	Galvanized Steel	1.2*	Galvanized Steel	0.7	Fiber Glass	32	50

Table 1

* 1.5mm for units above 15000cfm

63mm thick panels are available only with aluminum pentapost construction and polyurethane insulation. Different sheet thickness, other than mentioned on table 1 available on request.

Options:

- Stainless steel outer skin [SOS]
- Aluminum outer skin [AOS]
- Stainless steel inner skin [SIS]
- Perforated inner skin [PIS] (Not applicable with foam injection insulation)
- Aluminum inner skin [AIS]

Painting

MAH units are supplied unpainted in a galvanized finish. Units are painted only when specified. Painted MAH units are made out of a zinc coated galvanized steel thoroughly de-greased and then phosphated before application of an average 60 micron backed electrostatic polyester dry powder coating in RAL 7032 color scheme. This finish and coating can pass a 1000 hour 5% salt spray testing at 95°F (35°C) and 95% relative humidity as per ASTM B 117. Specify option [BEP] for painted units. Inner skin panels for double skin units are supplied in galvanized finish unless otherwise stated.

Options:

- Marine paint which include zinc-rich epoxy powder coating as primer coat and polyester powder coating as finish coat.

Insulation

For best thermal and acoustical performance, all panels are internally insulated. Polyurethane foam insulation is standard for Aluminum profile construction and insulation conform to density of 2.5 lb/ft³ (40 kg/m³) according to the test standard ASTM D-1622-88 and thermal conductivity of 0.14 BTU.in/ft². °F.h. (0.020 W/m²k) according to test standard ASTM C 518-56.

For units with Steel pentapost construction, panels are insulated with Fiber glass insulation of 2 lb/ft³(32 kg/m³) density and 0.23 BTU.in/ft².F.h.(0.033 W/m²k) thermal conductivity, and it shall be conformed to HH-1-545B Type 1, SMACNA standard for duct liners and ASTM-C-423 and NFPA90A and 90B standards for fire resistance.

Options:

- Rock Wool insulation with density up to 6.875 lb/ft³ (110kg/m³).
- 2" (50mm) polyisocyanurate board, [2SB] with density in the range of 2 to 3 lb/ft³ (32 to 48 kg/m³) and thermal conductivity of 0.16 BTU.in /ft². °F.h (0.023 W/m²K).

Base Frame

Since MAH is constructed from Pentapost profile, which has inherent rigidity and stability, most sizes of MAH series (up to size 10000 cfm) do not require structure steel base frame. Sheet metal frame with holes for vibration mounts are provided on each side of the unit. For larger MAH units (sizes above 10000 cfm), a steel structure is provided, coated with galvanized primer and black enamel finish. Structural steel accordance to JIS-G-3103SS41 standard.

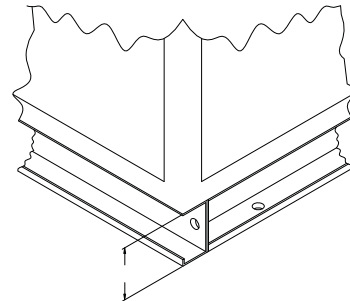


Figure 3: Sheet metal Base Frame (For Models up to 10000 cfm)

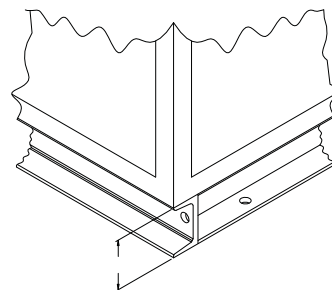


Figure 4: Channel Base Frame (For Models above 10000 cfm)

- For units with sheet metal base frame, units would be shipped upto maximum frame lengths of 124 inches(3150 mm), above this, units should be shipped in knockdown sections.
- For Ceiling suspended units (models upto 10000cfm) structural steel channel frame should be provided.

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Major Sections & Sub Assemblies

MAH series is constructed of suitable sized casing module and following sub-assemblies

Fan Section

Fan

Double inlet double width centrifugal fans are supplied as standard in SKM **MAH** units. Fans used in SKM **MAH** units are tested in a registered laboratory in accordance with AMCA standard 210. All fans are statically and dynamically balanced in accordance to ISO 1940 and performance data according to DIN 24 166 tolerance class 2. The impellers can have forward curved **[FAT]** or **[FADH]**, backward curved **[FRDH]** or airfoil profiles **[FRDA]** depending on the requirements. Forward curved fans are generally used for low static pressure applications. Forward curved blades shall be made of galvanized steel and Fan shaft shall be made of carbon steel with corrosion protection coating.



Figure 5: FAN Section

Backward curved fans can handle high static pressure system and show higher efficiency over a broader range of higher system resistance. Backward inclined blades shall be made of sheet steel and Fan shaft shall be made of carbon steel with corrosion protection coating. Aerofoil fan shows higher efficiency, generate low noise level and can handle higher static pressures. Backward inclined airfoil blades shall be made of mild steel. Fan shaft shall be made of carbon steel and polished with protection paint.

SKM fans use self-aligned ball or pillow block bearings that are greased for life. Pillow block bearings are provided with re-greasing fittings. Fans are selected for best sound characteristics based on maximum fan efficiency. Different fan positions are available depending on the requirement. Refer to dimensional data for details.

Motors

Fan motors are totally enclosed fan cooled (TEFC), foot mounted, 4 poles, IP-55 protected and Class-F insulated. The motor is mounted on adjustable base, so that belt tension can be easily adjusted. The complete fan motor drive assembly is mounted on floating sub base.

In order to limit transmission of noise and vibration the complete fan motor sub-base assembly is mounted on anti-vibration mounts. Rating & operating characteristics of motors are in accordance with IEC 60034-1 & IEC60085.

Motors can be provided on either right or left hand side facing the unit from return air side (see figure 6). Section is sized to accommodate different motor sizes depending on the actual requirement of air flow and static pressure.

All fans are belt-driven by motors, with a set of fixed pitch; variable pitch pulleys and matching belts. SKM provides Variable pitch pulley with single/double groove systems.

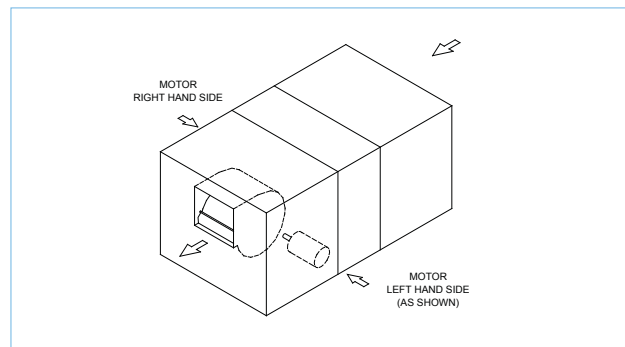


Figure 6: Motor Handing

Options

- Spark proof fans. **[SPF]**
- Explosion proof motor. **[EXM]**. Suitable for zone I or zone 2; Eexd II BT4. (zone to be specified, by the customer)
- Variable speed drive (Frequency Inverter). **[VSD]**
- Standby motor (additional) with manual change over. **[MMC]**
- Starter Panel Control. **[SPC]**. Comprising of contactor/overload and fuse for fan motor. Control to be specified by customer, [Thermostat, start stop push button, volt free contact from BMS.etc]
- Stainless steel fan shaft. **[SSS]**
- Extended lubrication fittings. **[LFE]**
- Polyglycoat coating on fans. **[PGF]**
- Spring vibration isolators for fan sub-frame. **[FAVM]**
- Plug fans. **[FRPF]**
- Fan Belt Guard. **[FBG]**

Coil Section

Variety of coils including chilled water **[CCW]**, direct expansion **[CDX]**, hot water **[CHW]** and steam **[CST]** are available to meet a wide range of application requirements.

Coil performance are certified in accordance with AHRI Standard 410.



Figure 7: Coil with Eliminator

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Coils are tested by air pressure while coils are submerged in water to a pressure of 300 psig (2060 kPa).

Coils are constructed from seamless copper tubes (3/8" or 5/8" O.D) and are mechanically expanded into continuous corrugated aluminum fins to provide continuous compression bond over the entire finned length for maximum heat transfer rates. Coils can be manufactured from 4; 6; 8; 10 & 12 rows for both chilled water and direct expansion coils, and up to 4 rows for heating coils. The standard number of fins per inch is 12 FPI; however 8 and 10 FPI coils are available as an option upon the customer request or to achieve the determined conditions.

Coils are assembled in slide-in guides for easy removal for maintenance or replacement. Copper tubes of 3/8" (9.5 mm) OD is standard for sizes up to 7000 cfm and 5/8" (15.9mm) OD for sizes more than 7000 cfm.

Headers are made out of seamless copper pipe. The headers joints are extruded to provide large bearing surface for maximum strength. Air vents and drain plugs are standard for water coils.

Coils can be provided with moisture eliminator depending on the air conditions. Eliminator blades are made of PVC, with shape specially designed to trap water droplets blown off the coil. Please specify [CCWE] & [CDXE] for chilled water and DX coils with eliminator, respectively.

Drain Pan

Cooling coil section is provided with insulated drain pan with MPT drain connection, in order to hold and remove the condensate formed during dehumidification. Drain pan is made of painted zinc coated steel sheet insulated from outside by fiberglass insulation for maximum protection against sweating and corrosion. The pan shall be sloped toward the drain connection. Drain pan is extended to include coil; headers and U-bends. Drain connection can be provided on either side or on both sides as required. The pan shall be sloped toward the drain connection to meet ASHRAE standard 62.

Coil Circuiting and Handling

Water coils can be provided with various coils circuiting like half, full or double depending on the water flow rate and water pressure drop through the coil. Direct expansion coils are equipped with a properly sized 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. Coil connections can be provided on either right or left hand side facing the unit from return air side (see figure 8). Inlet and outlet connections are sealed against unit panel by means of specially designed rubber flanges. SKM provides sweat connections for coils as standard.

