Carrier

United Technologies

turn to the experts

AQUAFLOW™

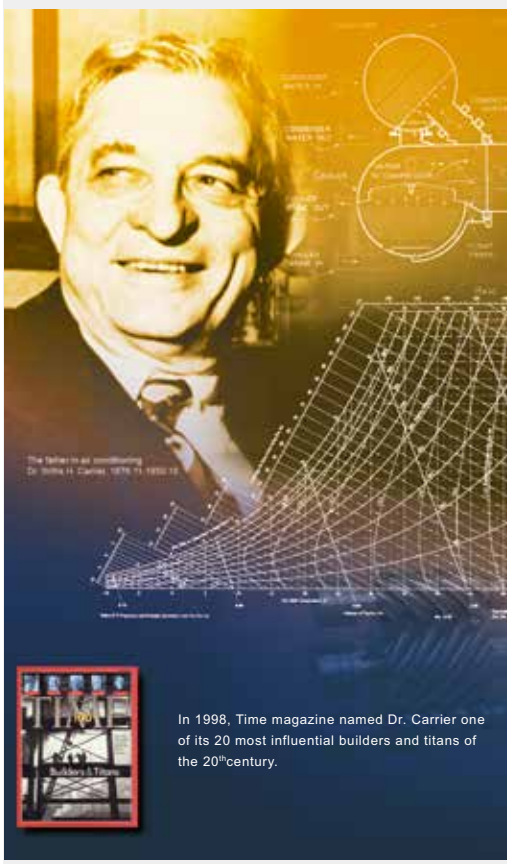
VWV SYSTEM

Design, installation, commissioning manual for Aqua–flow™ VWV system

Carrier China

Carrier Corporation is a subsidiary of the United Technologies Corp. (UTC), which ranks the 150th in Fortune Top 500 in 2011 and has its operations in aerospace and building systems industries all over the world. From the time the founder Dr. Carrier invented the first system of modern air conditioning in 1902, Carrier has been the world leader in the air conditioning industry with its products and system solutions supplied to numerous famous buildings, and up to now, the network of distribution cover more than 170 countries all over the world. In 2011, Carrier ranked top in the HVAC industry field with its sales revenue of US $12 billion.

In China, there are 6 Carrier factories which have more than 2500 employees. As the world-class factory, Carrier has a number of technically advanced production lines, manufacturing commercial and residential chillers, compressors and air-side products. A wide range of products are able to meet diversified requirements of different customers. The global R&D center located in Shanghai has the capability of developing several major projects in the same time, with many advanced technical patents awarded to support Carrier stay most competitive in terms of technology advantage in the HVAC industry.



In 1998, Time magazine named Dr. Carrier one of its 20 most influential builders and titans of the 20th century.

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Chapter I System Introduction

1.1 System Overview

Carrier′ s innovative new Aqua-flow VWV system delivers flexibility and energy efficiency. As a flagship of the Carrier product line, the VWV system comprises a new-generation outdoor air-cooled cooling-only/heat pump unit (ODU) , indoor networked fan–coil unit (IDU), heat recovery fresh air unit (FAU), integrated hydronic kit, indoor thermostat and networked System Manager. Customers and designers integrate different systems according to their precise needs, delivering top-quality air-conditioning systems for commercial sites such as shopping malls, offices and hotels.

As the leading manufacturer in the air-conditioning industry, Carrier has the technology and experience to develop and deliver the best chilled water systems. The new Aqua-flow VWV system uses water as the secondary refrigerant. Outdoor and indoor units are connected through water pipes, with the coolant concentrate in the outdoor unit only, so customers need not worry about safety risks caused by coolant leakage. Meanwhile, outdoor and indoor units are easy to dismantle and assemble, which is convenient for the expansion and renovation of the air-conditioning system.

As a manufacturer with a broad range of equipment under a single brand, we provide customers with fully integrated air-conditioning systems. The installer is only responsible for materials such as electric wires, water pipes and ventilation ducts that have little effect on the system. Customers are free from worrying about compatibility i ssues, as all equipment is designed to work together and model selection and installation is straightforward and convenient. In addition, we can provide customers with timely and effective after-sales service on all our air-conditioning systems.

1.2 System Features

The new Aqua-flow VWV system is a standardized, modular air-conditioning solution. All standard components are pre-confgured according to cooling capacity to reduce the project design cycle and solution cost.

Flexible control

- Start/stop and operation modes of indoor units are controlled by the indoor unit thermostat, automatically determining the start/stop and operation modes of the outdoor unit.
- Indoor and outdoor units can be operated via the System Manager.
- The System Manager supports TCP/IP, allowing the system to be monitored and managed via a web browser when connected to the building services network through a local area network (LAN).

Energy saving

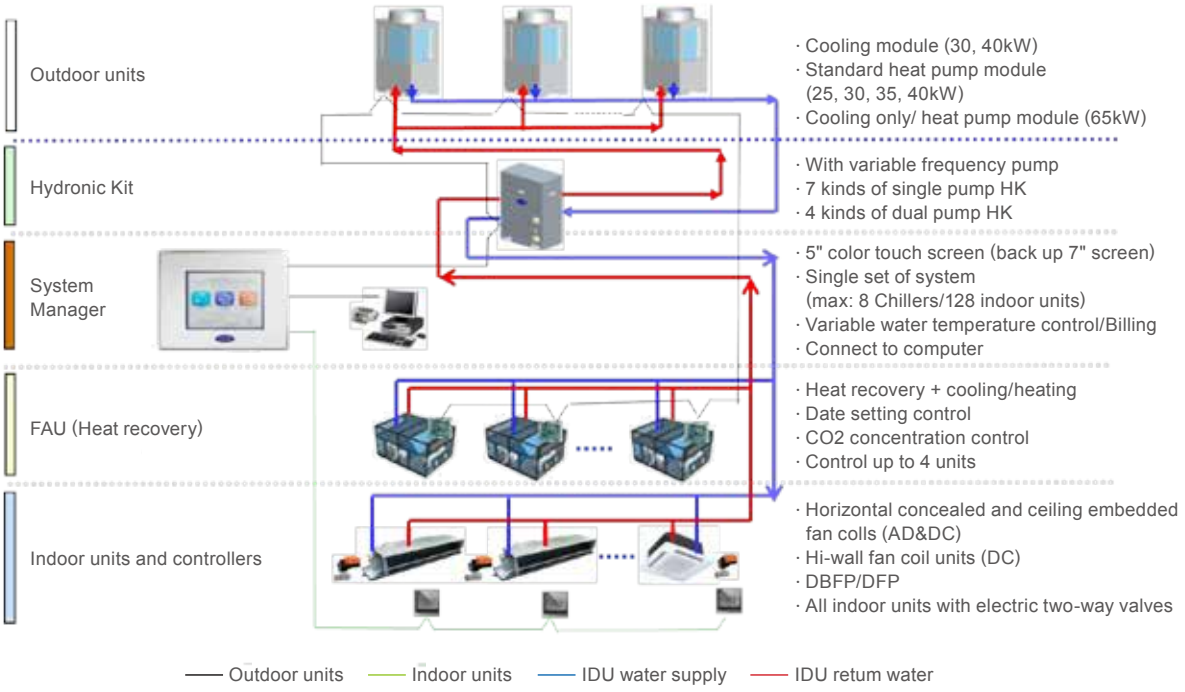
- The whole range of outdoor units complies with China’s national Energy Efficiency standard (China GB) and is certifed to National Energy Conservation standards.
- The system automatically regulates the outdoor unit, in a timely manner, based on variations of the indoor load, to ensure energy conservation.
- The VWV system intensively monitors the indoor units and controls their operation according to area division and predetermined schedule to prevent unnecessary energy consumption resulting from the operation of too many indoor units or overheating.
- The VWV system provides adaptive variable water temperature control . It automatically regulates the LWT (leaving water temperature) of the air conditioner based on indoor conditions, which guarantees indoor comfort and reduces operating cost during transition seasons.
- The VWV system provides variable fow control. It automatically regulates the frequency of the variable frequency pump in the hydronic kit according to the status of outdoor and indoor units, thus signifcantly reducing operating cost at part load.
- When auto-commissioning is engaged, it is even easier to adjust the system to the best differential pressure.
- The fresh air system operates in heat recovery mode to take full advantage of waste indoor heat and reduce the fresh air load by more than 50%. This signifcantly reduces the capacity required of equipment such as outdoor units and saves initial investment.
- Fresh air is provided on demand. The system’s built-in CO2 concentration detector controls the heat recovery fresh air unit to minimize operating cost.
- The VWV system saves up to 20% energy compared to traditional air conditioning systems without System Management.

Easy installation and commissioning

- Standardized equipment, all of which can be transported in a standard elevator.
- The hydronic kit combines multiple parts to save installation space and time.
- Impurities in the water system are easily removed through an automatic one-button process, reducing operator workload.
- The system can be easily expanded and indoor units can be easily moved.
- The system supports automatic navigation of system settings.

1.3 System composition

1.3.1 Basic construction



1.3.2 Exterior Drawing

Outdoor Unit

Cooling only :

30 RBM 030

30 RBM 040

Heat pump :

30 RQM 025

30 RQM 030

30 RQM 035

30 RQM 040

Outdoor Unit

Cooling only：

30 RBH 065

Heat pump：

30 RQH 065

Hydronic Kit

HK 030 ~ HK 520

System Manager

Standard option(on wall):

HSM5IPRT0/HSM7IPRT0

Standard option(in wall):

HSM5RPKT0/HSM7RPKT0

Thermostat

CTC100

CTC200

Billing

BILA101~BILA107

FAU

BFP 1

BFP 1.5 ~ BFP 8

DBFP/DFP

DBFP1(I) ~ DBFP6(I)

DBFPX1(I) ~ DBFPX6(I)

DFP(X)2

DFP(X)3

DFP(X)4

Horizontal ceiling fan coil unit

42 CE/CN 002

42 CE/CN 003 ~ 42 CE/CN 014

Cassesste

42 GWC 003

42 GWC 004 ~ 42 GWC 014

Hi-wall fan coil unit

42 CM 002
42 CM 003
42 CM 004
42 CM 005

1.3.3 Main Components and Capacity Range

1.3.3.1 Outdoor Unit

Type	Standard unit							
	Cooling only(30RBM)		Heat pump(30RQM)				Cooling only (30RBH065)	Heat pump (30RQH065)
	030	040	025	030	035	040		
Cooling capacity/kW	29.2	39.5	24.5	28.9	33.9	39.2	65	65
Heating capacity/kW	-	-	24.5	30	34.8	39.5	/	68

1.3.3.2 Hydronic Kit

Type	HK030	HK040	HK080	HK150	HK210	HK320	HK520
Maximum matched system	25~30kW	25~40 kW	25~80 kW	25~150 kW	25~210 kW	25~320 kW	65~520 kW
Matching range	25~30kW	35~40kW	50~80kW	90~150kW	160~210kW	240~320kW	390~520kW

1.3.3.3 FAU

Parameters of two-row coils units

Type	BFP1	BFP1.5	BFP2	BFP2.5	BFP3	BFP4	BFP5	BFP6	BFP8
Air volume/ CMH	1000	1500	2000	2500	3000	4000	5000	6000	8000
Cooling capacity /kW	10.3	15.9	21.9	26.5	31.2	42.4	55.3	68.2	92.7
Heating capacity /kW	12.2	18.1	24.2	29.7	35.0	46.5	59.5	72.5	97.4

Parameters of four-row coils unit

Type	BFP1	BFP1.5	BFP2	BFP2.5	BFP3	BFP4	BFP5	BFP6	BFP8
Air volume / CMH	1000	1500	2000	2500	3000	4000	5000	6000	8000
Cooling capacity /kW	15.5	23.3	31.3	38.2	45.2	60.2	70.3	86.8	119.7
Heating capacity /kW	16.4	24.2	32.3	39.9	47.4	62.7	76.3	92.8	125.8

1.3.3.4 Indoor Units

Horizontal ceiling FCU (42CE) external static pressure: 12/30/50 Pa

Parameters of two-row coils units

Type	002	003	004	005	006	008
Cooling capacity /kW	1.90	2.82	3.64	4.50	5.40	7.20
Heating capacity /kW	3.10	4.40	5.82	6.90	8.40	11.16
Noise/dB (12/30/50Pa)	36/40/42	38/41/44	41/44/46	43/46/47	45/47/49	46/48/50

Parameters of three-row coils units

Type	002	003	004	005	006	008	010	012	014
Cooling capacity /kW	2.30	3.20	4.15	5.00	6.20	8.10	9.80	11.50	13.50
Heating capacity /kW	3.60	5.10	6.45	7.87	9.30	12.50	15.2	17.2	20.5
Noise/dB (12/30/50Pa)	36/40/42	38/41/44	41/44/46	43/46/47	45/47/49	46/48/50	47/49/51	50/51/53	51/53/54

External static pressure of low noise horizontal ceiling fan coil unit (42CN) : 12/30/50Pa

Parameters of two-row coils units

Type	002	003	004	005	006	008
Cooling capacity /kW	1.90	2.82	3.64	4.50	5.40	7.20
Heating capacity /kW	3.10	4.40	5.82	6.90	8.40	11.16
Noise /dB (12/30/50Pa)	34/37.5/41	36/39.5/43	38/41.5/44.5	42/43.5/45.5	44/44.5/46.5	43/46/47.5

Parameters of three-row coils units

Type	002	003	004	005	006	008	010	012	014
Cooling capacity /kW	2.30	3.20	4.15	5.00	6.20	8.10	9.80	11.50	13.50
Heating capacity /kW	3.60	5.10	6.45	7.87	9.30	12.50	15.20	17.20	20.50
Noise/dB (12/30/50Pa)	34/37.5/41	36/39.5/43	38/41.5/44.5	42/43.5/45.5	44/44.5/46.5	43/46/47.5	46.5/48.5/50	48.5/49.5/50.5	48.5/51/52

Cassette (42GWC)

Type	003	004	005	006	008	010	012	014
Cooling capacity /kW	2.4	4.0	4.7	5.9	8.3	9.1	10.9	12.6
Heating capacity /kW	4.5	6.5	7.7	9.9	12.5	13.7	16.3	18.9
Noise/ dB (High/Middle/Low)	39/33/29	42/36/31	49/41/34	39/31/25	48/40/25	48/45/41	50/47/43	52/49/46

Hi-wall fan coil unit (42CM)

Type	002	003	004	005
Cooling capacity /kW	1.84	2.80	3.60	4.50
Heating capacity /kW	2.71	4.10	5.40	6.75
Noise /dB	32	37	41	43

DBFP

Type	1	1I	1.5	1.5I	2	2I	2.5	2.5I	3	3I	4	4I	5	5I	6	6I
Cooling capacity /kW	5	5	7.8	7.8	11.1	11.1	13.9	13.9	16.9	16.9	22.1	22.1	28.9	28.9	34.5	34.5
Heating capacity /kW	11.2	11.2	17	17	23	23	28.7	28.7	34.8	34.8	45.7	45.7	58.2	58.2	69.5	69.5
Noise /dB	52	55	55	58	56.5	59.5	60	61	62	62	58	61	60.5	61.5	62.5	63.5

Type	X1	X1I	X1.5	X1.5I	X2	X2I	X2.5	X2.5I	X3	X3I	X4	X4I	X5	X5I	X6	X6I
Cooling capacity /kW	6.4	6.4	10	10	12.7	12.7	16.1	16.1	20.2	20.2	27.2	27.2	37	37	44	44
Heating capacity /kW	13	13	19.6	19.6	26	26	32.6	32.6	39.2	39.2	52.6	52.6	67	67	80.2	80.2
Noise /dB	52	55	55	58	56.5	59.5	60	61	62	62	58	61	60.5	61.5	62.5	63.5

DFP

Type	2	X2	3	X3	4	X4
Cooling capacity /kW	12.7	12.7	20.2	20.2	27.2	27.2
Heating capacity /kW	26	26	39.2	39.2	52.6	52.6
Noise /dB	58.2	58.2	58.5	58.5	60	60

1.3.3.5 Controllers

System Manager (HSM5IPRT0、HSM5IPRB0)

Standard option: (BACnet function)

5"screen: intergrated: HSM5IPRB0 embedded : HSM5RPKB0 7"screen: intergrated: HSM7IPRB0 embedded : HSM7RPKB0

Indoor Thermostat (CTC100、CTC200)

CTC100：AC fan- coil controller powered by 220V AC；
CTC200：DC fan-coil and DBFP/DFP controller powered by 12V DC
(provided by the DC fan-coil driveboard or DBFP/DFP driveboard).

1.3.4 Outdoor system

1.3.4.1 Model Number

Nomenclature

A	water system type A:2-pipe water system
240	System model 025/030/035…520
RQ	Unit model RBM: Cooling only (with standard cooling only unit) RQM: Heat pump (with standard heat pump unit) RQE: Heat pump (with enhanced heat pump unit) RBH: Modular Cooling only (with standard cooling only unit) RQH: Modular Heat pump (with standard heat pump unit)
SHS	Product series SHS: variable flow air conditioning system

1.3.4.2 System Solution Matrix

Cooling only type

Unit module	System cooling capacity	Number of outdoor units	Composite module		Hydronic kit		System rated flow	Head	Water pressure drop	Available water pressure
			30RBM030	30RBM040	Type	Quantity	m3/h	kPa	kPa	kPa
SHSRBM030	29.2	1	1		HK030	1	5	253	65	188
SHSRBM040	39.5	1		1	HK040		6.8	281	63	218
SHSRBM060	58.4	2	2		HK080		10	283	65	218
SHSRBM070	68.7	2	1	1			11.8	260	65	195
SHSRBM080	79	2		2			13.6	241	63	178
SHSRBM090	87.6	3	3		HK150 / HK150D		15	280	65	215
SHSRBM100	97.9	3	2	1			16.8	276	65	211
SHSRBM110	108.2	3	1	2			18.6	274	65	209
SHSRBM120	118.5	3		3			20.4	272	63	209
SHSRBM130	127.1	4	3	1			21.8	267	65	202
SHSRBM140	137.4	4	2	2			23.6	264	65	199
SHSRBM150	147.7	4	1	3			25.4	260	65	195
SHSRBM160	158	4		4	HK210 / HK210D		27.2	309	63	246
SHSRBM170	166.6	5	3	2			28.6	306	65	241
SHSRBM180	176.9	5	2	3			30.4	304	65	239
SHSRBM190	187.2	5	1	4			32.2	300	65	235
SHSRBM200	197.5	5		5			34	297	63	234
SHSRBM210	206.1	6	3	3			35.4	290	65	225
SHSRBM220	216.4	6	2	4	HK320/ HK320D		37.2	315	65	250
SHSRBM230	226.7	6	1	5			39	313	65	248
SHSRBM240	237	6		6			40.8	311	63	248
SHSRBM250	245.6	7	3	4			42.2	308	65	243
SHSRBM260	255.9	7	2	5			44	307	65	242
SHSRBM270	266.2	7	1	6			45.8	305	65	240
SHSRBM280	276.5	7		7			47.6	302	63	239
SHSRBM290	285.1	8	3	5			49	301	65	236
SHSRBM300	295.4	8	2	6			50.8	300	65	235
SHSRBM310	305.7	8	1	7			52.6	292	65	227
SHSRBM320	316	8		8			54.4	286	63	223

1.3.4.2 System Solution Matrix

Heat pump type

Unit module	System cooling capacity	Number of outdoor units	Composite module				Hydronic kit		System rated flow	Head	Water pressure drop	Available water pressure
			30RQM 025	30RQM 030	30RQM 035	30RQM 040	Type	Quantity	m³/h	kPa	kPa	kPa
SHSRQM025	24.5	1	1				HK030	1	4.2	290	54	236
SHSRQM030	28.9	1		1					5	253	65	188
SHSRQM035	33.9	1			1		HK040		5.8	292	57	235
SHSRQM040	39.2	1				1			6.8	281	63	218
SHSRQM050	49.0	2	2				HK080		8.4	301	54	247
SHSRQM055	53.4	2	1	1					9.2	295	65	230
SHSRQM060	57.8	2		2					10	283	65	218
SHSRQM065	62.8	2		1	1				10.8	275	65	210
SHSRQM070	67.8	2			2				11.6	262	57	205
SHSRQM075	73.1	2			1	1			12.6	253	63	190
SHSRQM080	78.4	2				2			13.6	241	63	178
SHSRQM085	82.3	3	1	2			HK150 / HK150D		14.2	282	65	217
SHSRQM090	86.7	3		3					15	280	65	215
SHSRQM095	91.7	3		2	1				15.8	279	65	214
SHSRQM100	96.7	3		1	2				16.6	278	65	213
SHSRQM105	101.7	3			3				17.4	277	57	220
SHSRQM110	107.0	3			2	1			18.4	276	63	213
SHSRQM115	112.3	3			1	2			19.4	274	63	211
SHSRQM120	117.6	3				3			20.4	272	63	209
SHSRQM125	120.6	4		3	1				20.8	270	65	205
SHSRQM130	125.6	4		2	2				21.6	269	65	204
SHSRQM135	130.6	4		1	3				22.4	265	65	200
SHSRQM140	135.6	4			4				23.2	264	57	207
SHSRQM145	140.9	4			3	1			24.2	263	63	200
SHSRQM150	146.2	4			2	2			25.2	262	63	199
SHSRQM155	151.5	4			1	3	HK210 / HK210D		26.2	310	63	247
SHSRQM160	156.8	4				4			27.2	309	63	246
SHSRQM165	159.5	5		2	3				27.4	308	65	243
SHSRQM170	164.5	5		1	4				28.2	307	65	242
SHSRQM175	169.5	5			5				29	305	57	248

1.3.4.2 System Solution Matrix

Heat pump type

Unit module	System cooling capacity	Number of outdoor units	Composite module				Hydronic kit		System rated flow	Head	Water pressure drop	Available water pressure
			30RQM 025	30RQM 030	30RQM 035	30RQM 040	Type	Quantity	m³/h	kPa	kPa	kPa
SHSRQM180	175.4	5		2		3	HK210 / HK210D	1	30.4	304	65	239
SHSRQM185	180.1	5			3	2			31	302	63	239
SHSRQM190	185.4	5			2	3			32	300	63	237
SHSRQM195	190.7	5			1	4			33	298	63	235
SHSRQM200	196.0	5				5			34	297	63	234
SHSRQM205	198.4	6		1	5				34	297	65	232
SHSRQM210	203.4	6			6				34.8	295	57	238
SHSRQM215	208.7	6			5	1			35.8	290	63	227
SHSRQM220	214.0	6			4	2	HK320 / HK320D		36.8	315	63	252
SHSRQM225	219.3	6			3	3			37.8	314	63	251
SHSRQM230	224.6	6			2	4			38.8	313	63	250
SHSRQM235	229.9	6			1	5			39.8	312	63	249
SHSRQM240	235.2	6				6			40.8	311	63	248
SHSRQM245	237.3	7			7				40.6	310	57	253
SHSRQM250	242.6	7			6	1			41.6	309	63	246
SHSRQM255	247.9	7			5	2			42.6	308	63	245
SHSRQM260	253.2	7			4	3			43.6	307	63	244
SHSRQM265	258.5	7			3	4			44.6	306	63	243
SHSRQM270	263.8	7			2	5			45.6	305	63	242
SHSRQM275	269.1	7			1	6			46.6	304	63	241
SHSRQM280	274.4	7				7			47.6	302	63	239
SHSRQM285	276.5				7	1			47.4	301	63	238
SHSRQM290	281.8	8			6	2			48.4	301	63	238
SHSRQM295	287.1	8			5	3			49.4	300	63	237
SHSRQM300	292.4	8			4	4			50.4	300	63	237
SHSRQM305	297.7	8			3	5			51.4	296	63	233
SHSRQM310	303.0	8			2	6			52.4	292	63	229
SHSRQM315	308.3	8			1	7			53.4	288	63	225
SHSRQM320	313.6	8				8			54.4	286	63	223

1.3.4.2 System Solution Matrix

Cooling only type

Unit module	cooling capacity	Number of outdoor units	Composite module	Hydronic kit		System rated flow	Head	Water pressure drop	Available water pressure
			30RQE065	Type	Quantity	m³/h	kPa	kPa	kPa
SHSRBM065	65	1	1	HK080	1	11.2	270	77	193
SHSRBH130	130	2	2	HK150/HK150d		22.4	265	77	188
SHSRBH195	195	3	3	HK210/HK210d		33.6	297	77	220
SHSRBH260	260	4	4	HK320/HK320d		44.8	305	77	228
SHSRBH325	325	5	5			56	295	77	218
SHSRBH390	390	6	6	HK520		67.2	294	77	217
SHSRBH455	455	7	7	HK520		78.4	275	77	198
SHSRBH520	520	8	8	HK520		89.6	245	77	168

Heat pump type

Unit module	cooling capacity	Number of outdoor units	Composite module	Hydronic kit		System rated flow	Head	Water pressure drop	Available water pressure
			30RQH065	Type	Quantity	m³/h	kPa	kPa	kPa
SHSRQH065	65	1	1	HK080	1	11.2	270	77	193
SHSRQH130	130	2	2	HK150/HK150d		22.4	265	77	188
SHSRQH195	195	3	3	HK210/HK210d		33.6	297	77	220
SHSRQH260	260	4	4	HK320/HK320d		44.8	305	77	228
SHSRQH325	325	5	5			56	295	77	218
SHSRQH390	390	6	6	HK520		67.2	294	77	217
SHSRQH455	455	7	7	HK520		78.4	275	77	198
SHSRQH520	520	8	8	HK520		89.6	245	77	168

Model selection restrictions

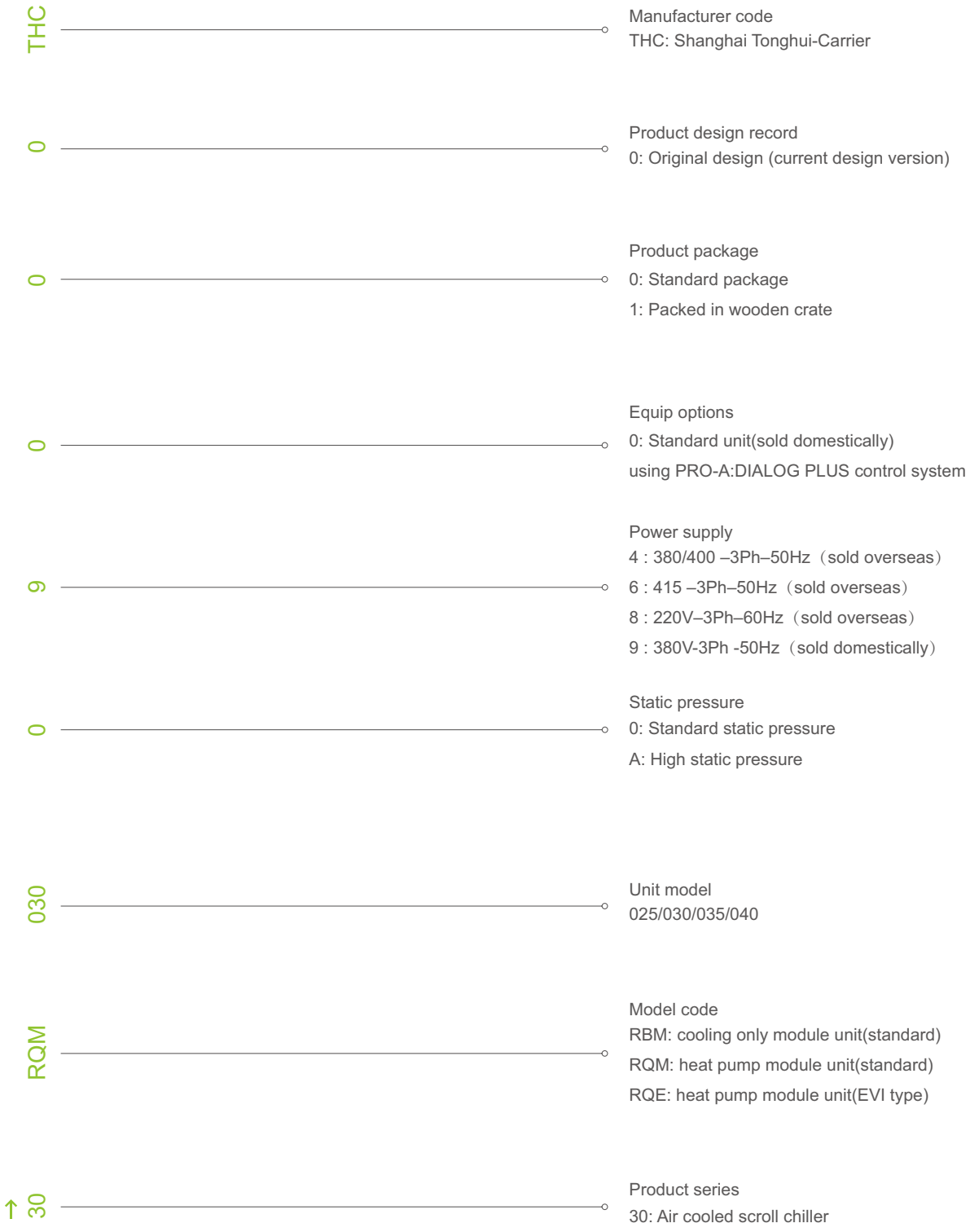
1.Up to 8 outdoor units of the same model can be combined.
2.The maximum compatible capacity of the hydronic kit must exceed the system cooling capacity of the outdoor unit.

Chapter II Product Introduction

2.1 Outdoor Unit

2.1.1 Model number

Nomenclature



2.1 室外主机

2.1.1 型号编码

Nomenclature

2.1.2 Unit Features

Carrier's new Aqua- flow VWV system includes the latest technical breakthroughs from three major global research and development centers: high-effciency chlorine-free HFC-410A refrigerant, a high-performance scroll compressor, a high-effciency plate heat exchanger, the adaptive PRO-DIALOG PLUS control system, an integrated hydronic kit, and other innovations. All models in the range comply with the requirements of China's national energy effciency standard (China GB).

Energy effcient

- High-effciency scroll compressor designed for HFC-410A.
- Highly effcient fan motor that reduces power consumption by 10-30%.
- Enhanced heating option (EVI compressor) and outdoor unit cooling system economizer to lower power consumption.
- Twin compressors in each outdoor unit, operating in parallel, precisely match cooling capacity to actual customer need and reduce energy consumption.
- Built-in electric two-way valves to control the water side loop and lower the power consumption of the water pump.

Quiet operation

- A new generation enclosed scroll compressor that oper ates smoothly and steadily with little vibration, plus two layers of foating seals on the air exhaust side to further reduce noise.
- An innovative elastic vibration damping base on the compressor effectively blocks the transmission of vibrations to the unit.
- New low-noise axial fan with fan bl ades that optimi ze air flow, a unique rigid suppor ting structure that eliminates the amplifcation of vibration and noise through the unit frame, and quieter unit start-up and operation.
- Double- speed fan motor that automatically switches to low speed at par tial load when the outdoor air temperature is relatively low (cooling)/high (heating).

Environment friendly

- High-effciency chlorine-free HFC-410A refrigerant (Puron).
- No-leakage cooling circuit design, with welded connections between all cooling pipes and components.

Easy to install

- Modular outdoor unit with integrated water inlet and outlet assemblies (including flter, pressure gauge, drain valve and shut-off valve) to greatly save installation space, time and labor for cost saving.
- "Quick Self- checking" function that runs successive checks on electrical equipment (including instruments, electrical elements, compressors, fan motors and water pumps) before the unit operates.

Reliable quality

- Critical parts designed and optimized in cooperation with world-renowned professional labs, using the fnite element method.
- Rigorous endurance tests, salt- spray tests, accelerated fatigue tests, transport simulation tests, and more ensure high reliability of the chiller unit.

2.1.3 Technical Parameters

30RBM

Type	Unit	30RBM030	30RBM040
Nominal cooling capacity	kW	29.2	39.5
Cooling input power	kW	8.8	12.0
Energy effciency ratio (EER)	kW/kW	3.32	3.29
Part-load performance factor of cooling	kW/kW	5.20	5.18
Electric parameters			
Main power supply		380/400/415V-3Ph-50Hz	
Control current		Powered by the main power supply through built-in transformer	
Nominal operating current	A	16.0	23.2
Net weight	kg	310	360
Noise	dB(A)	62	64
Refrigerant		HFC-410A	
Refrigerant charge	kg	10.0	12.0
Compressor		Enclosed scroll compressors	
Quantity		2	2
Control system		Pro-dialog Plus microcomputer control system	
Condensers		Copper and aluminum fn tube coil, with hydrophilic coating	
Number of fans		1	1
High fan speed	rpm	720	720
Evaporator		Brazing plate exchanger	
Nominal water fow	m3/h	5.0	6.8
Internal water pressure drop of the unit	kpa	65	63
Maximum water-side pressure	kpa	1000	1000
Hydronic parts of the outdoor unit		Main unit inlet pipe accessories (pressure gauge, shutoff valve, Y-type strainer) Main unit outlet pipe accessories (pressure gauge, shutoff valve, drain valve)	
Water inlet/outlet connector (male thread)		1-1/4"	1-1/2"
Nominal diameter of water pipes		DN32	DN40
External dimensions (L*W*H)	mm	990*755*1800	1240*860*1820

30RQM

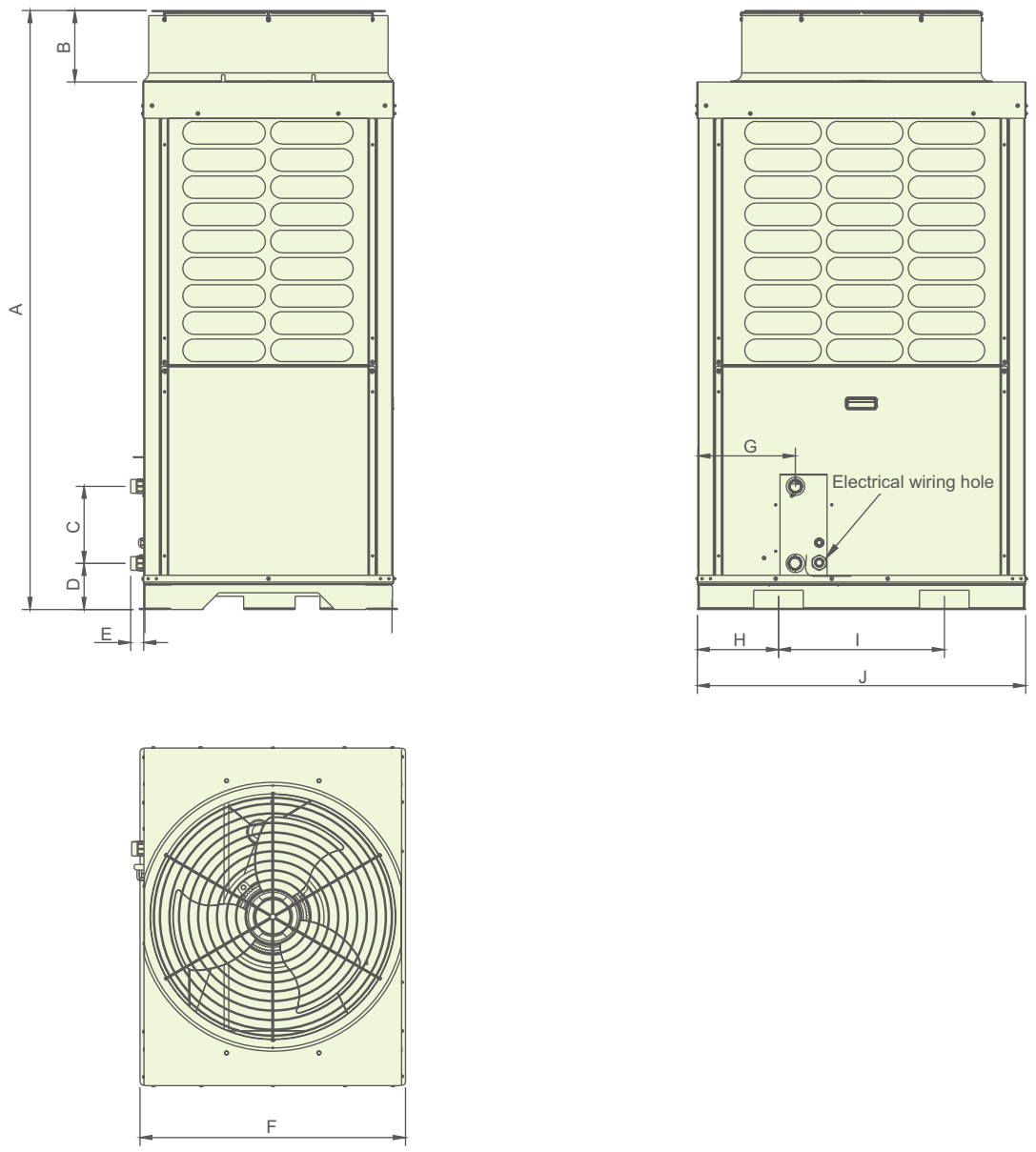
Type	Unit	30RQM025	30RQM030	30RQM035	30RQM040
Nominal cooling capacity	kW	24.5	28.9	33.9	39.2
Nominal heating capacity	kW	24.5	30.0	34.8	39.5
Cooling input power	kW	7.3	8.8	10.1	12.2
Heating input power	kW	7.8	9.4	10.9	12.2
Energy effciency ratio (EER)	kW/kW	3.36	3.28	3.36	3.21
Coefficient of performance(COP)	kW/kW	3.14	3.19	3.19	3.24
Part-load performance factor of cooling(ARI IPLV)	kW/kW	5.26	5.20	5.28	5.18
Electric parameters					
Main power supply	kW	380V-3Ph-50Hz			
Control current	kW/kW	Powered by the main power supply through built-in transformer			
Nominal operating current(cooling)	A	13.9	16.0	18.0	23.2
Nominal operating current(heating)	A	14.9	16.8	18.6	23.5
Net weight	kg	315	335	360	380
Noise	dB(A)	62	62	64	64
Refrigerant		HFC-410A			
Refrigerant charge	kg	9.0	11.0	10.9	12.8
Compressor		Enclosed scroll compressors			
Quantity		2	2	2	2
Control system		Pro-dialog Plus microcomputer control system			
Condensers		Copper and aluminum fn tube coil, with hydrophilic coating			
Number of fans		1	1	1	1
High fan speed	rpm	720	720	720	720
Evaporator		Brazing plate exchanger			
Nominal water flow(cooling)	m3/h	4.2	5.0	5.8	6.8
Nominal water flow(heating)	m3/h	4.2	5.2	6.0	6.8
Internal water pressure drop of the unit *(cooling)	kpa	54	65	57	63
Internal water pressure drop of the unit *(heating)	kpa	54	70	60	63
Maximum water-side pressure	kpa	1000	1000	1000	1000
Hydronic parts of the outdoor unit		Main unit inlet pipe accessories (pressure gauge, shutoff valve, Y-type strainer) Main unit outlet pipe accessories (pressure gauge, shutoff valve, drain valve)			
Water inlet/outlet connector (male thread)		1-1/4"	1-1/4"	1-1/2"	1-1/2"
Nominal diameter of water pipes		DN32	DN32	DN40	DN40
External dimensions (L*W*H)	mm	990*755*1800		1240*860*1820	

30RQH065 30RBH065

ModelNumber	Unit	30RQH06501000YLC	30RBH06501000YLC
Nominal Cooling Capacity	kW	65	65
Nominal Heating Capacity	kW	68	-
Total Power Input(Cooling)	kW	20.2	20.2
Total Power Input(Heating\)	kW	21.1	-
Cooling Efficiency	kW/kW	3.22	3.22
Heating Efficiency	kW/kW	3.22	-
Cooling Part load(CPLV)	kW/kW	4.2	4.2
Cooling Part load(IPLV)	kW/kW	5.2	5.2
Electrical Data			
Nominal Power Supply		380V/400V-3Ph-50Hz	
Control Power Supply		230V (unit built in)	
Nominal unit current draw(Cooling)	A	35.9	35.9
Nominal unit current draw(Heating)	A	37.6	-
Operating Weight	kg	754	705
Shipping Weight	kg	748	699
A-Weighted Sound Pressure Level	dB(A)	66	66
Refrigerant		HFC-410A	HFC-410A
Charging	kg	18.3	18
Compressor		Hermetic scroll compressor	
Quantity		2	
Control System		Pro-dialog Plus Microcomputer control system	
Condenser		Grooved copper tubes and aluminum fins	
Quantity of Fan		2	2
Fan Speed	rpm	720	720
Evaporator		Brazed plate heat exchanger	
Nominal water flow（cooling）	m3/h	11.2	11.2
Nominal water flow（heating）	m3/h	11.8	-
Nominal water-side pressure drop(Cooling)	kpa	77	77
Nominal water-side pressure drop(Heating)	kpa	86	-
Max. water-side pressure drop	kpa	1000	1000
Hydronic Part		Inlet Pipe(Y type Strainer）	
		Outlet Pipe（Flow switch、Drain Plug）	
		Conector(Victaulic to Screw)	
Inlet/Outlet Pipe		Victaulic(1-1/2")	
Nominal Diameter		DN40	
Dimension（Length*Width*Height)	mm	2236*1100*1898	2236*1100*1898

