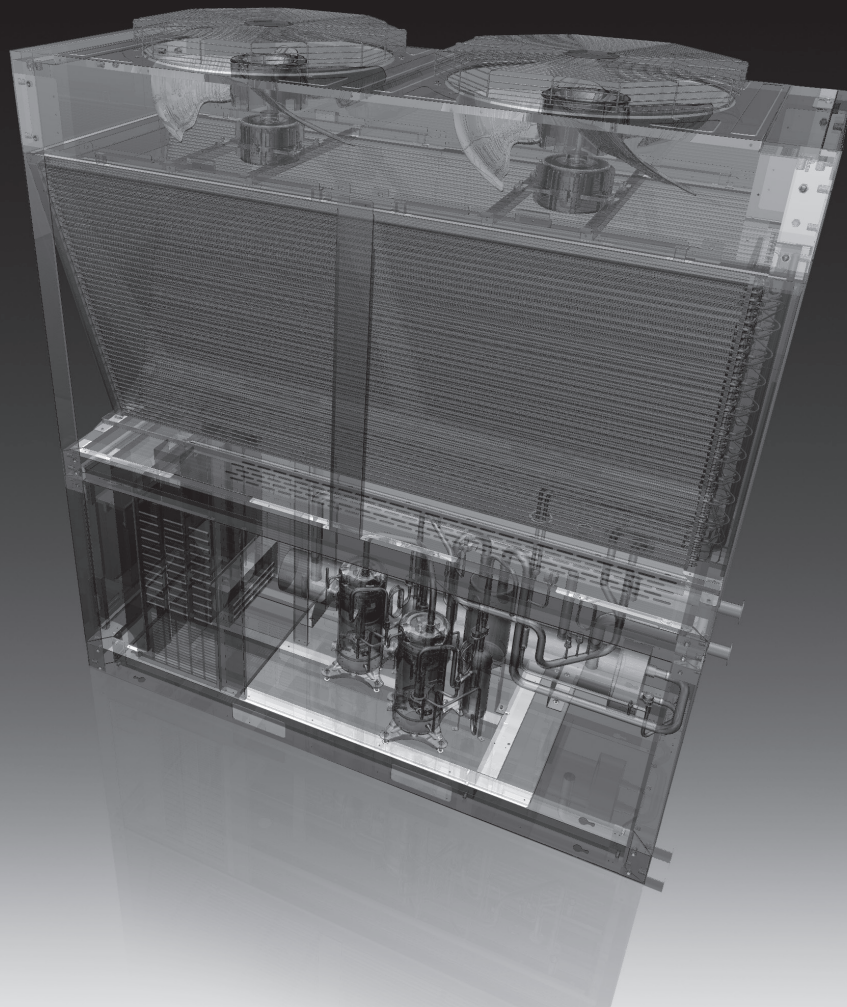
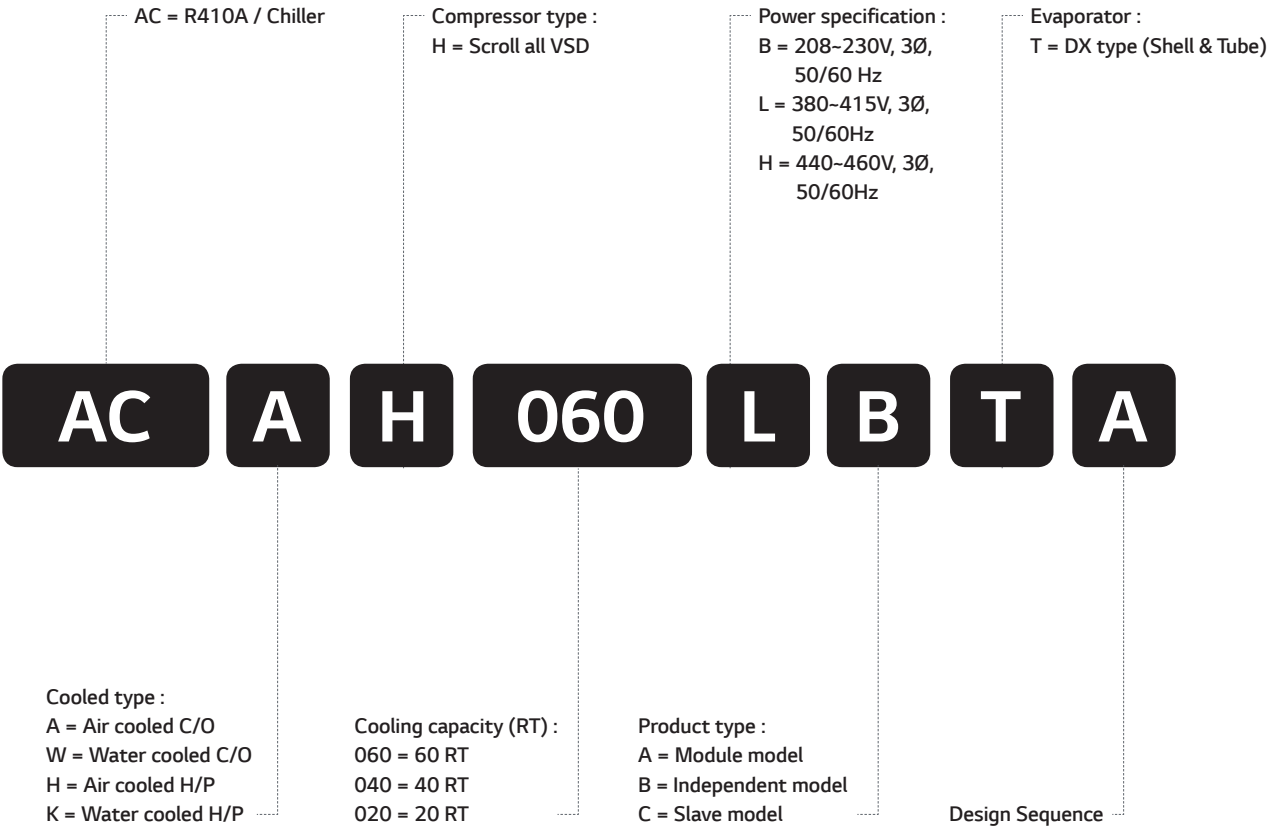


LG HVAC SOLUTION

AIR COOLED SCROLL CHILLER



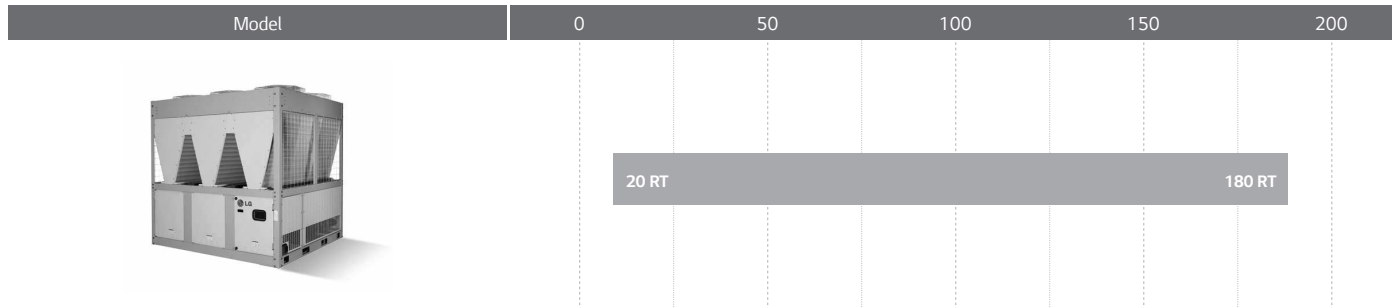


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Line up



LG Air cooled water chillers are complete, self-contained automatic refrigerating units that include the latest in engineering components arranged to provide a compact and efficient unit.

Each unit is completely assembled; factory wired, evacuated, charged, tested and comes complete and ready for installation.

Each unit consists of multiple air-cooled condensers with integral sub-cooler sections, two or more accessible hermetically scroll compressors, high efficiency evaporator, and electronic expansion valves.



- High-performance compressor manufactured by LG to ensure that the chiller is economical and durable with low vibration and low noise.
- Highly integrated motherboard is adopted and hence the function is strong and reliable.
- Advanced control algorithm is adopted to control chiller in advance and hence avoid frequent stoppage protection of chiller.
- We have set complete safety protection function in order to make chiller safely and reliably run.
- The linkage control and remote monitoring function of peripheral equipment ensure that the chiller can run safely and the operation and monitoring are convenient.
- The selection of excellent raw materials and fittings is the key to guaranteeing chiller quality.

Excellent reliability and powerful operation

The cutting-edge design of Air-cooled scroll chiller accomplishes high performance and reliability for industrial

and commercial market.

LG Air-cooled scroll compressors are precisely machined from solid compound metal bar using profound cutting process. Tolerance is maintained within a few microns just like one-tenth hair thickness. Robust components with highly skilled assembling process help the compressor last for a long time. LG condenser production technology is already well-known to worldwide air conditioning manufacturing industries because of its leading technologies.

World class high efficiency

The evaporator uses internally grooved tubes having helical angle which enhanced the refrigerant side heat transfer performance. The V-shape of condenser allows the largest heat transfer surface area for the same footprint, resulting in largest heat transfer performance when the configuration is optimally designed.

The LG V-shape condenser coil was designed using numerical and experimental analysis, having optimum air flow path to

optimize heat rejection performance.

Also, the enhanced condenser fin geometry allows the optimum heat transfer performance at small air side pressure drop, and this reduces the fan-motor power consumption. The fin is pre-coated to prevent corrosion at normal conditions and epoxy coated fin condenser which is sustainable in harsh conditions, is also available as option.

Low noise and low vibration

The unit was designed with a compact structure and robust assembly. The condenser fan is completed with high-efficiency wing style axial fan and direct driven motor for low sound level. The unit configures compressor sound insulation box (Option), which makes LG chillers silent and stable.

Installation, start-up

- Small operating footprint fit most retrofit applications.
- Factory testing for high reliability.
- Factory-installed and tested controls help to reduce start up time and minimized extra cost.
- Display temperatures and pressure for each component spot.

Compressor specification

- Hermetically sealed DC Scroll compressor.
- Variable Speed Drive (VSD)
- The VSD optimized for part-load conditions.
- A refrigerant dispersing device is set internally to the compressor for motor cooling.

Factory testing / Unit performance testing

LG air-cooled scroll chillers are given a complete functional test at the factory. LG computer-based testing programs completely check the components including sensors, wiring, electronics and microprocessor control functions.

LG promotes factory performance tests for air-cooled chillers to show that we stand behind the products which are designed and build up.

The benefits of a performance test include verification of performance, prevention of operational problems, and assurance of a smooth start-up. Each compressor is run and tested to verify capacity and efficiency.

Structural strength analysis

Structure is designed to ensure stiffness for various disturbances by steps of structure modeling, meshing, excitation and evaluation.

Structural strength evaluation simulation

Aerodynamic analysis

Condenser part is appropriately designed by aerodynamic analysis like inlet and outlet uniform airflow design and dead zone reduction design.

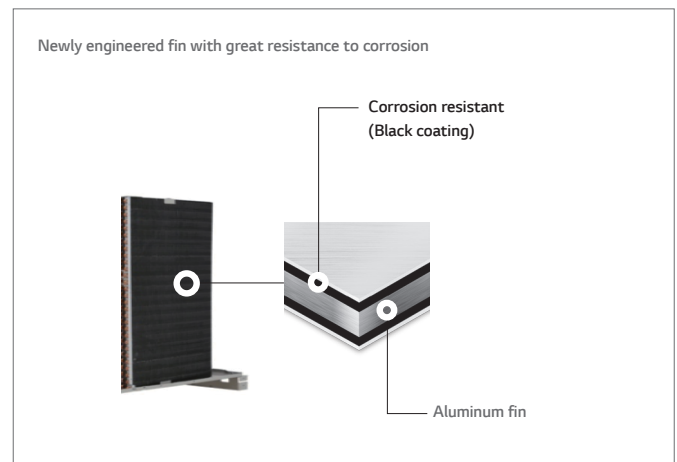
Heat circulation evaluation simulation

Eco-friendly refrigerant R410A

System designed with Eco-friendly refrigerant R410A which does not harm the ozone layer & protects the environment. The HCFC (R22, R123) series cannot produce any more from 2020 according to the Montreal Protocol for protection of ozone layer.

Black fin (Heat exchanger)

Heat Exchanger of outdoor unit is the core part that contributes to consistent cooling performance, yet is most vulnerable to corrosion. LG's exclusive black fin is highly corrosion resistant, designed to perform in corrosive environments such as coastal area.



Ocean black fin (Heat exchanger)

Black coating

The black coating is heavy anti-corrosion treatment applied to industrial equipment in the ocean. This special coating protects heat exchanger from high salinity, humidity and pollution

Salt water spray test

Heat exchanger with black fin passed 3,000 hour salt water spray test, while conventional heat exchanger started to corrode after 1,000 hours.

Dual protection (Components)

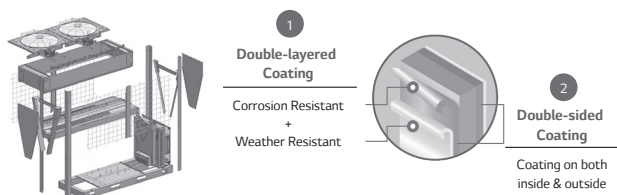
LG Corrosion resistance shields corrosive components with dual protection:

Double-layered Coating and Double-sided Coating. Components include panels, base pan, brackets and valve supporter.