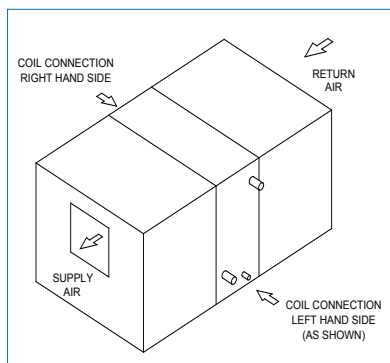


Figure 8: Coil Handling

Options

- Protective coating on coils.

Aeris Guard Coil Coat [EFAA]:

Aeris Guard Coil Coat is a self etching high performance epoxy water based finish. For single dip coating there was no evidence of corrosion after exposure to 5% Neutral Salt Spray under AS 2331.32-1980 (ASTM B-117) conditions over periods in excess of 3000 hours.

Pre-Coated Fins [EFAP]

The pre-coating is hydrophobic polyurethane. Pre coated fins passed a 1000 hr, 5% salt spray test at 95 F (35 C) temperature and 95 % RH; according to ASTM-B117.

- Electro-tinned coils. [EFCT]
- Copper fins. [EFC]
- Stainless steel drain pan. [SDP]
- MPT, FPT or flanged coil connectors. [PTA]
- Optional 5/8" OD Coils for models below 7000 cfm. [OTD]

Filter Section

A wide variety of filtration systems are available to meet the different applications, which includes flat filters, V-filters, bag filters, HEPA filters, carbon filters and other types.

Filters using in SKM Air handling units are in accordance with ASHRAE 52.2 and EN779 standards.

Panel filters [FIP1] : In SKM Air handling units, the following types of flat filters can be provided.

- 2" (50 mm) panel filters with aluminum washable media [FIP2] used as standard in SKM Air Handling units. EN class: G2.
- 2" (50 mm) fiberglass/synthetic either disposable or washable media [FIS2] available as an option. EN Class: G3.

Vee filters [FIPV] : Filters arranged in a vee bank to increase the filtration area. Media options are the same as in Panel filters.

Bag Filter : 22" (559 mm) [FIBG1], deep high efficiency bag filters with synthetic media used as standard in SKM Air Handling units. Bag filters with 30" (762 mm) [FIBG2] or 36" (914 mm) [FIBG3] depth are available as an option. Combination of bag & flat filters are available under code [FIPBG1], [FIPBG2] & [FIPBG3] corresponding to [FIBG1], [FIBG2] & [FIBG3] respectively. EN Class: F7. Higher EN classes F8 & F9, available on request.

Consult SKM for short depth, 4" (100 mm) thick extended surface mini pleat filters [FIPF4] equivalent efficiency to bag filter for cases where there are restrictions in dimension.



Figure 9: Bag Filter Section

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HEPA Filter [FIHP] : Ultra high Absolute HEPA (High Efficiency Particulate Air) filter with efficiency in excess of 99% when measured by using DOP (Di-Octyle Phthalate) method. HEPA filters in SKM Air handling units are in accordance with EN1882 standards.

Options

- Carbon Filter [FICF]
- Auto roll filter [FIRL]
- Sand inertia filter [FISI]
- Differential Air Pressure Switch. [DPS]
- Manometers [MAF] to monitor air pressure drop across filters.

SKM can provide any of the following types of manometers:

- Inclined tube manometers.
- Dial type manometers
- Magnehelic type Manometers

Electric Heater Section [CEHF]

Electric heater batteries are available in a wide range of capacity (kW) and steps as an integral part of MAH units. It consists of finned type heating elements constructed from 80/20 nickel chrome resistance wire, which is connected to terminal pins and centered in stainless steel grade 304L sheath metal tubes by compressed magnesium oxide. The fins are helical; mild steel galvanized and tightly wound around tubular heating elements. The terminal pins shall be insulated from metal tube by ceramic bushes. Electric heater elements are in accordance with IEC standards.

Standard components included with the heater shall be:

- 3 pole magnetic contactor per stage.
- Primary over temperature protection provided by auto reset high limit safety cut outs.
- Secondary over temperature protection provided by manual reset high limit safety cut-out for positive break.
- Control fuse.
- Control switch.
- Power fuses per NEC if total load exceeds 48 amps.
- Factory installed air flow switch.

Recommended kW capacity on standard (nominal air flow) rate is given in the table. Batteries other than this can be supplied upon request.

Electric heater capacity in kW can be calculated in Imperial system as:

$$\text{Capacity (kW)} = 1.085 \times \text{Air flow Rate (cfm)} \times \text{Air Temperature Rise (°F)/3412}$$

Or in SI system as:

$$\text{Capacity (kW)} = 1.21 \times \text{Air flow Rate (l/s)} \times \text{Air Temperature Rise (°C)/1000.}$$

SKM MODEL	cfm at 500 fpm	Option 1	Stage	Option 2	Stage
MAH0202	1000	6	1	9	2
MAH0203	1750	9	1	15	2
MAH0204	2500	12	1	24	2
MAH0303	2917	15	2	24	2
MAH0304	4167	18	2	36	2
MAH0305	5417	24	2	48	2
MAH0306	6667	30	2	60	2
MAH0405	7583	36	2	72	2
MAH0406	9333	48	2	84	4
MAH0407	11083	60	2	84	4
MAH0506	12000	72	2	108	3
MAH0507	14250	72	2	108	3
MAH0508	16500	90	2	144	4
MAH0509	18750	90	2	144	4
MAH0608	20167	90	2	180	5
MAH0609	22917	120	4	180	5
MAH0709	27083	144	4	225	5
MAH0710	30333	180	5	270	5
MAH0711	33583	180	5	270	5
MAH0811	38750	180	5	270	5
MAH0812	42500	216	6	324	6
MAH0813	46250	216	6	324	6

Table 2

Options

- Thyristor controller [SCR] that accepts 0-10V DC input signals from temperature controllers to achieve accurate proportional control over heating.

Humidifier Section

SKM provides both steam and water humidifiers depending upon requirement.

Steam humidifiers:

Following types of Steam humidifier can be supplied:

- **Internal Steam Humidifier [HSIG]:** This system consists of immersed electrode steam generating cylinders; steam distribution pipe and necessary controls. Steam generating cylinders are mounted on to the AHU within a special enclosure. The steam distributor passes through the unit casing to inject steam in the air stream to reach the required humidity conditions. ON-OFF control for humidifier is provided as standard.
- **External Steam Humidifier [HSEG]:** This system consists of steam generating cylinders and steam distribution pipe. Steam generator is supplied separately and is complete with necessary controls. In this case the Humidifier is remote to the unit. ON-OFF control for humidifier is provided as standard.
- With only steam distributor pipe and hoses which will be connected to the steam main by the installer. Supply of steam and all the controls by others.

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Options:

- Condensate drain pan for humidifier section
- Proportional control based on 0-10 V DC/4-20 mA.

Water humidifiers

SKM air handling units can be equipped with Water Humidifier section which mainly serves for adiabatic cooling, humidifying and air washing. Water Humidifier consist of spray nozzle system, heat exchanger media, tank for collecting spray water and eliminator section for removing entrained drops of water from the air. Pump recirculates water at a rate higher than the evaporation rate. Water tank is equipped with drain connection, overflow outlet, water feed with float valve and suction connection with screen.

Two types of Water humidifier arrangement can be supplied as follows:

- **Evaporative Type [HFF]:** This type consists of evaporative flooded fill media. Water is supplied to the top of the evaporative media via a distribution header. The water flows down the surface of the media and the warm and dry air passes through the media it evaporates a proportion of the water and thus produces cold, humidified air. The rest of the water assists in washing the media, and is drained back to the tank.
- **Spray Pad Type (Air Washer) [HFS]:** This type, water is sprayed over the pad area through spray nozzle system. Air is humidified and cooled as it passes through the wetted pad media.

Dampers

SKM air handling units are equipped with multi blade, low leakage, and heavy duty dampers to control the airflow rate by introducing resistance to airflow in the system. Dampers are available with parallel blades and opposed blades. Links are provided for either manual or motorized operation. The following dampers are available:

- Full face air intake damper [DFC]
- Face & bypass damper [DFBP]
- Fresh, exhaust and return air damper for mixing box and economizer control
- Hot deck and cold deck dampers for multi-zone application.

The damper frame is constructed from galvanized steel, blades from galvanized steel, shafts from steel, bearing from bronze and linkage and brackets from galvanized steel.

Options

- Aluminium damper blades in airfoil profile. [ADB]
- Stainless steel damper blades. [SDB]
- Motorized Damper Actuators [ON-OFF] or modulating.

Sound Attenuator Section

Sound attenuator can be provided in both supply and return air side. The standard design is with vertical specially designed splitters consisting of sound absorbing material parallel to the air stream matching unit cross section. Two different media depths of 24" (600 mm) [SAT1] and 48" (1200 mm) [SAT2] are available as standard.

A variety of splitter material, thickness, length, spacing and casing are available in order to satisfy even the most strict sound attenuation requirements. For quick selection of standard series MAH attenuators, the following insertion losses (db) are listed in the table:

Hz	63	125	250	500	1000	2000	4000	8000
SAT 1	5	11	11	15	22	29	22	15
SAT 2	10	20	21	28	42	56	42	27

Table 3

Mixing Box Section

Mixing box [BMX] with fresh air and return air dampers are available to mix the outside fresh air with recirculated return air. Both the return and fresh air dampers are sized to handle 0-100% of the total supply air. Combination of mixing box and panel filter [BMXP] can be provided in one section, if required.



Figure 10: Mixing Box Section

Exhaust Box Section

Exhaust box [BEX] with exhaust air dampers are available. When used in combination with mixing box with motorized dampers, it provides excellent economizer control.

Return Box Section

Return air box [BRX] with return air dampers are available. Section length of Return Air box is same as mixing box. For sizes please refer page 19.

Multi-zone & Dual-duct Sections

SKM air handling units can be designed to incorporate blow through multi-zone section complete with cooling/heating (if required) coils and mechanically interlocked dampers. Vertical [MZN] and horizontal [MZNH] discharge arrangements are also available. A blow through dual duct [DDCT] can be provided to meet the required application.

Plenum Sections

Empty plenums can be supplied either for future use or for particular applications like access, end vertical assembly, end bottom plenum for bottom return air applications, etc. Standard sizes are listed in the dimensional data.