2.1.4 External Dimensions

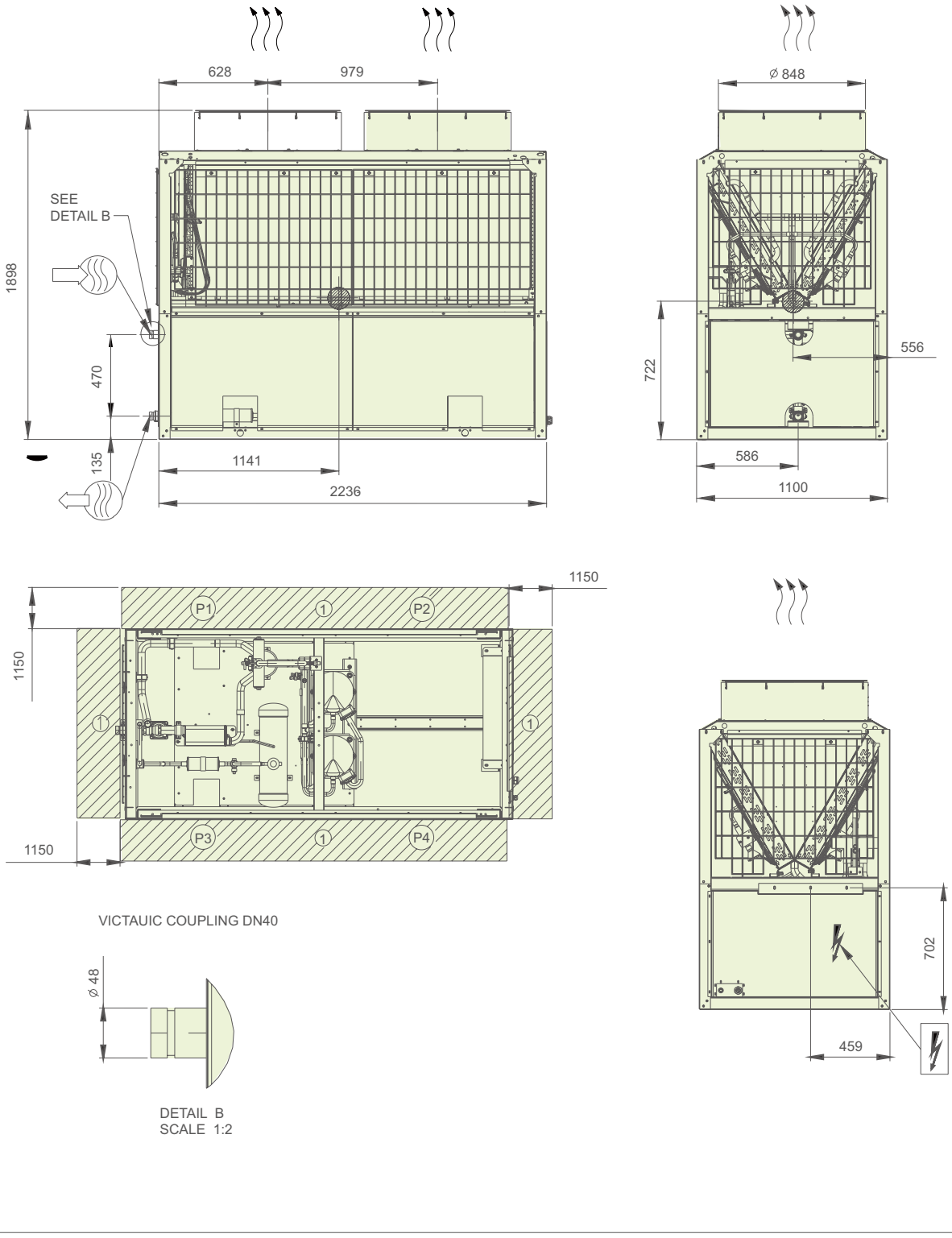
Unit size: 025~040



Type	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm	J mm
25 (RQM)	1800	215	232	139	39	755	294	245	500	990
30 (RBM/RQM/RQE)	1800	215	232	139	39	755	294	245	500	990
35 (RQM/RQE)	1820	235	232	139	45	860	183	368	500	1240
40 (RBM/RQM/RQE)	1820	235	232	139	45	860	183	368	500	1240

2.1.4 External Dimensions

Unit size: 30RQH065

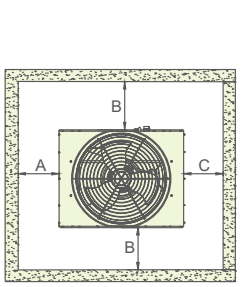


type	Unit weight (kg)	P1 (kg)	P2 (kg)	P3 (kg)	P4 (kg)
30RQH065	748	209	227	150	162

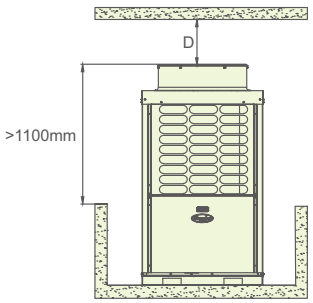
2.1.5 维修及最小运行空间

2.1.5.1 单机安装

机组规格：025~040



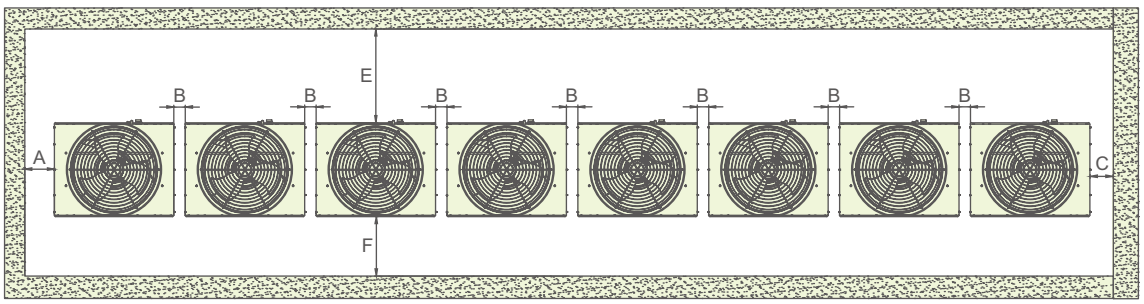
Top view



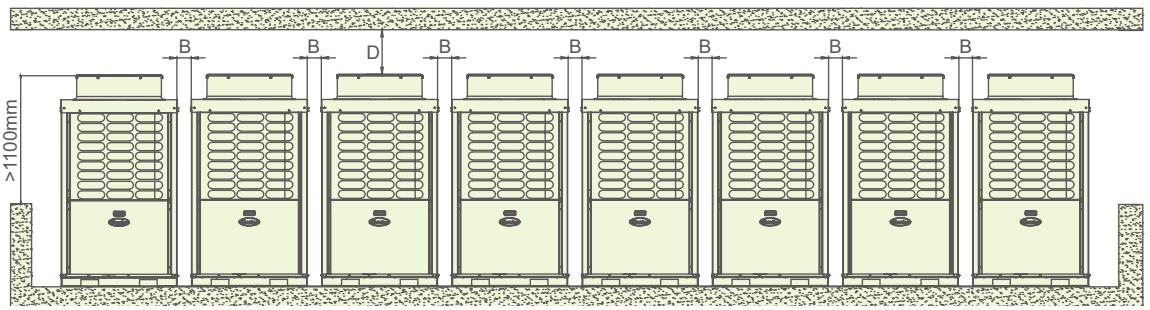
Front view

A mm	400
B mm	500
C mm	200
D mm	1800

2.1.5.2 Installation of Units in Parallel



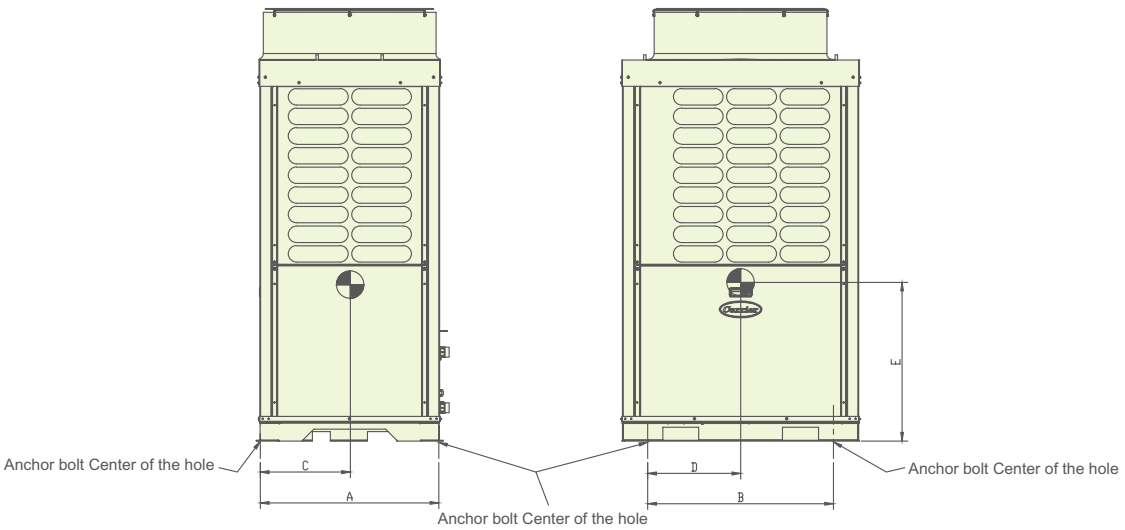
Top view



Front view

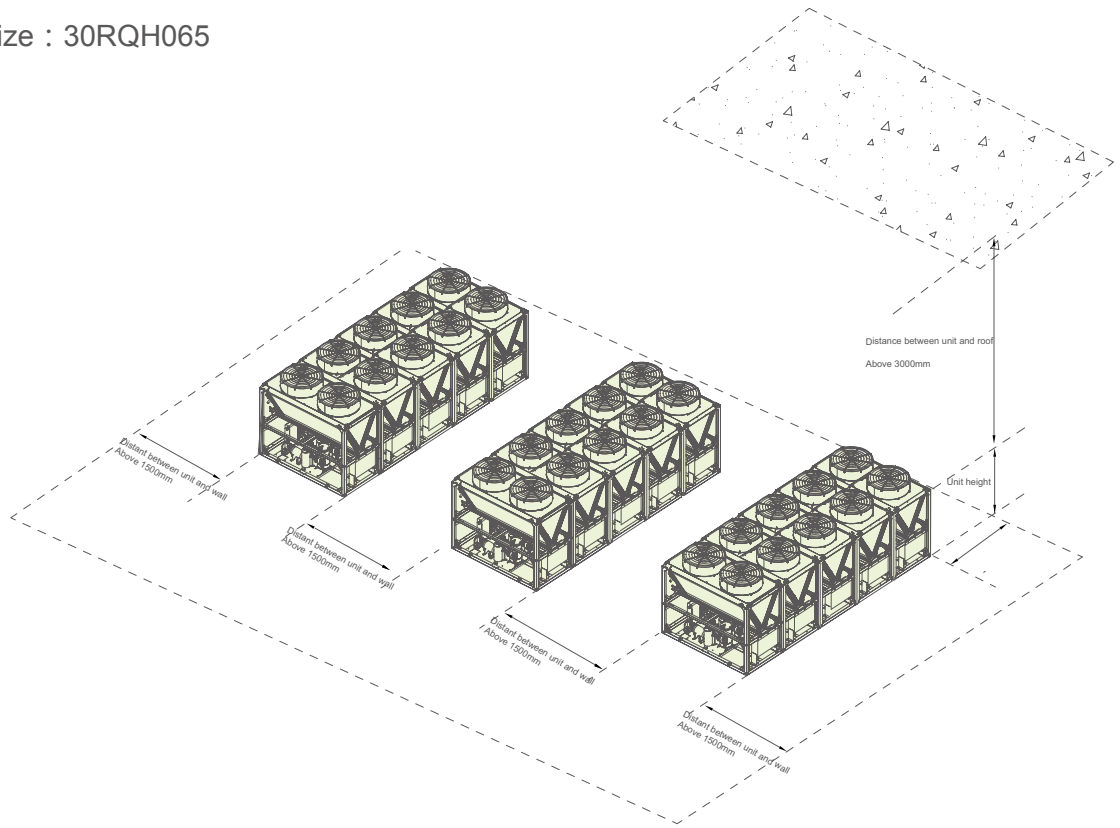
A mm	B mm	C mm	D mm	E mm	F mm
400	>20	200	1800	500	500

2.1.6 Center of Gravity Diagram

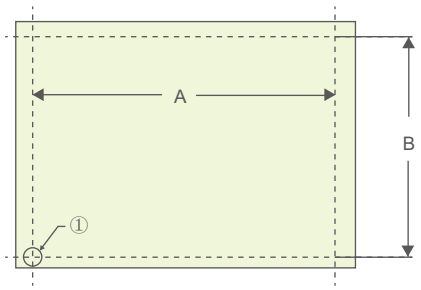


Type	A	B	C	D	E
30RBM030	745	780	410	394	708
30RBM040	830	1018	431	509	690
30RQM025	745	780	382	385	643
30RQM030	745	780	393	392	680
30RQM035	830	1018	424	478	673
30RQM040	830	1018	420	481	661

Unit size：30RQH065



2.1.7 Foundation Drawing



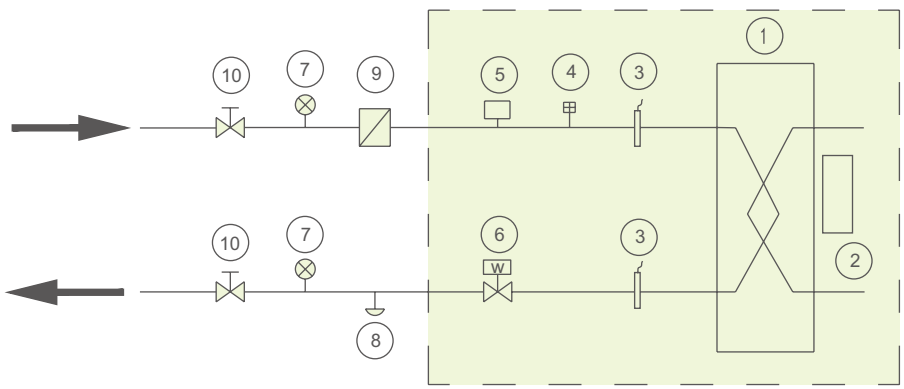
Unit model	A mm	B mm
025/030	780	745
035/040	1018	830
30RQH065	1297	1027

① Erection bolt4-Φ10, threads should protrude from the supporting surface at a height less than 20mm.

Note: - Heat pump type, must have a certain height from the foor, usually lifted to higher than 100mm.
- If the equipment is installed in a place where may have heavy snows, the mounting height must be lifted to 200mm above the usual height of accumulated snow.

2.1.8 Outdoor Unit Water System Components

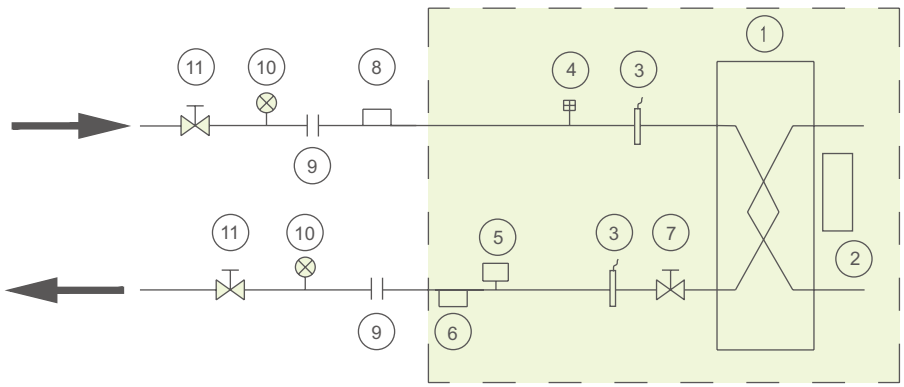
Unit size: 025~040



Outdoor Unit Water System Components	
Factory Installation	Field Installation
1、Plate exchanger	7 、Pressure gage （include in the integrated water inler/outlet pipe ）
2、Anti-freeze electric heater for plate exchanger	8、 Drain valve (included in the integrated water inlet/outlet pipe)
3、Temperature sensor	9、 Y-type flter (included in the integrated water inlet/outlet pipe)
4、Automatic air valve	10、Shutoff valve (included in the integrated water inlet/outlet pipe)
5、Flow switch	
6、Electric two-way valve	

2.1.8 Outdoor Unit Water System Components

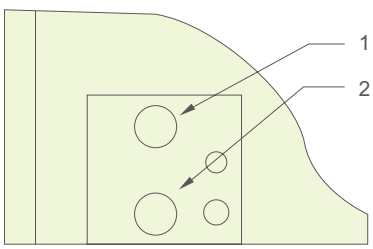
Unit model: 30RQH065



Outdoor Unit Water System Components	
Factory Installation	Field Installation
1、Plate exchanger	8 、exhaust valve
2、Anti-freeze electric heater for plate exchanger	9、Soft connector
3、Temperature sensor	10、Pressure gage
4、Y-type flter	11、Shutoff valve
5、Flow switch	
6、 drain water plug	
7、Electric two-way valve	

2.1.9 Water Pipe Connection

Water Pipe Connection



Unit size：025~030
1 1-1/4" Male thread water inlet connector
2 1-1/4" Male thread water outlet connector

Unit size：035~040
1 1-1/2" Male thread water inlet connector
2 1-1/2" Male thread water outlet connector

Unit size：30RQH065
1 2" Clamp outlet connector
2 2" Clamp outlet connector

2.1.10 Electrical Features

Unit electrical parameters

Type	Power supply	Locked-rotor current	Full load current	Allowed sectional area of the power cord		Time-lag fuse	
				Minimum	Maximum	Power supply protection	Control loop protection
	V-ph-Hz	LRA	FLA	mm^2	mm^2	A	A
30RBM 030	380/400/415-3-50	81	21.5	5×6	5×10	32	5
30RBM 040		122	27.8	5×6	5×10	40	5
30RQM 025		81	17.1	5×6	5×10	32	5
30RQM 030		81	20.6	5×6	5×10	32	5
30RQM 035		95	22	5×6	5×10	32	5
30RQM 040		122	27	5×6	5×10	40	5
30RQE 030		95	22.4	5×6	5×10	32	5
30RQE 035		122	26.5	5×6	5×10	38	5
30RQE 040		122	29.5	5×6	5×10	40	5
30RQH065		177	35.9	5x10	5x16	80	5

Note: Select distribution capacity according to full load current value; power supply protection current is used for selection of circuit breakers and fuses.

Electrical parameters of critical parts

Type	Compressor		Fan motor	Compressor crankcase heaters		Electric heater band for plate exchanger	
	Power supply	Locked-rotor current	Input current	Power	Input current	Power	Input current
	LRA	FLA	A	W	A	W	A
30RBM 030	64	10.9	1.7	30	0.14	60	0.28
30RBM 040	101	13.6	1.7	30	0.14	60	0.28
30RQM 025	64	10.7	1.7	30	0.14	60	0.28
30RQM 030	64	10.9	1.7	30	0.14	60	0.28
30RQM 035	75	12.5	1.7	30	0.14	60	0.28
30RQM 040	101	13.6	1.7	30	0.14	60	0.28
30RQE 030	75	12.9	1.7	30	0.14	60	0.28
30RQE 035	101	14.3	1.7	30	0.14	60	0.28
30RQE 040	101	14.6	1.7	30	0.14	60	0.28
30RQH 065	147	16.1	1.9	90	0.24	60	0.16

High static pressure Chiller parameter correction table

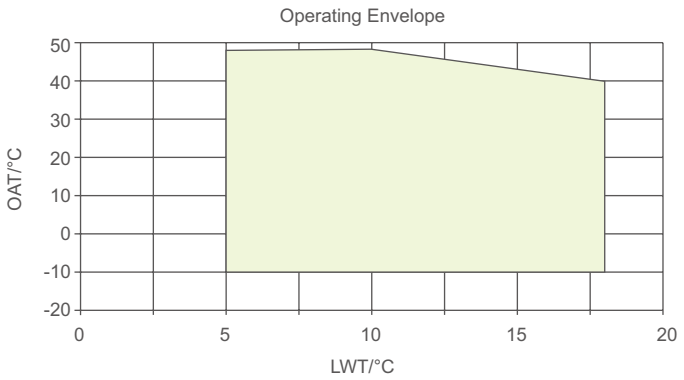
Type	Unit	30RQM 025	30RQM 030	30RQM 035	30RQM 040	30RBM 030	30RBM 040
Cooling Input Power@Max external static pressure	kW	7.8	9.3	10.76	12.86	9.3	12.7
Heating Input Power@Max external static pressure	kW	8.3	9.9	11.56	12.86	-	-
Nominal operating current(cooling)@ Max external static pressure	A	14.8	17.7	19.2	24.5	17.6	24.2
Nominal operating current(Heating)@ Max external static pressure	A	15.9	18.2	19.6	24.6	-	-
Max static pressure	Pa	85	85	100	100	85	100
Fan high speed@ Max external static pressure	rpm	960	960	960	960	960	960

Note: Select distribution capacity according to full load current value; power supply protection current is used for selection of circuit breakers and fuses.

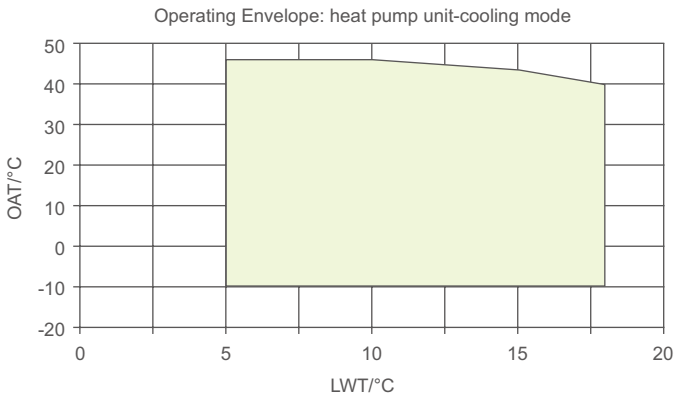
2.1.11 Operating Range

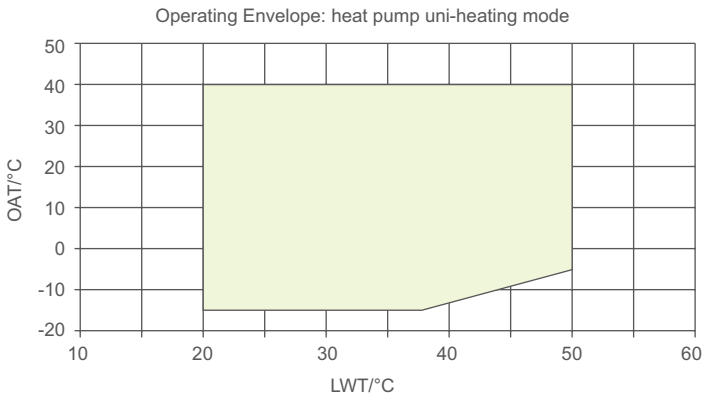
30RB/RQ

Cooling-only unit:



Heat pump unit:

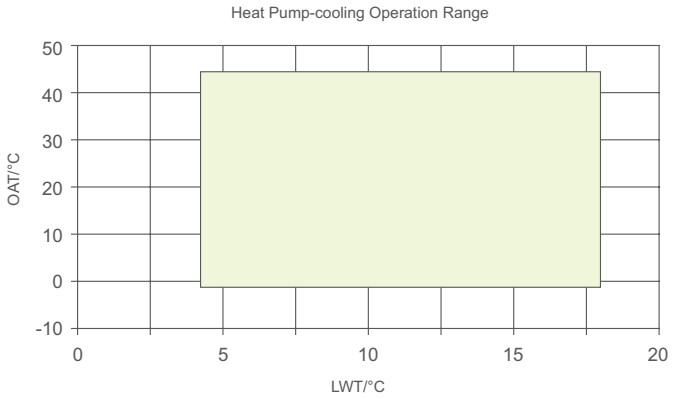




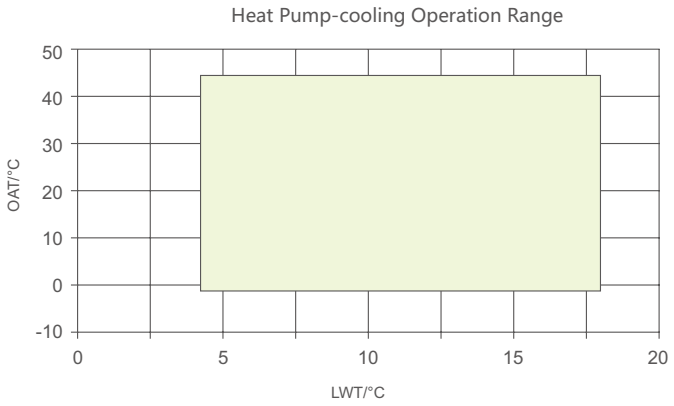
2.1.11 Operating Range

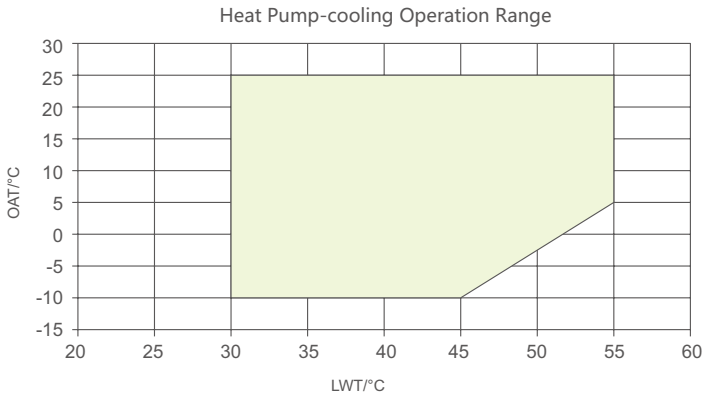
30RQH065

Cooling-only unit:



Heat pump unit:





2.1.12 Outdoor Unit Capacity Table

Cooling Performance of 30 RBM

Type	LWT ℃	OAT(DB)/℃														
		25			30			35			40			45		
		CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h
030	5	30.4	7.3	5.0	28.9	8.0	5.0	27.3	8.6	5.0	25.7	9.3	5.0	24.0	10.0	5.0
040		41.2	9.4	6.8	39.1	10.6	6.8	37.0	11.8	6.8	34.8	13.2	6.8	32.5	14.6	6.8
030	6	31.4	7.4	5.0	29.9	8.1	5.0	28.3	8.7	5.0	26.6	9.4	5.0	24.8	10.1	5.0
040		42.6	9.5	6.8	40.4	10.7	6.8	38.2	11.9	6.8	35.9	13.3	6.8	33.6	14.7	6.8
030	7	32.5	7.5	5.0	30.9	8.1	5.0	29.2	8.8	5.0	27.5	9.5	5.0	25.7	10.2	5.0
040		44.0	9.6	6.8	41.8	10.7	6.8	39.5	12.0	6.8	37.2	13.3	6.8	34.7	14.7	6.8
030	8	33.6	7.6	5.0	31.9	8.2	5.0	30.2	8.9	5.0	28.4	9.6	5.0	26.5	10.3	5.0
040		45.4	9.7	6.8	43.2	10.8	6.8	40.8	12.1	6.8	38.4	13.4	6.8	35.9	14.8	6.8
030	9	34.6	7.7	5.0	32.9	8.3	5.0	31.1	9.0	5.0	29.3	9.7	5.0	27.4	10.4	5.0
040		46.9	9.7	6.8	44.6	10.9	6.8	42.2	12.2	6.8	39.7	13.5	6.8	37.1	14.9	6.8
030	10	35.8	7.8	5.0	34.0	8.4	5.0	32.1	9.1	5.0	30.2	9.8	5.0	28.2	10.5	5.0
040		48.4	9.8	6.8	46.0	11.0	6.8	43.5	12.3	6.8	41.0	13.6	6.8	38.3	15.0	6.8
030	11	36.9	7.9	5.0	35.1	8.5	5.0	33.2	9.2	5.0	31.2	9.9	5.0	29.1	10.6	5.0
040		49.9	9.9	6.8	47.5	11.1	6.8	44.9	12.4	6.8	42.3	13.7	6.8	39.5	15.1	6.8

Cooling Performance of 30 RQM

Type	LWT ℃	OAT(DB)/℃														
		25			30			35			40			45		
		CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h
025	5	25.9	5.7	4.2	24.5	6.4	4.2	22.9	7.2	4.2	21.3	8.0	4.2	19.6	8.8	4.2
030		30.3	7.3	5.0	28.7	8.0	5.0	27.0	8.6	5.0	25.4	9.2	5.0	23.6	9.9	5.0
035		35.4	8.2	5.8	33.6	9.0	5.8	31.6	10.0	5.8	29.7	10.9	5.8	27.6	12.0	5.8
040		41.2	9.6	6.8	39.1	10.8	6.8	36.8	12.0	6.8	34.5	13.4	6.8	32.1	14.8	6.8
025	6	26.7	5.8	4.2	25.3	6.5	4.2	23.7	7.2	4.2	22.1	8.0	4.2	20.3	8.9	4.2
030		31.3	7.4	5.0	29.7	8.0	5.0	28.0	8.7	5.0	26.2	9.3	5.0	24.4	10.0	5.0
035		36.6	8.2	5.8	34.7	9.1	5.8	32.8	10.0	5.8	30.7	11.0	5.8	28.6	12.1	5.8
040		42.5	9.7	6.8	40.3	10.9	6.8	38.0	12.1	6.8	35.6	13.4	6.8	33.2	14.8	6.8
025	7	27.6	5.8	4.2	26.1	6.5	4.2	24.5	7.3	4.2	22.8	8.1	4.2	21.0	8.9	4.2
030		32.3	7.5	5.0	30.6	8.1	5.0	28.9	8.8	5.0	27.1	9.4	5.0	25.2	10.1	5.0
035		37.9	8.3	5.8	35.9	9.2	5.8	33.9	10.1	5.8	31.8	11.1	5.8	29.6	12.1	5.8
040		43.8	9.8	6.8	41.6	10.9	6.8	39.2	12.2	6.8	36.8	13.5	6.8	34.2	14.9	6.8
025	8	28.5	5.8	4.2	26.9	6.6	4.2	25.3	7.3	4.2	23.6	8.1	4.2	21.7	8.9	4.2
030		33.4	7.6	5.0	31.7	8.2	5.0	29.9	8.9	5.0	28.0	9.5	5.0	26.1	10.2	5.0
035		39.2	8.4	5.8	37.2	9.2	5.8	35.1	10.1	5.8	32.9	11.1	5.8	30.6	12.2	5.8
040		45.2	9.8	6.8	42.9	11.0	6.8	40.4	12.2	6.8	37.9	13.6	6.8	35.3	15.0	6.8
025	9	29.4	5.9	4.2	27.8	6.6	4.2	26.1	7.4	4.2	24.3	8.2	4.2	22.4	9.0	4.2
030		34.5	7.7	5.0	32.7	8.3	5.0	30.8	9.0	5.0	28.9	9.7	5.0	26.9	10.3	5.0
035		40.5	8.4	5.8	38.4	9.3	5.8	36.3	10.2	5.8	34.0	11.2	5.8	31.6	12.3	5.8
040		46.6	9.9	6.8	44.2	11.1	6.8	41.7	12.3	6.8	39.0	13.6	6.8	36.3	15.0	6.8
025	10	30.3	5.9	4.2	28.7	6.6	4.2	26.9	7.4	4.2	25.1	8.2	4.2	23.1	9.0	4.2
030		35.6	7.8	5.0	33.7	8.4	5.0	31.8	9.1	5.0	29.8	9.8	5.0	27.8	10.4	5.0
035		41.8	8.5	5.8	39.7	9.4	5.8	37.5	10.3	5.8	35.1	11.3	5.8	32.7	12.3	5.8
040		48.0	10.0	6.8	45.5	11.1	6.8	42.9	12.4	6.8	40.2	13.7	6.8	37.3	15.1	6.8
025	11	31.3	5.9	4.2	29.6	6.7	4.2	27.8	7.4	4.2	25.9	8.2	4.2	23.8	9.1	4.2
030		36.7	7.9	5.0	34.8	8.5	5.0	32.8	9.2	5.0	30.8	9.9	5.0	28.6	10.6	5.0
035		43.1	8.6	5.8	41.0	9.4	5.8	38.7	10.4	5.8	36.3	11.4	5.8	33.8	12.4	5.8
040		49.4	10.0	6.8	46.8	11.2	6.8	44.1	12.4	6.8	41.2	13.7	6.8	38.2	15.1	6.8

Heating Performance of 30 RQM

Type	LWT ℃	OAT(DB/WB)/℃														
		-13.7/-15			-9.8/-11			-5/-5.6			-3/-3.7			0/-0.7		
		CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h
025	35	14.9	6.1	4.2	16.5	6.1	4.2	19.2	6.1	4.2	20.2	6.1	4.2	21.9	6.1	4.2
030		17.8	6.8	5.2	19.8	7.0	5.2	23.2	7.3	5.2	24.5	7.4	5.2	26.7	7.6	5.2
035		20.9	8.5	6.0	23.0	8.6	6.0	27.0	8.7	6.0	28.5	8.7	6.0	30.9	8.8	6.0
040		24.0	9.2	6.8	26.7	9.4	6.8	31.0	9.6	6.8	32.6	9.6	6.8	35.3	9.6	6.8
025	40	—	—	—	16.2	6.9	4.2	18.9	6.9	4.2	19.9	6.9	4.2	21.5	6.9	4.2
030		—	—	—	19.4	7.6	5.2	22.6	8.0	5.2	23.9	8.1	5.2	26.0	8.3	5.2
035		—	—	—	22.8	9.6	6.0	26.7	9.7	6.0	28.2	9.7	6.0	30.5	9.8	6.0
040		—	—	—	26.1	10.6	6.8	30.1	10.8	6.8	31.6	10.8	6.8	34.2	10.9	6.8
025	45	—	—	—	—	—	—	18.5	7.6	4.2	19.5	7.6	4.2	21.1	7.6	4.2
030		—	—	—	—	—	—	21.9	8.6	5.2	23.1	8.8	5.2	25.1	9.0	5.2
035		—	—	—	—	—	—	26.4	10.7	6.0	27.9	10.8	6.0	30.1	10.8	6.0
040		—	—	—	—	—	—	29.4	12.1	6.8	30.8	12.1	6.8	33.3	12.1	6.8
025	50	—	—	—	—	—	—	—	—	—	19.0	8.4	4.2	20.7	8.4	4.2
030		—	—	—	—	—	—	—	—	—	22.2	9.5	5.2	24.1	9.7	5.2
035		—	—	—	—	—	—	—	—	—	27.6	11.9	6.0	29.7	11.9	6.0
040		—	—	—	—	—	—	—	—	—	30.3	13.4	6.8	32.6	13.5	6.8

The chart continued

Type	LWT ℃	OAT(DB/WB)/℃														
		3/2.2			5/4.1			7/6			9/7.9			11/9.8		
		CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h
025	35	23.5	6.1	4.2	24.4	6.1	4.2	26.3	6.1	4.2	27.5	6.1	4.2	28.4	6.1	4.2
030		29.0	7.7	5.2	30.5	7.8	5.2	32.0	7.9	5.2	33.7	8.0	5.2	35.3	8.1	5.2
035		33.0	8.8	6.0	34.2	8.8	6.0	39.4	8.8	6.0	40.5	8.8	6.0	41.5	8.8	6.0
040		38.1	9.7	6.8	40.0	9.7	6.8	42.1	9.7	6.8	44.3	9.7	6.8	46.8	9.7	6.8
025	40	23.1	6.9	4.2	24.1	6.8	4.2	25.7	6.9	4.2	27.1	6.9	4.2	28.2	6.9	4.2
030		28.2	8.4	5.2	29.6	8.5	5.2	31.1	8.6	5.2	32.7	8.7	5.2	34.3	8.8	5.2
035		32.5	9.8	6.0	33.7	9.8	6.0	37.5	9.8	6.0	39.1	9.8	6.0	40.5	9.9	6.0
040		36.9	10.9	6.8	38.8	10.9	6.8	40.8	10.9	6.8	43.0	10.9	6.8	45.3	10.9	6.8
025	45	22.7	7.6	4.2	23.6	7.6	4.2	24.5	7.8	4.2	26.1	7.8	4.2	27.4	7.7	4.2
030		27.2	9.2	5.2	28.6	9.3	5.2	30.0	9.4	5.2	31.5	9.5	5.2	33.0	9.6	5.2
035		32.1	10.9	6.0	33.2	10.9	6.0	34.8	10.9	6.0	36.9	10.9	6.0	38.7	11.0	6.0
040		35.8	12.2	6.8	37.6	12.2	6.8	39.5	12.2	6.8	41.6	12.2	6.8	43.9	12.2	6.8
025	50	22.2	8.4	4.2	23.1	8.4	4.2	22.6	8.7	4.2	24.4	8.7	4.2	26.0	8.6	4.2
030		26.0	9.9	5.2	27.3	10.1	5.2	28.6	10.2	5.2	30.0	10.3	5.2	31.5	10.5	5.2
035		31.6	12.0	6.0	32.6	12.0	6.0	31.4	12.1	6.0	33.9	12.1	6.0	36.3	12.2	6.0
040		34.9	13.5	6.8	36.6	13.6	6.8	38.5	13.6	6.8	40.5	13.6	6.8	42.7	13.6	6.8

Note: CAP is cooling/heating capacity; POW is input power; FLOW is water flow rate.

Cooling Performance of 30RQH065

Type	LWT ℃	OAT(DB/WB)/℃														
		25			30			35			40			45		
		CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h
065	5	68.3	16.5	11.7	64.9	18.2	11.2	61.4	19.9	10.6	57.8	21.8	9.9	21.7	23.8	3.7
	6	70.3	16.6	12.1	66.9	18.3	11.5	63.3	20.0	10.9	59.5	21.9	10.2	22.8	23.9	3.9
	7	72.4	16.7	12.4	68.8	18.4	11.8	65.2	20.2	11.2	61.3	22.1	10.5	23.9	24.0	4.1
	8	74.5	16.9	12.8	70.9	18.5	12.2	67.1	20.3	11.5	63.1	22.2	10.8	25.0	24.2	4.3
	9	76.6	17.0	13.2	72.9	18.6	12.5	69.0	20.4	11.9	64.9	22.3	11.2	26.1	24.3	4.5
	10	78.8	17.1	13.5	74.9	18.8	12.9	70.9	20.5	12.2	66.7	22.4	11.5	27.3	24.4	4.7
	11	80.9	17.2	13.9	77.0	18.9	13.2	72.9	20.7	12.5	68.6	22.6	11.8	28.4	24.5	4.9

Type	LWT ℃	OAT(DB/WB)/℃											
		5			10			15			20		
		CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h
065	5	80.7	11.2	13.9	77.7	12.3	13.4	74.7	13.6	12.8	71.5	15.0	12.3
	6	83.1	11.3	14.3	80.0	12.4	13.8	76.9	13.7	13.2	73.7	15.1	12.7
	7	85.5	11.4	14.7	82.4	12.5	14.2	79.1	13.8	11.2	75.8	15.2	13.0
	8	88.0	11.5	15.1	84.7	12.6	14.6	81.4	13.9	14.0	78.0	15.3	13.4
	9	90.4	11.6	15.5	87.1	12.8	15.0	83.7	14.0	14.4	80.2	15.4	13.8
	10	93.0	11.7	16.0	89.6	12.9	15.4	86.1	14.2	14.8	82.5	15.6	14.2
	11	95.5	11.8	16.4	92.0	13.0	15.8	88.4	14.3	15.2	84.8	15.7	14.6

Heating Performance of 30RQH065

Type	LWT ℃	OAT(DB/WB)/℃														
		-9.8/-11			-7/-7.6			-3/-3.7			0/-0.7			3/2.2		
		CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h
065	35	48.1	16.3	8.4	51.3	16.3	8.9	56.9	16.3	9.9	61.6	16.4	10.7	66.6	16.3	11.6
	40	46.4	18.1	8.1	49.5	18.1	8.6	54.9	18.2	9.5	59.5	18.2	10.3	64.3	18.2	11.2
	45	44.5	20.0	7.7	47.6	20.0	8.3	52.8	20.1	9.2	57.2	20.1	9.9	61.8	20.1	10.7
	50	—	—	—	—	—	—	50.8	22.2	8.8	55.1	22.2	9.6	59.5	22.2	10.3

Type	LWT ℃	OAT(DB/WB)/℃											
		5/4.1			7/6			9/7.9			11/9.8		
		CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h	CAP kW	POW kW	FLOW m³/h
065	35	70.0	16.3	12.2	73.4	16.3	12.8	76.8	16.3	13.3	80.1	16.3	13.9
	40	67.5	18.2	11.7	70.7	18.2	12.3	73.8	18.1	12.8	76.8	18.1	13.4
	45	64.9	20.1	11.3	67.9	20.1	11.8	70.8	20.1	12.3	73.6	20.1	12.8
	50	62.4	22.2	10.8	65.3	22.2	11.3	68.0	22.2	11.8	70.6	22.2	12.3

Note: CAP is cooling/heating capacity; POW is input power; FLOW is water flow rate.

Formula for calculating the capacity of multiple units parallel:
Cooling/Heating capacity = Cooling/Heating capacity of single unit x number of units

2.2 Hydronic Kit

2.2.1 Model Number

Nomenclature

THC	Manufacturer code THC: Shanghai Tonghui-Carrier YLC: Shanghai Yileng-Carrier
0	Product design record 0: Original design 1: First design modification
0	Product package 0: Standard package 1: Packed in wooden crate
0	Equip option 0:Single pump unit, 20m standard bearing capacity, using PRO-DIALOG PLUS control system 1: Single pump unit, 40m high bearing capacity, using PRO-DIALOG PLUS control system 2: Dual pump as back up, 20m high bearing capacity, using PRO-DIALOG PLUS control system 3: Dual pump as back up, 40m high bearing capacity, using PRO-DIALOG PLUS control system 4: Middle East option:OAT max=52C, Single pump unit, 20m high bearing capacity using PRO-DIALOG PLUS control system 5: Middle East option:OAT max=52C, Single pump unit, 40m high bearing capacity using PRO-DIALOG PLUS control system 6: Middle East option:OAT max=52C, Dual pump as back up, 20m high bearing capacity using PRO-DIALOG PLUS control system 7: Middle East option:OAT max=52C, Dual pump as back up, 20m high bearing capacity using PRO-DIALOG PLUS control system
09	Power supply 01: 380~415V-3Ph-50Hz (sold overseas) 04: 380/ 400V – 3Ph – 50HZ (sold overseas) 06 : 415V – 3Ph – 50HZ (sold overseas) 08 : 230V – 3Ph – 60HZ (sold overseas) 09 : 380V - 3Ph - 50HZ (sold domestically)
030	Unit model 030: Max.cooling capacity compatible with 30kW 040: Max.cooling capacity compatible with 40kW 080: Max.cooling capacity compatible with 80kW 150: Max.cooling capacity compatible with 150kW 210: Max.cooling capacity compatible with 210kW 320: Max.cooling capacity compatible with 325kW 520: Max.cooling capacity compatible with 520kW
HK	Product series HK: Hydronic Kit

2.2.2 Advantages of an Integrated Hydronic Kit

- Integrating a range of hydronic components, the module signifcantly saves installation space and is easy to install, savintime, manpower and money.
- The module supplies water to multiple outdoor and indoor units and adjusts the balance in the watercourse according to their status, ensuring that the system always operates in an energy-saving way.
- Modular control of the control box and circuit board.
- The differential pressure bypass valve determines optimal water output according to the pressure difference in the return pipe to reduce the energy needed to run the water pump.