Dual protection coating on core components provides strong protection for both inside and outside

1 Double-layered coating

Double-layered coating protects the system not only from damage of harsh weather but also from deterioration of metal.



2 Double-sided Coating

Double-sided coating applied in the manufacturing process protects the system both inside and outside at the same time.

Salt water spray test

Components with dual protection passed 1,500 hour salt water spray test, while components with conventional coating started to corrode after 500 hours.

Selection guide

The product information required in various requirements is written in detail from performance data.

If you need a product for special system application or product with the condition outside this catalogue, please get consultation from nearby sales office or specialty store.

Selection procedure

1. Check usage condition

Before selecting the model, the following usage conditions must be decided.

- Chilled water in/out temperature and outdoor temperature
- Chilled water flow amount (flow amount can be calculated if you know the freezing load and chilled water in/out temperature.)

2. Selecting candidate model

Required rated capability is selected through load calculation, and you can select the corresponding model by looking at specification & performance data table.

When you select the candidate model, do not select a model with less volume than the required rated capability, but select a model with the same or bigger volume.

3. Performance adjustment for fouling

The data in this technical data manual is based on chilled water fouling coefficient of 0.000018 m²°C/W at sea level. If altitude or fouling coefficient is different, you have to apply appropriate adjustment coefficient from the following

table to calculate data for the operation condition.

Altitude	Water in/out temperature difference (°C)	Fouling coefficient			
		0.000018 m ² °C/W		0.000054 m ² °C/W	
		Cooling capability	Power consumption	Cooling capability	Power consumption
Sea level (0m)	4	0.991	0.998	0.979	0.996
	5	1.000	1.000	0.990	0.998
	6	1.010	1.002	1.001	1.000
	7	1.020	1.005	1.010	1.003
	8	1.028	1.006	1.019	1.004
500 m	4	0.988	1.004	0.979	1.002
	5	0.998	1.006	0.988	1.004
	6	1.008	1.008	0.998	1.006
	7	1.017	1.010	1.008	1.008
	8	1.026	1.012	1.017	1.010
1,000 m	4	0.985	1.011	0.977	1.008
	5	0.995	1.013	0.985	1.010
	6	1.005	1.015	0.995	1.012
	7	1.014	1.017	1.005	1.014
	8	1.023	1.019	1.014	1.016
1,500 m	4	0.982	1.018	0.974	1.016
	5	0.992	1.020	0.983	1.018
	6	1.002	1.022	0.993	1.020
	7	1.011	1.025	1.003	1.023
	8	1.020	1.027	1.011	1.025

4. Performance adjustment after adding freeze and burst prevention solution

If cooling operation is performed in Winter, or if water inside the cycle is not removed in the resting phase, you have to add freeze and burst prevention solution to protect from freeze and burst.

Freezer characteristics change by adding freeze and burst prevention solution, so it should be adjusted.

Refer to the following table for the adjustment coefficient after adding freeze and burst prevention solution.

Antifreeze Type	Item	Antifreeze % by wt				
		10 %	20 %	30 %	40 %	50 %
Methanol	Cooling	0.998	0.997	0.995	0.993	0.992
	Pressure Drop	1.023	1.057	1.091	1.122	1.160
Ethylene glycol	Cooling	0.996	0.991	0.987	0.983	0.979
	Pressure Drop	1.024	1.068	1.124	1.188	1.263
Propylene glycol	Cooling	0.993	0.987	0.980	0.974	0.968
	Pressure Drop	1.040	1.098	1.174	1.273	1.405

5. Finalizing the model

As a result of verifying product performance and power consumption considering various adjustment coefficients for the candidate models, if there is no problem, you can

finalize it as the final model.

If there is a problem, review again from the candidate model selection stage.

Example: selecting model

1. Site with outdoor temperature is 30°C, fouling coefficient is 0.000054m²°C/W, altitude is 500m, ethylene glycol volume concentration 30% added chilled water is used, required cooling capability is 65kW, chilled water in/out condition is 14°C > 9°C.
2. Find appropriate model in product dimension table and verify power consumption, dimension, etc.
 - Candidate model ACAH020LBTA: cooling capability 65kW, power consumption 21.7kW, COP 3.0, dimension: 765 x 2 351 x 2 154 mm
3. Check the capability and power consumption in the usage condition of the selected model by cooling capability change table.
 - Chilled water in/out condition: in 14°C > 9°C condition, cooling capability: 72.3 kW, power consumption: 19.4 kW, COP: 3.7
4. Carry out performance adjustment after fouling and freeze and burst solution addition.
 - Cooling capability: 72.3 X 0.988 x 0.987 = 70.5 kW
 - Power consumption: 19.4 X 1.006 = 19.5 kW
5. Calculate freezer power consumption in usage condition.
 - Load ratio: required cooling capability / model cooling capability = 65 / 70.5 = 0.92
 - In rated condition, power consumption \div model power consumption x load ratio = 19.5 x 0.92 = 17.9 kW
6. Calculate flow amount in usage condition.
 - Formula to get flow amount: l / min = kW X 12.9 / ΔT
 Flow amount = 65 kW X 12.9 / 5°C = 168 l / min
7. Review if the calculated specification is suitable for the site.

Range of outlet water temperature

Model	Cold water outlet temperature (°C)	
	Min.	Max.
ACAH020	5	15
ACAH040		
ACAH060		

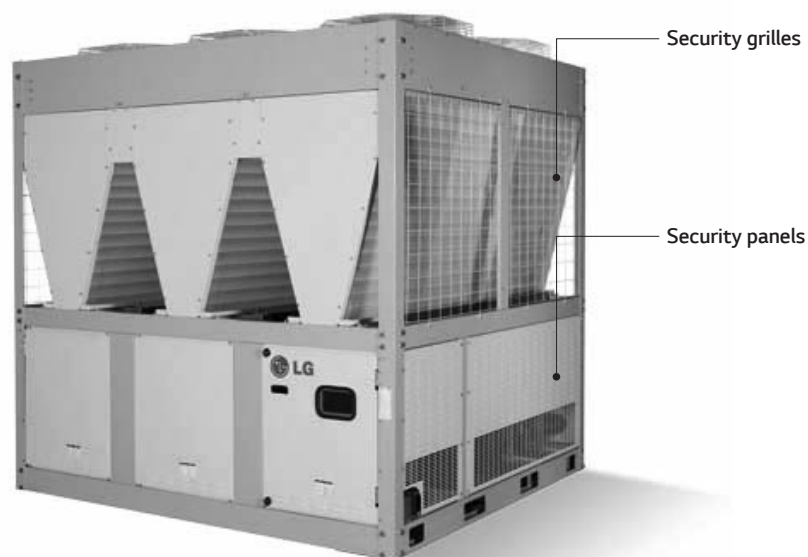
Range of outdoor air temperature

Model	Cooling outdoor air temperature	
	Min.	Max.
ACAH020	-10	48
ACAH040		
ACAH060		

Operation Limit

Model	Voltage (V)		Capacity		Cold water flow rate(/min)	
	Min.	Max.	Max.	Max.	Min.	Max.
ACAH020BBTA	180	253			126	250
ACAH040BBTA					252	500
ACAH060BBTA					378	750
ACAH020LBTA	342	456	10 %	100 %	126	250
ACAH040LBTA					252	500
ACAH060LBTA					378	750
ACAH020HBTA	396	506			126	250
ACAH040HBTA					252	500
ACAH060HBTA					378	750

Category	Optional list	Standard	Option	Remark
Refrigerant	Factory charging		√	
Operation temperature	Leaving chilled water	√		5~15°C
	Air ambient	√		-10~48°C
BMS Interface	Modbus	√		
Corrosion protection	Gold fin		√	
	Pre coated fin		√	Polyurethane including aluminum powder
	Black fin		√	Epoxy resin coating covered with hydrophilic film
	Double-layered coating		√	
Protection guard	Security grilles (upper side)		√	Wire grille only
	Security panels (lower side)		√	Louver panel only
Evaporator	10kg/cm ²	√		
	Flange	√		Exclude counter flange
Insulations	Compressor acoustic enclosure		√	
	Double thickness insulation		√	
Others	High/Low pressure protection	√		
	Anti-Freezing	√		
	Anti-Phase sensor	√		
	Flow switch	√		



Specification

Model		Units	ACAH020	ACAH040	ACAH060
Standard Condition	Cooling capacity	kW	65	130	195
		RT	18	37	55
	Input Power	kW	21.7	43.3	65.0
	COP	W/W	3		
Compressors	Type	-	Hermetically sealed DC scroll (VSD)		
	No	EA	2	4	6
	Oil	-	PVE		
	Oil Charging	cc	1,400 x 2	1,400 x 4	1,400 x 6
	Sump Heater	W	60 x 2	60 x 4	60 x 6
	Refrigerant Name	m ²	R410A		
Refrigerant	Weight	EA	14 x 1	14 x 2	14 x 3
Condenser	Type	-	Fin & Tube		
	Material		Al / Cu		
	Fin Type	-	Wide Louver PLUS		
	Tube Diameter	mm	Ø 7		
Evaporator	Type	-	Shell & Tube		
	Pressure Drop	kPa	114		
	Operating Max Pressure (Refrigerant/Water)	kg/cm ²	42 / 10		
	Flow Rate	LPM	187	373	560
	Inlet/Outlet Diameter	mm	40A / 40A	65A / 65A	65A / 65A
Fan Motor	Type	-	BLDC		
	No	EA	2	4	6
	Blade	EA	4	4	4
	Air Flow	CMM	210 x 2 @1,000rpm	210 x 4 @1,000rpm	210 x 6 @1,000rpm
	Motor Ouput	W	900 x 2	900 x 4	900 x 6
Expasion Device		-	EEV		
Weight		kg	590	1,150	1,710
Dimension	W x H x D	mm	765 x 2,351 x 2,154	1,528 x 2,351 x 2,154	2,291 x 2,351 x 2,154
Footprint		m ² /RT	0.089		
Safety Device	High/Low Protection	-	0		
	Anti-Freezing	-	0		
	Anti-Phase Sensor	-	0		
	Flow Switch	-	0		
Remote Control		-	Modbus		
Outlet Water Temperature Range		°C	5~15		
Operating Outdoor Temperature Range		°C	-10~48		

Note:

1. Standard conditions:

Ambient temperature is 35°C.

Chilled water temperature outlet is 7°C. Temperature difference is 5°C.

2. Due to our policy of innovation some specifications may be changed without prior notification.

Performance data

ACAH020

Outdoor Air Temp.(°C)	Classification	Water Outlet Temperature (°C)					
		5	7	9	11	13	15
-5	Capacity	83.0	85.3	87.6	90.0	92.5	95.0
	Power input	13.7	13.8	14.0	14.1	14.2	14.4
	COP	6.1	6.2	6.3	6.4	6.5	6.6
0	Capacity	81.3	83.6	85.9	88.3	90.8	93.4
	Power input	13.9	14.0	14.2	14.3	14.4	14.6
	COP	5.9	6.0	6.1	6.2	6.3	6.4
5	Capacity	79.5	81.7	83.9	86.3	88.7	91.1
	Power input	14.3	14.5	14.6	14.7	14.9	15.0
	COP	5.5	5.6	5.7	5.8	6.0	6.1
10	Capacity	77.6	79.7	81.9	84.2	86.5	88.9
	Power input	14.8	14.9	15.1	15.2	15.3	15.5
	COP	5.3	5.3	5.4	5.5	5.6	5.7
15	Capacity	75.4	77.8	80.3	82.9	85.6	88.3
	Power input	15.5	15.7	15.8	15.9	16.1	16.2
	COP	4.9	5.0	5.1	5.2	5.3	5.4
20	Capacity	73.2	75.9	78.7	81.6	84.6	87.7
	Power input	16.3	16.4	16.6	16.7	16.8	17.0
	COP	4.5	4.6	4.8	4.9	5.0	5.2
25	Capacity	70.1	72.8	75.5	78.3	81.3	84.3
	Power input	17.9	17.9	18.0	18.0	18.0	18.1
	COP	3.9	4.1	4.2	4.4	4.5	4.7
30	Capacity	67.1	69.6	72.3	75.1	77.9	80.9
	Power input	19.5	19.4	19.4	19.3	19.2	19.2
	COP	3.4	3.6	3.7	3.9	4.1	4.2
35	Capacity	62.2	65.0	68.0	71.1	74.4	77.8
	Power input	21.5	21.7	21.9	22.1	22.3	22.5
	COP	2.9	3.0	3.1	3.2	3.3	3.4
40	Capacity	57.2	60.4	63.7	67.2	70.8	74.7
	Power input	23.5	24.0	24.5	25.0	25.5	26.0
	COP	2.4	2.5	2.6	2.7	2.8	2.9
45	Capacity	51.9	55.4	59.1	63.0	67.2	71.6
	Power input	25.7	26.4	27.2	28.1	28.9	29.8
	COP	2.0	2.1	2.2	2.2	2.3	2.4

Note:
 1. Unit: Capacity / Power input (kW), COP (W/W)
 2. Water flow rate of test condition: 180 LPM

