

Engineered for flexibility and performance.™

4-pipe Cooling & Heating Air Cooled Screw Unit

Solution to Energy Utilization Ratio Maximization of Urban Building Complex



To satisfy the simultaneous cooling and heating demands of places such as large-scale integrated commercial buildings, hospital complexes, swimming pool buildings and cultural venues where have accurate temperature and humidity requirement, DAIKIN based on its rich development technologies and application experience on air cooled heat pump for over four decades, launched the following solution:

Solution to Energy Utilization Ratio Maximization of Urban Building Complex

——4-pipe Cooling & Heating Air Cooled Screw Unit

● Energy utilization ratio maximization

The design of building complex mainly takes into account reduction in the initial investment and later operation costs. For the place with coexistence of the cooling and heating demands, the 4-pipe cooling & heating air cooled screw unit supplies cold and heat sources at the same time. It recycles the waste condense heat to generate hot water during cooling, uses it to prepare hot water, and supplies the hot water to the terminal equipment as a heat source. With the integrated efficiency ICOP nearly reach 9.0, saves a lot of operating cost.

Integrated efficiency ICOP = (Cooling capacity + Heating capacity)/Input power

The unit integrated design does not require any special machine room and avoids splashing of cooling water. The rooftop or other open spaces are utilized effectively to maintain the appearance of the building.

● Improving the comfort greatly

Improvement of the quality of life guides people to seek the living air environment with higher quality. For the projects with high indoor temperature and humidity requirements, the 4-pipe cooling & heating air cooled screw unit provides cold source and heat source for 4-pipe terminal units at the same time, implements easy dehumidification and reheating at any time, achieves accurate temperature and humidity control.



Comprehensive building application:

Due to functional division, large comprehensive buildings are usually designed as podium building business district, tower office area and high-rise advanced hotel. In the business district: cooling is required all the year round due to the high crowd density and high heating load; Outside the office area: cooling required in summer and heating required in winter; Advanced hotel: adopting the 4-pipe terminal units to implement cooling in summer and heating in winter; customers have different cooling and heating demands in transition seasons.



Hospital application:

The hospital complex comprises numerous functional areas. For the operation room, ICU and other areas with accurate temperature and humidity control requirements: usually adopt 4-pipe AHU terminal with cooling coil and heating coil, and simultaneous cooling and heating is needed to realize accurate control on temperature and humidity.



Swimming pool application:

The indoor swimming pool with a high indoor moisture load requires cooling and dehumidification throughout the year; the water temperature of swimming pool needs to be kept constant by heating all the year round. Meanwhile, the indoor audience's stand and office area require cooling in summer and transition seasons, and air conditioning heating is needed in winter.



Other applications:

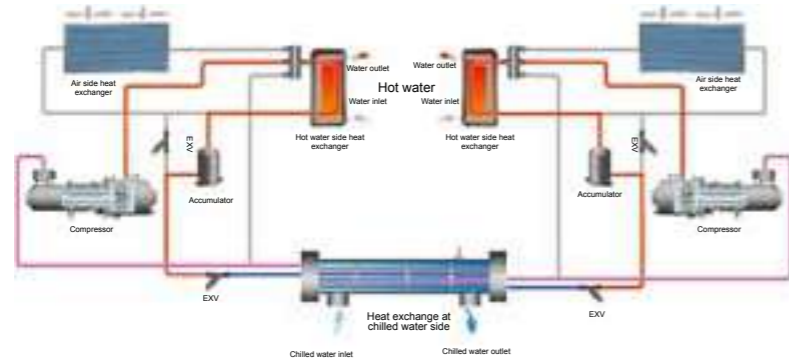
For the indoor environment of places such as museum, archives and art gallery with relatively high temperature and humidity requirements, the AHU terminal air supply equipment of 4-pipe system is used to implement cooling and dehumidification through the built-in cooling coil and reheating through the heating coil.

01

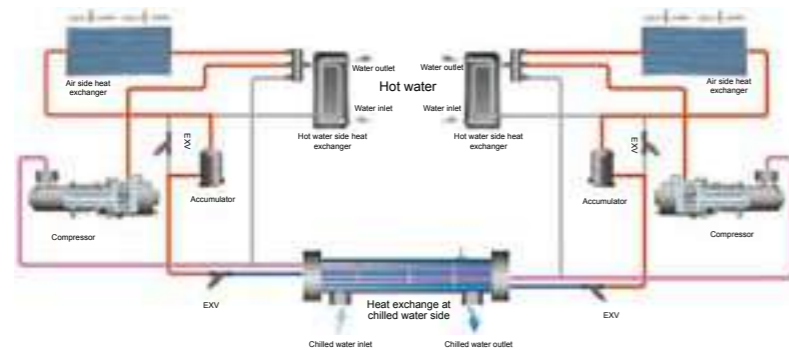
Simultaneous Cooling and Heating System Solutions

For buildings requiring cooling and heating at the same time, the need of cooling capacity and heating capacity may vary in different seasons or under different requirements. DAIKIN 4-pipe cooling & heating air cooled screw unit realize automatic output within the range of 12.5% to 100% according to the cooling capacity and heating capacity needs of buildings and become a perfect system solution implementing cooling and heating at the same time.