2.2.3 Technical Parameters

Single pump

Type	HK030	HK040	HK080	HK150	HK210	HK320	HK520
Dimensions mm L×W×H	785×425×1075			985×545×1105	1305×725×1085		1466×910×1186
Water pump type	Horizontal			Vertical			Vertical
Number of water pumps	1						
Expansion tank capacity L	8	8	12	35	50	80	80
Noise dB(A) (50 Hz)	50	52	54	60	60	70	70
Net weight	100	110	130	140	250	340	494
Connector	male thread						clamp
Connect size	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	4”
Water pipes Nominal diameter	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100	DN 100

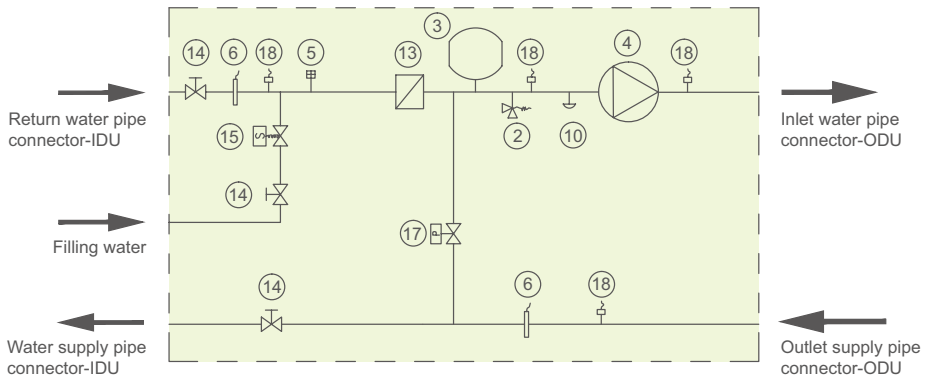
Dual pump

Type	HK150d	HK210d	HK320d	HK520d
Dimensions mm L×W×H	1208×936×1105	1566×1014×1085		1612×1314×1186
Water pump type	Vertical			
Number of water pumps	2			
Expansion tank capacity L	35	50	80	80
Noise dB(A) (50 Hz)	60	60	70	70
Net weight	280	510	550	779
Connector	male thread			clamp
Connect size	2-1/2"	3"	4"	4"
Water pipes Nominal diameter	DN 65	DN 80	DN 100	DN 100

Note: HK150d/210d/320d/520d means dual pump system.

2.2.4 Water System Components

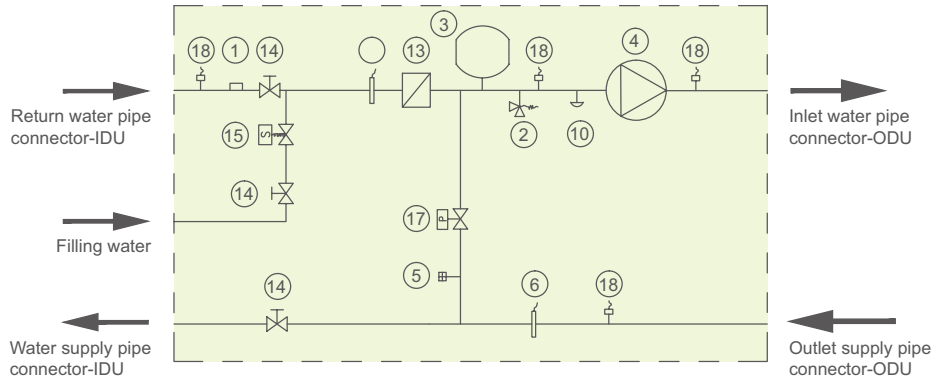
Single pump system: HK030~080



Hydronic Kit schematic	
2、Safety valve	13、Filter
3、Expansion tank	14、Manual valve
4、Pump	15、Automatic filling valve
5、Automatic relief valve	17、Differential pressure bypass valve
6、Water temperature thermistor	18、Pressure transducer
10、Drain valve	

Note: The pressure gauges shall be prepared by user.

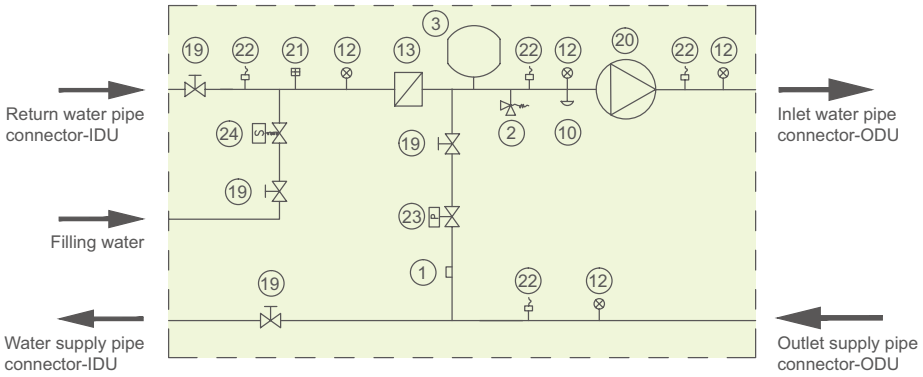
HK150~320



Hydronic Kit schematic	
1、Manual relief valve	10Drain valve
2、Safety valve	13、Filter
3、Expansion tank	14、Manual valve
4、Variable frequency water pump	15、Automatic filling valve
5、Automatic relief valve	17、Differential pressure bypass valve
6、Water temperature thermistor	18、Pressure transducer

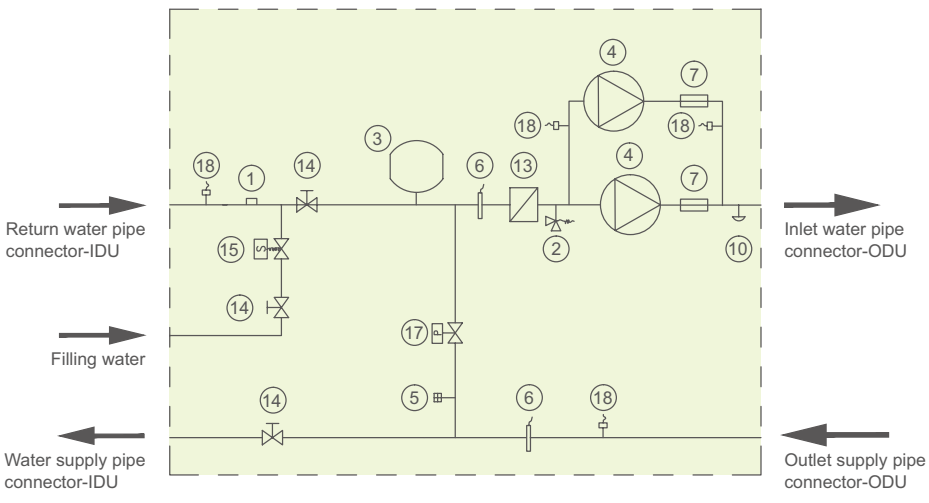
Note: The pressure gauges shall be prepared by user.

HK520



Hydronic Kit schematic	
1、Manual relief valve	19、Manual valve
2、Safety valve	20、Pump
3、Expansion tank	21、Automatic relief valve
10、Drain valve	22、Pressure transducer
12、Pressure transducer	23、Differential pressure bypass valve
13、Filter	24、Automatic filling valve

Dual pump system: HK 150d~520d



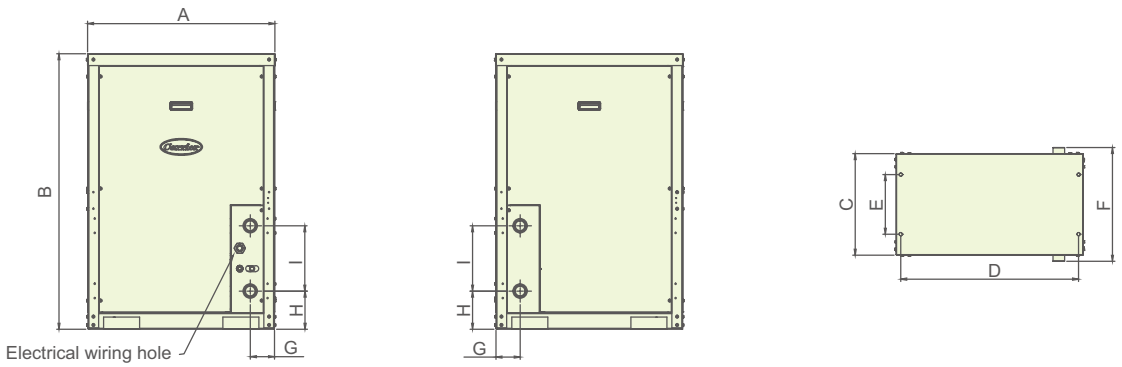
Hydronic Kit schematic	
1、Manual relief valve	10、Drain valve
2、Safety valve	13、Filter
3、Expansion tank	14、Manual valve
4、Water pump	15、Automatic filling valve
5、Automatic relief valve	17、Differential pressure bypass valve
6、Water temperature thermistor	18、Pressure transducer
7、Check valve	

Note: The pressure gauges shall be prepared by user.

2.2.5 External Dimensions

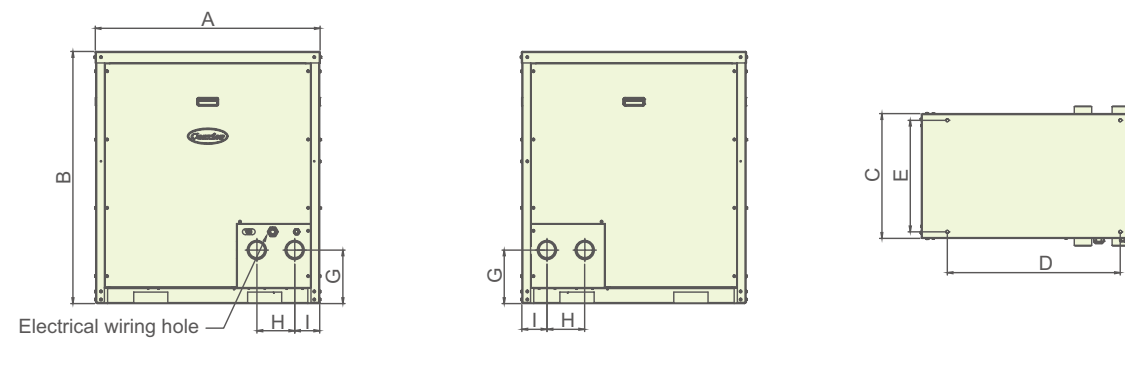
Single pump system

Hydronic Kit: 030~080



Type	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm
HK030	785	1075	425	746	250	480	93.5	201.5	232.5
HK040	785	1075	425	746	250	480	93.5	201.5	232.5
HK080	785	1075	425	746	250	480	93.5	201.5	232.5

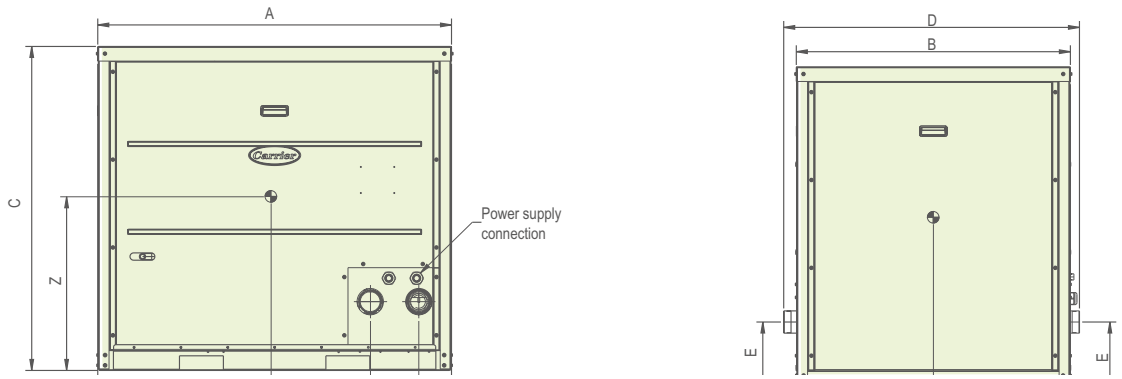
Hydronic Kit: 150~520



Type	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm
HK150	985	1105	545	760	490	615	235	109.5	166
HK210	1305	1085	725	1050	670	800	272	131.5	220
HK320	1305	1085	725	1050	670	800	272	131.5	220
HK520	1466	1186	910	930	856	986	272	249	144

Dual pump system

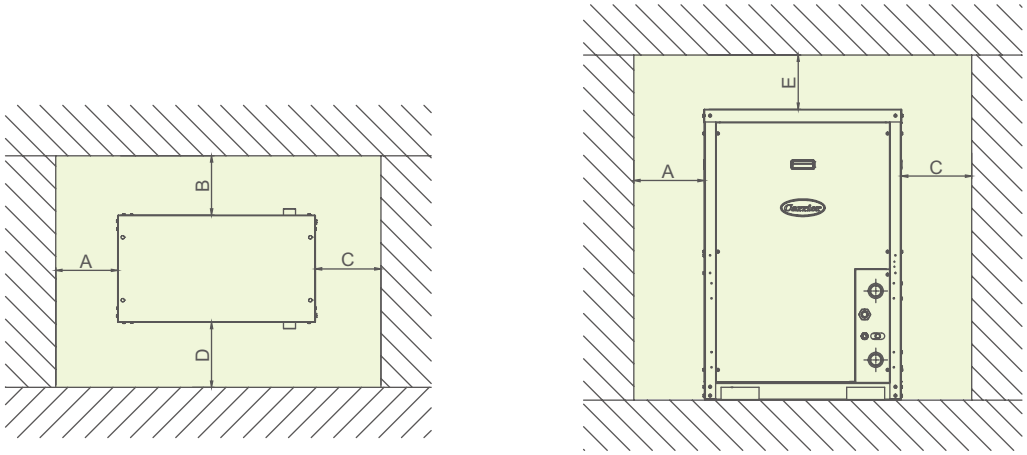
Hydronic Kit: 150d~520d



Type	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm
HK150d	1208	1105	936	760	876	1010	235	166	110
HK210d	1566	1085	1014	1050	958	1110	272	219	131
HK320d	1566	1085	1014	1050	958	1110	272	219	131
HK520d	1612	1186	1314	1074	1260	1390	272	250	142.5

2.2.6 Minimum Working Space for Operation, Maintenance and Repair

Hydronic Kit: 030~080

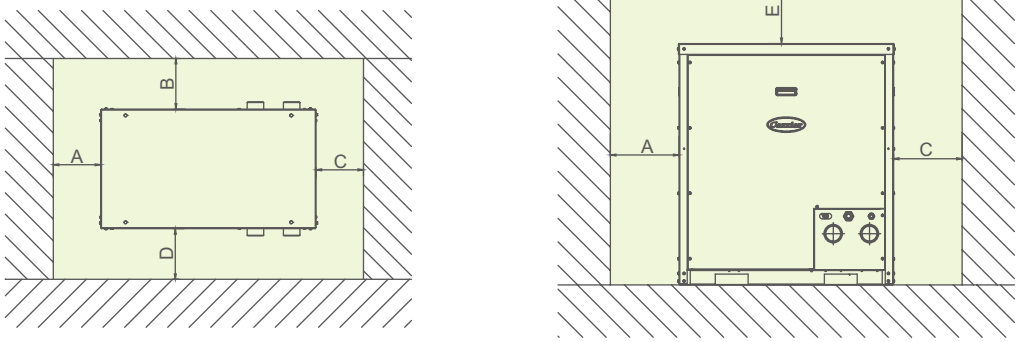


Top view

Front view

A mm	B mm	C mm	D mm	E mm
100	500	100	500	100

Hydronic Kit: 150d~520d



Top view

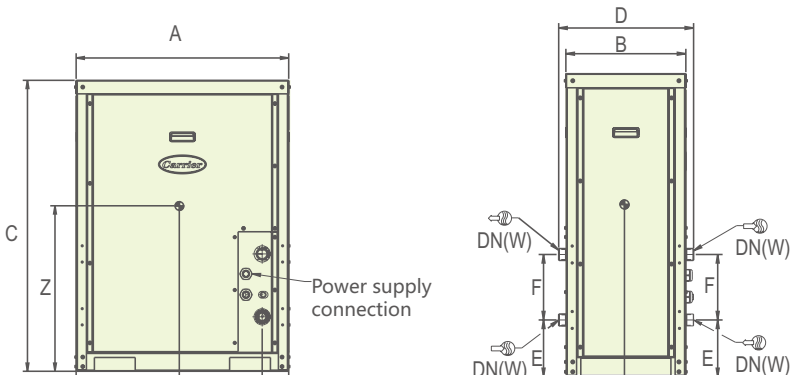
Front view

Type	A mm	B mm	C mm	D mm	E mm
150(d)~ 320(d)	100	500	100	500	100
520(d)	500	600	500	600	100

2.2.7 Center of Gravity Diagram

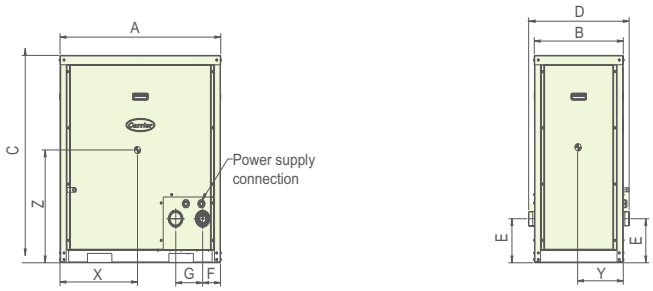
Single pump system

Hydronic Kit: 030~080

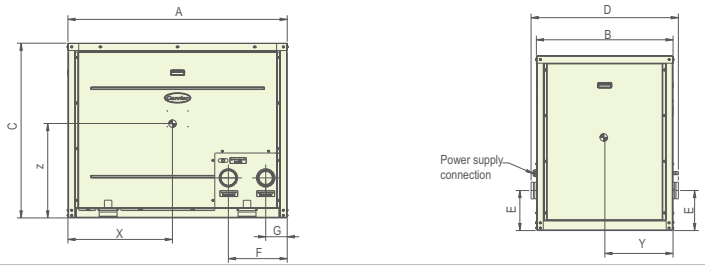


Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	X mm	Y mm	Z mm
HK030	785	425	1075	480	201.5	232.5	93.5	428	219	443
HK040	785	425	1075	480	201.5	232.5	93.5	428	213	436
HK080	785	425	1075	480	201.5	232.5	93.5	398	225	435

Hydronic Kit: 150~520



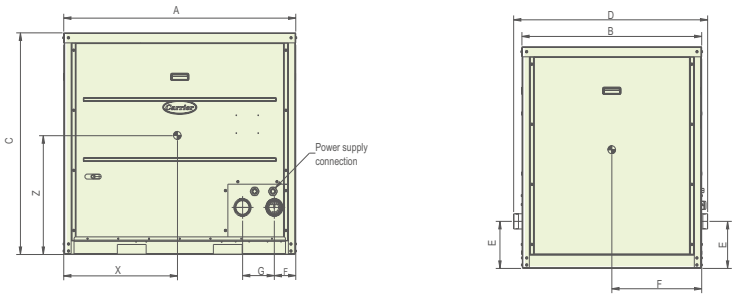
Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	X mm	Y mm	Z mm
HK150	985	545	1105	615	235	166	109.5	475	310	484
HK210	1305	725	1085	800	272	220	131.5	650	404	471
HK320	1305	725	1085	800	272	220	131.5	660	376	471



Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	X mm	Y mm	Zmm
HK520	1466	910	1186	986	272	393	144	673	552	530

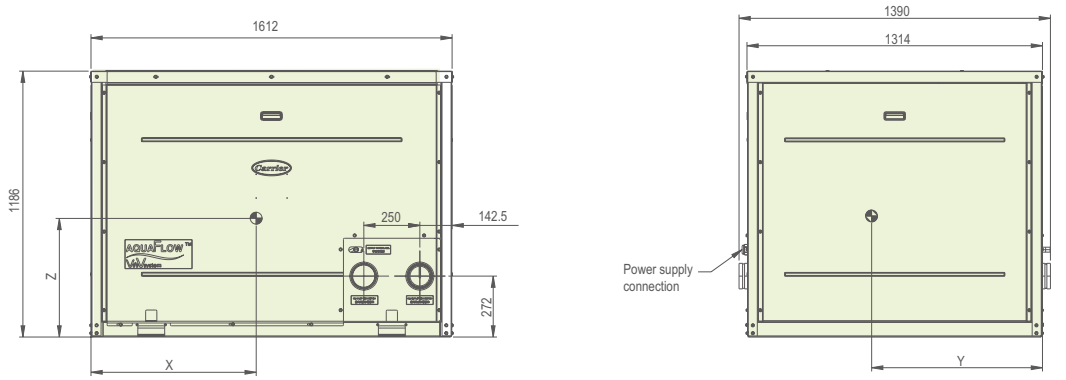
Dual pump system

Hydronic Kit: 150d~320d



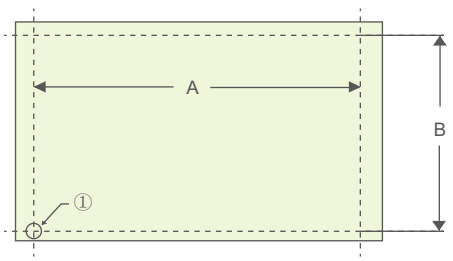
Model	A mm	B mm	C mm	D mm	E mm	F mm	G mm	X mm	Y mm	Zmm
HK150d	1208	936	1105	1010	235	110	166	592	515	459
HK210d	1566	1014	1085	1110	272	131	219	730	570	465
HK320d	1566	1014	1085	1110	272	131	219	774	555	466

Hydronic Kit:520d



Model	X mm	Y mm	Z mm
HK520d	751	765	555

2.2.8 Foundation Drawing



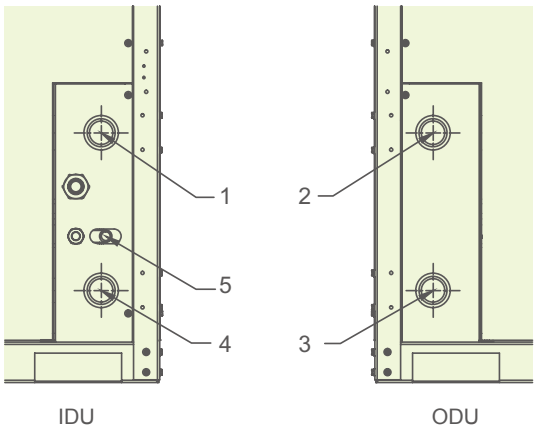
① Erection bolt4-Φ10 , threads should protrude from the supporting surface at a height less than 20mm

Note: If the equipment is installed in a place where may have heavy snows, the mounting height must be lifted to 200mm above the usual height of accumulated snow.

Type	A mm	B mm
HK030	746	250
HK040	746	250
HK080	746	250
HK150	760	490
HK210	1050	670
HK320	1050	670
HK520	930	856
HK150d	760	876
HK210d	1050	958
HK320d	1050	958
HK520d	1074	1260

2.2.9 Water Pipe Connection

HK030~080

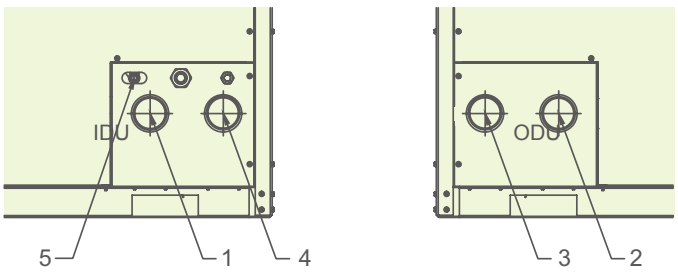


HK030
1. 1-1/4" male thread, IDU inlet connection
2. 1-1/4" male thread, ODU inlet connection
3. 1-1/4" male thread, ODU outlet connection
4. 1-1/4" male thread, IDU outlet connection
5. 1/2” male thread, water filling inlet

HK040
1. 1-1/2" male thread, IDU inlet connection
2. 1-1/2" male thread, ODU inlet connection
3. 1-1/2" male thread, ODU outlet connection
4. 1-1/2" male thread, IDU outlet connection
5. 1/2” male thread, water filling inlet

HK080
1. 2" male thread, IDU inlet connection
2. 2" male thread, ODU inlet connection
3. 2" male thread, ODU outlet connection
4. 2" male thread, IDU outlet connection
5. 1/2” male thread, water filling inlet

HK150~520



HK150
1. 2-1/2" male thread, IDU inlet connection
2. 2-1/2" male thread, ODU inlet connection
3. 2-1/2" male thread, ODU outlet connection
4. 2-1/2" male thread, IDU outlet connection
5. 1/2" male thread, water filling inlet

HK210
1. 3" male thread, IDU inlet connection
2. 3" male thread, ODU inlet connection
3. 3" male thread, ODU outlet connection
4. 3" male thread, IDU outlet connection
5. 1/2” male thread, water filling inlet

HK320
1. 4" male thread, IDU inlet connection
2. 4" male thread, ODU inlet connection
3. 4" male thread, ODU outlet connection
4. 4" male thread, IDU outlet connection
1. 1/2" male thread, water filling inlet

HK520
1. 4" Clamp, IDU inlet connection
2. 4" Clamp, ODU inlet connection
3. 4" Clamp, ODU outlet connection
4. 4" Clamp, IDU outlet connection
1. 1/2" male thread, water filling inlet

2.2.10 Electrical Features

Model	Power Supply	Pump Rated Power	Max. Pump Operating Current	Min. Allowable CSA of Power Cord		Time Lag Fuse	
				Min	Max	Power Supply Protection	Control Loop Protection
	V-Ph-Hz	kW	A	mm²	mm²	A	A
HK030	See Note 3	0.75	1.9	4	10	3	5
HK040		1.1	2.4	4	10	4	5
HK080		1.85	5	4	10	8	5
HK150		4	7.7	4	10	12	5
HK210		5.5	10.2	4	10	16	5
HK320		7.5	13.7	4	10	20	5
HK150d		4	7.7	4	10	12	5
HK210d		5.5	10.2	4	10	16	5
HK320d		7.5	13.7	4	10	20	5
HK520d		11	20.6	10	6	35	5
HK520d		11	20.6	10	6	35	5

Note1: Connecting cable of main power should be no lighter than CR armoured cord (No. 57 Line in IEC 60245) and in compliance with local standard and copper core should be used.
Note2: Power supply capacity is to be selected based on full load current. Power supply protection current is used for selecting line circuit breaker and fuse.
Note3: Selectable power supply type: 380/400V~3Ph~50Hz or 415V~3Ph~50Hz.

2.2.11 Range of Operation

Maximum operating temperature is 48℃ (52℃ for ME condition)
Minimum operating temperature is -20℃
Maximum storage temperature is 65℃
Minimum storage temperature is -40℃

2.3 Fresh Air Unit

2.3.1 Model Number

Nomenclature

2.3.2 Unit Features

- Energy effcient: The unit uses an air-air heat exchanger with a higher vapor transmission rate, lower thermal resistance and higher mechanical strength, as well as an integrated heat recovery system and fan coil system to save energy while delivering optimal indoor comfort.
- Quiet comfort: The unit features a low-noise centrifugal fan and an air-air heat exchanger with superior flter paper to absorb more fan noise.
- Easy maintenance: All equipment has an access door to facilitate daily maintenance and prolong the unit' s service life.
- Convenient operation: The specially designed LCD controller has a user-friendly interface and is more convenient to operate.
- Lightweight structure: With an aluminum alloy frame and integral PU foam door panel and colored cover plates inside and out, the unit is lightweight for easy transportation and installation.

2.3.3 Technical Parameters

Two-row coil parameters

Unit Model			BFP1	BFP1.5	BFP2	BFP2.5	BFP3	BFP4	BFP5	BFP6	BFP8
Air volume	CMH		1000	1500	2000	2500	3000	4000	5000	6000	8000
Style			Ceiling								Horizontal
Outlet total pressure (Pa)	Fresh air side	LL	135	189	161	116	160	248	321	362	240
		HH	266	233	251	265	253	425	365	449	417
	Exhaust side	LL	128	84	90	107	103	244	205	284	141
		HH	174	234	244	168	217	312	386	428	317
Heat exchange rate(%)	Sensible heat	Summer/ Winter	67.2/70.9	66.9/70.6	67.1/71.6	65.7/69.4	64.3/67.8	66.2/69.8	67.9/71.7	68.9/72.7	63.0/66.5
	Total heat	Summer/ Winter	53.3/62.8	53.3/62.4	53.7/63.4	52.2/61.4	51.3/60.2	52.6/61.8	53.8/63.5	54.5/64.3	50.5/59.1
Motor power (kW)	Fresh air side	LL	0.12	0.25	0.32	0.45	0.55	1	1.3	2.2	1x2
		HH	0.2	0.25	0.32	0.55	0.75	1.3	1.3	2.2	1.3x2
	Exhaust side	LL	0.09	0.18	0.25	0.32	0.45	1	1	1.8	0.75x2
		HH	0.12	0.25	0.32	0.45	0.55	1	1.3	2.2	1x2
Motor input power (kW)	Fresh air side	LL	0.29	0.42	0.57	0.66	0.79	1.66	1.83	2.96	3.32
		HH	0.41	0.42	0.63	0.82	1.11	1.83	1.99	3.14	3.66
	Exhaust side	LL	0.16	0.31	0.39	0.57	0.66	1.54	1.75	2.08	2.5
		HH	0.29	0.42	0.63	0.66	0.79	1.66	1.83	2.96	3.1
Total capacity	Cooling capacity	kW	10.3	15.9	21.9	26.5	31.2	42.4	55.3	68.2	92.7
	Heating capacity	kW	12.2	18.1	24.2	29.7	35	46.5	59.5	72.5	97.4
Recovered capacity	Cooling capacity	kW	6	9.1	12.2	14.8	17.5	23.9	30.5	37.1	45.8
	Heating capacity	kW	5	7.4	10	12.2	14.3	19.6	25.2	30.6	37.5
Cooling capacity of coil	Cooling capacity	kW	4.3	6.8	9.7	11.7	13.7	18.5	24.8	31.1	46.9
	Water flow rate	m^3/h	0.73	1.17	1.66	2.01	2.36	3.18	4.26	5.34	8.06
	Water resistance	kPa	1.96	4.52	3.68	4.76	3.32	6.22	11.59	15.42	32.7
Heating capacity of coil	Heating capacity	kW	7.2	10.7	14.2	17.5	20.7	26.9	34.3	41.9	59.9
	Water flow rate	m^3/h	0.63	0.93	1.25	1.53	1.81	2.35	3	3.66	5.24
	Water resistance	kPa	1.48	2.91	2.13	2.82	2.02	3.53	6.02	7.68	14.93
Noise dB(A)		LL	52	52	54	57	61	64	65	67	68
		LH	53	53	54	59	61	65	66	68	69
		HH	54	54	54	61	62	66	67	69	69
		HL	53	53	54	60	62	66	67	69	69
Weight kg		LL	160	200	230	240	260	325	375	470	595
		LH	160	200	230	240	265	325	375	475	610
		HH	160	200	230	245	265	330	390	475	615
		HL	160	200	230	240	265	325	390	470	600

Four-row coil parameters

Unit Model			BFP1	BFP1.5	BFP2	BFP2.5	BFP3	BFP4	BFP5	BFP6	BFP8
Air volume	CMH		1000	1500	2000	2500	3000	4000	5000	6000	8000
Style			Ceiling								Horizontal
Outlet total pressure (Pa)	Fresh air side	LL	111	161	131	82	122	203	275	316	196
		HH	243	205	221	231	215	380	320	403	373
	Exhaust side	LL	128	84	90	107	103	244	205	284	141
		HH	174	234	244	168	217	312	386	428	317
Heat exchange rate(%)	Sensible heat	Summer/ Winter	67.2/70.9	66.9/70.6	67.1/71.6	65.7/69.4	64.3/67.8	66.2/69.8	67.9/71.7	68.9/72.7	63.0/66.5
	Total heat	Summer/ Winter	53.3/62.8	53.3/62.4	53.7/63.4	52.2/61.4	51.3/60.2	52.6/61.8	53.8/63.5	54.5/64.3	50.5/59.1
Motor power (kW)	Fresh air side	LL	0.12	0.25	0.32	0.45	0.55	1	1.3	2.2	1x2
		HH	0.2	0.25	0.32	0.55	0.75	1.3	1.3	2.2	1.3x2
	Exhaust side	LL	0.09	0.18	0.25	0.32	0.45	1	1	1.8	0.75x2
		HH	0.12	0.25	0.32	0.45	0.55	1	1.3	2.2	1x2
Motor input power (kW)	Fresh air side	LL	0.29	0.42	0.57	0.66	0.79	1.66	1.83	2.96	3.32
		HH	0.41	0.42	0.57	0.82	1.11	1.83	1.99	3.14	3.66
	Exhaust side	LL	0.16	0.31	0.39	0.57	0.66	1.54	1.75	2.08	2.5
		HH	0.29	0.42	0.63	0.66	0.79	1.66	1.83	2.96	3.1
Total capacity	Cooling capacity	kW	15.5	23.3	31.3	38.2	45.2	60.2	70.3	86.8	119.7
	Heating capacity	kW	16.4	24.2	32.3	39.9	47.4	62.7	76.3	92.8	125.8
Recovered capacity	Cooling capacity	kW	6	9.1	12.2	14.8	17.5	23.9	30.5	37.1	45.8
	Heating capacity	kW	5	7.4	10	12.2	14.3	19.6	25.2	30.6	37.5
Cooling capacity of coil	Cooling capacity	kW	9.5	14.2	19.1	23.4	27.7	36.3	39.8	49.7	73.9
	Water flow rate	m³/h	1.64	2.43	3.28	4.01	4.76	6.24	6.84	8.53	12.7
	Water resistance	kPa	10.97	21.26	17.47	22.49	17.61	31.64	16.06	17.25	27.02
Heating capacity of coil	Heating capacity	kW	11.4	16.8	22.3	27.7	33.1	43.1	51.1	62.2	88.3
	Water flow rate	m³/h	0.99	1.47	1.95	2.42	2.89	3.77	4.47	5.44	7.72
	Water resistance	kPa	4.25	8.19	6.63	8.69	6.98	12.35	7.11	7.37	10.77
Noise dB(A)		LL	52	52	54	57	61	64	65	67	68
		LH	53	53	54	59	61	65	66	68	69
		HH	54	54	54	61	62	66	67	69	69
		HL	53	53	54	60	62	66	67	69	69
Weight kg		LL	165	205	235	245	270	335	385	485	615
		LH	165	205	235	250	270	335	390	490	630
		HH	165	205	235	250	275	340	400	485	635
		HL	165	205	235	250	270	335	400	485	620

Working conditions: Summer: outdoor dry bulb temperature: 35 ℃ ; wet bulb temperature: 28 ℃ ; indoor dry bulb temperature: 27 ℃ ; wet bulb temperature: 19.5 ℃ ; water inlet/outlet temperature: 7/12℃ .
Winter: outdoor dry bulb temperature: 5℃ ; wet bulb temperature: 2.1℃ ; indoor dry bulb temperature: 21℃ , wet bulb temperature: 13.1℃ ; water inlet temperature: 60℃ .

Wet Film Humidifier option

Unit Type			BFP1R	BFP1.5R	BFP2R	BFP2.5R	BFP3R	BFP4R	BFP5R	BFP6R	BFP8R
Air Volumn (m3/h)			1000	1500	2000	2500	3000	4000	5000	6000	8000
Wind Speed [m/s]			1.68	1.89	1.96	2.14	2.28	2.56	2.58	2.6	2.54
100mm wet film	Saturation efficiency [%]		71	67	66	62	59	54	53	53	54
	2 rows	Unit Humidification [kg/h]	9.9	14	18.7	21.8	24.9	31.1	39.9	48.8	62.1
	4 rows	Unit Humidification [kg/h]	12.4	17.6	23.4	27.7	32	39.9	50.5	57.8	80.1

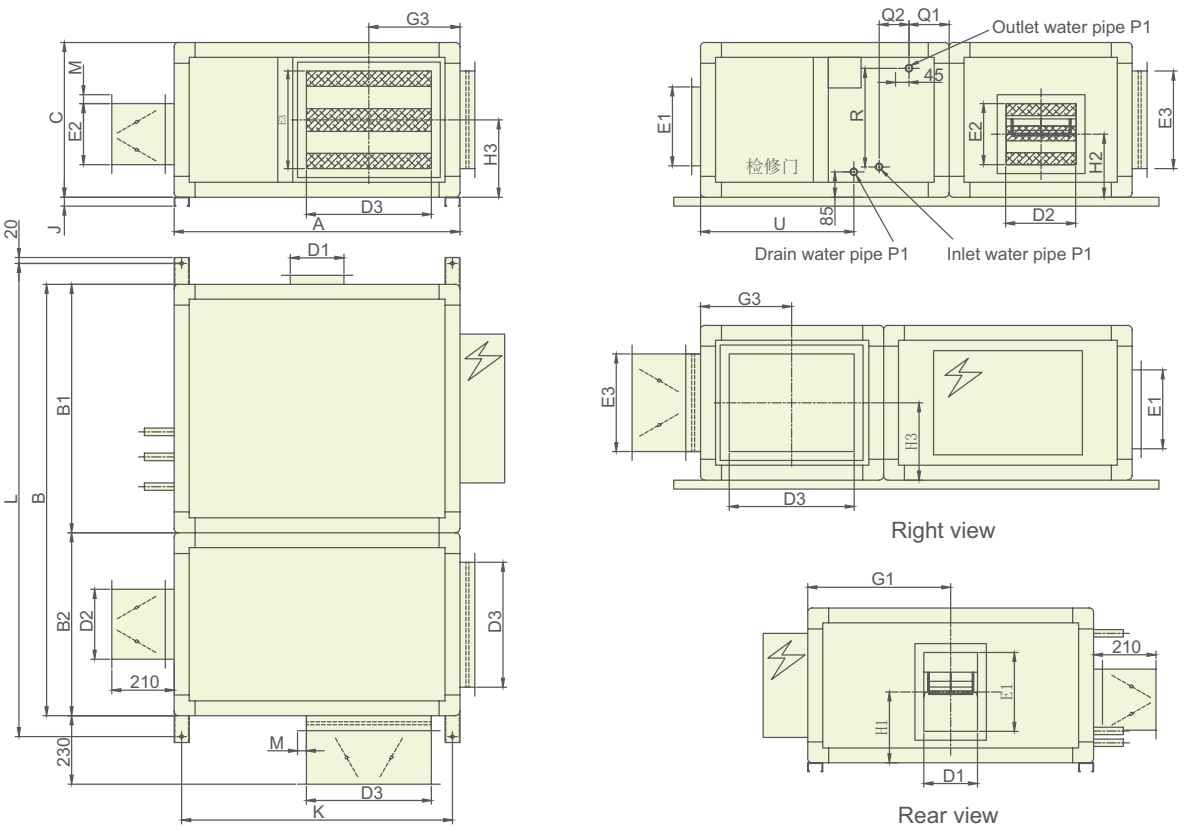
Filter box option

Model	BFP1F	BFP1.5F	BFP2F	BFP2.5F	BFP3F	BFP4F	BFP5F	BFP6F	BFP8F
Air Volumn (m3/h)	1000	1500	2000	2500	3000	4000	5000	6000	8000
Power[V]	380V/3P/50Hz	80V/3P/50Hz	80V/3P/50Hz	80V/3P/50Hz	80V/3P/50Hz	80V/3P/50Hz	80V/3P/50Hz	80V/3P/50Hz	80V/3P/50Hz
Rated power[kW]	0.2	0.32	0.37	0.55	0.75	1.0	1.5	2.2	3.0
Input power[kW]	0.38	0.65	0.64	0.84	1.1	1.6	2.0	3.1	3.8
current[A]	0.8	1.3	1.21	1.6	2.3	3.0	3.9	5.9	7.8
primarygrade	G3	G3	G3	G3	G3	G3	G3	G3	G3
Middle grade	F7	F7	F7	F7	F7	F7	F7	F7	F7
Weight[kg]	45	60	65	85	95	110	135	145	165
Width[mm]	431	635	635	822	1026	1230	1128	1230	1230
depth[mm]	1130	1200	1240	1280	1320	1360	1360	1480	1480
Height[mm]	480	480	582	582	582	582	684	684	871

Working conditions: Summer (Outdoor): Air DB 35℃ , WB 28℃ , Relative humidity 59.1% (Indoor): Air DB 27℃ , WB 19.5℃ , Relative humidity 50%
Winter (Outdoor): Air DB 5℃ , WB 2.1℃ , Relative humidity 60% (Indoor):Air DB 21℃ , WB 13.1℃ , Relative humidity 40%
Summer: Inlet/Outlet water 7℃ /12℃
Winter: Inlet/Outlet water 60℃ /50℃

2.3.4 External Dimensions

Fresh air unit: BFP 1~6

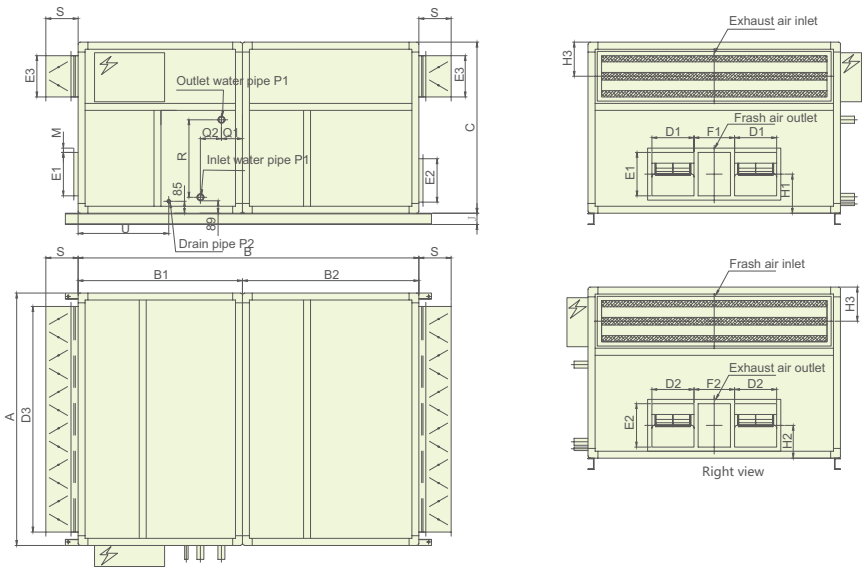


Type	BFP1	BFP1.5	BFP2	BFP2.5	BFP3	BFP4	BFP5	BFP6
A	960	1120	1220	1180	1180	1370	1520	1710
B	1450	1520	1610	1660	1750	1970	2130	2300
B1	835	845	875	925	1015	1115	1155	1225
B2	615	675	735	735	735	855	975	1075
C	520	580	640	700	770	770	770	7700
D1(1)	235	260	300	300	300	310	305	385
D1(2)	180	260	300	250	300	305	385	385
D2(1)	170	300	250	300	300	310	310	385
D2(2)	235	260	300	300	300	310	305	385

D3	420	480	540	540	540	660	780	880
E1(1)	205	185	185	230	230	285	310	340
E1(2)	265	200	230	250	245	310	310	360
E2(1)	205	230	250	185	230	285	285	360
E2(2)	205	185	200	230	230	285	310	360
E3	328	388	448	508	578	578	578	578
G1	480	560	610	590	590	685	760	855
G2	306	336	366	366	366	426	486	536
G3	306	336	366	366	366	426	486	536
H1(1)	208	198	221	221	221	248	261	276
H1(2)	238	206	198	231	228	261	261	286
H2(1)	212	221	206	208	221	248	248	294
H2(2)	212	208	231	221	221	248	261	294
H3	260	290	320	350	385	385	385	385
J	30	30	30	30	30	30	30	30
K	910	1070	1170	1130	1130	1320	1470	1660
L	1590	1660	1750	1800	1890	2110	2270	2440
M	30	30	30	30	30	30	30	30
P1(1)	ZG3/4"	ZG3/4"	ZG3/4"	ZG3/4"	ZG3/4"	ZG1"	ZG1"	ZG1-1/4"
P1(2)	ZG3/4"	ZG3/4"	ZG1"	ZG1"	ZG1-1/4"	ZG1-1/4"	ZG1-1/4"	ZG1-1/2"
P2	ZG3/4"	ZG3/4"	ZG3/4"	ZG3/4"	ZG3/4"	ZG3/4"	ZG3/4"	ZG3/4"
Q1(1)	100	100	100	100	100	100	100	100
Q1(2)	113	113	113	113	113	113	113	113
Q2(1)	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5
Q2(2)	82.5	82.5	82.5	82.5	82.5	82.5	82.5	82.5
R	300	364	428	492	554	554	554	554
S	230	230	230	230	230	230	230	230
U	515	525	555	605	695	795	800	805

Note: D1(1)、E1(1)、H1(1) are suitable for low air supply total pressure units; D1(2)、E1(2)、H1(2) are suitable for high air supply total pressure units；
D2(1)、E2(1)、H2(1) are suitable for low return air total pressure units; D2(2)、E2(2)、H2(2) are suitable for high return air total pressure units；
Q1(1)、Q2(1)、P1(1))are suitable for two-row unit connection pipes, Q1(2)、Q2(2)、P1(2) are suitable for four-row unit connection pipes.

