VERANO®
BY MDL SOLUTIONS
COMPACT LOWER VOLTAGE FAN COILS AND HYDRONIC HEAT | MDLSOLN.COM

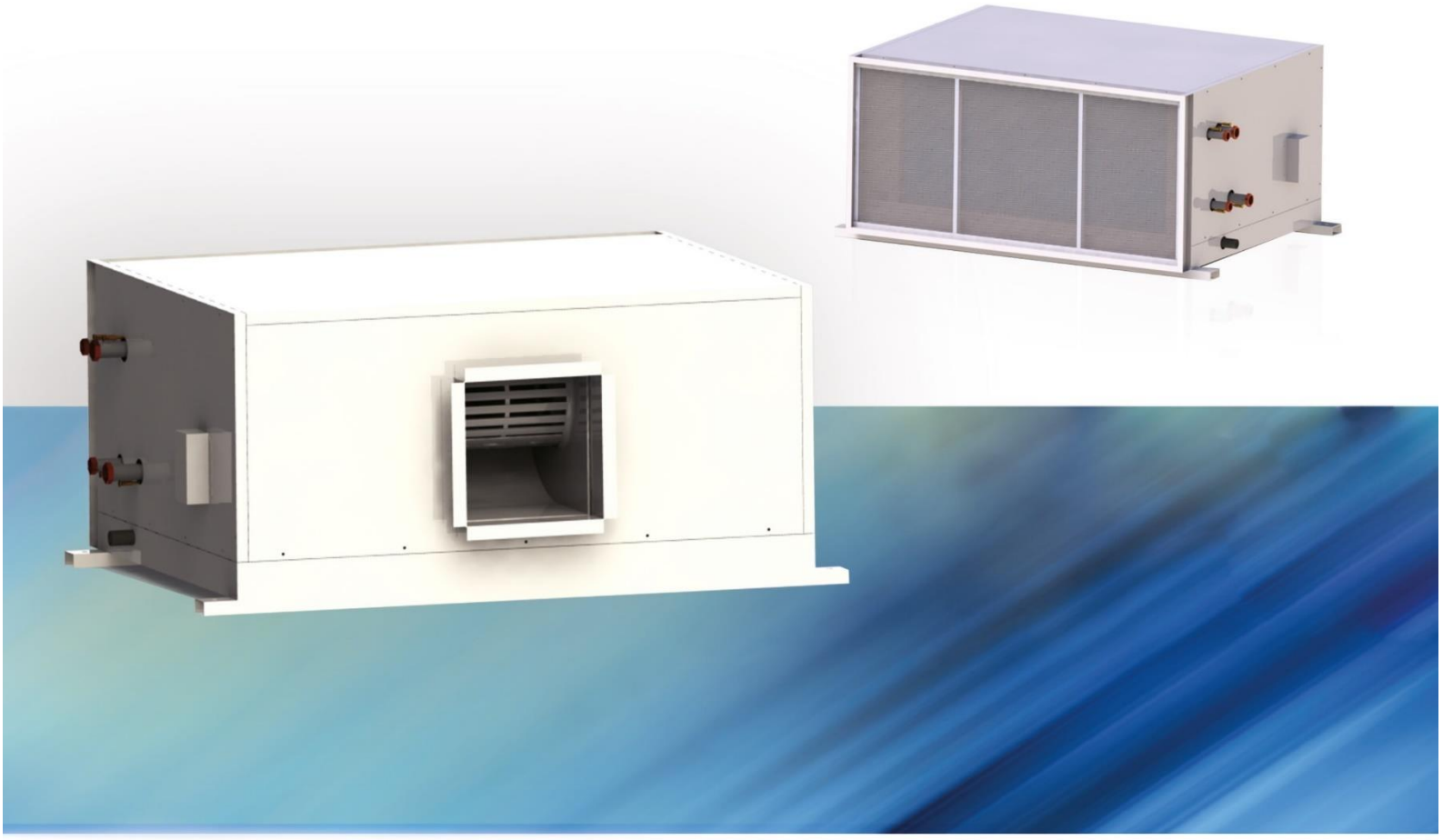
AHRI

M/H-STAT HORIZONTAL MINI AHU SERIES

INSTALLATION, OPERATION & SERVICE MANUAL

HAHU - V / P - AECM MOTOR

V - 2pipe / P - 4pipe



ISO 9001 QUALITY

Every product is manufactured to meet the stringent requirements of the internationally recognized ISO 9001 standard for quality assurance in design, development and production.

ETL SAFETY STANDARDS

All products conform to UL standard for Safety for Heating and Cooling Equipment UL1995 4th Edition, October 14, 2011;

All products conform to CSA standard for Safety for Heating and Cooling Equipment CSA C22.2 No.236-11, 4th Edition, October 14 2011.

WEEE MARK

All products conform to the **"WEEE"** directive to guarantee correct standards of environmental solutions.

World Leading Design and Technology

Equipped with the latest air-conditioning test rooms and manufacturing technology, we produce over 50,000 fan coil units each year, all conforming to the highest international standards of quality and safety.

The Highest Standards of Manufacturing

In order to guarantee the very highest standards and performance, we manage every stage in the manufacturing of our products. Throughout the production process we maintain strict control, starting with our extensive resources in research and development through to the design and manufacture of almost every individual component, from molded plastics to the assembly of units and controllers.

Quality Controlled from Start to Finish

Our highly trained staff and strict quality control methods enable us to produce products with an exceptional reputation for reliability and efficiency, maintained over many years. As well as full CE certification and ISO 9001, several products have UL/ ETL safety approval in the USA and Canada, Eurovent performance and sound certification as well as ROHS compliance for Europe, giving you the confidence of knowing our company is the right choice when selecting fan coil units.

ALWAYS MAKE SURE THIS MANUAL REMAINS WITH THE UNIT. READ THIS MANUAL BEFORE PERFORMING ANY OPERATION ON THE UNIT.

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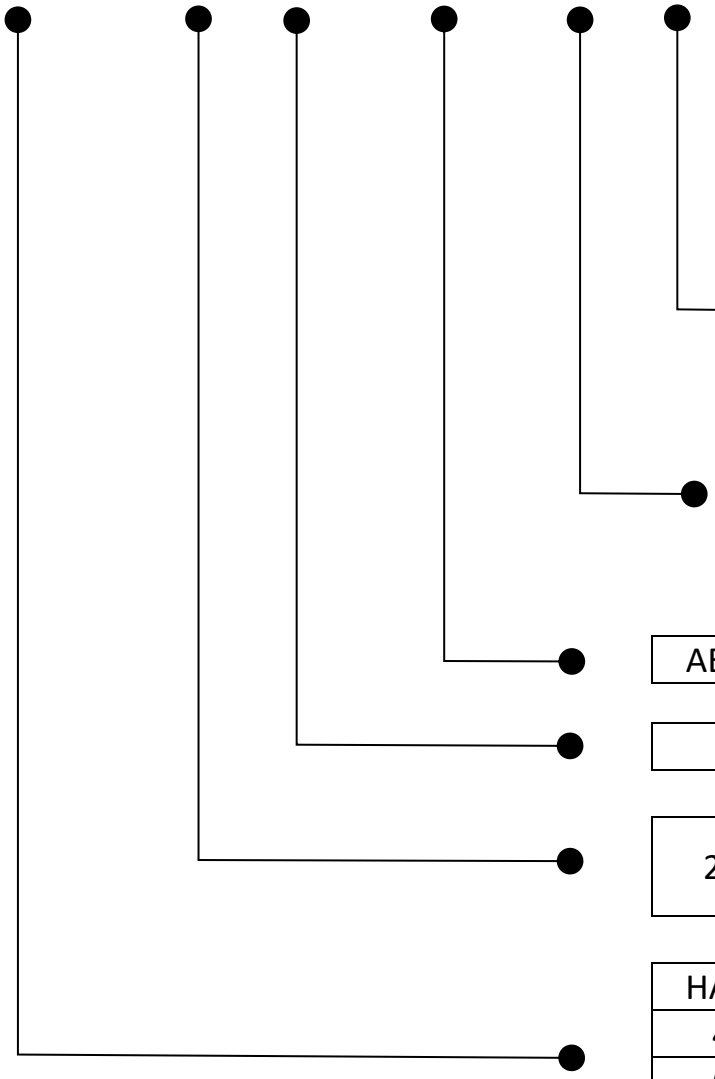
Model Code Nomenclature

HAHU(4R) -200 -X -AECM -VW -LS



LS	Left Side
RS	Right Side

P	4-Pipe
V	2-Pipe
S	Complete Function Control
W	Flexible Function Control

AECM	EC motor configuration

X	220V/1Ph/60Hz

200	Unit Sizes. See General Specification Section A for cooling and heating capacities

HAHU	Horizontal Air Handling Unit
4R	2 pipes 4 rows
6R	2 pipes 6 rows
4+2R	4 pipes with 4 rows cooling and 2 rows heating

A. Technical Data

A.1. General Description

HAHU unit is an ideal air handling terminal unit for suspended ceiling installation and suitable for ducted air distribution. It is constructed of sandwich panels to achieve low noise level during operation. HAHU air handling unit is shipped completely assembled and motor wiring is introduced into the control box to reduce on-site installation time and manpower. Every unit is thoroughly inspected and tested to clear up potential problems during startup. The unit contains side panels that provide easy access to fans, motors and filters.

FRAMEWORK

A frameless structure is used. The panel is integrated folding steel structure and tested to ensure that there is no air leakage.

CASING

Casing is double skinned and basically consists of two panels with internal insulation. Each panel is 1" thick. The inner and outer panels are made of plane galvanized steel and pre-coated galvanized steel. The insulation consists of a high-pressure PU foam sandwiched in between to reinforce the panel.

FILTER

Filter is washable, double-layer acrylic nylon with aluminum frame. G4 (Merv 8) or F8 (Merv 14) filter is optional.

COOLING COIL

The Cooling Coil is standard Cu/Al 3/8" OD. The manifolds are made of steel with threaded connections. The Cooling Coil is provided with manual Air-Vent valve. The aluminum fins are pre-coated for protection by hydrophilic blue fin process. Coils are tested at 435 PSI and recommended operating at no more than 232 PSI.

DRAIN PAN

Drain pan is made of single wall painting steel with 3/16" insulation on outer wall. The drain pan extends the full length and width of the coil and is sloped for positive drainage and includes 3/4" male pipe threaded galvanized drain connector.

FAN SECTION

Fans are mainly constructed of housing, impeller, mounting feet, and DC motor. The housing is made of hot-dip galvanized steel. The side panel includes inlet cones whose inlet conditions are designed for optimum aerodynamics. The scroll is fixed on the side panel by spot welding. The wheel is made of hot-dip galvanized steel. The forward curved blades feature an advanced aerodynamic design for maximum efficiency and minimum noise level. The impeller is fixed on the center plate and on the end ring with riveting compression. The impeller is designed for maximum strength and can withstand continuous operation with maximum power. All impellers and motor are fully balanced according to ANSI/AMCA-204 standard. The mounting feet are made of galvanized steel sheet with unique technical to ensure adequate strength. HAHU fans are equipped with YZWWSL external rotor BLDC motor. The motor consists of motor body and BLDC driver, controlled by 0~10VDC or Modbus RS485. This new designed motor significantly reduces motor torque fluctuation, vibration and noise resulting in high efficiency, reliability and long-life operation.

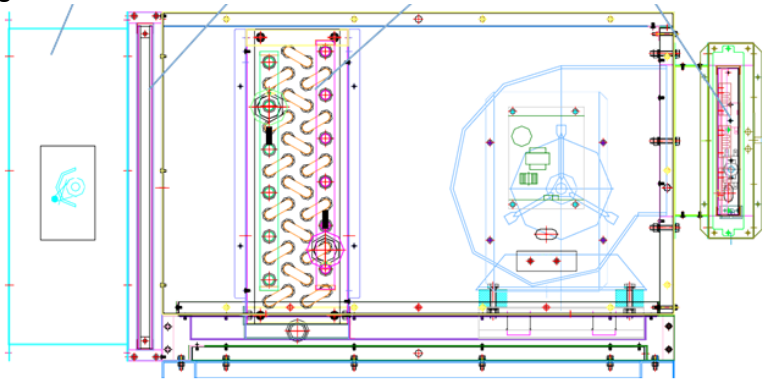
CONTROL SYSTEM (W4 type)

A 0~10VDC motor modulating signal is received from thermostat which is powered by R and C or by indoor room terminals Vsp and GND. If the input signal is greater than 2VDC, the unit is turned on. If the control signal is lower than 1.5VDC, the unit is off. Motor speed depends on input signal. Motor RPM can be set from 300~1500. The unit is equipped with a 40VA 240~24/12VAC transformer as standard which supplies power input to thermostat and other devices.

ACCESSORIES

Optional accessories can be selected: G4 (Merv 8) filter module, Mixing and recirculating chamber, 0~10V Modulating 2-way valve kit, On/Off 2-way valve kit, On/Off 3-way valve kit, Electrical heating module, AC/EC thermostat, AQI control PCB-S5, Complete function PCB-S6, Wired wall pad, Differential pressure transducer.

Mixing and recirculating chamber **Filter** **Coil** **Electric Heater Module**



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A.2. General Specifications

A.2.1. 2-pipe systems

HAHU(4R)-V-AECM 4-row coil 2-pipe with EC motor(s)

		HAHU(4R)-[Size]-V~-AECM			200	300	400	600	800
Unit configuration		Configuration			2 pipes				
		Number of Fan Blowers			1			2	
		Power supply (V/Ph/Hz)			220/1/60				
		Control Type			~W: Flexible function PCB				
Performance Data	**Air**	Air flow	H	CFM	1339	1882	2429	3764	4858
			M		1138	1600	2065	3199	4130
			L		803	1129	1458	2258	2915
		External Static Pressure	H	in. wg	0.5				
			M		0.5				
			L		0.5				
	Cooling	Cooling capacity	H	BTU/h	54088	73377	95657	144596	182100
			M		47794	64937	84962	127964	161741
			L		36357	49362	64616	97272	123008
		Sensible cooling capacity	H		35966	49326	63881	95903	122522
			M		31558	43195	56096	84858	107592
			L		23625	32437	42196	63723	80931
	Heating	Heating capacity	H	BTU/h	84082	114068	148703	224780	283083
			M		74299	100948	132078	198926	251434
			L		56519	76736	100449	151214	191222
		Max. EH capacity		kW	4.5	6	7.5	9	9
	Sound	Sound pressure		dB(A)	70	75	77	78	80
		Sound power			79	84	86	87	89
	Electrical	Power		W	412	650	765	1300	1530
		Current		A	1.63	2.17	2.17	4.34	4.34
	Hydraulic	Cooling Water Flow Rate	H	GPM	10.7	14.5	18.9	28.6	36
			M		9.44	12.8	16.8	25.3	31.9
			L		7.18	9.75	12.8	19.2	24.3
		Cooling Pressure Drop	H	Ft. wg.	6.3	4.0	7.2	16.4	12.8
			M		5.1	3.3	5.9	13.3	10.4
			L		3.2	2.1	3.7	8.4	6.5
		Heating Water Flow Rate		GPM	Same As "Cooling Water Flow Rate"				
		Heating Pressure Drop	H	Ft. wg.	5.7	3.6	6.4	14.8	11.5
			M		4.6	3.0	5.3	12	9.4
			L		2.9	1.9	3.3	7.5	5.9
		Water content		Gallons	1.6	2.0	2.4	2.8	3.3
Construction and Packing Data		Water Connections	In	inch	NPT 1 1/4”				
			Out						
		Condensate Drainage Connection		inch	1”				
		Dimensions	L	inch	50 3/8	58 1/4	66 1/8	74	85 13/16
			W		40 9/16				
			H		25 3/16				

Remarks:

a. Cooling conditions:
Air temperature: 80 °F DB /67 °F WB.
Water inlet/outlet: 45/55 °F.

b. Heating conditions:
Air temperature: 70 °F.
Water inlet temperature: 140 °F.
Water flow same as cooling model.

All dimensions are approximate within 1/16 of an inch of those indicated.

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HAHU(6R)-V-AECM 6-row coil 2-pipe with EC motor(s)

		HAHU(6R)-[Size]-V~-AECM			200	300	400	600	800
Unit configuration		Configuration			2 pipes				
		Number of Fan Blowers			1			2	
		Power supply (V/Ph/Hz)			220/1/60				
		Control Type			~W: Flexible function PCB				
Performance Data	**Air**	Air flow	H	CFM	1209	1789	2341	3577	4683
			M		1028	1520	1990	3041	3980
			L		726	1073	1405	2146	2810
		External Static Pressure	H	in. wg	0.5				
			M		0.5				
			L		0.5				
	Cooling	Total Cooling capacity	H	BTU/h	54859	80713	107061	148861	198866
			M		48298	71490	94692	131850	175889
			L		37057	54639	72085	100771	133898
		Sensible cooling capacity	H		35709	52622	69539	98948	131553
			M		31064	46057	60761	86604	114946
			L		23587	34840	45786	65512	86616
	Heating	Heating capacity	H	BTU/h	85280	125472	166432	231410	309146
			M		75081	111134	147203	204966	273428
			L		57606	84938	112060	156653	208150
		Max. EH capacity		kW	4.5	6	7.5	9	9
	Sound	Sound pressure		dB(A)	70	75	77	78	80
		Sound power			79	84	86	87	89
	Electrical	Power		W	412	650	765	1300	1530
		Current		A	1.63	2.17	2.17	4.34	4.34
	Hydraulic	Cooling Water Flow Rate	H	GPM	10.8	15.9	21.1	29.4	39.3
			M		9.54	14.1	18.7	26	34.7
			L		7.32	10.8	14.2	19.9	26.4
		Cooling Pressure Drop	H	Ft. wg.	3.2	7.2	13.2	3.9	7.3
			M		2.6	5.8	10.7	3.1	6.0
			L		1.7	3.7	6.7	2.0	3.7
		Heating Water Flow Rate		GPM	Same As "Cooling Water Flow Rate"				
		Heating Pressure Drop	H	Ft. wg.	2.9	6.5	11.8	3.5	6.6
			M		2.3	5.3	9.6	2.8	5.4
			L		1.5	3.3	6.0	1.8	3.4
		Water content		Gallons	2.4	3.0	3.6	4.2	5.0
Construction and Packing Data		Water Connections	In	Inch	NPT 1 1/4”				
			Out						
		Condensate Drainage Connection		inch	1”				
		Dimensions	L	inch	50 3/8	58 1/4	66 1/8	74	85 13/16
			W		40 9/16				
			H		25 3/16				

Remarks:

a. Cooling conditions:
Air temperature: 80 °F DB /67 °F WB.
Water inlet/outlet: 45/55 °F.

b. Heating conditions:
Air temperature: 70 °F.
Water inlet temperature: 140 °F.
Water flow same as cooling model.

All dimensions are approximate within 1/16 of an inch of those indicated.