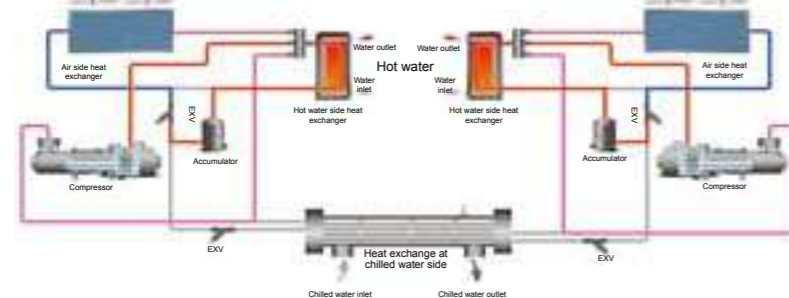
Cooling + heating: When cooling and heating are implemented at the same time, cold water is always provided at the cold water side, and hot water is always provided at the hot water side; the unit automatically detects the cooling and heating demands and balances the cooling and heating demands through the auxiliary heat exchanger, satisfying the application of providing cold water and hot water at the same time.



Cooling only: When cooling only is needed, the unit implements cooling separately, cold water is provided at the cold water side, and the air side heat exchanger is used as a condenser to discharge condensation heat to the atmosphere.



Heating only: When heating only is needed, the unit implements heating separately, hot water is provided at the hot water side and can be used for heating or used to heat water, and the air side heat exchanger is used as an evaporator to absorb heat from the atmosphere.



02

High Efficiency & Energy Saving and Stepless Regulation

Energy utilization ratio maximization

- ◆ Cooling and heating are implemented at the same time by consuming a small amount of electrical energy, and the cooling capacity and heating capacity are distributed according to buildings' needs to maximize the energy utilization ratio and achieve the comprehensive energy efficiency ICOP nearly reach 9.0, ensuring the most energy saving application; **Integrated efficiency ICOP = (Cooling capacity + Heating capacity)/Input power**
- ◆ With the high efficiency design, the full series reach the national level-2 energy efficiency standard and have passed the energy conservation certification.



Energy conservation certification



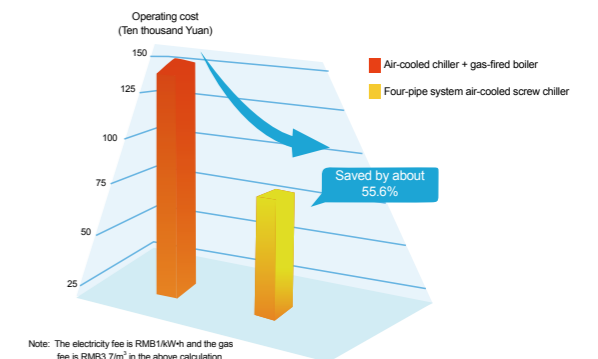
Energy efficiency label

Energy conservation certification

Take the operation room in a hospital in East China for an example, the cooling capacity is 720 kW, all-day operation for 24 h is supposed, the coefficient 0.7 is used, and the operating cost of the 4-pipe cooling & heating air cooled screw unit is compared with that of the traditional air-cooled chiller + gas-fired boiler solution:

Energy saving calculation analysis

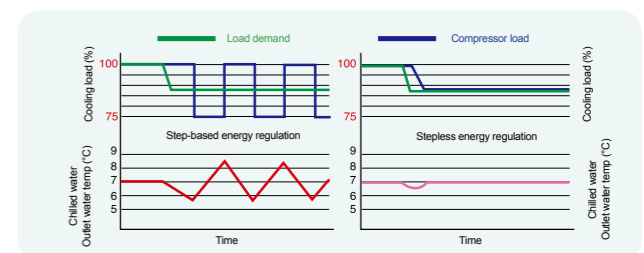
Season	Operation time/ h	Cooling load/ kW	Heating load/ kW	Operating cost (RMB)	
				Four-pipe system air-cooled screw chiller	Air-cooled chiller + gas-fired boiler
Summer	2,880	720	216	304,179	577,320
Transition season	2,880	360	432	161,009	560,004
Winter	2,880	36	432	219,691	405,316
Total annual operating cost (RMB)				648,878	1,542,640



Note: The electricity fee is RMB1/kWh and the gas fee is RMB3.7/m³ in the above calculation.

Free output of cold and heat and automatic balance of cooling and heating demands

- ◆ The unit adopts the adaptive cold and heat balance technology and controls output automatically according to the cooling and heating demand changes of buildings;
- ◆ The unit implements stepless regulation in the capacity range of 12.5% to 100% and responds rapidly to realize continuous and stable "output on demand". Meanwhile, the outlet water temperature is controlled accurately to make users feel more comfortable.