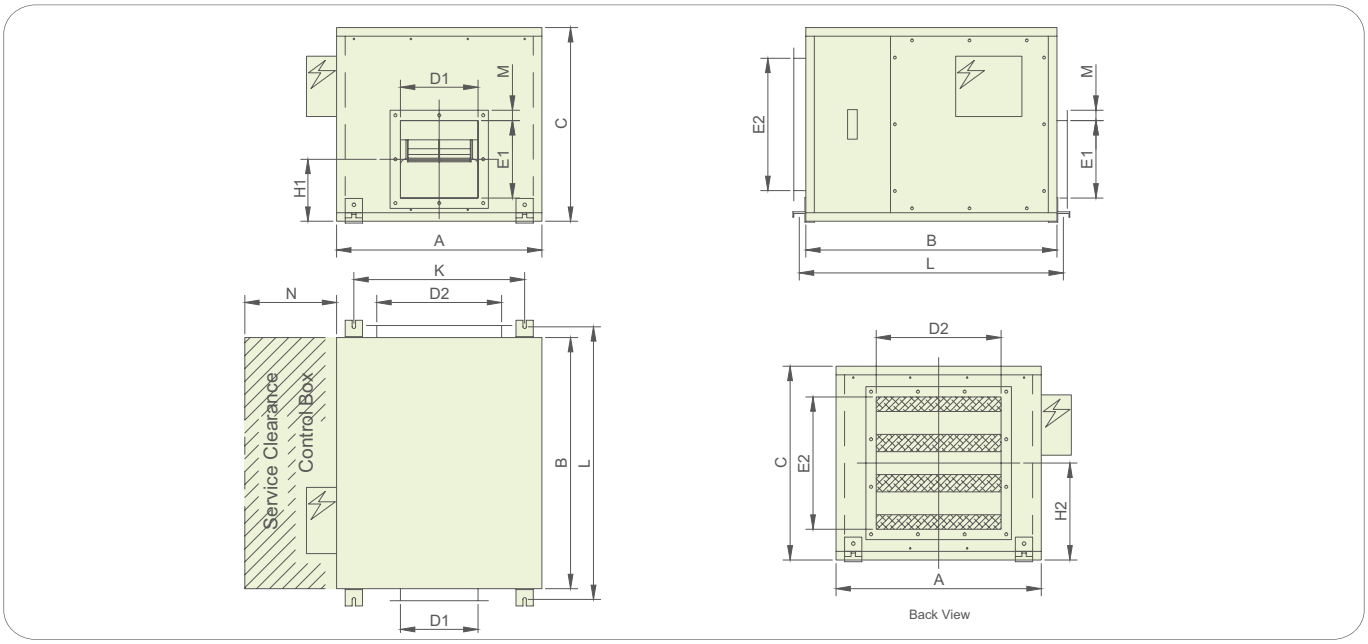
Fresh air unit: BFP8



Type	BFP80	型号	BFP80
A	1800	H1(2)	279
B	2430	H2(1)	222
B1	1172	H2(2)	234
B2	1258	H3	243
C	1220	J	80
D1(1)	310	M	30
D1(2)	300	P1(1)	ZG1-1/2"
D2(1)	310	P1(2)	ZG2"
D2(2)	300	P2	ZG1"
D3	1608	Q1(1)	100
E1(1)	285	Q1(2)	113
E1(2)	310	Q2(1)	67.5
E2(1)	285	Q2(2)	82.5
E2(2)	310	R	554
E3	294	S	230
F1	290	U	646
F2	290	V	85
H1(1)	266	W	89

Note: D1(1) 、E1(1) 、H1(1) are suitable for low air supply total pressure units; D1(2)、E1(2)、H1(2) are suitable for high air supply total pressure units ;
D2(1) 、E2(1) 、H2(1) are suitable for low return air total pressure units; D2(2)、E2(2)、H2(2) are suitable for high return air total pressure units ;
Q1(1)、Q2(1)、P1(1))are suitable for two-row unit connection pipes, Q1(2)、Q2(2) 、P1(2) are suitable for four-row unit connection pipes.

BFP (With Filter)



Unit Dimensions (BFP*F) (50Hz)													
Unit Type	A	B	C	D1	D2	E1	E2	H1	H2	K	L	M	N
BFP1FTHC	431	1130	480	180	200	260	324	202	234	341	1190	30	500
BFP1，5FTHC	635	1200	480	230	400	260	324	202	234	545	1260	30	700
BFP2FTHC	635	1240	582	250	400	245	404	194	274	545	1300	30	700
BFP2，5FTHC	822	1280	582	250	500	245	404	194	274	732	1340	30	500
BFP3FTHC	1026	1320	582	300	600	240	404	192	274	936	1380	30	600
BFP4FTHC	1230	1360	582	310	800	280	404	212	274	1140	1420	30	700
BFP5FTHC	1128	1360	684	380	800	305	510	224	327	1038	1420	30	700
BFP6FTHC	1230	1480	684	380	800	355	510	250	327	1140	1540	30	700
BFP8FTHC	1230	1480	871	380	800	355	650	250	397	1140	1540	30	700

2.3.5 Electrical Features

Model	Power supply	Power cord permitted section area		time-lag fuse	
		Min	Max	power supply protection	control loop protection
	V-ph-Hz	mm²	mm²	A	A
BFP 1	380-3-50	1.5	2.5	3	3
BFP 1.5	380-3-50	1.5	2.5	3	3
BFP 2	380-3-50	1.5	2.5	4	3
BFP 2.5	380-3-50	1.5	2.5	6	3
BFP 3	380-3-50	1.5	2.5	8	3
BFP 4	380-3-50	2.5	4.0	12	3
BFP 5	380-3-50	2.5	4.0	18	3
BFP 6	380-3-50	4.0	6.0	25	3
BFP 7	380-3-50	4.0	6.0	25	3
BFP 8	380-3-50	4.0	6.0	30	3

Note: Please refer to Section2.3.3 for the power.

2.4 Indoor units

2.4.1 Unit Features

2.4.1.1 Ceiling Fan Coil Unit

Ultra-low noise

- The unit makes use of a new wide impeller design and has a forward direction multi-wing impeller with low rotational speed to perfectly match the motor and further reduce noise. Combined with the use of sound dampening material, the unit's operating noise level is decreased by 2-5 dBA compared to similar units, making it best-in-class.

Extreme efficiency

- 1.The unit adopts a newly developed double-folded wide-fn design. An advanced mechanical pipe extrusion process ensures the copper coil makes perfect contact with the aluminum. The wide fin provides an ideal heat transfer channel for superb heat exchange, while the ultra-wide impeller supports more effcient heat exchange. As a result, the cooling capacity of the two-row coil units exceeds that of three-row coil units currently on the market in China and internationally.
- 2.Electric two-way valves and the ability to control the operation of indoor units based on actual indoor load further improves energy efficiency.

Compact design

- The unit is only 230mm high, which saves installation space and allows for flexible deployment in a range of environments.

2.4.1.2 Cassette

- Ultra-thin body design, easy for installation.
- Air supply from four directions brings unique comfort with each air outlet can be freely controlled.
- Optimized centrifugal fan realizes high efficiency, great performance and quiet operation.
- High performance upper row condensate pump covered with special insulation and sound damping materials allows quiet, quick and smooth draining.
- Air inlet grate has removable and cleanable strainer which keeps indoor air fresh through continuous cycling filtration.
- Particularly designed air outlet realizes quick mixing of air supply from the air conditioner and air inside the room.
- Thermostat with large screen LCD can be equipped.
- The equipment is built with electric two-way valves making the use of system more energy efficient.

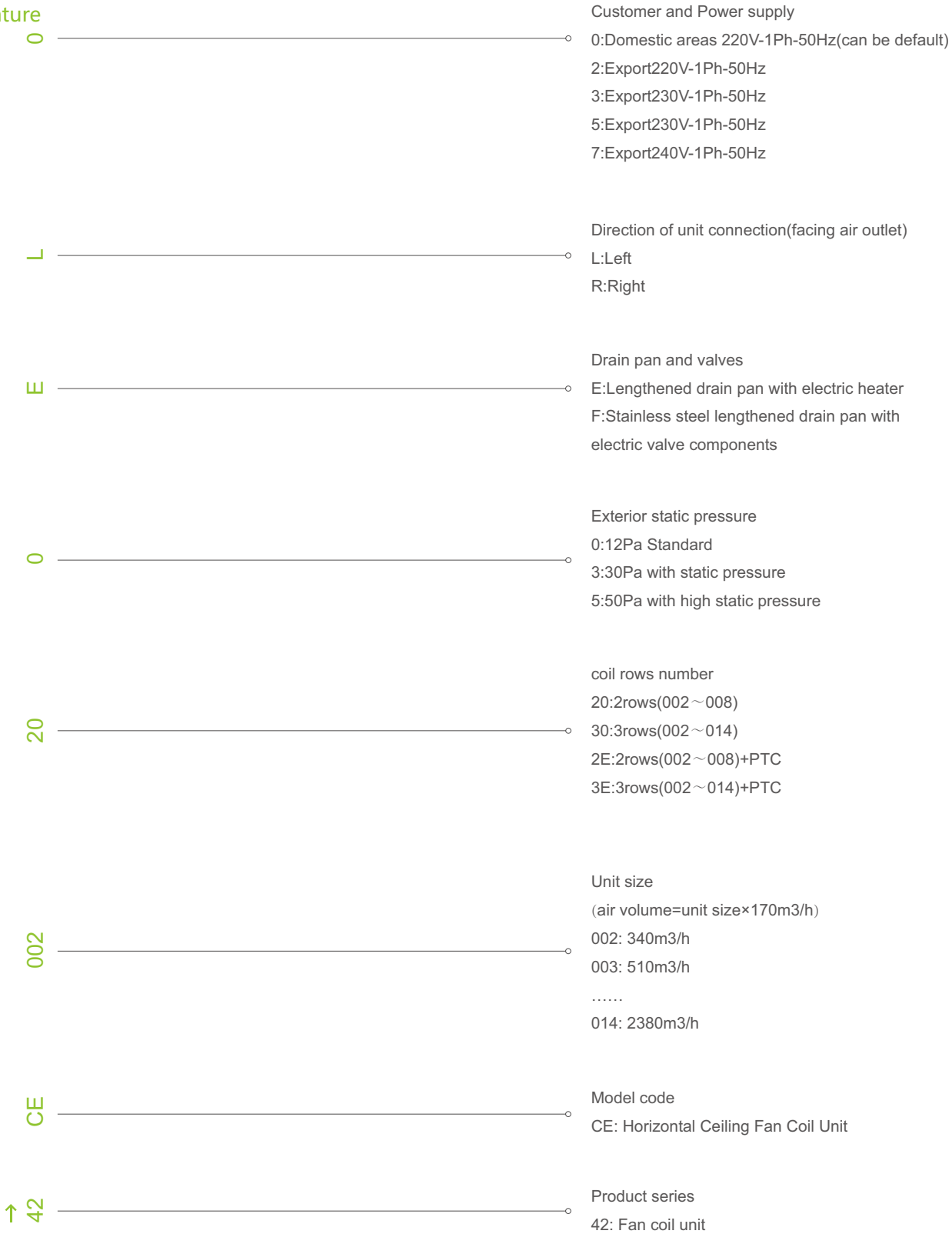
2.4.1.3 Hi-wall fan coil unit

- The plastic enclosure is compact and exquisite with concise line; delicately designed air inlet plate is easier to remove.
- The hydrophilic aluminum foil heat exchanger is equipped with air release valve and drain valve; the mechanical expansion pipe guarantees high heat exchange effciency. Built-in two-way valve with metallic hose is easy to install.
- The EC motor saves up to 60% energy, which starts smoothly and steadily with no low-frequency noise.
- The flter mesh is cleanable and easy to dismount.
- The unit has the function of automatic swing from up-down and left-right at a large angle of 130°, blowing comfortable wind to every corner of the room.
- Microcomputer control promises with more precise environmental temperature control.

2.4.2 Horizontal Ceiling Fan Coil Unit (42 CE)

2.4.2.1 Model Number

Nomenclature



2.4.2.2 Technical Parameters

Parameters of two-row coil units

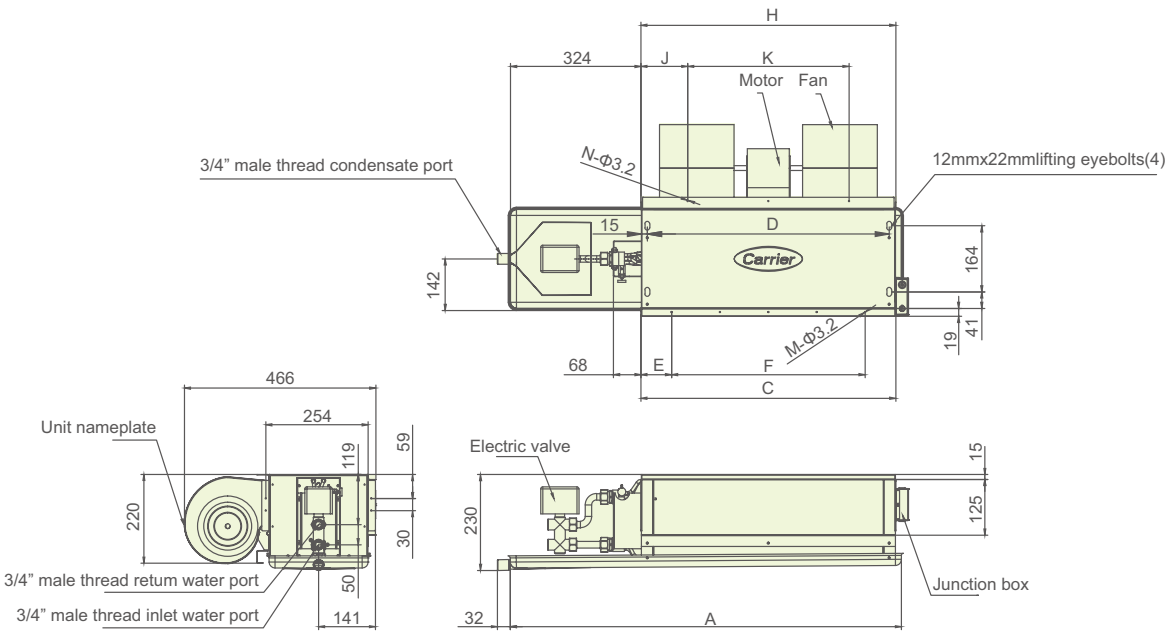
Performance	Type	002	003	004	005	006	008
Rated airfow m³/h	High	340	530	700	880	1020	1430
	Middle	270	420	560	700	810	1140
	Low	200	310	420	520	610	850
Cooling capacity W		1900	2820	3640	4500	5400	7200
Heating capacity W		3100	4400	5820	6900	8400	11160
Input power W	12 Pa	32	46	56	75	94	134
	30 Pa	40	54	72	87	102	155
	50 Pa	46	65	84	98	112	174
NoisedB(A)	12 Pa	36	38	41	43	45	46
	30 Pa	40	41	44	46	47	48
	50 Pa	42	44	46	47	49	50
Water flow m3/h		0.324	0.486	0.624	0.774	0.93	1.236
Water pressure drop KPa		20	28	30	30	38	38
Electric heater	Quantity			1			2
	Power W	1000	1200	1500	1800	2200	1200
Fan	Form	centrifugal, forward direction, multi-wing					
Motor	Form	Permanent capacitor motor					
Coil	Number of rows	2					
	Used pressure	1.6 MPa					
Connection	Inlet return water	3/4”male thread					
	Condensed water	3/4”male thread					
Weight kg		12.7	14.2	16.1	17.4	18.5	25.8
Optional Accessories		Return air cap					

Parameters of three-row coil units

Performance	Type	002	003	004	005	006	008	010	012	014
Rated airfow m³/h	High	340	510	680	850	1020	1360	1700	2040	2380
	Middle	265	405	535	680	790	1060	1360	1595	1904
	Low	195	305	405	510	585	790	1020	1180	1428
Cooling capacity W		2300	3200	4150	5000	6200	8100	9800	11500	13500
Heating capacity W		3600	5100	6450	7870	9300	125¬00	15200	17200	20500
Input power W	12 Pa	32	46	56	75	94	134	150	180	225
	30 Pa	40	52	72	87	102	155	172	210	240
	50 Pa	46	63	84	98	112	174	195	236	290
NoisedB(A)	12 Pa	36	38	41	43	45	46	47	50	51
	30 Pa	40	41	44	46	47	48	49	51	53
	50 Pa	42	44	46	47	49	50	51	53	54
Water flow m3/h		0.396	0.552	0.714	0.858	1.068	1.392	1.686	1.974	2.316
Water pressure drop KPa		25	21	30	30	32	28	40	40	40
Electric heater	Quantity			1				2		
	Power W	1000	1200	1500	1800	2200	1200	1500	1800	2200
Fan	Form	centrifugal, forward direction, multi-wing								
Motor	Form	Permanent capacitor motor								
Coil	Number of rows	3								
	Used pressure	1.6 MPa								
Connection	Inlet return water	3/4″ male thread								
	Condensed water	3/4″ male thread								
Weight kg		13.4	14.9	16.9	18.2	19.5	26.9	29.5	33.6	39.5
Optional Accessories		Return air cap								

Note: 1.Performance data collected at high speed with relevant static pressure.
2.The cooling capacity is measured under the following conditions: chilled water EWT: 7°C, inlet and outlet temperature difference: 5°C and inlet air DB=27°C/wb=19.5°C; Heating capacity is measured under the following conditions: hot water EWT: 60°C air inlet temperature DB=21°C; water volume the same°C.
3.Noise is measured in semi-anechoic room, 1 m from the front and bottom of the unit.
4.Electric heater is applicable only for units with this option.
5.Standard water pressure drop doesn't include the water pressure drop of electric water valve and the kv value is 3.0.

2.4.2.3 External Dimensions

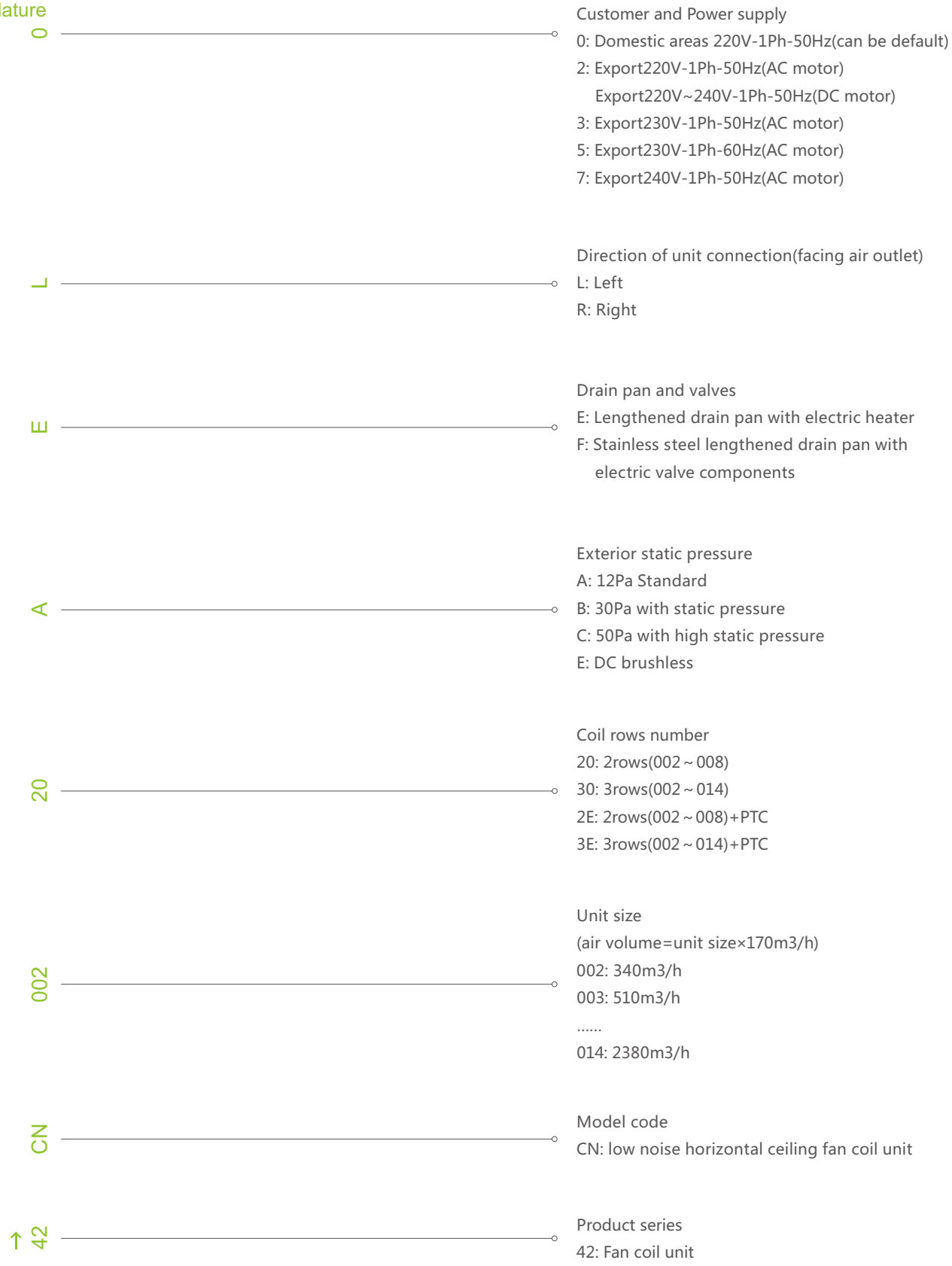


Type	Dimmension									
	A	C	D	E	F	H	J	K	M	N
42CE002	890	550	520	35	480	550	75	400	10	6
42CE003	970	630	600	75	480	630	115	400	12	6
42CE004	1090	750	720	75	600	750	75	600	14	6
42CE005	1170	830	800	55	720	830	115	600	16	8
42CE006	1410	1030	1000	95	840	1030	115	800	18	8
42CE008	1650	1270	1240	95	1080	1270	35	1200	26	10
42CE010	1770	1390	1360	95	1200	1390	95	1200	28	10
42CE012	2010	1630	1600	95	1440	1630	115	1400	32	12
42CE014	2250	1870	1840	95	1680	1870	135	1600	36	14

2.4.3 Low-noise Horizontal Ceiling Fan Coil Unit (42 CN)

2.4.3.1 Model Number

Nomenclature



2.4.3.2 Technical Parameters

Parameters of two-row coil units

Performance	Type	002	003	004	005	006	008
Rated airflow m³/h	High	340	530	700	880	1020	1430
	Middle	270	420	560	700	810	1140
	Low	200	310	420	520	610	850
Cooling capacity W		1900	2820	3640	4500	5400	7200
Heating capacity W		3100	4400	5820	6900	8400	11160
Input power (AC) W	12 Pa	32	46	56	75	94	134
	30 Pa	42	54	72	87	106	155
	50 Pa	46	65	84	98	116	174
Input power (DC) W	12 Pa	18	23	33	45	54	64
	30 Pa	22	32	45	57	66	75
	50 Pa	30	45	63	72	88	115
Noise dB(A)	12 Pa	34	36	38	42	44	43
	30 Pa	37.5	39.5	41.5	43.5	44.5	46
	50 Pa	41	43	44.5	45.5	46.5	47.5
Water flow mm³/h		0.324	0.486	0.624	0.774	0.93	1.236
Water pressure drop KPa		20	28	30	30	38	38
Electric heater	Quantity	1					2
	Power W	1000	1200	1500	1800	2200	1200
Fan	Form	centrifugal, forward direction, multi-wing					
Motor	Form	Permanent capacitor motor/DC brushless motor					
Coil	Number of rows	2					
	Used pressure	1.6MPa					
Connection	Inlet return water	3/4″ male thread					
	Condensed water	3/4″ male thread					
Weight kg		12.7	14.2	16.1	17.4	18.5	25.8
Optional Accessories		Return air cap					

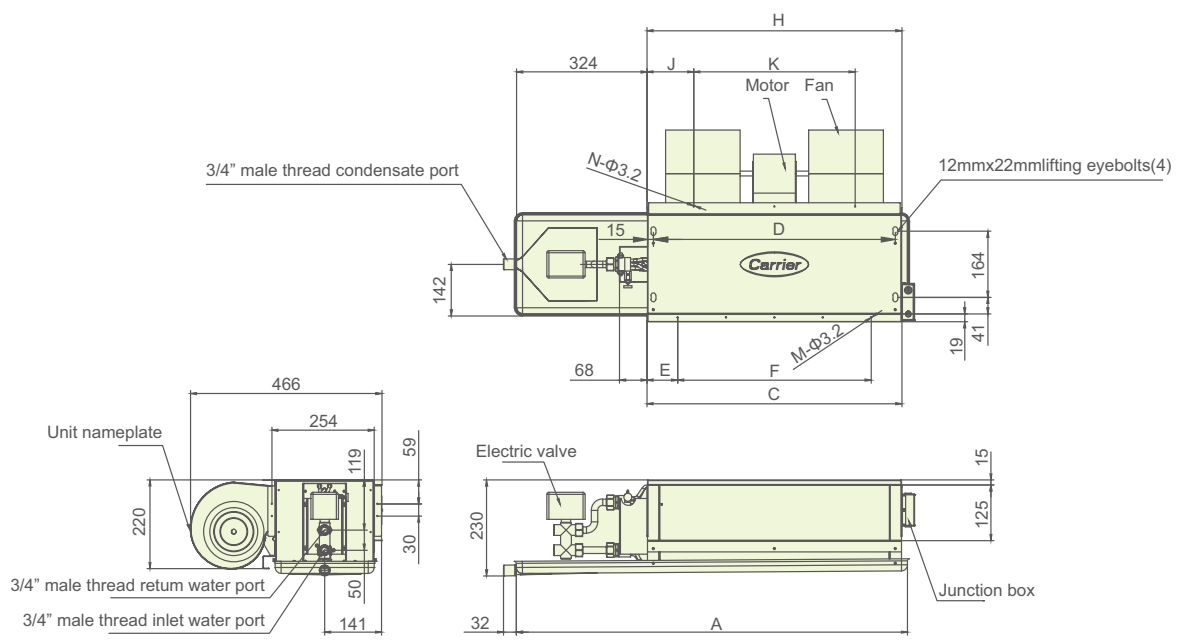
Parameters of three-row coil units

Performance	Type	002	003	004	005	006	008	010	012	014
Rated airflow m³/h	High	340	510	680	850	1020	1360	1700	2040	2380
	Middle	265	405	535	680	790	1060	1360	1595	1904
	Low	195	305	405	510	585	790	1020	1180	1428
Cooling capacity W		2300	3200	4150	5000	6200	8100	9800	11500	13500
Heating capacity W		3600	5100	6450	7870	9300	12500	15200	17200	20500
Input power (AC) W	12 Pa	32	46	56	75	94	134	150	180	225
	30 Pa	42	52	72	87	106	155	172	210	240
	50 Pa	46	63	84	98	116	174	195	236	290
Input power (DC) W	12 Pa	18	23	33	45	54	64	88	116	/
	30 Pa	22	32	45	57	66	75	111	146	/
	50 Pa	30	45	63	72	88	115	121	115	/
Noise dB(A)	12 Pa	34	36	38	42	44	43	46.5	48.5	48.5
	30 Pa	37.5	39.5	41.5	43.5	44.5	46	48.5	49.5	51
	50 Pa	41	43	44.5	45.5	46.5	47.5	50	50.5	52
Water flow mm³/h		0.396	0.552	0.714	0.858	1.068	1.392	1.686	1.974	2.316
Water pressure drop KPa		25	21	30	30	32	28	40	40	50
Electric heater	Quantity			1			2			
	Power W	1000	1200	1500	1800	2200	1200	1500	1800	2200
Fan	Form	centrifugal, forward direction, multi-wing								
Motor	Form	Permanent capacitor motor/DC brushless motor								
Coil	Number of rows	3								
	Used pressure	1.6MPa								
Connection	Inlet return water	3/4″ male thread								
	Condensed water	3/4″ male thread								
Weight kg		13.4	14.9	16.9	18.2	19.5	26.9	29.5	33.6	39.5
Optional Accessories		Return air cap								

Note: 1.Performance data collected at high speed with relevant static pressure.
2.The cooling capacity is measured under the following conditions: chilled water EWT: 7°C, inlet and outlet temperature difference: 5°C and inlet air DB=27°C/wb=19.5°C; Heating capacity is measured under the following conditions: hot water EWT: 60°C air inlet temperature DB=21°C; water volume the same°C.
3.Noise is measured in semi-anechoic room, 1 m from the front and bottom of the unit.
4.Electric heater is applicable only for units with this option.
5.Standard water pressure drop doesn't include the water pressure drop of electric water valve and the kv value is 3.0.

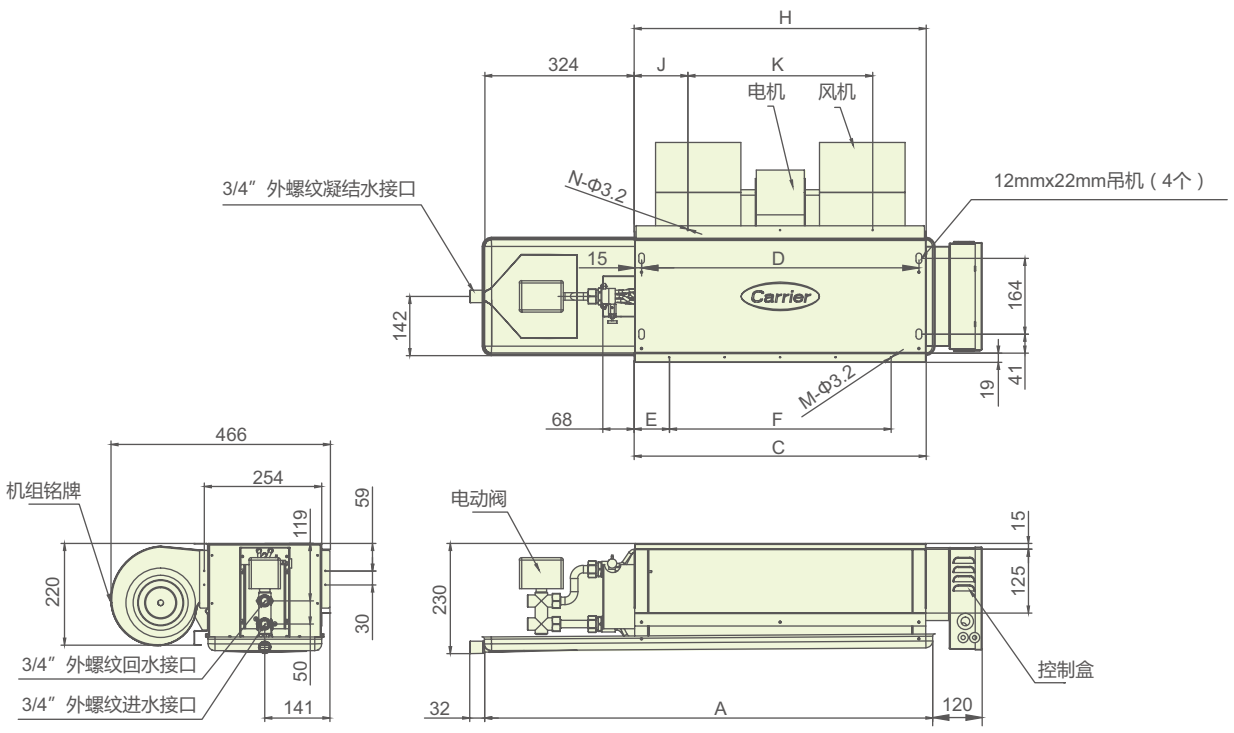
2.4.3.3 External Dimensions

AC motor FCU



Type	Dimmension									
	A	C	D	E	F	H	J	K	M	N
42CN002	890	550	520	35	480	550	75	400	10	6
42CN003	970	630	600	75	480	630	115	400	12	6
42CN004	1090	750	720	75	600	750	75	600	14	6
42CN005	1170	830	800	55	720	830	115	600	16	8
42CN006	1410	1030	1000	95	840	1030	115	800	18	8
42CN008	1650	1270	1240	95	1080	1270	35	1200	26	10
42CN010	1770	1390	1360	95	1200	1390	95	1200	28	10
42CN012	2010	1630	1600	95	1440	1630	115	1400	32	12
42CN014	2250	1870	1840	95	1680	1870	135	1600	36	14

DC motor FCU



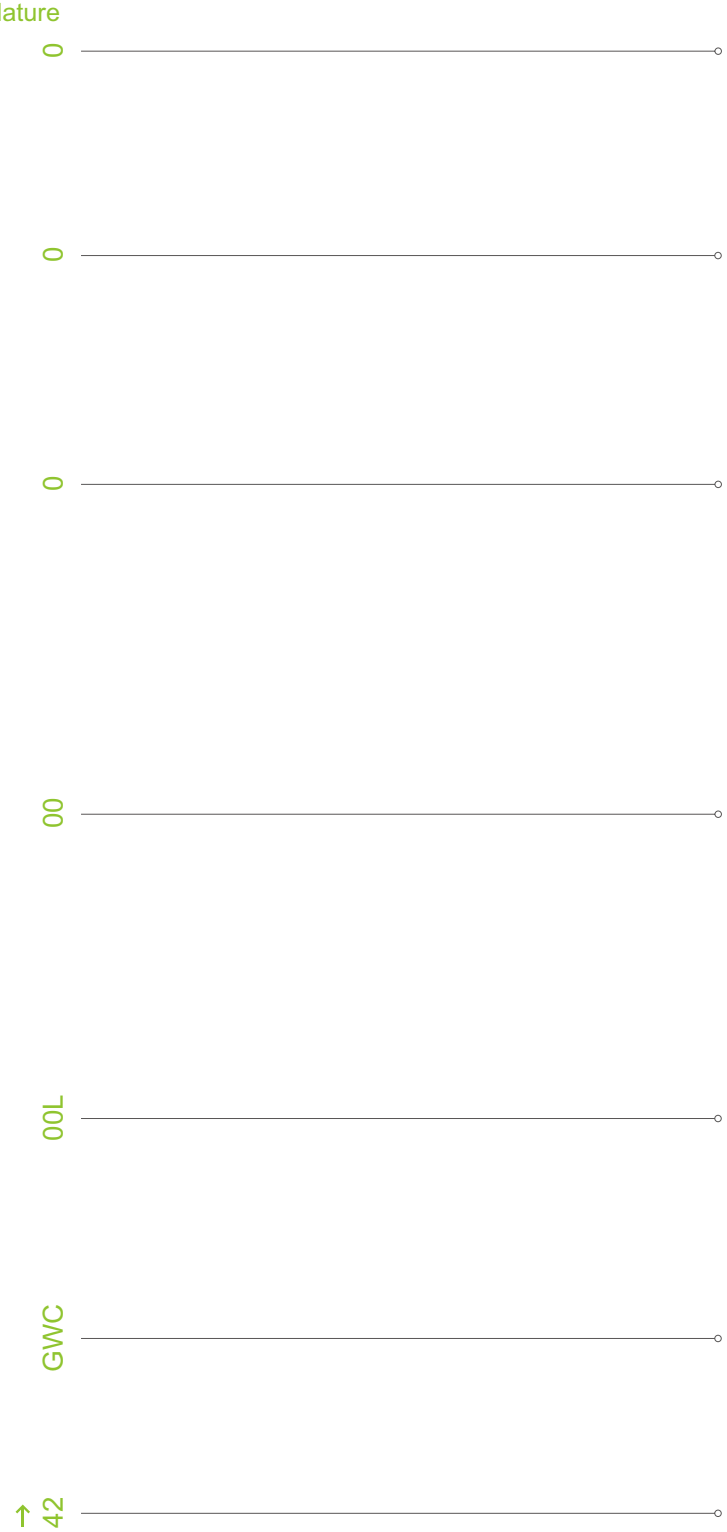
Type	Dimmension									
	A	C	D	E	F	H	J	K	M	N
42CN002	890	550	520	35	480	550	75	400	10	6
42CN003	970	630	600	75	480	630	115	400	12	6
42CN004	1090	750	720	75	600	750	75	600	14	6
42CN005	1170	830	800	55	720	830	115	600	16	8
42CN006	1410	1030	1000	95	840	1030	115	800	18	8
42CN008	1650	1270	1240	95	1080	1270	35	1200	26	10
42CN010	1770	1390	1360	95	1200	1390	95	1200	28	10
42CN012	2010	1630	1600	95	1440	1630	115	1400	32	12
42CN014	2250	1870	1840	95	1680	1870	135	1600	36	14

2.4.4 Cassette (42GWC)

2.4.4.1 Model Number

Unit Nomenclature

Panel Nomenclature



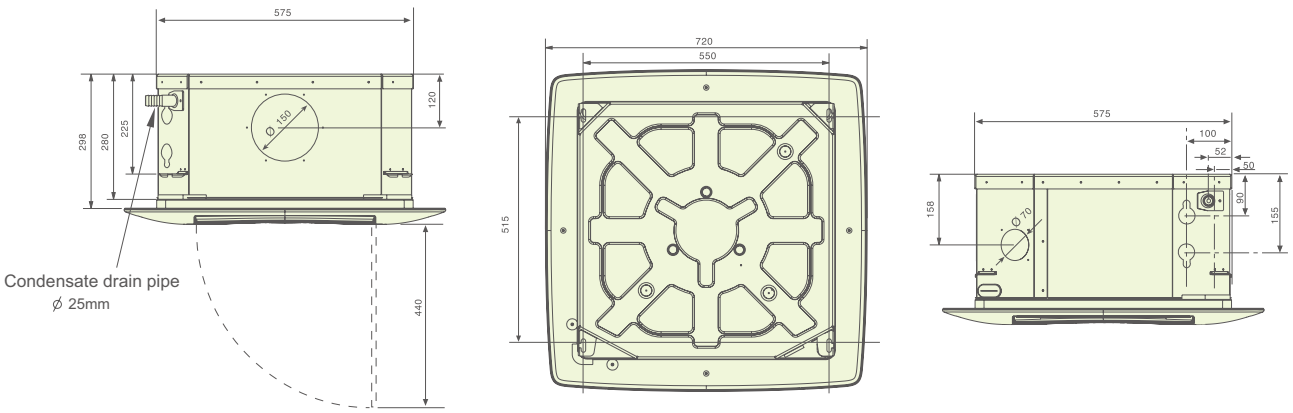
2.4.4.2 Technical Parameters

Performance	Type	003	004	005	006	008	010	012	014
Rated airflow m³/h	High	540	680	850	1020	1360	1700	2040	2380
	Middle	430	540	680	810	1080	1300	1570	1830
	Low	350	440	550	660	880	1010	1210	1410
Cooling capacity W		2950	3650	5000	5850	7500	9100	10900	12600
Heating capacity W		4700	5800	8000	9300	12500	13700	16300	18900
Input power (AC) W		35	48	50	60	126	150	160	190
Input power (DC) W		13	26	22	28	49	/	/	/
NoisedB(A)	High	36	40	37	38	45	48	50	52
	Middle	32	35	33	33	40	45	47	49
	Low	28	30	29	28	35	41	43	46
Water flow rate l/min		8.5	10.5	14.5	17	21.5	27.8	31.2	36
Water pressure drop KPa		18	22	20	30	36	30	35	50
Connection dimension inch		3/4	3/4	1	1	1	3/4	3/4	3/4
Panel size mm		720*720	960*960	1050*1050	1	1	1	1	1
Body dimension mm		575*575*298	825*825*298	930*930*930	960*960	960*960	960*960	960*960	960*960
Weight of panel kg		2.5	2.5	5.0	5.0	5.0	6.5	6.5	6.5
Unit body weight kg		16.5	16.5	37.0	37.0	39.6	37.0	37.0	39.6

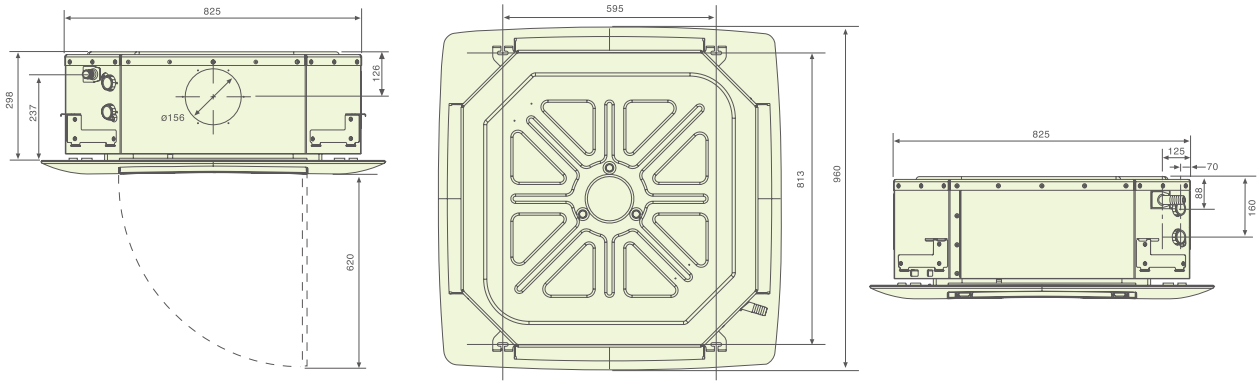
Note: 1.The cooling capacity is measured under the following conditions: chilled water EWT: 7°C; inlet and outlet temperature difference: 5°C and inlet air DB=27°C/wb=19.5°C; Heating capacity is measured under the following conditions: hot water EWT: 60°C; air inlet temperature DB=21°C; water volume the same°C.
2. Noise is measured in semi-anechoic room, 1 m from the front and bottom of the unit.
3. The indicated water pressure drop does not include that of the electrical water valve, 42GWC002/003 electrical water valve kv=2.5, 42GWC005/006/008 electrical water valve kv=5.2.