Performance data

ACAH040

Outdoor Air Temp.(°C)	Classification	Water Outlet Temperature (°C)					
		5	7	9	11	13	15
-5	Capacity	166.0	170.6	175.2	180.0	185.0	190.0
	Power input	27.3	27.5	27.9	28.1	28.3	28.7
	COP	6.1	6.2	6.3	6.4	6.5	6.6
0	Capacity	162.6	167.2	171.8	176.6	181.6	186.8
	Power input	27.7	27.9	28.3	28.5	28.7	29.1
	COP	5.9	6.0	6.1	6.2	6.3	6.4
5	Capacity	159.0	163.4	167.8	172.6	177.4	182.2
	Power input	28.5	28.9	29.1	29.3	29.7	29.9
	COP	5.6	5.6	5.8	5.9	6.0	6.1
10	Capacity	155.2	159.4	163.8	168.4	173.0	177.8
	Power input	29.5	29.7	30.1	30.3	30.5	30.9
	COP	5.3	5.4	5.4	5.6	5.7	5.7
15	Capacity	150.8	155.6	160.6	165.8	171.2	176.6
	Power input	30.9	31.3	31.5	31.7	32.1	32.3
	COP	4.9	5.0	5.1	5.2	5.3	5.5
20	Capacity	146.4	151.8	157.4	163.2	169.2	175.4
	Power input	32.5	32.7	33.1	33.3	33.5	33.9
	COP	4.5	4.6	4.8	4.9	5.0	5.2
25	Capacity	140.2	145.6	151.0	156.6	162.6	168.6
	Power input	35.7	35.7	35.9	35.9	35.9	36.1
	COP	3.9	4.1	4.2	4.4	4.5	4.7
30	Capacity	134.2	139.2	144.6	150.2	155.8	161.8
	Power input	38.9	38.7	38.7	38.5	38.3	38.3
	COP	3.4	3.6	3.7	3.9	4.1	4.2
35	Capacity	124.4	130.0	136.0	142.2	148.8	155.6
	Power input	42.9	43.3	43.7	44.1	44.5	44.9
	COP	2.9	3.0	3.1	3.2	3.3	3.5
40	Capacity	114.4	120.8	127.4	134.4	141.6	149.4
	Power input	46.9	47.9	48.9	49.9	50.9	51.9
	COP	2.4	2.5	2.6	2.7	2.8	2.9
45	Capacity	103.8	110.8	118.2	126.0	134.4	143.2
	Power input	51.3	52.7	54.3	56.1	57.7	59.5
	COP	2.0	2.1	2.2	2.2	2.3	2.4

Note:
 1. Unit: Capacity/Power input (kW), COP (W/W)
 2. Water flow rate of test condition: 360 LPM

Performance data

ACAH060

Outdoor Air Temp.(°C)	Classification	Water Outlet Temperature (°C)					
		5	7	9	11	13	15
-5	Capacity	249.0	255.9	262.8	270.0	277.5	285.0
	Power input	41.0	41.3	41.9	42.2	42.5	43.1
	COP	6.1	6.2	6.3	6.4	6.5	6.6
0	Capacity	243.9	250.8	257.7	264.9	272.4	280.2
	Power input	41.6	41.9	42.5	42.8	43.1	43.7
	COP	5.9	6.0	6.1	6.2	6.3	6.4
5	Capacity	238.5	245.1	251.7	258.9	266.1	273.3
	Power input	42.8	43.4	43.7	44.0	44.6	44.9
	COP	5.6	5.6	5.8	5.9	6.0	6.1
10	Capacity	232.8	239.1	245.7	252.6	259.5	266.7
	Power input	44.3	44.6	45.2	45.5	45.8	46.4
	COP	5.3	5.4	5.4	5.5	5.7	5.7
15	Capacity	226.2	233.4	240.9	248.7	256.8	264.9
	Power input	46.4	47.0	47.3	47.6	48.2	48.5
	COP	4.9	5.0	5.1	5.2	5.3	5.5
20	Capacity	219.6	227.7	236.1	244.8	253.8	263.1
	Power input	48.8	49.1	49.7	50.0	50.3	50.9
	COP	4.5	4.6	4.7	4.9	5.0	5.2
25	Capacity	210.3	218.4	226.5	234.9	243.9	252.9
	Power input	53.6	53.6	53.9	53.9	53.9	54.2
	COP	3.9	4.1	4.2	4.4	4.5	4.7
30	Capacity	201.3	208.8	216.9	225.3	233.7	242.7
	Power input	58.4	58.1	58.1	57.8	57.5	57.5
	COP	3.4	3.6	3.7	3.9	4.1	4.2
35	Capacity	186.6	195.0	204.0	213.3	223.2	233.4
	Power input	64.4	65.0	65.6	66.2	66.8	67.4
	COP	2.9	3.0	3.1	3.2	3.3	3.5
40	Capacity	171.6	181.2	191.1	201.6	212.4	224.1
	Power input	70.4	71.9	73.4	74.9	76.4	77.9
	COP	2.4	2.5	2.6	2.7	2.8	2.9
45	Capacity	155.7	166.2	177.3	189.0	201.6	214.8
	Power input	77.0	79.1	81.5	84.2	86.6	89.3
	COP	2.0	2.1	2.2	2.2	2.3	2.4

Note:
 1. Unit: Capacity/Power input (kW), COP (W/W)
 2. Water flow rate of test condition: 540 LPM

Electric characteristics

ACAH

ACAH	Frequency (Hz)	Voltage (V)	RLA (A)	MCA (A)	MFA (A)	Inv. Comp		Fan Motor	
						Q'ty	RLA	Q'ty	RLA
020BBTA	50-60	220	59.0	111.7	167.5	2	26.5	2	3
040BBTA			118.0	222.3	272.9	4	26.5	4	3
060BBTA			177.0	332.9	378.2	6	26.5	6	3
020LBTA		380	34.4	65.6	92.0	2	14.1	2	3
040LBTA			68.9	130.2	151.0	4	14.1	4	3
060LBTA			103.3	194.8	210.0	6	14.1	6	3
020HBTA		460	28.2	53.9	75.7	2	11.6	2	2
040HBTA			56.3	106.7	124.2	4	11.6	4	2
060HBTA			84.5	159.5	172.6	6	11.6	6	2

MCA: Minimum Circuit Ampere, A
MFA: Maximum Fuse Ampere, A
RLA: Rated Load Ampere, A

Note:

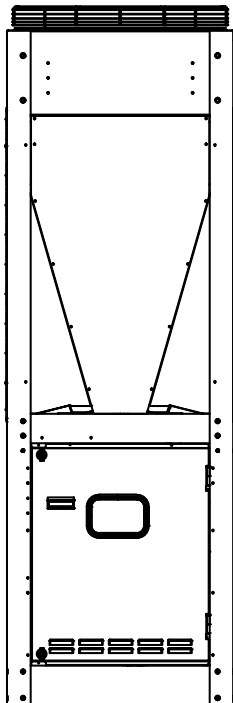
1. RLA is the current required when operated in the following condition.
 - Outdoor air temp. 27°C DB / 19.0°C WB,
 - Water inlet / Outlet temp. 12°C / 7°C
2. Voltage range

The chiller must be operated at the voltage within the upper and lower limit supplied from the power terminal to operate normally.
3. Maximum voltage variance permitted between phases is 2%.
4. MCA is the criteria of selecting the wiring standard.
5. MFA is used when selecting circuit breaker and grounding error circuit breaker (Electricity leakage circuit breaker).

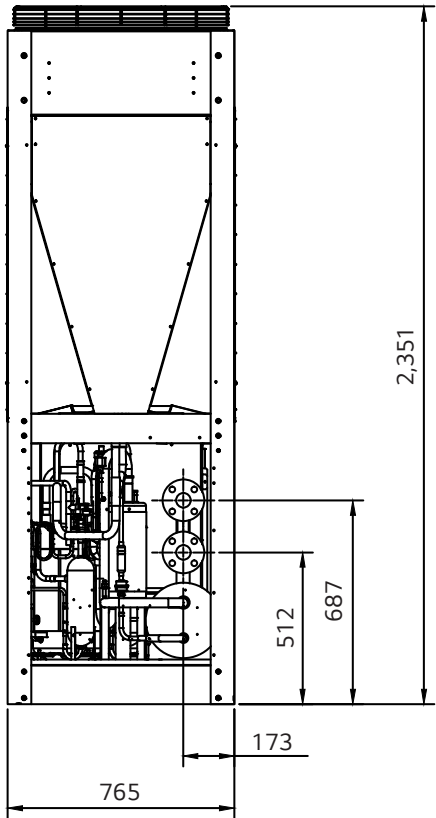
Outline dimension

ACAH020

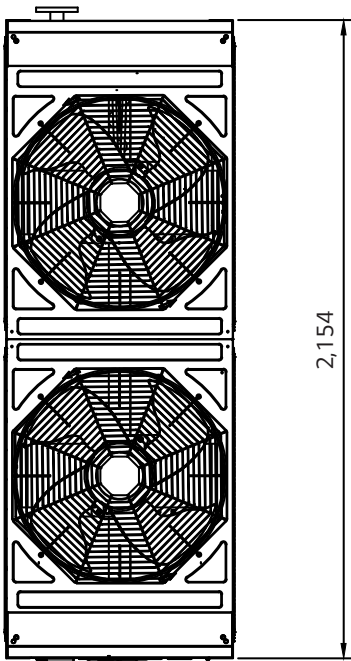
Unit(mm)



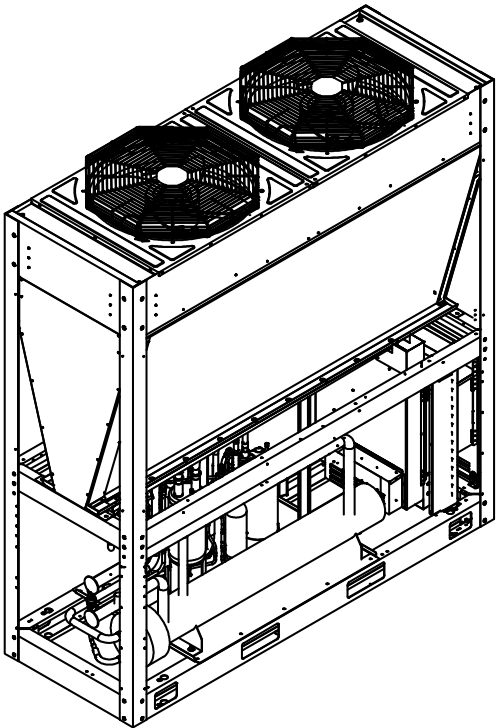
Front view



Rear view



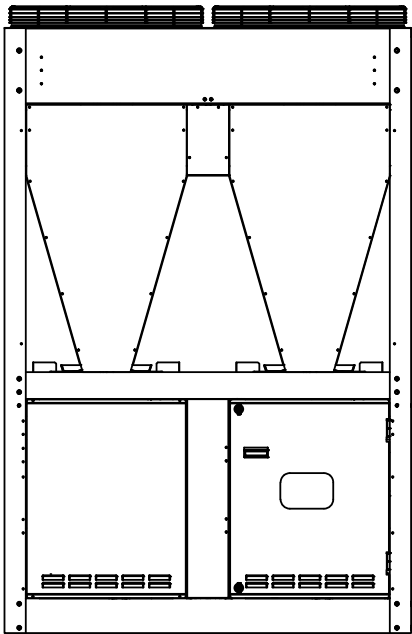
Top view



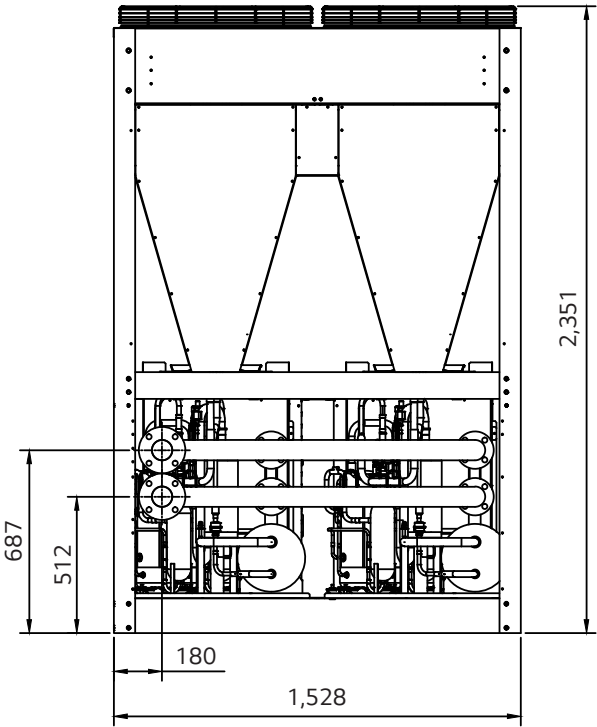
Outline dimension

ACAH040

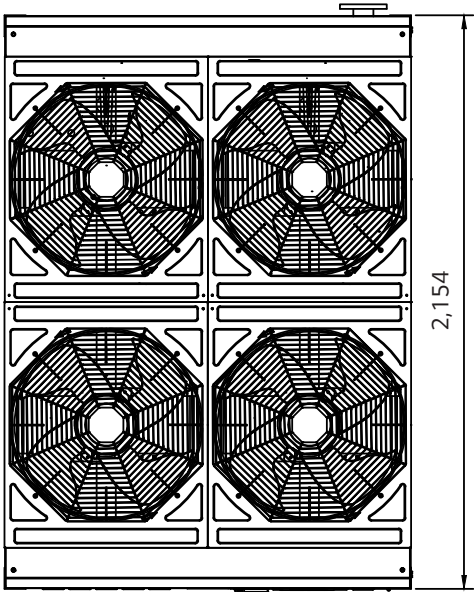
Unit(mm)