Plenums are available in three different sizes of [PEM1], [PEM2], and [PEM3] depth. Custom sizes to suite a particular requirement can be supplied as an option.

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Heat Recovery Section

In order to conserve the energy consumption by exchanging energy between the supplies and exhaust air streams, various types of heat recovery systems can be provided as an integral part of SKM air handling units. These depend upon special installation and other requirements like:

- **Run Around Coil System [RRC]** : This system comprises of two coils placed in the supply and exhaust air stream. The coils are to be connected in a closed loop via piping and circulating pump (supplied by others). Water or glycol is circulated as a heat transfer medium. This system offers efficiency up to 65% and recovers sensible heat only.
- **Fixed Plate Heat Recovery System [RHP]** : Fixed plate heat recovery system consists of fixed aluminum plates separating the exhaust and supply air streams. The exhaust air passes through the exchanger from end to end and the supply air stream individual passages formed by the plates within the exchanger. The plates separating the two air streams act as the heat transfer medium. This system offers efficiency up to 70% and recovers sensible heat only.

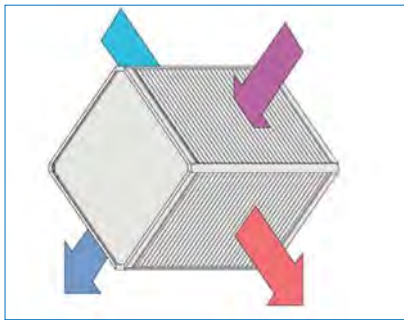


Figure 11: Fixed Plate Heat Exchanger

- **Rotary Heat Recovery System (Thermal Wheel) [RHR]**:

Heat Wheels are revolving cylinders consisting of an air permeable matrix with large interior surface. The matrix is cooled as cold air is passed through the wheel. This in turn cools the fresh air stream when the cooled rotating matrix comes in line with the supply air stream. When sprayed with a hygroscopic coating, the heat wheel will transfer moisture from the fresh air stream to the exhaust stream. Heat Wheel offers are capable of recovering both sensible and latent heats and offer efficiencies as high as 85%. Heat wheels are ideal for applications that demand high percentage of fresh air intake like in research labs, schools and pharmaceutical companies.

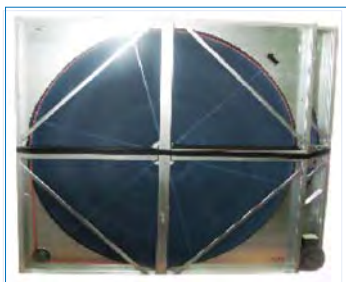


Figure 12: Energy Recovery Wheel

- **Heat Pipe System [RPR]** : Heat pipe is a simple heat transfer devices consisting of two coils, pre-cooling and re-heating, connected together without any moving part in between them and containing phase change fluid. It is automatically activated by the difference in temperature performing a double function. First, pre-cooling the return air allows the cooling coil to work cooler and condense more moisture. Second, re-heating the supply air brings about a more comfortable temperature and relative humidity. This entire function of humidity reduction is performed while saving energy.

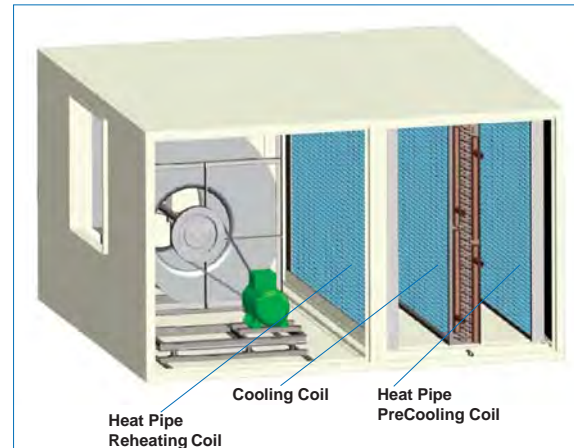


Figure 13: Heat Pipe

MAH Units for Outdoor Installation

For outdoor installations SKM provides various options to protect the unit from varying climates. These include:

- **Weather proof top cover [ATC]** to protect against rain. It is made with slight pitch down from the centerline to ends on both sides to avoid rain accumulation on the top cover of the unit.
- **Air Intake Louver [AIL]** to prevent foreign material to enter the unit in fresh air intake.
- **Sand trap louver [ASL]** to extract coarse sand prior to the entry in the unit.
- **Rain hood [ARH]** to prevent rain entering the fresh air intake.
- **Bird screen [ABS]** to prevent foreign material to enter the unit in fresh air intake.

Accessories and Options

In order to meet most application requirements, MAH units can be supplied with various accessories and options, such as:

- **Stainless steel construction. [SSC]**
- **Aluminum construction. [AAC]**
- **Bulk Head Light Fittings. [BLF]**
- **Stainless Steel Fasteners. [SSF]**
- **Hinged Access doors with latches. [QDL]**
- **Walkway [WAW]** can be provided in the desired section for ease of maintenance. Standard walkway section is 570mm length. Length other than this can be provide on request.
- **Knockdown unit [SKD]** can be provided for ease of transportation or for difficult access areas.
- **Ceiling Suspended Units [CSU]**
- **External Vibration Isolators [CAVM]** can be supplied loose for site installation.
- **UV Lamp (UVL).**
- **Inspection Window [IW]**

SKM Modular Air Handling Units MAH Series

Software

SKM Visual AHU Software is a powerful tool for the proper technical selection and economic evaluation of Air Handling Units. This software has a unique 3D visualization and can be fully customisable. The program performs technical verification and selection for each section until the whole unit is completed. In each section, options related to that particular section can be added. The output of Visual AHU Software is an economic offer including all the technical data, drawing, psychrometric diagram and fan performance curves.

The image displays several overlapping screenshots of the SKM Visual AHU software interface. The central focus is a 3D perspective view of a modular air handling unit, showing its internal components like filters and coils. Surrounding this are various technical data windows:

- Technical Specification Sheet:** A detailed table with columns for 'No.', 'Type', 'Pressure', 'Flow Rate', 'Static Pressure', 'Max. Airflow', 'Sound Power', 'Sound Pressure', 'Fan Power', 'Fan Efficiency', 'Fan Speed', and 'Fan Voltage'. It lists multiple unit configurations.
- Psychrometric Diagrams:** Two circular diagrams showing air conditioning processes on a humidity ratio vs. dry-bulb temperature scale.
- 3D Model:** A 3D rendering of the air handling unit with a green mesh filter and blue internal components.
- Energy Efficiency Class:** A section titled 'Air Handling Units Energy Efficiency Class' with a '3+' rating and a 'EUROVENT CERTIFIED PERFORMANCE' logo.
- Customization and Dimensions:** Tables for 'CUSTOMIZATION' (listing options like 'Panel Thickness', 'Panel Coefficient', 'Panel Material', 'Panel Frame', 'Panel Gasket') and 'CUSTOMIZATION AND DIMENSIONS' (listing 'Section No.', 'Length', 'Width', 'Height', 'Weight').
- Performance Curves:** A graph showing 'Flow Rate' vs. 'Static Pressure' for different fan speeds.



You name it....We cool it

SKM Modular Air Handling Units MAH Series

MAH With Eurovent Certification

Mechanical Characteristics

AHU Construction	60 mm Aluminium Profile	60 mm Aluminium Profile	70 mm Steel Pentapost
Panel Thickness (mm)	48	63	50
Insulation Material	Polyurethane	Polyurethane	Fiberglass
Insulation Density (kg/m ³)	40	40	32
Thermal conductivity (W/m K)	0.02	0.02	0.033

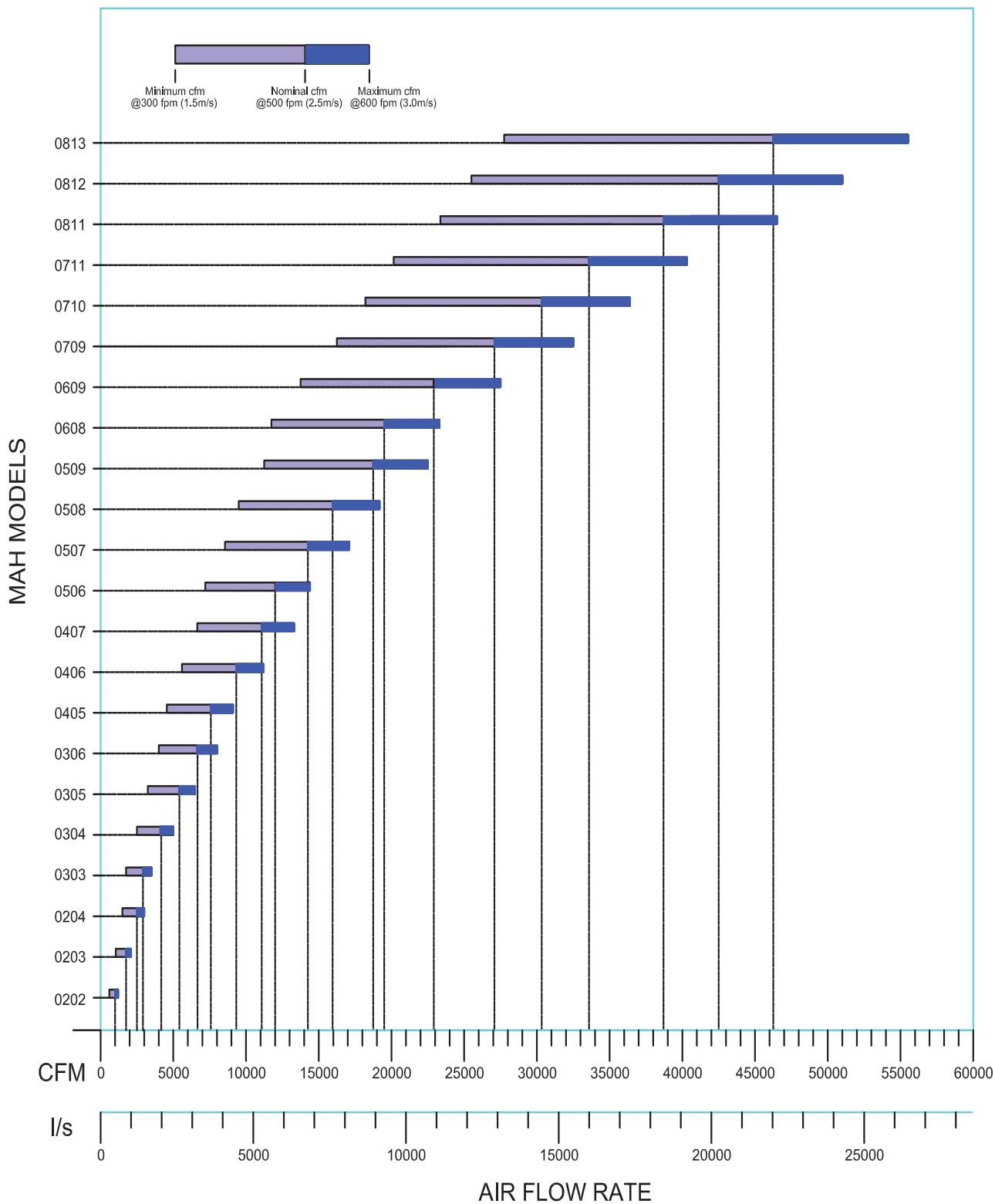
Casing Strength	D1	D1	D1
Casing Air Leakage Class at -400 Pa	L2	L2	L2
Casing Air Leakage Class at +700Pa	L2	L2	L2
Thermal Transmittance Class	T2	T3	T4
Thermal Bridge Factor Class	TB2	TB2	TB2
Filter Bypass Class	F9	F9	F9