2.4.4.3 External Dimensions

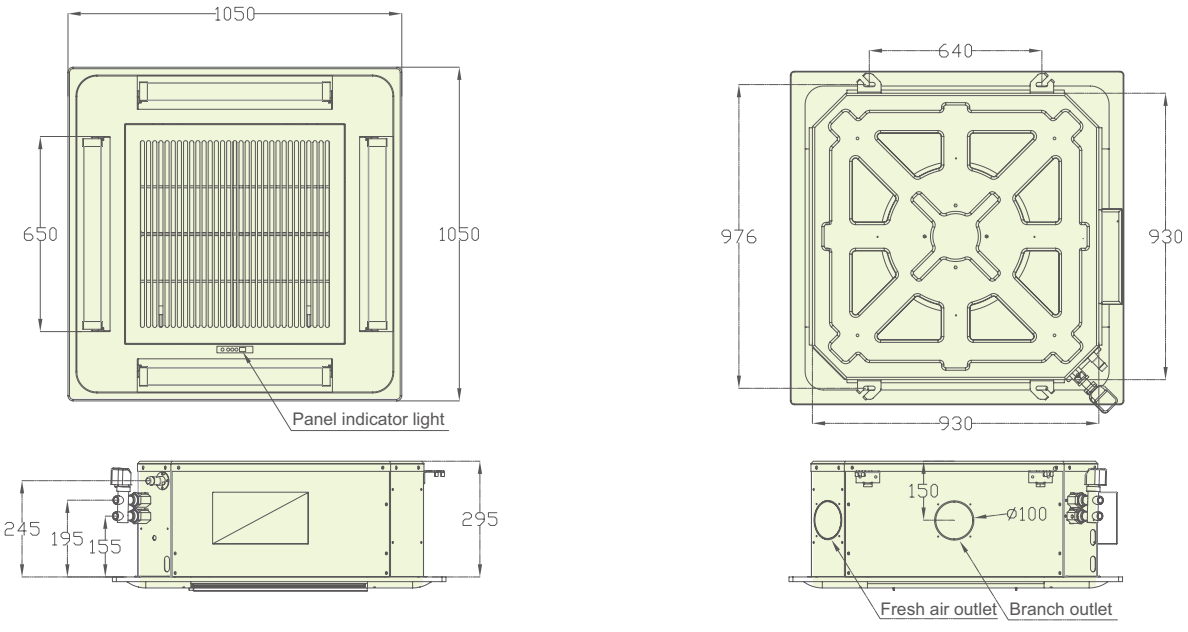
Unit size: 003~005



Unit size: 006~008



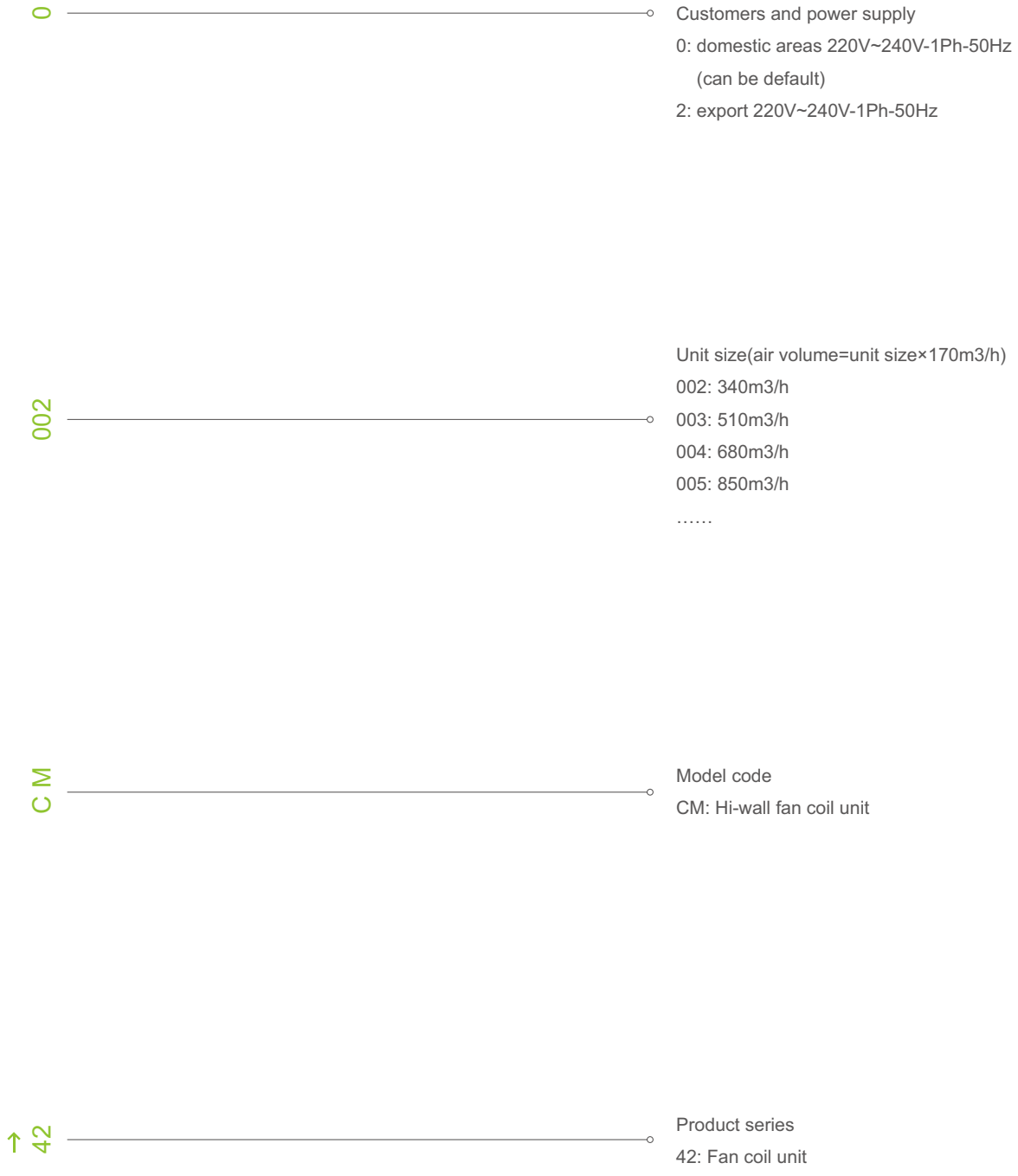
Unit size: 010~014



2.4.5 Hi-wall Fan Coil Unit (42CM)

2.4.5.1 Model Number

Nomenclature



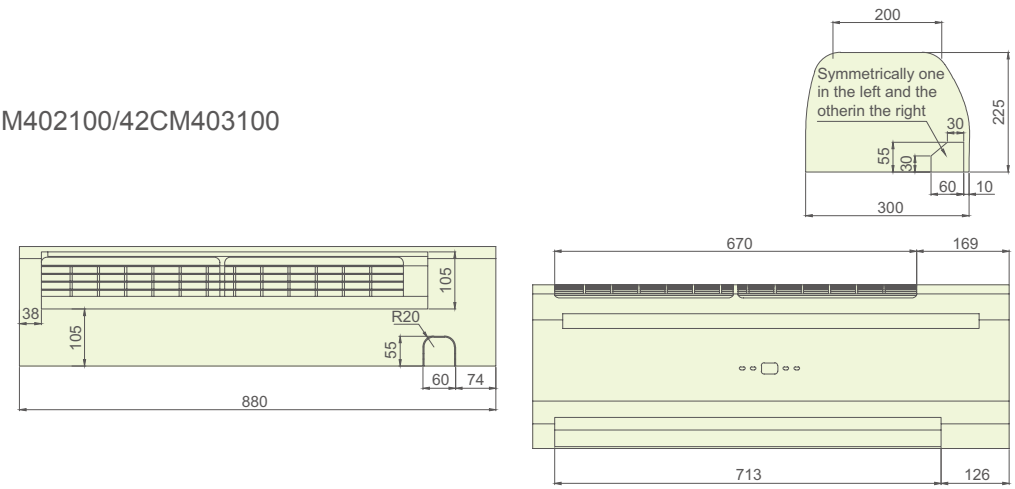
2.4.5.2 Technical Parameters

Performance	Type	002	003	004	005
Rated airflow m³/h	High	360	510	700	850
	Middle	300	370	450	740
	Low	230	290	375	570
Cooling capacity W		1980	2950	3700	5100
Heating capacity W		3000	4450	5550	7650
Input power (EC) W		12	20	25	32
NoisedB(A)	High	36	39	41	43
	Middle	33	35	36	39
	Low	30	31	32	35
Water flow rate l/min		5.8	8.7	10.5	14.5
Water pressure drop KPa		15	30	30	30
Connection dimension (Inlet return water) mm		12.7	12.7	12.7	12.7
Connection dimension (Condensed water) mm		16	16	16	16
Dimension mm		876*228*300		1063*240*310	
Weight kg		12	13	16	16

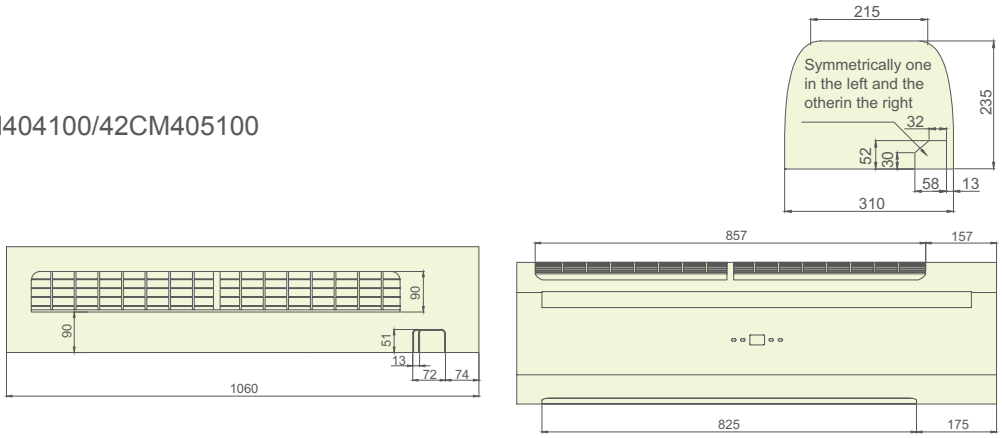
Note: 1.The cooling capacity is measured under the following conditions: chilled water EWT: 7°C; inlet and outlet temperature difference: 5°C and inlet air DB=27°C/wb=19.5°C; Heating capacity is measured under the following conditions: hot water EWT: 60°C; air inlet temperature DB=21°C; water volume the same°C.
2. Noise is measured in semi-anechoic room, 1 m from the front and bottom of the unit.
3. The indicated water pressure drop does not include that of the electrical water valve, electrical water valve kv=1.6.

2.4.5.3 External Dimensions

42CM402100/42CM403100



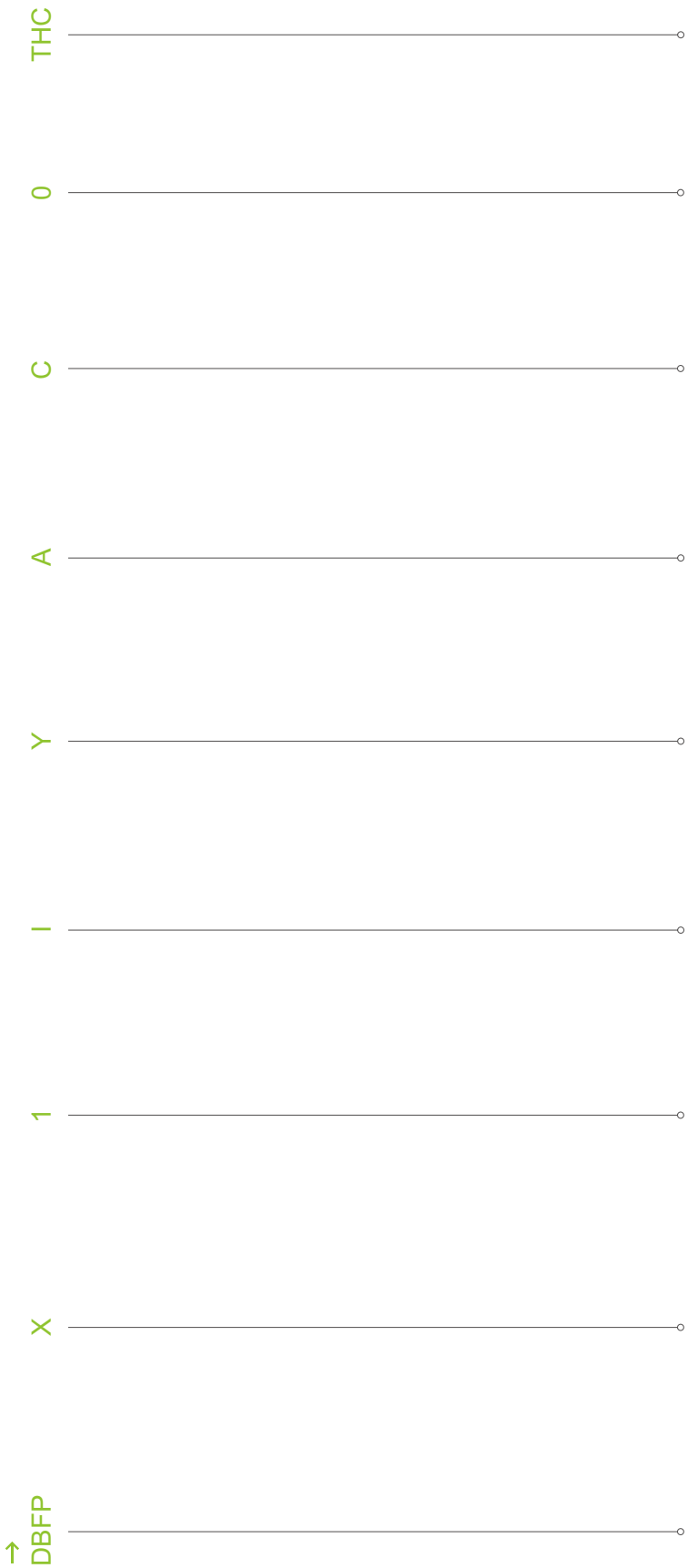
42CM404100/42CM405100



2.4.6 High static pressure air handling unit (DBFP)

2.4.6.1 Nomenclature

Nomenclature



2.4.6.2 Technical Parameters

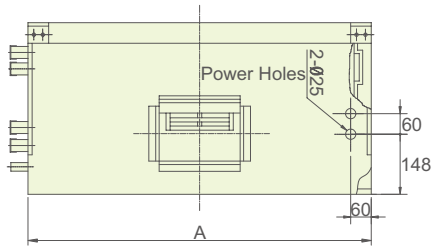
Unit Type	Volumn m³/h	Dimensions W(Unit+Control Box) ×L×H	Input Power (kw)	Static Pressure Pa	Total Static Pressure Pa	Cooling Cap. kw	Heating Cap. kw	Net Weight kg	Unit Noise dB(A)
DBFP1	1000	(680+154)×986×380	0.34	130	234	5.0	11.0	46	52
DBFP1I			0.44	220	321			47	55
DBFP1.5	1500	(875+154)×986×380	0.44	115	227	8.0	16.8	53	55
DBFP1.5I			0.79	215	320			55	58
DBFP2	2000	(872+150)×986×500	0.63	195	300	11.1	22.6	63	56.5
DBFP2I			0.84	280	381			64	59.5
DBFP2.5	2500	(1018+150)×986×500	0.83	165	265	13.9	28.2	67	60
DBFP2.5I			0.84	250	356			70	61
DBFP3	3000	(1166+150)×986×500	1.09	120	250	17.1	34.1	75	62
DBFP3I			1.09	200	330			75	62
DBFP4	4000	(1458+150)×986×500	0.63X2	185	300	22.1	44.9	108	58
DBFP4I			0.84X2	250	381			112	61
DBFP5	5000	(1752+150)×986×500	0.83X2	160	265	29.0	57.0	123	60.5
DBFP5I			0.84X2	250	356			127	61.5
DBFP6	6000	(2044+150)×986×500	1.09X2	150	250	34.7	68.0	134	62.5
DBFP6I			1.09X2	220	330			138	63.5
DBFPX1	1000	(680+150)×986×380	0.34	90	234	6.6	12.5	49	52
DBFPX1I			0.44	175	321			50	55
DBFPX1.5	1500	(875+150)×986×380	0.44	70	227	10.1	18.7	56	55
DBFPX1.5I			0.79	170	320			58	58
DBFPX2	2000	(872+150)×986×500	0.63	160	300	13	24.8	67	56.5
DBFPX2I			0.84	230	381			68	59.5
DBFPX2.5	2500	(1018+150)×986×500	0.83	140	265	16.6	31.1	75	60
DBFPX2.5I			0.84	210	356			75	61
DBFPX3	3000	(1166+150)×986×500	1.09	85	250	20.3	37.4	81	62
DBFPX3I			1.09	150	330			81	62
DBFPX4	4000	(1458+150)×986×500	0.63X2	150	300	27.9	50.1	115	58
DBFPX4I			0.84X2	215	381			119	61
DBFPX5	5000	(1752+150)×986×500	0.83X2	120	265	37.5	63.4	129	60.5
DBFPX5I			0.84X2	210	356			133	61.5
DBFPX6	6000	(2044+150)×986×500	1.09X2	115	250	44.6	75.8	142	62.5
DBFPX6I			1.09X2	185	330			146	63.5

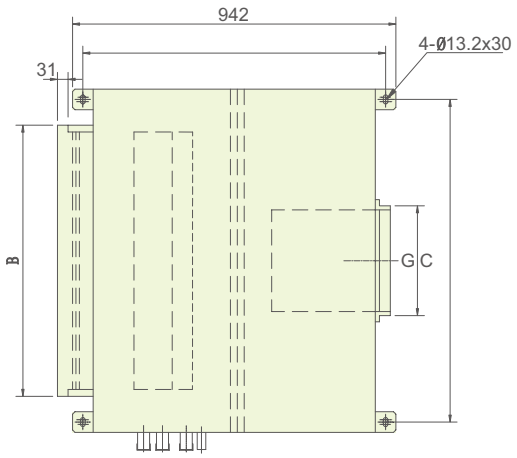
Return Air Conditions:
Cooling: Entering Water 7°C, Temperature Rise 5°C, Entering Air DB 27°C, WB 19.5°C.
Heating: Entering Water 60°C, Leaving Water 50°C, Entering Air DB 15°C.
Fresh Air Conditions:
Cooling: Entering Water 7°C, Temperature Rise 5°C, Entering Air DB 35°C, WB 28°C.
Heating: Entering Water 60°C, Leaving Water 50°C, Entering Air DB 7°C.

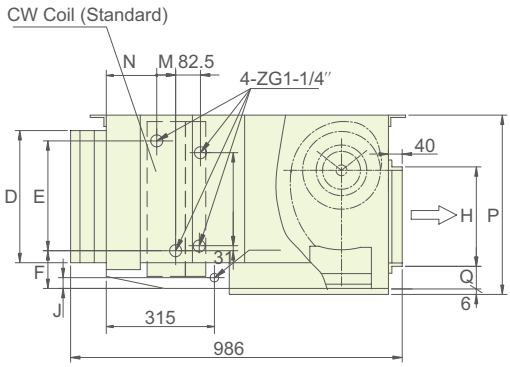
Note: 1.Face the return air inlet side to judge connection direction.
2.Motor input power refers to total motor input power.
3.If heating coil or wet film humidifier is selected, please consider the pressure drop accordingly.

2.4.6.3 External Dimensions

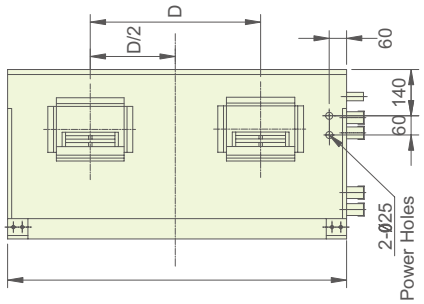
DBFP1~3

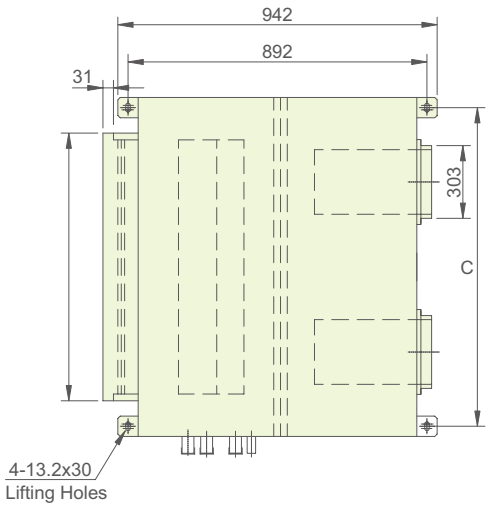


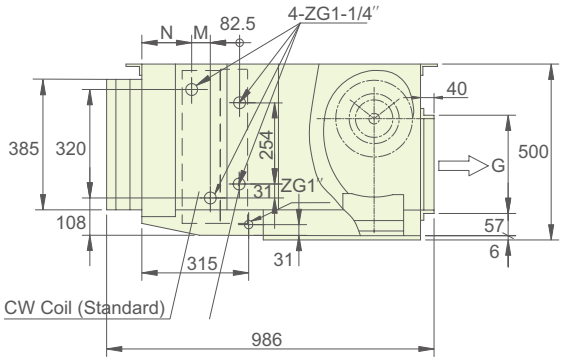




DBFP4~6







2.4.7 Ultra-thin high static pressure air handling unit (DFP)

2.4.7.1 Nomenclature

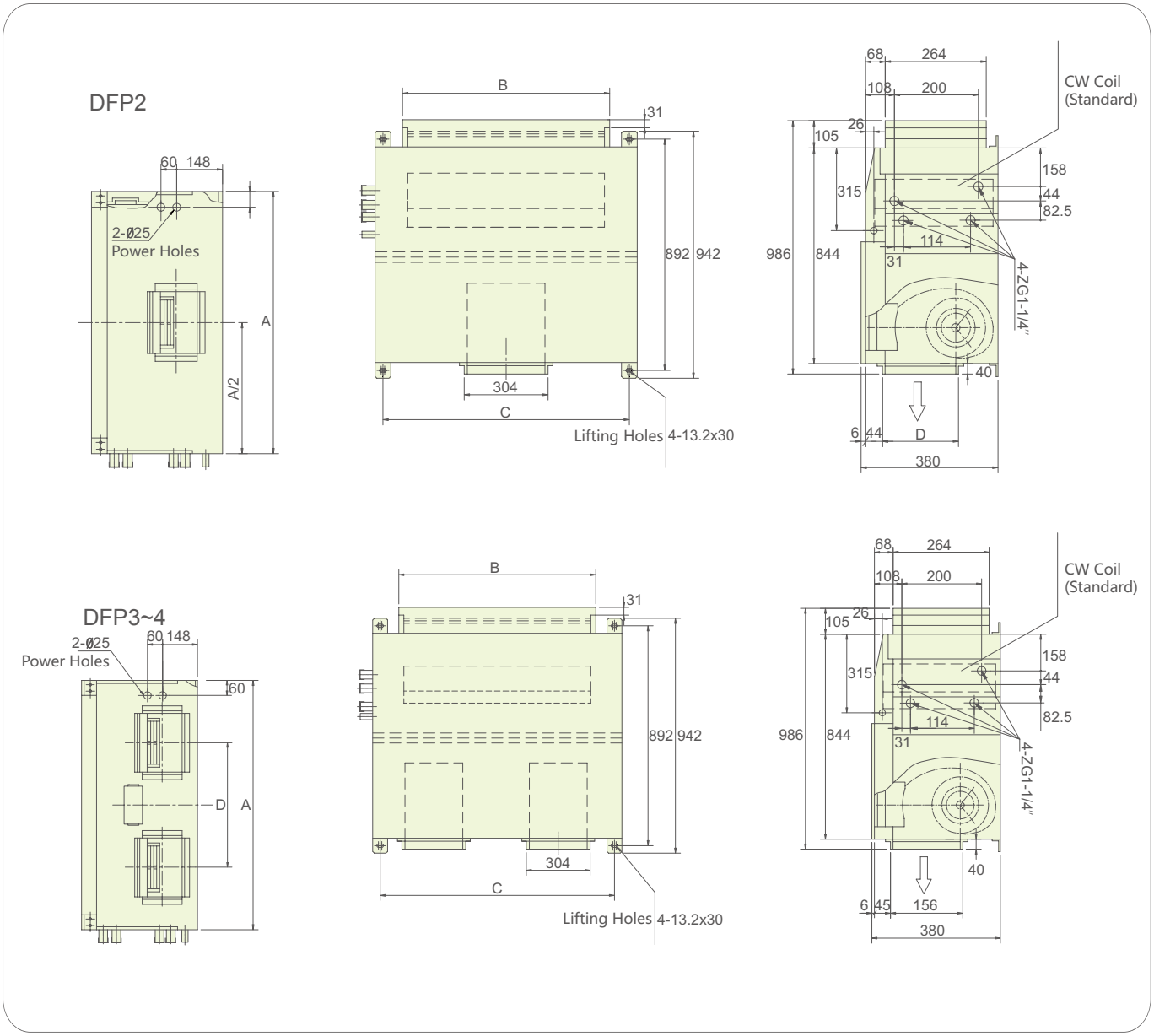
Nomenclature

2.4.7.2 Technical Parameters

Unit Type	Volumn m³/h	Dimensions W(Unit+Control Box) ×L×H	Input Power (kw)	Static Pressure Pa	Total Static Pressure Pa	Motor kw-poles	Net Weight kg	Unit Noise dB(A)
DFP2	2000	(1018+154) ×986×380	0.79×1	95	297	0.425×1	65	58.2
DFPX2	2000		0.79×1	65	297	0.425×1	67	58.2
DFP3	3000	(1458+154) ×986×380	0.79×2	130	320	0.425×2	92	58.5
DFPX3	3000		0.79×2	100	320	0.425×2	95	58.5
DFP4	4000	(1752+154) ×986×380	0.79×2	85	297	0.425×2	105	60
DFPX4	4000		0.79×2	55	297	0.425×2	109	60

Note: 1.Face the return air inlet side to judge connection direction.
2.Motor input power refers to total motor input power.
3.If heating coil or wet film humidifier is selected, please consider the pressure drop accordingly.

2.4.7.3 External Dimensions

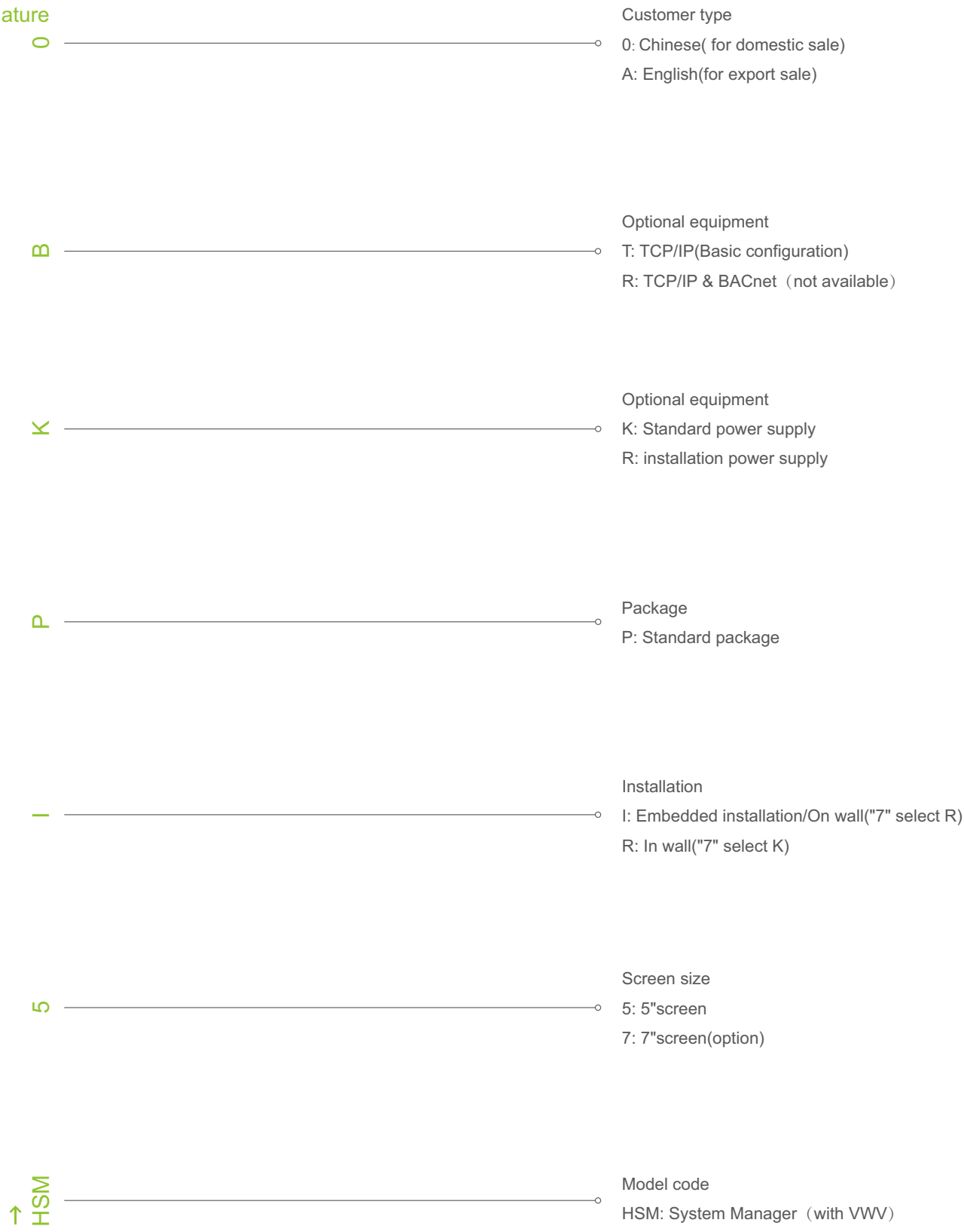


2.5 Control System

2.5.1 System Manager

2.5.1.1 Model Number

Nomenclature



2.5.1.2 Main Features

User-friendly interface

- The System Manager has a 5" TFT true color touch screen LCD with a large display for easy operation. It supports Chinese, English and graphics.
- All critical equipment parameters can be acquired and set through the centralized controller.
  - The System Manager can query and modify the current operating mode of indoor units and set temperature and air flow, for example. It can also monitor indoor ambient temperature.
  - It can remotely monitor and manage fresh air unit status and such parameters as temperature, CO2 concentration, and indoor temperature and humidity.
  - In addition, it controls all critical parameters of the outdoor system, including operational status, mode, load ratio and system water temperature. It monitors the operation of each outdoor unit (controlling inlet/outlet water temperature, ambient temperature and the operational status of the compressor, water pump and fan, for example) as well the hydronic kit.

- The System Manager provides the administrator with three levels of user permissions to control access and protect the system.
- System alarms will be displayed on the System Manager by means of alarm code plus a text explanation. A thorough alarm history is maintained for operator convenience.

Advanced control function

- Advanced variable flow technology balances the circulation flow rate between indoor and outdoor units. This not only delivers exceptional indoor comfort at maximum load but also signifcantly reduces the power consumption of the water pump at part load.
- Using adaptive control logic, the System Manager and outdoor units work together to ensure that compressors operate at optimal levels, eliminating the risk of overuse.
- The system balances the running time of each unit when multiple outdoor units are operating in parallel. It automatically switches units in the event of a unit failure.

Powerful diagnostics

- The manual Quick Check function confrms whether each unit and controller is operating normally.
- In the event of equipment failure, users can stop the failed equipment or the entire system through System Manager. They can also reset the failed equipment and browse alerts and failure codes.

2.5.1.3 Control Function

All indoor units, fresh air units, outdoor units and hydronic kits are connected and controlled via System Manager. The System Manager is capable of controlling up to eight outdoor units, one hydronic kit, four fresh air units and 128 indoor units. It monitors the working conditions of dispersed indoor and outdoor units, and operates each indoor unit and fresh air unit separately. The operating method is as follows:

- The System Manager can query, manage and control each indoor unit. It can carry out advanced functions such as start/stop control, mode switching, temperature setting, air fow adjustment and parameter setting. Users at the local end can also set operation mode, air fow, temperature, etc.
- The System Manager can query, manage and control each fresh air unit and carry out start-stop control, adjust temperature settings and confgure parameters.
- The System Manager can query, manage and contr ol the entire outdoor system and can combine the outdoor units and hydronic kit for the purposes of start/stop control, set point adjustment, and parameter setting.
- Indoor uni ts can be divided into up to 128 zones at wil l thr ough the System Manager; each zone can be operated independently.
- Timetables for each indoor unit, fresh air unit and outdoor system can be set through the System Manager; each timetable can cover one or more pieces of equipment.
  The System Manager has a graphic touch screen interface supporting Simplifed Chinese and English. It includes many useful built-in tools including an installation wizard, automatic system cleaning, system alerts, time and calendar setting etc.

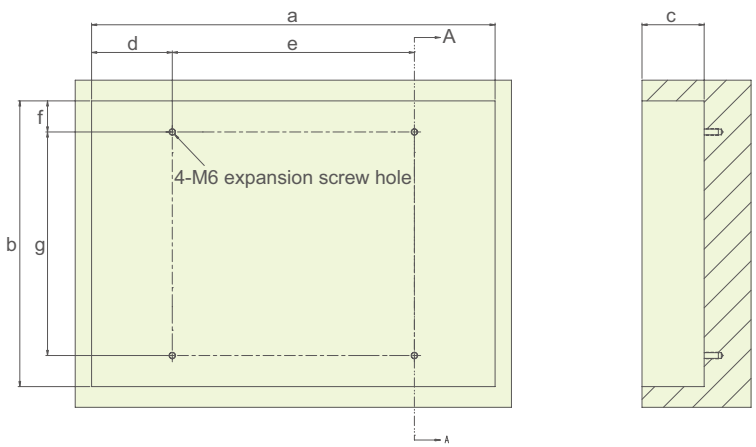
2.5.1.4 Panel Diagram

2.5.1.5 Installation Dimension

1. System Manager Panel dimensions (unit:mm):

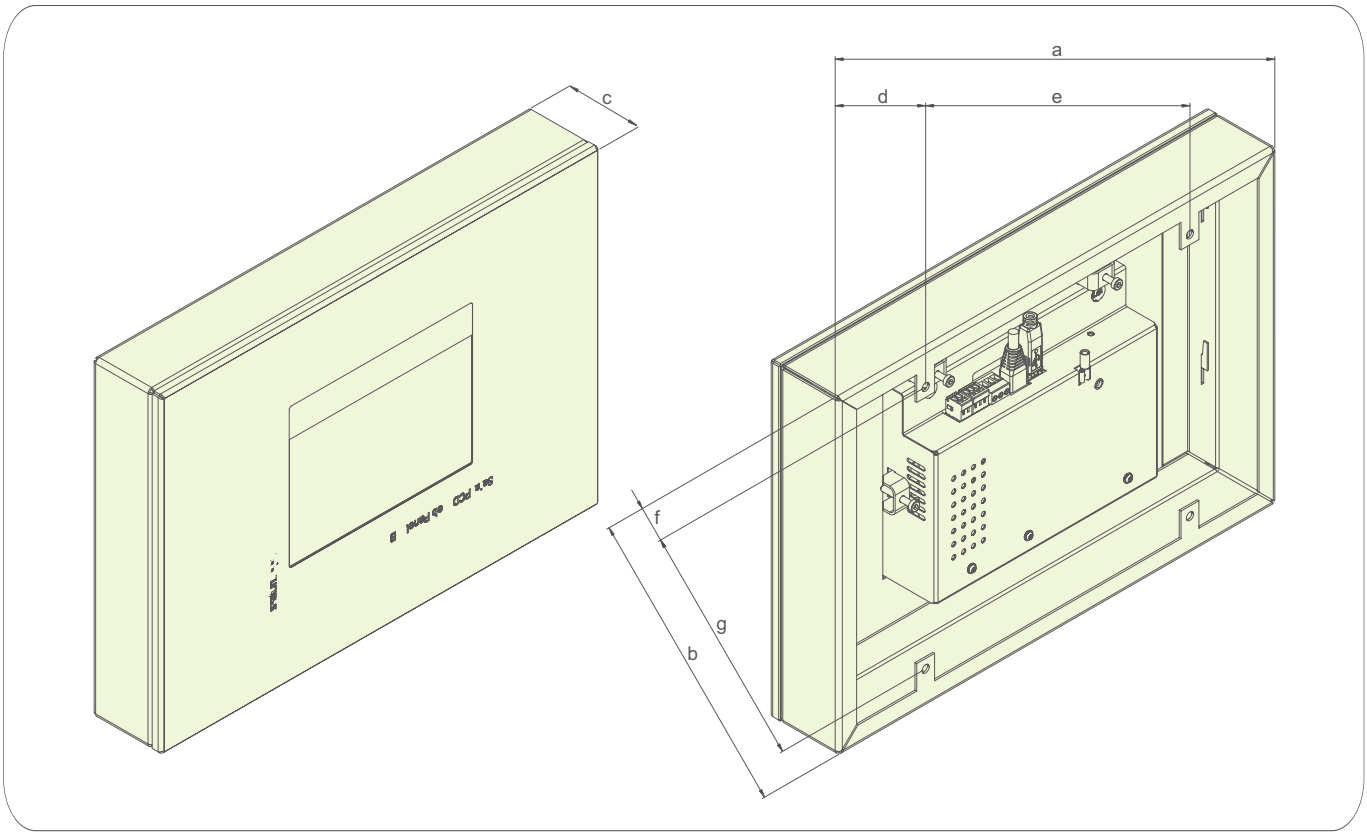
System Manager type	L	W	H
5” screen	166	126	50
7” screen	204	157	55

2.Embedded System Manager assembly mounting dimensions(unit:mm):



System Manager type	a	b	c	d	e	f	g
5” screen	217	177	57	66	85	16	145
7” screen	370	262	52	74	222	28.5	205

3.Intergrated System Manager assembly mounting dimensions (unit:mm):



System Manager type	a	b	c	d
5” screen	280	230	330	255
7” screen	280	220	380	265

2.5.1.6 Range of Operation

The controller is designed for indoor use in residential or commercial environments.
It needs only to be installed on the wall at a suitable height for user access.

Maximum operating temperature is +50℃ .
Minimum operating temperature is +0℃ .
Maximum storage temperature is +65℃ .
Minimum storage temperature is -20℃ .
Maximum operating RH is 95%, without condensation
Maximum storage RH is 95%, without condensation
Rated supply voltage is 24V DC,0.5A,50/60Hz.

2.5.2 Thermostat

2.5.2.1 Model Number

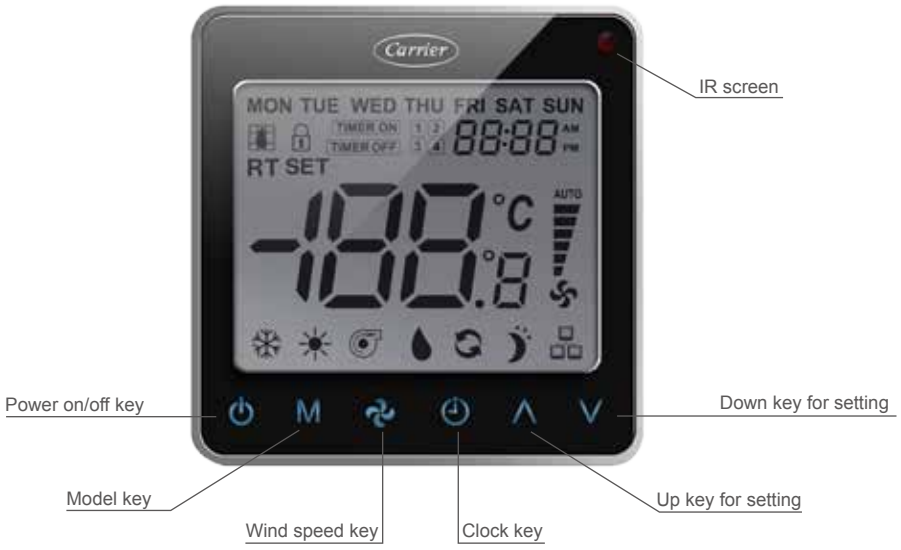
Nomenclature

2.5.2.2 Main Features

The Thermostat designed for temperature control in two-pipe water system has the following features:

- Ultra-large LCD display, smooth touch buttons, and a sleek, modern design suitable for offices, hotels and high-end residential developments.
- Icons to show heating, cooling, ventilation and dehumidifcation modes.
- Real-time clock display, with 12- and 24-hour modes.
- Ambient temperature display and setting, in °C or °F.
- Adjustable temperature setting for cooling and heating, as well as temperature deviation.
- Power-failsafe backup memory function for operating status and set parameters.
- Optional backlight and alarm status.
- Sleep function.
- Filter cleaning reminder.
- Weekly programming (daily four-period on/off programming).
- Optional remote control function.
- Separate key locking functions (with System Manager only).