03

Simplification, Reliability, Environmental Protection and Low Noise

Integrated design and simple maintenance

- The cooling and heating integration design of unit avoids the defect of traditional cold source and heat source in separate configuration in the case of simultaneous supply.
- The unit can be installed flexibly, without setting any special room or purchasing equipment such as cooling tower and cooling water pump.



- The dual compressor design is adopted to balance the operating time of each compressor automatically, and the standby performance of compressor is bettered to guarantee use for users. The compressors start up one by one, so the startup current is small and reduces the impact on the power grid.
- The electrical part of unit and the master unit are designed as a whole, so the user does not need to set a special electric control cabinet; the intelligent control system monitors and controls the unit operating status automatically and displays the fault cause to facilitate unit maintenance.



Optimal configuration and reliable operation

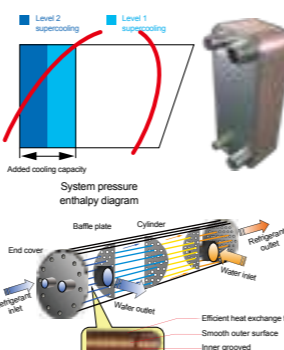
- Adopt R134a dedicated single screw compressor with patented technology, has higher energy efficiency in comparison with the regular screw compressor.



- The most advanced electronic expansion valve is used to control the refrigerant flow rate accurately, and make the unit adapt itself to multiple working conditions and operate in a wider operating range.



- The unit adopts the air heat exchanger with optimized design to realize level-1 supercooling, and the efficient stainless steel plate supercooling circuit realizes the secondary deep supercooling to enhance the unit cooling capacity and efficiency greatly.



- In the new efficient pure reverse-flow shell-and-tube evaporator, the refrigerant and water exchange heat in a reverse way to achieve an ultrahigh evaporation temperature and improve the heat exchange efficiency.

Low noise and environmental protection

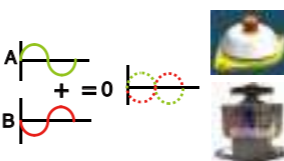
- The unit adopts an efficient and low-noise glass fiber resin screw-type fan, which is directly driven by the motor to eliminate the transmission loss and reduce vibration. Compared with the regular screw-type fan, the noise of the fan is reduced by 3 dB(A). Meanwhile, all the fans have undergone the static and dynamic stability test to ensure zero idling and thermal protection.



- The environment-friendly refrigerant R134a does not damage the ozone layer and also reduces the CO₂ discharge amount.



- The unit adopts compact design, rubber damper is installed under the compressor, and the base bears the weight of the whole unit in balance to reduce the vibration transmission. The standard factory configuration of the unit includes the spring damper to realize double shock absorption and further reduce vibration transmission in the building.



- The unit uses the clean electric energy, does not consume energy sources such as coal, oil and gas, so it does not generate harmful gas and waste material.



04

Intelligent Platform Comprehensive Monitoring

The unit adopts new generation controller Micro Tech III, which integrates heat pump application and empirical technologies of more than 4 decades and provides the programmable software to realize the compressor and fan combination with the highest energy efficiency. The controller can be used to change the unit setting point and check the unit control parameters, improving the unit energy efficiency and reliability to the greatest extent. All kinds of sensors of the system can pass various signal data to the controller accurately, enabling the controller to control and protect the unit more accurately, more reliable. The unit is simple to operate, only need to set the water temperature. The unit automatically controls output according to the cooling and heating load demands of buildings and does not require human intervention, saving a lot of management expenses for the equipment management party.

Built-in controller

- Controller type: PLC programmable;
- Operation language: Chinese / English;
- Screen display: LCD display;
- Working condition: Temperature: -20°C to 60°C; Relative humidity: < 90%.

Operating status query

- Unit status
- System status
- Temperature and superheat of suction and discharge
- Electronic expansion valve opening
- Inlet/Outlet water temperature
- Suction/Discharge pressure
- Oil pressure
- Ambient temperature

Main functions

- Auto load/unload based on changes of actual load;
- Operating status display;
- Common fault alarm display;
- Output load PID control;
- Common load control;
- Stepless load adjustment;
- Automatic startup after power restoration;
- Water temperature control accuracy to 0.5°C;
- Balancing the operating duration of each compressor;
- Three-level password protection;
- Fault history query;
- Timed power-on/off

