



Central Station Air Handling Units  
ECS3, ESCS3, CS3, SCS3 Series 50/60Hz  
Air Volume: 1000 to 56000 cfm (1700 to 95000 m<sup>3</sup>/hr)



**DUNHAM-BUSH**<sup>®</sup>

Products that perform...By people who care

# INTRODUCTION

For more than 100 years, Dunham-Bush has focused on innovative product development. Today, we provide a full portfolio of HVAC/R products from Fan Coil Units to large centrifugal chillers as well as many other innovative green solutions. Our commitment to innovation, matched with an aggressive attitude toward growth, makes Dunham-Bush a leader in global markets. Our product development is tailored to meet the specific needs of customers, building-by-building, country-by-country and region-by-region. No other HVAC/R manufacturer takes this approach to meeting your performance expectations.



Dunham-Bush fix construction Central Station Air Handling Units (ESC3 & ESCS3), have an air volume range from 1000 to 36,000 cfm (1700 to 61,000 m<sup>3</sup>/hr) and modular Central Station Air Handling Units (CS3 & SCS3 series), have an air volume range from 1000 to 56,000 cfm (1700 to 95,000 m<sup>3</sup>/hr) with new extruded aluminum frame profile. The entire product line features rigid construction, installation ease, control flexibility, high reliability and versatile functions, which is suitable for both commercial and industrial applications.


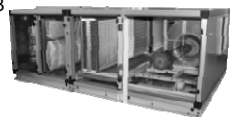
Dunham-Bush Air Handling Units are certified in accordance with AHRI Standard 430, which is the industry standard for central station air handling units. Certification by participating manufacturers of units within the scope of this program requires that the ratings and performance of any central station unit certified to AHRI be established in accordance with the AHRI Standard. Coils installed in the Dunham-Bush AHU are rated and certified in accordance to AHRI Standard 410, except for electric heating coil ratings are not within the scope of the AHRI Central Station Air Handlers Certification program. Casing and construction design are certified in accordance to AHRI 1350 for ESCS3 & SCS3 series.

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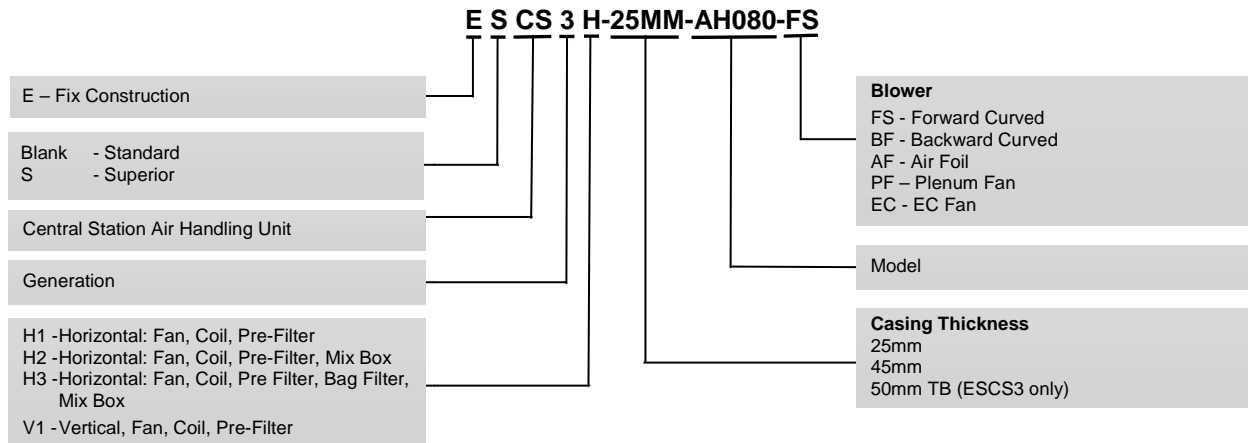
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# PRODUCT RANGE

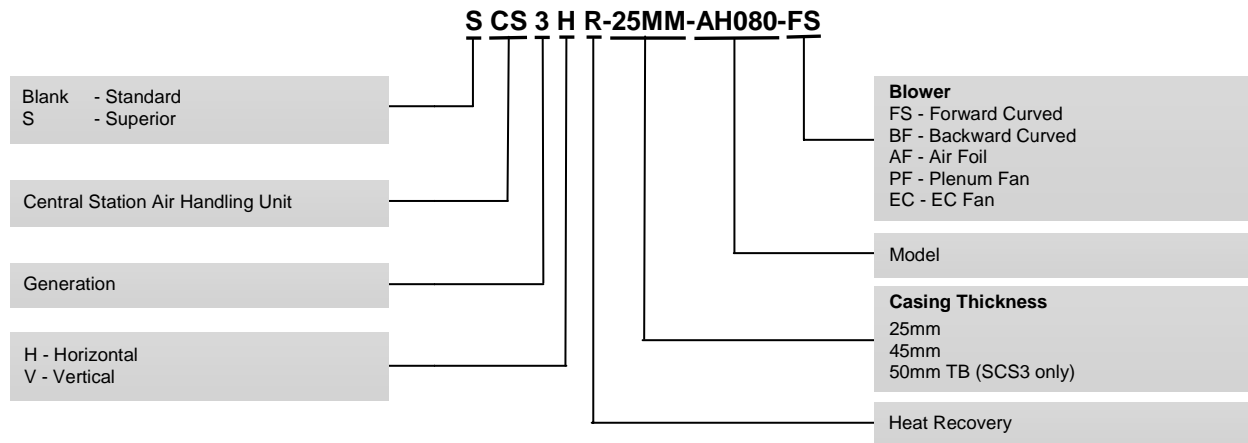
Model	12	18	22	30	36	42	48	58	64	75	90	100	120	135	150	165	180	195	210	240	270	300	360	
	ECS3H-25MM																							
	ECS3H-45MM																							
	ESCS3H-50MM																							

Model	12	22	32	40	48	64	80	100	120	150	180	210	240	270	320	420	520	
	CS3H-25MM																	
	CS3H-45MM																	
	SCS3H-50MM																	

# NOMENCLATURE



Notes: Fix Construction Central Station Air Handling Units.



Notes: Modular Central Station Air Handling Units.

## DUNHAM-BUSH ESC3 & ESCS3 Series

### FEATURES

The ECS3 & ESCS3 range of Air Handling Units from Dunham-Bush, have an air volume range from 1000 to 36,000 cfm (1700 to 61,000 m<sup>3</sup>/hr). The product features an extruded aluminium frame profile that provides a high level of unit design and application flexibility necessary to meet the rising demands for improved Indoor Air Quality. The unit is constructed using rigid nylon corners and double skin polyurethane foam insulated panels. Internal joints are insulated with rigid PVC strip and PE foam to provide airtight casing and minimize cold bridging.

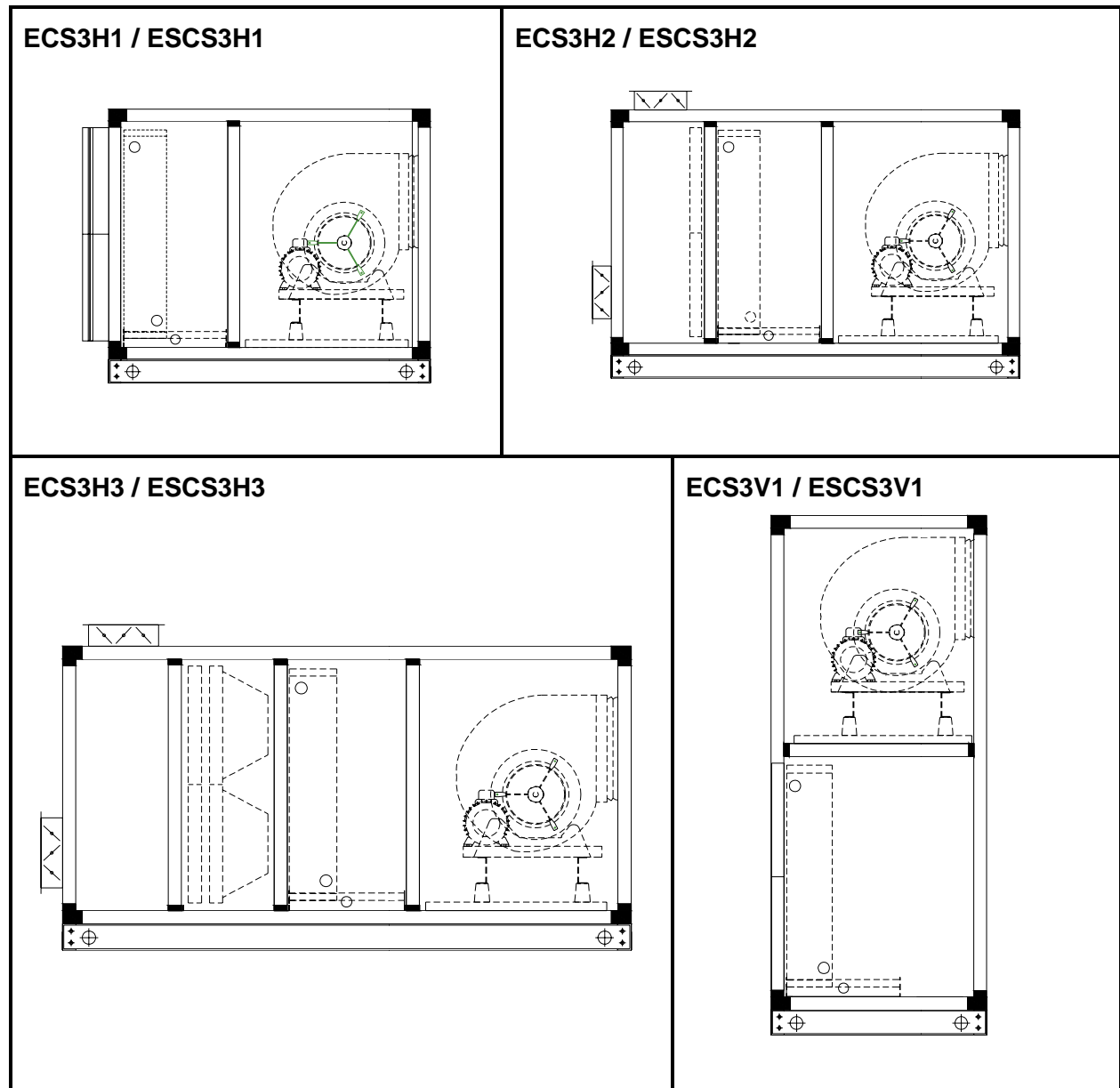
The ECS3 & ESCS3 range is available in horizontal and vertical construction.