Casing Acoustical Insulation (db)			
125 Hz	12.1	13.0	17.4
250 Hz	11.3	13.4	23.8
500 Hz	14.8	16.4	29.6
1000 Hz	14.4	17.4	28.1
2000 Hz	14.9	23.7	27.1
4000 Hz	33.5	35.4	36.8
8000 Hz	38.4	40.1	37.5

Table 4

SKM Modular Air Handling Units MAH Series

Quick Selection



SKM Modular Air Handling Units MAH Series

Nominal Capacity Rating - Cooling Coils

Fin Spacing :12 fpi (2.1 mm)				Chilled Water Coils @ 80/67°F (26.7/19.4°C) On-Coil DBT/WBT & 45/55°F (7.2/12.8°C) EWT/LWT								DX Coils @ 80/67°F (26.7/19.4°C) On-Coil DBT/WBT & 45°F (7.2°C) SST					
Model MAH	Coil area		Rows	Airflow Rate		Total Capacity		Sensible Capacity		Waterflow Rate		Water Pressure Drop		Total Capacity		Sensible Capacity	
	ft²	m²		cfm	l/s	MBh	kW	MBh	kW	gpm	l/s	ft.wg	kPa	MBh	kW	MBh	kW
0202	2.0	0.2	4.0	1000.0	472.0	26.6	7.8	21.0	6.1	5.3	0.3	5.1	15.2	31.1	9.1	22.7	6.6
			6.0			36.9	10.8	26.1	7.6	7.4	0.5	7.6	22.8	38.0	11.1	26.5	7.8
			8.0			44.4	13.0	29.5	8.7	8.9	0.6	10.2	30.6	41.2	12.1	28.2	8.3
0203	3.5	0.3	4.0	1750.0	826.0	52.6	15.4	39.0	11.4	10.5	0.7	13.7	41.0	54.5	16.0	39.6	11.6
			6.0			62.7	18.4	44.9	13.2	12.5	0.8	6.1	18.3	66.5	19.5	46.4	13.6
			8.0			76.3	22.4	51.1	15.0	15.3	1.0	8.0	24.0	72.1	21.1	49.4	14.5
0204	5.0	0.5	4.0	2500.0	1180.0	70.0	20.5	53.7	15.7	14.0	0.9	7.1	21.1	77.8	22.8	56.6	16.6
			6.0			95.7	28.1	66.5	19.5	19.1	1.2	11.6	34.7	95.0	27.8	66.2	19.4
			8.0			114.0	33.4	75.1	22.0	22.8	1.4	15.8	47.1	103.0	30.2	70.5	20.7
0303	5.8	0.5	4.0	2917.0	1377.0	87.7	25.7	64.9	19.0	17.5	1.1	13.7	41.0	90.8	26.6	66.1	19.4
			6.0			104.5	30.6	74.8	21.9	20.9	1.3	6.1	18.3	110.8	32.5	77.3	22.7
			8.0			127.2	37.3	85.2	25.0	25.4	1.6	8.0	24.0	120.1	35.2	82.3	24.1
0304	8.3	0.8	4.0	4167.0	1967.0	116.6	34.2	89.5	26.2	23.3	1.5	7.1	21.1	129.7	38.0	94.4	27.7
			6.0			159.5	46.8	110.9	32.5	31.9	2.0	11.6	34.7	158.3	46.4	110.4	32.4
			8.0			190.1	55.7	125.1	36.7	38.0	2.4	15.8	47.2	171.6	50.3	117.6	34.5
0305	10.8	1.0	4.0	5417.0	2557.0	160.5	47.0	119.7	35.1	32.1	2.0	11.7	35.1	168.6	49.4	122.7	36.0
			6.0			203.1	59.5	142.4	41.8	40.6	2.6	8.8	26.5	205.8	60.3	143.5	42.1
			8.0			233.2	68.3	156.9	46.0	46.6	2.9	7.1	21.1	223.1	65.4	152.8	44.8
0306	13.3	1.2	4.0	6667.0	3146.0	204.9	60.1	150.1	44.0	41.0	2.6	18.0	53.9	207.5	60.8	151.0	44.3
			6.0			257.9	75.6	178.5	52.3	51.6	3.3	13.2	39.5	253.3	74.2	176.6	51.8
			8.0			296.1	86.8	196.9	57.7	59.2	3.7	10.2	30.6	274.5	80.5	188.1	55.1
0405	15.2	1.4	4.0	7583.0	3579.0	241.2	70.7	179.9	52.7	48.2	3.0	8.7	26.0	262.4	76.9	187.9	55.1
			6.0			282.5	82.8	201.7	59.1	56.5	3.6	3.4	10.0	340.8	99.9	225.2	66.0
			8.0			333.2	97.7	223.8	65.6	66.6	4.2	4.9	14.5	380.3	111.5	243.6	71.4
0406	18.7	1.7	4.0	9333.0	4405.0	306.2	89.7	224.9	65.9	61.2	3.9	15.1	45.3	323.0	94.7	231.2	67.8
			6.0			361.1	105.8	253.5	74.3	72.2	4.6	5.0	15.0	419.4	122.9	277.2	81.2
			8.0			419.5	122.9	279.3	81.9	83.9	5.3	7.4	22.0	468.1	137.2	299.8	87.9
0407	22.2	2.1	4.0	11083.0	5231.0	332.5	97.5	255.4	74.9	66.5	4.2	3.9	11.7	383.5	112.4	274.6	80.5
			6.0			437.9	128.4	304.7	89.3	87.6	5.5	7.3	21.8	498.1	146.0	329.2	96.5
			8.0			506.3	148.4	335.0	98.2	101.3	6.4	11.1	33.2	555.8	162.9	356.0	104.4
0506	24.0	2.2	4.0	12000.0	5663.0	346.3	101.5	271.4	79.5	69.3	4.4	2.8	8.2	415.3	121.7	297.3	87.1
			6.0			464.3	136.1	326.0	95.5	92.9	5.9	5.0	15.0	539.3	158.1	356.4	104.5
			8.0			539.3	158.1	359.1	105.3	107.9	6.8	7.4	22.0	601.8	176.4	385.5	113.0
0507	28.5	2.6	4.0	14250.0	6725.0	427.6	125.3	328.4	96.2	85.5	5.4	3.9	11.7	493.1	144.5	353.1	103.5
			6.0			563.1	165.0	391.8	114.8	112.6	7.1	7.3	21.8	640.4	187.7	423.2	124.0
			8.0			651.0	190.8	430.8	126.3	130.2	8.2	11.1	33.2	714.7	209.5	457.8	134.2
0508	31.9	3.0	4.0	15938.0	7522.0	489.7	143.5	371.6	108.9	97.9	6.2	5.0	14.9	551.5	161.7	394.9	115.7
			6.0			638.8	187.2	441.8	129.5	127.8	8.1	9.6	28.7	716.3	209.9	473.4	138.7
			8.0			734.8	215.4	484.6	142.0	147.0	9.3	14.9	44.5	799.3	234.3	512.0	150.1
0509	37.5	3.5	4.0	18750.0	8849.0	592.1	173.6	443.2	129.9	118.4	7.5	7.3	21.8	648.8	190.2	464.5	136.2
			6.0			765.4	224.3	525.3	154.0	153.1	9.7	14.8	44.3	842.6	247.0	556.9	163.2
			8.0			819.3	240.1	551.5	161.6	163.9	10.3	4.1	12.3	940.3	275.6	602.3	176.5
0608	39.0	3.6	4.0	19480.0	9194.0	598.5	175.4	454.2	133.1	119.7	7.6	5.0	14.9	674.1	197.6	482.6	141.5
			6.0			780.8	228.9	540.0	158.3	156.2	9.9	9.6	28.7	875.4	256.6	578.5	169.6
			8.0			898.1	263.2	592.3	173.6	179.6	11.3	14.9	44.5	976.9	286.3	625.8	183.4
0609	45.8	4.3	4.0	22917.0	10816.0	723.7	212.1	541.7	158.8	144.7	9.1	7.3	21.8	793.0	232.4	567.8	166.4
			6.0			935.4	274.2	642.0	188.2	187.1	11.8	14.8	44.3	1029.9	301.9	680.6	199.5
			8.0			1001.4	293.5	674.0	197.6	200.3	12.6	4.1	12.3	1149.3	336.9	736.2	215.8
0709	54.2	5.0	4.0	27083.0	12782.0	855.3	250.7	640.2	187.6	171.1	10.8	7.3	21.8	937.2	274.7	671.0	196.7
			6.0			1105.5	324.0	758.8	222.4	221.1	13.9	14.8	44.3	1217.2	356.7	804.4	235.8
			8.0			1183.5	346.9	796.6	233.5	236.7	14.9	4.1	12.3	1358.3	398.1	870.0	255.0
0710	60.7	5.6	4.0	30333.0	14316.0	974.8	285.7	723.3	212.0	195.0	12.3	9.8	29.3	1049.7	307.7	751.5	220.3
			6.0			1195.8	350.5	832.9	244.1	239.2	15.1	6.7	20.1	1363.2	399.6	900.9	264.1
			8.0			1346.8	394.7	900.9	264.1	269.4	17.0	5.2	15.5	1521.3	445.9	974.4	285.6
0711	67.2	6.2	4.0	33583.0	15849.0	1096.0	321.2	807.1	236.6	219.2	13.8	13.0	38.7	1162.1	340.6	832.1	243.9
			6.0			1342.3	393.4	929.4	272.4	268.5	16.9	8.7	25.9	1509.3	442.4	997.4	292.3
			8.0			1504.9	441.1	1003.2	294.0	301.0	19.0	6.4	19.1	1684.3	493.7	1078.8	316.2
0811	77.5	7.2	4.0	38750.0	18288.0	1264.7	370.7	931.3	273.0	252.9	16.0	13.0	38.7	1340.9	393.0	960.1	281.4
			6.0			1548.8	453.9	1072.4	314.3	309.8	19.5	8.7	25.9	1741.5	510.4	1150.9	337.3
			8.0			1736.4	508.9	1157.5	339.3	347.3	21.9	6.4	19.1	1943.4	569.6	1244.8	364.9
0812	85.0	7.9	4.0	42500.0	20058.0	1408.5	412.8	1029.5	301.8	281.7	17.8	16.8	50.1	1470.7	431.1	1053.0	308.6
			6.0			1715.4	502.8	1182.9	346.7	343.1	21.6	11.0	32.9	1910.0	559.8	1262.3	370.0
			8.0			1921.6	563.2	1276.6	374.2	384.3	24.2	7.9	23.6	2131.5	624.7	1365.3	400.2
0813	92.5	8.6	4.0	46250.0	21828.0	1378.8	456.0	1062.4	311.4	275.8	17.4	3.5	10.4	1600.5	469.1	1145.9	335.9
			6.0			1884.9	552.5	1294.5	379.4	377.0	23.8	13.8	41.3	2078.5	609.2	1373.6	402.6
			8.0			2108.3	618.0	1396.3	409.3	421.7	26.6	9.7	29.1	2319.5	679.9	1485.8	435.5