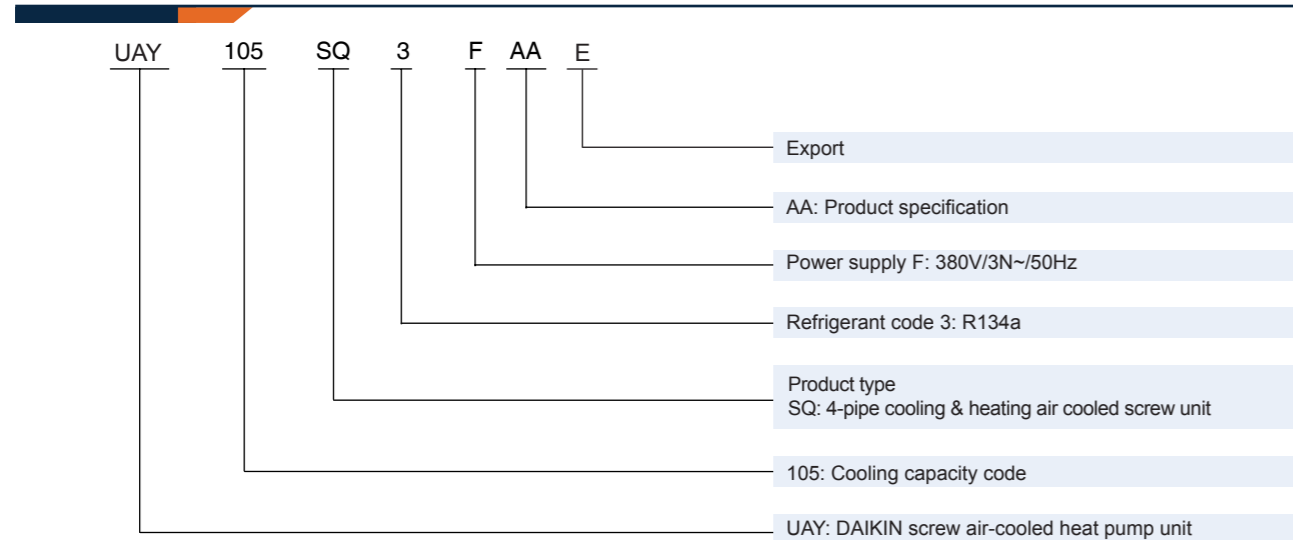
Protection functions

- High pressure protection
- Fan overload protection
- Discharge temperature protection
- Low compression ratio protection
- Controller communication failure protection
- Compressor startup failure
- Evaporator anti-freezing protection
- Low pressure protection
- Compressor overload protection
- High oil pressure difference protection
- Sensor failure protection
- Reverse phase and phase loss protection
- Water flow protection

Network control

The controller can add Modbus, LonWorks, BACnet protocol interfaces, can connect to central control or BAS, easy to realize intelligent management (optional).

Model Description



Operating Range

		UAY-SQ3
Cooling-only	Ambient temperature	-10°C ~ 50°C
	Outlet water temperature	4°C ~ 15°C
Heating-only	Ambient temperature	-10°C ~ 45°C
	Outlet water temperature	30°C ~ 60°C
Simultaneous cooling and heating	Ambient temperature	-10°C ~ 50°C
	Outlet chilled water temperature	4°C ~ 15°C
	Outlet hot water temperature	30°C ~ 60°C

Note: To control the outlet cooling water temperature of unit at -8°C to 4°C and 15°C to 35°C, please contact factory.

Optional Configuration

- Air side heat exchanger protection grille
- 50Pa/100Pa/150Pa high static pressure fan
- External controller
- Anti-corrosion fin
- Compressor box
- Soft starter
- BMS: Modbus, LonWorks, BACnet

Specifications

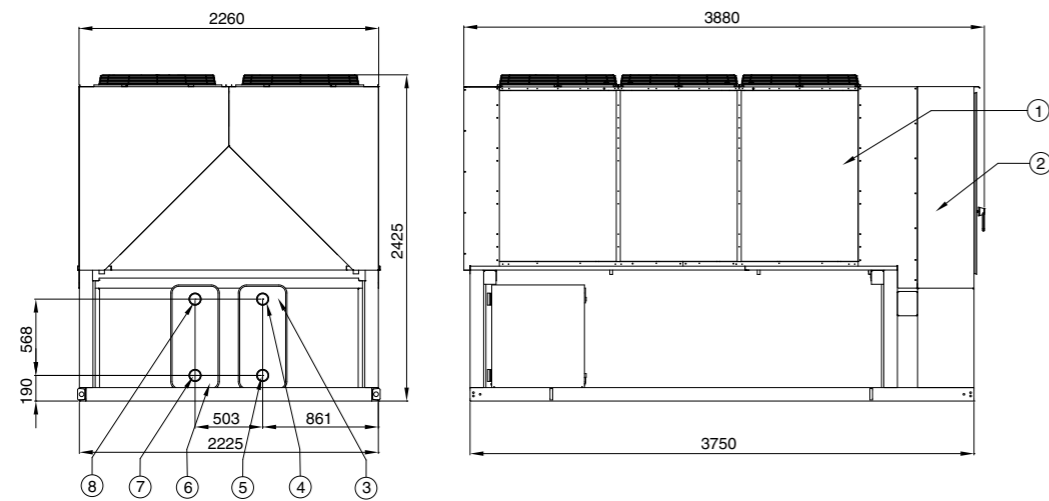
Unit Model UAY-SQ3		090	105	140	175	204	245		
Cooling Only	Nominal Cooling Capacity	kW	315	362	496	600	720	ZSS	
		10 ⁴ kca/h	27	31	43	52	62	74	
Heating Only	Nominal Heating Capacity	kW	84.6	100.8	139.0	166.3	201.0	237.5	
		10 ⁴ kca/h	28	32	43	52	63	75	
Simultaneous Cooling And Heating	Cooling Capacity	kW	325	365	500	610	724	S60	
	Heating Capacity	kW	403	462	634	772	918	1087	
	Total Input Power	kW	82.0	102.1	139.2	166.6	199.2	232.4	
Power Supply		380V / 3N ~ / 50HZ							
Capacity Steps		12.5%~100%							
Refrigerant		R134a							
Number Of Refrigerant Circuits		2							
Refrigerant Control		EXV							
Compressor	Type	Semi-hermetic Single-screw							
	Startup	Star-delta							
Air-side Heat Exchanger		Crossed Fin and Tube							
Fan	Type	Efficient spiral axial fan							
	Qty	n	6	6	8	10	12	14	
	Air Flow Input	x 10 ⁴ m ³ /h	10.8	10.8	14.4	18.0	21.6	25.2	
	Total Power	kW	12	12	16	20	24	28	
Heat Exchanger At Chilled Water Side	Type	Plate Heat Exchanger			Shell and Tube Heat Exchanger				
	Water Flow	m ³ /h	56	63	86	105	125	146	
	Water Pressure	kPa	13	16	61	42	65	56	
	Connection Pipe (OD)	inch	3			6			
	Maximum Pressure at Water Side	MPa	1.0						
Hot Water Side Heat Exchanger	Type	Plate Heat Exchanger							
	Qty	n	1			2			
	Water Flow	m ³ /h	69	79	109	133	158	187	
	Water Resistance	kPa	41	60	56	42	35/35	63/63	
	Connection Pipe (OD)	inch	3			8			
Maximum Pressure-bearing	MPa	1.0							
Unit Dimensions	Length	mm	3880	3880	4780	5700	6600	7500	
	Width	mm	2260						
	Height	mm	2425						
Weight	Transport Weight	kg	3620	3670	5130	5680	6360	7060	
	Operating Weight	kg	4000	4080	5490	6320	6750	7480	
Standard Accessories		Unit installation manual, spring shock absorber, water flow switch							