### MEETING IAQ DESIGN REQUIREMENT

Double Skin “Sandwich” panel construction has smooth inner surfaces for easy and effective cleaning to reduce risk of dirt and bacteria accumulation. The sandwich panels are injected with Polyurethane Foam of 40kg/m<sup>3</sup> density. Panel of nominal 25mm and 45mm thickness for ECS3 and 50mm thickness for ESCS3 is available. The external surface of all panels with 0.5mm high strength pre-painted and 0.5mm galvanized steel (GI) as internal skin.

# STANDARD UNIT CONFIGURATION

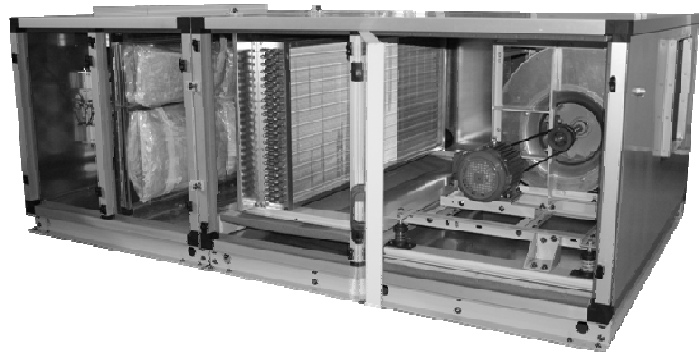


# DUNHAM-BUSH CS3 & SCS3 Series

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## FEATURES

The CS3 & SCS3 range of Air Handling Units from Dunham-Bush, have an air volume range from 1000 to 56,000 cfm (1700 to 95,000 m<sup>3</sup>/hr). The product features an extruded aluminum frame profile that provides a high level of unit design and application flexibility necessary to meet the rising demands for improved Indoor Air Quality. The CS3 & SCS3 range is available in horizontal and vertical construction with a wide range of options and accessories that can be selected from the Dunham-Bush Selection Program. Dunham-Bush Air Handling Units can be configured to meet the requirements of all standard and many specialized applications.



## MEETING IAQ DESIGN REQUIREMENT

Double Skin "Sandwich" panel construction has smooth inner surfaces for easy and effective cleaning to reduce risk of dirt and bacteria accumulation. The sandwich panels are injected with Polyurethane Foam of 40kg/m<sup>3</sup> density. Panel of nominal 25mm and 45mm thickness for CS3 and 50mm thickness for SCS3 is available. The external surface of all panels with 0.5mm high strength pre-painted and 0.5mm galvanized steel (GI) as internal skin.

# CASING PERFORMANCE ESCS3 & SCS3 Series

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## SUPERIOR CASING PERFORMANCE

Certified According to AHRI-1350 Standard for Mechanical Performance Rating of Central Station Air-handling Unit Casings.

### Excellent Air Tightness

The casing is constructed using rigid nylon corners, double skin polyurethane foam insulated panels, aluminum frame and sealing strips. New casing structure of the unit avoids any of the interior support member is exposed and ensures smooth internal surface, easy for maintenance and effective cleaning to reduce risk of dirt and bacteria accumulation.

New type of sealing strips between the frame and the panels, and careful sealing design to all panels ensures excellent air tightness of the casing structure and minimize air leakage.

### Thermal Bridge Free

Dunham-Bush unique frame design enables interpost covered by rigid PVC insulator to prevent exposing in treated air, so the thermal bridge at post is avoided. Each junction is subjected to special heat insulation treatment to prevent the thermal bridge effect. New design of screw also prevents the occurring of thermal bridge at screws, contributes to better casing performance.

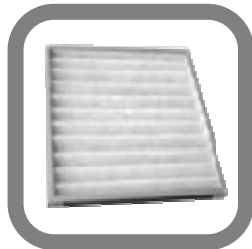
### Optimal Thermal Insulation

The unit wall is made up by minimum 50mm double skin polyurethane foam (PU) insulation panel with 0.5mm high strength powder coated steel as external skin and 0.5mm galvanized steel (GI) as internal skin. The sandwich panels are injected with PU foam of 40kg/m<sup>3</sup> density with light weight, good rigidity and thermal conductivity.

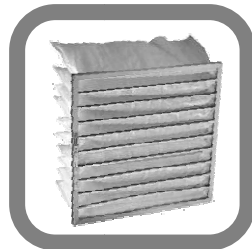
# SPECIFICATION

## YOUR CHOICE OF FILTRATION

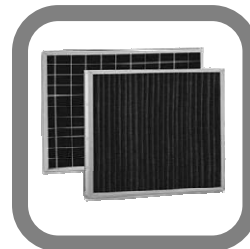
Air filtration is an important component to achieve an acceptable indoor air quality. The structure of filters are stable and firm, high strength and intensity, easy changing and the filters efficiency is up to 95%. Various options of filter type, filter media and filter efficiency are available to meet the different air quality requirement.



High Efficiency Filter



Bag Filter



Carbon Filter



HEPA Filter

## YOUR CHOICE OF COILS

There are three typical types of coils: chilled water coils, hot water coils and steam heater coils. All coils are AHRI certified and provided to meet the scheduled performance. Coils are consisted of copper-tubes and aluminum fins. The fins are design with slits for better heat transfer efficiency and moisture carry-over limit performance.

Three-way pitch drain pan design discharges condensate quickly and prevents microbial growth. Condensate pans of 304 stainless steel material are also available as an option.

Coil performance are certified in accordance with AHRI Standard 410.

## YOUR CHOICE OF BLOWER

The fan impeller and pulley are statically and dynamically balanced, and the whole fan is calibrated through the operational vibration testing, making the fan to operate stably and smoothly. With the fan and motor assembly mounted on a common base with shock absorber and the fan outlet isolated from the casing by a flexible connection and completely separated from moving parts, the vibration is effectively isolated. Moreover, the forward or backward impeller may be selected according to the air pressure and volume. Blower shall be coupled with pulley and motors. Certified in accordance with AHRI standard 430 for Fan Performance (except plenum fan & EC fan)



Forward Fan (FS)



Airfoil Fan (AF)



Direct Driven DIDW Fan



Direct Driven Plenum Fan



EC Fan

## OPTIONAL

A wide choice of accessory sections – diffuser sections, mixing box sections, face and bypass damper sections, humidifier sections, reheating sections and heat recovery sections are available to meet the required air conditions application needs. For outdoor installation, applications in corrosive or hazardous atmosphere, other material options are available. Special motor voltages and dual speed motors can be supplied. Frequency inverter drive for Variable Air Volume applications is also offered as an option.



Product that perform...By people who care

# COMPUTER SELECTION SOFTWARE

## COMPUTER SELECTION

There is a powerful selection software program available to optimize the best arrangement and performance of any air handling unit for a specific job requirement with its computer selection programs. Standard components can be selected and be placed according to customer requirement. Dunham-Bush software gives immediate feedback if there is no suitable choice for the units. The program provides us with fan curves data, coil performance data, dimension and shipment weight.

**SPECIAL CHECKLIST**

Project Name	JPC POS KUA	Project Number	06
Tag	AHU 1	Database Version	20160215
Model	CSDH-25mm-AH18D-BF	Printing Version	20160107
Location	Malaysia	Report Date	21/02/2016

**SERIAL LABEL**

Model	CSDH-25mm-AH18D-BF	Serial No. 1	
Order No.	AHU 1	Factory Order	
Blower Size	500-180F-036	AW Power	18072 CFM
WPM	1441	Designed T.S.P.	1.00 in.wg
Remark	AH18D		

Coil Type	Blower Deep	FPM	Circuit	Piping Conn.
Cooling	4 F.	14 F.	F (ATC) / -	3" MBSP / -
Heating	- / -	- / -	- / -	- / -

Blower Fan Motor	Qty	No. Blasts	FLA (Blasts)	LRA (Blasts)	WMA / FPM / Hz
	1	201	38.80	165.84	380-415/30/2000V-1

**PANEL / FRAME**

Inner Material	0.8mm	Outer Material	0.8mm/Painted
Inner Skin	0.5 mm	Outer Skin	0.5 mm

**PRIMARY FILTER SECTION**

Filter Type	Flat Filter (Washable 2")	Filter Class	95% Arrestance (G3)
24" x 24"	0	24" x 20"	0
24" x 12"	0	20" x 20"	0

**WATER COOLING COIL**

Coil Code	AH18D-4818UH
Medium	Water
Tube Length	48
Fin Length	88
Flow	R
FPM	14
Cooling Method	F (ATC)
Tube Diameter	1/2" (Type A)
Coil Frame	GI
Coil Spacer	None

**FAN SECTION**

Air Flow	18072
TSP	2.00
ISP	1.08
ESP	2.01
Fan Size	500 (CSD)
Blade Type	Backward
Fan Guard	1441
Fan Orientation	Front
Altitude	0

**TECHNICAL REPORT**

Project Name	JPC POS KUA	Project Number	06
Tag	AHU 1	Database Version	20160215
Model	CSDH-25mm-AH18D-BF	Printing Version	20160107
Location	Malaysia	Report Date	21/02/2016

**OUTLINE DRAWING**

**GENERAL SPECIFICATIONS**

AHU Type	25mm	Total Height	76.50 in
PU Thickness	25.5 mm	Total Width	103.94 in
Insulation Type	rubber	Total Length	80.76 in

**GENERAL SPECIFICATIONS**

AHU Type	25mm	Total Height	76.50 in
PU Thickness	25.5 mm	Total Width	103.94 in
Insulation Type	rubber	Total Length	80.76 in

**STRUCTURAL PROFILE**

**TECHNICAL REPORT**

Project Name	JPC POS KUA	Project Number	06
Tag	AHU 1	Database Version	20160215
Model	CSDH-25mm-AH18D-BF	Printing Version	20160107
Location	Malaysia	Report Date	21/02/2016