Table 5

For Capacities at different air conditions please refer to SKM Computer Selection Software

SKM Modular Air Handling Units MAH Series

Nominal Capacity Rating - Heating Coils

Fin Spacing :12 fpi (2.1 mm)						Hot Water Coils @ 70 °F On-Coil EDBT & 180/160°F EWT/LWT					
Model MAH	Coil area		Rows	Airflow Rate		Total Capacity		Waterflow Rate		Water Pressure Drop	
	ft ²	m ²		cfm	l/s	MBh	kW	gpm	l/s	ft.wg	kPa
0202	2.00	0.19	1	1000	472	30.1	8.8	3.0	0.2	1.5	4.4
			2			56.2	16.5	5.6	0.4	2.7	7.9
0203	3.50	0.33	1	1750	826	57.8	17.0	5.8	0.4	3.0	8.8
			2			102.3	30.0	10.2	0.6	9.8	29.4
0204	5.00	0.46	1	2500	1180	85.0	24.9	8.5	0.5	6.3	18.7
			2			142.1	41.7	14.2	0.9	4.0	11.9
0303	5.83	0.54	1	2917	1377	96.4	28.3	9.6	0.6	3.0	8.8
			2			170.5	50.0	17.1	1.1	9.8	29.4
0304	8.33	0.77	1	4167	1967	141.6	41.5	14.2	0.9	6.3	18.7
			2			236.9	69.4	23.7	1.5	4.0	11.9
0305	10.83	1.01	1	5417	2557	189.9	55.7	19.0	1.2	12.7	38.0
			2			314.5	92.2	31.4	2.0	7.7	23.1
0306	13.33	1.24	1	6667	3146	241.1	70.7	24.1	1.5	23.7	70.7
			2			395.1	115.8	39.5	2.5	13.9	41.6
0405	15.17	1.41	1	7583	3579	245.3	71.9	24.5	1.5	3.4	10.1
			2			414.3	121.4	41.4	2.6	2.0	6.1
0406	18.67	1.73	1	9333	4405	305.8	89.6	30.6	1.9	4.6	13.7
			2			521.5	152.9	52.2	3.3	2.9	8.6
0407	22.17	2.06	1	11083	5231	368.0	107.9	36.8	2.3	6.3	18.9
			2			625.0	183.2	62.5	3.9	4.0	12.0
0506	24.00	2.23	1	12000	5663	393.2	115.3	39.3	2.5	4.6	13.7
			2			670.6	196.5	67.1	4.2	2.9	8.6
0507	28.50	2.65	1	14250	6725	473.1	138.7	47.3	3.0	6.3	18.9
			2			803.6	235.5	80.4	5.1	4.0	12.0
0508	31.88	2.96	1	15938	7522	535.3	156.9	53.5	3.4	8.1	24.2
			2			905.0	265.2	90.5	5.7	5.1	15.2
0509	37.50	3.48	1	18750	8849	641.9	188.1	64.2	4.0	12.2	36.6
			2			1078.8	316.2	107.9	6.8	7.5	22.6
0608	38.96	3.62	1	19480	9194	654.2	191.8	65.4	4.1	8.1	24.2
			2			1106.1	324.2	110.6	7.0	5.1	15.2
0609	45.83	4.26	1	22917	10816	784.5	229.9	78.5	4.9	12.2	36.6
			2			1318.5	386.5	131.9	8.3	7.5	22.6
0709	54.17	5.03	1	27083	12782	927.2	271.8	92.7	5.8	12.2	36.6
			2			1558.2	456.7	155.8	9.8	7.5	22.6
0710	60.67	5.64	1	30333	14316	1054.1	309.0	105.4	6.7	16.8	50.3
			2			1764.1	517.1	176.4	11.1	10.2	30.6
0711	67.17	6.24	1	33583	15849	1184.7	347.2	118.5	7.5	22.8	68.3
			2			1973.5	578.4	197.4	12.5	13.7	40.9
0811	77.50	7.20	2	38750	18288	2277.1	667.4	227.7	14.4	13.7	40.9
0812	85.00	7.90	2	42500	20058	2523.4	739.6	252.3	15.9	18.0	53.9
0813	92.50	8.59	2	46250	21828	2774.5	813.2	277.4	17.5	23.4	69.9

For Capacities at different air conditions please refer to SKM Computer Selection Software

Table 6



You name it....We cool it

SKM Modular Air Handling Units MAH Series

Fan Performance

Model MAH	Fan Type	Air flow		Total Static Pressure																			
				0.5 (125)		1 (250)		1.5 (375)		2 (500)		2.5 (625)		3 (750)		3.5 (875)		4 (1000)		4.5 (1125)		5 (1250)	
		cfm	l/s	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW
0202	FAT	1000	472	749	0.11	1083	0.20	1358	0.31	1593	0.43	1798	0.56	1984	0.70	-	-	-	-	-	-	-	-
	FADH			-	-	1153	0.24	1423	0.37	1643	0.50	1833	0.64	-	-	-	-	-	-	-	-	-	-
0203	FAT	1750	826	685	0.23	935	0.36	1155	0.52	1349	0.69	1523	0.87	1682	1.07	1827	1.27	1963	1.48	-	-	-	-
	FADH			761	0.25	1028	0.40	1264	0.59	1472	0.80	1659	1.02	1827	1.25	1983	1.50	2127	1.75	2261	2.02	2388	2.29
0204	FAT	2500	1180	783	0.49	972	0.65	1152	0.84	1322	1.03	1482	1.25	1632	1.47	1773	1.71	1907	1.96	-	-	-	-
	FADH			875	0.51	1079	0.70	1271	0.91	1454	1.15	1625	1.40	1786	1.67	1938	1.96	2081	2.26	2216	2.57	2344	2.89
0303	FAT	2917	1377	610	0.45	799	0.66	980	0.90	1145	1.17	1296	1.47	1434	1.78	-	-	-	-	-	-	-	-
	FADH			582	0.42	789	0.69	974	0.99	1138	1.32	1284	1.68	1417	2.05	1539	2.43	1652	2.82	1757	3.23	1857	3.65
	FRDH			1555	0.52	1750	0.71	1925	0.91	2084	1.12	2230	1.33	2366	1.54	2495	1.76	2619	1.99	2738	2.22	2853	2.46
0304	FAT	4167	1966	524	0.64	676	0.91	819	1.24	953	1.61	1076	2.01	1189	2.44	-	-	-	-	-	-	-	-
	FADH			671	0.88	825	1.18	974	1.53	1116	1.91	1250	2.32	1376	2.76	1495	3.22	1608	3.69	1714	4.18	1814	4.69
	FRDH			2071	1.14	2216	1.38	2356	1.64	2490	1.91	2616	2.19	2736	2.47	2850	2.76	2959	3.05	3064	3.34	3165	3.64
0305	FAT	5417	2556	595	1.17	718	1.50	835	1.85	948	2.25	1058	2.69	1162	3.15	-	-	-	-	-	-	-	-
	FADH			485	0.87	629	1.29	766	1.77	893	2.32	1011	2.92	1121	3.55	1222	4.22	1317	4.91	1406	5.63	1491	6.38
	FRDH			1385	1.09	1517	1.41	1638	1.75	1751	2.10	1856	2.46	1957	2.84	2053	3.23	2144	3.62	2233	4.02	2318	4.44
	FRDA			1471	1.08	1607	1.41	1730	1.74	1844	2.09	1951	2.44	2052	2.80	2148	3.17	2240	3.54	2329	3.93	2415	4.32
0306	FAT	6667	3146	461	1.16	581	1.61	692	2.11	794	2.64	889	3.20	978	3.80	1062	4.42	-	-	-	-	-	-
	FADH			536	1.39	654	1.84	770	2.36	883	2.94	991	3.57	1094	4.25	1191	4.97	1284	5.72	1372	6.50	1455	7.31
	FRDH			1646	1.78	1758	2.16	1864	2.55	1964	2.96	2059	3.39	2149	3.82	2236	4.26	2320	4.71	2401	5.18	2480	5.64
	FRDA			1749	1.76	1866	2.15	1975	2.55	2077	2.96	2173	3.37	2264	3.79	2352	4.22	2437	4.66	2518	5.10	2597	5.55
0405	FAT	7583	3578	492	1.56	601	2.06	702	2.59	798	3.17	888	3.77	973	4.40	1054	5.06	-	-	-	-	-	-
	FADH			476	1.45	588	1.97	698	2.60	807	3.34	911	4.17	1009	5.09	1102	6.06	1190	7.10	1273	8.18	1351	9.30
	FRDH			1336	1.78	1440	2.23	1536	2.68	1627	3.15	1714	3.63	1798	4.13	1879	4.64	1957	5.16	2033	5.69	2107	6.24
	FRDA			1421	1.72	1533	2.17	1637	2.63	1733	3.10	1823	3.58	1909	4.07	1991	4.57	2069	5.07	2145	5.59	2218	6.12
0406	FADH	9333	4404	443	1.74	547	2.37	646	3.10	741	3.92	830	4.82	913	5.79	991	6.81	1064	7.88	1133	9.00	1199	10.16
	FRDH			1186	2.11	1280	2.66	1367	3.21	1449	3.78	1527	4.36	1602	4.95	1675	5.56	1746	6.19	1816	6.83	1883	7.49
	FRDA			1273	2.11	1375	2.67	1468	3.23	1555	3.82	1636	4.41	1714	5.01	1788	5.63	1859	6.26	1927	6.90	1993	7.55
0407	FADH	11083	5230	381	1.84	478	2.59	570	3.48	658	4.50	739	5.62	816	6.85	887	8.16	954	9.54	1017	11.00	1076	12.51
	FRDH			997	2.19	1087	2.83	1170	3.48	1247	4.15	1320	4.85	1390	5.57	1457	6.31	1522	7.07	1585	7.85	1646	8.65
	FRDA			1059	2.15	1151	2.75	1236	3.38	1316	4.03	1392	4.71	1465	5.40	1534	6.12	1601	6.86	1666	7.61	1729	8.39