Notes:

- Nominal cooling conditions: EWT/LWT 12°C/7°C; ambient DB temperature 35°C;
- Nominal heating conditions: EWT/LWT 40°C/45°C; ambient DB temperature 7°C, WB temperature 6°C;
- Operating conditions of simultaneous cooling and heating: EWT/LWT 12°C/7°C; EWT/LWT of heating: 40°C/45°C.

Unit Dimension

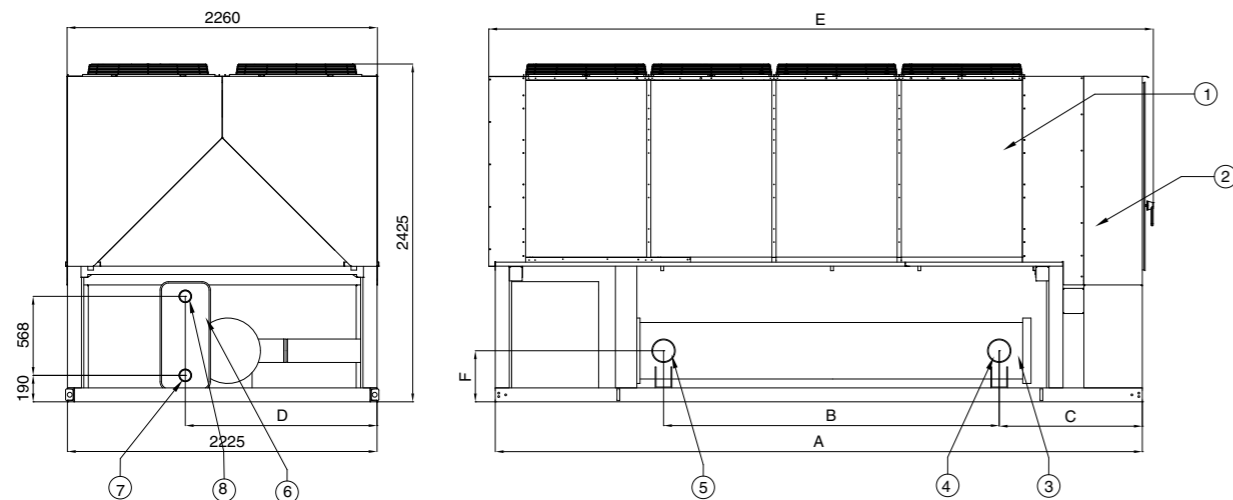
UAY090/105SQ3



1	Condenser	
2	Control cabinet	
3	Heat exchanger at chilled water side	
4	Chilled water inlet	3" victaulic connection (OD88.9)
5	Chilled water outlet	3" victaulic connection (OD88.9)
6	Hot water side heat exchanger	
7	Hot water inlet	3" victaulic connection (OD88.9)
8	Hot water outlet	3" victaulic connection (OD88.9)