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A.2.2. 4-pipe Systems

HAHU(4+2R)-P-AECM 4-row cooling coil and 2-row heating coil 4-pipe with EC motor(s)

		HAHU(4+2R)-[Size]-P~-AECM			200	300	400	600	800
Unit configuration		Configuration			4 pipes				
		Number of Fan Blowers			1			2	
		Power supply (V/Ph/Hz)			220/1/60				
		Control Type			~W: Flexible function PCB				
Performance Data	**Air**	Air flow	H	CFM	1339	1882	2429	3764	4858
			M		1138	1600	2065	3199	430
			L		803	1129	1458	2258	2915
		External Static Pressure	H	in. wg	0.5				
			M		0.5				
			L		0.5				
	Cooling	Total Cooling capacity	H	BTU/h	54088	73377	95657	144596	182100
			M		47794	64937	84962	127964	161741
			L		36357	49362	64616	97272	123008
		Sensible cooling capacity	H		35966	49326	63881	96903	122522
			M		31558	43195	56096	84858	107592
			L		23625	32437	42196	63723	80931
	Heating	Heating capacity	H	BTU/h	76725	105471	134486	198076	252457
			M		67742	93013	119172	174679	223710
			L		51720	71167	90438	133653	169771
	Sound	Sound pressure		dB(A)	70	75	77	78	80
		Sound power			79	84	86	87	89
	Electrical	Power input		W	412	650	765	1300	1530
		Current		A	1.63	2.17	2.17	4.34	4.34
	Hydraulic	Cooling Water Flow Rate	H	GPM	10.7	14.5	18.9	28.6	36
			M		9.44	12.8	16.8	25.3	31.9
			L		7.18	9.75	12.8	19.2	24.3
		Cooling Pressure Drop	H	Ft. wg.	6.3	4.0	7.2	16.4	12.8
			M		5.1	3.3	5.9	13.3	10.4
			L		3.2	2.1	3.7	8.4	6.5
		Heating Water Flow Rate	H	GPM	3.82	5.25	6.7	9.87	12.6
			M		3.37	4.63	5.94	8.7	11.1
			L		2.58	3.55	4.51	6.66	8.46
		Heating Pressure Drop	H	Ft. wg.	2.6	1.7	1.3	2.9	1.6
			M		2.1	1.3	1.1	2.3	1.3
			L		1.3	0.9	0.7	1.5	0.8
		Cooling Water Content		Gallons	1.6	2.0	2.4	2.8	3.3
		Heating Water Content			0.8	1.0	1.2	1.4	1.7
Construction and Packing Data		Cooling Water Connections	In	inch	NPT 1 1/4”				
			Out						
		Heating Water Connections	In		NPT 1”				
			Out						
		Condensate Drainage Connection		inch	1”				
		Dimensions	L	inch	50 3/8	58 1/4	66 1/8	74	85 13/16
			W		40 9/16				
			H		25 3/16				

Remarks:

a. Cooling conditions:
Air temperature: 80 °F DB /67 °F WB.
Water inlet/outlet: 45/55 °F.

b. Heating conditions:
Air temperature: 70 °F.
Water inlet/ outlet temperature: 180/140 °F.

All dimensions are approximate within 1/16 of an inch of those indicated.

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A.3. Sound Data

Model		HAHU-200-AECM							
Speed		800 RPM	900 RPM	1000 RPM	1100 RPM	1200 RPM	1300 RPM	1400 RPM	1500 RPM
Sound Power dB(A)		**53.6**	**57.3**	**64.4**	**68.7**	**71.3**	**70.7**	**70.5**	**71.3**
Sound Power in 1/3 Octave-bands under ESP:120Pa (dB)	20 Hz	14.4	9.1	13.0	12.5	23.7	15.0	17.2	14.4
	25 Hz	13.0	12.9	12.5	14.4	19.2	15.4	15.0	16.1
	31.5 Hz	14.0	10.8	21.0	23.1	25.3	19.6	20.4	22.9
	40 Hz	17.3	23.7	21.2	24.6	27.8	25.7	27.4	23.9
	50 Hz	26.9	30.7	32.0	31.0	40.2	33.5	37.5	30.2
	63 Hz	29.8	34.2	38.0	41.2	44.7	40.6	42.6	41.6
	80 Hz	33.2	40.0	40.8	43.5	43.0	45.3	45.3	47.1
	100 Hz	31.2	37.0	39.5	42.8	46.4	45.2	45.0	41.4
	125 Hz	31.1	36.1	42.1	42.6	45.4	45.1	46.1	46.5
	160 Hz	39.7	39.7	45.2	47.5	49.9	50.5	50.0	48.8
	200 Hz	40.5	42.4	50.7	53.7	54.9	54.3	56.5	55.3
	250 Hz	39.1	42.7	50.0	54.8	57.0	57.2	56.0	55.5
	315 Hz	44.7	43.4	51.7	57.6	62.2	60.2	58.2	59.8
	400 Hz	41.3	43.6	49.3	55.2	57.1	55.8	55.2	56.6
	500 Hz	43.8	44.8	49.9	56.1	58.2	56.6	57.3	56.9
	630 Hz	48.4	50.3	55.2	60.5	61.4	61.1	60.9	61.5
	800 Hz	46.2	46.4	53.1	57.7	59.7	59.7	59.5	60.5
	1000 Hz	45.9	46.9	54.4	58.1	61.5	61.1	61.0	61.4
	1250 Hz	44.6	46.2	54.2	57.9	62.1	60.5	60.4	61.9
	1600Hz	42.6	46.2	54.4	57.5	60.0	59.6	59.2	61.2
	2000 Hz	42.6	45.7	53.2	57.1	59.9	59.5	59.0	60.2
	2500 Hz	40.9	44.3	53.7	57.6	60.5	60.0	59.5	60.3
	3150 Hz	37.9	41.9	52.1	56.8	60.0	59.2	59.5	59.5
	4000 Hz	35.1	38.3	48.6	53.9	57.5	56.8	56.8	57.2
	5000 Hz	29.2	32.8	43.5	48.5	52.7	51.8	51.5	53.2
	6300 Hz	26.2	31.6	41.9	46.7	51.0	50.5	50.1	50.9
	8000 Hz	21.6	27.6	36.8	42.5	46.7	46.0	45.9	46.4
	10000 Hz	16.4	23.8	30.8	35.9	39.9	39.2	39.4	39.9
	12500 Hz	12.0	19.7	25.8	29.7	34.2	33.3	33.2	34.1
	16000 Hz	16.7	21.7	19.8	22.6	25.9	25.3	24.9	27.3

Model		HAHU-300-AECM							
Speed		800 RPM	900 RPM	1000 RPM	1100 RPM	1200 RPM	1300 RPM	1350 RPM	1400 RPM
Sound Power dB(A)		**56.6**	**59.9**	**67.7**	**72.6**	**75.2**	**74.2**	**74.1**	**74.3**
Sound Power in 1/3 Octave-bands under ESP:120Pa (dB)	20 Hz	18.4	15.1	25.9	27.9	19.2	29.0	32.7	32.7
	25 Hz	9.9	16.8	19.6	19.6	22.0	24.1	23.4	23.4
	31.5 Hz	19.0	17.7	21.8	27.5	24.8	27.9	30.2	30.2
	40 Hz	21.0	23.3	27.2	28.6	31.4	29.7	32.8	32.8
	50 Hz	26.4	33.8	31.1	32.8	32.1	35.4	41.5	41.5
	63 Hz	30.9	32.6	37.7	40.5	41.0	42.1	41.2	41.2
	80 Hz	37.3	39.6	43.9	44.7	47.6	45.2	49.3	49.3
	100 Hz	35.6	41.8	44.0	49.3	52.4	50.9	53.5	53.5
	125 Hz	39.9	42.2	49.8	52.7	54.6	53.4	55.4	55.4
	160 Hz	40.6	44.6	48.6	54.6	57.8	55.6	54.6	54.6
	200 Hz	44.0	45.3	52.5	60.0	59.6	61.1	61.2	61.2
	250 Hz	44.5	49.1	53.5	58.2	59.5	60.3	58.6	58.6
	315 Hz	46.0	50.0	53.9	59.8	61.3	59.8	60.9	60.9
	400 Hz	45.2	48.3	52.8	58.3	59.8	59.8	59.5	59.5
	500 Hz	44.1	47.6	53.3	57.9	59.7	59.3	59.8	59.8
	630 Hz	44.5	48.7	55.7	59.8	62.2	60.9	61.3	61.3
	800 Hz	51.3	50.4	58.6	63.2	66.1	64.0	64.9	64.9
	1000 Hz	45.6	49.3	58.5	62.7	65.8	64.2	64.2	64.2
	1250 Hz	43.7	48.8	58.4	62.5	66.2	64.7	65.0	65.0
	1600Hz	43.9	49.3	57.7	61.9	65.1	64.0	64.0	64.0
	2000 Hz	42.4	47.0	56.4	61.0	63.9	62.6	62.8	62.8
	2500 Hz	40.7	45.7	56.3	61.2	63.5	62.6	63.1	63.1
	3150 Hz	39.0	43.9	55.5	59.9	63.9	62.2	62.3	62.3
	4000 Hz	35.7	40.4	53.9	58.7	62.3	60.9	60.8	60.8
	5000 Hz	31.3	36.7	50.2	55.7	59.4	57.7	57.8	57.8
	6300 Hz	25.6	31.4	45.3	51.1	54.7	53.4	53.4	53.4
	8000 Hz	19.9	26.5	40.4	46.9	50.8	49.3	49.1	49.1
	10000 Hz	14.4	20.2	34.6	41.9	46.3	44.2	44.2	44.2
	12500 Hz	10.5	14.0	27.8	35.1	39.9	37.6	37.9	37.9
	16000 Hz	20.2	20.3	22.4	26.9	31.2	29.4	29.3	29.3

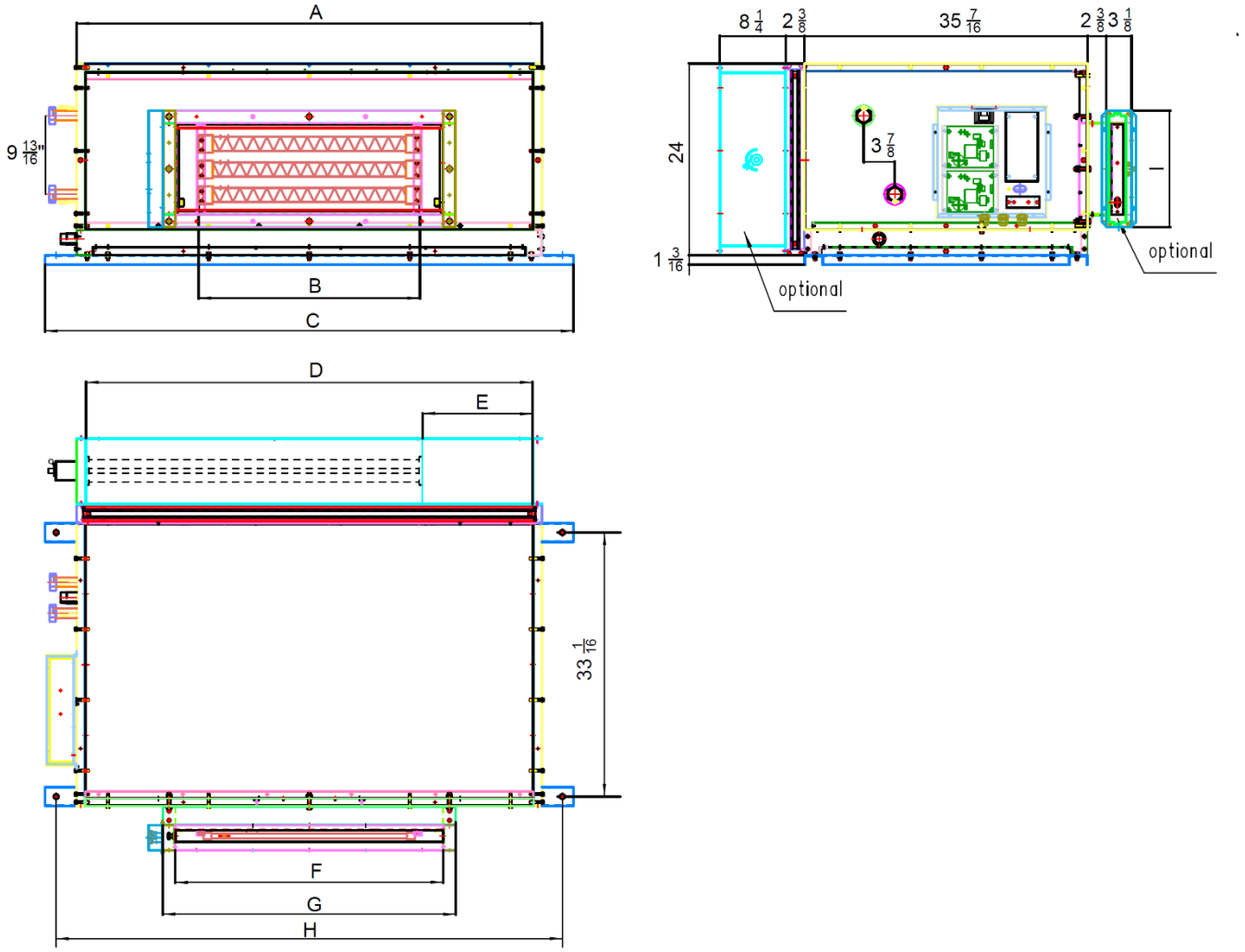
Model		HAHU-400-AECM							
Speed		800 RPM	900 RPM	1000 RPM	1100 RPM	1200 RPM	1300 RPM	1350 RPM	1400 RPM
Sound Power dB(A)		62.1	65.4	73.2	78.1	80.7	79.7	79.6	79.8
Sound Power in 1/3 Octave-bands under ESP:120Pa (dB)	20 Hz	23.9	20.6	31.4	33.4	24.7	34.5	38.2	38.2
	25 Hz	15.4	22.3	25.1	25.1	27.5	29.6	28.9	28.9
	31.5 Hz	24.5	23.2	27.3	33.0	30.3	33.4	35.7	35.7
	40 Hz	26.5	28.8	32.7	34.1	36.9	35.2	38.3	38.3
	50 Hz	31.9	39.3	36.6	38.3	37.6	40.9	47.0	47.0
	63 Hz	36.4	38.1	43.2	46.0	46.5	47.6	46.7	46.7
	80 Hz	42.8	45.1	49.4	50.2	53.1	50.7	54.8	54.8
	100 Hz	41.1	47.3	49.5	54.8	57.9	56.4	59.0	59.0
	125 Hz	45.4	47.7	55.3	58.2	60.1	58.9	60.9	60.9
	160 Hz	46.1	50.1	54.1	60.1	63.3	61.1	60.1	60.1
	200 Hz	49.5	50.8	58.0	65.5	65.1	66.6	66.7	66.7
	250 Hz	50.0	54.6	59.0	63.7	65.0	65.8	64.1	64.1
	315 Hz	51.5	55.5	59.4	65.3	66.8	65.3	66.4	66.4
	400 Hz	50.7	53.8	58.3	63.8	65.3	65.3	65.0	65.0
	500 Hz	49.6	53.1	58.8	63.4	65.2	64.8	65.3	65.3
	630 Hz	50.0	54.2	61.2	65.3	67.7	66.4	66.8	66.8
	800 Hz	56.8	55.9	64.1	68.7	71.6	69.5	70.4	70.4
	1000 Hz	51.1	54.8	64.0	68.2	71.3	69.7	69.7	69.7
	1250 Hz	49.2	54.3	63.9	68.0	71.7	70.2	70.5	70.5
	1600Hz	49.4	54.8	63.2	67.4	70.6	69.5	69.5	69.5
	2000 Hz	47.9	52.5	61.9	66.5	69.4	68.1	68.3	68.3
	2500 Hz	46.2	51.2	61.8	66.7	69.0	68.1	68.6	68.6
	3150 Hz	44.5	49.4	61.0	65.4	69.4	67.7	67.8	67.8
	4000 Hz	41.2	45.9	59.4	64.2	67.8	66.4	66.3	66.3
	5000 Hz	36.8	42.2	55.7	61.2	64.9	63.2	63.3	63.3
	6300 Hz	31.1	36.9	50.8	56.6	60.2	58.9	58.9	58.9
	8000 Hz	25.4	32.0	45.9	52.4	56.3	54.8	54.6	54.6
	10000 Hz	19.9	25.7	40.1	47.4	51.8	49.7	49.7	49.7
	12500 Hz	16.0	19.5	33.3	40.6	45.4	43.1	43.4	43.4
	16000 Hz	25.7	25.8	27.9	32.4	36.7	34.9	34.8	34.8

Model		HAHU-600-AECM							
Speed		800 RPM	900 RPM	1000 RPM	1100 RPM	1200 RPM	1300 RPM	1350 RPM	1400 RPM
Sound Power dB(A)		60.6	63.9	71.7	76.6	79.2	78.2	78.1	78.3
Sound Power in 1/3 Octave-bands under ESP:120Pa (dB)	20 Hz	22.4	19.1	29.9	31.9	23.2	33.0	36.7	36.7
	25 Hz	13.9	20.8	23.6	23.6	26.0	28.1	27.4	27.4
	31.5 Hz	23.0	21.7	25.8	31.5	28.8	31.9	34.2	34.2
	40 Hz	25.0	27.3	31.2	32.6	35.4	33.7	36.8	36.8
	50 Hz	30.4	37.8	35.1	36.8	36.1	39.4	45.5	45.5
	63 Hz	34.9	36.6	41.7	44.5	45.0	46.1	45.2	45.2
	80 Hz	41.3	43.6	47.9	48.7	51.6	49.2	53.3	53.3
	100 Hz	39.6	45.8	48.0	53.3	56.4	54.9	57.5	57.5
	125 Hz	43.9	46.2	53.8	56.7	58.6	57.4	59.4	59.4
	160 Hz	44.6	48.6	52.6	58.6	61.8	59.6	58.6	58.6
	200 Hz	48.0	49.3	56.5	64.0	63.6	65.1	65.2	65.2
	250 Hz	48.5	53.1	57.5	62.2	63.5	64.3	62.6	62.6
	315 Hz	50.0	54.0	57.9	63.8	65.3	63.8	64.9	64.9
	400 Hz	49.2	52.3	56.8	62.3	63.8	63.8	63.5	63.5
	500 Hz	48.1	51.6	57.3	61.9	63.7	63.3	63.8	63.8
	630 Hz	48.5	52.7	59.7	63.8	66.2	64.9	65.3	65.3
	800 Hz	55.3	54.4	62.6	67.2	70.1	68.0	68.9	68.9
	1000 Hz	49.6	53.3	62.5	66.7	69.8	68.2	68.2	68.2
	1250 Hz	47.7	52.8	62.4	66.5	70.2	68.7	69.0	69.0
	1600Hz	47.9	53.3	61.7	65.9	69.1	68.0	68.0	68.0
	2000 Hz	46.4	51.0	60.4	65.0	67.9	66.6	66.8	66.8
	2500 Hz	44.7	49.7	60.3	65.2	67.5	66.6	67.1	67.1
	3150 Hz	43.0	47.9	59.5	63.9	67.9	66.2	66.3	66.3
	4000 Hz	39.7	44.4	57.9	62.7	66.3	64.9	64.8	64.8
	5000 Hz	35.3	40.7	54.2	59.7	63.4	61.7	61.8	61.8
	6300 Hz	29.6	35.4	49.3	55.1	58.7	57.4	57.4	57.4
	8000 Hz	23.9	30.5	44.4	50.9	54.8	53.3	53.1	53.1
	10000 Hz	18.4	24.2	38.6	45.9	50.3	48.2	48.2	48.2
	12500 Hz	14.5	18.0	31.8	39.1	43.9	41.6	41.9	41.9
	16000 Hz	24.2	24.3	26.4	30.9	35.2	33.4	33.3	33.3