Table 7

Performance shown at nominal airflow rates. For other airflow rates refer to SKMcomputer selection.

kW ratings are fan absorbed power. To get motor power, multiply this kW by 1.20 for kW <10, and by 1.15 for kW > 10.

SKM Modular Air Handling Units MAH Series

Fan Performance

Model MAH	Fan Type	Air flow		Total Static Pressure																	
				0.5 (125)		1 (250)		1.5 (375)		2 (500)		2.5 (625)		3 (750)		3.5 (875)		4 (1000)		5 (1250)	
		cfm	l/s	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW	rpm	kW
0506	FADH	12000	5663	397	2.20	487	2.98	574	3.89	657	4.92	736	6.06	811	7.30	881	8.63	947	10.03	1069	13.06
	FRDH			1064	2.63	1149	3.32	1228	4.02	1301	4.74	1371	5.48	1438	6.23	1503	7.01	1565	7.81	1684	9.46
	FRDA			1131	2.59	1218	3.24	1299	3.91	1375	4.60	1447	5.31	1517	6.04	1583	6.80	1648	7.57	1771	9.17
0507	FADH	14250	6725	323	2.34	410	3.33	495	4.49	573	5.81	646	7.23	714	8.75	777	10.36	837	12.03	945	15.59
	FRDH			886	2.76	962	3.54	1032	4.35	1099	5.18	1164	6.05	1226	6.96	1287	7.90	1346	8.87	1460	10.92
	FRDA			954	2.78	1035	3.55	1110	4.35	1180	5.18	1247	6.04	1311	6.92	1372	7.84	1431	8.78	1544	10.72
0508	FADH	16500	7786	348	3.28	424	4.33	499	5.55	571	6.92	640	8.41	705	10.01	766	11.70	824	13.47	932	17.22
	FRDH			1003	3.93	1070	4.83	1134	5.74	1194	6.67	1252	7.63	1309	8.62	1364	9.64	1417	10.69	1521	12.88
	FRDA			1080	3.97	1152	4.84	1220	5.74	1284	6.67	1345	7.62	1404	8.60	1461	9.61	1516	10.64	1621	12.76
0509	FADH	18750	8848	376	4.49	443	5.61	509	6.89	575	8.31	639	9.86	700	11.53	759	13.29	815	15.14	920	19.06
	FRDH			1121	5.43	1182	6.45	1240	7.47	1295	8.51	1348	9.57	1400	10.65	1450	11.75	1500	12.88	1595	15.23
	FRDA			1208	5.49	1273	6.47	1334	7.48	1393	8.51	1450	9.56	1504	10.63	1557	11.73	1608	12.85	1707	15.15
0608	FADH	20167	9517	314	3.89	386	5.22	452	6.71	516	8.38	575	10.20	631	12.15	684	14.21	734	16.38	-	-
	FRDH			869	4.60	930	5.69	987	6.80	1041	7.93	1093	9.09	1143	10.29	1192	11.53	1240	12.80	1331	15.44
	FRDA			928	4.48	994	5.55	1056	6.65	1114	7.79	1170	8.96	1223	10.16	1274	11.40	1324	12.67	1419	15.29
0609	FADH	22917	10815	338	5.28	402	6.73	463	8.32	521	10.06	577	11.95	630	13.97	681	16.12	729	18.37	-	-
	FRDH			971	6.38	1026	7.61	1078	8.85	1128	10.11	1175	11.40	1222	12.71	1266	14.06	1310	15.43	1395	18.27
	FRDA			1037	6.21	1096	7.41	1153	8.64	1206	9.90	1258	11.19	1307	12.51	1355	13.86	1401	15.24	1490	18.08
0709	FADH	27083	12780	279	5.63	341	7.39	398	9.31	452	11.38	502	13.59	549	15.93	594	18.39	636	20.97	716	26.45
	FRDH			809	6.72	860	8.20	909	9.69	956	11.22	1002	12.78	1045	14.37	1088	16.01	1130	17.68	1211	21.13
	FRDA			825	6.25	882	7.72	934	9.21	985	10.73	1033	12.29	1079	13.89	1124	15.52	1168	17.19	1251	20.64
0710	FADH	30333	14314	234	5.24	293	7.19	350	9.52	403	12.19	453	15.11	500	18.25	543	21.54	584	24.98	-	-
	FRDH			648	6.27	700	7.88	749	9.56	796	11.30	840	13.10	883	14.96	925	16.88	965	18.85	1042	22.93
	FRDA			662	5.84	717	7.49	768	9.19	817	10.93	863	12.73	907	14.59	950	16.49	991	18.44	1070	22.50
0711	FADH	33583	15848	246	6.68	300	8.71	353	11.10	403	13.83	451	16.84	496	20.07	539	23.50	579	27.08	-	-
	FRDH			706	8.10	754	9.86	799	11.69	843	13.57	885	15.51	925	17.51	964	19.56	1002	21.66	1075	26.00
	FRDA			721	7.51	772	9.33	820	11.18	865	13.08	908	15.02	950	17.01	990	19.05	1030	21.13	1105	25.44
0811	FADH	38750	18286	207	6.88	259	9.41	308	12.23	355	15.38	399	18.83	440	22.56	480	26.57	517	30.83	586	40.05
	FRDH			598	8.52	643	10.49	686	12.57	727	14.75	767	17.01	805	19.34	841	21.75	877	24.22	944	29.35
	FRDA			687	7.88	741	9.98	791	12.13	838	14.34	883	16.61	927	18.95	969	21.34	1009	23.80	1087	28.88
0812	FADH	42500	20056	218	8.44	267	11.15	313	14.11	358	17.37	400	20.93	441	24.76	479	28.86	516	33.20	585	42.60
	FRDH			648	10.66	690	12.79	731	15.02	770	17.36	808	19.77	844	22.27	879	24.83	913	27.46	979	32.89
	FRDA			744	9.80	795	12.09	843	14.43	888	16.81	931	19.26	973	21.76	1013	24.32	1052	26.93	1127	32.33
0813	FADH	46250	21825	229	10.34	274	13.25	318	16.35	359	19.73	400	23.37	438	27.28	476	31.45	512	35.86	579	45.37
	FRDH			698	13.31	737	15.60	775	17.99	812	20.48	847	23.04	882	25.69	915	28.40	948	31.17	1010	36.91
	FRDA			801	12.17	848	14.65	893	17.17	936	19.74	977	22.35	1016	25.02	1054	27.74	1092	30.51	1163	36.21

Table 8

Performance shown at nominal airflow rates. For other airflow rates refer to SKMcomputer selection.
kW ratings are fan absorbed power. To get motor power, multiply this kW by 1.20 for kW <10, and by 1.15 for kW > 10.