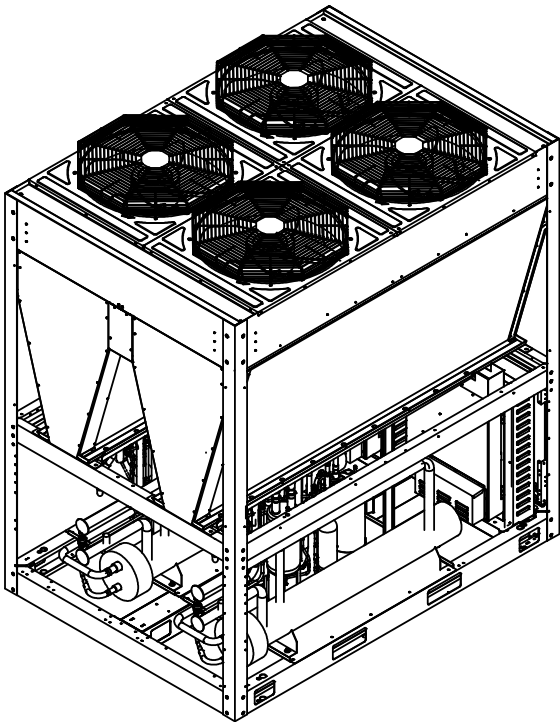
Front view



Rear view



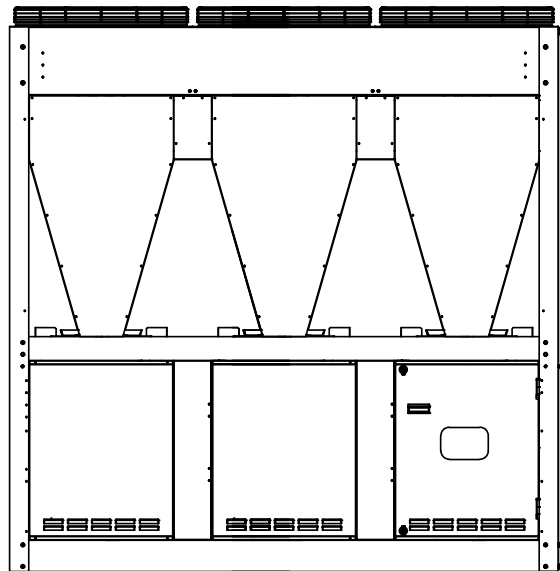
Top view



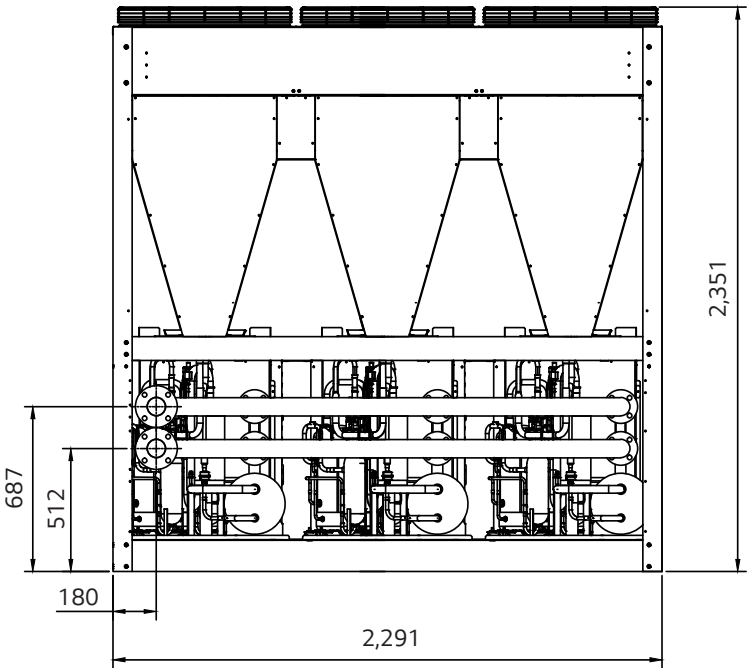
Outline dimension

ACAH060

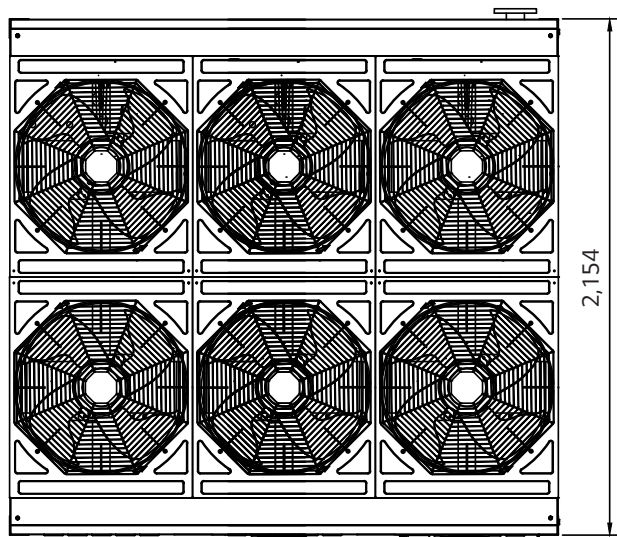
Unit(mm)



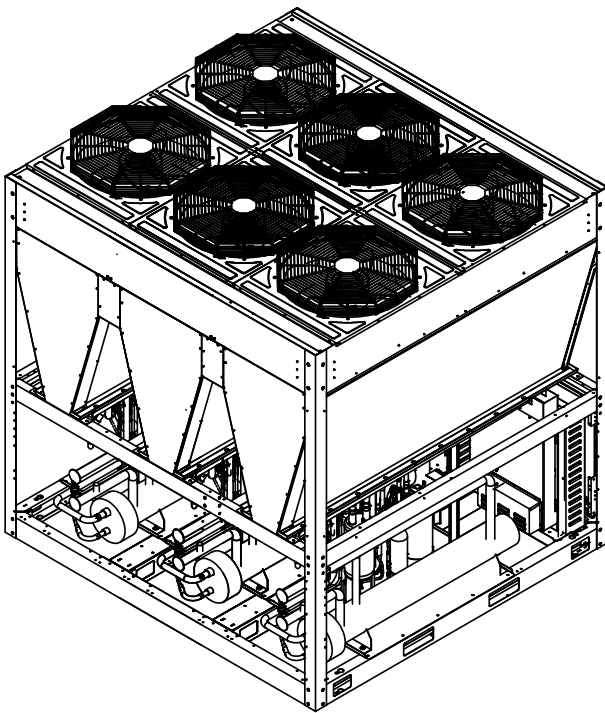
Front view



Rear view



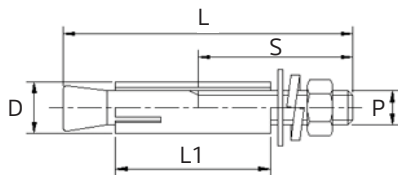
Top view



Details to consider when installing the base

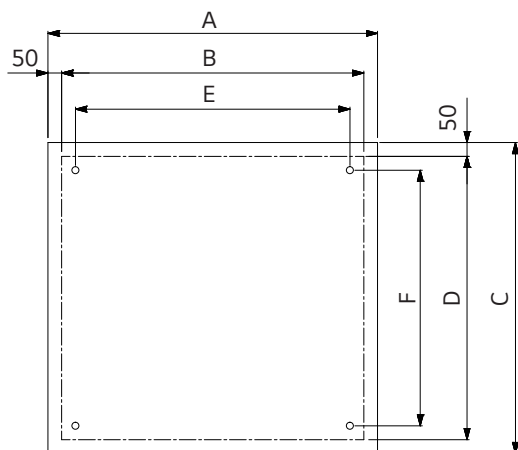
- The base must be able to withstand concentrated load.
- The base must be installed with maximum gradient of 1/300.
- The height of the base must be higher than the surface of the water and drain holes must be installed around.
- Set the height of the base according to the installation environment so that the product is not submersed in water.
The default height of the base is 200mm and it must be at least doubled in areas with double the snowfall of 100mm or above.
- Install the drain pipe in the drain hole.
The drainage must be finished so that particles around the drainage do not clog the pipes.
- LG is not responsible for product failure or damage from incorrectly designed or manufactured base.

Shape of anchor bolt



Specification of anchor bolt

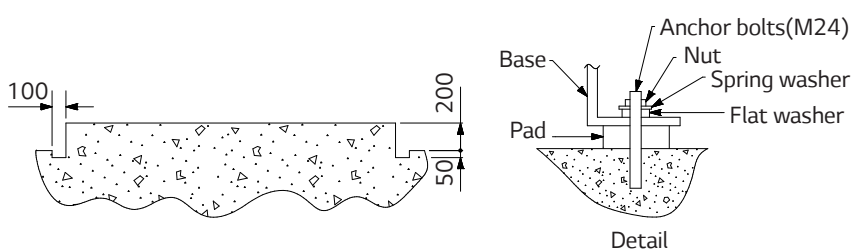
Screw size (d)	L	S	D	L1	Used drill	Depth of drill(min.)	Pullout load (N)
15.88mm(M16)	125	70	22	65	22	65	42,140



Note

1. Please install a drain hole to drain water and prevent corrosion of chiller parts.
2. If the concrete foundation construction, please be flat and horizontal. (Please within 0.5mm with respect to the horizontal degree of 1m between the center of the plate during installation.)
3. Basic concrete and grout construction, is the range of the user side of the installation.
4. Since there is a case where the chiller inside is frozen by the snow, please install the chiller to 500mm or more high basal platform than the annual average snowfall eyes in a lot of piling region.

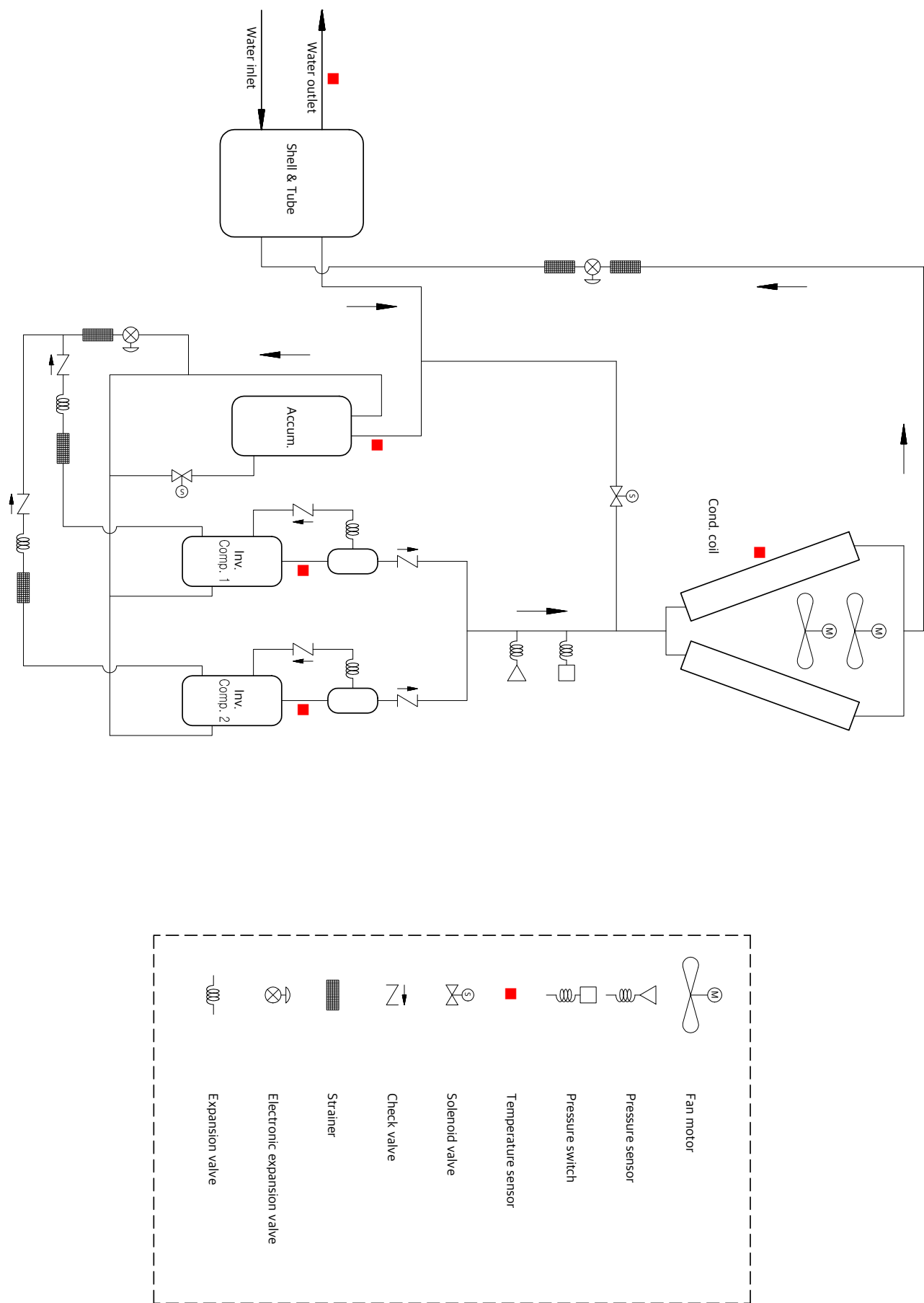
(Unit: mm)



ACAH***	020	040	060
A	865	1,630	2,395
B	765	1,530	2,295
C	2,254	2,254	2,254
D	2,154	2,154	2,154
E	691	1,456	2,221
F	1,707	1,707	1,707