Unit: mm

UAY140/175SQ3



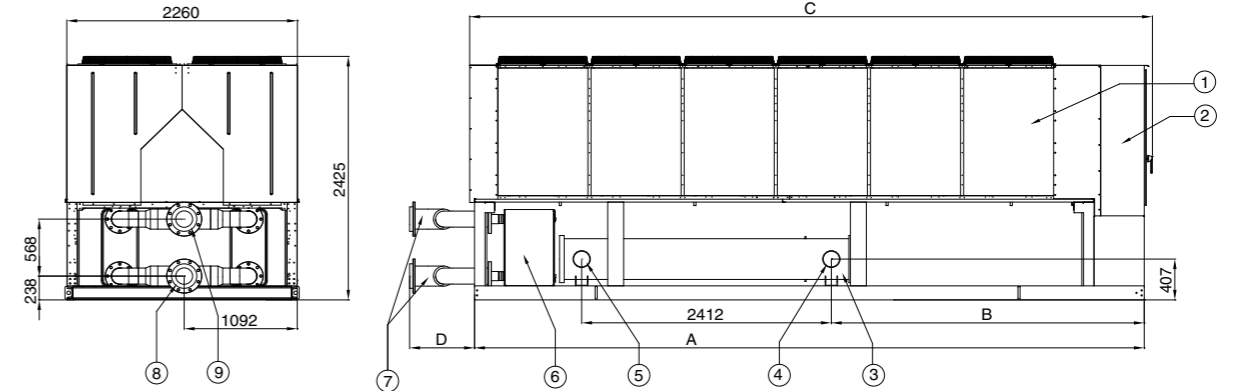
	A	B	C	D	E	F
UAY140	4650	2412	1029	1378	5700	367
UAY175	5570	2962	1193	1567	4780	407

1	Condenser	
2	Control cabinet	
3	Heat exchanger at chilled water side	
4	Chilled water inlet	6" victaulic connection (OD168.3)
5	Chilled water outlet	6" victaulic connection (OD168.3)
6	Hot water side heat exchanger	
7	Hot water inlet	3" victaulic connection (OD88.9)
8	Hot water outlet	3" victaulic connection (OD88.9)

Unit: mm

Unit Dimension

UAY204/245SQ3



	A	B	C	D
UAY204	6470	3023	6600	637
UAY245	7370	3477	7500	494

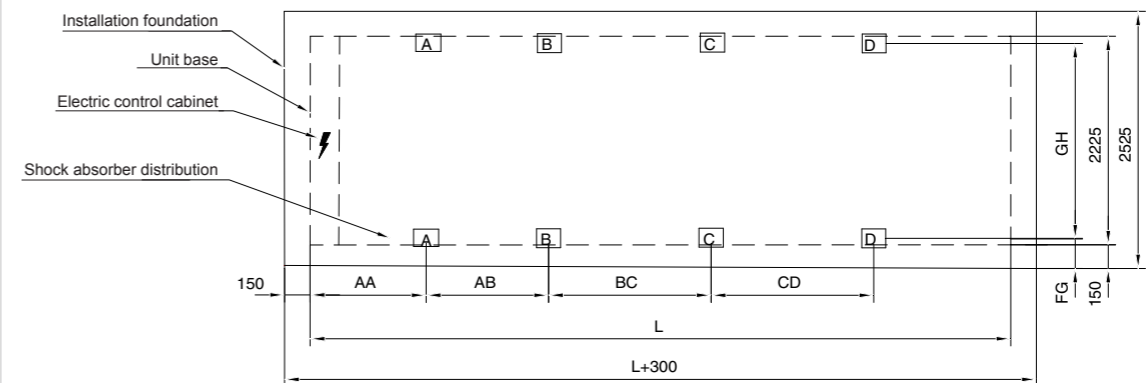
Remarks: Three-way valves for water inlet/outlet on the hot water side are supplied with the unit; field connection is completed by installation provider.

1	Condenser	
2	Control cabinet	
3	Heat exchanger at chilled water side	
4	Chilled water inlet	6" victaulic connection (OD168.3)
5	Chilled water outlet	6" victaulic connection (OD168.3)
6	Hot water side heat exchanger	
7	Three-way valves for water inlet/outlet on the hot water side	
8	Hot water inlet	8" flange (GB/T 9115.1,PN 1.6,DN200)
9	Hot water outlet	8" flange (GB/T 9115.1,PN 1.6,DN200)