**1 PRIMARY FILTER**

**1 FILTER SPECIFICATIONS**

Fan Type	Flat Filter (Washable 2")	Air Flow	18072 CFM	14" x 24"	0
Filter Grade	95% Arrestance (G3)	Static PD	6.16 in.wg	14" x 12"	0
Mounting Type	Slide Loading	Front PD	8.50 in.wg	14" x 20"	12
Filter Area	48.000 sq'	Design PD	8.16 in.wg	17" x 20"	0
Filter Velocity	482 ft/min				

**WATER COOLING COIL**

**COIL SPECIFICATIONS**

Coil Code	AH18D-4818UH	Coil Layer	1
Coil Tube Size	1/2" (Type A)	Medium	Water
Coil Flow	R	Cooling Method	F (ATC)
Coil FPM	14	Tube / Fin Material	Copper / Aluminum
Tube Face	48	Tube Spacing (in)	1.25
Fin Height	88.00 in	Coil Spacer	None
Fin Length	88.00 in	Cooling Material	None

**PERFORMANCE**

Total Capacity	746968	Btu/h
Sensible Capacity	622769	Btu/h
Latent Capacity	124199	Btu/h

**TECHNICAL REPORT**

Project Name	JPC POS KUA	Project Number	06
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Location	Malaysia	Report Date	21/02/2016

**2 SUPPLY FAN**

**FAN SPECIFICATIONS**

Fan Code	500-RF (CSD)	Installed Power	20.80 hp
Fan Type	Backward	Power Supply	380-415/30/200V
Fan Quantity	1	Motor Efficiency	85.5 %
Fan Shaft Power	18.52 hp	Efficiency Type	IE3/IEPF2
Blower Speed	1441 rpm	Motor Frame	190L
Maximum Fan Speed	1700 rpm	Motor Poles	4
Discharge Opening	31.9073 50 in	Mounting Position	Right
Air Flow	18072 CFM	Motor Type	AC
		Shaft Speed	1450 rpm
		Clear in Motor	No
		2 Speed Motor	No

**MOTOR SPECIFICATIONS**

Total Efficiency	87.00 %
Discharge Velocity	3500' ft/min
ISP	1.08 in.wg
ESP	2.01 in.wg
TSP	2.00 in.wg
VFD	No
VFD Type	No
VFD Installation	No

**FAN SOUND LEVEL**

Sound Frequency, Hz	63	125	250	500	1000	2000	4000	8000	Overall
	Lw	93.0	95.5	98.1	92.3	97.6	93.3	91.5	73.7
Lw(dB)	68.0	70.5	73.1	67.3	72.6	68.3	66.5	48.7	66.7
	Lp(dB)	60.7	63.7	66.2	61.4	66.8	63.0	61.3	43.9

**PHSYCHROMETRIC REPORT**

Project Name	ECES Catalog	Project Number	06
Tag	AHU 1	Database Version	20160215
Model	CSDH-25mm-AH18D-BF	Printing Version	20160107
Location	Malaysia	Report Date	21/02/2016

**Chart Display**

**Entering/Leaving Air Condition**

Condition	1	2	3	4	5	6	7	8
Comp. No.	E	L	A	2	3	4	5	6
Air Direction	E	L	E	L	E	L	E	L
DB Temp. °C	26.7	9.0	26.7	9.0	26.0	14.3		
WB Temp. °C	16.4	9.0	16.4	9.0	16.0	14.8		
WB Temp. °F	61.7	48.2	61.7	48.2	60.8	58.6		

**PHSYCHROMETRIC REPORT**

Project Name	ECES Catalog	Project Number	06
Tag	AHU 1	Database Version	20160215
Model	CSDH-25mm-AH18D-BF	Printing Version	20160107
Location	Malaysia	Report Date	21/02/2016

**Chart Display**

**Entering/Leaving Air Condition**

Condition	1	2	3	4	5	6	7	8
Comp. No.	E	L	A	2	3	4	5	6
Air Direction	E	L	E	L	E	L	E	L
DB Temp. °C	26.7	9.0	26.7	9.0	26.0	14.3		
WB Temp. °C	16.4	9.0	16.4	9.0	16.0	14.8		
WB Temp. °F	61.7	48.2	61.7	48.2	60.8	58.6		

**PHSYCHROMETRIC REPORT**

Project Name	ECES Catalog	Project Number	06
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**Chart Display**

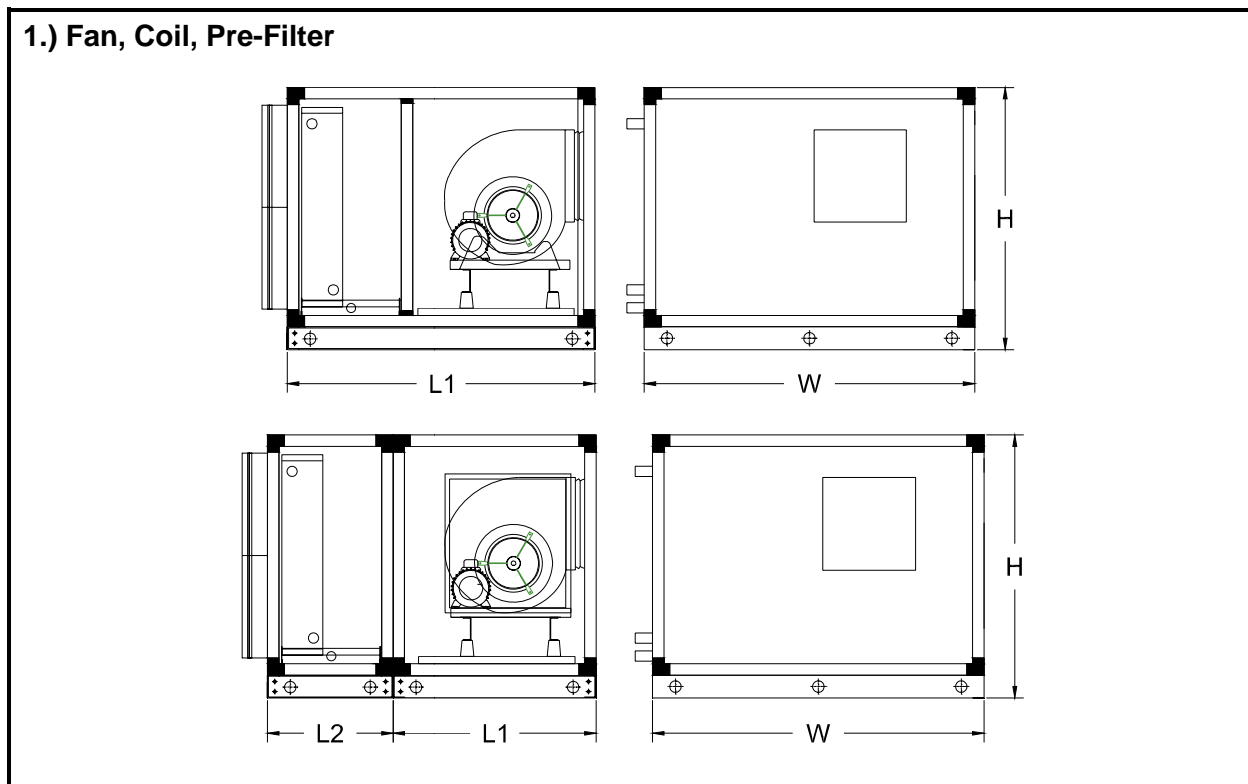
**Entering/Leaving Air Condition**

Condition	1	2	3	4	5	6	7	8
Comp. No.	E	L	A	2	3	4	5	6
Air Direction	E	L	E	L	E	L	E	L
DB Temp. °C	26.7	9.0	26.7	9.0	26.0	14.3		
WB Temp. °C	16.4	9.0	16.4	9.0	16.0	14.8		
WB Temp. °F	61.7	48.2	61.7	48.2	60.8	58.6		