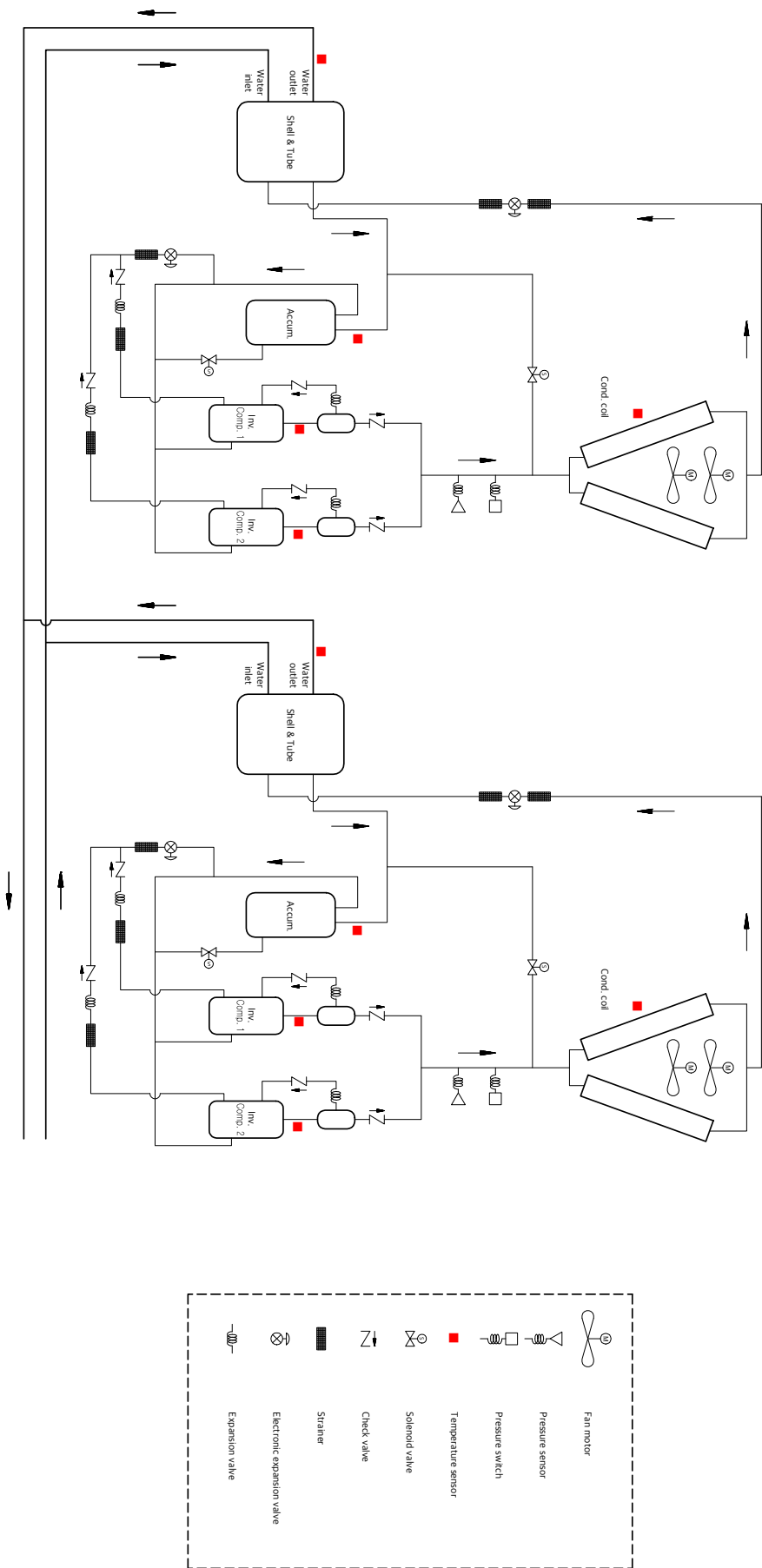
Piping diagram

ACAH020



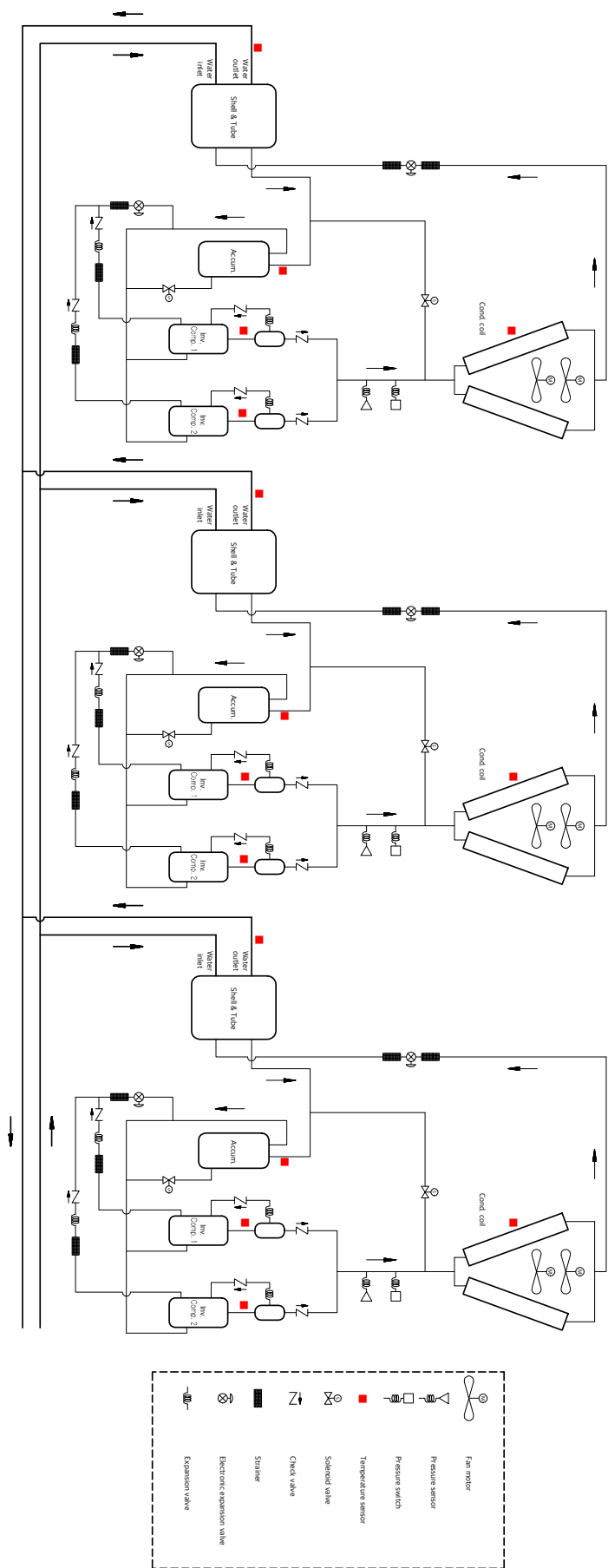
Piping diagram

ACAH040



Piping diagram

ACAH060



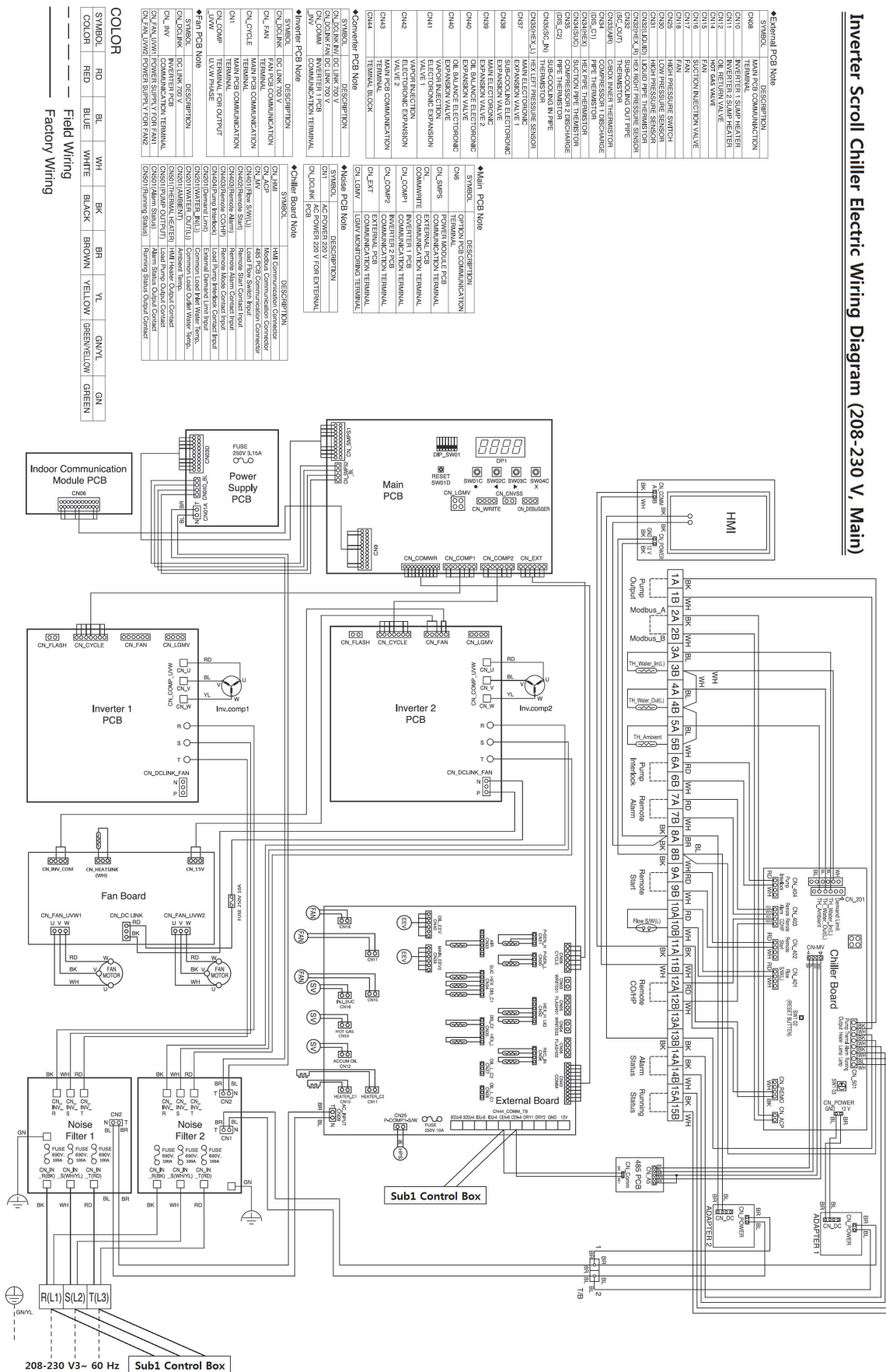
ACAHO20BTA Electric Wiring Diagram

COLOR	
SYMBOL	RD BL WH BK BR YL GN/YL GN
COLOR	RED BLUE WHITE BLACK BROWN YELLOW GREEN/YELLOW GREEN



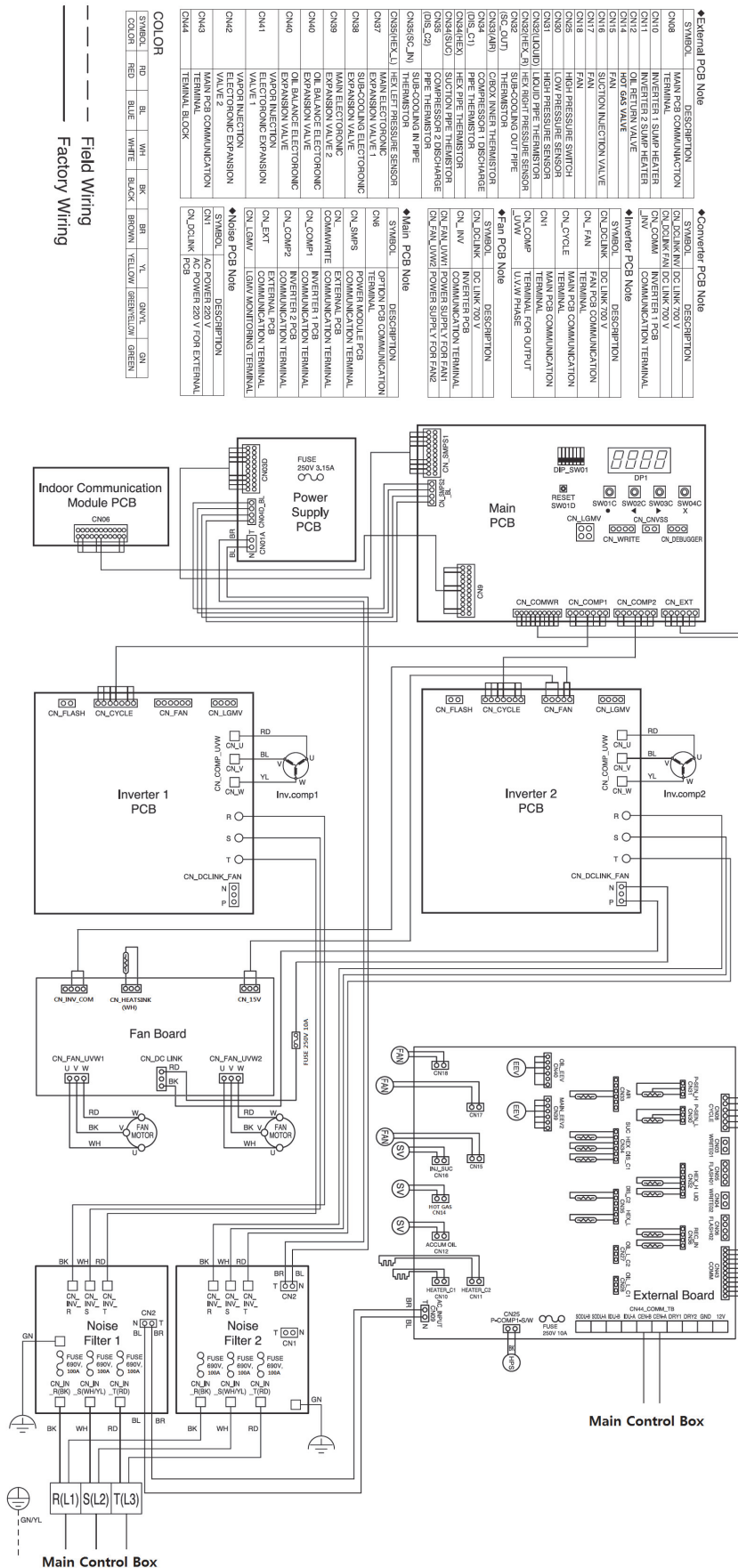
ACAH040BBTA / ACAH060BBTA (Main)