2.5.2.3 Panel Diagram



2.5.2.4 Installation Dimension

86×86×40 (W×H×D) mm

2.5.2.5 Range of Operation

The controller is designed for indoor use in residential or commercial environments. It needs only to be installed on the wall at a suitable height for user access.
Maximum operating RH is 95%, without condensation
Maximum storage RH is 98%, without condensation
Rated supply voltage of CTC100 series is AC 220~242V, 50/60Hz AC
Rated voltage of CTC200 series is DC12V supplied by DC fan coil controller.

Type	CTC100	CTC200
	42CE/CN/GWC Fan coil unt(AC)	42CN/GWC Fan coil unit(DC);DBFP/DFP; 42CM
Working voltage	AC 220 ~ 240V, 50/60Hz	DC12V supplied by DC fan motor driver board
Electrical specification	Relay capability:3A; Max switch current: 3A	Drived by DC fan motor driver board
Temperature control perfomance	Control precision : ±0.5℃ ; adjust range: 16 ~ 32℃	
Installation dimension	86×86×40 mm(w×h×d)	
Temperature and humidity	operating temperature : 0~45℃ , storage temperature: -10~60℃ 5 ~ 95% RH without condensation	
Protection degree	IP 20	

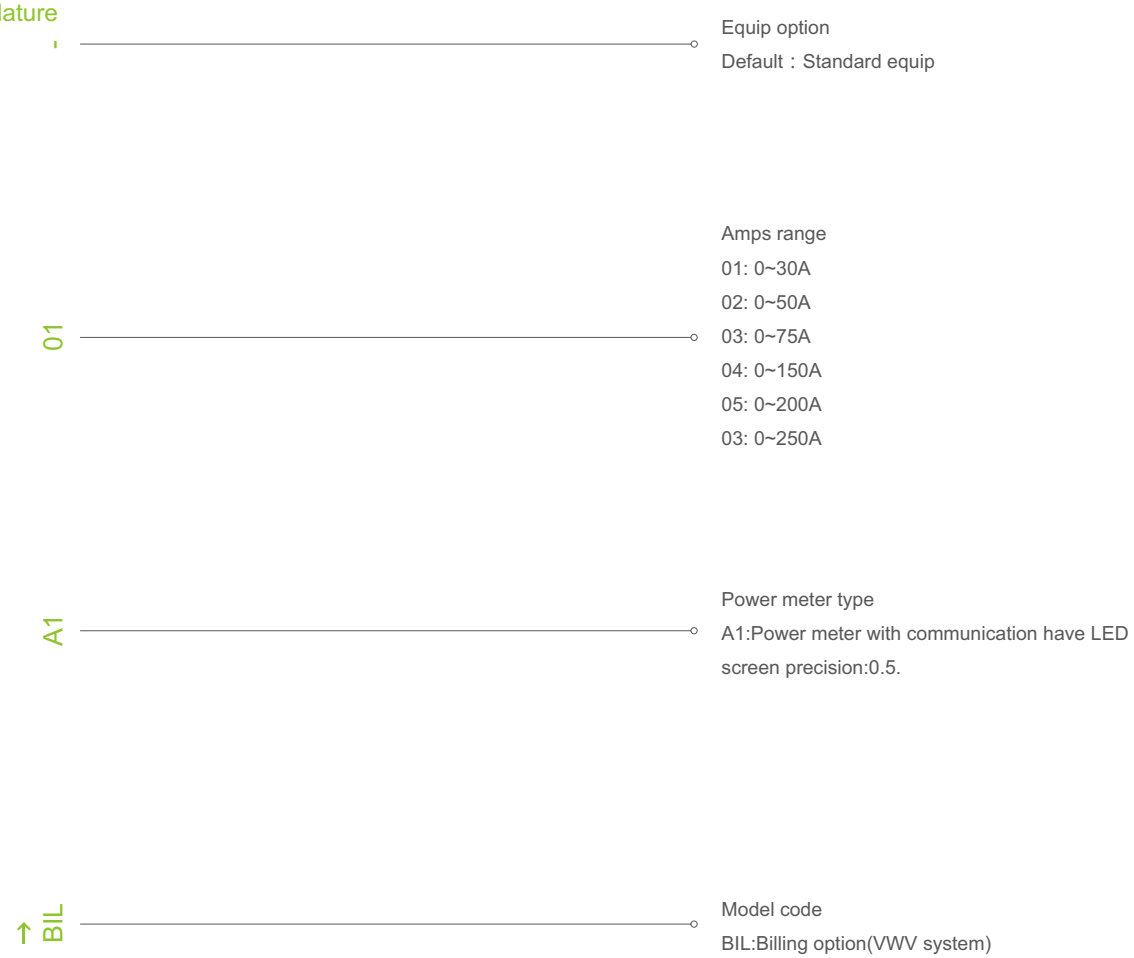
2.6 Accessories

2.6.1 HMI controller(optional)

Part.No.	00PSY143780200
Applicable equipment	Outdoor main unit, hydronic kit, fresh air unit

2.6.2 Billing(optional accessory)

Nomenclature

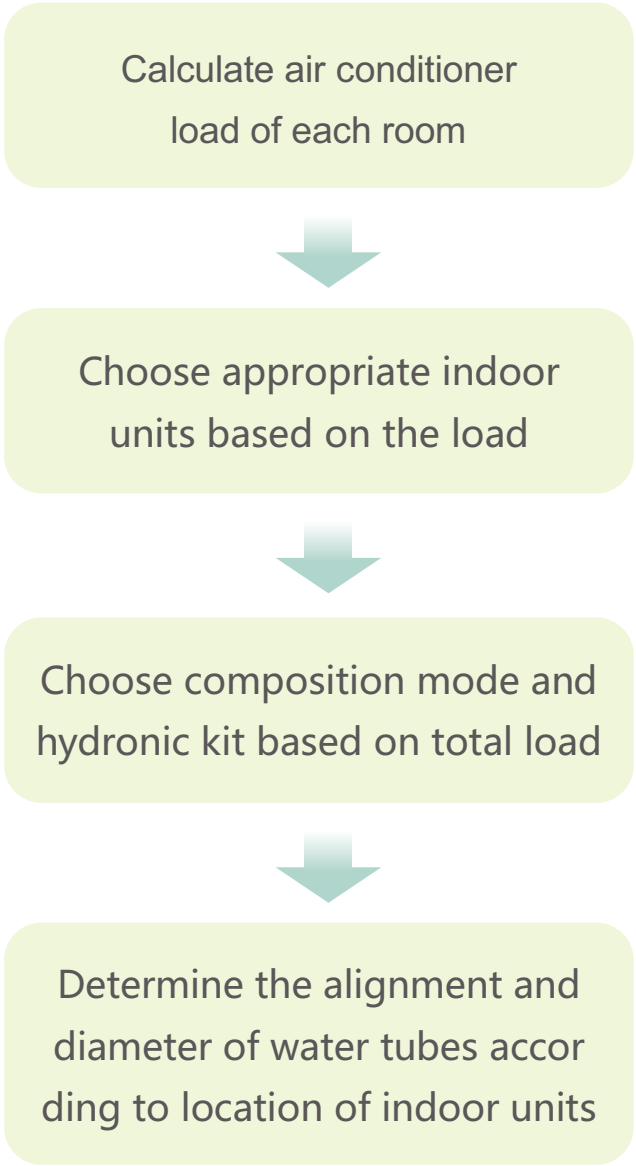


2.6.3 Remote control (optional accessory)

Part.No.	CTCIR01
Applicable equipment	Thermostat with IR receiving function

Chapter III: Quick Model Selection

3.1 Procedures for System Model Selection



3.2 Load Calculation and Reference for Quick Equipment Model Selection

3.2.1 Calculation of Indoor Load

The unit area cooling load index method can be adopted, using the following formula:

$Q=Q'\times S$

where: Q = total cooling load of air conditioned rooms in the building (W)

Q' = cooling load index (W/m^2)

S = area of air conditioned rooms (m^2)

It should be noted that the unit area cooling load index is different for rooms with exterior walls and/or roofs. This is the greatest defect of this estimation method. However, system balancing allows for regulation of such errors.

The following tables present cooling load estimates for China.
Cooling load estimate index: various building types, Shanghai.

Application/Type of building		Total load (W/m²)	Application/Type of building		Total load (W/m²)
Apartment	Living	165	Dance hall		260
	Bedroom	150	Courtyard, reception area		180
Office	Office	180	Shopping mall, ground floor		280
	Meeting room	220	Shopping mall, second floor		260
Villa	Basement	130	Shopping mall, third floor		250
	First floor/ground floor	165	Gymnasium, bowling alley		270
	Topfloor	180	Library, reading room		160
Club		250	Exposition hall, display room		175
Research building, office building		151	Council hall, lecture theater		250
Leisure center(beauty salon, teahouse)		200	Hospital	Outpatient clinic	175
Western-style restaurant		280		Outpatient hall	230
Chinese restaurant		300	School	Classroom	200
Banquet hall		360		Library	175
Coffee bar, pub		256		Dining hall	250

Notes: Heating load estimate index of air conditioners in winter: 80~120W/m².

Cooling load estimate index: various building types, different regions of China
Cooling/heating load index of typical houses

Zone	Outdoor design parameters, summer		Outdoor design parameters, winter		Cooling target, summer(W/m²)	Cooling target, winter(W/m²)	Typical cities
	Dry bulb temperature(℃)	Wet bulb temperature(℃)	Dry bulb temperature(℃)	Relative humidity(%)			
Zone 1	34.1 ~ 36.8	18.5 ~ 20.2	-23 ~ -28	63 ~ 80	65 ~ 75	110 ~ 120	Urumqi, Qomul, Karamay
					75 ~ 80	140 ~ 160	
Zone 2	29.9 ~ 31.4	20.8 ~ 25.4	-22 ~ -29	56 ~ 74	65 ~ 75	105 ~ 125	Harbin, Changchun, Shenyang, Hohhot
					70 ~ 80	140 ~ 160	
Zone 3	30.5 ~ 31.2	20.2 ~ 23.4	-13 ~ -18	48 ~ 64	75 ~ 85	110 ~ 130	Taiyuan, Lanzhou, Yinchuan
					80 ~ 90	135 ~ 160	
Zone 4	28.4 ~ 30.7	25 ~ 26	-9 ~ -14	58 ~ 64	85 ~ 90	95 ~ 115	Qingdao, Yantai, Dalian
					90 ~ 95	120 ~ 140	
Zone 5	33.2 ~ 35.6	26 ~ 27.4	-7 ~ -12	45 ~ 67	95 ~ 100	90 ~ 110	Beijing, Tianjin, Shijiazhuang, Zhengzhou, Xi'an, Ji'nan
					100 ~ 110	120 ~ 130	
Zone 6	33.9 ~ 36.5	23.2 ~ 28.5	-7 ~ 2	73 ~ 82	100 ~ 110	65 ~ 100	Wuhan, Changsha, Heifei, Nanjing, Nanchang, Shanghai
					115 ~ 130	80 ~ 120	
Zone 7	25.8 ~ 31.6	19.9 ~ 26.7	-3 ~ 2	51 ~ 80	65 ~ 95	70 ~ 85	Guiyang, Kunming, Chengdu
					75 ~ 110	85 ~ 105	
Zone 8	32.4 ~ 35.2	27.3 ~ 28.3	4 ~ 10	70 ~ 85	100 ~ 105	40 ~ 60	Fuzhou, Shenzhen, Guangzhou, Haikou, Nanjing, Taipei, HongKong
					110 ~ 115	50 ~ 70	

Notes:
1. Zone 1 and Zone 2 regions are areas of severe year-round cold, Zone 3, 4, 5 regions are cold, Zone 6 regions are cold in winter, hot in summer, Zone 7 regions have moderatetemperatures, Zone 8 regions are warm in winter, hot in summer.
2. Cooling/heating index is based on indoor areas and excludes outdoor areas such as balconies. When choosing air conditioners, an interval application factor of 1.2 and a structural load add-on factor of 1.2 for temporary maintenance of rooms without air conditioners shall be considered.
3. In the cooling/heating index, the upper column is standard floor index, the lower column is top floor index. For office, catering, shopping and entertainment buildings, the air-conditionercooling load target can be chosen from the following list: offices: 90~140W/m²; catering building: 200~250W/m²; shops: 150~250W/m²; entertainment buildings: 200~350W/m².

Note: The above two load estimation methods reference Practical Central Air Conditioner Design Guide edited by Ou Zhengyuan.

Cooling/heating load index for public and commercial buildings:

Building type			Cooing/heating load		Indoor cooling/heating load conditions			
			Cooling	Heating	Lighting*	Occupancy	Fresh air volume	Infiltration air
			W/m²	W/m²	W/m²	p/m²	m³/(m²/h)	h-1
Bank	Teller console		242	220	50	0.3	6	1.5
	Reception room		179	184	30	0.2	4	0.5
Department store	High-end shop		307	161	60	1.0	10	0.5
	Shopping mall		217	137	60	0.4	8	0.5
Supermarket	Food department		212	195	60	0.6	6	0.5
	Clothing deparment		215	167	60	0.3	6	0.5
Hotel	Ballroom		449	312	80	1.0	20	0
	Guest room	South-facing	127	207	20	0.12	6	0.5
		West-facing	131	207	20	0.12	6	0.5
		North-facing	125	207	20	0.12	6	0.5
		East-facing	130	207	20	0.12	6	0.5
Restaurant	Restaurant		286	228	40	0.6	12	0.5
Community center	Study room		233	228	20	0.5	10	0.5
Hospital	Ward (6 beds)	South-facing	91	112	15	0.2	4	0.5
		West-facing	110	112	15	0.2	4	0.5
		North-facing	79	112	15	0.2	4	0.5
		East-facing	96	112	15	0.2	4	0.5
Theatre	Auditorium		512	506	25	1.5	30	0
	Hall		237	219	30	0.3	6	0.5

*Including automatic office facilities.

Using the cooling/heating load index for public and commercial buildings, cooling and heating load correction coefficients for China's main cities are:

City	Summer indoor temperature		Winter indoor temperature	City	Summer indoor temperature		Winter indoor temperature
	25℃	26℃	22℃		26℃	22℃	22℃
Beijing	1.01	1.01	1.62	Wuhan	1.14	1.14	1.29
Tianjin	0.99	0.99	1.57	Xiamen	1.10	1.11	0.76
Shijiazhuang	1.04	1.04	1.57	Changsha	1.14	1.15	1.19
Taiyuan	0.95	0.95	1.76	Guangzhou	1.07	1.07	0.81
Shenyang	0.94	0.94	2.10	Haikou	1.11	1.12	0.57
Dalian	0.90	0.90	1.71	Chengdu	0.96	0.96	1.00
Changchun	0.90	0.90	2.29	Chongqing	1.08	1.08	0.95
Harbin	0.91	0.90	2.43	Guiyang	0.96	0.96	1.19
Shanghai	1.07	1.07	1.24	Kunming	0.87	0.87	1.00
Nanjing	1.09	1.09	1.33	Lhasa	0.83	0.83	1.43
Hangzhou	1.09	1.10	1.24	Xi'an	1.06	1.06	1.43
Hefei	1.10	1.10	1.38	Lanzhou	0.98	0.97	1.67
Fuzhou	1.12	1.12	0.86	Xining	0.88	0.88	1.76
Nanchang	1.14	1.15	1.19	Yinchuan	0.94	0.94	1.90
Ji'nan	1.08	1.06	1.52	Urumqi	1.06	1.07	2.33
Qingdao	0.97	0.97	0.48	Taipei	1.12	1.12	0.62
Ninning	1.05	1.05	0.81	Hong Kong	1.11	1.12	0.67
Zhengzhou	1.07	1.07	1.38	Hohhot	0.96	0.95	2.10

Note: the load estimation table references Practical Heating Air Conditioner Design Manual (Edition 2) edited by Lu Yaoqing.

Estimates presented in the previous four tables are based on indoor area. Refer to the following table when taking building area into consideration:

Building area cooling index

Building type	Cooling load index (W/m² building area)	Building type	Cooling load index (W/m² building area)
Hotel	80-90	Stadium	100-135 200-350 (on number of seats)
Office building	85-100	Computer room	190-380
Library	35-40	Data center	320-400
Hospital	80-90	Theater	126-160 200-300 (on auditorium area)
Shop	105-125 if in a mall equipped with air conditioners 200-250 based on the mall area	Council hall	180-225

Note: 1. The above targets are cooling targets based on total building area. When the total building area is smaller than 5000m2, take the upper limit; when it is larger than 10000m2, take the lower limit.
2. Cooling load, as determined according to the above targets, is the capacity of the cooler; no more factors need to be added.
3. Since there are large temperature differences between regions, assume the Beijing index as the standard, with southern areas taking the upper limit.

Building area heating index

Building type	Cooling load index (W/m² building area)	Building type	Cooling load index (W/m² building area)
Residential	45-70	Single-story house	80-105
Office building, school	60-80	Council hall, dining hall	115-140
Hospital, kindergarten	65-80	Cinema, theater	90-115
Hotel	60-70	Large auditorium	115-160
Library	45-75	Stadium	115-160

Note: If the total building area is large, the building envelope has good thermal performance, and the window area is small, take the lower limit; otherwise, take the upper limit.

Note: Note: The above four load estimation methods reference Practical Central Air Conditioner Design Guide edited by Ou Zhengyuan.

3.2.2 Quick Model Selection of Indoor Units

- Choose an appropriate indoor unit model according to room loads and factors such as interior design.

3.2.3 Quick Model Selection of Fresh air handling Unit

- According to the population density and the minimum amount of fresh air, determine the amount of wind, determine the type of FAU.

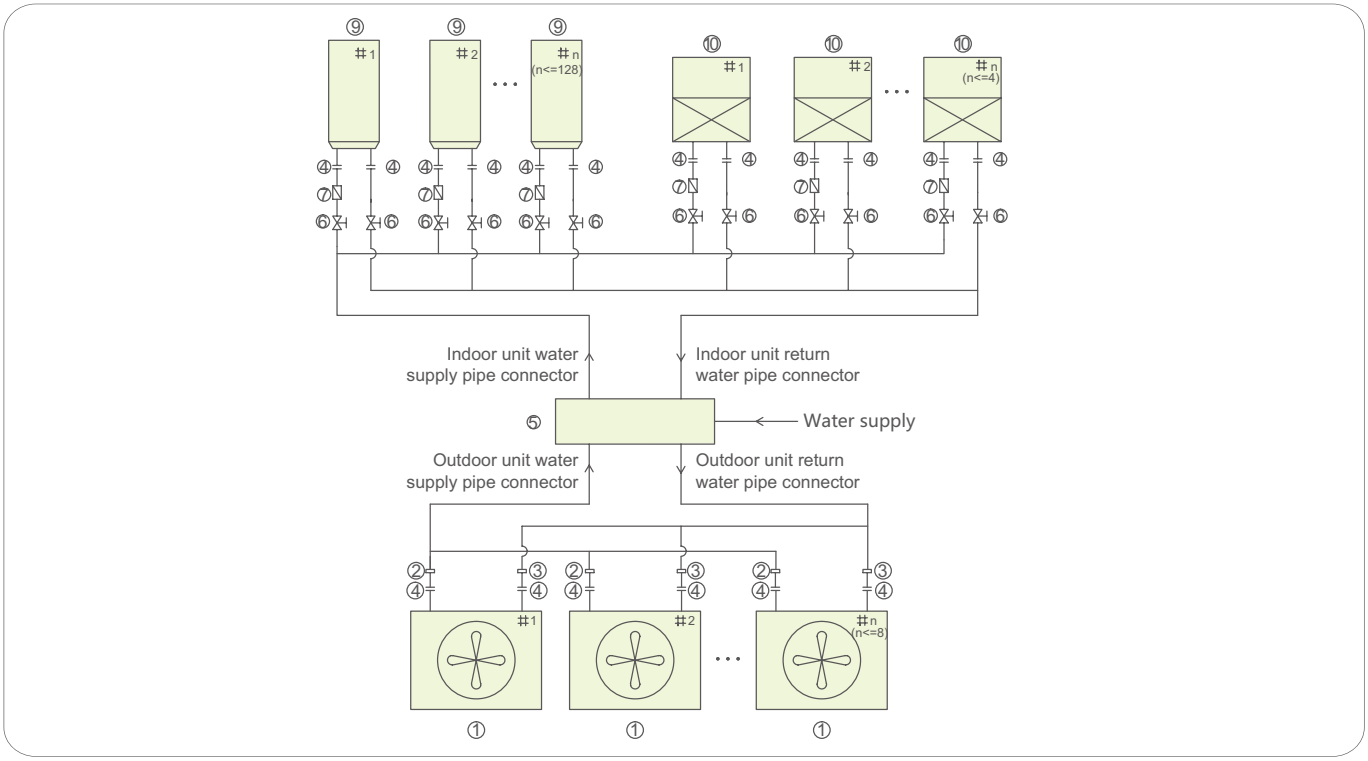
3.2.4 Quick Model Selection of Outdoor Units and Hydronic Kit

- The total cooling capacity of a building is calculated according to total indoor load plus variable working condition parameters and simultaneous startup factor (0.6-1.0). This cooling capacity allows you to select outdoor unit models and a relevant hydronic kit based on the following capacity table. Since up to eight outdoor units can be installed in parallel, the cooling/heating capacity range of each can reach 25-320 kW. If the cooling capacity exceed320kw, two or more systems can be built up.

Chapter IV Water System Installation

4.1 Design for water system

4.1.1 Typical Water System Piping Connection Schematic



Products and attachments provided by Carrier	Components provided by the user
1 Outdoor unit	4 Elastic connector
2 Outdoor unit outlet water pipe accessories (pressure gauge, drain valve shut-off valve)	6 Manual gate valves
3 Outdoor unit inlet water pipe accessories (pressure gauge, filter shut-off valve)	7 Filter(indoor unit and fresh air unit inlet)
5 Hydronic kit	
9 Indoor unit	
10 Fresh air unit	

Note: The air exhaust valve must be located at the highest point of the system.

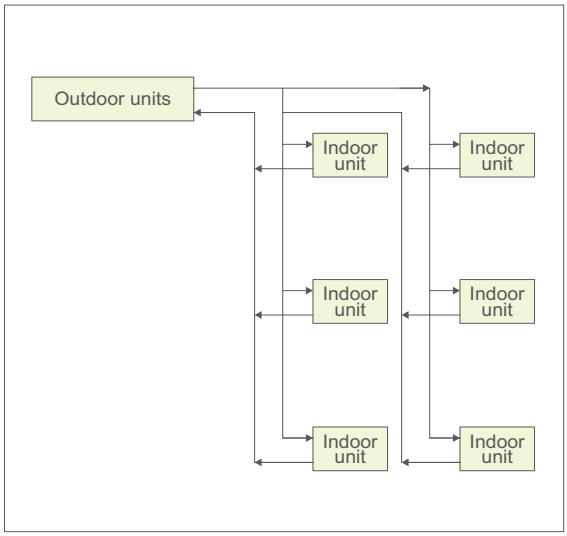
The pipe coupling diagram above shows the following water circulation process. Chilled or hot water from the outdoor unit enters the hydronic kit through the water supply pipe, where it is pressurized and pushed to the indoor unit by the hydronic kit's water pump. The indoor and fresh air units absorb or release heat to cool or heat the room. Following heat exchange, water passes through the return water pipe and enters back into the hydronic kit before returning to the outdoor unit to start another circulation.

When connecting water pipes, note the following issues:

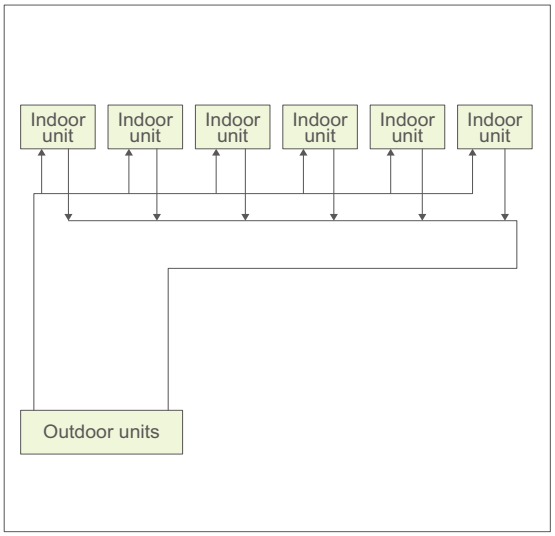
- Ensure that hydronic kit pipes and outdoor unit inlet/outlet water pipes are correctly connected: the outdoor unit outlet water pipe must be connected to the outdoor unit outlet water pipe port on the hydronic kit and the outdoor unit inlet water pipe must be connected to the outdoor unit inlet water pipe port on the hydronic kit.
- Ensure that the hydronic kit pipes and outdoor unit supply/return water pipes are correctly connected: the outdoor unit water supply pipe must be connected to the outdoor unit water supply pipe port on the hydronic kit and the outdoor unit return water pipe must be connected to the outdoor unit return water pipe port on the hydronic kit.
- To prevent the transfer of vibrations from the outdoor unit, indoor units and fresh air units to the exterior pipe network, the water pipe connector connected to these units must be elastic or use anti-shock hose.
- The water supply pipe connected to the indoor and fresh air units must be equipped with flers to prevent impurities from entering the units and causing contamination or blockage. Indoor and fresh air units are equipped with electric two-way/ three-way valves. In the event that the unit stops working, these should be closed to cut off the water supply. Furthermore, the water supply pipe and return water pipe of the indoor and fresh air units must be connected to manual shutoff valves to facilitate maintenance.

4.1.2 Selection of Water Pipe Connection Method

The following diagrams illustrate reversed return and direct return piping systems:



(A) Direct return system



(B) Reversed return system

A direct return system can provide simple piping and a small initial investment. However, since the length of each piping sub-circuit is different, each is subject to a different pressure drop and balancing this pressure with a balance valve or porting ring can be diffcult, requiring careful calculation at the design phase. Even so, hydronic imbalance is common in a direct return system. Direct return water systems are seldom used in large-scale air-conditioning installations due to piping complexity and balancing challenges. The system can be applied to smaller air-conditioning systems when balancing measures are taken, such as using fow control valves on branch pipes, minimizing pressure drops in distribution pipes and providing for balanced pressure drops in parallel branch pipes.

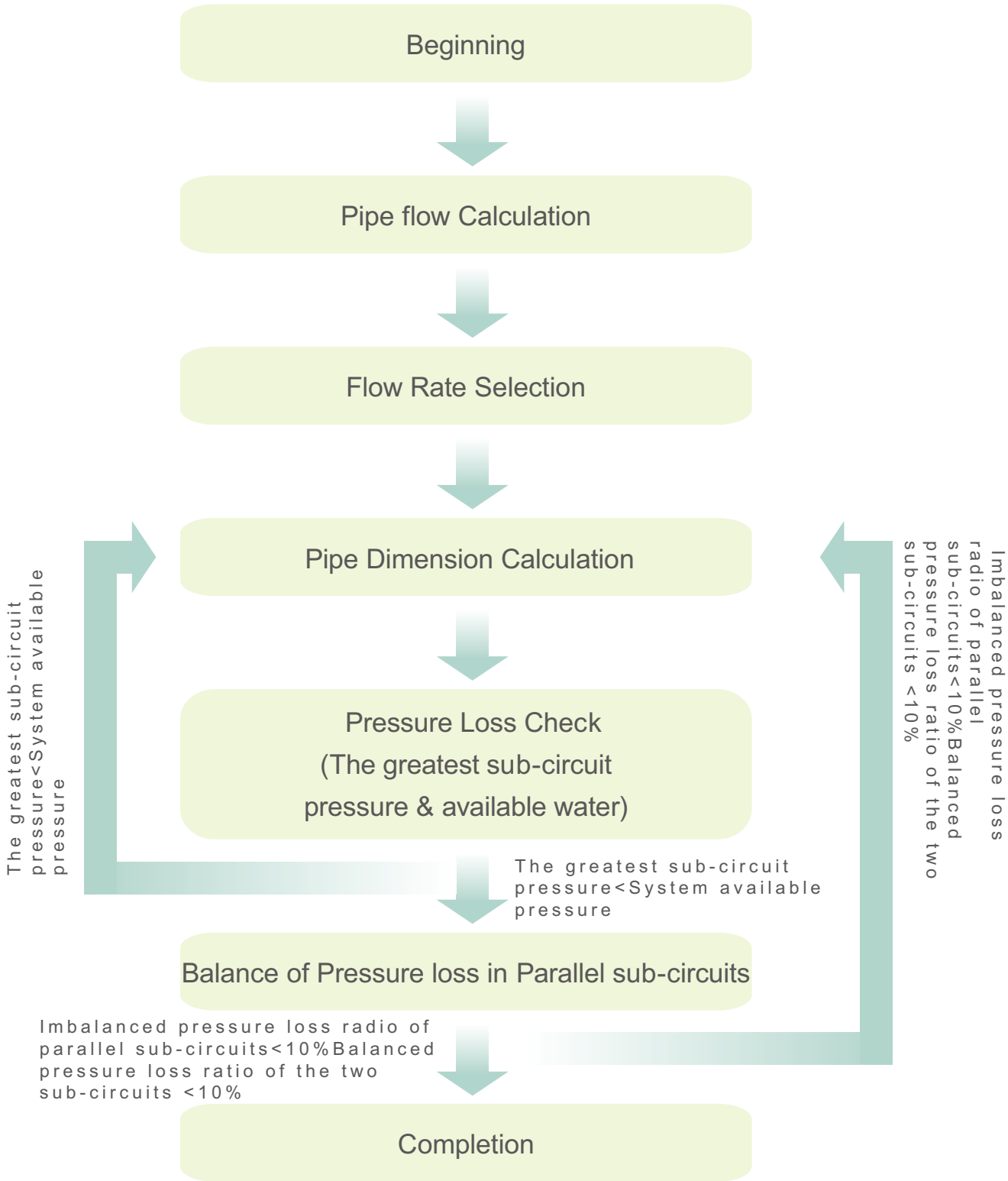
A reversed return system provides equal pipe lengths in each piping sub-circuit.In this case, indoor units have the same or similar pressure loss, the impedance difference is small, and the fow distribution can easily meet requirements. This result is confrmed theoretically and from actual operational experience. Tall buildings usually use a vertical reversed return system, while buildings with a wide horizontal spread of pipes use a horizontal reversed return system.

CAUTION: We recommend you use a reversed return system at the following locations:

- between indoor units and fresh air units;
- between indoor unit circuits and fresh air unit circuits;
- between outdoor units.

4.1.3 Hydronic Calculations for Chilled Water System

Hydronic calculations determine the diameter and resistance of each pipe in the piping network according to required flow distribution so as to match the power equipment.
Concrete steps are shown in the following illustration:



4.1.3.1 Pipe Flow Calculationa

- Water flow in each branch pipe = water flow of indoor or fresh air unit.
- Water flow in each pipe = total water flow of the indoor or fresh air units connected to the pipe.
- Water flow of the mains pipe = total water flow of outside units.

4.1.3.2 Flow Rate Selection

Selecting a suitable fow rate requires taking economic factors and noise into account, as the following table shows:

Flow rate selection	Tube diameter	Economy principle		Noise consideration
High fow rate	Pipe diameter	Saves on piping, low initial	High operation cost	High noise
Low fow rate	Large diameter	More pipes needed, high initial investment	Low operation cost	Low noise

Considering initial and ongoing cost and noise levels, the following is recommended:

Flow rate in main pipes: 1.2~1.5m/s;

Flow rate in branch pipes: 0.6~0.8m/s.

4.1.3.3 Pipe Dimension Calculation

Calculate pipe diameter based on the following formula:

$Q=V\times S$ (Formula 4-1)

$S= Q/V$ (Formula 4-2)

Where:

S = cross-sectional area of pipe in m^2

Q = volumetric flow rate in m^3/s

V = flow rate in m/s

$S= \frac{\pi x d^2}{4}$ (Formula 4-3)

$d= \sqrt{\frac{4xS}{\pi}}$ (Formula 4-4)

Where:

d = inner diameter of pipe in m

S = cross-sectional area of pipe, m^2

4.1.3.4 Pressure Loss Check

Fluid flowing along a pipe is subject to frictional and local resistance.

Frictional resistance is caused by friction between fuid molecules and between the fuid and pipe wall. The formula to calculate this for a straight pipe is:

$P_{ml}=R_m l$ (Formula 4-5)

Where:

Rm = specifc frictional resistance in Pa/m

L = pipe length in m

Specifc frictional resistance (Rm) is affected by the pipe material, cross sectional area, fuid status and other factors and is complicated to calculate.

The following table shows empirical data for pipe Rm:

Steel tube specific frictional resistance														
Dynamic pressure (Pa)	Flow rate	Nominal pipe diameter DN(mm) L— flow rate (l/s) ; R— pipe specific frictional resistance (Pa/m)												
		Nominal diameter	15	20	25	32	40	50	70	80	100	125	150	200
		Actual inner diameter	15.8	21.3	27	35.8	41	53	68	80.5	106	131	156	217
20	0.2	L	0.04	0.07	0.11	0.2	0.26	0.44	0.73	1.02	1.76	2.69	3.8	7.4
		R	71	47	34	24	20	14	10	8	6	4	4	2
45	0.3	L	0.06	0.11	0.17	0.3	0.4	0.66	1.09	1.53	2.65	4.04	5.73	11.09
		R	146	98	72	49	41	29	21	17	12	9	7	5
80	0.4	L	0.08	0.14	0.23	0.4	0.53	0.88	1.45	2.03	3.5	5.4	7.6	14.8
		R	251	168	122	84	70	50	36	29	21	16	13	8
125	0.5	L	0.1	0.18	0.29	0.5	0.66	1.1	1.81	2.54	4.4	6.7	9.6	18.5
		R	378	253	184	128	107	76	55	45	31	24	19	13
180	0.6	L	0.12	0.21	0.34	0.6	0.79	1.32	2.18	3.1	5.3	8.1	11.5	22.2
		R	538	359	260	180	150	108	78	63	44	34	27	18
245	0.7	L	0.14	0.25	0.4	0.7	0.92	1.54	2.54	3.6	6.2	9.4	13.4	25.9
		R	715	480	350	241	202	145	104	84	60	46	37	24
319	0.8	L	0.16	0.28	0.46	0.8	1.06	1.76	2.9	4.1	7.1	10.8	15.3	29.6
		R	929	621	451	311	260	186	135	109	77	59	47	31
404	0.9	L	0.18	0.32	0.52	0.9	1.19	1.98	3.3	4.6	7.9	12.1	17.2	33.3
		R	1157	776	564	390	326	234	170	137	96	74	59	39
499	1	L	0.19	0.35	0.57	1.0	1.32	2.21	3.6	5.1	8.8	13.5	19.1	37.0
		R	1425	947	690	477	399	286	208	167	118	90	73	48
604	1.1	L	0.21	0.39	0.63	1.1	1.45	2.43	4.0	5.6	9.7	14.8	21.0	40.7
		R	1704	1142	829	574	480	344	250	201	142	109	87	58
719	1.2	L	0.23	0.43	0.69	1.2	1.58	2.65	4.4	6.1	10.6	16.2	22.9	44.4
		R	2025	1348	983	679	568	407	295	238	168	129	103	68
844	1.3	L	0.25	0.46	0.74	1.3	1.72	2.87	4.7	6.6	11.5	17.5	24.8	48.1
		R	2356	1578	1147	793	663	475	345	278	196	150	121	80
978	1.4	L	0.27	0.5	0.8	1.4	1.85	3.1	5.1	7.1	12.4	18.9	26.8	51.8
		R	2731	1819	1324	916	765	549	398	321	226	173	139	92
1123	1.5	L	0.29	0.53	0.86	1.5	1.98	3.3	5.4	7.6	13.2	20.2	28.7	55.5
		R	3112	2084	1513	1047	875	628	456	367	259	198	159	106
1278	1.6	L	0.31	0.57	0.92	1.61	2.11	3.5	5.8	8.1	14.1	21.6	30.6	59.1
		R	3540	2359	1719	1187	992	712	517	416	294	225	181	120
1442	1.7	L	0.33	0.6	0.97	1.71	2.24	3.8	6.2	8.7	15.0	22.9	32.5	62.8
		R	3972	2660	1933	1337	1117	801	581	469	330	253	203	135
1617	1.8	L	0.35	0.64	1.03	1.81	2.38	4.0	6.5	9.2	15.9	24.3	34.4	66.5
		R	4454	2970	2161	1494	1249	896	650	524	370	283	227	151
1802	1.9	L	0.37	0.67	1.09	1.91	2.51	4.2	6.9	9.7	16.8	25.6	36.3	70.2
		R	4937	3306	2400	1660	1388	996	723	582	411	315	253	167
1996	2	L	0.39	0.71	1.14	2.01	2.64	4.4	7.3	10.2	17.6	26.9	38.2	73.9
		R	5445	3650	2657	1836	1535	1100	799	644	454	348	279	185
2201	2.1	L	0.41	0.74	1.2	2.11	2.77	4.6	7.6	10.7	18.5	28.3	40.1	77.6
		R	6007	4011	2922	2020	1689	1211	879	709	500	383	307	204
2416	2.2	L	0.43	0.78	1.26	2.21	2.9	4.9	8.0	11.2	19.4	29.6	42.0	81.3
		R	6566	4400	3200	2212	1850	1326	963	776	547	419	337	223
2640	2.3	L	0.45	0.82	1.32	2.31	3.0	5.1	8.4	11.7	20.3	31.0	43.9	85.0
		R	7181	4796	3491	2415	2019	1448	1051	847	597	457	367	244
2875	2.4	L	0.47	0.85	1.37	2.41	3.2	5.3	8.7	12.2	21.2	32.3	45.9	88.7
		R	7791	5221	3793	2625	2195	1573	1142	921	649	497	399	265
3119	2.5	L	0.49	0.89	1.43	2.51	3.3	5.5	9.1	12.7	22.1	33.7	47.8	92.4
		R	8460	5651	4115	2843	2378	1705	1238	998	704	539	433	287
3374	2.6	L	0.51	0.92	1.49	2.61	3.4	5.7	9.4	13.2	22.9	35.0	49.7	96.1
		R	9120	6111	4443	3072	2568	1841	1337	1078	760	582	468	310
3639	2.7	L	0.53	0.96	1.55	2.71	3.6	6.0	9.8	13.7	23.8	36.4	51.6	99.8
		R	9843	6575	4784	3308	2766	1984	1440	1161	819	627	504	334
3918	2.8	L	0.55	0.99	1.6	2.81	3.7	6.2	10.2	14.2	24.7	37.7	53.5	104
		R	10554	7071	5137	3553	2972	2130	1547	1247	879	673	541	359
4198	2.9	L	0.56	1.03	1.66	2.91	3.8	6.4	10.5	14.8	25.6	39.1	55.4	107
		R	11330	7569	5510	3809	3184	2283	1657	1336	942	722	580	384
4492	3	L	0.58	1.06	1.72	3.0	4.0	6.6	10.9	15.3	26.5	40.4	57.3	111
		R	12100	8085	5889	4071	3404	2440	1772	1428	1007	771	620	410

Notes: The above data is the result of theoretical calculations based on pipe wall roughness: 0.2, water temperature: 12℃ .