# PHYSICAL DIMENSION ECS3 & ESCS3

## HORIZONTAL TYPE (H1)

### 1.) Fan, Coil, Pre-Filter



Model Code	Air Flow CFM	Coil Size TH FL		Horizontal Unit (Fan (BF/AF/FC) + Coil + Pre-Filter), H1								Horizontal Unit (Fan (EC) + Coil + Pre-Filter), H1								Horizontal Unit (Fan (PF) + Coil + Pre-Filter), H1							
				25mm Casing				45/50mm Casing				25mm Casing				45/50mm Casing				25mm Casing				45/50mm Casing			
				L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)
AH012	1200	12	24	1040	-	940	640	1050	-	950	650	1640	-	940	640	1650	-	950	650	1340	-	940	640	1350	-	950	650
AH018	1800	16	28	1040	-	1040	740	1050	-	1050	750	1640	-	1040	740	1650	-	1050	750	1340	-	1040	740	1350	-	1050	750
AH022	2200	18	32	1140	-	1140	840	1150	-	1150	850	1640	-	1140	840	1650	-	1150	850	1440	-	1140	840	1450	-	1150	850
AH030	3000	20	36	1140	-	1240	840	1150	-	1250	850	1640	-	1240	840	1650	-	1250	850	1440	-	1240	840	1450	-	1250	850
AH036	3600	24	36	1140	-	1240	1040	1150	-	1250	1050	1640	-	1240	1040	1650	-	1250	1050	1440	-	1240	1040	1450	-	1250	1050
AH042	4200	26	40	1240	-	1340	1040	1250	-	1350	1050	1640	-	1340	1040	1650	-	1350	1050	1640	-	1340	1040	1650	-	1350	1050
AH048	4800	26	44	1340	-	1440	1040	1350	-	1450	1050	1640	-	1440	1040	1650	-	1450	1050	1640	-	1440	1040	1650	-	1450	1050
AH058	5800	32	44	1340	-	1440	1240	1350	-	1450	1250	1640	-	1440	1240	1650	-	1450	1250	1740	-	1440	1240	1750	-	1450	1250
AH064	6400	32	48	1340	-	1540	1240	1350	-	1550	1250	1640	-	1540	1240	1650	-	1550	1250	1740	-	1540	1240	1750	-	1550	1250
AH075	7500	34	52	1340	-	1640	1340	1350	-	1650	1350	1640	-	1640	1340	1650	-	1650	1350	1840	-	1640	1340	1850	-	1650	1350
AH090	9000	38	56	1440	-	1740	1440	1450	-	1750	1450	1640	-	1740	1440	1650	-	1750	1450	1840	-	1740	1440	1850	-	1750	1450
AH100	10000	40	60	1440	-	1840	1540	1450	-	1850	1550	1640	-	1840	1540	1650	-	1850	1550	1940	-	1840	1540	1950	-	1850	1550
AH120	12000	42	68	1540	-	2040	1540	1550	-	2050	1550	1640	-	2040	1540	1650	-	2050	1550	2040	-	2040	1540	2050	-	2050	1550
AH135	13500	48	68	1540	-	2040	1740	1550	-	2050	1750	1640	-	2040	1740	1650	-	2050	1750	2040	-	2040	1740	2050	-	2050	1750
AH150	15000	52	68	1640	-	2040	1940	1650	-	2050	1950	1640	-	2040	1940	1650	-	2050	1950	2040	-	2040	1940	2050	-	2050	1950
AH165	16500	56	68	1640	-	2040	2040	1650	-	2050	2050	1640	-	2040	2040	1650	-	2050	2050	2240	-	2040	2040	2250	-	2050	2050
AH180	18000	64	68	1840	-	2040	2240	1850	-	2050	2250	1640	-	2040	2240	1650	-	2050	2250	2240	-	2040	2240	2250	-	2050	2250
AH195	19500	64	72	1840	-	2140	2240	1850	-	2150	2250	1640	-	2140	2240	1650	-	2150	2250	2040	440	2140	2240	2050	450	2150	2250
AH210	21000	64	80	1840	-	2340	2240	1850	-	2350	2250	1640	-	2340	2240	1650	-	2350	2250	2040	440	2340	2240	2050	450	2350	2250
AH240	24000	64	88	1940	-	2540	2240	1950	-	2550	2250	1640	-	2540	2240	1650	-	2550	2250	2240	440	2540	2240	2250	450	2550	2250
AH270	27000	64	100	1940	-	2840	2240	1950	-	2850	2250	1640	-	2840	2240	1650	-	2850	2250	2240	440	2840	2240	2250	450	2850	2250
AH300	30000	64	110	2140	-	3140	2240	2150	-	3150	2250	1640	-	3140	2240	1650	-	3150	2250	2240	440	3140	2240	2250	450	3150	2250
AH360	36000	64	132	1940	440	3740	2240	1950	450	3750	2250	1640	-	3740	2240	1650	-	3750	2250	2240	440	3740	2240	2250	450	3750	2250

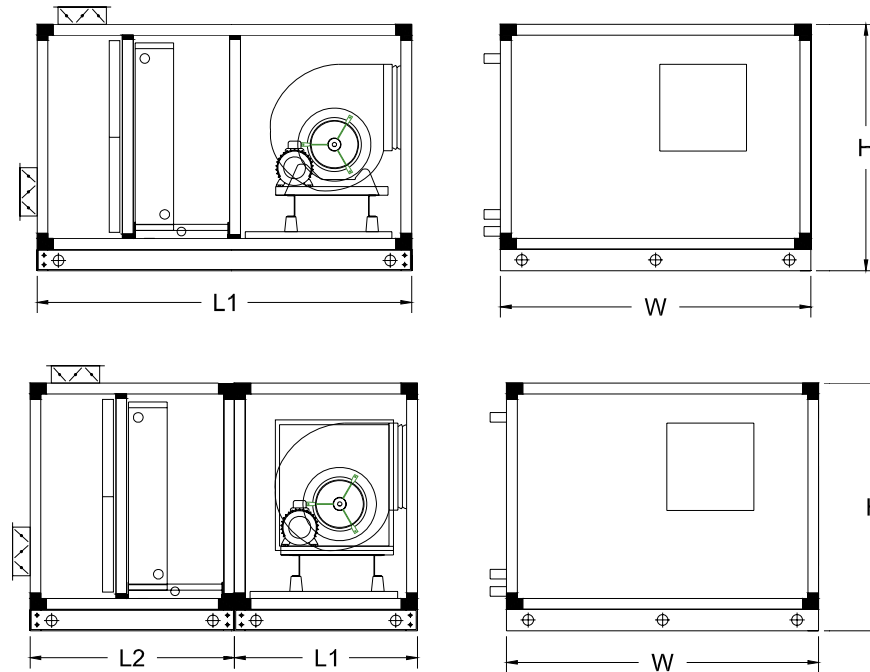
Notes: 1) Height (H) includes the unit base.  
 2) R/H motor and R/H piping shown.  
 3) Unit AH360 available in two sections.



# PHYSICAL DIMENSION ECS3 & ESCS3

## HORIZONTAL TYPE (H2)

### 2.) Fan, Coil, Pre-Filter, Mix Box



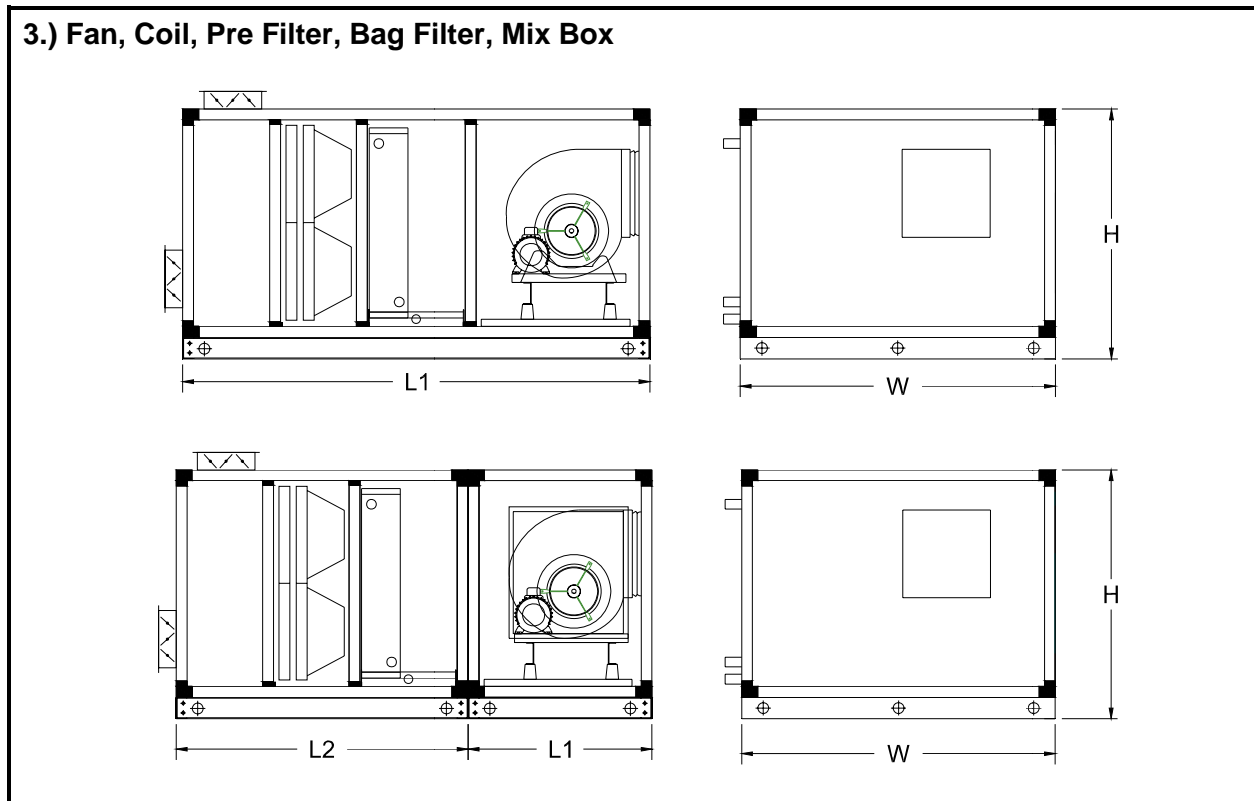
Model Code	Air Flow CFM	Coil Size TH FL		Horizontal Unit (Fan (BF/AF/FC) + Coil + Pre-Filter), H2								Horizontal Unit (Fan (EC) + Coil + Pre-Filter), H2								Horizontal Unit (Fan (PF) + Coil + Pre-Filter), H2							
				25mm Casing				45/50mm Casing				25mm Casing				45/50mm Casing				25mm Casing				45/50mm Casing			
				L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)
AH012	1200	12	24	1340	-	940	640	1350	-	950	650	1940	-	940	640	1950	-	950	650	1640	-	940	640	1650	-	950	650
AH018	1800	16	28	1340	-	1040	740	1350	-	1050	750	1940	-	1040	740	1950	-	1050	750	1640	-	1040	740	1650	-	1050	750
AH022	2200	18	32	1440	-	1140	840	1450	-	1150	850	1940	-	1140	840	1950	-	1150	850	1740	-	1140	840	1750	-	1150	850
AH030	3000	20	36	1440	-	1240	840	1450	-	1250	850	1940	-	1240	840	1950	-	1250	850	1740	-	1240	840	1750	-	1250	850
AH036	3600	24	36	1540	-	1240	1040	1550	-	1250	1050	1940	-	1240	1040	1950	-	1250	1050	1840	-	1240	1040	1850	-	1250	1050
AH042	4200	26	40	1640	-	1340	1040	1650	-	1350	1050	1940	-	1340	1040	1950	-	1350	1050	2040	-	1340	1040	2050	-	1350	1050
AH048	4800	26	44	1740	-	1440	1040	1750	-	1450	1050	1940	-	1440	1040	1950	-	1450	1050	2040	-	1440	1040	2050	-	1450	1050
AH058	5800	32	44	1840	-	1440	1240	1850	-	1450	1250	1940	-	1440	1240	1950	-	1450	1250	2240	-	1440	1240	2250	-	1450	1250
AH064	6400	32	48	1840	-	1540	1240	1850	-	1550	1250	1940	-	1540	1240	1950	-	1550	1250	2240	-	1540	1240	2250	-	1550	1250
AH075	7500	34	52	1840	-	1640	1340	1850	-	1650	1350	1940	-	1640	1340	1950	-	1650	1350	2340	-	1640	1340	2350	-	1650	1350
AH090	9000	38	56	1940	-	1740	1440	1950	-	1750	1450	1940	-	1740	1440	1950	-	1750	1450	2340	-	1740	1440	2350	-	1750	1450
AH100	10000	40	60	1940	-	1840	1540	1950	-	1850	1550	1940	-	1840	1540	1950	-	1850	1550	2440	-	1840	1540	2450	-	1850	1550
AH120	12000	42	68	2040	-	2040	1540	2050	-	2050	1550	1940	-	2040	1540	1950	-	2050	1550	2540	-	2040	1540	2550	-	2050	1550
AH135	13500	48	68	2140	-	2040	1740	2150	-	2050	1750	1940	-	2040	1740	1950	-	2050	1750	2640	-	2040	1740	2650	-	2050	1750
AH150	15000	52	68	2340	-	2040	1940	2350	-	2050	1950	1940	-	2040	1940	1950	-	2050	1950	2740	-	2040	1940	2750	-	2050	1950
AH165	16500	56	68	2340	-	2040	2040	2350	-	2050	2050	1940	-	2040	2040	1950	-	2050	2050	2940	-	2040	2040	2950	-	2050	2050
AH180	18000	64	68	2590	-	2040	2240	2600	-	2050	2250	1940	-	2040	2240	1950	-	2050	2250	2990	-	2040	2240	3000	-	2050	2250
AH195	19500	64	72	1340	1140	2140	2240	1350	1150	2150	2250	1940	-	2140	2240	1950	-	2150	2250	2040	1140	2140	2240	2050	1150	2150	2250
AH210	21000	64	80	1340	1140	2340	2240	1350	1150	2350	2250	1940	-	2340	2240	1950	-	2350	2250	2040	1140	2340	2240	2050	1150	2350	2250
AH240	24000	64	88	1440	1140	2540	2240	1450	1150	2550	2250	1940	-	2540	2240	1950	-	2550	2250	2240	1140	2540	2240	2250	1150	2550	2250
AH270	27000	64	100	1440	1140	2840	2240	1450	1150	2850	2250	1940	-	2840	2240	1950	-	2850	2250	2240	1140	2840	2240	2250	1150	2850	2250
AH300	30000	64	110	1640	1140	3140	2240	1650	1150	3150	2250	1940	-	3140	2240	1950	-	3150	2250	2240	1140	3140	2240	2250	1150	3150	2250
AH360	36000	64	132	1840	1140	3740	2240	1850	1150	3750	2250	1940	-	3740	2240	1950	-	3750	2250	2240	1140	3740	2240	2250	1150	3750	2250