Inverter Scroll Chiller Electric Wiring Diagram (208-230 V, Main)

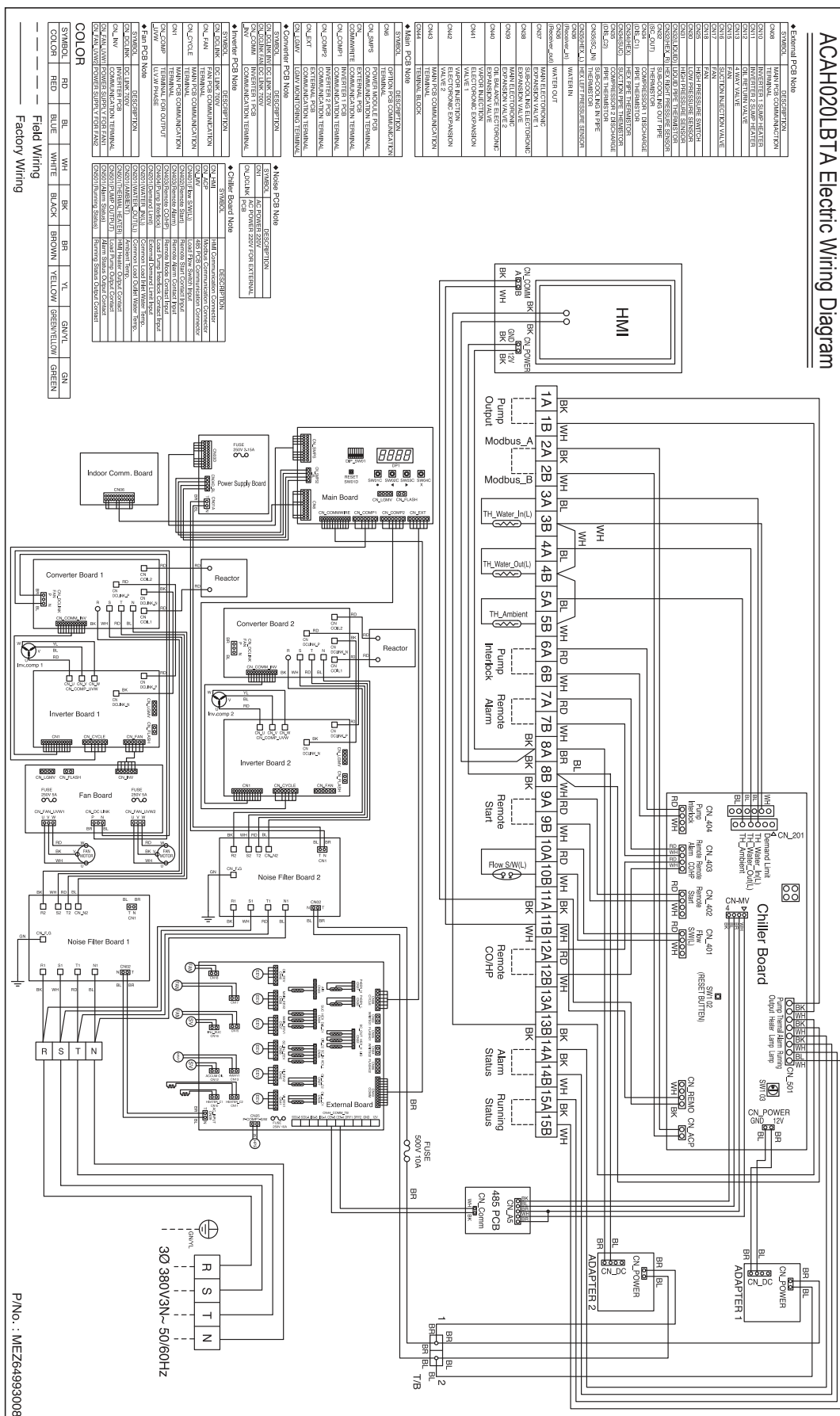


ACAH040BBTA / ACAH060BBTA (Sub)

Inverter Scroll Chiller Electric Wiring Diagram(208~230 V, Sub)



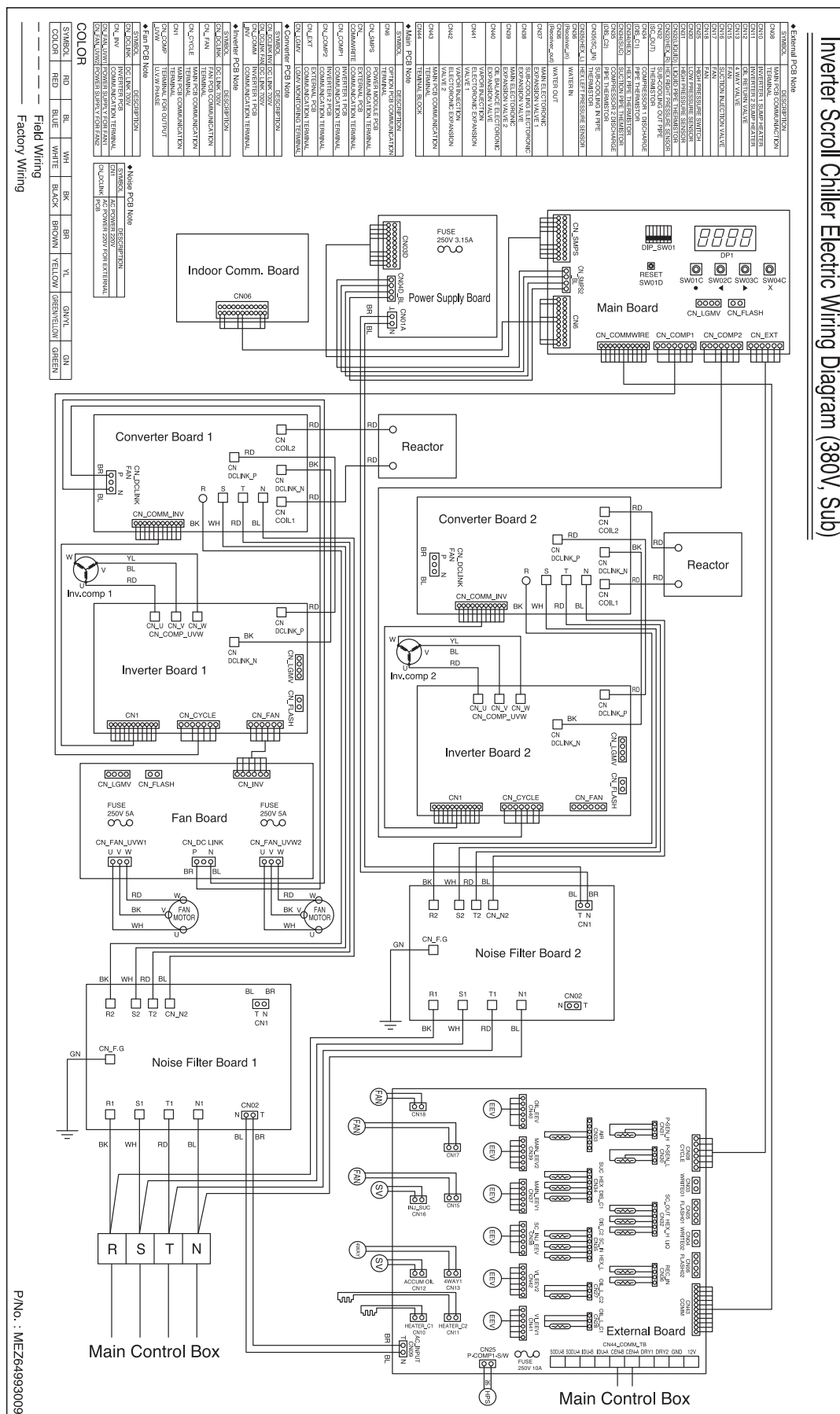
ACAH020LBT Electric Wiring Diagram



Inverter Scroll Chiller Electric Wiring Diagram (380 V, Main)



Inverter Scroll Chiller Electric Wiring Diagram (380V, Sub)

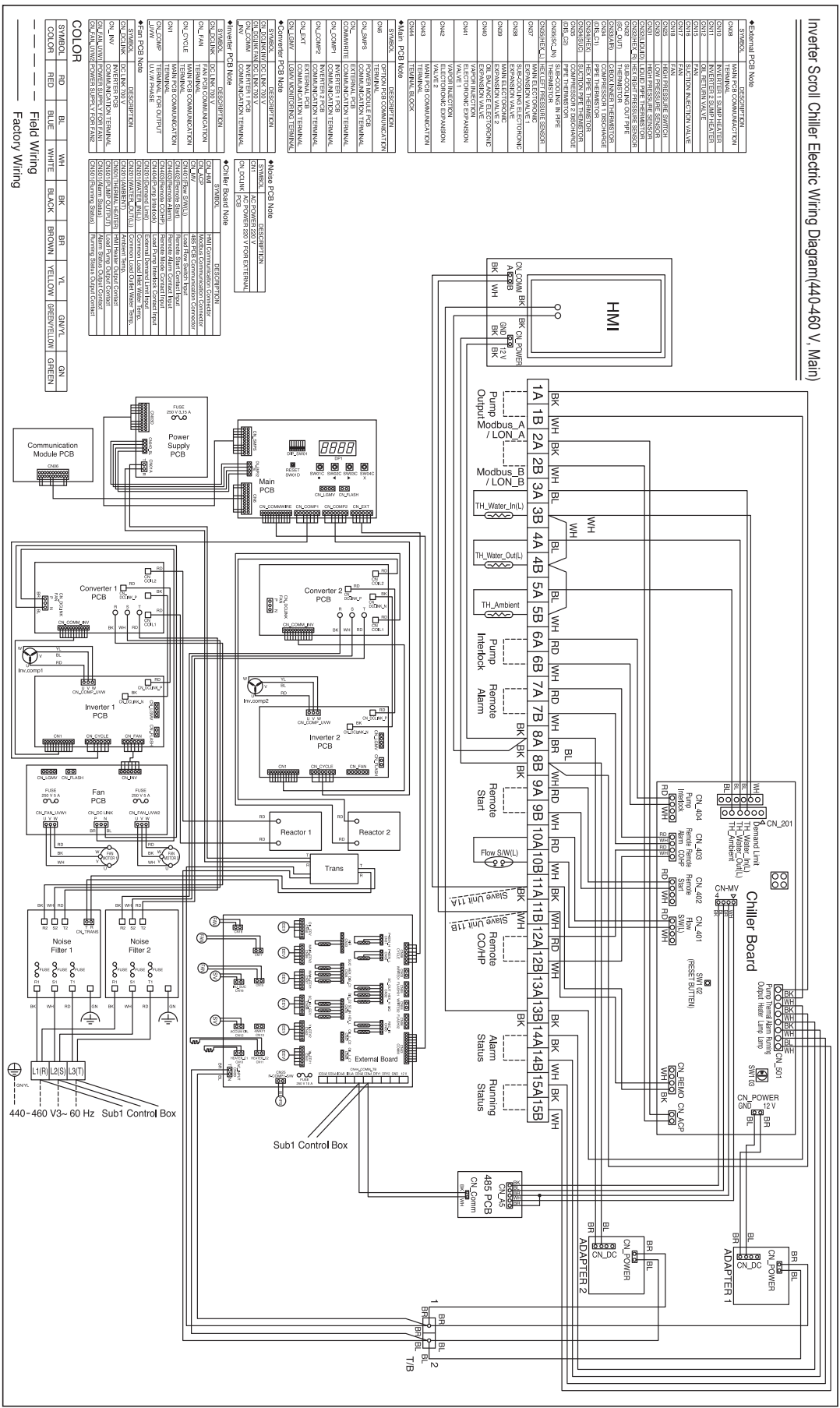


ACAHO20HBT Electric Wiring Diagram



ACAH040HBTA / ACAH060HBTA (Main)

Inverter Scroll Chiller Electric Wiring Diagram(440-460 V, Main)



Inverter Scroll Chiller Electric Wiring Diagram(440-460 V, Sub)



Selecting installation location

Precaution when selecting the installation location

Select the location that fits the following conditions to install the product.