PP-R specific frictional resistance

Dynamic pressure (Pa)	Flow rate	Nominal pipe diameter DN(mm) L— flow rate (l/s) ; R— pipe specific frictional resistance (Pa/m)												
		Nominal diameter	20	25	32	40	50	63	75	90	110	125	140	160
		Actual inner diameter	14.4	18	23.2	29	36.2	45.8	54.4	65.4	79.8	89.6	101.6	116.2
20	0.2	L	0.03	0.05	0.09	0.13	0.21	0.33	0.47	0.67	1.00	1.26	1.62	2.12
		R1	62	46	34	26	19	15	12	9	7	6	5	5
45	0.3	L	0.05	0.08	0.13	0.20	0.31	0.49	0.70	1.01	1.50	1.89	2.43	3.2
		R1	124	93	69	52	40	30	24	19	15	13	11	10
80	0.4	L	0.07	0.10	0.17	0.26	0.41	0.66	0.93	1.34	2.00	2.52	3.2	4.2
		R1	205	157	115	87	66	50	40	32	25	22	19	16
125	0.5	L	0.08	0.13	0.21	0.33	0.51	0.82	1.16	1.68	2.50	3.2	4.1	5.3
		R1	303	232	170	130	99	74	60	48	37	33	28	24
180	0.6	L	0.10	0.15	0.25	0.40	0.62	0.99	1.39	2.02	3.00	3.8	4.9	6.4
		R1	425	323	236	179	136	102	83	66	52	45	39	33
245	0.7	L	0.11	0.18	0.30	0.46	0.72	1.15	1.63	2.35	3.5	4.4	5.7	7.4
		R1	556	423	310	235	179	135	109	87	68	59	51	43
319	0.8	L	0.13	0.20	0.34	0.53	0.82	1.32	1.86	2.69	4.0	5.0	6.5	8.5
		R1	702	534	392	298	228	170	138	110	86	75	64	54
404	0.9	L	0.15	0.23	0.38	0.59	0.93	1.48	2.09	3.0	4.5	5.7	7.3	9.5
		R1	863	661	483	368	280	210	170	136	106	92	79	67
499	1	L	0.16	0.25	0.42	0.66	1.03	1.65	2.32	3.4	5.0	6.3	8.1	10.6
		R1	1049	794	584	443	338	253	205	164	128	111	95	81
604	1.1	L	0.18	0.28	0.47	0.73	1.13	1.81	2.56	3.7	5.5	6.9	8.9	11.7
		R1	1239	944	691	525	401	300	243	194	152	132	113	96
719	1.2	L	0.20	0.31	0.51	0.79	1.23	1.98	2.79	4.0	6.0	7.6	9.7	12.7
		R1	1442	1099	806	613	467	350	283	226	177	154	132	112
844	1.3	L	0.21	0.33	0.55	0.86	1.34	2.14	3.0	4.4	6.5	8.2	10.5	13.8
		R1	1672	1270	928	706	538	403	327	261	204	177	152	129
978	1.4	L	0.23	0.36	0.59	0.92	1.44	2.31	3.3	4.7	7.0	8.8	11.3	14.8
		R1	1902	1445	1061	805	614	460	372	297	233	202	173	147
1123	1.5	L	0.24	0.38	0.63	0.99	1.54	2.47	3.5	5.0	7.5	9.5	12.2	15.9
		R1	2146	1638	1198	910	694	520	421	336	263	228	196	166
1278	1.6	L	0.26	0.41	0.68	1.06	1.65	2.64	3.7	5.4	8.0	10.1	13.0	17.0
		R1	2402	1833	1342	1021	778	583	472	377	295	256	220	186
1442	1.7	L	0.28	0.43	0.72	1.12	1.75	2.8	3.9	5.7	8.5	10.7	13.8	18.0
		R1	2687	2037	1494	1136	867	649	526	420	329	285	244	207
1617	1.8	L	0.29	0.46	0.76	1.19	1.85	3.0	4.2	6.0	9.0	11.3	14.6	19.1
		R1	2969	2260	1656	1258	959	719	582	464	364	316	271	229
1802	1.9	L	0.31	0.48	0.80	1.25	1.96	3.1	4.4	6.4	9.5	12.0	15.4	20.1
		R1	3262	2483	1822	1384	1056	791	641	511	400	347	298	253
1996	2	L	0.33	0.51	0.85	1.32	2.06	3.3	4.6	6.7	10.0	12.6	16.2	21.2
		R1	3587	2725	1994	1516	1155	866	701	560	439	380	326	277
2201	2.1	L	0.34	0.53	0.89	1.39	2.16	3.5	4.9	7.1	10.5	13.2	17.0	22.3
		R1	3906	2967	2173	1653	1260	945	765	610	478	415	356	302
2416	2.2	L	0.36	0.56	0.93	1.45	2.26	3.6	5.1	7.4	11.0	13.9	17.8	23.3
		R1	4236	3228	2364	1796	1369	1026	831	663	519	451	386	328
2640	2.3	L	0.37	0.59	0.97	1.52	2.37	3.8	5.3	7.7	11.5	14.5	18.6	24.4
		R1	4577	3488	2556	1943	1481	1110	898	717	562	488	418	355
2875	2.4	L	0.39	0.61	1.01	1.58	2.47	4.0	5.6	8.1	12.0	15.1	19.4	25.4
		R1	4953	3757	2756	2095	1597	1197	969	773	606	526	451	382
3119	2.5	L	0.41	0.64	1.06	1.65	2.57	4.1	5.8	8.4	12.5	15.8	20.3	26.5
		R1	5318	4046	2961	2253	1718	1287	1042	832	652	565	485	411
3374	2.6	L	0.42	0.66	1.10	1.72	2.68	4.3	6.0	8.7	13.0	16.4	21.1	27.6
		R1	5695	4332	3179	2415	1841	1380	1117	892	698	606	519	441
3639	2.7	L	0.44	0.69	1.14	1.78	2.78	4.4	6.3	9.1	13.5	17.0	21.9	28.6
		R1	6082	4639	3397	2582	1968	1475	1195	953	747	648	555	471
3918	2.8	L	0.46	0.71	1.18	1.85	2.88	4.6	6.5	9.4	14.0	17.6	22.7	29.7
		R1	6506	4943	3622	2757	2099	1574	1274	1017	797	691	592	503
4198	2.9	L	0.47	0.74	1.23	1.92	2.98	4.8	6.7	9.7	14.5	18.3	23.5	30.7
		R1	6917	5268	3854	2934	2234	1675	1356	1082	848	736	631	535
4492	3	L	0.49	0.76	1.27	1.98	3.1	4.9	7.0	10.1	15.0	18.9	24.3	31.8
		R1	7338	5588	4097	3116	2373	1779	1440	1149	900	781	670	568

Notes: The above data is the result of theoretical calculations based on water temperature: 12℃ ;PPR pipe grade: S3.2.

Local resistance refers to the pressure drop caused when a fluid flows through fittings, parts or equipment. The formula to calculate local resistance is:

$$\Delta P=\xi \frac{\rho v^2}{2} \qquad \text{(Formula 4-6)}$$

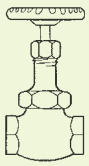
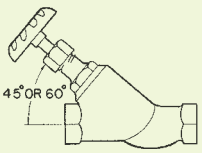
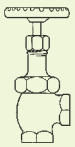
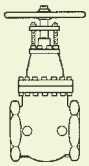
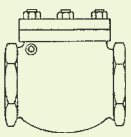
Where:

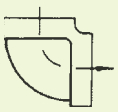
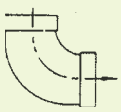
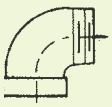
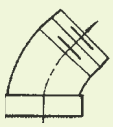
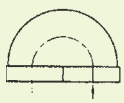
ξ = coefficient of local resistance

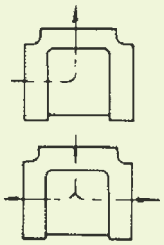
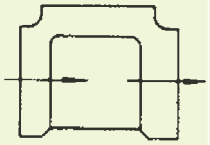
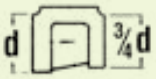
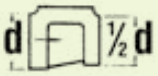
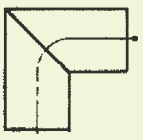
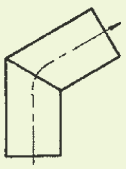
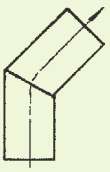
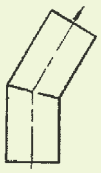
v = characteristic velocity in m/s

The coefficient of local resistance ξ is dependent on geometric parameters of flow passage such as fittings, parts or equipment, usually regardless of the affect of relative roughness or the Reynolds number.

The following table shows the equivalent value of local resistance of commonly used fittings, parts or equipment, compared to straight-pipe length:

Valve resistance loss							
	Ball valve	60°-Y shaped valve	45°- Y shaped valve	Angle valve	Gate valve	Rotating shutoff valve	Lifting shutoff valve
Nominal diameter/ pipe dimension mm							
10	5.1	2.4	1.8	1.8	0.2	1.5	Same as ball Valve
15	5.4	2.7	2.1	2.1	0.2	1.8	
20	6.6	3.3	2.7	2.7	0.3	2.4	
25	8.7	4.6	3.6	3.6	0.3	3.6	
32	11.4	6.1	4.6	4.6	0.5	4.2	
40	12.6	7.3	5.4	5.4	0.5	4.8	
50	16.5	9.1	7.3	7.3	0.7	6.1	
65	20.7	10.7	8.7	8.7	0.9	7.6	

Device resistance loss						
Smooth elbow						
	90°standard	90°lengthened	90°inner & outer diameter	45°standard	45°inner & outer diameter	180°standard
Nominal diameter/ pipe dimension mm						
10	0.4	0.3	0.7	0.2	0.3	0.7
15	0.5	0.3	0.8	0.2	0.4	0.8
20	0.6	0.4	1.0	0.3	0.5	1.0
25	0.8	0.5	1.2	0.4	0.6	1.2
32	1.0	0.7	1.7	0.5	0.9	1.7
40	1.2	0.8	1.9	0.6	1.0	1.9
50	1.5	1.0	2.5	0.8	1.4	2.5
65	1.8	1.2	3.0	1.0	1.6	3.0

smooth bent three-way				
	Branch flow	Main flow		
		Not convengent	Convengent	
Nominal diameter/ pipe dimension mm			1/4 	1/2 
10	0.8	0.3	0.4	0.4
15	0.9	0.3	0.4	0.5
20	1.2	0.4	0.6	0.6
25	1.5	0.5	0.7	0.8
32	2.1	0.7	0.9	1.0
40	2.4	0.8	1.1	1.2
50	3.0	1.0	1.4	1.5
65	3.7	1.2	1.7	1.8
elbow				
	90°	60°	45°	30°
Nominal diameter/ pipe dimension mm				
10	0.8	0.3	0.2	0.1
15	0.9	0.4	0.2	0.1
20	1.2	0.5	0.3	0.2
25	1.5	0.6	0.3	0.2
32	2.1	0.9	0.5	0.3
40	2.4	1.0	0.5	0.3
50	3.0	1.4	0.7	0.4
65	3.6	1.6	0.9	0.5

Notes: The above data references Aquasmart 2010 Hydraulic System Application Guide.

Using the above tables, calculate the greatest sub-circuit pressure loss and compare it to the available water pressure. If pressure loss is lower than available water pressure, the calculated diameter is sufficient; if pressure loss is larger than available water pressure, we should change the supposed flow rate and re-calculate the diameter.

4.1.3.5 Available Water Pressure Calculation

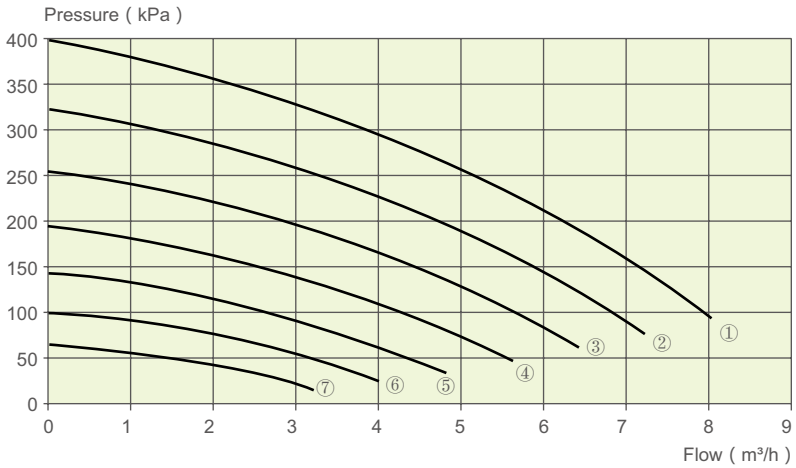
(1) Hydronic Kit Exterior Pressure Curve

The main internal components of the hydronic kit include: variable frequency water pump, filter, shut-off valve, automatic filling valve, pressure differential bypass valve and sensor. The variable frequency water pump provides water pressure in the system, while the other components reduce it.

External pressure of the hydronic kit = pressure provided by the water pump - pressure reduced by system components

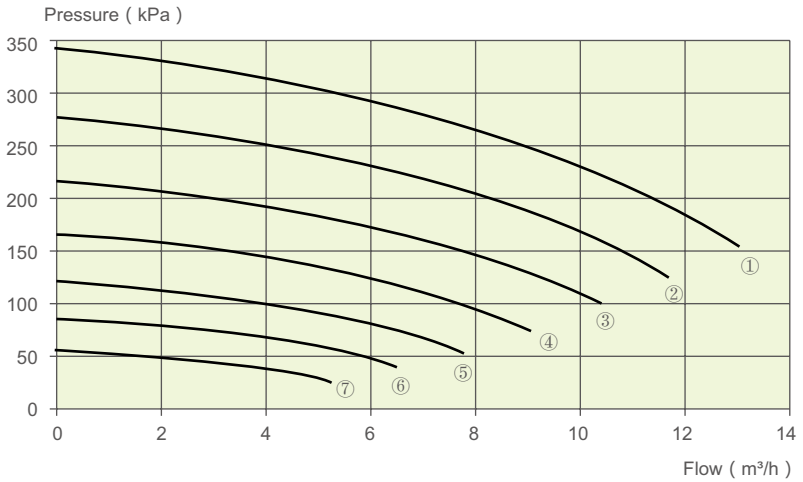
External pressure curve of six hydronic kits

HK030 external pressure curve



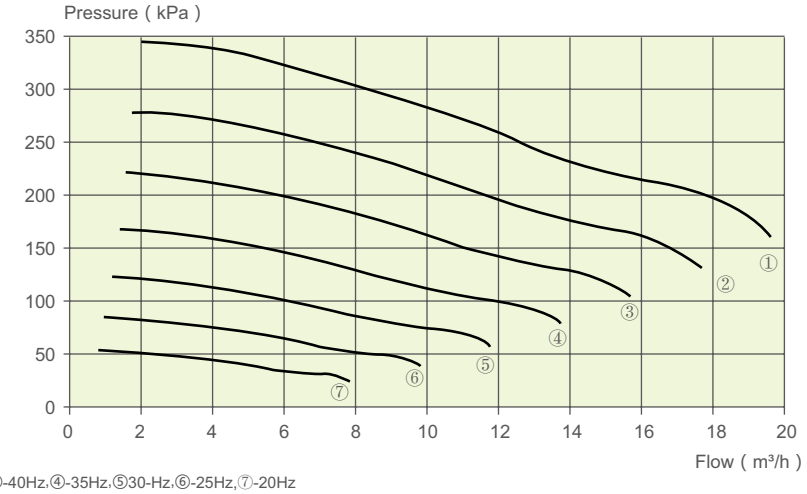
注：①-50Hz,②-45Hz,③-40Hz,④-35Hz,⑤30-Hz,⑥-25Hz,⑦-20Hz

HK040 external pressure curve



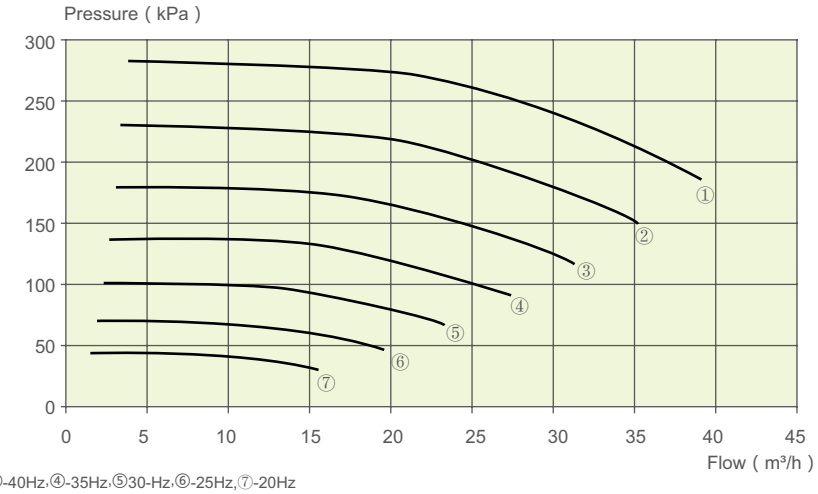
注：①-50Hz,②-45Hz,③-40Hz,④-35Hz,⑤30-Hz,⑥-25Hz,⑦-20Hz

HK080 external pressure curve



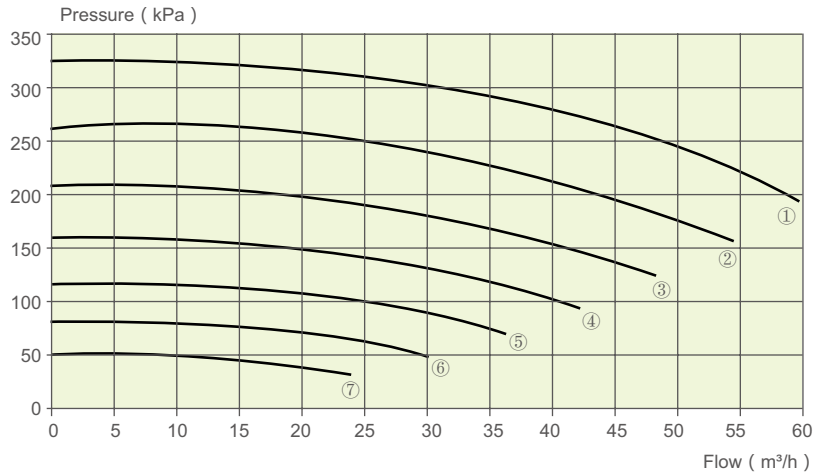
注：①-50Hz,②-45Hz,③-40Hz,④-35Hz,⑤30-Hz,⑥-25Hz,⑦-20Hz

HK150 external pressure curve



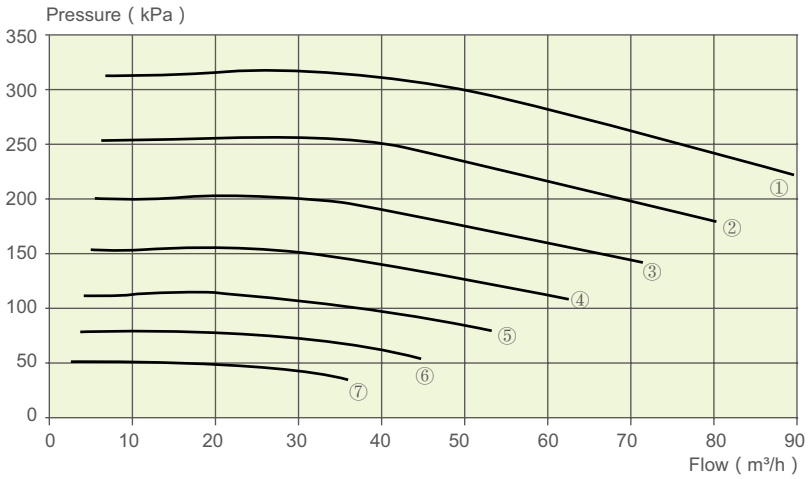
注：①-50Hz,②-45Hz,③-40Hz,④-35Hz,⑤30-Hz,⑥-25Hz,⑦-20Hz

HK210 external pressure curve



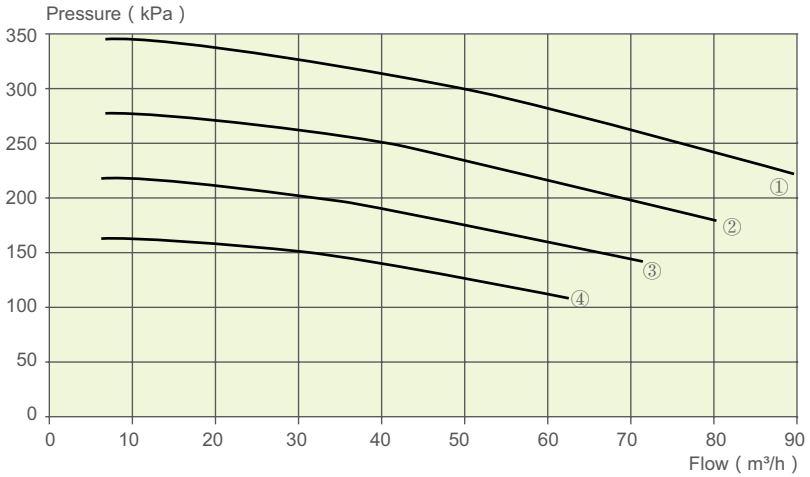
注：①-50Hz,②-45Hz,③-40Hz,④-35Hz,⑤30-Hz,⑥-25Hz,⑦-20Hz

HK320 external pressure curve



注：①-50Hz,②-45Hz,③-40Hz,④-35Hz,⑤30-Hz,⑥-25Hz,⑦-20Hz

HK520 external pressure curve



注：①-50Hz,②-45Hz,③-40Hz,④-35Hz

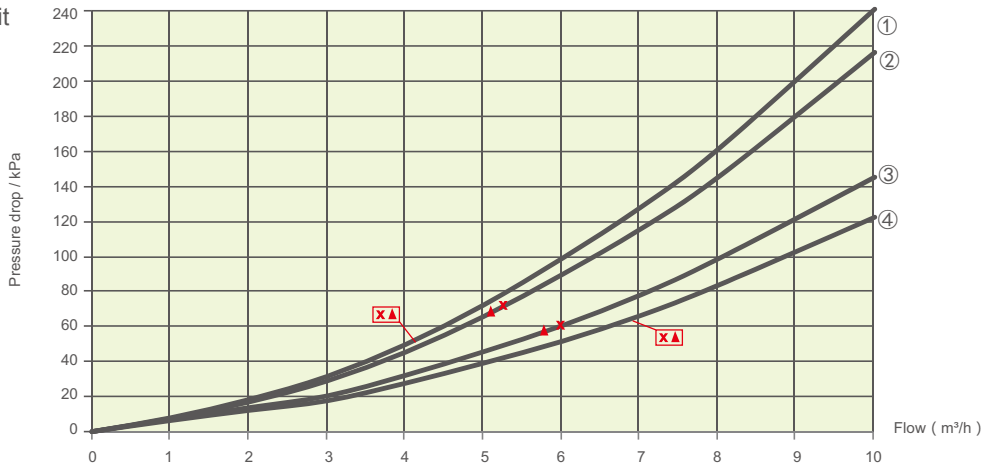
(2) Outdoor Unit Pressure Loss

The components of the outdoor unit's water system, including the plate heat exchanger, filter, flow switch, water pipe solenoid valve, all cause local resistance and thus reduce pressure in the system.

Outside unit pressure drop = pressure drop of the plate exchanger + frictional resistance and local loss of outdoor unit pipes

Frictional resistance and local pressure loss of outdoor unit and outdoor unit pipes are as follows:

1.Standard unit



Note: Illustration above include the pressure drop of inlet and outlet pipes of main unit(filter).

①-025, cooling rated flow rate 4.2m³/h, water pressure drop 54kPa;

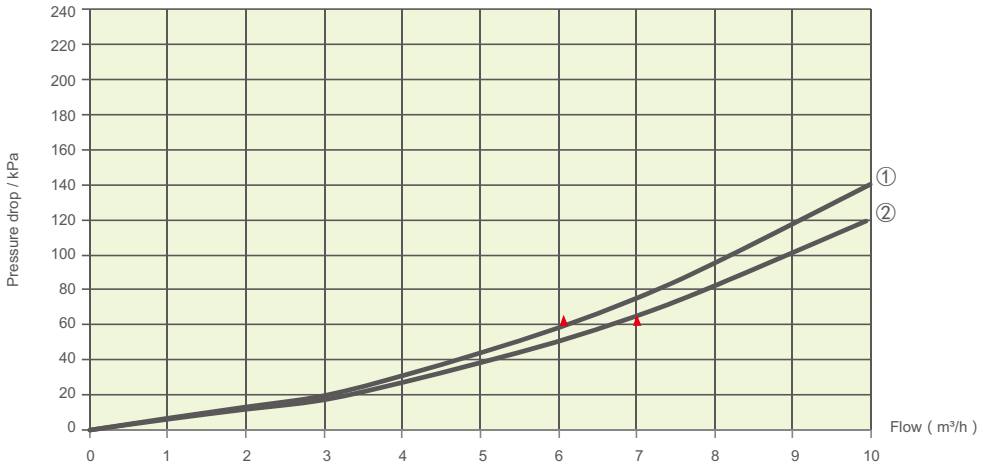
②-030, cooling rated flow rate 5.0m³/h, water pressure drop 65kPa;

③-035, cooling rated flow rate 5.8m³/h, water pressure drop 57kPa;

④-040, cooling rated flow rate 6.8m³/h, water pressure drop 63kPa;

▲-cooling rated point x-heating rated point

2.EVI unit



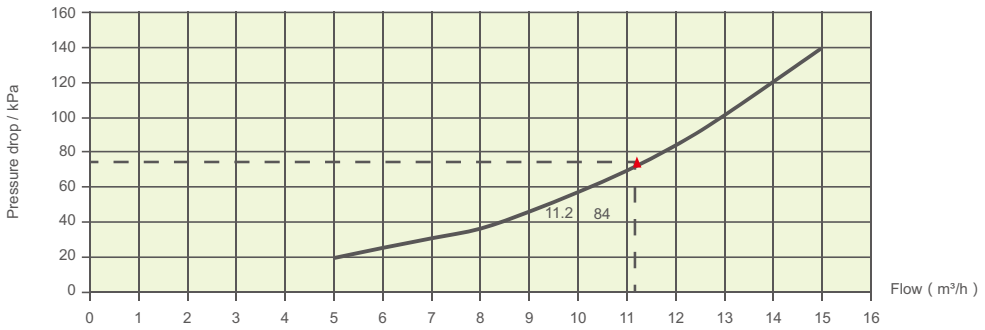
Note: Illustration above include the pressure drop of inlet and outlet pipes of main unit(filter).

①-EVI035, cooling rated flow rate 6.1m³/h, water pressure drop 60kPa;

②-EVI030, cooling rated flow rate 7.1m³/h, water pressure drop 65kPa;

③▲-Cooling rated point

3.Modular unit



(3) Available Water Pressure

System available pressure head is different from the above mentioned external available pressure head of the hydronic kit. The system available pressure head equals to the external available pressure head of the hydronic kit deducting outdoor main unit side water pressure drop, the local resistance of the pipe accessories between hydronic kit and on-way resistance.

Available water pressure = external pressure of the hydronic kit – outdoor unit pressure drop

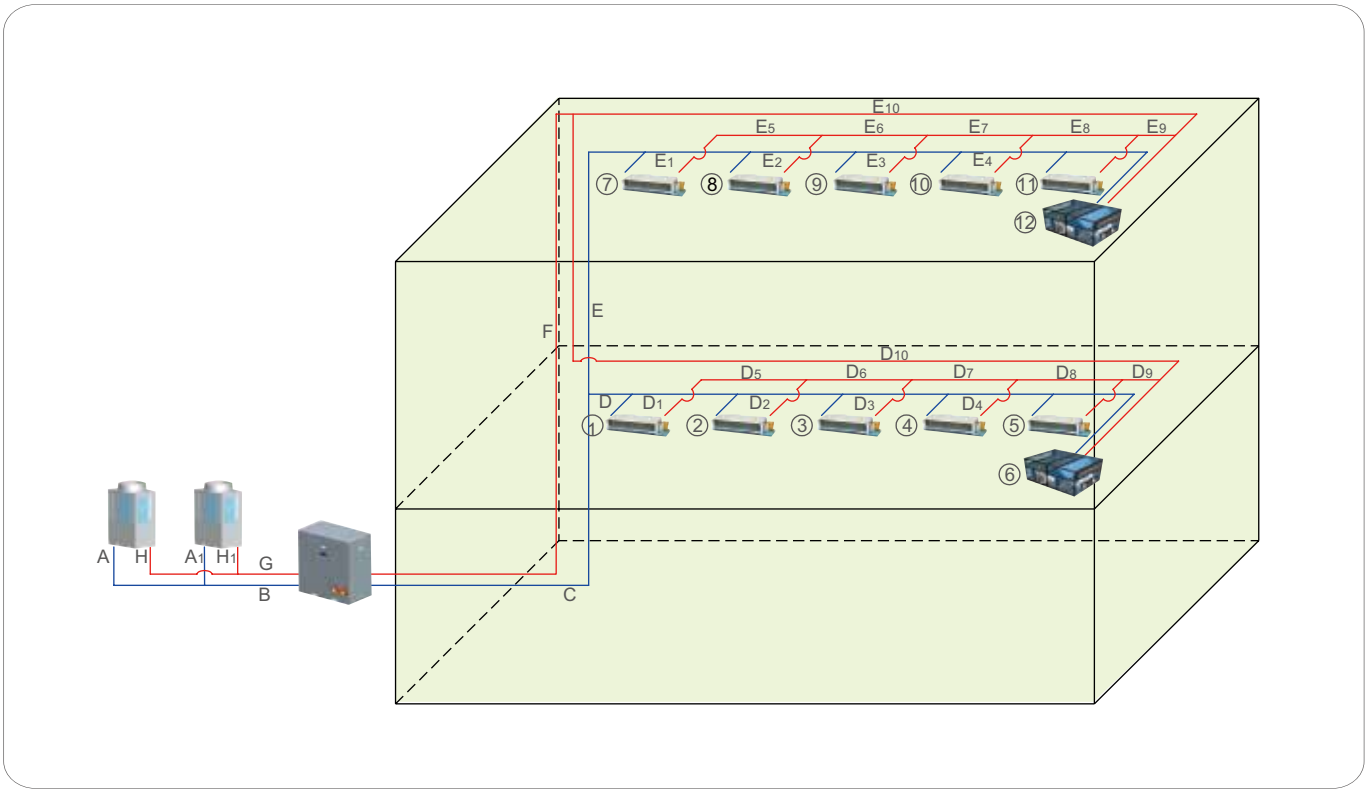
Available water pressure at rated cooling conditions, when the water pump is operated at 50Hz, is shown in the following table:

Unit model	Outdoor unit model/Number				Hydronic kit model	System rated flow	Head	Water pressure drop	Available water pressure
	30RQM 025	30RQM 030	30RQM 035	30RQM 040		m³/h	kPa	kPa	kPa
SHSRQ025	1				HK030	4.2	290	54	236
SHSRQ030		1				5.0	253	65	188
SHSRQ035			1		KH040	5.8	292	57	235
SHSRQ040				1		6.8	281	63	218
SHSRQ050	2				HK080	8.4	301	54	247
SHSRQ060		2				10.0	283	65	218
SHSRQ070			2			11.6	262	57	205
SHSRQ080				2		13.6	241	63	178
SHSRQ090		3			HK150	15.0	280	65	215
SHSRQ105			3			17.4	277	57	220
SHSRQ120				3		20.4	272	63	209
SHSRQ140			4			23.2	264	57	207
SHSRQ150		5				25.0	259	54	205
SHSRQ160				4	HK210	27.2	309	63	246
SHSRQ180		6				30.0	303	54	249
SHSRQ200				5		34.0	295	63	232
SHSRQ210		7				35.0	292	54	238
SHSRQ240				6	HK32	40.8	307	63	244
SHSRQ280				7		47.6	298	63	235
SHSRQ320				8		54.4	286	63	223

Note: In this table, available water pressure ignores any pressure drop in the pipes between the hydronic kit and the outdoor unit. If the distance between the main unit and hydronic kit is great and there are many valves offering local resistance, the pressure drop this causes must be deducted to calculate available pressure in the system.

For a piping sub-circuit to meet requirements under the most adverse pressure-loss conditions, resistance in the parallel pipes must be balanced. The previously mentioned reversed return system can relieve resistance imbalance, but it cannot keep the pressure loss difference of all sub-circuits within 10%. Therefore, we must use resistance balancing to ensure that the resistance loss within each of the parallel sub-circuits is equal or similar. This will allow the system to deliver the required flow rate to each of the outdoor unit, indoor unit and fresh air unit sub-circuits.

4.1.4 System resistance balance calculation



Notes: Indoor inlet is pipe 1, outlet is pipe 2 (e.g. inlet pipe number of # ① indoor unit: ① -1, oulet pipe number: ① -2)

In an air-conditioning system with cooling capacity of 60 kW, the performance of different pieces of equipment is as follows:

Module	Type	Number	S/N	Performance
ODU	30RQM030	2		Cooling capacity: 30kW, flow rate: 5.0m³/h, water pressure drop: 65 kPa
HK	HK080	1		Matching system maximum cooling capacity 80kW
FAU	BFP1HH	2	⑥ ⑫	Recycled cooling capacity:6kW, flow rate: 0.73m³/h, water pressure drop: 1.96 kPa
IDU	42CN00420AEL	3	①②③	Cooling capacity: 3.64 kW, flow rate: 0.624m³/h, water pressure drop: 30 kPa
	42CN00520AEL	5	⑦ ~ ⑪	Cooling capacity: 4.5 kW, flow rate: 0.774m³/h, water pressure drop: 30 kPa
		2	④⑤	Cooling capacity: 7.2 kW, flow rate: 1.236m3/h, water pressure drop: 38 kPa

Ⅰ Selecting the sub-circuit with the most adverse pressure loss

The sub-circuit with the most adverse pressure loss will be the sub-circuit with the longest pipe and most components offering local resistance.

In the above diagram, pressure loss in the pipes is basically the same due to the reversed return system. The sub-circuit with the most adverse pressure loss is the one with the greatest end pressure drop. This “most adverse” sub-circuit is:

A→B→C→D→D1→D2→D3→D4→ ⑤ -1→ ⑤ -2→D9→D10→F→G→H.

Ⅱ Calculating flow rate, pipe diameter and pressure loss

Flow rate selection: According to the Practical Centralized Air Conditioner Design Guide, we can temporarily assume a 0.8m/s flow rate in system branch pipes and a 1.3m/s flow rate in mains pipes.

Flow calculation: The flow in each branch pipe can be determined by end equipment. The flow in the mains pipe equals the total in/out flow of all branch pipes.

Diameter calculation: Based on known flow and supposed flow rate, use the formula (4-1)~(4-4) to calculate pipe diameter. The result is the inner pipe diameter, which needs to be standardized to determine nominal pipe size.

Pressure loss calculation: Using the tabl e, determine the specific frictional resistance of each pipe. Use the formula (4-5) to determine frictional pressure loss. Using the table, determine the pipe length that corresponds to the pipe’s local resistance. Use the formula (4-5) to determine local pressure loss. Their sum is the total pressure loss.

Calculated flow and pipe diameter are shown in the following table:

Pipe section	Flow rate	Calculated inside diameter	Nominal Pipe diameter	Actual inside diameter	Actual Flow speed	Pipe length	Local resistance	Local resistance equivalent pipe length	Equivalent total pipe pipe length	Specific frictional resistance	Compression Losses
	l/s	mm	DN	mm	m/s	m		m	m	Pa/m	Pa
A	1.343	36.28	32 (steel)	35.8	1.3	20	1-90° Elbow 1-straght three-way	2.4	22.4	793	17763.2
B	2.686	51.30	50 (steel)	53	1.2	20	-	0	20	407	8140
C	2.686	51.30	50 (steel)	53	1.2	40	1-90° Elbow	1.5	41.5	407	16890.5
D	1.408	47.35	50 (steel)	53	0.6	3	1-branch three-way flow	3	6	108	648
D1	1.235	44.35	40 (steel)	41	0.9	5	1-branch three-way flow	1.4	6.4	326	2086.4
D2	1.062	41.12	40 (steel)	41	0.8	5	1-branch three-way flow	0.8	5.8	260	1508
D3	0.889	37.62	50 (PPR)	36.2	0.9	5	1-branch three-way flow	1.1	6.1	280	1708
D4	0.546	29.49	40 (PPR)	29	0.8	5	1-branch three-way flow	0.9	5.9	298	1758.2
⑤ -1	0.343	23.37	32 (PPR)	23.2	0.8	1.5	1-branch three-way flow	1.5	3	392	1176
⑤ -2	0.343	23.37	32 (PPR)	23.2	0.8	2	1-branch three-way flow 1- Elbow	2.7	4.7	392	1842.4
D9	1.205	43.80	40 (steel)	41	0.9	5	1-branch three-way flow	2.4	7.4	326	2412.4
D10	1.408	47.35	40 (steel)	41	1.1	40	2-90° Elbow 1-branch three-way flow	4.8	44.8	480	21504
F	2.686	51.30	50 (steel)	53	1.2	50	2-90° Elbow	3	53	407	21571
G	2.686	51.30	50 (steel)	53	1.2	20	-	0	20	407	8140
H	1.343	36.28	32 (steel)	35.8	1.3	20	1-branch three-way flow 1-90° Elbow	2.4	22.4	793	17763.2
						241.5					124911.3

Pressure loss of most adverse sub-circuit = pipe pressure loss (frictional and local) + end equipment pressure loss +Terminal two-way valve resistance = 124.9+38+40 kPa

= 202.9 kPa

Ⅲ Pressure Check

The available water pressure drop of the SHS060 system is 218 kPa, which is larger than the pressure loss of sub-circuit with the most adverse pressure loss (202.9) and thus meets the circulation requirements of the hydronic system.

Ⅳ Pressure Loss Imbalance in Parallel Pipes

It is necessary to balance pressure loss in pipes in parallel sub-circuits to ensure that the flow is distributed as required. If there is a large difference between pressure loss in each of the pipes (over 10%), the pipe network will automatically adjust the flow of each pipe to equalize the actual flow resistance in each parallel pipe. In this case, the flow of parallel pipes is not a design requirement.

In this example, all the sub-circuits are in parallel, so the water pressure drop at the end determines the balance of the watersystem. Calculate hydronic balance between fresh air .

unit at frst layer and # ⑤ indoor unit:

First layer # ⑤ indoor unit loop												
Pipe section	Flow rate	Inner diameter calculation	Nominal Pipe Diameter	Actual inner diameter	Actual flow rate	Tube length	Pipe length	Local resistance equivalent pipe length	Equivalent total pipe pipe length	Specific frictional resistance	Total pressure Losses	# ⑤ Inner unit Water Pressure drop
	l/s	mm	DN	mm	m/s	m		m	m	Pa/m		Pa
D	1.408	47.35	50(steel)	53	0.64	3	1-branch three-way flow	3	6	108	648	78000
D1	1.235	44.35	40(steel)	41	0.94	5	1-straght three-way flow	1.4	6.4	326	2086.4	
D2	1.062	41.12	40(steel)	41	0.80	5	1-straght three-way flow	0.8	5.8	260	1508	
D3	0.889	37.62	50(PPR)	36.2	0.86	5	1-straght three-way flow	1.1	6.1	280	1708	
D4	0.546	29.49	40(PPR)	29	0.83	5	1-straght three-way flow	0.9	5.9	298	1758.2	
⑤-1	0.343	23.37	32(PPR)	23.2	0.81	1.5	1-branch three-way flow	1.5	3	392	1176	
⑤-2	0.343	23.37	32(PPR)	23.2	0.81	2	1-branch three-way flow 1-Elbow	2.7	4.7	392	1842.4	
D9	1.205	43.80	40(steel)	41	0.91	5	1-branch three-way flow	2.4	7.4	326	2412.4	
						31.5					13139.4	91139.4
First layer fresh air unit loop												
Pipe section	Flow rate	Inner diameter calculation	Nominal Pipe Diameter	Actual inner diameter	Actual flow rate	Tube length	Pipe length	Local resistance equivalent pipe length	Equivalent total pipe pipe length	Specific frictional resistance	Total pressure Losses	Fresh air units Water pressure drop
	l/s	mm	DN	mm	m/s	m		m	m	Pa/m		Pa
D	1.408	47.35	50(steel)	53	0.64	3	1-branch three-way flow	3	6	108	648	41960
D1	1.235	44.35	40(steel)	41	0.94	5	1-straght three-way flow	1.4	6.4	326	2086.4	
D2	1.062	41.12	40(steel)	41	0.80	5	1-straght three-way flow	0.8	5.8	260	1508	
D3	0.889	37.62	50(PPR)	36.2	0.86	5	1-straght three-way flow	1.1	6.1	280	1708	
D4	0.546	29.49	40(PPR)	29	0.83	5	1-straght three-way flow	0.9	5.9	298	1758.2	
⑥-1	0.203	17.98	25(PPR)	18	0.80	8	1-90° Elbow	0.8	8.8	534	4699.2	
⑥-2	0.203	17.98	25(PPR)	18	0.80	2	1-straght three-way flow	0.7	2.7	534	1441.8	
						33					13849.6	55809.6

Note: Indoor unit water pressure drop includes the two-way valve resistance.

Imbalanced pressure loss ratio of the two sub-circuits is:

$$\frac{91139.4-55809.6}{91139.4} \times 100\% = 39\%$$

When the resistance imbalance between the two sub-circuits is too large and cannot be corrected by modifying pipe diameter, valves are added on the fresh air units. These valves are adjusted to restore hydronic balance between the two sub-circuits.

Realize hydronic balance between layer 1 # ⑤ indoor unit and layer 2 # ⑪ indoor unit:

First layer # ⑤ indoor unit loop												
Pipe section	Flow rate	Inner diameter calculation	Nominal Pipe Diameter	Actual inner diameter	Actual flow speed	pipe length	Local resistance	Local resistance equivalent pipe length	Equivalent total pipe pipe length	Specific frictional resistance	Total pressure Losses	# ⑤ Inner unit Water Pressure drop
	l/s	mm	DN	mm	m/s	m		m	m	Pa/m		Pa
D	1.408	47.35	50(steel)	53	0.64	3	1-branch three-way flow	3	6	108	648	
D1	1.235	44.35	40(steel)	41	0.94	5	1-straght three-way flow	1.4	6.4	326	2086.4	
D2	1.062	41.12	40(steel)	41	0.80	5	1-straght three-way flow	0.8	5.8	260	1508	
D3	0.889	37.62	50(PPR)	36.2	0.86	5	1-straght three-way flow	1.1	6.1	280	1708	
D4	0.546	29.49	40(PPR)	29	0.83	5	1-straght three-way flow	0.9	5.9	298	1758.2	78000
⑤-1	0.343	23.37	32(PPR)	23.2	0.81	1.5	1-branch three-way flow	1.5	3	392	1176	
⑤-2	0.343	23.37	32(PPR)	23.2	0.81	2	1-branch three-way flow 1- Elbow	2.7	4.7	392	1842.4	
D9	1.205	43.80	40(steel)	41	0.91	5	1-branch three-way flow	2.4	7.4	326	2412.4	
D10	1.408	47.35	40(steel)	41	1.07	40	2-90° Elbow 1-branch three-way flow	4.8	44.8	480	21504	
						31.5					13139.4	91139.4

Layer 2 # ⑪ indoor unit loop												
Pipe section	Flow rate	Inner diameter calculation	Nominal Pipe Diameter	Actual inner diameter	Actual flow speed	pipe length	Local resistance	Local resistance equivalent pipe length	Equivalent total pipe pipe length	Specific frictional resistance	Total pressure Losses	# ⑪ Inner unit Water Pressure drop
	l/s	mm	DN	mm	m/s	m		m	m	Pa/m		Pa
E	1.278	45.11	50(steel)	53	0.58	8	1-straght three-way flow 1-90° Elbow	3.2	11.2	108	1209.6	
E1	1.063	41.14	40(steel)	41	0.81	5	1-straght three-way flow	1.4	6.4	260	1664	
E2	0.848	36.75	50(PPR)	36.2	0.82	5	1-straght three-way flow	1.4	6.4	228	1459.2	
E3	0.633	31.75	40(PPR)	29	0.96	5	1-straght three-way flow	1.4	6.4	443	2835.2	
E4	0.418	25.80	32(PPR)	23.2	0.99	5	1-straght three-way flow	1.1	6.1	584	3562.4	70000
41214	0.203	17.98	25(PPR)	18	0.80	6	1-straght three-way flow 1-90° Elbow	1.7	7.7	534	4111.8	
41215	0.203	17.98	25(PPR)	18	0.80	1.5	1-straght three-way flow	1.5	3	534	1602	
E9	1.075	41.37	40(steel)	41	0.81					260		
E10	1.278	45.11	50(steel)	53	0.58	33	1-90° Elbow 1-branch three-way flow	2.5	35.5	108	3834	
						68.5					20278.2	90278.2

Note: Indoor unit water pressure drop includes the two-way valve resistance.