Model		HAHU-800-AECM							
Speed		800RPM	900RPM	1000RPM	1100RPM	1200RPM	1300RPM	1350RPM	1400RPM
Sound Power dB(A)		65.1	68.4	76.2	81.1	83.7	82.7	82.6	82.8
Sound Power in 1/3 Octave-bands under ESP:120Pa (dB)	20 Hz	26.9	23.6	34.4	36.4	27.7	37.5	41.2	41.2
	25 Hz	18.4	25.3	28.1	28.1	30.5	32.6	31.9	31.9
	31.5 Hz	27.5	26.2	30.3	36.0	33.3	36.4	38.7	38.7
	40 Hz	29.5	31.8	35.7	37.1	39.9	38.2	41.3	41.3
	50 Hz	34.9	42.3	39.6	41.3	40.6	43.9	50.0	50.0
	63 Hz	39.4	41.1	46.2	49.0	49.5	50.6	49.7	49.7
	80 Hz	45.8	48.1	52.4	53.2	56.1	53.7	57.8	57.8
	100 Hz	44.1	50.3	52.5	57.8	60.9	59.4	62.0	62.0
	125 Hz	48.4	50.7	58.3	61.2	63.1	61.9	63.9	63.9
	160 Hz	49.1	53.1	57.1	63.1	66.3	64.1	63.1	63.1
	200 Hz	52.5	53.8	61.0	68.5	68.1	69.6	69.7	69.7
	250 Hz	53.0	57.6	62.0	66.7	68.0	68.8	67.1	67.1
	315 Hz	54.5	58.5	62.4	68.3	69.8	68.3	69.4	69.4
	400 Hz	53.7	56.8	61.3	66.8	68.3	68.3	68.0	68.0
	500 Hz	52.6	56.1	61.8	66.4	68.2	67.8	68.3	68.3
	630 Hz	53.0	57.2	64.2	68.3	70.7	69.4	69.8	69.8
	800 Hz	59.8	58.9	67.1	71.7	74.6	72.5	73.4	73.4
	1000 Hz	54.1	57.8	67.0	71.2	74.3	72.7	72.7	72.7
	1250 Hz	52.2	57.3	66.9	71.0	74.7	73.2	73.5	73.5
	1600Hz	52.4	57.8	66.2	70.4	73.6	72.5	72.5	72.5
	2000 Hz	50.9	55.5	64.9	69.5	72.4	71.1	71.3	71.3
	2500 Hz	49.2	54.2	64.8	69.7	72.0	71.1	71.6	71.6
	3150 Hz	47.5	52.4	64.0	68.4	72.4	70.7	70.8	70.8
	4000 Hz	44.2	48.9	62.4	67.2	70.8	69.4	69.3	69.3
	5000 Hz	39.8	45.2	58.7	64.2	67.9	66.2	66.3	66.3
	6300 Hz	34.1	39.9	53.8	59.6	63.2	61.9	61.9	61.9
	8000 Hz	28.4	35.0	48.9	55.4	59.3	57.8	57.6	57.6
	10000 Hz	22.9	28.7	43.1	50.4	54.8	52.7	52.7	52.7
	12500 Hz	19.0	22.5	36.3	43.6	48.4	46.1	46.4	46.4
	16000 Hz	28.7	28.8	30.9	35.4	39.7	37.9	37.8	37.8

A.4. Dimension Drawings

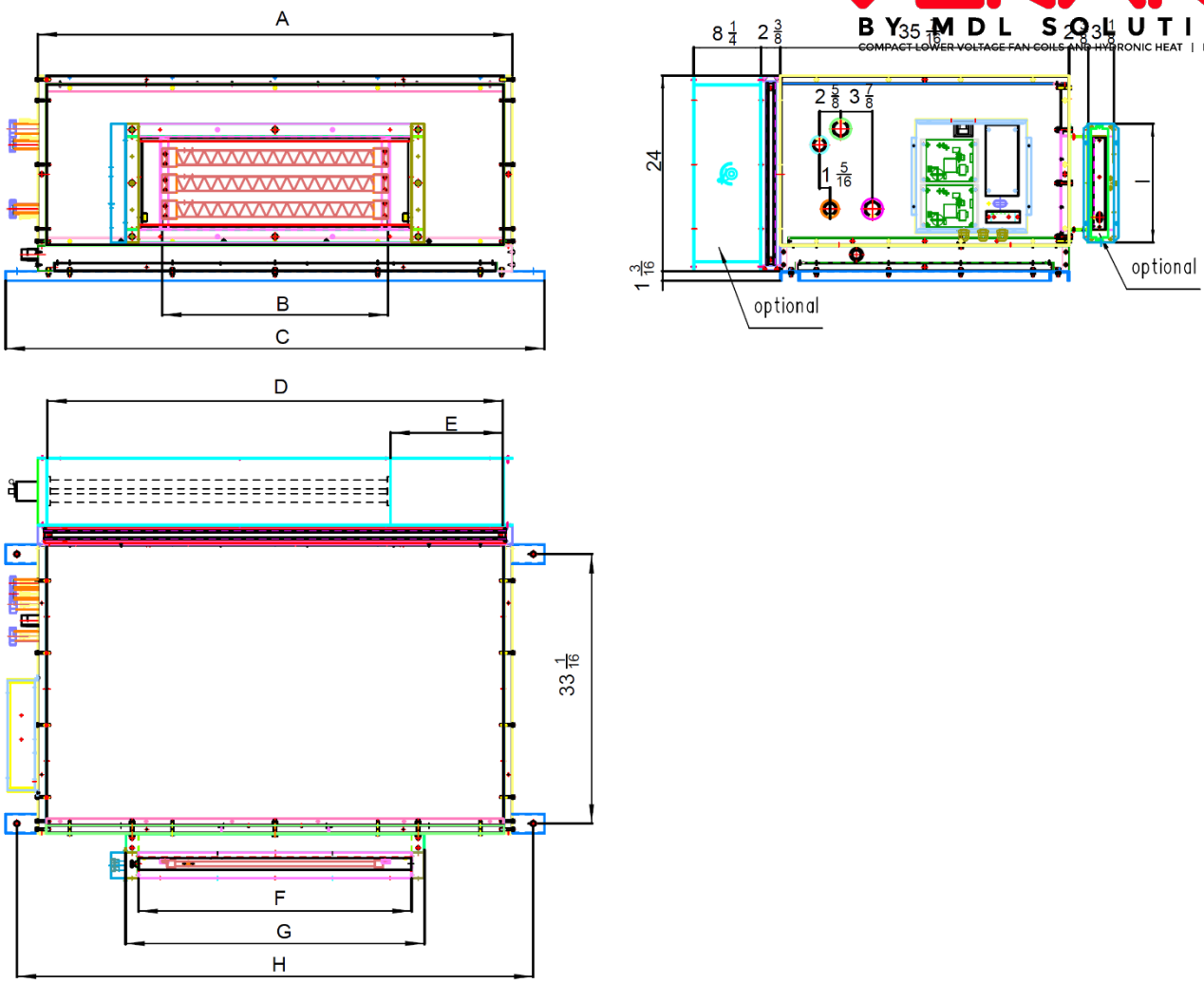
HAHU-V-AECM



Model	A	B	C	D	E	F	G	H	I
200	42 1/2	18 1/2	50 3/8	40 3/16	10 1/16	23 5/8	26 3/4	47 5/8	13 1/4
300	50 3/8	22 3/16	58 1/4	48 1/16	11 13/16	27 9/16	30 11/16	55 1/2	13 7/16
400	58 1/4	27 11/16	66 1/8	55 7/8	13 3/4	33 7/16	36 5/8	63 3/8	14 5/8
600	66 1/8	36 1/8	74	63 3/4	15 3/4	49 3/16	52 3/8	71 1/4	13 7/16
800	77 15/16	36 1/8	85 13/16	75 9/16	18 7/8	53 15/16	57 1/16	83 1/16	14 5/8

All dimensions are approximate within 1/16 of an inch of those indicated.

HAHU-P-AECM



Model	A	B	C	D	E	F	G	H	I
200	42 1/2	18 1/2	50 3/8	40 3/16	10 1/16	23 5/8	26 3/4	47 5/8	13 1/4
300	50 3/8	22 3/16	58 1/4	48 1/16	11 13/16	27 9/16	30 11/16	55 1/2	13 7/16
400	58 1/4	27 11/16	66 1/8	55 7/8	13 3/4	33 7/16	36 5/8	63 3/8	14 5/8
600	66 1/8	36 1/8	74	63 3/4	15 3/4	49 3/16	52 3/8	71 1/4	13 7/16
800	77 15/16	36 1/8	85 13/16	75 9/16	18 7/8	53 15/16	57 1/16	83 1/16	14 5/8

All dimensions are approximate within 1/16 of an inch of those indicated.

B. Installation

B.1. Safety Precautions

- When installing, performing maintenance or servicing Polar Air fan coil units observe the precautions stated in this manual as well as those stated on the labels attached to the unit.
- Ensure all local and national safety codes, laws, regulations, as well as general electrical and mechanical safety guidelines are followed for installation, maintenance and service.
- The appliance is for indoor use only.
- Ensure the correct power supply is provided.
- If the power supply cord is damaged, it must be replaced by qualified personnel.
- Installing and servicing fan coil unit should be performed by qualified service personnel only.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or persons lacking in experience and knowledge of the appliance, unless they have been given supervision or instruction concerning it.
- User of this appliance is responsible for his/her own safety.
- Warranty shall be voided if installation instructions and safety precaution stated in this manual are not observed.
- The unit should only be switched off by using the ON-OFF button on the control interface.

CAUTIONS

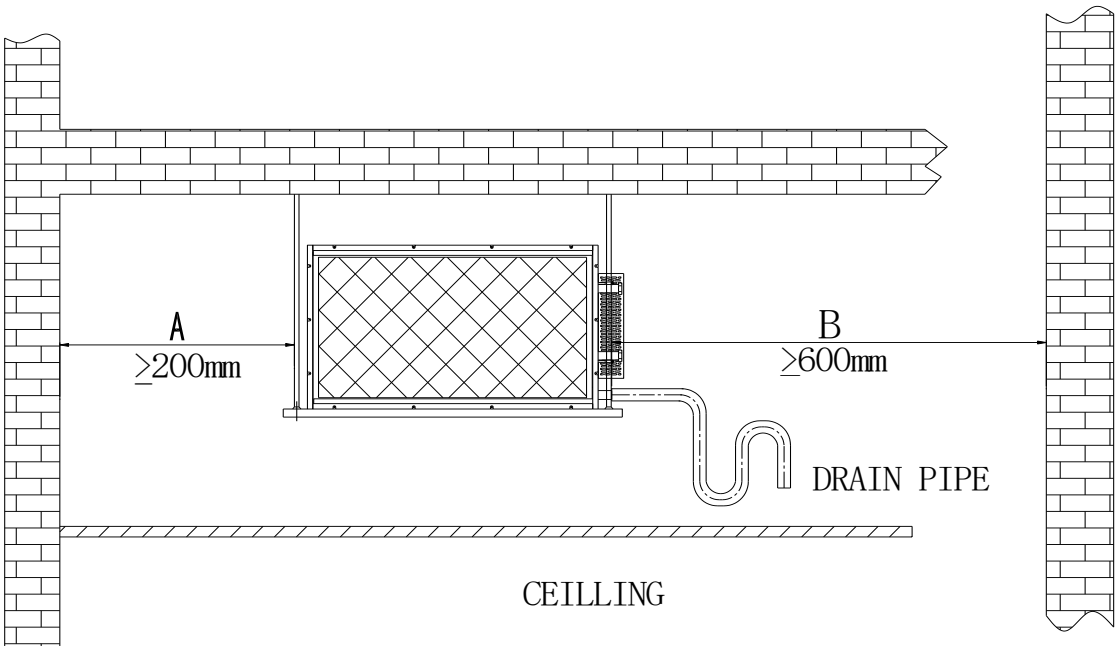
Before any service or maintenance operations turn off the mains electrical supply.

DO NOT turn OFF the main power supply when the unit is operating. Turn off the unit BEFORE turning off the main power

B.2. Location

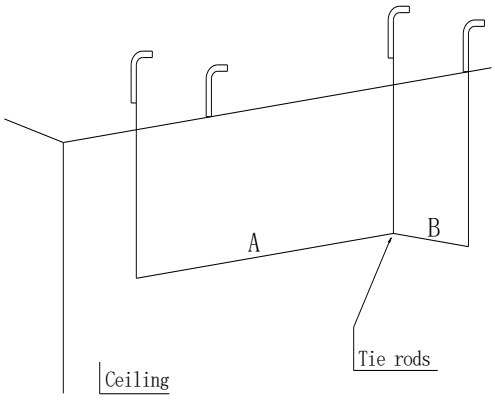
Before installing and running the unit, please check the following:

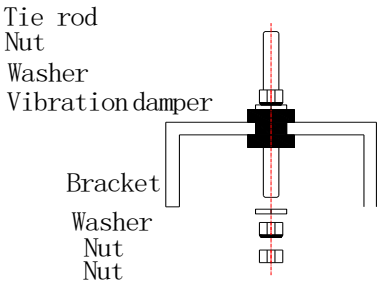
1. There must be enough space for the unit installation and maintenance. Please refer to the below figures for the unit's outlines and dimensions and for the minimum distance between the unit and the obstacle/ any obstructions/ its surroundings.
2. Please ensure there is enough space for piping connections and electrical wiring.
3. Check whether the hanging rods can support the weight of the unit (see specification table for weight of the unit).
4. The unit must be installed horizontally to ensure proper operation and condensate draining.
5. The external static pressure of the ducting must be within the unit's static pressure range.
6. Confirm that the unit has been switched OFF before installing or servicing the unit.

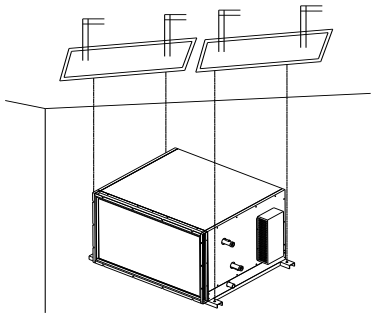


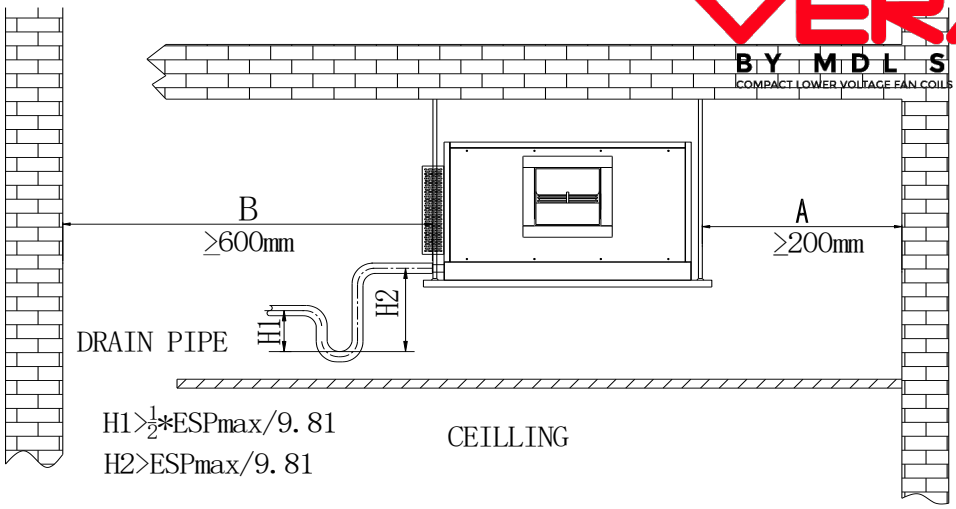
B.3. Concealed Ceiling Installation

1. The unit is designed to be installed in a concealed ceiling. Installation and maintenance should be performed by qualified personnel who are familiar with local codes and regulations and are experienced with this type of appliance.
2. Please refer to the pictures below for installation procedures.



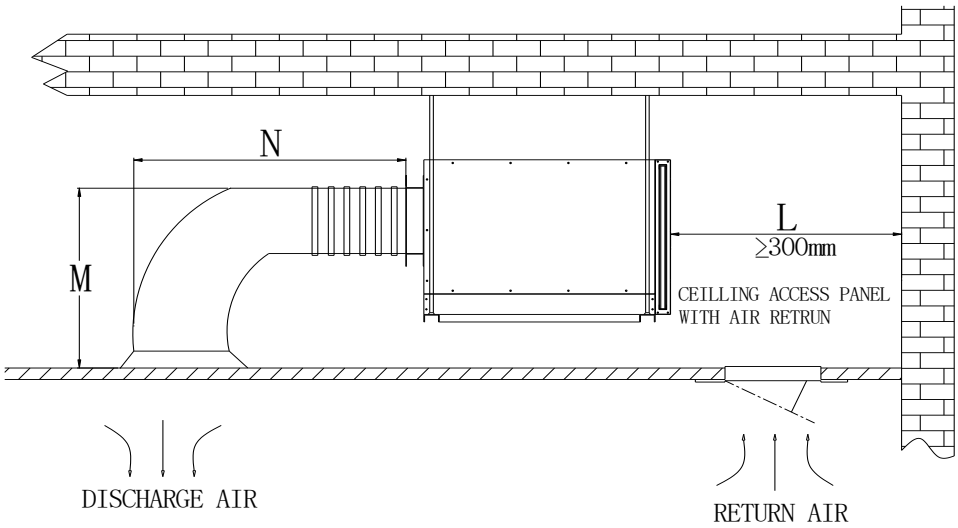






CAUTION

Make sure the top of the unit is level after installation. The drain pan is designed with a slight gradient to facilitate drainage.



CAUTIONS

Dimension M and N are determined by air duct design.
Air duct should be fire-proof. Please refer to concerned country national and local regulation.
Circulatory air pressure drop should be approximately equal to the External Static Pressure.

B.4. Insulation

1. The insulation design and materials should be complying with local and national codes and regulations.
2. Chilled water pipes and all parts on the pipes should be insulated.
3. It is also necessary to insulate the air duct.

B.5. Air Duct Connection

1. Circulatory air pressure drop should be within External Static Pressure.
2. Galvanized steel air ducts are suitable.
3. Make sure there is no leak of air.
4. Air duct should be fire-proof, refer to concerned national and local regulations.

B.6. Pipe Connection

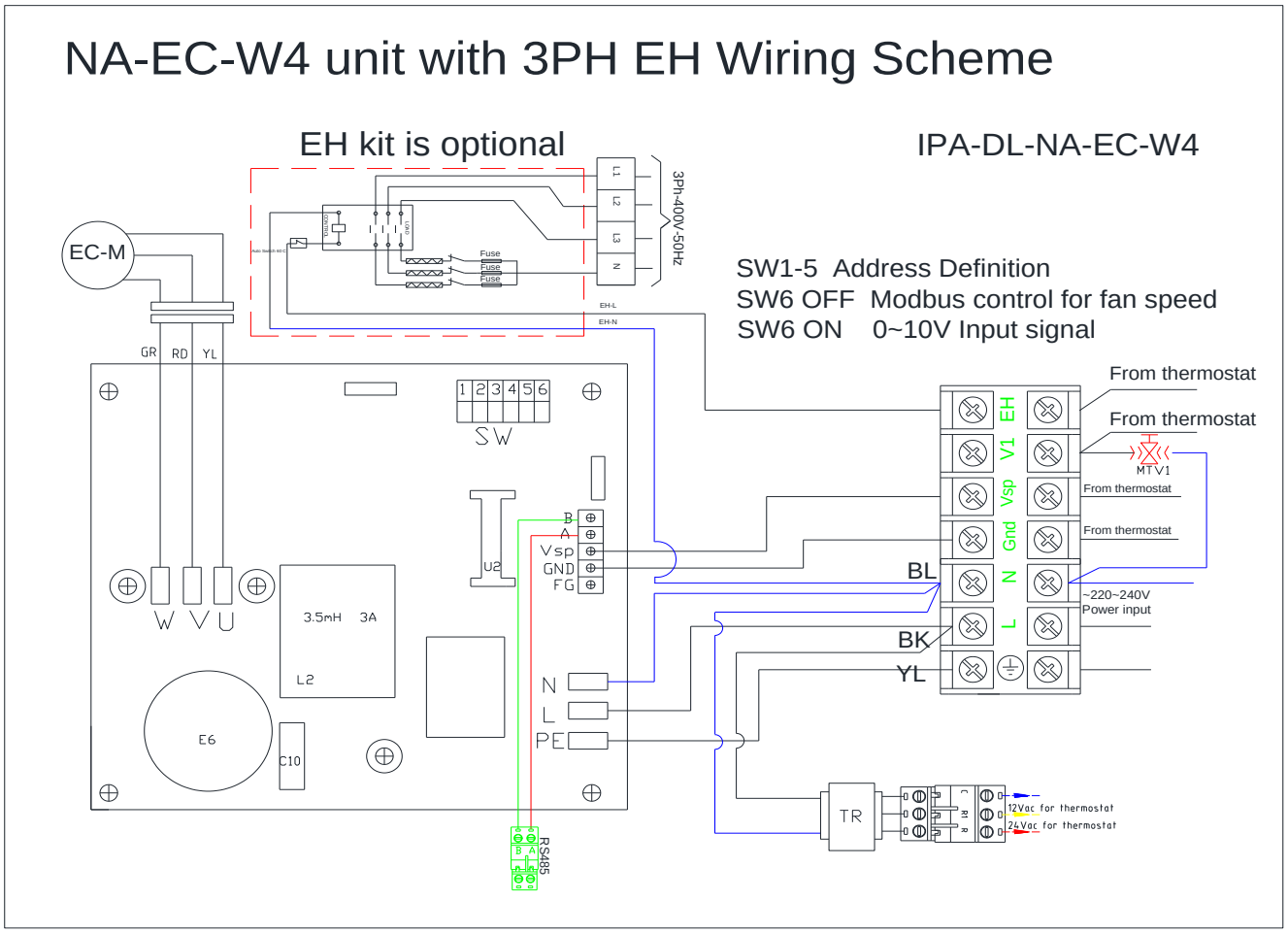
1. Using suitable fittings as water pipe connections with reference to the outline and dimensions.
2. The water inlet is on the bottom while outlet on top.
3. The connection must be concealed with rubberized fabric to avoid leakage.
4. Drain pipe can be PVC or steel.
5. Tightening torque should not be too high when connecting water pipes, in order to avoid brass deformation or water-leakage by torsion split.
6. The suggested slope of the drain pipe is at least 1:50.