- Location without direct heat from other heat source
- Location where noise of the chiller does not have negative impact to the neighbors
- Check the installation direction of the unit for the seasonal wind during the winter.
Install the product so that the seasonal wind does not affect only one side of the product.
- Location not exposed to strong winds
- Location that can support the weight of the chiller
- Location with space for air flow and service
- Install the boundary sign, danger sign or barricade, if necessary.
- It is recommended to install a fence around chiller so that people or animals will not be able to access the area.
- When installing the product in areas with high humidity during the winter (Coast, seaside, lakeside), install the product where it is well ventilated and has plenty of exposure to sunlight. (Ex: Roof top with sunlight)
- If the product does not run during the winter, establish a plan to use the anti-freeze for the water supply.
- To prevent the condensed water from flowing, insulate the connected evaporator and pipe.
- To smoothly drain the condensed water, establish an inclined structure.
- Avoid installing the product at locations with the following conditions.
 - Location with corrosive gas such as acid or alkali gas.
(Coolant can leak from the corroded pipes.)
 - Location with electromagnetic wave.
(It can cause the product to malfunction from defective parts.)
 - Location where flammable gas is generated or flows to prevent fire.
 - Location with high level of carbon fiber or dust
 - Special location exposed to oil, steam or emulsified gas

Precaution for seasonal wind and winter season

In areas with heavy snow or in extremely cold areas, sufficient planning is required for the product to run smoothly. Even in other areas, planning is required for seasonal wind during the winter season.

- Snow can go into the air discharge outlet of the condenser to freeze inside the chiller.
Therefore install a large cover over the chiller for areas with heavy snowfall to prevent the snow from accumulating on the top.
- The chiller can freeze inside when the air inlet is clogged with snow.
Therefore install the chiller on the base with at least twice the height of the average snow accumulation.
(Default height of base: 300mm)
- If there is more than 100mm of snow on top of the chiller, always operate the unit after cleaning the snow.
- Do not install the product where there could be negative impact from snow in areas with heavy snowfall.
Decide the installation direction of the chiller so that the side of the air heat exchanger does not face the direction of the snow.
(Make the side of the air heat exchanger parallel to the direction of the snowfall.)
Install a blocker with the height of the snow accumulation to avoid the snow around the chiller from being sucked into the coil side. (Prepare on site)
- If the wind comes in one direction of the unit where the seasonal wind is strong, there is a high chance that it can lead to issue with product capacity or imbalance of load. Therefore install the product so that it has consistent effect on the product cycle. If that is not possible, consider using a wind blocker or other devices.
In areas with strong seasonal wind during the winter, apply the wind blocker hood, especially near the coastal area, without blocking the suction inlet of the chiller considering the direction of the wind. If the chiller is directly exposed to the seasonal wind during the winter, separately install a wind baffle. (Prepare on site)

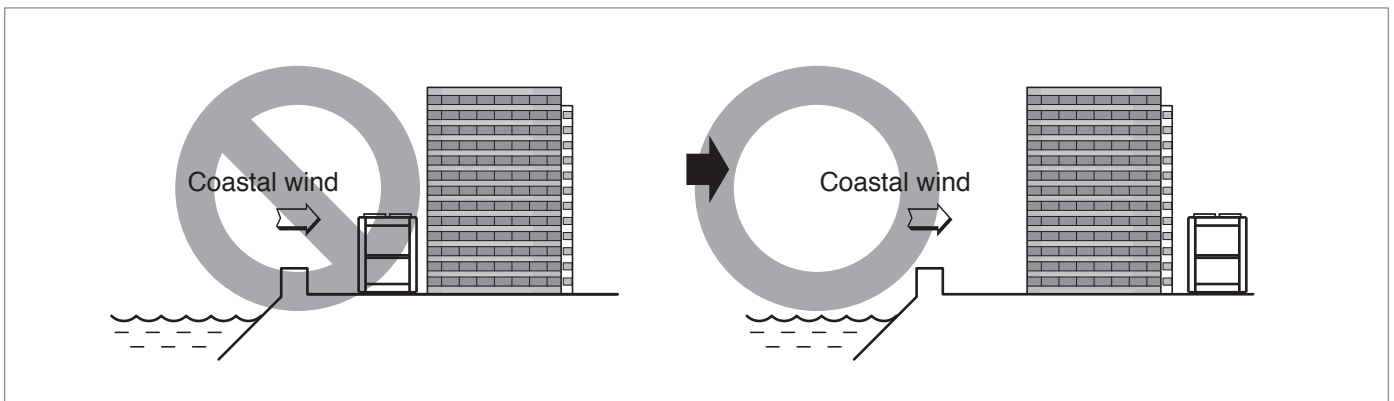
Installation Guide at the seaside

CAUTION

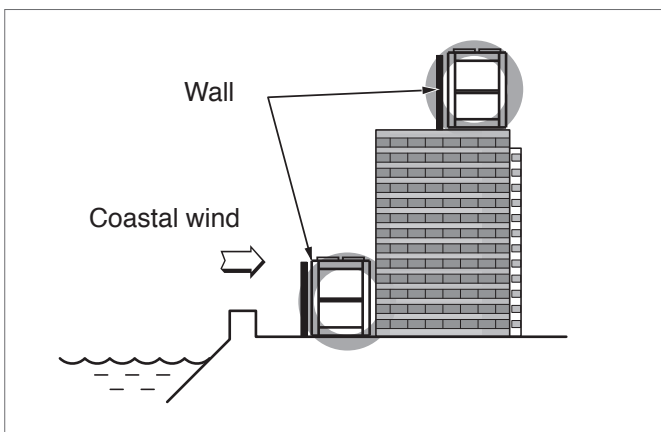
- When installing the chiller near the coast, make sure that it is not directly exposed to the coastal wind.
- When installing the chiller directly exposed to the coastal wind, separate anti-corrosive treatment must be done on the condenser of the chiller.

* Selecting location of chiller

Install the chiller where the building can block the coastal wind.



If the product has to be installed inevitably facing the coast, install a wall around the outdoor unit.



The wall must be made of sufficiently strong material such as concrete to block the coastal wind and must be 1.5 times larger than the size of the product to protect the product 1,000mm apart. There must be 1,000mm of clearance between the wall and the chiller for smooth circulation of air.

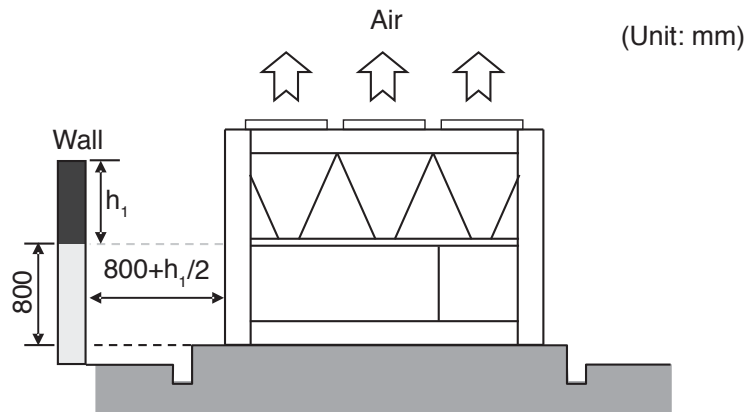
Install the product where the drainage is smooth.

When installing the product, secure minimum space as shown below considering the service, suction and discharge of air flow.

Consider the ventilation condition

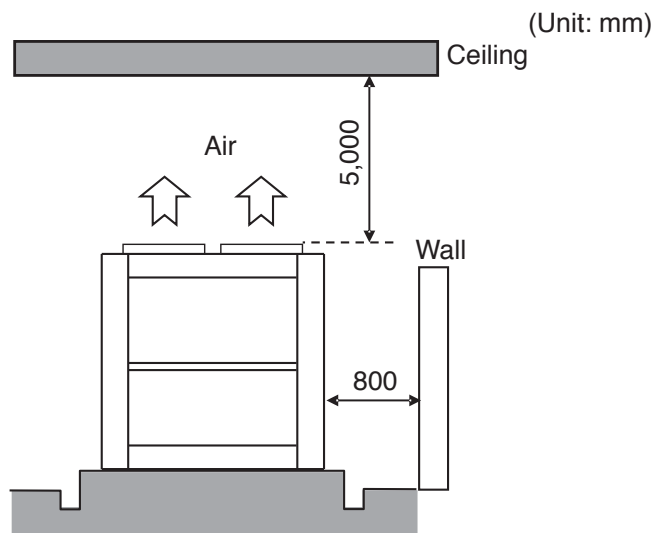
The air cooled chiller must be installed on open space or must have appropriate ventilation.

When installed along the wall, there must be sufficient space for ventilation.



Reference

If the side of the chiller is near the wall and the height of the wall is less than 800mm, the distance between the wall and the chiller must be at least 800mm. If the side of the chiller is near the wall and the wall is 800mm or higher, space of half of h_1 must additionally be secured on top of the 800mm for the distance between the wall and the chiller.



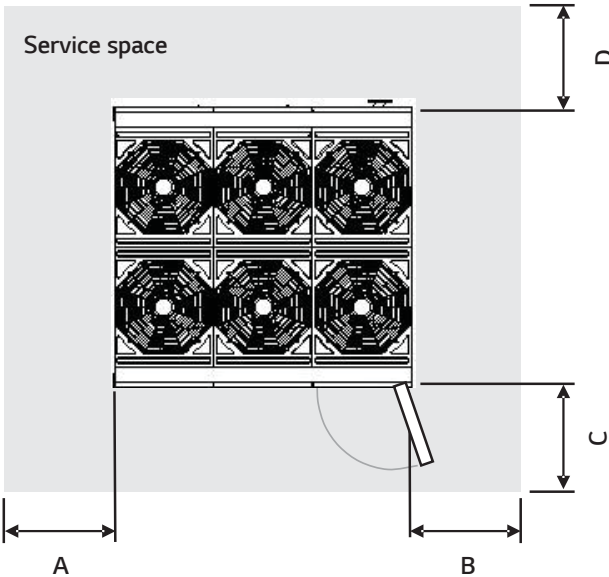
Reference

If there is a ceiling on the top part of the chiller, the distance from the chiller to the ceiling must be 5,000mm or above.

If the front or rear side of the chiller is close to the wall, the distance from the wall to the chiller must be 800mm or above.

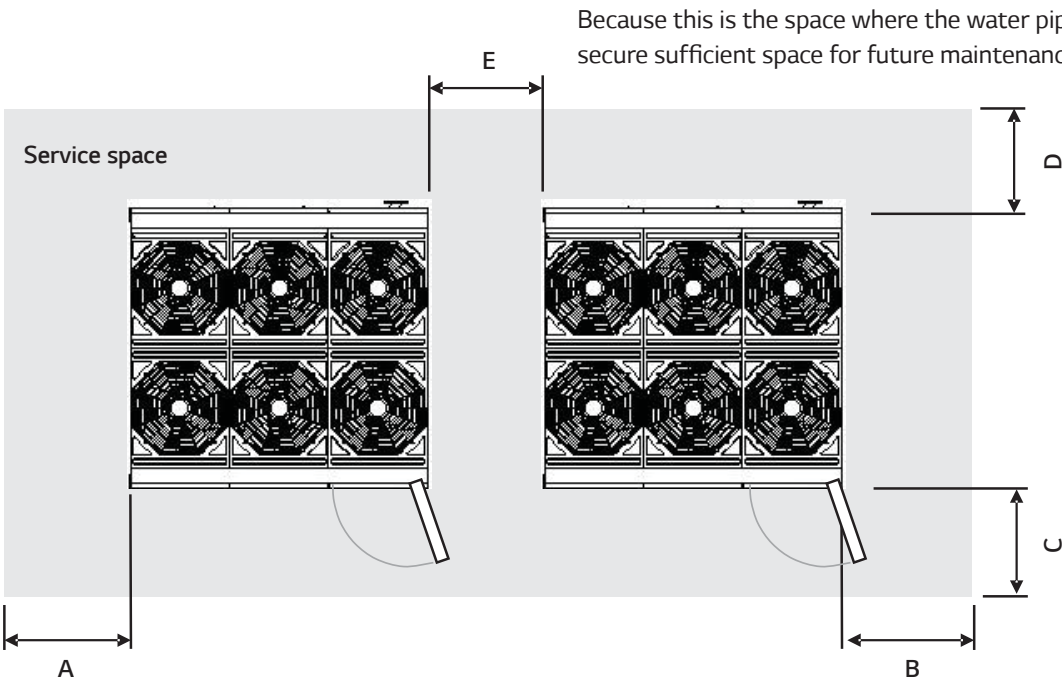
Consider the service space

There must be sufficient space for maintenance and repair work around the chiller.



Because this is the space where the water pipes are installed, make sure to secure sufficient space for future maintenance and repair work.

Model	Service space (Unit : mm)			
	A	B	C	D
ACAH020	800	800	800	800
ACAH040	800	800	800	1,800
ACAH060	800	800	800	1,800



Because this is the space where the water pipes are installed, make sure to secure sufficient space for future maintenance and repair work.

Model	Service space (Unit : mm)				
	A	B	C	D	E
ACAH020	800	800	800	800	600
ACAH040	800	800	800	1,800	600
ACAH060	800	800	800	1,800	600

Water management

The water quality of the cold (hot) water is described as follows. The water quality must not fall below the following standard. If so, it can be judged to have risk within relatively short period of time.