SKM Modular Air Handling Units MAH Series

Dimensional DATA

COMMON SIDE VIEW				HEPA FILTER	FAN SECTION ARRANGEMENTS						HUMIDIFIER SECTIONS		HEATING SECTIONS				
					FAN SECTION ARRANGEMENTS						HUMIDIFIER SECTIONS		HEATING SECTIONS				
					FAN PLAN VIEW		TOP DISCHARGE		HSEG		CEHF						
					FAN POSITION 1		FAN POSITION 4		HSG		CHW						
					FAN POSITION 2		FAN POSITION 5		HFF		CST						
				FAN POSITION 3		FAN POSITION 6		HPS									
MAH MODEL	W	H	h	L	L	FAT			FADH/FRD/HFTZAF			MOTOR LOCATION		L1	L2	L	L1
						N	J	K	N	J	K						
0202	29.53 750	29.53 750	394 100		41.93 1065	-	10.31 262	11.73 298	-	11.30 287	11.34 288	BACK					
0203	41.98 1065	29.53 750				-	11.38 289	13.03 331	-	12.68 322	12.68 322						
0204	54.13 1375	29.53 750				-	13.43 341	15.55 395	-	15.91 403	15.91 404						
0303	41.98 1065	41.93 1065				-	15.91 404	18.54 471	25.00 635	19.96 507	19.96 507						
0304	54.13 1375	41.93 1065	492 125	41.93 1065	46.46 1180	24.00 609	15.91 404	18.54 471	25.00 635	19.96 507	19.96 507	SIDE		41.98 1065	54.13 1375		
0305	66.53 1690	41.93 1065				30.30 769	-	-	29.59 751	25.00 635	22.48 571	22.40 569					
0306	79.13 2010	41.93 1065				25.00 635	18.82 478	21.93 557	25.00 635	22.48 571	22.40 569						
0405	66.53 1690	54.13 1375				54.13 1375	-	-	30.00 762	25.24 641	25.12 638						
0406	79.13 2010	54.13 1375	394 100	41.93 1065	66.55 1690	-	-	-	29.90 759	28.19 716	28.15 715	SIDE		41.98 1065	54.13 1375		
0407	91.34 2320	54.13 1375				-	-	-	33.11 841	25.24 641	25.12 638						
0506	79.13 2010	66.53 1690				-	-	-	29.90 759	28.19 716	28.15 715						
0507	91.34 2320	66.53 1690				-	-	-	29.90 759	31.54 801	31.54 801						
0508	100.79 2560	66.53 1690	492 125	41.93 1065	81.30 2065	-	-	-	34.68 879	35.35 898	35.35 898	SIDE		41.98 1065	54.13 1375		
0509	116.14 2950	66.53 1690				-	-	-	42.30 1074	35.35 898	35.35 898						
0608	100.79 2560	79.13 2010				-	-	-	32.72 831	35.35 898	35.35 898						
0609	116.14 2950	79.13 2010				-	-	-	40.49 1028	35.35 898	35.35 898						
0709	116.14 2950	90.55 2300	492 125	41.93 1065	90.55 2300	-	-	-	35.83 910	44.49 1130	44.49 1130	SIDE		41.98 1065	54.13 1375		
0710	128.15 3255	90.55 2300				-	-	-	41.88 1063	44.49 1130	44.49 1130						
0711	140.55 3570	90.55 2300				-	-	-	48.08 1220	44.49 1130	44.49 1130						
0811	140.55 3570	102.36 2600				-	-	-	45.33 1151	44.49 1130	44.49 1130						
0812	152.17 3865	102.36 2600	492 125	41.93 1065	90.55 2300	-	-	-	51.14 1299	49.88 1267	49.88 1267	SIDE		41.98 1065	54.13 1375		
0813	164.57 4180	102.36 2600				-	-	-	57.34 1456	49.88 1267	49.88 1267						

* For fan section with motor location at side, N dimensions varies according to motor kW.

• Overall unit height and width will be same for both aluminium and steel penta post construction.

• Length of each separate sections are provided.

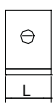
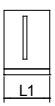
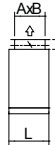
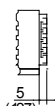


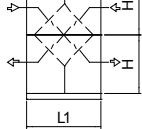
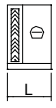
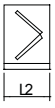
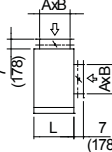
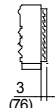
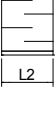
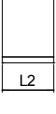
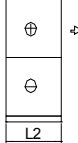
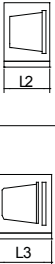
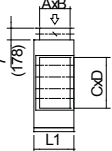

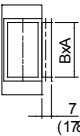
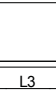
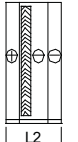
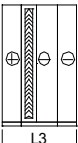
• For units without knockdown or knockdown frames with more than one section, length will be reduced by 60 mm * (No. sections-1). [Only for aluminium profile construction]

• Dimensions are subject to change without any notice for future improvement.

• Units with heat recovery system and interlaced DX coils, consult SKM for width of machine.

SKM Modular Air Handling Units MAH Series

Dimensional DATA

COOLING SECTIONS	FILTER SECTIONS			EXHAUST AND MIXING BOX		LOUVERS & DAMPER	SOUND ATENUATOR		PLENUMS			HEAT RECOVERY SECTIONS			
	CCW, CDX	FIF	L1	BEX	L	L1	ASL	SAT1	PEM1	L1	RFP	L1	RHR	L2	RRC
															
															
															
															
L	L1	L2	L3	L	L1		L1	L2	L1	L2	L3	L1	L2	L3	SIZE
29.53 750	14.57 370	29.53 750	37.20 945	22.44 570	41.93 1065	37.20 945	54.13 1375	22.44 570	29.53 750	37.20 945	46.45 1180	41.93 1065	54.13 1375	54.13 1375	0202
				29.53 750							54.13 1375				0203
				29.53 750							54.13 1375				0204
				29.53 750							54.13 1375				0303
				29.53 750							54.13 1375				0304
				29.53 750							54.13 1375				0305
				29.53 750							54.13 1375				0306
				29.53 750							54.13 1375				0405
				29.53 750							54.13 1375				0406
				29.53 750							54.13 1375				0407
				29.53 750							54.13 1375				0506
				29.53 750							54.13 1375				0507
				29.53 750							54.13 1375				0508
29.53 750	54.13 1375	0509													
29.53 750	54.13 1375	0608													
29.53 750	54.13 1375	0609													
29.53 750	54.13 1375	0709													
29.53 750	54.13 1375	0710													
29.53 750	54.13 1375	0711													
29.53 750	54.13 1375	0811													
29.53 750	54.13 1375	0812													
29.53 750	54.13 1375	0813													

For FIBG3 & FIPBG2 section length is 1065mm (41.93") & for FIPBG3 section length is 1180mm (46.46").

For mixing box section, A,B,C&D dimensions varies according to fresh air & return air percentage.

* For Return air box with air entry from top/back/side, section length is same as BMX.

• Overall unit height and width will be same for both aluminium and steel penta post construction.

• Length of each separate sections are provided.

• For units without knockdown or knockdown frames with more than one section, length will be reduced by 60 mm * (No. sections-1). [Only for aluminium profile construction]

• Dimensions are subject to change without any notice for future improvement.



SKM Modular Air Handling Units MAH Series

GUIDE SPECIFICATIONS

General

SKM Modular Air Handling Units (**MAH**) are designed to a high engineering standard to provide the requirements of ventilation, heating, cooling, de-humidification and air distribution to a conditioned space. To meet project requirements, units shall be consist of a wide choice of combinations of sections like fan, cooling coil, heating coil, humidifier, filter, heat recovery system, sound attenuator, multi zone, mixing box, return air fan, plenums, etc as indicated on the equipment schedule. Units shall be installed at site as per Installation Operation & Maintenance Manual. MAH Series air handling units are manufactured in modular sections. Units are normally shipped with each section fully assembled in the factory. The unit is however designed to be supplied in knockdown arrangement for quick site assembly, where shipping or plant room restrictions demand.

Casing & Construction

- Unit shall be constructed of a complete frame with easily removable panels.
- **MAH** unit's frames shall be constructed of either extruded aluminum profiles or hot dip coated galvanized steel profile (steel pentapost).
- Access and fixed panels shall be constructed of hot dipped galvanized steel conforming to JIS-G 3302 and ASTM A653
- To prevent insulation erosion into air stream, the unit shall be provided with double wall panels "Double Skin unit".
- Fixed panels shall be bolted to the frame and removal of access panels shall not affect on the structural integrity of the unit.
- Unit frame and panels shall be thermal bridge protected to minimize the conduction path from the inside of the casing to the outside.
- Access panels shall be one piece double-wall construction with insulation sealed between the inner and outer panels.
- Access panels shall be provided with quick release fasteners to facilitate access to all internal components for maintenance and service.
- Units casing shall be in galvanized or painted finish as indicated on the equipment schedule.
- Painted casing shall be made of hot-dip galvanized steel sheets. Fabricated steel shall be thoroughly de-greased and then phosphatized before application of an average 60 micron baked electrostatic polyester dry powder coating in RAL7032 color scheme. This finish can pass 1000-hour, 5% salt spray test at 95°F (35°C) and 95% relative humidity (ASTM B 117).
- Units up to size 10000 cfm shall be provided with painted sheet metal base frame.
- Larger units shall be provided with painted rigid steel structure base frame.

- Structural Steel shall be in accordance to JIS-G-3103 SS41 standards.
- All ceiling suspended units shall be provided with painted rigid steel structure base frame.

Options:

- Panels shall be constructed of aluminum or stainless steel with different sheets thickness
- Perforated inner skin. (Not applicable with polyurethane foam insulation.
- Access panels with inspection window.
- Hinged Access doors with handles and latches.
- Painting of sheet metal suitable for marine applications.
- Painting of structural steel frames suitable for marine applications.
- Units for outdoor installation shall be provided with weatherproof top cover.

Insulations

- Polyurethane foam insulation shall be standard for Aluminum profile construction.
- For units with Steel pentapost construction, standard insulation material shall be Fiber glass.
- Injected Polyurethane foam insulation have density of 2.5 lb/ft³ (40 kg/m³) according to the test standard ASTM D-1622-88 and thermal conductivity of 0.14 BTU.in/ft. 2°F.h. (0.020 W/m²K) according to test standard ASTM C 518-56.
- The fiber glass insulation shall be conforms to HH-1-545B Type 1, SMACNA standard for duct liners and ASTM-C-423 and NFPA90A and 90B standards for fire resistance.

Options

- Rock Wool insulation with density upto 6.875 lb/ft³ (110 kg/m³)
- 2" (50mm) polyisocyanurate board, [2SB] with density in the range of 2 to 3 lb/ft³ (32 to 48 kg/m³) and thermal conductivity of 0.16 BTU.in /ft².°F.h (0.023 W/m²K).