Notes: 1) Height (H) includes the unit base.  
 2) R/H motor and R/H piping shown.  
 3) Unit AH195 to AH360 available in two sections.

# PHYSICAL DIMENSION ECS3 & ESCS3

## HORIZONTAL TYPE (H3)

### 3.) Fan, Coil, Pre Filter, Bag Filter, Mix Box

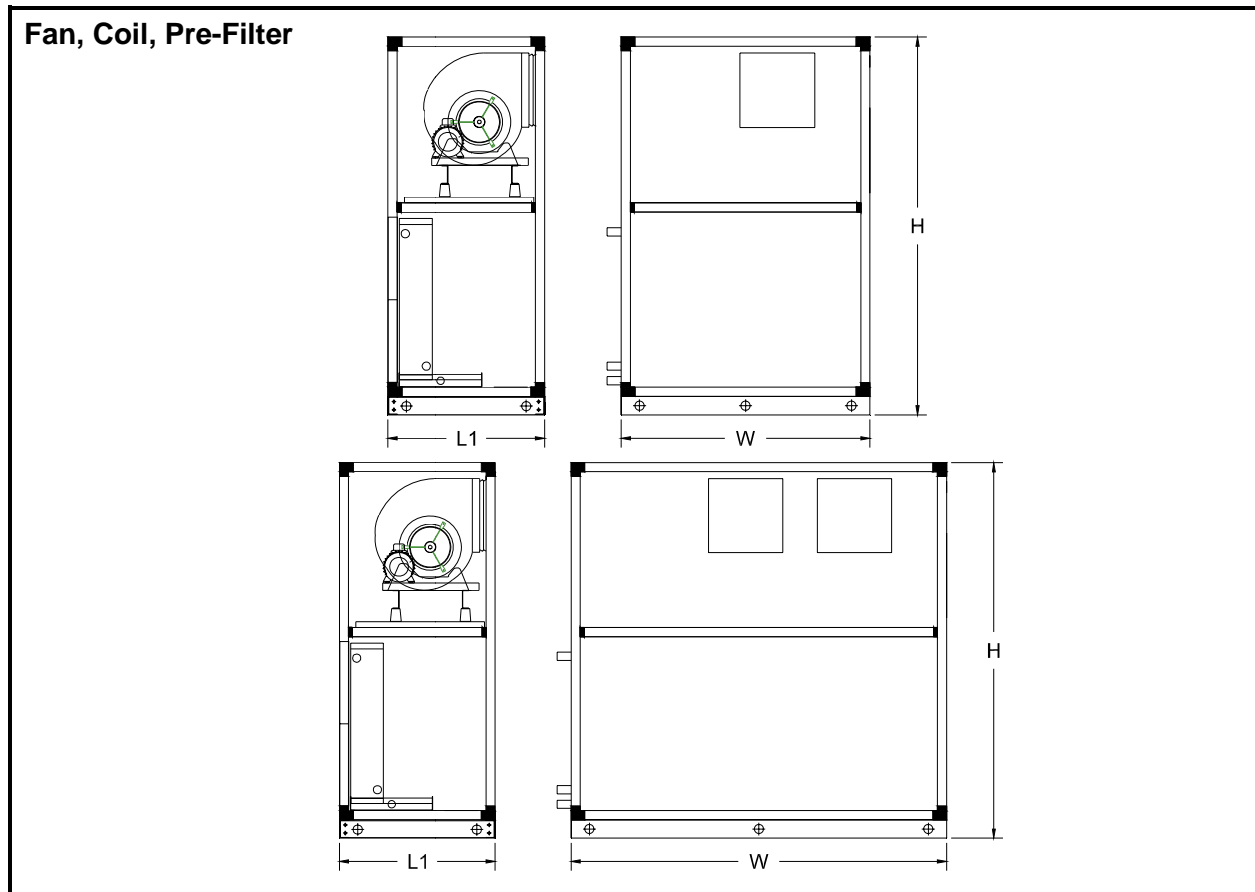


Model Code	Air Flow CFM	Coil Size TH FL		Horizontal Unit (Fan (BF/AF/FC) + Coil + Pre-Filter), H3								Horizontal Unit (Fan (EC) + Coil + Pre-Filter), H3								Horizontal Unit (Fan (PF) + Coil + Pre-Filter), H3							
				25mm Casing				45/50mm Casing				25mm Casing				45/50mm Casing				25mm Casing				45/50mm Casing			
				L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	W (mm)	H (mm)
AH012	1200	12	24	1740	-	940	640	1750	-	950	650	2240	-	940	640	2250	-	950	650	2040	-	940	640	2050	-	950	650
AH018	1800	16	28	1740	-	1040	740	1750	-	1050	750	2240	-	1040	740	2250	-	1050	750	2040	-	1040	740	2050	-	1050	750
AH022	2200	18	32	1840	-	1140	840	1850	-	1150	850	2240	-	1140	840	2250	-	1150	850	2140	-	1140	840	2150	-	1150	850
AH030	3000	20	36	1840	-	1240	840	1850	-	1250	850	2240	-	1240	840	2250	-	1250	850	2140	-	1240	840	2150	-	1250	850
AH036	3600	24	36	1940	-	1240	1040	1950	-	1250	1050	2240	-	1240	1040	2250	-	1250	1050	2240	-	1240	1040	2250	-	1250	1050
AH042	4200	26	40	2040	-	1340	1040	2050	-	1350	1050	2240	-	1340	1040	2250	-	1350	1050	2440	-	1340	1040	2450	-	1350	1050
AH048	4800	26	44	2140	-	1440	1040	2150	-	1450	1050	2240	-	1440	1040	2250	-	1450	1050	2440	-	1440	1040	2450	-	1450	1050
AH058	5800	32	44	2240	-	1440	1240	2250	-	1450	1250	2240	-	1440	1240	2250	-	1450	1250	2640	-	1440	1240	2650	-	1450	1250
AH064	6400	32	48	2240	-	1540	1240	2250	-	1550	1250	2240	-	1540	1240	2250	-	1550	1250	2640	-	1540	1240	2650	-	1550	1250
AH075	7500	34	52	2240	-	1640	1340	2250	-	1650	1350	2240	-	1640	1340	2250	-	1650	1350	2740	-	1640	1340	2750	-	1650	1350
AH090	9000	38	56	2340	-	1740	1440	2350	-	1750	1450	2240	-	1740	1440	2250	-	1750	1450	2740	-	1740	1440	2750	-	1750	1450
AH100	10000	40	60	2340	-	1840	1540	2350	-	1850	1550	2240	-	1840	1540	2250	-	1850	1550	2840	-	1840	1540	2850	-	1850	1550
AH120	12000	42	68	2440	-	2040	1540	2450	-	2050	1550	2240	-	2040	1540	2250	-	2050	1550	2940	-	2040	1540	2950	-	2050	1550
AH135	13500	48	68	2540	-	2040	1740	2550	-	2050	1750	2240	-	2040	1740	2250	-	2050	1750	3040	-	2040	1740	3050	-	2050	1750
AH150	15000	52	68	2740	-	2040	1940	2750	-	2050	1950	2240	-	2040	1940	2250	-	2050	1950	3140	-	2040	1940	3150	-	2050	1950
AH165	16500	56	68	2740	-	2040	2040	2750	-	2050	2050	2240	-	2040	2040	2250	-	2050	2050	3340	-	2040	2040	3350	-	2050	2050
AH180	18000	64	68	2940	-	2040	2240	2950	-	2050	2250	2240	-	2040	2240	2250	-	2050	2250	3340	-	2040	2240	3350	-	2050	2250
AH195	19500	64	72	1340	1540	2140	2240	1350	1550	2150	2250	2240	-	2140	2240	2250	-	2150	2250	2040	1540	2140	2240	2050	1550	2150	2250
AH210	21000	64	80	1340	1540	2340	2240	1350	1550	2350	2250	2240	-	2340	2240	2250	-	2350	2250	2040	1540	2340	2240	2050	1550	2350	2250
AH240	24000	64	88	1440	1540	2540	2240	1450	1550	2550	2250	2240	-	2540	2240	2250	-	2550	2250	2240	1540	2540	2240	2250	1550	2550	2250
AH270	27000	64	100	1440	1540	2840	2240	1450	1550	2850	2250	2240	-	2840	2240	2250	-	2850	2250	2240	1540	2840	2240	2250	1550	2850	2250
AH300	30000	64	110	1640	1540	3140	2240	1650	1550	3150	2250	2240	-	3140	2240	2250	-	3150	2250	2240	1540	3140	2240	2250	1550	3150	2250
AH360	36000	64	132	1840	1540	3740	2240	1850	1550	3750	2250	2240	-	3740	2240	2250	-	3750	2250	2240	1540	3740	2240	2250	1550	3750	2250

Notes: 1) Height (H) includes the unit base.  
 2) R/H motor and R/H piping shown.  
 3) Unit AH195 to AH360 available in two sections.