Unit: mm

Foundation

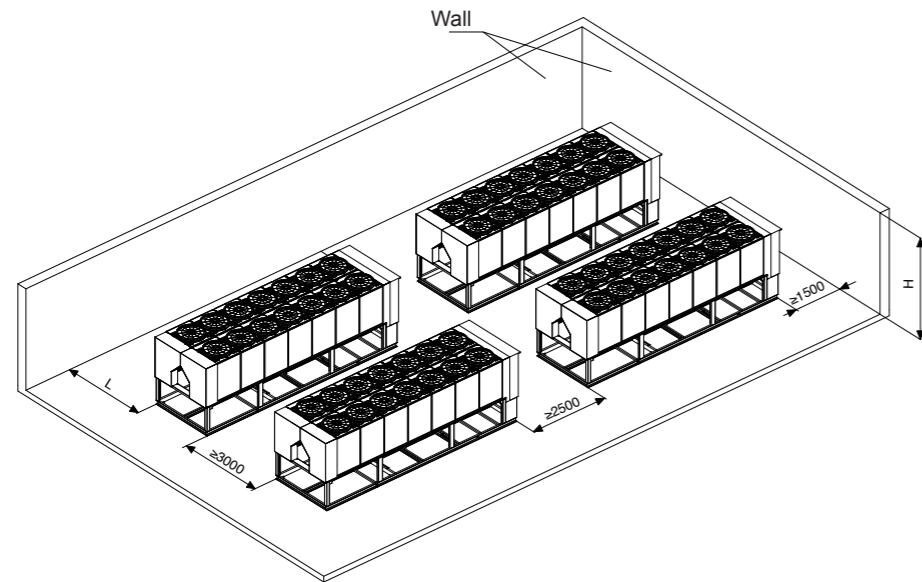
UAY090~245SQ3



Unit model	Installation dimensions of spring shock absorber (mm)							Load of spring shock absorber (kg)			
	L	AA	AB	BC	CD	FG	GH	A	B	C	D
UAY090SQ3	3750	1050	1800	--	--	170	2185	1005	995	--	--
UAY105SQ3	3750	1050	1800	--	--	170	2185	1025	1015	--	--
UAY140SQ3	4650	770	1500	1600	--	170	2185	900	935	910	--
UAY175SQ3	5570	770	1800	2000	--	178	2169	1045	1075	1040	--
UAY204SQ3	6470	770	1600	1600	1600	178	2169	825	885	870	795
UAY245SQ3	7370	1150	1800	1800	1600	178	2169	915	975	950	900

Unit: mm

Requirements for Unit Installation Space



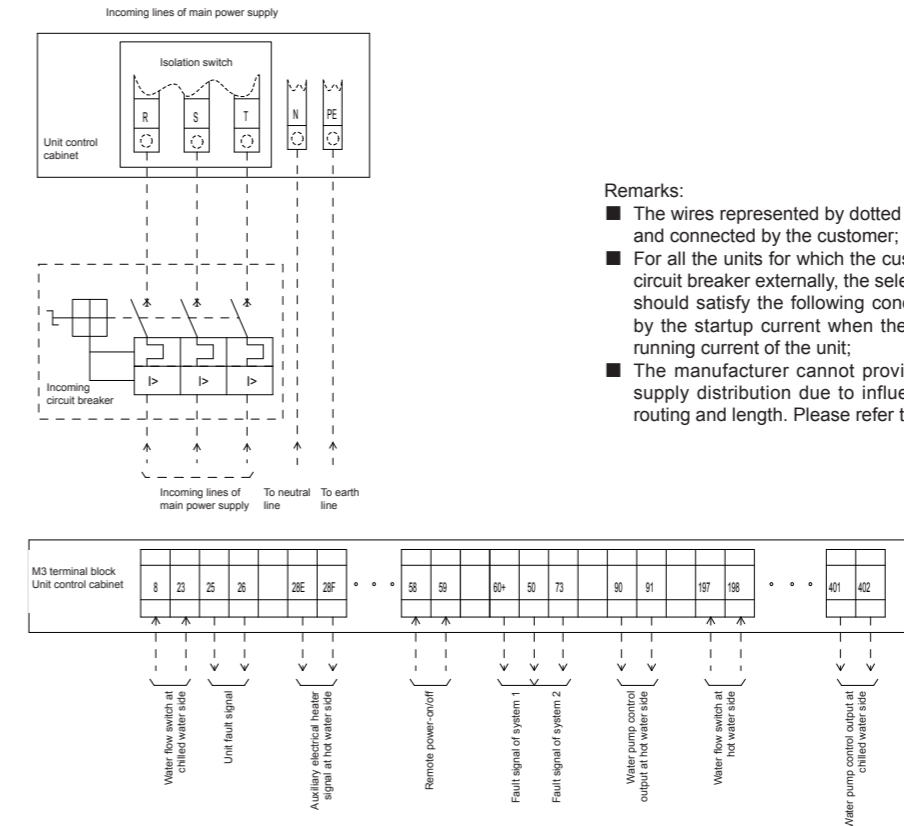
- Notes:
- During unit installation, (1) If $H > 2.5$ m, L should not less than 3.0 m; (H: wall height; L: unit-to-wall distance)
 - (2) If $1.1 \text{ m} \leq H \leq 2.5$ m, L should not less than 2.5 m;
 - (3) If $H < 1.1$ m, L should not less than 1.5 m.
 - If multiple units are installed, the maintenance space size requirements of a single unit should be satisfied at the same time.
 - The dimension unit is mm in the diagram unless otherwise specified.