CAUTION

When connecting pipe to fan coil unit, do not bend or reposition the coil header for alignment purposes. This could cause a tubing fracture resulting in a water leak when water pressure is applied to the system.

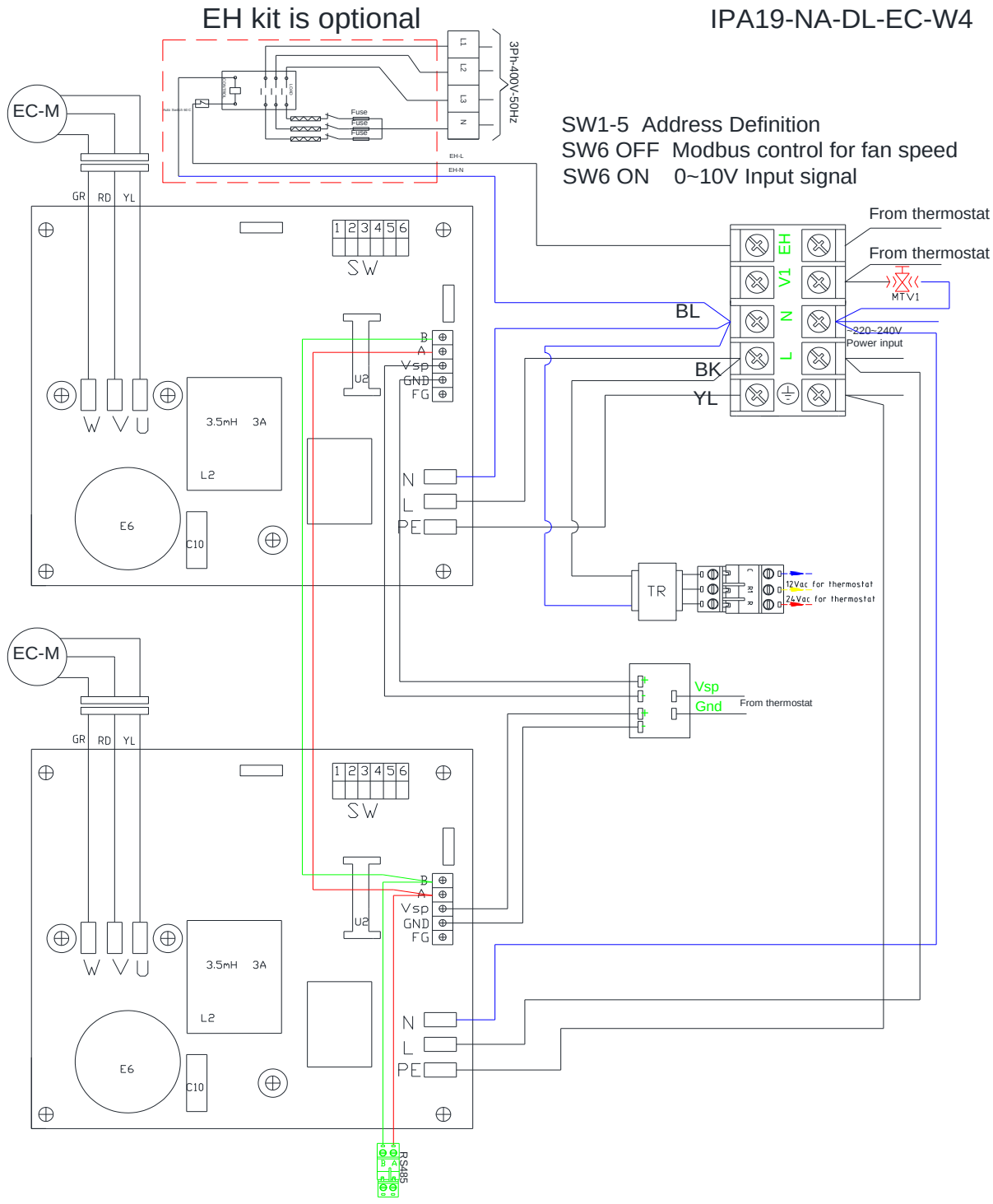
B.7. Electrical Connection

Standard W4 PCB for HAHU-200/400



Standard W4 PCB for HAHU-600/800

NA-EC-W4 unit with 3PH EH Wiring Scheme



C. Maintenance

C.1. General Maintenance

1. Installation and maintenance should be performed by qualified personnel who are familiar with local codes and regulations and experienced with this type of appliance.
2. Confirm that the unit has been switched OFF before installing or servicing the unit.
3. A good general maintenance plan will prevent damage to and unexpected shutting down of the equipment.
4. Dirty filters reduce air flow as well as unit performance. Therefore, changing or cleaning the filters is very important. Check the cleanliness of the filter and replace or clean as required monthly.
5. Coils should be cleaned with compressed air or water to remove dust, dirt or lint. They can be brushed with a soft brush or vacuumed with a vacuum cleaner.
6. If the water coil is not being used during the winter season it should be drained, or an anti-freezing solution should be added to the water circuit to avoid freezing.

C.2. Regular Maintenance

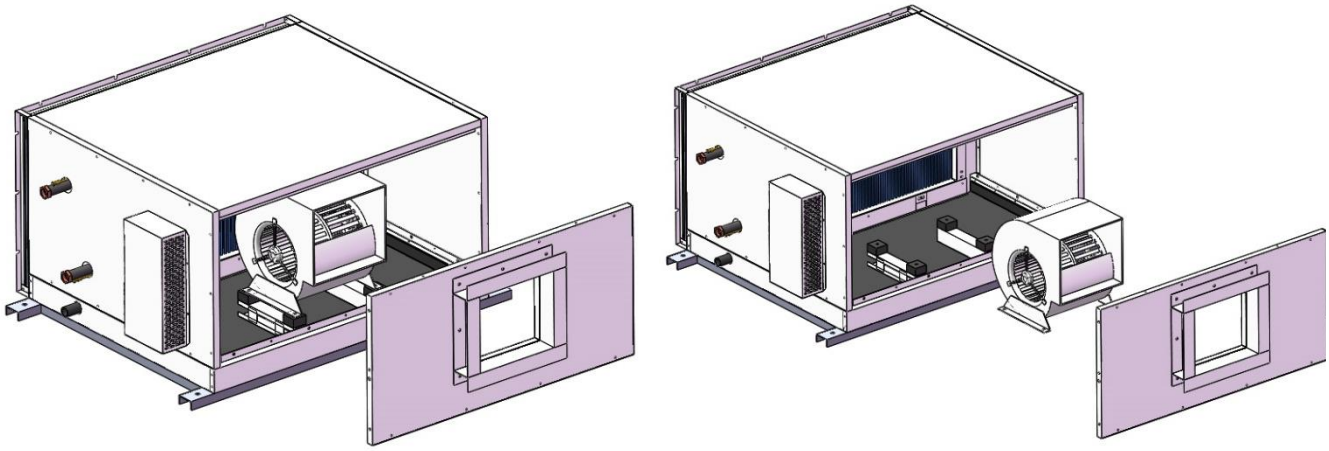
1. Inspect and clean the condensate drain pan to avoid any clogging of the drain by dirt, dust, etc. Inspect drainage piping to ensure the proper condensate flow.
2. Check and clean the coil. Clean the coils with a low-pressure water jet or low-pressure air.
3. Clean and tighten all the wiring connections.
4. Drain out the water system and check for buildup of residue deposits.

C.3. Filter Cleaning

1. Remove the filter from the rear or bottom.
2. Clean the filter with a brush, or with water jet.
3. Reinstall the filter by sliding it back into the groove.

C.4. Fan Replacement

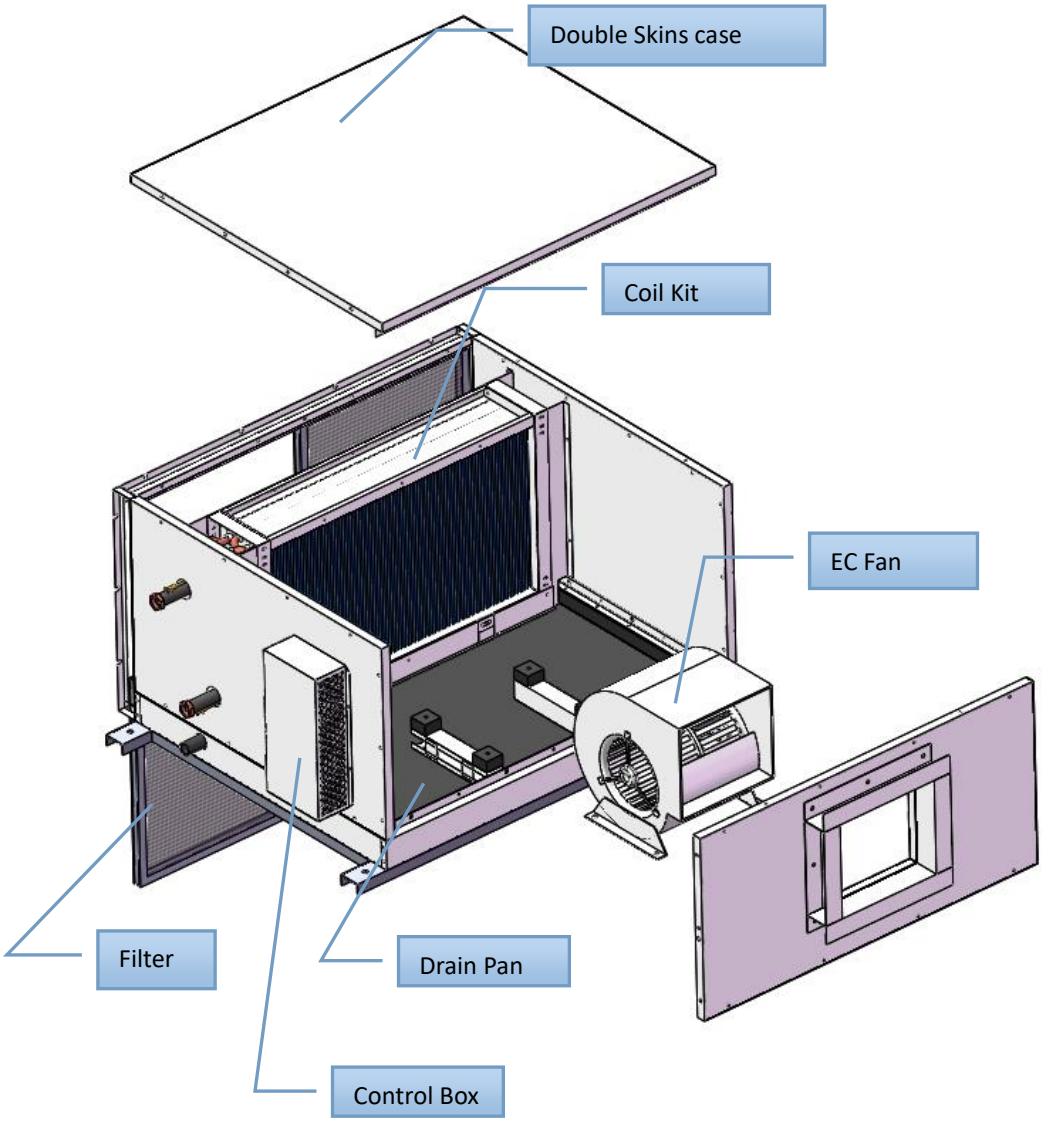
1. Loosen the screws from front panel.
2. Remove the fixing nuts of fan blower.
3. Replace the fan.
4. Reinstall the front panel with screws.



D. Troubleshooting

Symptom	Cause	Remedy
The fan coil does not start up	No voltage	- Check for presence of voltage - Check fuse on board
	Mains switch in the “OFF position	- Place in the “ON” position
	Faulty room control	- Check the room control
	Faulty fan	- Check fan motor
Insufficient output	Filter clogged	- Clean the filter
	Air flow obstructed	- Remove obstacles
	Room control regulation	- Check the room air sensor
	Incorrect water temperature	- Check the water source
	Air present	- Check the air vent
Noise and vibrations	Contact between metal parts	- Check for loosening parts
	Loose screws	- Tighten screws

E. Exploded Drawings

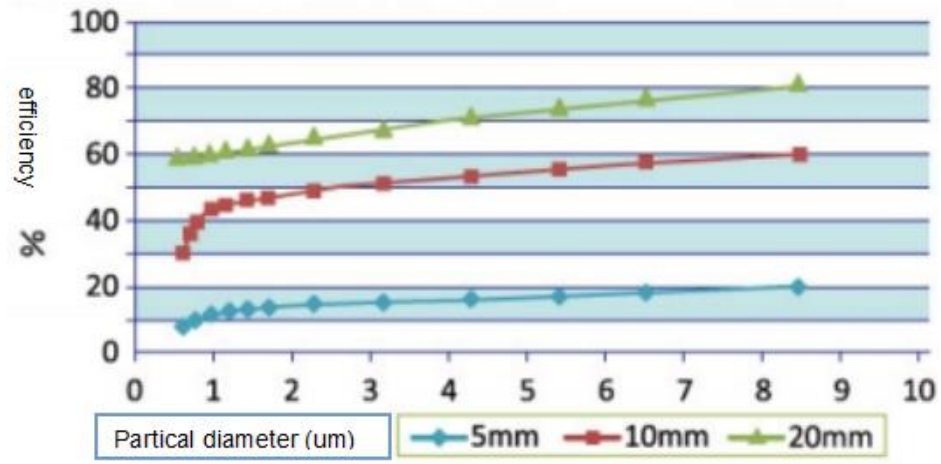


F. Accessories

F.1. Filters

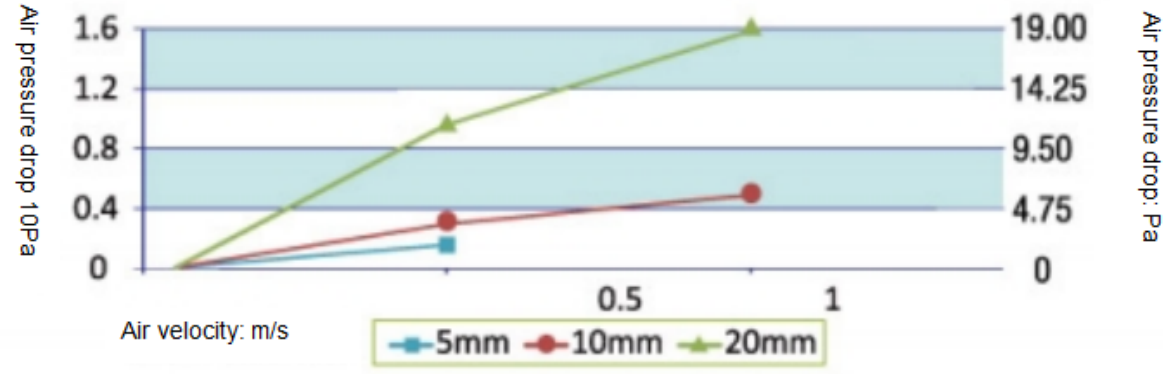
F.1.1. Merv 8 (G4) Filter

Filter efficiency: Merv 8 / G4;
Initial pressure drop: 0.12 in.wg @2m/s;
HAF filter efficiency: initial efficiency is tested under air velocity 0.1m/s



Remark: HAF filter efficiency will be down. The rate of diminishing efficiency is based on using conditions.

HAF material pressure drop 10Pa



F.1.2. Merv 14 (F8) Filter

Filter efficiency: Merv 14 /F8
Initial pressure drop: 0.32 in.wg @2m/s

Filter weight: g/m2	70
Air velocity: m/s	0.51
Resistance:	0.124 in.wg
0.3~0.4 efficiency	72%
0.4~0.55 efficiency	79.4%
0.55~0.7 efficiency	86.7%
0.7~1.0 efficiency	91.3%
1.0~1.3 efficiency	94.4%
1.3~1.6 efficiency	95.8%
1.6~2.2 efficiency	97.7%
2.2~3.0 efficiency	98.7%
3.0~4.0 efficiency	99.2%
4.0~5.5 efficiency	99.6%
5.5~7.0 efficiency	99.8%
7.0~10 efficiency	100%

F.2. Valves

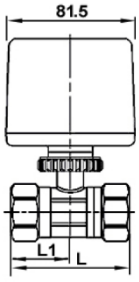
F.2.1. On/Off Ball Valve

Models

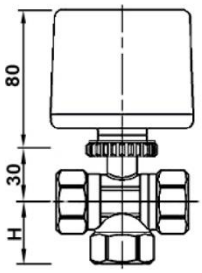
1. 3-way ball valve with 1” connectors and on/off motorized actuator
2. 2-way ball valve with 1” connectors and on/off motorized actuator
3. 3-way ball valve with 1-1/4” connectors and on/off motorized actuator
4. 2-way ball valve with 1-1/4” connectors and on/off motorized actuator

Specifications	
Medium: Cool/Hot water or 60% glycol	Body: Forged brass, nickel plated
Structure: Two way or Three way	Ball: Chrome plated brass
Operating Mode: On/Off	Stem: Brass
Power Supply: 24VAC	Seats: Fiberglass reinforced Teflon PTFE
Power Consumption: 6W (during valve position change)	Seal: 2 EPDM O-rings, lubricated
Running Times: 15 sec.	Pressure Rating: 2MPa
Pipe Fitting: NPT internal thread	Media Temp. Range: 34°F to 203°F (1°C to 95°C)
	Max. Differential Pressure: 1MPa
	Protection Grade: IP65

Dimensions and Cv Values



2-way Valve



3-way Valve

Size	Cv Value	L	L1	H
1” (DN25)	15.05	3 7/16	1 3/4	1 9/16
1 1/4” (DN32)	30.02	3 15/16	2	1 7/8

All dimensions are approximate within 1/16 of an inch of those indicated.