# PHYSICAL DIMENSION ECS3 & ESCS3

## VERTICAL TYPE (V1)

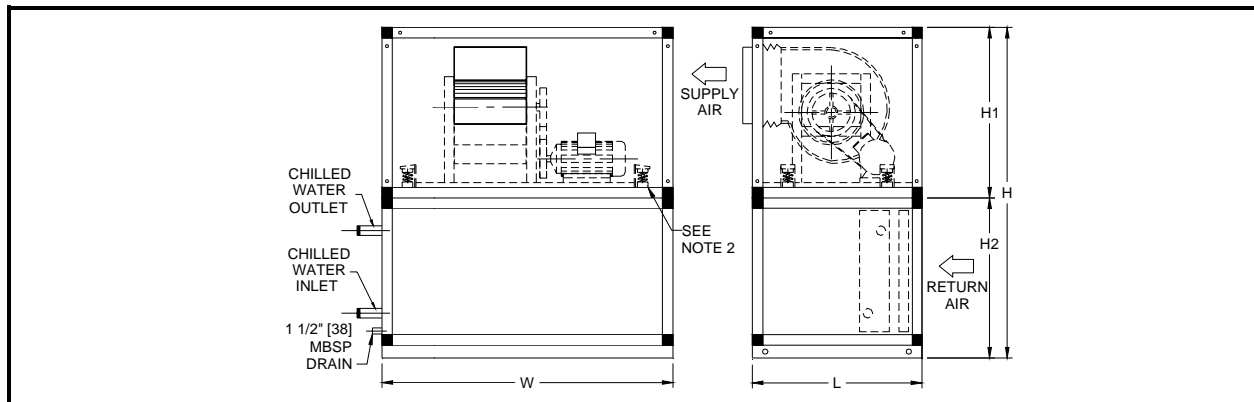


Model Code	Air Flow	Coil Size		Vertical Unit (Fan + Coil + Pre-Filter), V1					
				25mm Casing			45mm Casing		
				L1 (mm)	W (mm)	H (mm)	L1 (mm)	W (mm)	H (mm)
ECS3V	CFM	TH	FL	L1 (mm)	W (mm)	H (mm)	L1 (mm)	W (mm)	H (mm)
AH012	1200	12	24	640	940	1340	650	950	1350
AH018	1800	16	28	640	1040	1540	650	1050	1550
AH022	2200	18	32	740	1140	1740	750	1150	1750
AH030	3000	20	36	740	1240	1740	750	1250	1750
AH036	3600	24	36	740	1240	1840	750	1250	1850
AH042	4200	26	40	840	1340	2040	850	1350	2050
AH048	4800	26	44	840	1440	2040	850	1450	2050
AH058	5800	32	44	940	1440	2340	950	1450	2350
AH064	6400	32	48	940	1540	2340	950	1550	2350
AH075	7500	34	52	940	1640	2440	950	1650	2450
AH090	9000	38	56	940	2040	2440	950	2050	2450
AH100	10000	38	62	940	2240	2440	950	2250	2450
AH120	12000	36	82	940	2440	2440	950	2450	2450
AH135	13500	34	94	940	2740	2440	950	2750	2450
AH150	15000	34	104	940	2940	2440	950	2950	2450
AH165	16500	34	114	940	3240	2440	950	3250	2450
AH180	18000	34	126	940	3540	2440	950	3550	2450
AH195	19500	32	144	1040	4040	2440	1050	4050	2450
AH210	21000	32	154	1040	4240	2440	1050	4250	2450
AH240	24000	34	166	1040	4540	2440	1050	4550	2450

- Notes:
- 1) Height (H) includes the unit base.
  - 2) R/H motor and R/H piping shown.
  - 3) Unit AH090 to AH240 available in twin fans installation.

# PHYSICAL DIMENSION CS3 & SCS3

## VERTICAL TYPE



Model	1" Casing - inches [mm]					2" Casing - inches [mm]				
	H	W	H1	H2	L	H	W	H1	H2	L
12	60 5/8[1540]	33.1/16[840]	-	-	33 1/16[840]	61[1550]	33 7/16[850]	-	-	33 7/16[850]
22	68 1/2[1740]	48 13/16[1240]	-	-	33 1/16[840]	68 7/8[1750]	49 1/4[1250]	-	-	33 7/16[850]
32	76 3/8[1940]	48 13/16[1240]	-	-	33 1/16[840]	76 3/4[1950]	49 1/4[1250]	-	-	33 7/16[850]
40	84 1/4[2140]	56 11/16[1440]	-	-	33 1/16[840]	84 5/8[2150]	57 1/16[1450]	-	-	33 7/16[850]
48	84 1/4[2140]	64 9/16[1640]	-	-	40 15/16[1040]	84 5/8[2150]	65[1650]	-	-	41 3/8[1050]
64	85 7/8[2180]	80 5/16[2040]	40 15/16[1040]	44 7/8[1140]	40 15/16[1040]	86 5/8[2200]	80 3/4[2050]	41 3/8[1050]	45 1/4[1150]	41 3/8[1050]
80	101 1/2[2580]	80 5/16[2040]	48 13/16[1240]	52 3/4[1340]	48 13/16[1240]	102 3/8[2600]	80 3/4[2050]	49 1/4[1250]	53 1/8[1350]	49 1/4[1250]
100	109 7/16[2780]	80 5/16[2040]	48 13/16[1240]	60 5/8[1540]	48 13/16[1240]	110 1/4[2800]	80 3/4[2050]	49 1/4[1250]	61[1550]	49 1/4[1250]
120	117 5/16[2980]	80 5/16[2040]	48 13/16[1240]	68 1/2[1740]	48 13/16[1240]	118 1/8[3000]	80 3/4[2050]	49 1/4[1250]	68 7/8[1750]	49 1/4[1250]
150	133 1/16[3380]	80 5/16[2040]	56 11/16[1440]	76 3/8[1940]	56 11/16[1440]	133 7/8[3400]	80 3/4[2050]	57 1/8[1450]	76 3/4[1950]	57 1/16[1450]
180	NOT AVAILABLE					141 3/4[3600]	104 5/16[2650]	65[1650]	76 3/4[1950]	65[1650]
210						150 1/2[3815]	112 3/16[2850]	65[1650]	85 1/8[2165]	65[1650]
240						150 1/2[3815]	120 1/16[3050]	65[1650]	85 1/8[2165]	65[1650]

- Notes:
- 1) Height (H) includes the unit base.
  - 2) Spring type isolators are for standard fan of model AF64 onwards and FS80 onwards only. The rest are rubber isolator mounting.
  - 3) L/H motor and R/H piping shown.
  - 4) SCS3 series dimension is applicable for 2" casing only.

## STANDARD MODULAR UNIT CONFIGURATION

**1 Fans**

- ☒ Forward Curved
- ☒ Backward Curved
- ☒ Airfoil
- ☒ Plenum Fans

**2 Heat Recovery**

- ☒ Heat Pipe
- ☒ Plate Heat Exchanger
- ☒ Heat Recovery Wheels

**3 Filters**

- ☒ Washable Filter
- ☒ Disposable Filter
- ☒ Bag Filter
- ☒ Cartridge Filter
- ☒ HEPA Filter
- ☒ Carbon Filter
- ☒ Electrostatic Filter