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Fan Section

- Fans used in units shall be tested in a registered laboratory in accordance with AMCA standard 210.
- Double inlet double width centrifugal fans shall be standard supply in SKM MAH.
- The impellers shall be forward curved; backward curved or airfoil profile depending on the requirements.
- Forward curved blades shall be made of galvanized steel. Fan shaft shall be made of carbon steel with corrosion protection coating.
- Backward inclined blades shall be made of sheet steel. Fan shaft shall be made of carbon steel with corrosion protection coating.
- Backward inclined airfoil blades shall be made of mild steel. Fan shaft shall be made of carbon steel and polished with protection paint.
- All fans shall be belt driven; statically and dynamically balanced according to ISO 1940.
- Different fan positions shall be available; horizontally top or bottom; vertically up or down depending on the requirement.
- Fan impeller shall be keyed to fan shaft to prevent slipping.
- SKM fans use self-aligned ball or pillow block bearings that are greased for life. Pillow block bearings shall be provided with re-greasing fittings.
- Flexible connection shall be provided between fan discharge and casing panel to avoid transmission of vibration to the connecting duct
- Fan motors shall be totally enclosed fan cooled (TEFC), foot mounted, 4 poles, IP-55 protected and Class-F insulated.
- Motor size and electrical characteristics shall be as indicated on the equipment schedule.
- Rating and operating characteristics of motors shall be in accordance with IEC 60034-1 & IEC60085 standards.
- Fan and motor shall be mounted on a common base assembly. The base assembly is isolated from the outer casing with factory-installed vibration isolators.
- Fans shall be belt-driven by motors, with a set of fixed pitch; variable pitch pulleys and matching belts

Options

- Spark proof fans.
- Explosion proof motor. Suitable for zone I or zone 2; Eexd II BT4. (zone to be specified, by the customer)
- Variable speed drive (Frequency Inverter).
- Standby motor (additional) with manual change over.

- Starter Panel Control. Comprising of contactor, overload and fuse for fan motor control to be specified by customer, [Thermostat, start stop push button, volt free contact from BMS.etc].
- Stainless steel fan shaft.
- Extended lubrication fittings.
- Polyglycoat coating on fans.
- Spring vibration isolators for fan sub-frame.
- Plug fans.
- Fan Belt Guard.

Coil Section

- All coil performance shall be certified in accordance with AHRI Standard 410 and tested by compressed air under water to the pressure of 300 psig (21.09kg/cm²).
- All water, steam and direct expansion refrigerant coils shall be provided to meet the wide range of application requirements.
- Coils shall be constructed from seamless copper tubes (3/8" or 5/8" O.D) and are mechanically expanded into continuous corrugated aluminum fins to provide continuous compression bond over the entire finned length for maximum heat transfer rates.
- Chilled water and direct expansion coils shall be available in 4, 6, 8, 10 and 12 rows.
- Coils shall be available in 8, 10 and 12 fpi.
- All water coils shall be provided with air vents and drain plugs.
- DX coil shall be provided with distributor. Expansion valve shall be provided if so specified.
- Coil circuiting shall be counter flow. (Direction of coil water / refrigerant flow shall be counter to direction of unit airflow).
- Supply and return water connections of coil section shall be labeled with "WATER IN" & "WATER OUT" respectively.
- DX coil section shall be labeled with "LIQUID" & "SUCTION".
- Coil connections shall be sealed against unit panels by flexible special rubber flanges.
- Coil connections shall be sweat type
- Coils shall be provided with moisture eliminator depending on the air conditions. Eliminator blades are made of PVC, with shape specially designed to trap water droplets blown off the coil.
- The pan shall be sloped toward the drain connection to meet ASHRAE standard 62
- Cooling coil section shall be provided with insulated drain pan with MPT drain connection, in order to hold and remove the condensate formed during dehumidification.

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- Drain pan shall be made of painted zinc coated steel sheet insulated from outside for maximum protection against sweating and corrosion.
- Drain pan shall be extended to include coil; headers and U-bends. Drain connection can be provided on either side or on both sides as required.

Protective coating on coils

Aeris Guard Coil Coat

- Aeris Guard Coil Coat is a self etching high performance epoxy water based finish
- For single dip coating there was no evidence of corrosion after exposure to 5% Neutral Salt Spray under AS 2331.32-1980 (ASTM-B-117) conditions over periods in excess of 3000 hours.

Pre-Coated Fins

- The pre-coating is hydrophobic polyurethane.
- Pre coated fins passed a 1000 hr, 5% salt spray test at 95F (35°C) temperature and 95 % RH; according to ASTM-B117.

Options

- Copper fins.
- Electro-tinned coils.
- Stainless steel drain pan.
- MPT, FPT or flanged coil connectors.
- Stainless steel eliminator.

Filter section

- Filters using in SKM Air handling units shall be in accordance with ASHRAE 52.2 and EN779 standards.
- HEPA filters in SKM Air handling units shall be in accordance with EN1882 standards.

SKM Standard

- 2" (50 mm) panel filters with aluminum washable media EN class: G2.
- Bag Filter: 22" (559 mm) deep high efficiency bag filters with synthetic media EN Class: F7. Higher EN class, F8 & F9, available on request.

Options

- Bag Filter with 30" (762 mm) or 36" (914 mm) depth.
- 2" (50 mm) panel filters; Media: Synthetic.
- 2" (50 mm) pleated filters; Media: Synthetic.
- 4" (100mm) thick extended surface Mini - Pleat filters with equivalent efficiency to bag filter; Media: Synthetic.
- V Filters with aluminum washable media

- HEPA Filters: Ultra high absolute HEPA filter media shall be 12" (300mm) deep with efficiency >99% when measured by using DOP method.
- Carbon filters.
- Auto roll & sand inertia filters.
- Manometers to monitor air pressure drop across filters.

Electric Heater section

- Electric heater capacity and steps shall be as indicated on the equipment schedule.
- Electric heater elements shall be in accordance with IEC standards.
- Electric heater element shall be constructed from 80/20 nickel chrome resistance wire, which is connected to terminal pins and centered in stainless steel grade 304L sheath metal tubes by compressed magnesium oxide.

Standard components included with the heater shall be:

- 3 pole magnetic contactor per stage.
- Primary over temperature protection provided by auto reset high limit safety cut outs.
- Secondary over temperature protection provided by manual reset high limit safety cut-out for positive break.
- Control fuse.
- Control switch.
- Power fuses per NEC if total load exceeds 48 amps.
- Factory installed air flow switch.
- The terminal pins shall be insulated from metal tube by ceramic bushes.
- Helical fins mild steel galvanized shall be tightly wound around tabular heater elements.
- Helical fins stainless steel shall be provided if so specified.

Humidifier Section

Steam humidifiers:

Following types of Steam humidifier can be supplied:

- **Internal Steam Humidifier [HSIG]:** This system consists of immersed electrode steam generating cylinders; steam distribution pipe and necessary controls. Steam generating cylinders are mounted on to the AHU within a special enclosure. The steam distributor passes through the unit casing to inject steam in the air stream to reach the required humidity conditions. ON-OFF control for humidifier is provided as standard.

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- **External Steam Humidifier [HSEG]:** This system consists of steam generating cylinders and steam distribution pipe. Steam generator is supplied separately and is complete with necessary controls. In this case the Humidifier is remote to the unit. ON-OFF control for humidifier is provided as standard.

- With only steam distributor pipe and hoses which will be connected to the steam main by the installer. Supply of steam and all the controls by others.

Options:

- Condensate drain pan for humidifier section
- Proportional control based on 0-10 V DC/4-20 mA.

Water humidifiers:

Water Humidifier consist of spray nozzle system, heat exchanger media, tank for collecting spray water and eliminator section for removing entrained drops of water from the air. A pump recirculates water at a rate higher than the evaporation rate. Water tank is equipped with drain connection, overflow outlet, water feed with float valve and suction connection with screen.

Two types of Water humidifier arrangement can be supplied as follows:

- **Evaporative Type:** Water is supplied to the top of the evaporative media via a distribution header. The water flows down the surface of the media and the warm and dry air passes through the media it evaporates a proportion of the water and thus produces cold, humidified air.
- **Spray Pad type (Air Washer):** In this type, water is sprayed over the pad area through spray nozzle system. Air is humidified and cooled as it passes through the wetted pad media.

Dampers

- To control the fresh, return and exhaust airflow rates in mixing box, exhaust box, economizer, face & bypass and multi-zone sections, MAH units shall be provided with dampers.
- Damper shall be arranged in parallel or opposed blades configuration.
- Damper frame, shaft, linkages and brackets shall be constructed of galvanized steel.
- Damper blades shall be constructed of galvanized steel or aluminum in airfoil design.
- Damper blades shall be constructed of stainless steel if so specified.
- Damper blades shall be rotate in bronze bearings which lubrication is not required.

Sound Attenuator Section

- Sound attenuator section shall be sized to meet the sound level indicated on the equipment schedule.
- Sound attenuator section shall be consisting of splitters with 24" (600mm) or 48" (1200mm) in lengths.
- Outer skin of the splitters shall be constructed of perforated galvanized steel.
- Outer skin of the splitters shall be constructed of perforated aluminum or stainless steel if so specified.
- The insulation material of splitters shall be fiberglass.

Heat Recovery Section

To conserve the energy consumption, one of the following heat recovery systems shall be provided:

- Rotary heat recovery system (Thermal wheel): Sensible & latent heats can be recovered and Indoor Air Quality (IAQ) will be improved by maintaining the humidity. Over 85 % energy recovery can be achieved. The wheel shall be rotate in a relatively low speed (15–25 RPM). The wheel rotor shall be supported by two pillow block bearings to maintain / replace without actual removal of the rotor from its casing.
- Run around coil system: This system consists of two coils, pump and interconnecting piping. It recovers sensible heat only and it can reduce the differential in temperature between supply and exhaust air by as much as 60 %.
- Fixed plate heat recovery system (Plate heat exchanger): It shall be built from aluminum plates or stainless steel if so specified. It recovers sensible heat only and its efficiency is up to 70 %.
- Heat pipe system: This system shall be installed in which one side to be replaced in the warm return air and the other side in the cold supply air. By using this system, in addition to significant energy savings, the dehumidification capacity will be increased, the cooling load on the evaporator and compressor will be decreased and Indoor Air Quality (IAQ) will be improved.

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