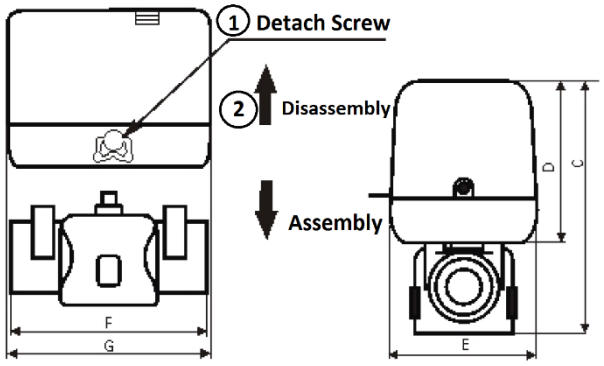
F.2.2. Modulating Valve

Models

2-way modulating valve with 1” connectors and 24VAC actuator with 0-10VDC input control signal
2-way modulating valve with 1-1/4” connectors and 24VAC actuator with 0-10VDC input control signal

Specifications	
24V AC power supply	Media Temp. Range: 34°F to 203°F (1°C to 95°C)
0~10VDC control signal	Rating pressure: 2.0MPa
Bi-directional modulating proportional control	Max. Differential Pressure: 0.3MPa
Working media: cool/hot water or with 60% glycol	Opening or closing time: 50 sec. (50Hz) 40 sec. (60Hz)
	Connection: NPT internal thread

Dimensions & Kv Values

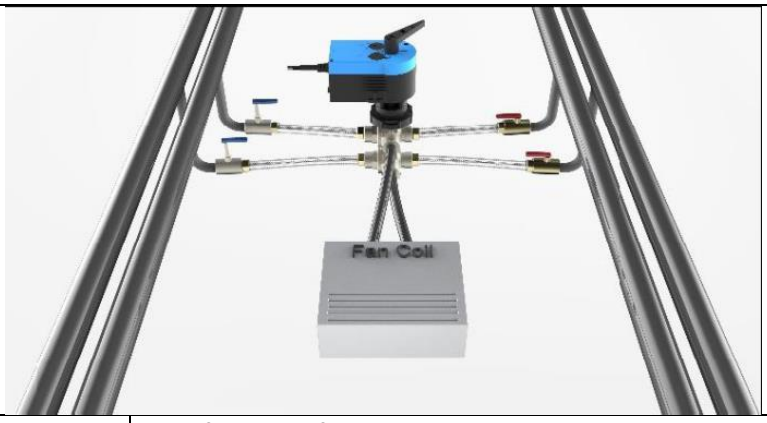


Size	Type	C	D	E	F	G	Cv Valve
1” (DN25)	2-way	4 5/8	2 7/8	2 5/8	3 11/16	3 9/16	7.86
1-1/4(DN32)	2-way	5 3/16	2 7/8	2 5/8	4 1/8	3 9/16	11.56

All dimensions are approximate and within 1/16 of an inch of those indicated.

F.2.3. 6-Way Valve

The 6-way valve allows 2-pipe fan coil units to be connected to heating and cooling water circuits which perform 4-pipe functions. This solution saves energy up to 30% (depending on the different applications) and significantly reduces installation costs and materials needed.



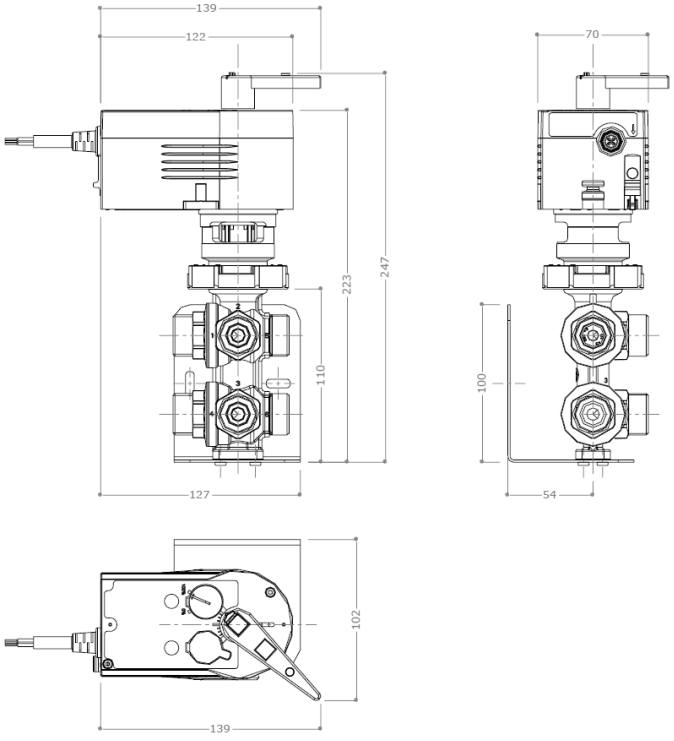
Specifications of Valve Body

Handled fluid: Water (glycol max 50%)
Min water temperature: -10 C
Max water temperature: 120 C
Nominal pressure: 16 bar
Characteristic curve: Linear
Total operation angle: 90°
First side operation angle: 0~32°
"Dead zone" operation angle: 32~58°
Second side operation angle: 58~90°
Max differential pressure: 2 bar
Leakage level EN12266-1/12-P12: Level A
Water quality: Fe<0.5mg/kg. Cu<0.1mg/kg
DN15 Kv: 1.25. DN20 Kv: 4
DN15 connection: G1/2"F. DN20 connection: G3/4"F

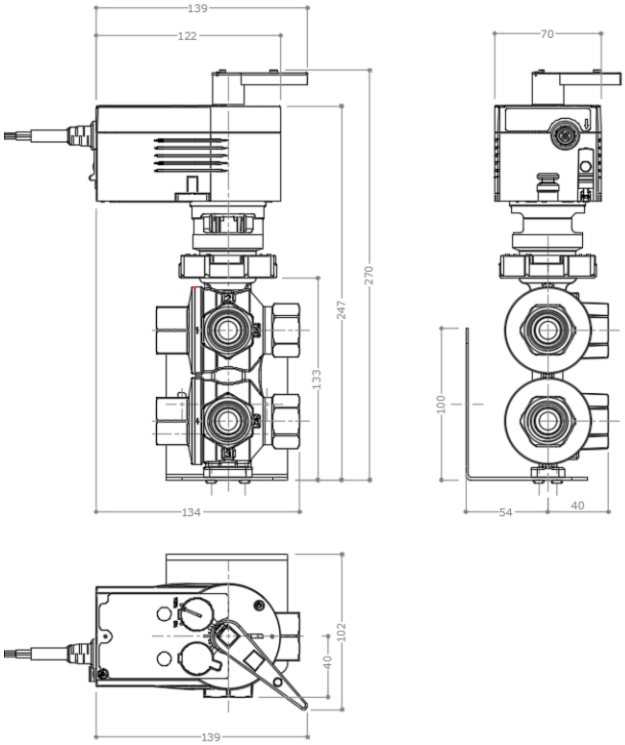
Specifications of Actuator

Supply voltage: 24VAC±20%(50/60Hz).24VCC(-10 to +20%)
Max power consumption: 4.9 W – 8.7 W
Running time: 120s(factory setting)/35s/60s
Angle of rotation: 0°-90°
Response time: 200 ms
Torque: 8 Nm (120 s and 60 s). 4 Nm (35 s)
Power cable length: 1.2 m
Admissible ambient humidity: 5% - 95% Hr (No condensing)
Max temperature medium: 100°C
Admissible ambient temperature: -10°C to +55°C
Type of protection (EN60529): IP54
Protection class (IEC60730): III
Power cable: 5 x 0.5 mm2
Weight: 700g

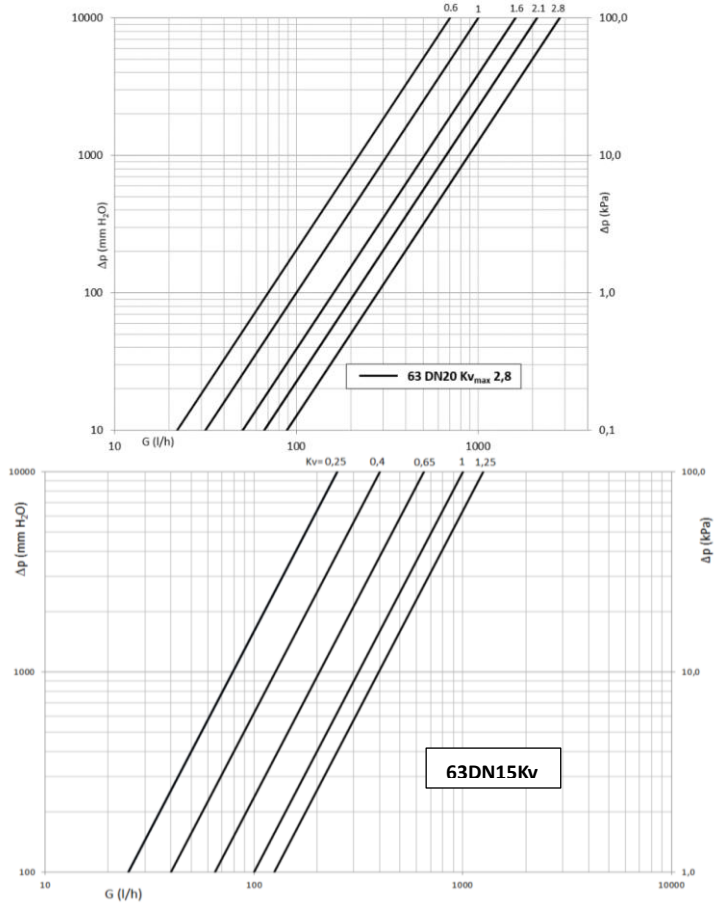
Dimensions of DN15

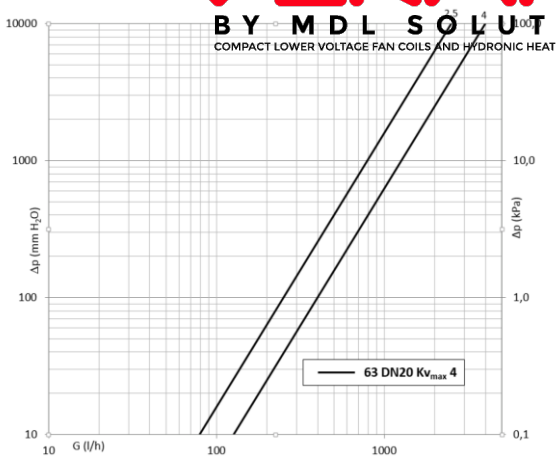


Dimensions of DN15

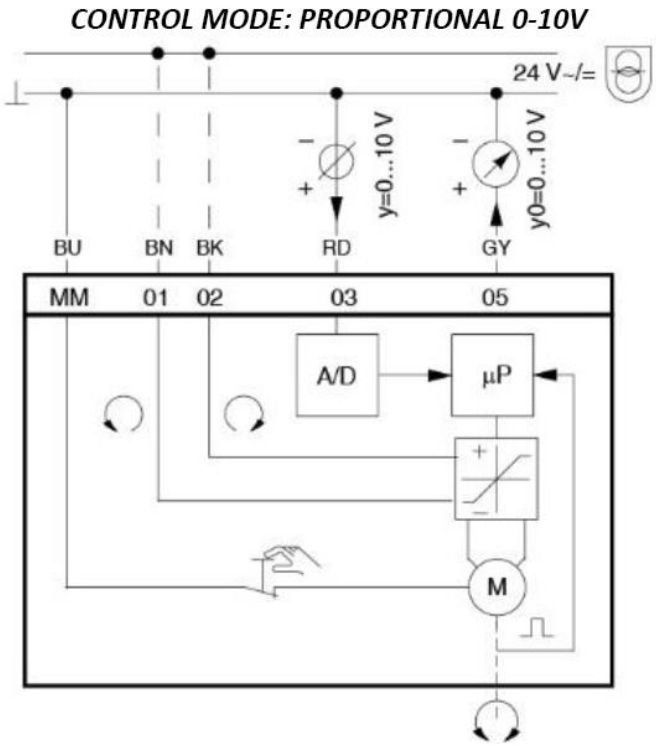


Pressure Drop Diagram





Wiring Diagram



Remark: 24VAC is supplied by FCU. 0~10VDC control signal is supplied by FCU.

F.3. Electric Heater Module

The electric heater module is supplied for winter heating as an alternative to the auxiliary hot water coil or a booster to the 2-pipe unit. The module must be installed downstream of the basic unit at air outlet side. The PTC heaters are mounted on a removable frame independent of the module. The heaters feature ON-OFF operation.

HAHU-AECM		200	300	400	600	800
Max. EH capacity	kW	4.5	6	7.5	9	9

Note: Make sure that the airflow is not less than the minimum value when electric heater is turned on. It is recommended to add an air flow switch or ESP transducer.

F.4. Two-way Intake Plenum with Damper

The two-way intake plenum with damper enables the room air intake duct and the external air intake duct to be connected when required. The cross section of the external air intake duct is accounted for 25% of the total cross section.

F.5. Two-way Intake Plenum with Modulating Control Damper

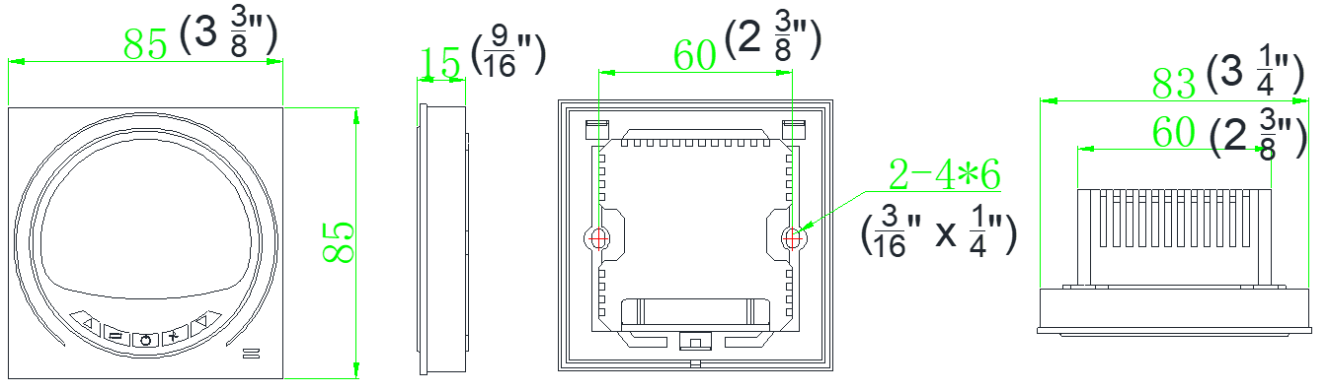
The two-way intake plenum with damper enables the room air intake duct and the external air intake duct to be connected when required. The cross section of the external air intake duct is accounted for 25% of the total cross section. The damper is equipped with a modulating actuator. The fresh air volume can be controlled from 0~25% according to indoor CO2 density PID calculation.

F.6. AC/EC Thermostat for W Type Control

Functions and Dimensions

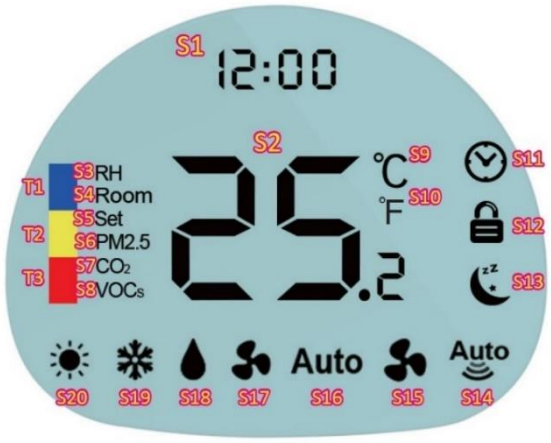
AC/EC thermostat is used to control fan coil unit (AC version/EC version, 2-pipe/4-pipe), or 2-pipe fan coil unit plus floor heating or floor radiated system. The thermostat can control on/off or modulating valve and communicate with chiller and boiler or heat pump.

Detect and Display room temperature	Set temperature range: 16 - 30°C
Room temperature setting	Accuracy displayed: 0.1°C
Fahrenheit or Celsius degree display	Accuracy: ±0.5°C
Timer and sleep mode	Rated Power: 1 W
AC/EC signal control	Sensor type: NTC
AC/EC motor 3-speed control	Display: LCD
Motorized valve control	Power: 12V±10%, 50Hz/60Hz
0~10Vdc Modulating valve control	Fan Output signal: AC 220V (rated 3A) or 24V
EC motor RPM control	Valve Output signal: AC 220V (rated 10W) or 24V
Low temperature protection	Input signal: Dry contact (NO)
Remote ON/Off	Dimensions: 85×85×23mm (3 3/8” x 3 3/8” x 15/16”)
RS485 Interface (Modbus)	Fixing screw width: 60mm (Standard)



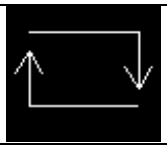
All dimensions are in mm/approximate and within 1/16 of an inch of those indicated.

Display



S1: Real Time
S2: Temp Display
S3: RH
S4: Room Temp
S5: Set Temp
S6: PM2.5 (ug/m3)
S7: CO2 (ppm)
S8: VOCs (PPb)
S9: Degree C
S10: Degree F
S11: Timer ON/OFF
S12: Keypad Lock
S13: Sleep Mode
S14: H/M/L/Auto Speed
S15: Fan
S16: Auto mode
S17: Fan mode
S18: Dehumidification mode
S19: Cooling mode
S20: Heating mode
T1 (Blue): Excellent Air Quality
T2 (Yellow): Good Air Quality
T3 (Red): Poor Air Quality

User Operation

Button					
Name	On/Off	Mode	Up	Down	Fan
Function	Switch on or off the unit	Switch between modes	Modify parameters	Modify parameters	Change Fan Speed

Lock Screen: Press  and  at the same time for 5 seconds until  displayed to lock the screen.

Press  and  for 5 seconds again until  disappeared to unlock the screen.

Boot by Timer: When power is off, press  for 5 seconds to enter Boot by Timer interface. Range is from 0 to 720 minutes. Time is increased by 30 minutes for every press.

Off by Time: When power is on, press  for 5 seconds to enter Off by Timer interface. Range is from 30 to 720 minutes. Time is increased by 30 minutes for every press.

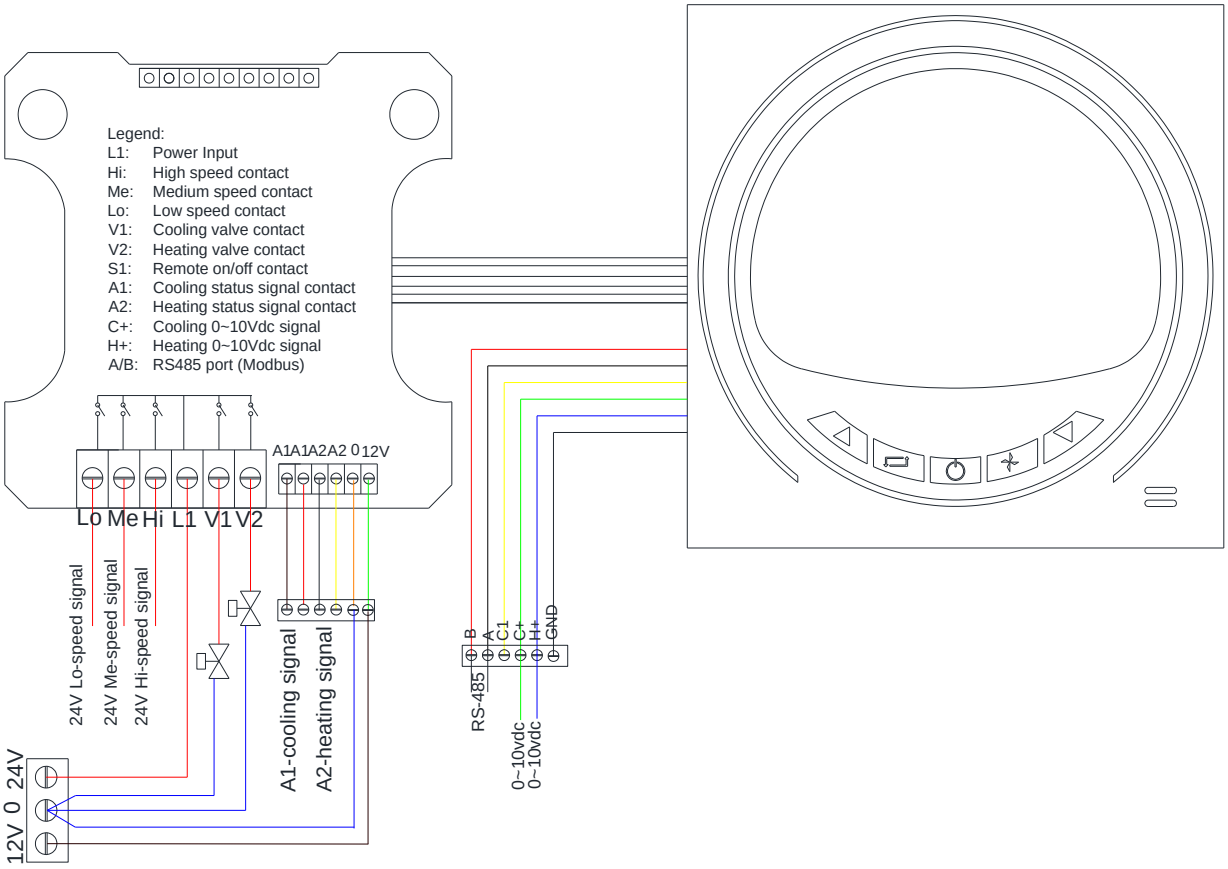
Sleep Mode: When power is on, press  for 5 seconds until  displayed.