**4 Coil**

- ☒ Chilled Water Coil
- ☒ Direct Expansion Coil
- ☒ Hot Water Coil

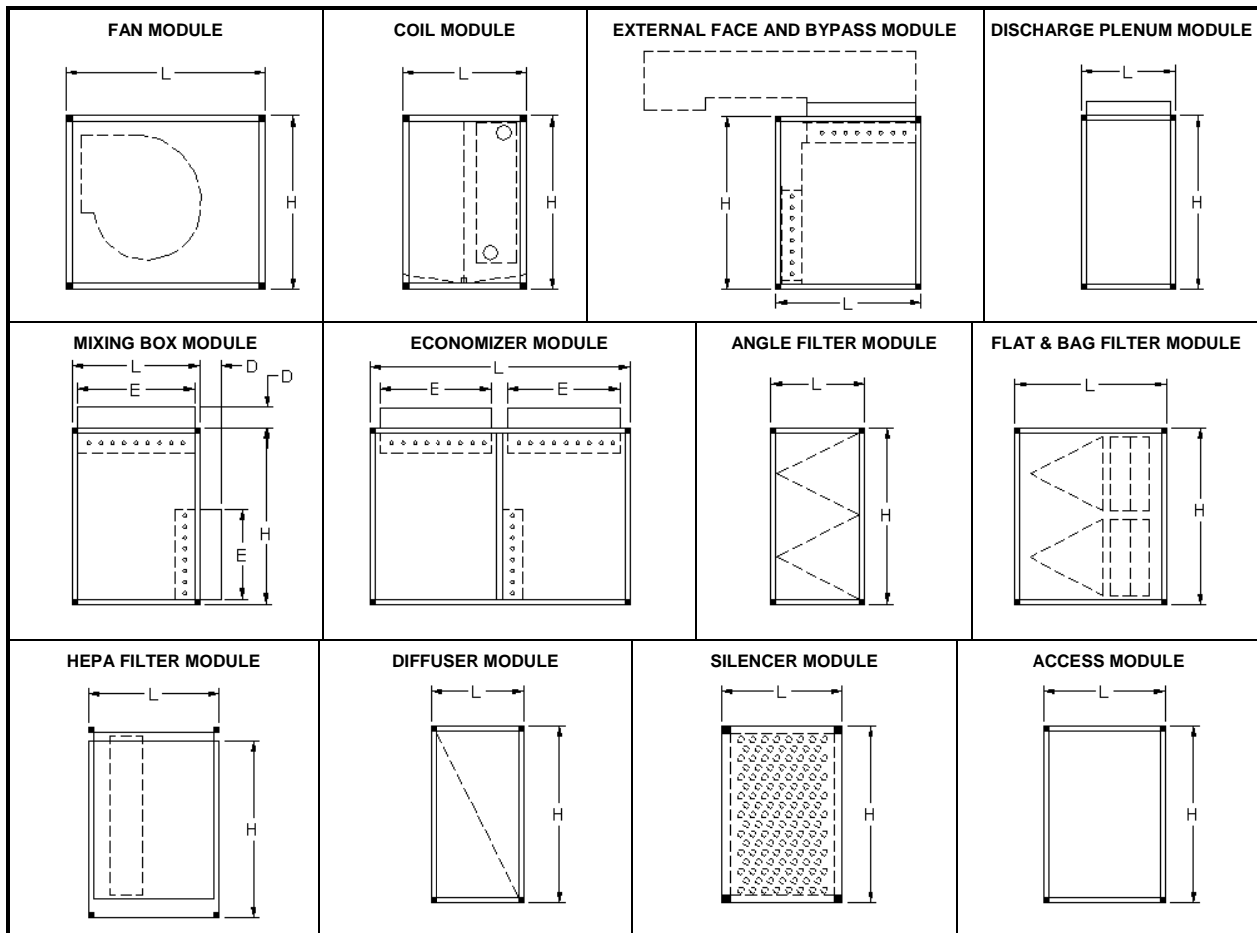
**5 Drain Pan**

- ☒ GI Steel
- ☒ Stainless Steel

Note: Please consult Dunham-Bush representative for other accessories required.

# PHYSICAL DIMENSION CS3 & SCS3

## DIMENSIONS FOR ACCESSORY SECTIONS



Model	Unit Height (H)	Unit Width (W)	Fan	Coil (Long)	Coil (Short)	External Face & Bypass	Mixing Box	Econo-mizer	Flat & Bag / Angle Filter	HEPA Filter	Diffuser	Silencer	Access	Discharge Plenum	Damper / Discharge Plenum Opening Size	
															Width (E)	Length (L)
															Inches [mm]	
Module															Module Length (M)	
12	4	4	4	4	3	2	2	4	3	5	2	5	3	2	8 1/4 [210]	11 13/16 [300]
22	4	6	4	4	3	2	2	4	3	5	2	5	3	2	8 1/4 [210]	19 11/16 [500]
32	5	6	4	4	3	3	3	6	3	5	2	5	3	3	8 1/4 [210]	27 9/16 [700]
40	5	7	4	4	3	3	3	6	3	5	2	5	3	3	8 1/4 [210]	35 7/16 [900]
48	5	8	5	4	3	3	3	6	3	5	2	5	3	3	8 1/4 [210]	39 3/8 [1000]
64	5	10	5	4	3	3	3	6	3	5	2	5	3	3	12 3/16 [310]	39 3/8 [1000]
80	6	10	6	4	3	3	3	6	3	5	3	5	3	3	12 3/16 [310]	47 1/4 [1200]
100	7	10	6	4	3	4	4	8	3	5	3	5	3	4	16 1/8 [410]	47 1/4 [1200]
120	8	10	6	4	3	4	4	8	3	5	4	5	3	4	16 1/8 [410]	63 [1600]
150	9	10	7	4	3	4	4	8	3	5	4	5	3	4	16 1/8 [410]	63 [1600]
180	9	13	8	4	3	5	5	10	3	5	4	5	3	5	20 [510]	63 [1600]
210	10	14	8	4	3	5	5	10	3	5	5	5	3	5	24 [610]	70 7/8 [1800]
240	10	15	8	4	3	5	5	10	3	5	5	5	3	5	24 [610]	78 3/4 [2000]
270	10	17	8	4	3	5	5	10	3	5	5	5	3	5	24 [610]	78 3/4 [2000]
320	11	18	9	4	3	6	6	6+6	3	5	5	5	3	6	28 [710]	78 3/4 [2000]
420	11	20	10	4	3	7	7	7+7	3	5	5	5	3	7	35 13/16 [910]	90 9/16 [2300]
520	11	21	10	6	5	8	8	8+8	3	5	5	5	3	8	43 11/16 [1110]	90 9/16 [2300]

- Notes: 1) To calculate actual unit height, **1 Module = 7 7/8" [200mm]**  
 Unit base = 4" [100mm]  
 eg. 2" Casing For Model 12, Unit Height (H) = (4 x 7 7/8"[200mm]) + 2"[50mm] + 4"[100mm] = 37 1/2"[950mm] (includes unit base)  
 For Model 210, Unit Height (H) = (10 x 7 7/8"[200mm]) + 2"[50mm] + 4 1/2"[115mm] = 85 1/8" [2165mm] (includes unit base)
- 2) To calculate actual unit width and length, **1 Module = 7 7/8" [200mm]**  
 2" Casing, For all Models, Unit Width (W) = (4 x 7 7/8"[200mm]) + 2"[50mm] = 33 1/2"[850mm]
- 3) Maximum shipping length, if:-  
 i) Unit Width <= 10M, Lmax = 15M  
 ii) Unit Width > 10M, Lmax = 10M

# GUIDE SPECIFICATION

This specification describes requirements for a non-modular central air handling unit. The system shall be designed to achieve required air conditions for various application such as commercial and industrial premises, healthcare premises, hotel, etc.

## DESIGN REQUIREMENTS

### (A) Complete Unit Requirement

- ✿ The unit is designed with 25mm / 45mm / 50mmTB type and Horizontal/Vertical orientation
- ✿ The unit is designed for indoor application and to be installed at \_\_\_meter altitude (or 0 meter as default).
- ✿ The unit shall be supplied with \_\_\_/\_\_\_/\_\_\_ (Volt/Phase/Hz) electrical power supply.
- ✿ The system is designed to supply \_\_\_CFM air volume and \_\_\_ in.wg supply fan ESP.
- ✿ Best model to be selected based on calculated coil velocity and filter face velocity.

### (B) Filter Assembly Requirement

- ✿ The unit shall be supplied with 2" disposable / 2" washable primary filter and optional 12" rigid / 15" bag secondary filter.

### (C) Chilled Water (CW) Coil System

- ✿ The system shall have a total cooling capacity of \_\_\_ MBH / \_\_\_kW and a sensible cooling capacity of \_\_\_ MBH / \_\_\_ kW based on an entering air temperature of \_\_\_°F/\_\_\_°C DB and \_\_\_°F/ \_\_\_°C WB.
- ✿ The system shall be supplied with chilled water with an entering water temperature of \_\_\_°F/\_\_\_°C and leaving water temperature \_\_\_°F/\_\_\_°C.
- ✿ The coil shall be supplied with 1/2" / 5/8" tube, aluminium/copper/hydrophilic fin material, standard steel/copper header and MBSP/MNPT/Flanged header connection.

### (D) Direct Expansion (DX) Coil System

- ✿ Only available for CS3 & SCS3 series.
- ✿ The system is designed for the use of R407C / R410A.
- ✿ The system shall have a total cooling capacity of \_\_\_ MBH / \_\_\_kW and a sensible cooling capacity of \_\_\_ MBH / \_\_\_ kW based on an entering air temperature of \_\_\_°F/\_\_\_°C DB and \_\_\_°F/ \_\_\_°C WB.
- ✿ The system shall be designed based on \_\_\_°F / \_\_\_°C DB ambient temperature. For low ambient application, the system shall also be designed to operate at \_\_\_°F/\_\_\_°C DB ambient temperature.
- ✿ The coil shall be supplied with 1/2" / 5/8" tube, aluminium/copper/hydrophilic fin material and copper header connection.

### (E) Fan Assembly Requirement

- ✿ The unit shall be supplied with belt driven and forward curve/ backward curve / airfoil type.
- ✿ The unit is designed with horizontal front / top fan discharge base on requirement.
- ✿ The unit shall be supplied with IE1/EFF2 / IE2/EFF1 motor efficiency and motor location RH side / LH side.

## 1.0 STANDARD FEATURES

### 1.1 Casing

The casing comprises an extruded aluminium frame, joint with nylon corner to form rigid structure and double skin panel construction with PU insulation. All panels and access doors fabricated from standard 0.5mm hot dipped galvanised steel (GI) with polyester powder coated oven baked beige colour paint externally to provide a durable finish and 0.5mm hot dipped galvanised steel (GI) unpainted liner. There is optional thickness: 1.0mm & 1.5mm and material: SS304 and Aluminium steel sheet. Panel available in 25mm and 45mm thick for ECS3 & CS3 Series, 50mm for ESCS3 & SCS3 Series.

### 1.2 Fan Assembly

Fan installed is belt driven or direct driven double inlet double width (DIDW) or direct driven plenum fan. DIDW fan offered forward curve (FC), backward curve (BC) and airfoil (AF) blade type with Class 1/2/3 are available. Fan shall be statically and dynamically balanced and all comply with AMCA Standard. Motor shall be installed with minimum 120% of the fan power absorbed (brake horsepower). Heavy duty V-belt fan drive with cast iron pulleys keyed and secured to the blower shaft shall be provided. Pulley type is taper lock complete with bush and available model are SPZ, SPA, SPB and SPC, balanced up to G6-3. Complete fan assembly shall be installed on the common base with rubber / spring mounted to isolate the vibration.

### 1.3 Motor Assembly

Motor installed is foot mounted, totally enclosed fan cooled (TEFC) with IP55 enclosure rating. There is various voltage available i.e. 380-415V/3Ph/50Hz, 208V/3Ph/60Hz, 230V/3Ph/60Hz, 460V/3Ph/60Hz, 480V/3Ph/60Hz, 575V/3Ph/60Hz and 380V/3Ph/60Hz. Motor efficiency are IE1, IE2 and IE3 (optional) for IEC motor and Premium Efficiency for NEMA motor. Standard motor is class F, and there are optional class H. Motor shall be mounted to an adjustable motor frame and fixed to the fan common base.