Electrical Specifications

Model	Compressor		Fan		Nominal operating current			Max. operating current (A)	Inrush current (A)
	Qty	Fuse specification (A)	Qty	Rated current (A)	Cooling (A)	Heating (A)	Simultaneous cooling and heating (A)		
UAY090SQ3	2	200/200	6	4	168	163	152	284	349
UAY105SQ3	2	200/200	6	4	195	186	174	294	349
UAY140SQ3	2	250/250	8	4	251	232	223	361	464
UAY175SQ3	2	315/315	10	4	317	297	282	441	704
UAY204SQ3	2	355/355	12	4	359	346	345	523	751
UAY245SQ3	2	425/425	14	4	425	404	371	643	804

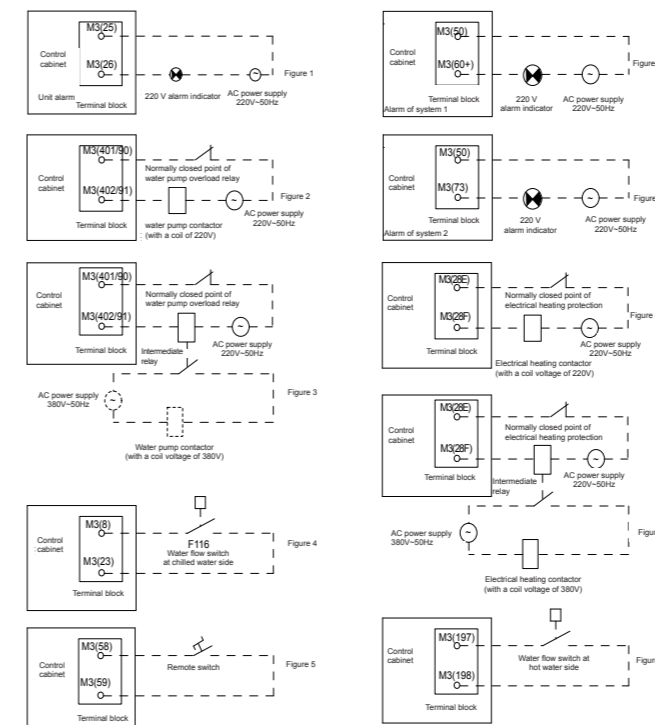
- Notes:
- The maximum operating current refers to the maximum operating current during cooling or heating and in the operating range of the unit;
 - Working conditions for nominal operating current: In cooling mode, ambient temperature: 35°C DB; chilled water inlet/outlet temperature: 12°C/7°C;
 - In heating mode, ambient temperature: 7°C DB (6°C WB); hot water inlet/outlet temperature: 40°C/45°C;
 - Inter-phase unbalance range: $\leq 2\%$;
 - Power supply voltage: 380V $\pm 10\%$.

Field Wiring Diagram



Remarks:

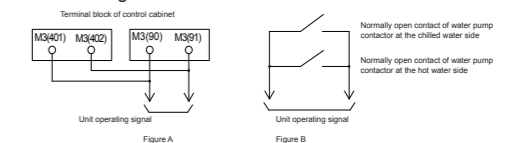
- The wires represented by dotted lines in the diagram should be provided and connected by the customer;
- For all the units for which the customer needs to configure the incoming circuit breaker externally, the selected external wires and circuit breakers should satisfy the following condition: misoperation will not be caused by the startup current when the current is greater than the maximum running current of the unit;
- The manufacturer cannot provide the specific specifications of main supply distribution due to influence by the actual conditions such as routing and length. Please refer to the related document.



No.	Signal	Signal type	Remarks
1	Unit failure	Passive dry contact output	For failure signal of the unit; see Figure 1
2	Water pump control output at chilled water side	Passive dry contact output	For the water pump control output at the chilled water side of the unit; see the wiring points of Figure 2 and Figure 3: M3(401)-M3(402)
3	Water pump control output at hot water side	Passive dry contact output	For the water pump control output at the hot water side of the unit; see the wiring points of Figure 2 and Figure 3: M3(90)-M3(91)
4	Water flow switch at chilled water side	Passive dry contact input	To check the water flow at the chilled water side of the unit; see Figure 4
5	Remote power-on/off	Passive dry contact input	To power on/off the unit; see Figure 5
6	Failure signal of system 1	Passive dry contact output	For the failure signal output of system 1; see Figure 6
7	Failure signal of system 2	Passive dry contact output	For the failure signal output of system 2; see Figure 7
8	Auxiliary electrical heater signal at hot water side	Passive dry contact output	For the auxiliary electrical heating signal output of the unit; see Figure 8 and Figure 9
9	Water flow switch at hot water side	Passive dry contact input	To check the water flow at the hot water side of unit; see Figure 10

Remarks:

- The unit operating signal can come from the wiring points for water pump control output signals at the chilled water side and hot water side on the terminal block, as shown in Figure A. If a wiring point is externally connected on the terminal block of the unit, the operating signal comes from the normally open contact of water pump contactor, as shown in Figure B.



- The fault, water pump output and auxiliary electrical heater contacts can be an AC voltage of 230V only. If the water pump and electrical heating contactor use a 380 V coil, converter is needed. See Figure 3 or Figure 9.
- Since the unit is subject to continuous improvement, please refer to drawings along with machine.



PM-UAY-SQ3-C001

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