When the module is off, press and hold  and  for 5 seconds to enter Parameter Setting Mode. Press  to select parameters from 1 to 20.

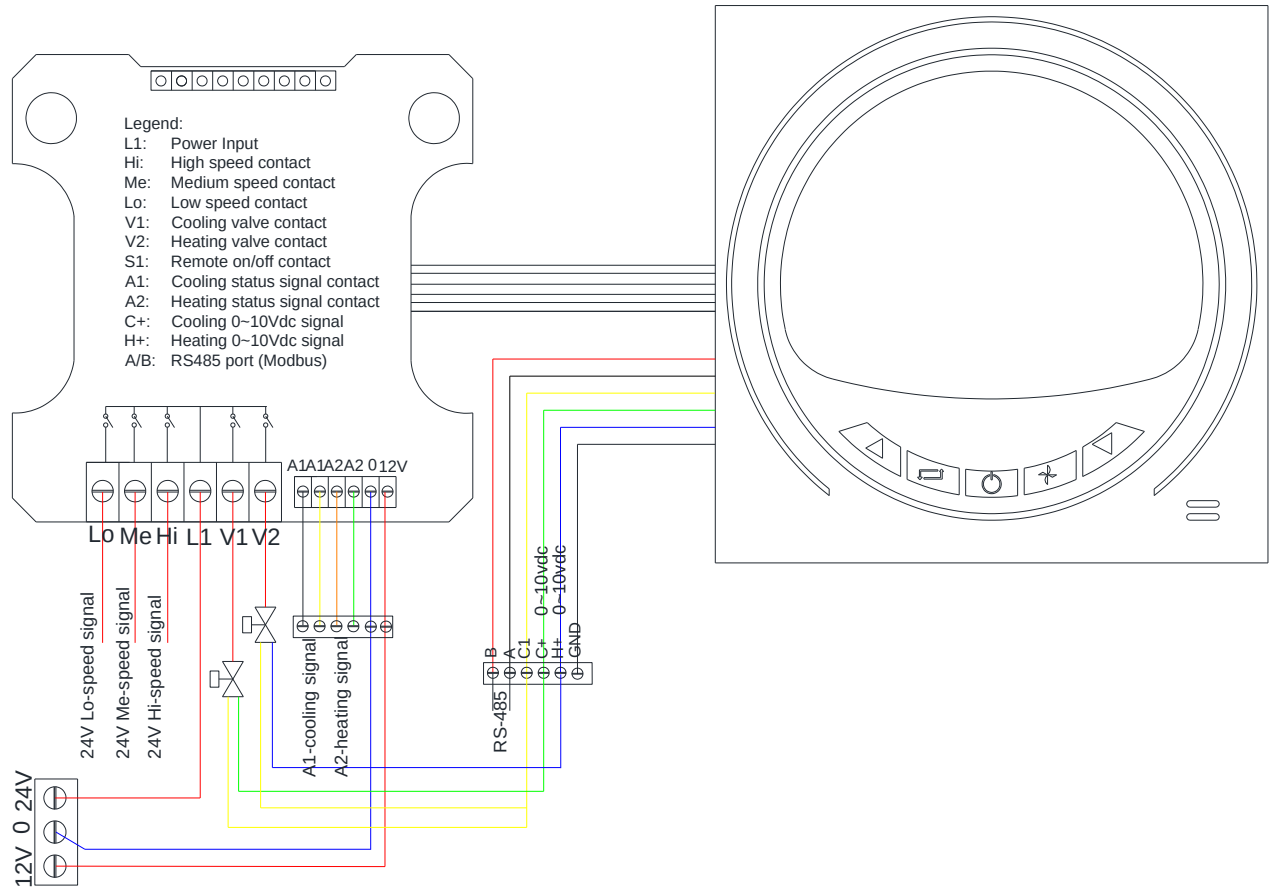
Parameter 1: Unit Type, 4 = FCU Thermostat, Function Keys are Cooling, Heating, Fan Modes. Displays Temperature only. 5 = Floor Heating Thermostat, Function Keys are Cooling, Heating Modes. Displays Temperature only. 6 = Independent Thermostat, Function Keys are Cooling, Heating, Fan Modes. Displays Temperature, RH, CO2, PM2.5 values.
Parameter 2: Temperature Display, 0 = Celsius, 1 = Fahrenheit.
Parameter 3: Sensor Display, 0 = Room temperature value, 1 = Set temperature value.
Parameter 4: Temperature Range Setting, 0 = Range from 16~30°C, 1 = Fixed at 24°C when Cooling and 21°C when Heating.
Parameter 5: Temperature Band, from 1 to 9, default setting = 1.
Parameter 14: Unit Address, from 0 to 31, default setting = 0.
Parameter 15: ESP, from 0 to 100%, default setting = 40%.
Parameter 16: Temperature Sensor Setting, 0 = Enable Internal and External Sensors, Internal Sensor displays room temperature, External Sensor displays water inlet temperature. 1 = Use External Sensor to detect room temperature if connected, use Internal Sensor to detect room temperature if External Sensor is disconnected.
Parameter 17: Unit Configuration, 0 = 2-pipe, 1 = 4-pipe, 2=2-pipe+floor heating, 3=2-pipe+floor cooling + floor heating
Parameter 18: Fan Control Mode, 0 = DA, in cooling mode, fan is still on when setting temperature is achieved.
1 = DB, in heating mode, fan is off when setting temperature is achieved.
Parameter 19: Thermostat C+ Setting: 0 = Fan control signal, 1 = Modulating valve control signal
Parameter 20: Reserved.

Wiring Diagram

EC Fan Coil Unit with 24V on/off valve



EC Fan Coil Unit with 24V modulating valve

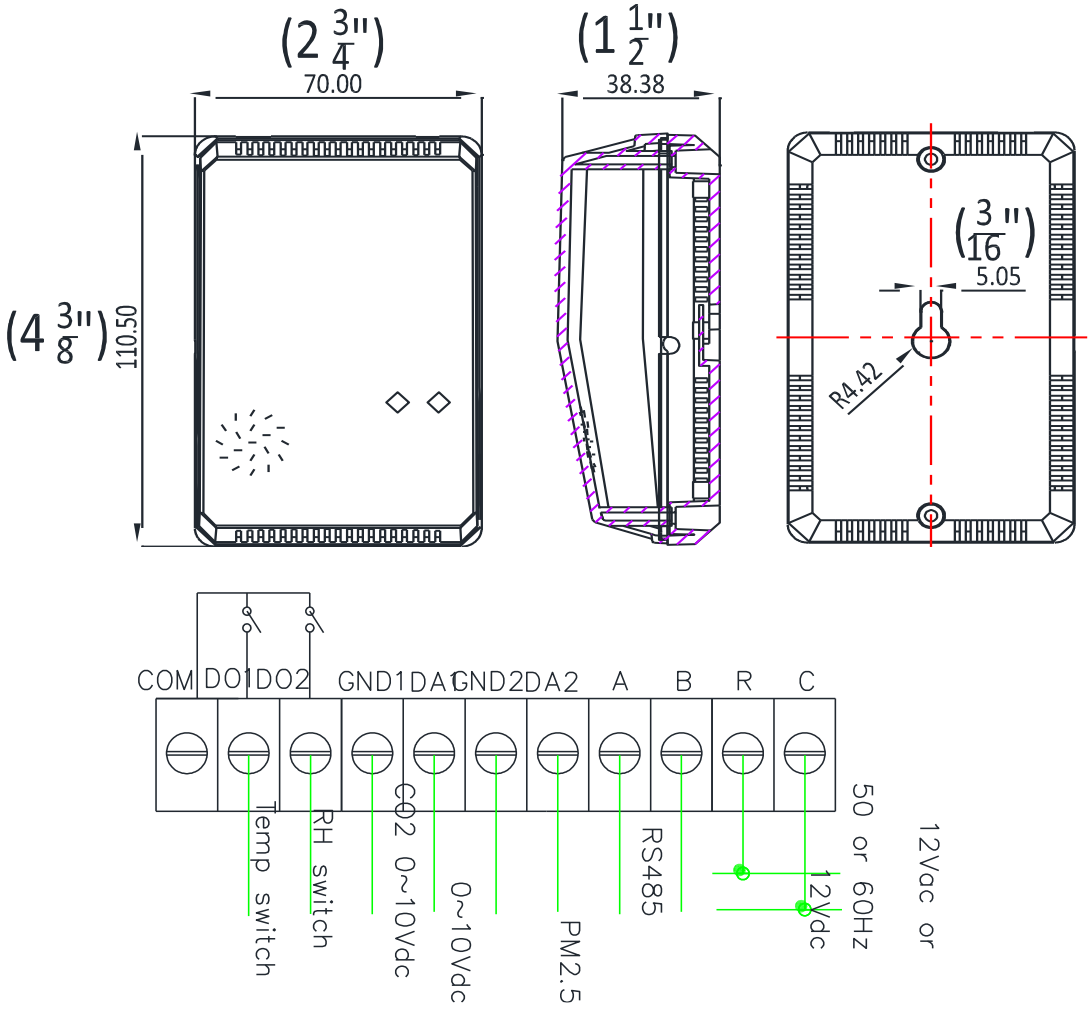


F.7. AQI Transducer

Functions

Temperature control switch RH control switch CO2 transducer 0~10Vdc output PM2.5 transducer 0~10Vdc output Modbus protocol Power supply: 12Vac or Vdc Working environment: 0~50°C, 5~95%RH (no condensate) Power consumption: <2W Protection class: IP30	
CO2 Sensor Technology:Non-dispersive infrared spectroscopy Range: 400~2000PPM Accuracy: ±(50ppm+5% reading) Stabilization time: 120s	PM2.5 Sensor Technology: Laser light scattering Range: 0~500ug/m3 Accuracy @(25±5)°C/50%RH: ±10% @(0~500)ug/m3 Resolutin ratio of partical concentration: 1ug/m3 Minimum resolution particle size: 0.3um Response time: <=3s
Temperature Sensor Accuracy: ±0.3°C Repeatability: 0.1°C Range: -40~125°C Response time: >2s	Humidity Sensor Accuracy: ±2% RH Repeatability: 0.2% RH Range: 0~100% RH Response time: >8s

Dimensions and Wiring Diagram

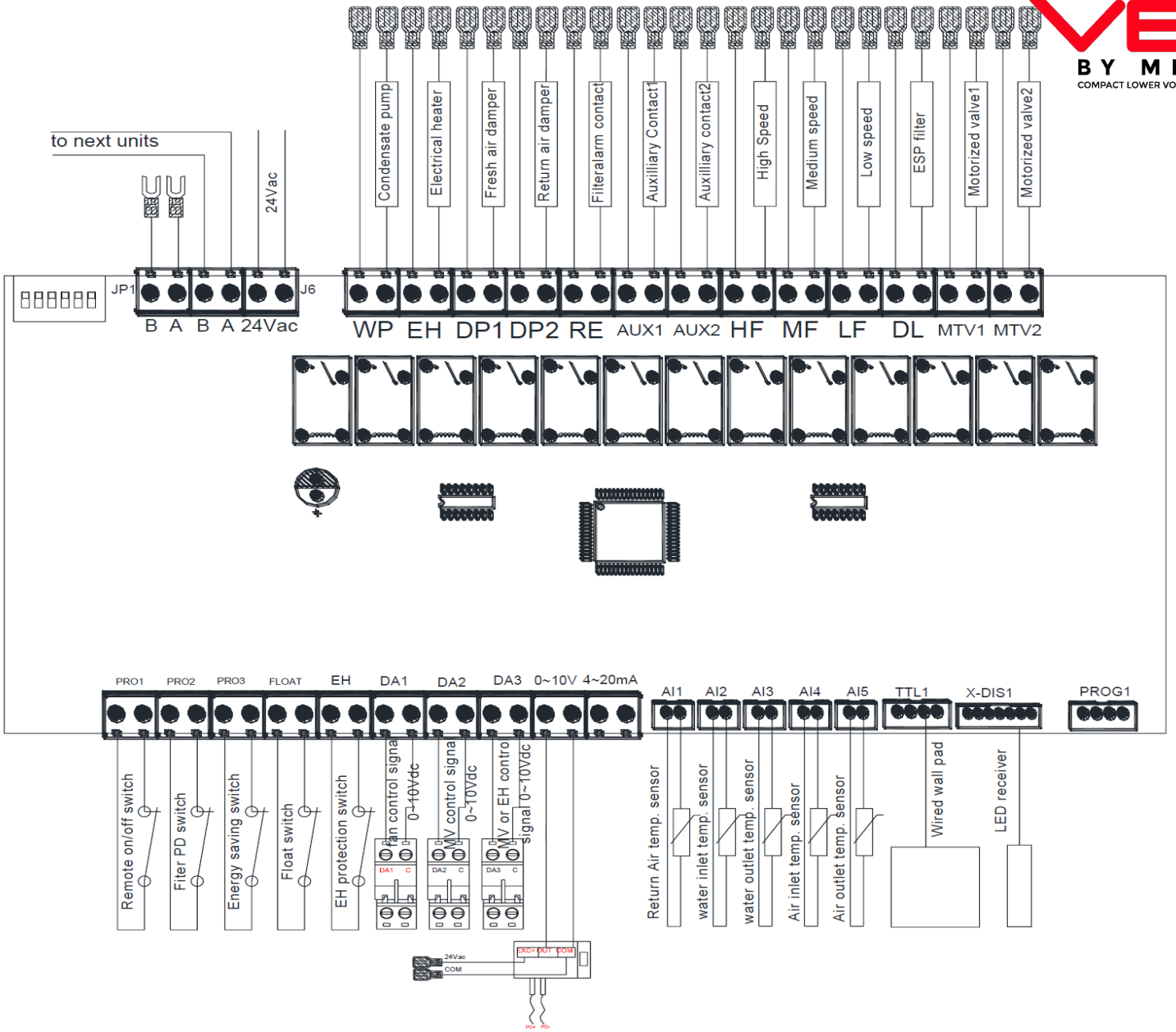


F.8. Complete Function PCB (AC/EC-S6)

When the AHU unit with W-PCB is connected to S6-PCB, the unit can be controlled by wired wall pad, IR handset or Modbus. The S6-PCB can control on/off or modulating valves, EH, condensate pump, dampers and AQI transducer if equipped.

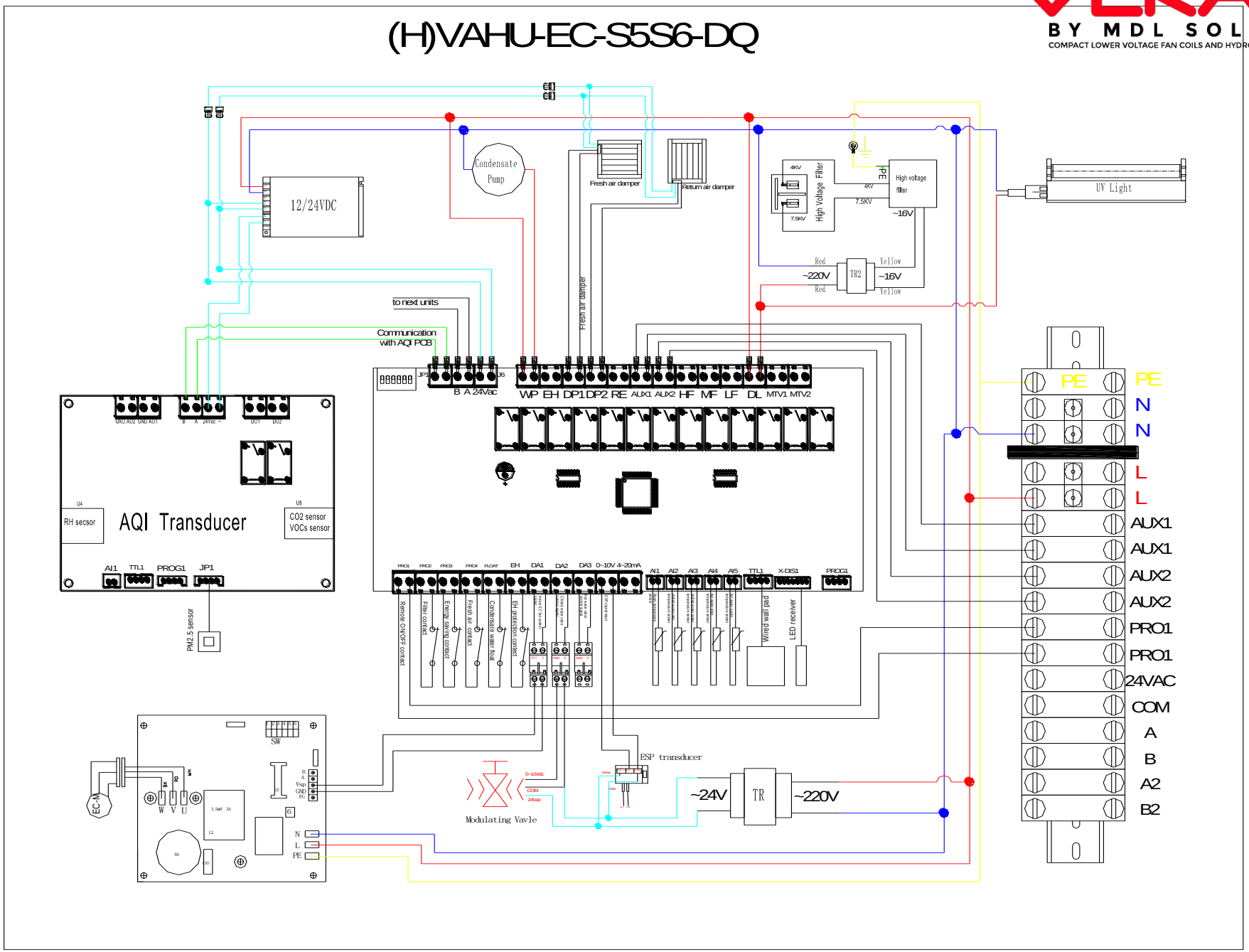
I/O Port Definitions

I/O		Code	2-Pipe	4-Pipe
Analogue Input	Air Temperature Sensor	AI1	Room air temperature sensor (Tr)	
	Chilled water inlet sensor (Ti1)	AI2	Water inlet temperature sensor (Ti1)	Chilled water inlet temperature sensor (Ti1)
	Chilled water outlet sensor (Ti2)	AI3	Water outlet temperature sensor (Ti2)	Chilled water outlet temperature sensor (Ti2)
	Hot water inlet sensor (Ti3)	AI4	Air inlet temperature sensor (Ti3)	Hot water inlet temperature sensor (Ti3)
	Hot water outlet sensor (Ti4)	AI5	Air outlet temperature sensor (Ti4)	Hot water outlet temperature sensor (Ti4)
	Transducer signal input	0~10VDC	ESP Transducer signal input	
		4~20mA	ESP Transducer 4~20mA signal input (Reserved)	
User interface	IR receiver	X-DIS 1	Digital communication port to LED / IR receiver board.	
	Wired wall pad	TTL1	Digital communication port to Wired wall pad board.	
Digital input	Occupancy contact	PRO1	The unit is ON. When occupancy contact is closed for 60s, the unit is turned OFF. When occupancy contact is open for 10s, the unit is turned ON.	
	Filter signal input	PRO2	The unit is on and the input is closed for 10S, RE contact will be closed.	
	Economy contact	PRO3	The unit is ON and input is closed for 60s, the temperature band is change to 3 times of bands.	
	Fresh air damper signal	PRO4	The unit is on. If the input is closed for 10S, DP1 contact will be closed and DP2 is open. If the input is opened for 10S, DP1 contact will be open and DP2 is closed.	
	Float switch	Float	NC signal for condensate water float switch.	
	EH protection	EH	NC signal for EH protection switch.	
Digital input	High speed	HF	High speed: Free of voltage contact	
	Medium speed	MF	Medium speed: Free of voltage contact	
	Low speed	LF	Low speed: Free of voltage contact	
	ESP filter	DL	ESP filter: Free of voltage contact	
	Motorized valve 1	MTV1	ON/OFF motorizes valve	Chilled water valve
	Motorized valve 2	MTV2	Reserved	Hot water valve
	Condensate water pump	WP	Condensate water pump: Free of voltage contact	
	Electrical heater	EH	EH: Free of voltage contact	
	Fresh air damper1	DP1	Fresh air damper: Free of voltage contact	
	Recirculating damper2	DP2	Recirculating damper: Free of voltage contact	
	Auxiliary contact1	AUX1	Cooling mode signal switch (NO). Voltage free contact.	
	Auxiliary contact2	AUX2	Heating mode signal switch (NO). Voltage free contact.	
	Filter alarm	RE	Filter alarm: Free of voltage contact	
	BUS port	A/B	Modbus network serial connection	
	EC fan control signal	DA1	EC fan control signal 0~10VDC, DA1 output is according Modbus address 310003, 310002, 310001 setting at high, medium and low speed.	
	Modulating valve 1	DA2	Modulating valve	Chilled water modulating valve
	Modulating valve 2	DA3	Modulating EH control signal	Hot water modulating valve