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## 1.4 Coil Assembly

The coil assembly available for use of water (CW), direct expansion (DX). The coil shall be assembled with corrugated fin and staggered tube configuration and suitable for 17.6 kg/cm<sup>2</sup> (250 Psi) working pressure. The coil assembly tested under water with 24.6 kg/cm<sup>2</sup> (350 Psi) air pressure. Fin material available are aluminium, copper and hydrophilic type. Tube material is copper and available in size 1/2" (CW & DX) and 5/8" diameter (CW, DX & steam). Header is made of heavy duty black steel pipe (CW) with inlet & outlet at the same end and copper pipe is optional. Connection for steel header are British Standard Male Threaded connection (M BSP), National

Pipe Male Thread (MNPT) or flanged connection, which required. Available fin density is 10, 12, 14 FPI (1/2 tube coil) and 6, 8, 10, 12, 14 FPI (5/8 tube coil). Available coil row is 1, 2, 3, 4, 5, 6, 8, rows (1/2 tube coil) and 1, 2, 3, 4, 5, 6, 8, 10 rows (5/8 tube coil). All standard coil casing is made of 1.5mm hot dipped galvanised steel (GI) and SS304 is optional. There are option of heresite coil coating available. The drain pan is fabricated from 1.5mm painted hot dipped galvanised steel (GI) and SS304 & SS316 are optional.

## 1.5 Filters

The filter assembly available are primary and secondary filter. There are various option of filter offered. Standard primary filter is 50mm thickness with media materials are synthetic washable, disposable or metal (aluminium). Available washable filter arrestance are 75%, 86% and 92% (Eurovent grade EU2, EU3 or EU4 respectively). Metal (aluminium) filter arrestance is 70% (EU2). Disposable filter efficiency is 25%-30% (ASHRAE dust spot efficiency), equivalent to: 90 % arrestance. Standard secondary filter is 4" & 12" depth rigid box type and 15" depth pocket bag type made of synthetic media material. Efficiencies of 60-65%, 80-85%, or 90-95% (ASHRAE dust spot efficiency) available for all types of secondary filter. Carbon filter option are available with 2" and 4" depth if required. Both primary and secondary filter are side loaded. Optional filter gauge with 5% accuracy (minihelic) or 2% accuracy (magnehelic) available if required.

## 1.6 Mixing Box

The mixing box available to mix the return air with fresh air. Standard design comprises flat blade GI damper for the air inlet and aluminium damper (flat or airfoil blade) is optional. There is also actuator option available if required.

## 2.0 STANDARD OPTIONS

### 2.1 Moisture Eliminator

The moisture eliminator is made of aluminium frame

and polypropylene blade. The standard model available is PSG33 (33mm pitch).

### 2.2 Marine Light

The bulkhead fitting for the marine light is weather proof type complete with non-corrosive aluminium alloy pressure die cast body with epoxy finish. Standard part is non UL (standard) and optional UL listed (for US and Latin market).

### 2.3 Viewport

Two models available are OBP25 (for 25mm panel) and OBP40 (for 45mm & 50mm panel). Made of Polycarbonate res.UV and gasket material is TPE (thermoplastic rubber).

### 2.4 Chilled Water Control

The water circuit control available with 2-way valve or 3-way valve for 1", 1 1/4", 1 1/2" and 2" pipe size. Also flanged type for 2 1/2" and 3" pipe size. Actuator for modulating control available with spring return and non-spring return type.

### 2.5 Damper Actuator

The damper actuator available in standard non-spring return, modulating or on/off control. Spring return actuator available as option.

### 2.6 Motor Starter Package

The motor starter package comprises Circuit Breaker, fuse, contactor, on/off switch, terminal block, overload protector and optional disconnect switch and transformer.

### 2.7 VFD Assembly

VFD assembly available as an option to unit drive control for the fan motor. Applicable for 50/60Hz and complied with CE or UL standard, optional bypass and contactor are available if required.

### 2.8 Filter Gauge

Filter gauge offered is diaphragm actuated, round dial type. There are two types available, minihelic (50mm diameter) with 5% accuracy and magnehelic (100mm diameter) with 2% accuracy.

### 2.9 Pressure Differential Switch

Pressure Differential switch provided to interlock with the control circuit. It shall be used to sense airflow & feedback to the controller.

### 2.10 EC fan

Junction box or control box will be automatically including and mounted outside the fan section if EC Fan option is chosen. This box will consist of terminal blocks to accommodate the power and control cable from the multiple fans.

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## 2.11 Evaporator Coil Fins Materials

In lieu of standard aluminium fin, alternative fin material and/or protective coating include,

- Hydrophilic coated aluminium fin
- Copper fin

## 2.12 Stainless Steel Drain Pan

A stainless-steel condensate drain pan shall be provided for the evaporator section in lieu of standard galvanized and painted drain pan.

## 2.13 Motor Termination Box

If no motor starter and VFD are selected, motor termination junction box will be automatically provided. The motor will be wired to this junction box mounted outside the unit which consists of terminal blocks. The outgoing cables from the field supplied motor starter have to be terminated at this junction box.

## 2.14 Disconnect

Isolator or MCCB with handle will be provided to isolate the main incoming power supply at supply fan or return/exhaust fan section. At least a motor starter, VFD or EC Fan is required to be selected to include this option.

## 2.15 VFD (STD)

VFD is available as an option to drive the fan motor. Applicable for 50/60Hz, available with UL compliance or NON-UL version and optional bypass contactor are available if required. The VFD will be installed inside a control box mounted outside the fan section.

## 2.16 UV Light with Door Switch

UV Light is commonly specified to reduce infectious agents in the airflow. UV light is designed base on the unit size if required. Door safety switch available: power to the ballast in control box which is turned the UV light ON when door is closed and turned OFF when door is open.

## 3.0 APPLICABLE OPTIONS FOR CS3 & SCS3 SERIES

### 3.1 Electric Heater

Finned tubular heating element type consists of a 80/20 nickel-chromium coiled resistor wire, centered in a stainless steel finned tube. The tube is filled with magnesium oxide and compressed to ensure rapid heat transfer. The elements will be sized and staged according to the air heating power required, and

mounted in a galvanized steel enclosure. Starter is not included unless otherwise specified.

### 3.2 Electric Heater Starter

Electric Heater have to be pre-selected in order to have this option. Contactor and circuit breaker shall be provided for each stage of electric heaters. The components will be installed inside a control box mounted on the unit.

### 3.3 Electric Heater Termination Box

Electric Heater have to be pre-selected in order to have this option. If no electric heater starter is selected, heater\ termination junction box will be automatically provided. The electric heaters and high temperature limit switch (HTL) located inside the unit is wired to this junction box mounted outside the unit which consists of terminal blocks. The outgoing cables from the field supplied heater starter have to be terminated at this junction box.

### 3.4 Heat Recovery System (Heat Recovery Wheel & Plate Heat Exchanger)

The heat recovery system available for the optimization of energy usage by transferring the heat and moisture from exhaust air to the supply air. Two type available, rotating air recovery unit i.e. heat recovery wheel (HW) which is designed to transfer heat and moisture and static recovery unit i.e. plate heat exchanger (PHE) specially designed to transfer the heat. There are standard or premium HW option available in selection software. If no motor starter is selected, termination junction box will be automatically provided. The motor will be wired to this junction box mounted outside the unit which consists of terminal blocks. The outgoing cables from the field supplied motor starter have to be terminated at this junction box.

### 3.5 Dehumidification System (Heat Pipe)

Heat pipe installed to enhance the air conditioner usage by promote dehumidification to the airflow. Available rows are 1, 2, 3, 4 rows and fin density are 8, 10, 12, 14, 16 FPI. Standard heat pipe is horseshoe type with working fluid R134A. The application of the heat pipe gives significant effect in energy saving.



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## 3.6 Sand Trap Louver

Sand trap louver are designed for removal of dust and sand particles. Made of 1.2mm galvanized steel construction with minimum 25% free area. The louver consists of two layers of vertical blades. The depth of the louver is 100mm. Sand particles trapped in the louver blades shall be discharged at the bottom of the louver face automatically. The louver is powder coated and furnished.

## 3.7 Silencer / Sound Attenuator

The acoustic splitter is consisting of a pre-galvanised steel framework into which is packed acoustic media. The acoustic media in-fill is covered in a glass fibre facing to prevent the erosion of particle into the air stream. As standard, the in-fill is then covered with pre-galvanised perforated sheet steel. The in-fill is mineral fibre which has Class 1 rating for surface spread of flame, as measured to BS476 and a non-combustible rating when exposed to BS476 Part 4

## 3.8 Outdoor Application

There is additional feature offered with the unit for outdoor application. Standard unit equipped with roof panel, air hood for air intake, stainless steel external fastener and RT access door for weatherproofing. The roof panel are pitched to the casing side with 1 ½" overhang to avoid rainwater flowing from roof panel drip onto the panel or door tops. Air hood is furnished for air intake, covered with standard bird screen made of wire mesh or aluminium flat filter available as option. RT access door is designed with double gasket. One layer of gasket is applied to the frame and there is another layer applied directly to the door.

## 3.9 Single point incoming power

By default, supply section and return / exhaust section will have its own incoming power supply termination point (dual point incoming). By adding single point incoming power option, the unit will be ready to accept one single incoming three phase power cables. Interconnecting power and control cables between sections will be bundled inside the unit with one end connected and another end for field termination.

## 3.10 DB Director Controller

The unit will be equipped with a DB Director Controller with the following features,

- The control algorithm and parameters shall be stored in flash memory and EPROM of the controller and shall retain even in the event of power failures, without requiring external backup battery
- User Interface with Display
- Temperature controlled
- Configurable by user
- Alarm status/display
- Analog input/output display
- Digital input/output status
- Remote start/stop input
- General alarm output
- Self-diagnostics
- Security password access with multiple access level for advanced settings
- Unit status display
- Built-in BMS Communication (Bacnet IP, Modbus IP or Modbus RTU comes as a standard in built feature)



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