Imbalanced pressure loss ratio of the two sub-circuits is:

$$\frac{91139.4-90278.2}{91139.4} \times 100\% = 0.9\%$$

The pressure loss imbalance is less than 10%, so the calculated pipe diameter meets requirements.

4.1.5 Water System Capacity Design

The minimum water capacity of the water circulating system is calculated according to the following formula:

Capacity (L) =CAP(kW)×3.5

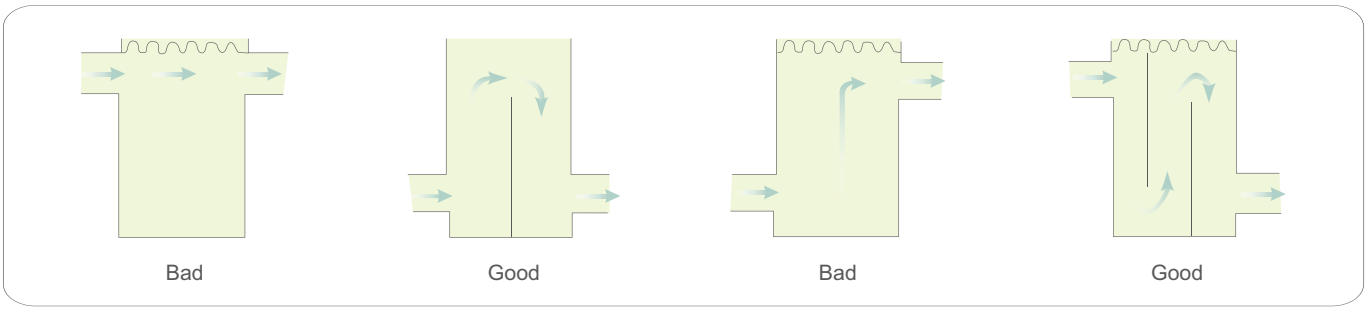
CAP is nominal cooling capacity under standard working conditions.

The maxmum water capacity of the water circulating system, please refer to the data sheet below:

Tank	The maximum water capacity
L	L
8	571
12	857
35	2498
50	3571
80	5710

If the capacity of the water system is smaller than the minimum capacity shown in the table, an additional buffer tank will need to be added. The volume of the buffer tank is equal to the minimum capacity minus actual capacity. The purpose of adding a buffer tank is to solve system temperature fluctuation issues and achieve good thermal stability by preventing rapid temperature fl uctuations caused when the compressor frequently starts and stops and when the water temperature falls rapidly during defrosting.

Correct buffer tank installation is shown in the following figure:



The unit water system expansion tank provides extra water capacity. If the water capacity of the system is larger than the maximum capacity of the tank, an additional expansion tank will be needed.

4.1.6 Pressure Design

Max. arcing voltage		Standard unit-Allowed maximum height difference(50℃)		40m high pressure option-Allowed maximum height difference(50℃)	
Outdoor unit Hydronic kit	Outdoor unit Hydronic kit	HK in the highest point	HK in the lowest point	HK in the highest point	HK in the lowest point
kPa	kPa	m	m	m	m
1000	500	100	20	100	40

Note: 1. If the intended location of the hydronic kit creates special installation requirements, contact a Carrier technician.
2. The above table shows the pressure limit value of the main unit and the hydronic kit, accordingly, the system pipes and pipe accessories shall also meet the above pressurerequirements.

4.2 installation of water system

4.2.1 Water Pipe Material Selection

The selection of water pipe material depends on the following conditions:

- Installation cost
- Installation conditions
- Technical features (specific frictional resistance and service life, etc.)
- Range of applicable pipe diameters

Air conditioner water pipes are usually made from steel or PP-R.

4.2.1.1 Steel Pipes

To reduce cost, use steel pipes only when the diameter is greater than DN40.

Steel pipes may be either seamless or welded. High-pressure systems should always use seamless steel pipes. Low-pressure systems can use welded steel pipes when pipes are smaller than DN50 and seamless steel pipes when pipes are larger than DN50.

Two layers of anti-corrosive primer should be applied to the pipe prior to any insulation treatment.

Advantages:

- Pipe properties (such as inner diameter, outer diameter and wall thickness) can be easily determined with reference to aninternational size table and relevant products and accessories are easy to acquire
- Flexible and convenient for installation
- Wide range of product diameters

Weaknesses:

- Large heat conductivity coefficient triggers high demand for insulation
- Transportation and installation can be challenging due to weight
- Liable to corrode and requires regular maintenance

4.2.1.2 PP-R Pipes

Pipes made of organic materials are increasingly popular in the air-conditioning industry due to demand for concealed piping solutions with reduced installation time, low noise and no possibility of corrosion.

Polypropylene random copolymer (PP-R) pipes are one option. They are joined through fusion welding and can be connected to other materials.

Advantages:

- Homogeneous hot melt connection (fusion welding): frm joint with very low leak rate, no need for maintenance, no corrosion, and can be inspected visually
- Good insulation performance: the heat conductivity coefficient of PP-R pipes is 0.21W/(m•K), only 1/200 of that of steel pipes
- Excellent heat resistance: instantaneous use temperature is 95℃ ; when used for a long period, the temperature may reach 75℃
- Lightweight: with density of 0.90 g/cm³ at 20℃ , PP-R pipes weigh 1/9 as much as steel pipes and 1/10 as much as copper pipes, reducing construction costs
- Corrosion-resistant, no fouling with long service life
- Recycled: PP-R pipes and fttings can contain up to 10% recycled PP-R material without affecting product quality

Weaknesses:

- Low hardness, poor rigidity
- Brittle at temperatures under 5℃
- May perish and degrade when exposed to ultra-violet light for a long period

4.2.2 Water System Pressure Test

System test pressure can be provided by an electric or manual pump. If the water pipes of the outdoor unit and hydronic kit share the same protection pressure, the maximum test pressure cannot exceed the maximum operating water pressure of the equipment to prevent damage to unit parts.

Generally, the test pressure for water system high-pressure leak detection is 1.5 times normal working pressure. An external test pressure gauge with accuracy greater than 10 kPa should be installed to test the pressure. The pressure gauge built into the hydronic kit can also be referred to.

Galvanized steel pipe water system:

(1) Pipe water pressure test conditions:

① Complete installation of the pipeline

② Secure installation of the brackets and hangers

③ Ensure pipe installation passes visual check

④ Ready supervisors for air exhaust and pumping tests

⑤ Take delivery of pumping test equipment

(2) Water pressure test

Before increasing the pressure, exhaust air from the system and ensure the system is flled with water. To begin, slowly increase the pressure to working pressure, using an external test pressure gauge (with an accuracy of higher than 10 kPa) or the built-in hydronic kit pressure gauge. Ensur e there is no leakage or deformation of the pipeline, then increase the pressure to test pressure (usually 1.5 times the working pressure) and keep it steady for 15 minutes. Pressure drops of no more than 2 kPa are acceptable.

PP-R pipe water system:

(1) The following requirements should be met prior to the pipe water pressure test being conducted:

① The water pressure test should be conducted more than 24 hours after fusion welding

② Secure pipes and check connectors before testing

③ After flling the pipeline, exhaust air and check for water-tightness

(2) Water pressure test

The test pressure shall be 1.5 times the working pressure of the pipeline. Increase the pressure with a manual pump for at least 10 minutes and use a pressure gauge with an accuracy of 10Kpa;

① Increase the pressure to the specifed test pressure and keep it steady for one hour. The pressure drop should be no more than 0.06MPa

② Hold the pressure (1.15 times the working pressure) for two hours. The pressure drop should be no more than 0.03MPa and there should be no leakage at any joint

4.2.3 Water System Installation Considerations

4.2.3.1 Exhaust Valve Setting

The outdoor unit and hydronic kit have an automatic exhaust valve that can be used to expel air from the system during system commissioning. Since air bubbles may accumulate in the water system, it is equipped with automatic or manual exhaust valves. Meanwhile, connecting pipes should have a gradient of at least 3/1000 to accelerate air exhaust. For exhaust devices, a shut-off device that is easy to replace in the case of breakage or failure is required. Exhaust pipes should be drained into pools or waste drains to prevent the exhaust device from failure, which may cause leakage affecting the installation environment.

4.2.3.2 Regulations about Heat Exchange Medium

Inlet water must be appropriately analyzed, filtered and treated. Meanwhile, control devices need to be instal led to prevent pumps from contamination, fouling and cross-contamination. Consult water treatment experts or relevant literature where necessary.

- NH4+ ion: Just a few tenths of one mg/L NH4+ ion will cause serious corrosion in copper pipes. We may use the sacrifcial anode protection method to remove the NH4+ ion when necessary.
- Chloride ion: The Cl ion can cause corrosion in copper pipes, leading to perforation, at concentrations above 10mg/L.
- S04 2- ion: May cause perforation corrosion at concentrations above 30mg/L.
- Fluoride ion: Concentrations less than 0.1mg/L.
- Fe2+ and Fe3+ ion: When the dissolved oxygen concentration is less than 5mg/L, dissolved iron concentration is also less than 5mg/L.
- Dissolved silicon: Silicon is an acidoid which may cause corrosion at concentrations less than 1mg/L.
- Water hardness: At greater than 2.8℃ , a total hardness (TH) value between 10 and 25 is recommended to reduce contamination of copper pipes . When a large TH value is recorded, a pipe blockage may occur due to scale buildup. Total alkalinity below 100 is preferred.
- Dissolved oxygen: It is necessary to avoid sudden changes in oxygen levels. Using inert gas to deoxidize water or adding pure oxygen to oxidize it is dangerous since it may cause the copper piping to produce hydroxide.
- Conductivity: The higher the conducti vity, the l ess possi bi lity of cor rosi on. Conductivity above 3000 Ohm/cm is recommended. Neutral environments produce the largest conductivity, which could be within 200-6000 S/cm.
- PH: At 20-25℃ , the PH value should be close to neutral: 7<PH<8.

If water pipes are to be drained for more than one month, fll the pipes with nitrogen to prevent corrosion.

CAUTION!

Water flow must fall within the design range. Keep the water clean and perform appropriate treatments to ensure unit performance and reduce the possibility of pipe breakage due to corrosion, fouling and algae.
Carrier is not responsible for any damage to units caused by a failure to provide water treatment or the use of an improper water treatment.

4.2.3.3 Anti-freeze Protection

4.2.3.3 Anti-freeze Protection

A frost prevention device is built into the outdoor unit, but the plate exchanger, water pipes and water circulation pump may be susceptible to frost damage.

Units with an anti-freezing electric heater may provide anti-freeze protection when water temperature is below 3℃ .

Do not shut down power to the water pump, evaporator and heater in the water system, or else the anti-freeze protection will be ineffective.

Note: When the ambient temperature is below 0℃ , water in the system may freeze, causing damages to equipment. To prevent water in the system from freezing during winter, use the following preventive measures:

- If the unit is not in use for a long time during winter, drain all water from the system through the drain valve at the lowest point of the unit and hydronic kit. Otherwise, add an appropriate concentration of ethylene-glycol to the circulation water, as detai led in the following table. (Note that Carrier is not responsi ble for any damage to the unit caused by freezing if appropriate measures are not taken.

Digram 1

Ethylene glycol monohexyl	10%	20%	30%	40%
Icing temperature	-4℃	-9℃	-15℃	-23℃
Energy	0.992	0.988	0.983	0.977
Input power	0.997	0.996	0.994	0.992
Flow rate	1.001	1.033	1.071	1.115
Water pressure drop	1.040	1.186	1.362	1.577

- Use the heat pump unit intermittently in cold weather when the unit is not operating but has not been drained of water. Do not cut power to the unit.

4.2.3.4 Pipe Insulation

- Pipes are insulated to reduce energy loss and prevent condensation forming on the pipe surface and to ensure that water remains at the correct temperature throughout the air-conditioning system. Insulation is usually composed of an insulating layer and a protective layer. If the pipe is to be located at basement level or used to deliver low-temperature water, another waterproof layer is usually added.
- When adding insulation to a metal pipe, remove all exterior dirt and rust and then apply two layers of antirust paint and a 5mm- thick layer of plaster. Cover this with an insulation sheath. If there are seams on the sheath, be sure to stagger them. Seams must be sealed with plaster and tied with galvanized iron wire, covered with asphalt and marked with fow direction. Use colored paint to indicate pipe usage.

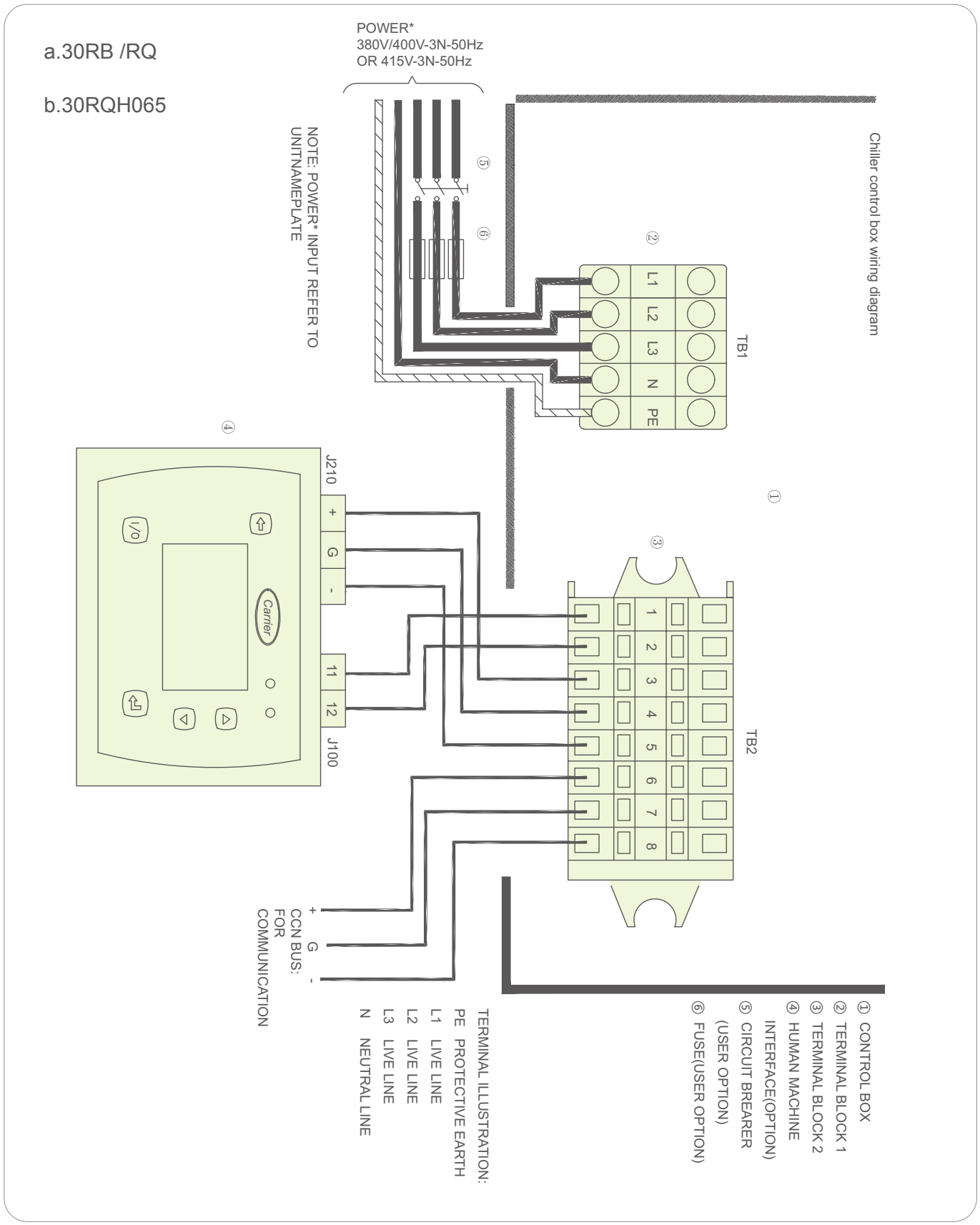
4.2.3.5 Pipe Installation Cautions

- Water system capacity must be regulated by professional designers to ensure that it matches the cooling capacity of indoor units.
- The pipe connector size of the air-conditioner outdoor unit must not be used to determine pipe size. Pipe size must be determined through water system design to guarantee correct water flow through the unit.
- To avoid damaging the unit, connect the inlet and outlet pipes as indicated. The water inlet pipe must be connected to the inlet connector labeled "water inlet". The water outlet pipe must be connected to the outlet connector labeled "water outlet".
- Connection the water system in the hydronic kit in accordance with the requirements stated in the Hydronic Kit Installation Manual.
- Install elastic connectors to reduce pipe vibration.
- During design, analyze the pressure at the lowest point of the water system or the outlet of the water pump and choose appropriate parts and equipment accordingly. Properly align the pipe network and equipment to help reduce pressure on the chilled water unit equipment and components.
- Pipes and equipment in the water system have pressure limits. The system pressure shall not exceed these limits. When pressure limits of pipes and equipments in tall buildings are insuffcient, they shall be partitioned by area.
- Before installing water system pipes, thoroughly clean the pipes using a soap solution. Scrub with cotton yarn, rinse with fresh water and then dry by wiping. If there is a delay during installation, block the pipe mouth with a rubber plug (or wrap it with tape) to prevent dirt or other contaminants from entering.Be sure not to leave cotton yarn, tape or other materials in the pipe as this may cause serious damage to the unit.
- After checking all pipes for leaks, wrap them with an insulation layer to reduce thermal loss and prevent condensation. The insulation material shall also be covered with a layer of waterproof material.
- When installing fusion-welded PP-R water pipes:
  1) Choose the correct pipe diameter to ensure that the inner diameter meets the water flow requirement.
  2) Do not allow the diameter of the pipe to shrink during fusion welding as this may increase water resistance.
  3) Consider the resistance added by PP-R pipe valves and various connectors.
  4) Consider the fixed space between pipes to prevent them bending and drooping during heating.
  5) When passing through a foundation wall, pipes must be equipped with metal sleeves.

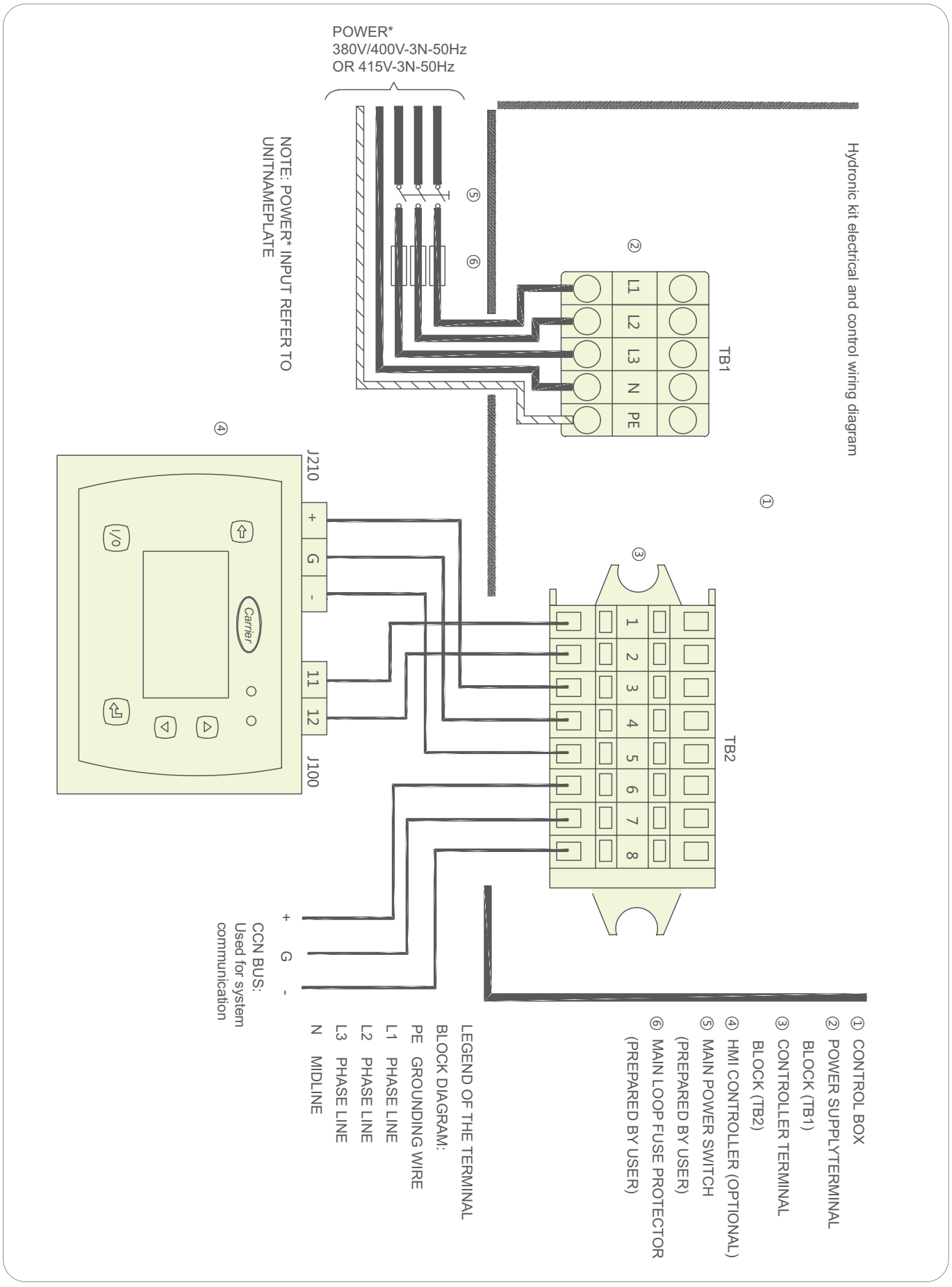
Chapter V Control System Installation

5.1 Control System Wiring Diagram

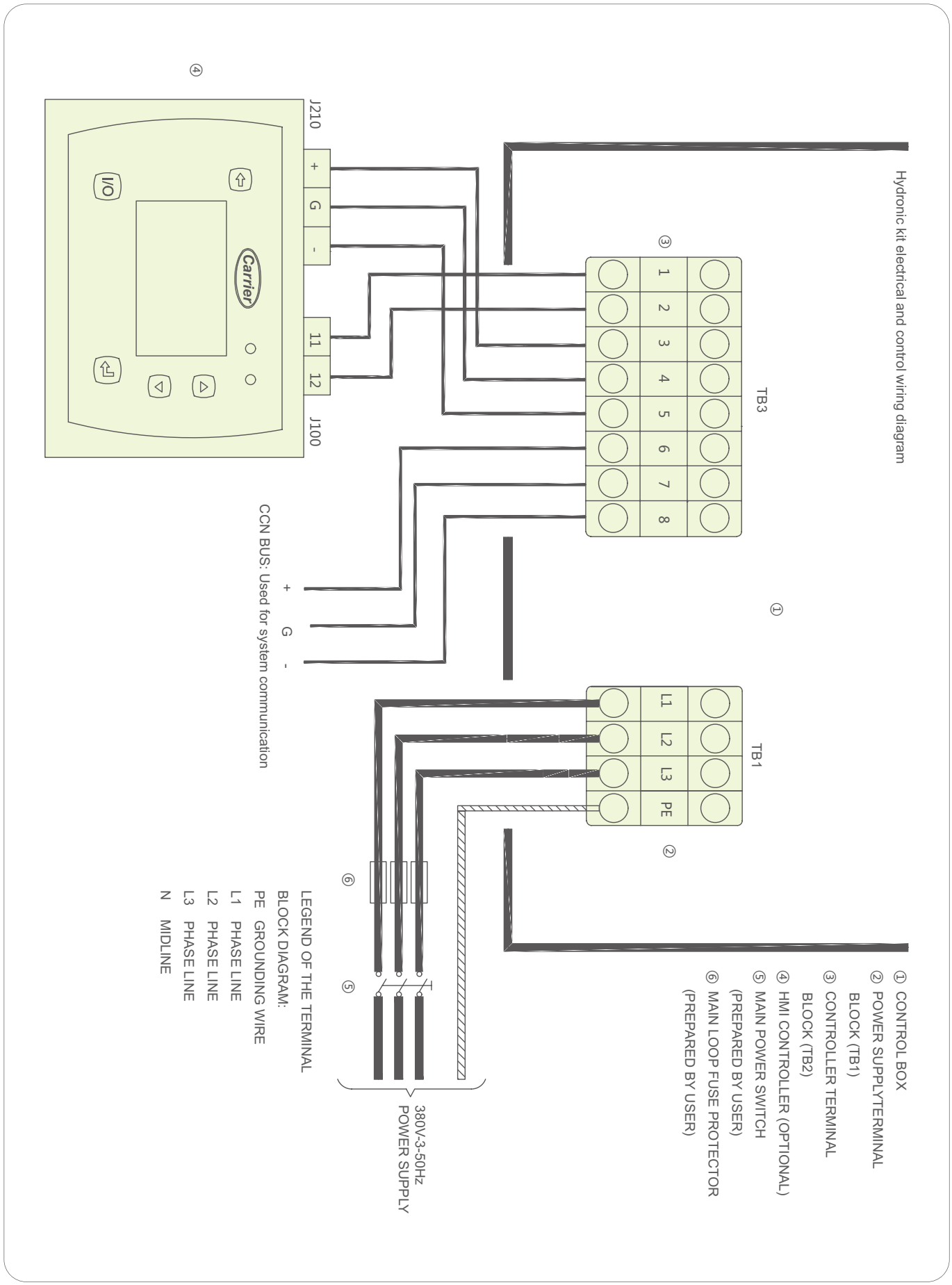
Chiller control box exterior wiring diagram:



Hydronic kit electrical and control wiring diagram:



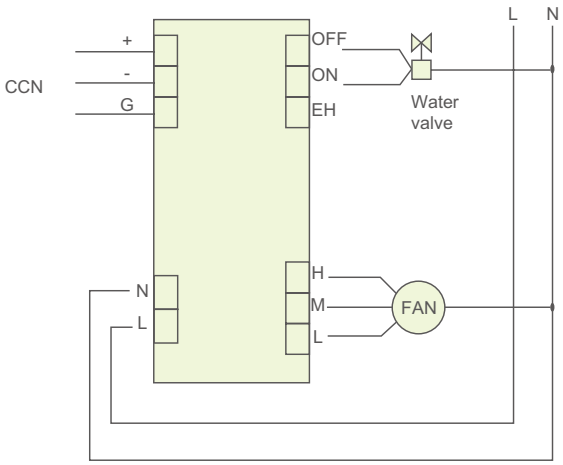
Fresh air unit electrical and control wiring diagram:



CTC100 thermostat electrical and control wiring diagram:

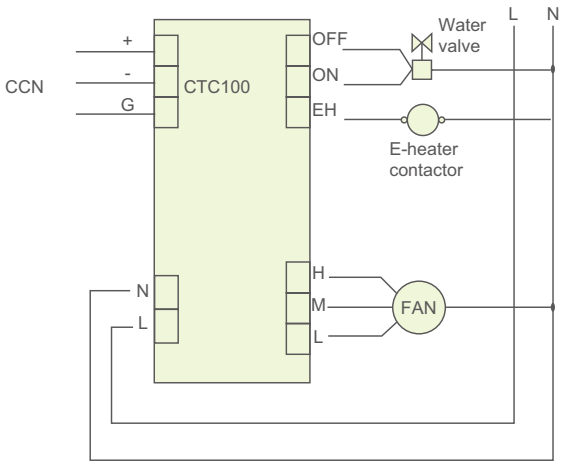
2 Pipes

AC220V~240V/50Hz



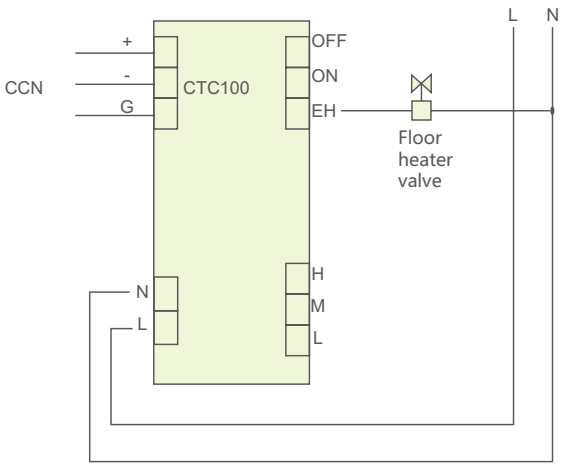
2 Pipes+E-heater

AC220V~240V/50Hz



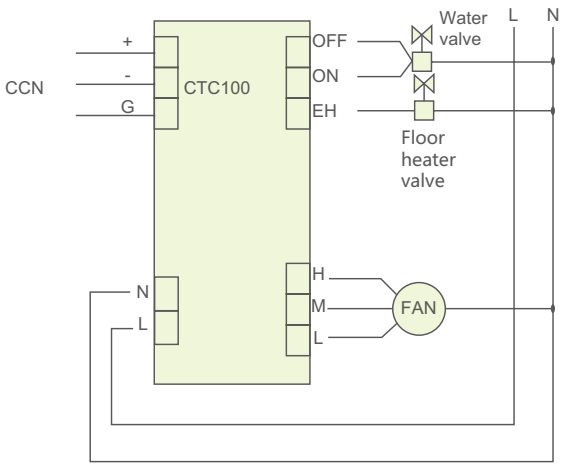
Floor heater

AC220V~240V/50Hz



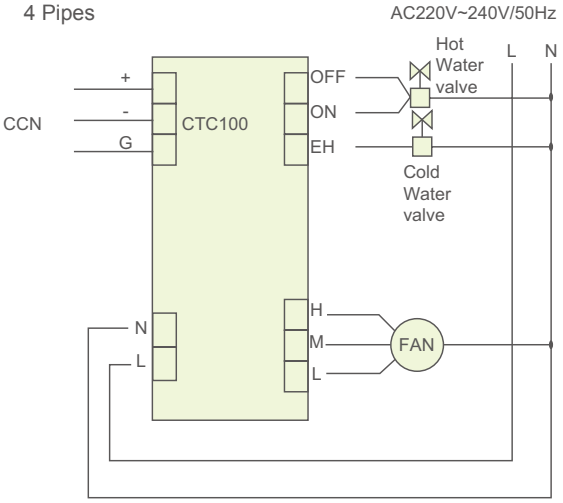
2 Pipes+floor heater

AC220V~240V/50Hz



4 Pipes

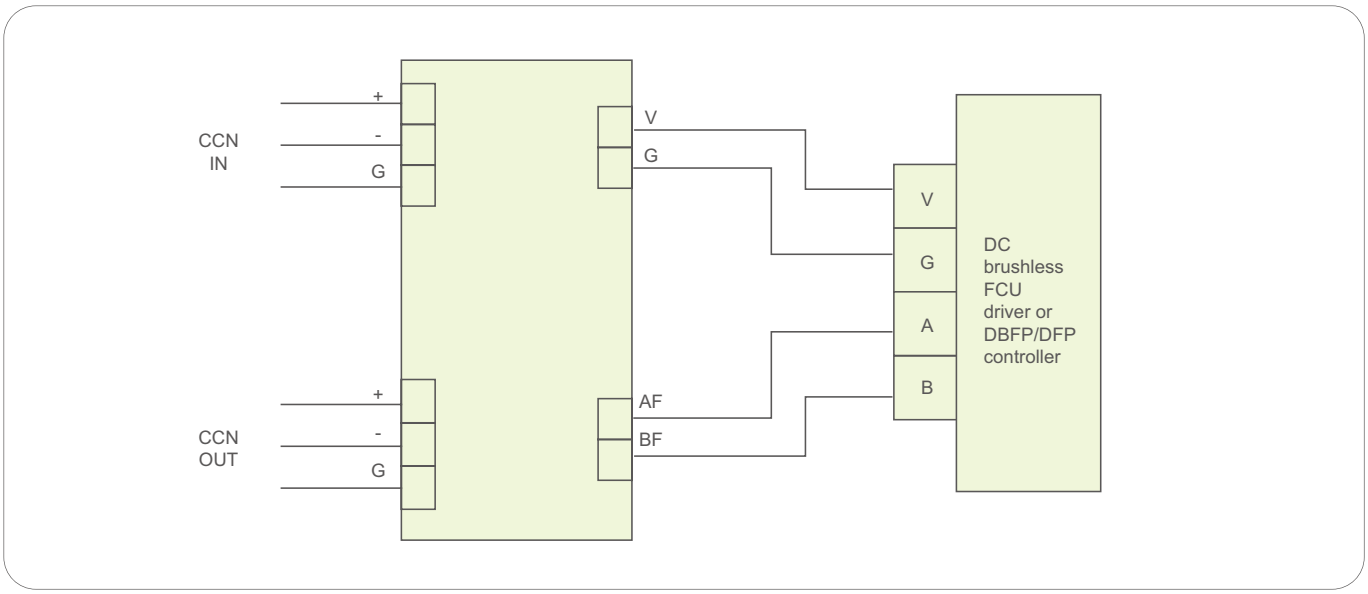
AC220V~240V/50Hz



CTC100 series AC fan-coil controller wiring diagram

Note: 1. CTC100 cannot drive electric heater directly, and contractor is selected by user;
2. CTC100 default application is “2-pipes”, please contact Carrier service engineer to change service configuration parameter if any other application is needed;
3. CTC only support 2-wire hot water valve under“4 pipes”or “radiator”application.

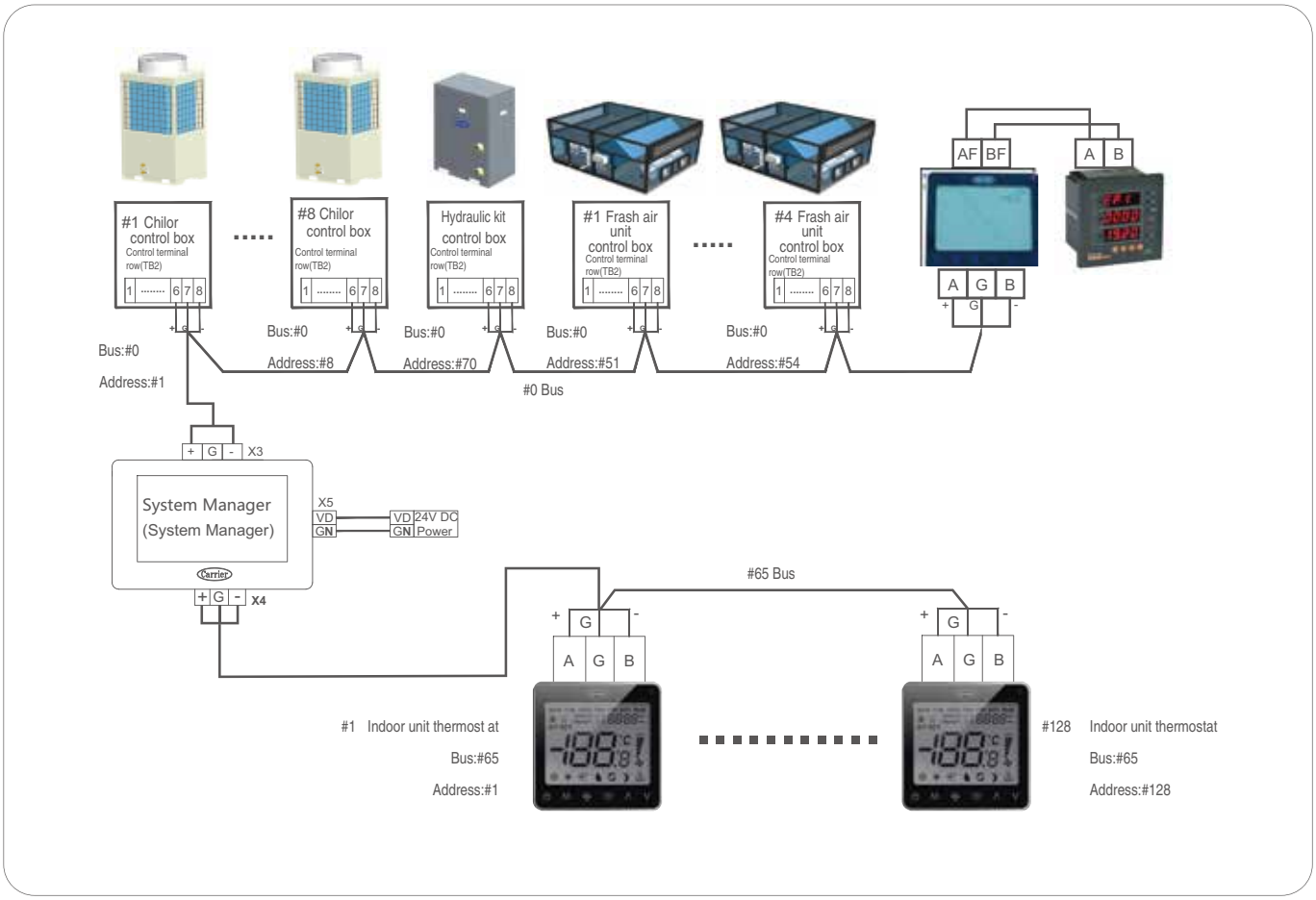
CTC200 thermostat electrical and control wiring diagram



CTC200 series DC brushless FCU driver or DBFP/DFP controller wiring diagram

Note: 1. Please make sure that communication cables AF and BF are connected correctly before starting CTC200.
2. CTC cannot support floor heating application.

System electrical and control wiring diagram:



说明：每台室外主机、水力模块、新风机和风机盘管必需单独引接电源，并配置相应的断路开关和过载保护，严禁通过另外一台机组的端子排引接。

Note:

Each outdoor unit, hydronic kit, fresh ai r unit and fan coil unit must be connected to the power supply separately and should be equipped with appropriate circuit breakers and overload protection. Connection through the terminal block of another unit is strictly prohibited.

#0 communication loop is used to connect the outdoor unit, hydronic kit and fresh air unit. Each piece of equipment must use the unit controller (optional) to set addresses. Bus address must be unique. Address of outdoor unit: Bus No.: 0, address range 1~8; address of hydronic kit: Bus No.: 0, address: 70; address of fresh air unit: Bus No.: 0, address range: 51~54. Connections must be chain mode. (Avoid star-shape, T-shape and loop.) The maximum allowed cable length is 400 meters.

#65 communication loop is used to connect the indoor fan coil controller. Address of fan coil controller: Bus No.: 65, address: 1-128. The address does not need to be set. It is automatically allocated by the System Manager. Connection must be chain mode. (Avoid star-shape, T-shape and loop.) The maximum allowed cable length is 400 meters.

Bus	Equipment	Bus No.	Address range	Setting description
#0Bus	ODU	0	1~8	Use HMI controller (optional) to set; do not repeat addresses
	FAU	0	51~54	Use HMI controller (optional) to set; do not repeat addresses
	Hydronic Kit	0	70	Use HMI controller (optional) to set
	Power meter converter	0	80	Use power meter converter (optional) to set, Power meter IP set as 1.
#65Bus	Thermostat	65	1~128	Use System Manager to automatically allocate

5.2 Wiring Requirements of Each Component

S/N	Description	Wiring recommendation requirements
1	Main unit power cable	refer to 5.1 graph
2	Indoor unit wiring (except for communication cables)	1.5mm² flexible wire
3	Hydronic kit power cable	refer to 5.1 graph
4	Fresh air unit power cable	refer to 5.1 graph
5	System Manager power cable	2×0.75mm² sheath wire
6	System Manager and computer connecting wire	Normal network cable
7	All communication cables	Use two core or three core shielded twisted pair, recommend for Belden8942, Belden8332,9829,8102,8302 also can be used.
8	HMI and outdoor unit connecting wire*	Power supply wire: 2x0.75mm² sheath wire communication wire: two core or three core shielded twisted pair, recommend for Belden8942, Belden8332, 9829,8102,8302 also can be used.
9	HMI and hydronic kit connecting wire*	Power supply wire: 2x0.75mm² sheath wire communication wire: two core or three core shielded twisted pair, recommend for Belden8942, Belden8332, 9829,8102,8302 also can be used.
10	HMI and fresh air unit connecting wire*	Power supply wire: 2x0.75mm² sheath wire communication wire: two core or three core shielded twisted pair, recommend for Belden8942, Belden8332, 9829,8102,8302 also can be used.

Note: : Items with * are options only used for system setting, address setting or single unit operation in emergency situation.

5.3 电气接线注意事项

- Open the electrical junction box lid and firmly connect the lead to the terminals in accordance with the above wiring diagrams.
- Electrical wiring must be in accordance with requirements in the manual and comply with local regulations.
- Consult the unit nameplate electrical parameters and comply with power source requirements.
- The main power source for each outdoor unit and hydronic kit must be equipped with an appropriate short circuit protection device such as circuit breaker, fuse etc. It is prohibited for multiple units to share a single short circuit protection device.
- Each indoor unit thermostat must be equipped with independent protected power.

Caution: Ensure that a circuit breaker that can cut off all phases is connected to the main power source. Its contact opening range shall be no less than 3mm.

- Concealed power and control cables must not be wired next to the refrigerant pipe. They must be enclosed in a separate duct.
- Wires must not come into contact with copper pipes, compressors, motors or other moving parts.
- The manufacturer is not responsible for problems caused by unauthorized changes to internal wiring.
- Wiring must be physically secured to avoid interference with operating machinery.
- All units must be grounded safely.
- The supply voltage 3-phase unbalanced ratio shall be no more than 2%. The supply voltage must be within 10% of the unit working voltage.

WARNINGS:

If the operating voltage of the unit exceeds the stated limits or voltage unbalance exceeds 2%, such improper operation may damage the unit. In such cases, please immediately contact your local power authority.

Cautions for RS485 communication cable wiring:

1. Communication line connecting the outdoor unit, hydronic kit and fresh ai r unit is the outdoor uni t bus; communication line connecting the indoor unit thermostat is the indoor unit bus. The outdoor unit bus must be connected tothe X3 terminal of the central control System Manager and the i ndoor unit bus must be connected to the X4 ter minal of the system control System Manager. X4 and X3 terminals shall not be reversed.
2. The two buses shall use hand-in-hand connection method, no star, T or ring type connection methods shall be used. The two buses cannot be connected together.
3. For all the communication terminals, A is positive terminal, B is negative and G is for grounding. A, B and G shall not be reversed.
4. Communication line shall utilize 24AWG shielded twisted pair, which shall be less than 400m long.

Cautions for avoidance of electromagnetic interference:

1. Install outdoor units away from sources of electromagnetic interference. Install controllers away from electrical equipment such as televisions and stereos to avoid interference.
2. Power cables and communication cables must be laid in separate ducts. Where there is not enough space, cross lay the cables.

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