to next units
24Vac
JP1
J6
B A B A 24Vac
Condensate pump
Electrical heater
Fresh air damper
Return air damper
Filteralarm contact
Auxilliary Contact1
Auxilliary contact2
High Speed
Medium speed
Low speed
ESP filter
Motorized valve1
Motorized valve2
WP EH DP1 DP2 RE AUX1 AUX2 HF MF LF DL MTV1 MTV2
PRO1 PRO2 PRO3 FLOAT EH DA1 DA2 DA3 0~10V 4~20mA
AI1 AI2 AI3 AI4 AI5 TTL1 X-DIS1 PROG1
Remote on/off switch
Filter PD switch
Energy saving switch
Float switch
EH protection switch
Fan control signa
0~10Vdc
MV control signa
0~10Vdc
MV or EH contro
signal 0~10Vdc
Return Air temp. sensor
water inlet temp. sensor
water outlet temp. sensor
Air inlet temp. sensor
Air outlet temp. sensor
Wired wall pad
LED receiver
24Vac
COM
EXC+ OUT COM

Wiring Diagram for S6-PCB with W-PCB and other Accessories

(H)VAHU-EC-S5S6-DQ



F.8.1. Control Logics for 2-pipe System

Set Modbus Address 300029=2 and 300042=0

COOLING MODE

a) If Tr ≥ Ts + 1°C (1.8°F), cooling mode is activated. MTV1 and AUX1 are turned on. Indoor fan runs at set speed. DA2 outputs 10VDC for 2 minutes. If Ti1 ≤ 8°C (46.4°F), DA2 outputs the minimum value (300015 setting)~10VDC signal depending on Ti1 and Ti2 difference (delta T) and Modbus parameter 300027 setting PID calculation. if 8 < Ti1 ≤ 10°C (50°F), DA2 outputs the minimum value (300015 setting)~10VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 1 PID calculation. If 10 < Ti1 ≤ 12°C (53.6°F), DA2 outputs the minimum value (300015 setting)~10VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 2 PID calculation. If 12 < Ti1 ≤ 15°C (59°F), DA2 outputs the minimum value (300015 setting)~10VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 3 PID calculation. If 15 < Ti1 ≤ 28°C (82.4°F or Modbus 300017 setting), DA2 output is kept at 10VDC. If Ti1 > 28°C (82.4°F or Modbus 300017 setting), DA2 output is at minimum setting of Modbus 300016 and report pre-heat signal.
b) If Tr < Ts - 1°C (1.8°F), cooling mode is terminated. MTV1 and AUX1 are off. DA2 is 0VDC. Indoor fan runs at set speed.
c) The range of Ts is 16- 30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

LOW TEMPERATURE PROTECTION IN COOLING MODE

a) If Ti1 ≤ 2°C (35.6°F) for 2 minutes, MTV1 and AUX1 are turned off. DA2=0VDC. If indoor fan is set for low speed, it will run at medium speed. If it is set at medium or high speed, it keeps running at the same speed.
b) If Ti1 ≥ 5°C (41°F) for 2 minutes, MTV1 and AUX2 are turned on. DA2 is calculated by delta T. Indoor fan runs at set speed.

FAN MODE

a) Indoor fan runs at the set speed while heater, MTV1, MTV2, AUX1 and AUX1 are turned off.
b) Indoor fan speed can be adjusted to low, medium and high.

HEATING MODE

Without electric heater (310043=0)

a) If Tr ≤ Ts - 1°C (1.8°F), heating mode is activated and MTV1 and AUX2 are turned on. DA2 outputs 10VDC for 2 minutes. If Ti1 ≤ 28°C (82.4°F) (300017 setting), fan is turned on at low speed and DA2 keeps at 10VDC. If 28°C (82.4°F or 300017) < Ti1 < 28°C (82.4°F or 300017) + 4°C (7.2°F), fan and DA2 keep at original status. If Ti1 ≥ 28 °C (82.4°F or 300017) + 4°C (7.2°F), fan runs at set speed and DA2 outputs the minimum value (300016)~10VDC signal depending on Ti1 and Ti2 difference. If Ti1 sensor is damaged, fan runs at set speed.
b) If Tr > Ts +1°C (1.8°F), heating mode is terminated. MTV1 and AUX2 are off. DA2 is 0VDC. Indoor fan is turned off.
c) The range of Ts is 16 - 30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

With electric heater as booster (310043=1)

a) If Tr ≤ Ts - 1°C (1.8°F), heating mode is activated and MTV1 and AUX2 are turned on. Indoor fan runs at the set speed. DA2 outputs 10VDC for 2 minutes. If Ti1≤ 28ºC (82.4°F or 300017 setting), EH is turned on and DA2 keeps at 10VDC. DA3 outputs 0~10VDC signal depending on Ti3 and Ti4 difference. If 28°C (82.4°F or 300017) < Ti1 ≤ 28°C (82.4°F or 300017) +4°C (7.2°F), EH and DA2 keep at original status. If Ti1 ≥ 28 °C (82.4°F or 300017) + 4°C (7.2°F), EH is turned off and DA3 is 0VDC. DA2 outputs the minimum value (300016)~10VDC signal depending on Ti1 and Ti2 difference.
b) If Tr > Ts +1°C (1.8°F), heating mode is terminated. MTV1 and AUX1 are off. DA2 is 0VDC. Indoor fan runs at auto speed.
c) The range of Ts is 16 - 30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

With electrical heater as primary heat source (310043=2)

a) If Ti2 ≤ 35°C (95°F) (or Ti2 is damaged or disconnected) and if Tr ≤ Ts-1°C (or -4°C (7.2°F) if economy contact is closed), heating mode is activated. EH and AUX1 are turned on. Indoor fan runs at set speed. After EH is turned on, DA3 outputs 0~10VDC signal depending on Ti4 and Ti3 difference.
b) If Tr > Ts +1°C (1.8°F), heating mode is terminated, EH and AUX1 are off. Indoor fan is turned off after 120s.
c) The range of Ts is 16-30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

OVERHEAT PROTECTION IN HEATING MODE

a) If Ti1 ≥ 75°C (167°F), MTV1, DA2, AUX2 and EH are turned off. Indoor fan runs at high speed even in standby mode.
b) If Ti1 < 70°C (158°F), the unit maintains its original status.
c) If Ti1 is damaged or disconnected, this function is unavailable. Preheat and Post-heat run according to set time.

POST-HEAT

Without electric heater

a) If Ti2 ≥ 38°C (100.4°F), MTV1, AUX2 and DA2 are off. Indoor fan runs at set speed.
b) If 36°C (96.8°F) ≤ Ti2 ≤ 38°C (100.4°F), MTV1, DA2 and AUX2 are turned off. Indoor fan maintains it original status.
c) If Ti2 < 36°C (96.8°F), MTV1, DA2 and AUX2 are turned off. Indoor fan is turned off.
d) If Ti2 is damaged or disconnected, post heat time is set to 2 minutes and then indoor fan is turned off.

With electric heater

a) Indoor fan runs at set speed for 1 minute and then stops.

DEHUMIDIFICATION MODE

a) AUX1 is turned on. DP1 is turned off. DP2 is turn on. Ts=24°C (75.2°F).
b) If Tr ≥ 25°C (77°F) for 30 seconds, MTV1 is turned on for 3 minutes and off for 4 minutes. DA2 outputs 3 times of the minimum value. Indoor fan runs at auto speed.
c) If 16°C (60.8°F) ≤ Tr < 25°C (77°F) for 30 second, MTV1 is turned on for 3 minutes and off for 6 minutes. DA2 outputs twice of the minimum value. Indoor fan runs at auto speed.
d) If Tr < 16°C (60.8°F) for 30 second, MTV1 is turned on for 4 minutes and off for 10 minutes. DA2 outputs the minimum values. Indoor fan runs at auto speed.

AUTO MODE

Fan is turned on at medium speed. Check Tr and Ts in 30 seconds.

a) If Ts > Tr+3°C (5.4°F) for 30 seconds, the unit runs in heating mode.
b) If Tr-3°C (5.4°F) < Ts < Tr+3°C (5.4°F), the unit runs in fan mode.
c) If Ts < Tr-3°C (5.4°F), the unit runs in cooling mode.

If the mode is confirmed and now operating, it cannot be changed. Mode is reset after unit turned off for 2 hours.

F.8.2. Control Logics for 4-pipe System

Set Modbus Address 300029=2 and 300042=1.

COOLING MODE

a) If Tr ≥ Ts + 1°C (1.8°F), cooling mode is activated. MTV1 and AUX1 are turned on. Indoor fan runs at set speed. DA2 outputs 10VDC for 2 minutes. If Ti1 ≤ 8°C (46.4°F), DA2 outputs the minimum value (300015 setting)~10VDC signal depending on Ti1 and Ti2 difference (delta T) and Modbus parameter 300027 setting PID calculation. if 8 < Ti1 ≤ 10°C (50°F), DA2 outputs the minimum value (300015 setting)~10VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 1 PID calculation. If 10 < Ti1 ≤ 12°C (53.6°F), DA2 outputs the minimum value (300015 setting)~10VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 2 PID calculation. If 12 < Ti1 ≤ 15°C (59°F), DA2 outputs the minimum value (300015 setting)~10VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 3 PID calculation. If 15 < Ti1 ≤ 28°C (82.4°F or Modbus 300017 setting), DA2 output is kept at 10VDC. If Ti1 > 28°C (82.4°F or Modbus 300017 setting), DA2 output is at minimum setting of Modbus 300016 and report pre-heat signal.
b) If Tr < Ts -1°C (1.8°F), cooling mode is terminated, MTV1 and AUX1 are off. DA2 is 0VDC. Indoor fan runs at set speed.
c) The range of Ts is 16- 30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

LOW TEMPERATURE PROTECTION IN COOLING MODE

a) If Ti1 ≤ 2°C (35.6°F) for 2 minutes, MTV1 and AUX1 are turned off. DA2=0VDC. If indoor fan is set for low speed, it will run at medium speed. If it is set at medium or high speed, it will keep running at the same speed.
b) If Ti1 ≥ 5°C (41°F) for 2 minutes, MTV1 and AUX2 are turned on. DA2 is calculated by delta T. Indoor fan runs at set speed.

FAN MODE

a) Indoor fan runs at set speed while heater, MTV1, MTV2, AUX1 and AUX1 are turned off.
b) Indoor fan speed can be adjusted to low, medium and high.

HEATING MODE

Without electric heater (310043=0)

a) If Tr ≤ Ts - 1°C (1.8°F), heating mode is activated, MTV2 and AUX2 are turned on. DA3 outputs 10VDC for 2 minutes. If Ti3 ≤ 28ºC (82.4°F) (300017 setting), fan is turned on at low speed and DA3 keeps at 10VDC. If 28°C (82.4°F) (300017 setting) < Ti3 < 28°C (82.4°F) (300017 setting) + 4°C (7.2°F), fan and DA3 keep at original status. If Ti3 ≥ 28 °C (82.4°F) (300017 setting) + 4°C (7.2°F), fan runs at set speed and DA3 outputs the minimum value (300016)~10VDC signal depending on Ti3 and Ti4 difference. If Ti3 sensor is damaged, fan runs at set speed.
b) If Tr > Ts +1°C(1.8°F), heating mode is terminated, MTV2 and AUX2 are off. DA3 is 0VDC. Indoor fan runs at low speed.
c) The range of Ts is 16-30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

With electric heater as booster (310043=1)

a) If Tr ≤ Ts - 1°C (1.8°F), heating mode is activated, MTV2 and AUX2 and turned on. Indoor fan runs at set speed. DA3 outputs 10VDC for 2 minutes. If Ti3 ≤ 28ºC (82.4°F) (300017 setting), EH is turned on and DA3 keeps at 10VDC. If 28°C (82.4°F) (300017 setting) < Ti3 < 28°C (82.4°F) (300017 setting) + 4°C (7.2°F), EH and DA3 keep at original status. If Ti3 ≥ 28 °C (82.4°F) (300017 setting) + 4°C (7.2°F), EH is turned off and DA3 outputs the minimum value (300016 setting). DA3 outputs 0~10VDC signal depending on Ti3 and Ti4 difference.
b) If Tr > Ts+1°C(1.8°F), heating mode is terminated, MTV2 and AUX2 are off. DA3 is 0VDC. Indoor fan runs at auto speed.
c) The range of Ts is 16- 30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

OVERHEAT PROTECTION IN HEATING MODE

a) If Ti3 ≥ 75°C (167°F), MTV2, DA3, AUX2 and EH are turned off. Indoor fan runs at high speed, even in standby mode.
b) If Ti3 < 70°C (158°F), the unit maintains its original status.
c) If Ti1 is damaged or disconnected, this function is unavailable. Preheat and Post-heat run according to set time.

POST-HEAT

Without electric heater

a) If Ti4 ≥ 38°C (100.4°F), MTV2, AUX2 and DA3 are turned off. Indoor fan continues running at set speed.
b) If 36°C (96.8°F) ≤ Ti4≤ 38°C (100.4°F), MTV2, DA3 and AUX2 are turned off. Indoor fan maintains its original status.
c) If Ti4 < 36°C (96.8°F), MTV2 and AUX2 are turned off. Indoor fan is turned off.
d) If Ti4 is damaged or disconnected, the post-heat time is set to 2 minutes and then indoor fan is turned off.

With electric heater

a) Indoor fan runs at set speed for 1 minute and then stops.

DEHUMIDIFICATION

a) AUX1 is turned on. DP1 is turned off. DP2 is turned on. Ts = 24°C (75.2°F).
b) If Tr ≥ 25°C (77°F) for 30 seconds, MTV1 is turned on for 3 minutes then stops for 4 minutes. DA2 outputs 3 times of the minimum values. Indoor fan runs at auto speed.
c) If 16°C (60.8°F) ≤ Tr < 25°C (77°F), MTV1 is turned on for 3 minutes then stops for 6 minutes. DA2 outputs twice of the minimum values. Indoor fan runs at auto speed.
d) If Tr < 16°C (60.8°F), MTV1 is turned on for 4 minutes and stops for 10 minutes. DA2 outputs the minimum values. Indoor fan runs at auto speed.

AUTO MODE

Fan is turned on at medium speed. Check Tr and Ts in 30 seconds.

a) If Ts > Tr+3°C (5.4°F) for 30 seconds, the unit runs in heating mode.
b) If Tr-3°C (5.4°F) < Ts < Tr+3°C (5.4°F) for 30 seconds, the unit runs in fan mode.
c) If Ts < Tr-3°C (5.4°F) for 30 seconds, the unit runs in cooling mode.
d) If unit is in heating mode or fan mode, if Tr-Ts > 3°C (5.4°F), MTV2, MTV1 and DA3 are off more than 3 minutes, working mode is changed to cooling mode. If unit is in cooling mode or fan mode, if Ts-Tr > 3°C (5.4°F), MTV2, MTV1 and DA2 are off more than 3 minutes, working mode is changed to heating mode.

F.8.3. Control Logics for 2-pipe Unit with 6-way Valve (4-pipe System)

Set Modbus Address 300029=2 and 300042=2.

COOLING MODE

a) If Tr ≥ Ts + 1°C (1.8°F), cooling mode is activated. MTV1 and AUX1 are turned on. Indoor fan runs at set speed. DA2 outputs 10VDC for 2 minutes. If Ti1 ≤ 8°C (46.4°F), DA2 outputs 0~4VDC signal depending on Ti1 and Ti2 difference (delta T) and Modbus parameter 300027 setting PID calculation. if 8 < Ti1 ≤ 10°C (50°F), DA2 outputs 0~4VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 1 PID calculation. If 10 < Ti1 ≤ 12°C (53.6°F), DA2 outputs 0~4VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 2 PID calculation. If 12 < Ti1 ≤ 15°C (59°F), DA2 outputs 0~4VDC signal depending on Ti1/Ti2 difference and Modbus parameter 300027 setting minus 3 PID calculation. If 15 < Ti1 ≤ 28°C (82.4°F or Modbus 300017 setting), DA2 output is kept at 0VDC. If Ti1 > 28°C (82.4°F or Modbus 300017 setting), DA2 output is 4VDC and reports pre-heat signal.
b) If Tr < Ts -1°C (1.8°F), cooling mode is terminated, MTV1 and AUX1 are off. DA2 is 5VDC. Indoor fan runs at set speed.
c) The range of Ts is 16- 30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

LOW TEMPERATURE PROTECTION IN COOLING MODE

a) If Ti1 ≤ 2°C (35.6°F) for 2 minutes, MTV1 and AUX1 are turned off. DA2=5VDC. If indoor fan is set for low speed, it will run at medium speed. If it is set at medium or high speed, it will keep running at the same speed.
b) If Ti1 ≥ 5°C (41°F) for 2 minutes, MTV1 and AUX2 are turned on. DA2 is calculated by delta T. Indoor fan runs at set speed.

FAN MODE

a) Indoor fan runs at set speed while heater, MTV1, MTV2, AUX1 and AUX1 are turned off.
b) Indoor fan speed can be adjusted to low, medium and high.

HEATING MODE

Without electric heater (310043=0)

a) If Tr ≤ Ts - 1°C (1.8°F), heating mode is activated, MTV1 and AUX2 are turned on. DA3 outputs 10VDC for 2 minutes. If Ti1 ≤ 28ºC (82.4°F) (300017 setting), fan is turned on at low speed and DA2 is on at 10VDC. If 28°C (82.4°F) (300017 setting) < Ti1 < 28°C (82.4°F) (300017 setting) + 4°C (7.2°F), fan and DA2 keep at original status. If Ti1 ≥ 28 °C (82.4°F) (300017 setting) + 4°C (7.2°F), fan runs at set speed and DA2 outputs 6~10VDC signal depending on Ti1 and Ti2 difference. If Ti1 sensor is damaged, fan runs at set speed.
b) If Tr > Ts +1°C(1.8°F), heating mode is terminated, MTV1 and AUX2 are off. DA2 is 5VDC. Indoor fan is turned off.
c) The range of Ts is 16-30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

With electric heater as booster (310043=1)

a) If Tr ≤ Ts - 1°C (1.8°F), heating mode is activated, MTV1 and AUX2 and turned on. Indoor fan runs at set speed. DA2 outputs 10VDC for 2 minutes. If Ti1 ≤ 28ºC (82.4°F) (300017 setting), EH is turned on and DA2 keeps at 10VDC. If 28°C (82.4°F or 300017) < Ti1 < 28°C (82.4°F or 300017) + 4°C (7.2°F), EH and DA2 keep at original status. If Ti1 ≥ 28 °C (82.4°F or 300017) + 4°C (7.2°F), EH is turned off and DA2 outputs 6~10VDC depending on Ti1 and Ti2 difference.
b) If Tr > Ts+1°C(1.8°F), heating mode is terminated, MTV2 and AUX2 are off. DA3 is 0VDC. Indoor fan runs at auto speed.
c) The range of Ts is 16- 30°C (60.8- 86°F) or fixed according to Parameter 4 setting.
d) Indoor fan speed can be adjusted to low, medium, high and auto.

OVERHEAT PROTECTION IN HEATING MODE

a) If Ti3 ≥ 75°C (167°F), MTV1, DA2, AUX2 and EH are turned off. Indoor fan runs at high speed, even in standby mode.
b) If Ti3 < 70°C (158°F), the unit maintains its original status.
c) If Ti1 is damaged or disconnected, this function is unavailable. Preheat and Post-heat run according to set time.

POST-HEAT

Without electric heater

a) If Ti4 ≥ 38°C (100.4°F), MTV1, AUX2 and DA2 are turned off. Indoor fan continues running at set speed.
b) If 36°C (96.8°F) ≤ Ti4≤ 38°C (100.4°F), MTV1, DA2 and AUX2 are turned off. Indoor fan maintains its original status.
c) If Ti4 < 36°C (96.8°F), MTV1, AUX2 and DA2 are turned off. Indoor fan is turned off.
d) If Ti4 is damaged or disconnected, the post-heat time is set to 2 minutes and then indoor fan is turned off.

With electric heater

b) Indoor fan runs at set speed for 1 minute and then stops.

DEHUMIDIFICATION

a) AUX1 is turned on. DP1 is turned off. DP2 is turned on. Ts = 24°C (75.2°F).
b) If Tr ≥ 25°C (77°F) for 30 seconds, MTV1 is turned on for 3 minutes then stops for 4 minutes. DA2 outputs 3 times of the minimum values. Indoor fan runs at auto speed.
c) If 16°C (60.8°F) ≤ Tr < 25°C (77°F), MTV1 is turned on for 3 minutes then stops for 6 minutes. DA2 outputs twice of the minimum values. Indoor fan runs at auto speed.
d) If Tr < 16°C (60.8°F), MTV1 is turned on for 4 minutes and stops for 10 minutes. DA2 outputs the minimum values. Indoor fan runs at auto speed.

AUTO MODE

Fan is turned on at medium speed. Check Tr and Ts in 30 seconds.

a) If Ts > Tr+3°C (5.4°F) for 30 seconds, the unit runs in heating mode.
b) If Tr-3°C (5.4°F) < Ts < Tr+3°C (5.4°F) for 30 seconds, the unit runs in fan mode.
c) If Ts < Tr-3°C (5.4°F) for 30 seconds, the unit runs in cooling mode.
d) If unit is in heating mode or fan mode, if Tr-Ts > 3°C (5.4°F), MTV2, MTV1 and DA3 are off more than 3 minutes, working mode is changed to cooling mode. If unit is in cooling mode or fan mode, if Ts-Tr > 3°C (5.4°F), MTV2, MTV1 and DA2 are off more than 3 minutes, working mode is changed to heating mode.

F.8.4. Function Description

a) DA1 0~10VDC Control Signal

At high speed, DA1 is set on address:310022. At medium speed, DA1 is set on address:310021. At low speed, DA1 is set on address:310020. At auto speed, DA1 is 0~10VDC calculated by PID. If address:300044=0, PID is calculated by Tr and Ts values. If address: 300044=1, PID is calculated by ESP.

b) DA2 0~10VDC Control Signal

After unit is turned on and MTV1 is on, DA2 outputs the minimum value (address:300016). After 5 minutes, DA2 output is 0~10VDC calculated by PID depending on Ti1 and Ti2 difference.

c) DA3 0~10VDC Control Signal

After unit is turned on and EH is on, DA3 outputs the minimum value (address:300017). After 5 minutes, DA3 outputs 0~10VDC depending on difference of Ti4 and Ti3.

d) DL Contact

When indoor fan is turned on, DL contact is closed. When indoor fan is turned off, DL is disconnected.

e) WP Contact

In cooling mode, if MTV1 is turned on, WP is turned on. MTV1 is turned off or mode is changed, WP continues working for 5 minutes and then off.

> **CAUTION**
>
> *If the system is turned off at the circuit breaker (or main power supply), the drain pump will not work.*

f) Water Float Switch (NC signal input)

Float switch contact opens before unit is turned on

If the float switch contact is opened before the unit is turned on, then MTV1 is turned off. The drain pump and indoor fan will operate. After float switch is closed, MTV1 is turned on.

Float switch contact opens when unit is turned on

If the float switch contact is opened continuously more than 5 seconds, the drain pump will be turned on and MTV1 will remain off. After the float switch is closed, the drain pump will run for an additional 5 minutes. If the float switch is opened for 10 minutes continuously, MTV1 will remain off. The indoor fan runs at set speed and alarm is activated.

Float switch contact opens, when unit is turned off
If the float switch contact is opened, the drain pump will be turned on.
After the float switch is closed, the drain pump will run for an additional 5 minutes. If the float switch is opened for 10 minutes continuously, alarm is activated.

g) PRO1 (NO signal input)
When the unit is on, PRO1 is opened or closed, the unit working status is not changed.
When the unit is off, PRO1 is closed for 60S, the unit is turned on. Fan runs at medium speed. MTV1, MTV2 are turned on, DA2 and DA3 are set to 10VDC. At this moment, if unit accepts ON instruction from remote handset, wired wall pad, or Modbus, the unit will work according to accepted instruction. If unit accepts OFF instruction from remote handset, wired wall pad or Modbus, the unit will keep at original state. PRO1 is opened for 60S, the unit is turned off after 15 minutes.

h) PRO2 (NO signal input)
If PRO3 is closed, RE contact will be closed. If PRO3 is open, RE contact will be open.

i) PRO3 (NO signal input)
The unit is ON and PRO3 input is closed for 60s, the temperature band is change to 3 times of the band.

j) PRO4 (NO signal input)
When the unit is on. If PRO4 contact is closed for 10s, DP1 contact will be closed and DP2 is open. If PRO4 contact is opened for 10s, DP1 contact is opened and DP2 is closed. In dehumidifier mode, DP1 contact is closed and DP2 is opened.

k) Sleep Mode
When sleep mode is activated, set point in cooling mode is increased by 0.5°C (0.9°F) for every 30 minutes then increased by 3°C (5.4°F) after 3 hours and then keeps at that value. Set point in heating mode is decreased by 0.5°C (0.9°F) for every 30 minutes then decreased by 3°C (5.4°F) after 3 hours and then keep at that value. When sleep mode is switched off, it returns to original set point.

l) EH Protection Switch
If EH protection switch is closed for 30 seconds and Fan is on, EH is turned on.
If EH is on, EH protection is open for 1 second. Or if fan is turned off, EH is turned off and alarm is activated.
If EH protection switch is closed for 180 seconds, EH can be turned on again.
If EH protection switch is opened for 3 times in 1 hour, EH will not be turned on again except resetting the main power.

m) Frost Protection in Standby Mode

I. For 2-pipe unit:

If Tr ≤ 2ºC for 2 minutes, MTV1 is turned on, AUX2 is closed, DA2 is 5VDC. If Ti1 < 5ºC for 2 minutes, EH (if present) is turned on. Indoor fan is turned on at low speed. If Tr ≥ 5ºC for 2 minutes, MTV2 is turned off, AUX2 is open, DA2 is 0 Vdc. Electric Heater is turned off. Indoor fan is turned off.

II. For 4-pipe unit:

If Tr ≤ 2ºC for 2 minutes, MTV2 is turned on, AUX2 is closed, DA3 is 5VDC. If Ti1 < 5ºC for 2 minutes, EH (if present) is turned on. Indoor fan is turned on at low speed. If Tr ≥ 5ºC for 2 minutes, MTV2 is turned off, AUX2 is open, DA3 is 0 Vdc. Electric Heater is turned off. Indoor fan is turned off.

III. For 2-pipe unit with 6-way:

If Tr ≤ 2ºC for 2 minutes, MTV1 is turned on, AUX2 is closed, DA2 is 8VDC. If Ti1 < 5ºC for 2 minutes, EH (if present) is turned on. Indoor fan is turned on at low speed. If Tr ≥ 5ºC for 2 minutes, MTV1 is turned off, AUX2 is open, DA2 is 5 Vdc. Electric Heater is turned off. Indoor fan is turned off.

F.8.5. Open Modbus Protocol for AC/EC-S6

Transfer Mode: RTU, BAUD Rate: 9600bps, 8 data bit, 1 stop bit, None parity bit

The communications require a delay of 80ms between reading an answer and sending the next command. All temperatures are equal to reading data *10 accuracy: 0.1°C/1°F.

Supported Functions:

Function Code	Function Description
01(01H)	Read Coils
02(02H)	Read Discrete Inputs
03(03H)	Read Holding Registers
04(04H)	Read Input Registers
05(05H)	Write Single Coil
06(06H)	Write Single Register
15(0FH)	Write Multiple Coils
16(10H)	Write Multiple Registers
255(FFH)	Extended Commands which are used to test unit

Valid Error code table:

Error code	Description	Definition
01 (01H)	Invalid commands	Received commands beyond valid commands
02 (02H)	Invalid data address	Data addresses beyond valid data address
03 (03H)	Invalid data	Data beyond definition range
04 (04H)	Write data not successful	Write data did not succeed

Coils table:

Description	Address	Type*	Remark
ON/OFF	100000	R/W	
Sleep mode	100001	R/W	
Swings	100002	R/W	

Discrete table:

Description	Address	Type*	Remark
MTV1	200000	R	
MTV2	200001	R	
AUX1	200002	R	
AUX2	200003	R	
Condensate pump	200004	R	
Electrical heater	200005	R	
Wired wall pad	200006	R	
PRO1	200007	R	
Float switch	200008	R	
PRO2	200009	R	
EH safety switch	200010	R	
Unit ON/OFF status	200011	R	Internal test only
PRO3	200012	R	
DP1	200013	R	
DP2	200014	R	
RE	200015	R	
D02	200016	R	
DO1	200017	R	
PRO4	200018	R	

Holding Register table:

Description	Address	Type*	Remark
Mode setting	300000	R/W	Cooling mode = 01(H) Humidify mode = 02(H) Fan mode = 04(H) Heating mode = 08(H) Auto mode = 10(H)
Fan speed setting	300001	R/W	Low speed = 04(H) Medium speed = 02(H) High speed = 01(H) Auto fan speed = 07(H)
Louver swing setting	300002	R/W	Position 1=01(H) Position2=02(H) Position3=03(H) Position4=04(H) Auto=0F(H) Stop=00(H)
Setting temperature	300003	R/W	16~30 (actual*10 format)
Address setting	300004	R/W	0~31
Reset	300005	W	=0x33 reset error
Reserved	300006	W	
Reserved	300007	W	
Reserved	300008	W	
Reserved	300009	W	
Hours in Timer on	300010	R/W	Timer ON
Minute in Timer on	300011	R/W	Timer ON
Hours in Timer off	300012	R/W	Timer OFF
Minute in Timer off	300013	R/W	Timer OFF
Icon of Timer ON or OFF	00014	R/W	BIT0 = Icon of Timer ON, BIT1 = Icon of Timer OFF 1 = enable, 0 = disable
Minimum output DA1\AO1	300015	R/W	Default 25% (2.5vdc)
Minimum output DA2\DA3\AO2	300016	R/W	Default 25% (2.5vdc)
Pre-heat temperature setting	300017	R/W	25~35, default: 30
0~10vdc signal input setting	300018	R/W	Default: 40% （4VDC) or （10.4mA)
Super low speed rpm	300019	R/W	0~10V , default:2VDC

Low speed rpm	300020	R/W	1~10VDC, default: 3VDC
Medium speed rpm	300021	R/W	1~10VDC, default: 6VDC
High speed rpm	300022	R/W	1~10VDC, default: 8.5VDC
Signal output setting	300023	R/W	1~10VDC (used to test，0 = disable)
Temperature sampling time	300024	R/W	2~100，default: 5S
Factor of auto fan speed	300025	R/W	2~150，default:20
Factor of modulating valve	300026	R/W	2~250，default:150
Ti1 and Ti2 difference setting	300027	R/W	3~15，default:5
Ti3 and Ti4 difference setting	300028	R/W	3~15, default:10
Unit type setting	300029	R/W	0=air cleaner 1=FCU 2=AHU 3=AHU+AQI
Degree unit setting	300030	R/W	0=degree C, 1=degree F
Temperature display setting	300031	R/W	0=Room temperature display on LED 1=Setting temperature display on LED
Setting temperature range	300032	R/W	0=setting temperature range is from 16~30 1=Setting temperature range is fixed. Cooling=24C Heating=21C
Temperature band setting	300033	R/W	1~9， default:1
PM2.5 setting	300034	R/W	30~200， default:60；
PM2.5 band setting	300035	R/W	10~80，default:50
CO2 setting	300036	R/W	460~1200， default:800
CO2 band setting	300037	R/W	100~500， default:200
Reserved	300038	R/W	
Reserved	300039	R/W	
RH setting	300040	R/W	30~70， default:50
RH band setting	300041	R/W	10~30，default:10
Unit type	300042	R/W	0=2-pipe with valve, 1=4-pipe with std valve, 2=4-pipe with 6-way valve, 3=AQI+2-pipe unit + radiating system
EH type	300043	R/W	0=without EH, 1=EH as booster; 2=EH as primary
DA1 control signal	300044	R/W	
EC motor input ports	3000045	R/W	0=CN4 working, 1=CN5 working, 2=CN4+CN5 working, default:0
PRO1 input type	300046	R/W	0=NO, 1=NC
Tr sensor setting	300047	R/W	0=sensor on the wired wall pad； 1=sensor on the main PCB；default：0
Factor setting between DA2/DA1	300048	R/W	0~120，default：80

Input Register table:

Description	Address	Type*	Remark
Tr temperature sensor	400000	R	
Ti1 temperature sensor	400001	R	
Ti2 temperature sensor	400002	R	
Ti3 temperature sensor	400003	R	
Ti4 temperature sensor	400004	R	
Error code	400005	R	Bit0 = Room temperature sensor error, Bit1 = Ti1 temperature sensor error, Bit2 = Ti2 temperature sensor error Bit3 = Float switch error, Bit4 = Indoor coil low temperature protection Bit5 = Indoor coil over heat protection, Bit6 =Filter switch ,Bit7 = Electrical heater failure, Bit8 = Ti3 temperature sensor error, Bit9 = Ti4 temperature sensor error, Bit10 = System parameters error Bit11 =PM2.5 sensor, Bit12 =CO2 sensor Bit13 = VOCs sensor, Bit14 = 4~20mA, Bit15 = 0`10vdc
Fan speed status	400006	R	Low = 04(H) Medium = 02(H) High = 01(H)
4~20mA	400007	R	
0~10VDC	400008	R	
EH	400009	R	0= disable, 1=booster, 2=primary
AO2	400010	R	
Unit type	400011	R	
DA1	400012	R	
DA2	400013	R	
DA3	400014	R	
Reserved	400015	R	
Reserved	400016	R	CN4-RPM
Reserved	400017	R	CN5-RPM
Unit status	400018	R	Cooling mode = 01(H) Humidify mode = 02(H) Fan mode = 04(H) Heating mode = 08(H)
Temperature in wall pad	400019	R	
Dew point	400020	R	
AO1	400021	R	0~10vdc output
AO2	400022	R	0~10vdc output
Temperature in AQI	400023	R	Temperature in AQI
PM2.5	400024	R	PM2.5 reading
CO2	400025	R	CO2 reading
VOC	400026	R	VOCs reading
RH	400027	R	RH reading

*R = read only, W = write only, R/W = read and write. Remark: The above protocol address is in Base 0.

F.9. Differential Pressure Transducer

1.0 GENERAL INFORMATION

Pressure transducers sense differential or gauge (static) pressure and convert this pressure difference to a proportional high
level analog output for both unidirectional pressure range.
Power input is 12~30VAC/VDC and output is 0~10VDC.

2.0 MECHANICAL INSTALLATION

2.1 Media Compatibility

The transducers are designed to be used with air or non-conductive gases. Use with liquids or corrosive gases will damage the unit.

2.2 Environment

The operating temperature limits of the 267 and 267MR are as follows:
Operating Temperature: 0°F to +150°F (-18°C to +65°C)
Compensated Temperature Range: +40°F to +150°F (+5°C to +65°C)

2.3 Pressure Fittings

The Module can be supplied with:
Static Pressure Probe – Installed on the duct by drilling a 7/16" hole in the duct at the desired mounting location, inserting the pressure probe into the duct, and mounting the meter onto the duct with the mounting tabs.
The static pressure probe is the positive (high) pressure port located on the back of the unit. The reference (low) pressure port is located on the bottom of the unit and can be used for differential pressure measurements.

3.0 ELECTRICAL INSTALLATION

Access the model electrical terminations by opening the cover. The label provided inside of the cover contains terminal designations wiring instructions.

3.1 Voltage output units

The model voltage output is a 3-wire circuit, with three terminals available for wiring. There terminals have the designation COM, OUT and EXC. The Excitation and Output are common on the circuits. The transducer voltage can operate 12~30Vac/Vdc excitation with 0~10VDC output.

4.0. CALIBRATION

The transducer is factory calibrated and should require no field adjustment. Generally, the mounting position will have a zero-shift effect on ranges below 250Pa. Wherever possible, any zero and/or span offsets should be corrected by software adjustment in the user's control system. However, both zero and span adjustments are accessible under the cover of the unit, underneath and to the right of the terminal strip. The transducer is calibrated in the vertical position at the factory (mounting tabs vertical).

4.1 Voltage Output Zero Adjustment

While monitoring the voltage between the positive output (OUT) and common (COM), and with both pressure ports open to atmosphere, the zero may be adjusted by turning the zero-adjustment screw. Factory settings is 0.05VDC for unidirectional pressure ranges.

4.2 Voltage Output Span Adjustment (Complete the zero adjustment before setting span.)

Span or full-scale output adjustments should only be performed by using an accurate pressure standard (electronic manometer, digital pressure gauge, etc.), with at least comparable accuracy to the s745 transducer (<±1% FS). With full range pressure applied to the high-pressure port (reference port open to atmosphere), the span may be adjusted by turning the SPAN adjustment screw. (See Diagram for location of SPAN adjustment.) Factory settings is 0.05VDC for unidirectional pressure ranges.

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