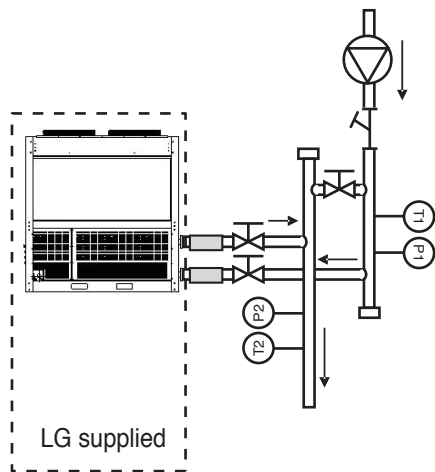
Item		Water	
		Circulation type cold water	Cold water
Reference	PH(25°C)	6.5 - 8.0	6.5 - 8.0
	Conduction rate (25°C μ s/cm)	500 or below	200 or below
	Alkali level (PPM)	100 or below	50 or below
	Hardness (PPM)	100 or below	50 or below
	Chlorine ion (PPM)	100 or below	50 or below
	Lactic acid ion (PPM)	100 or below	50 or below
	Iron (PPM)	0.1 or below	0.3 or below
	Sulfur ion (PPM)	Not detected	Not detected
	Ammonium ion (PPM)	0.5 or below	0.2 or below
	Silica (PPM)	50 or below	30 or below

Water pipe connection

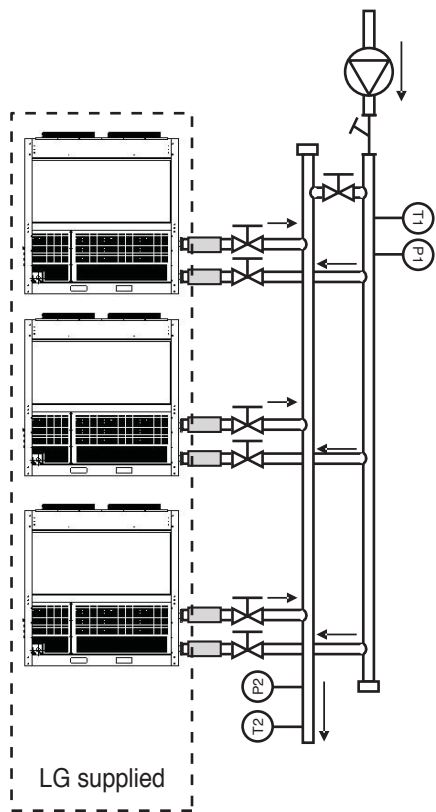
- Connect the pipe so that the entrance of the cold (hot) water pipe is correct.
- Permitted water pressure resistance of cold water pipe system is 1MPa
- To prevent any external heat loss or dew drops forming during the cooling operation on the water pipe system, apply thermal insulation treatment.
- Install the air vent at the output end of the water pipe. (Air vent)
- If the thermometer is installed on the inlet/outlet of the cold/hot water pipe, the operating condition of the chiller can be checked.
- Always install the strainer (50 Mesh or above) that can be cleaned on the water pipe inlet side to filter any alien particles from entering the heat exchanger.
- Always install the strainer on the leveled pipe.
(If sand, trash or rust gets mixed to the cold water system, it can cause product failure due to corrosion of metallic parts.)
- Install the on/off valve on the cold water inlet/outlet and bypass pipe on the pipe direction of the device side.
 - For the pipe system, it is recommended to install the bypass and clean the pipe before installing the product and during the annual pipe cleaning.
 - On/Off valve blocks the old water to the chiller that is not operating to reduce the power of the pump.
Therefore select whether to install to fit the need of the site.
- Install the pressure gauge and thermometer on the inlet and outlet of the water pipe.
- Always install the flexible joint to reduce the vibration of the pipe and product.
 - Vibration of water pipe system is absorbed to prevent water leakage.
- For the cold water system part, make sure to use the component that complies with designed water pressure or above.
- Before supplying cold water to the chiller, clean inside the pipe system to remove any negative impact of particles to the product.




Installation mode A (Recommended method)


• Independent product installation



• Independent product installation

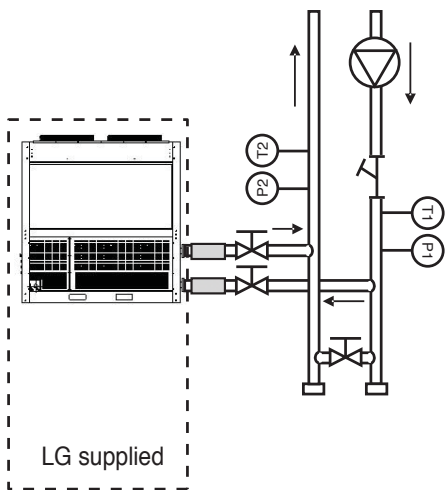


Symbol	Description
	Valve
	Strainer
	Flexible joint

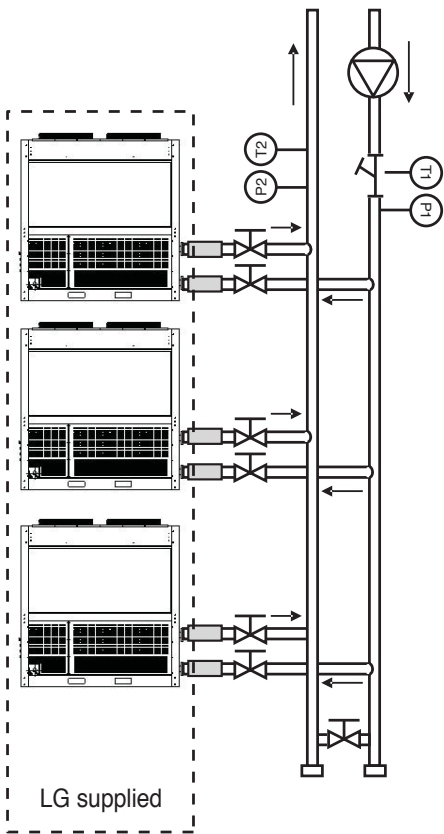
Symbol	Description
T1	Temperature sensor (1: Inlet 2: Outlet)
P1	Pressure gauge (1: Inlet, 2: Outlet)
	Cold water pump




Installation mode A (Recommended method)


• Independent product installation



• Independent product installation



Symbol	Description
	Valve
	Strainer
	Flexible joint

Symbol	Description
T1	Temperature sensor (1: Inlet 2: Outlet)
P1	Pressure gauge (1: Inlet, 2: Outlet)
	Cold water pump

CAUTION

- If the winter outdoor temperature is 0°C or below, take following measures to prevent the pipe from freezing as shown below.
 - If the outdoor temperature is low, the circulation water can freeze to damage the heat exchanger of the product when the product is stopped. If there is possibility of damage from low outdoor temperature, operate the pump to prevent the water from freezing.
 - If the product does not operate for a long period of time during the winter season, remove all the circulation water to prevent the damage of heat exchanger and pipe from freezing.
 - Add anti-freeze additive to prevent the circulation water from freezing during the winter season.
- Maintain the cold water flux within the designed flux to ensure appropriate chiller performance and reduce the tube damage from rusting, scaling and corrosion. LG is not responsible for any damage of chiller from poor water quality management or inappropriate processing water.

Water pipe installation

- Appropriate pressure of pipe connection is flange connection of 1 MPa or below.
- Size of the water pipe must be the same as that of the product or larger.
- If there is risk of dew drops forming, always install the thermal insulation material on the outlet pipe of the cold water.
- To avoid connected water pipe from creeping from the load, use appropriate hook for support.
- To prevent the pipe connected part from freezing during the winter season, always install the drain valve at the most bottom of the pipe system.
- Cold water inlet pipe is located at the bottom and the outlet pipe is installed on the top.
- When connecting several chillers, refer to the following for common pipe size.

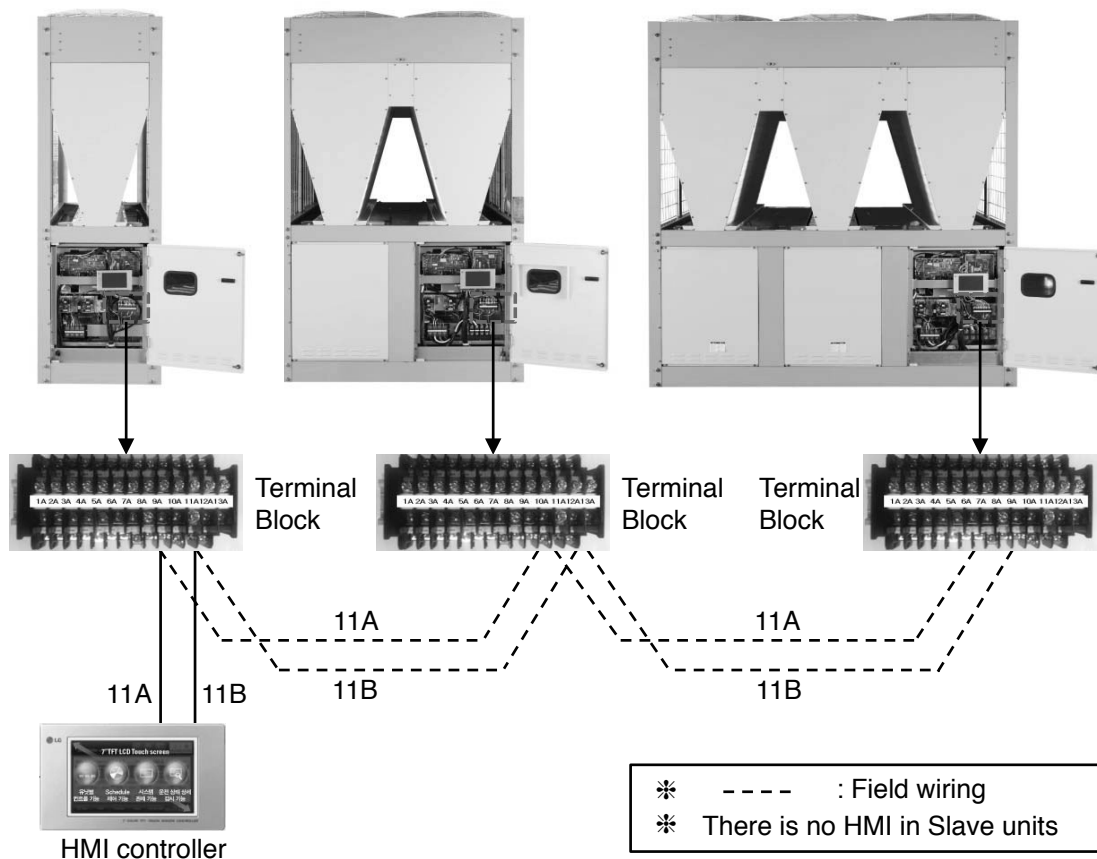
Full product capacity		20 RT	40 RT	60 RT	80 RT	100 RT	120 RT	140 RT	160 RT	180 RT
Common pipe size		65 A	80 A	100 A	100 A	125 A	125 A	125 A	150 A	150 A
Product	20 RT	●								
	40 RT		●		● ●	●		● ●	●	
	60 RT			●		●	● ●	●	● ●	● ● ●

Water pump control

- If the cold water pump is not operating for a long period of time or if the anti-freeze liquid is not used as the cold water, the anti-freeze pump control must be installed to prevent the pipe from freezing.
- The vibration of the pump can transfer to the pipe to cause noise indoors. As the plan to prevent the noise from spreading in the pump, install flexible joints at the inlet/outlet and use the anti-vibration amount for the pump support.

Unit Combination

- Appropriate pressure of pipe connection is flange connection of 1 MPa or below.
- Size of the water pipe must be the same as that of the product or larger.
- If there is risk of dew drops forming, always install the thermal insulation material on the outlet pipe of the cold water.
- To avoid connected water pipe from creeping from the load, use appropriate hook for support.
- To prevent the pipe connected part from freezing during the winter season, always install the drain valve at the most bottom of the pipe system.
- Cold water inlet pipe is located at the bottom and the outlet pipe is installed on the top.
- When connecting several chillers, refer to the following for common pipe size.



WARNING

Electric work using special circuit based on the overall regulation and this manual must be done by qualified electrician. If the capacity of the power supply circuit is insufficient or if there is a defect, it can cause electric shock or fire.

1) Communication cable connection

Refer to the above figure to connect the communication cable

For the communication cable, distinguish 11A and 11B to connect to the slave units.

2) Use 2-line shield cable as the communication cable.

3) Separately install the communication and power cable of the chiller so that the communication cable is not affected by the electric noise generated from power cable. (Do not pass through the same electric pipe)

4) Unit combination is able to connect up to 5 units

Guide specification

Contents

Manufacturing specification

Air cooled type scroll freezer product specification

1. Case
2. Compressor
3. Condenser
4. Electronic expansion valve
5. Evaporator
6. Control equipment
7. Ref. piping
8. Safety devices

Manufacturing specification

- 1) Use the parts and material of KS standard products or equivalent products for those not specified in this specification, and all parts should be designed with structure that is easy for replacement, repair, and inspection.
- 2) If there is a problem in the freezer, or if there is an abnormal status of chilled water temperature and flow amount, etc., immediately stop the freezer operation and you have to be equipped with marking equipment or function that can easily identify these.
- 3) There should be a protection circuit to prevent freezer damage by blackout or frequent voltage variation from KEPCO.
- 4) Freezer should be able to operate silently without abnormal noise or abnormal vibration.
- 5) Freezer should be composed of the central controller and the circuit possible for wired/wireless Start/Stop operation.
- 6) Easy combination should be possible with compact product design and module type design, and basic module insertion and assembly installation should be possible regardless of the volume.
- 7) It should be the structure possible for substitute operation even if compressor or some cycle parts fail and cooling operation should be possible during parts replacement, repair, or inspection.
- 8) The main power cable equivalent or above the specification presented in the product specification of each corresponding model should be used for the freezer, each communication line and power cable should use cable pipe for protection, and the cable pipe with the material that can block external noise according to the installation environment should be used.

Air cooled type scroll freezer product specification

1. Case

- 1) It should have the structure that is easy for disassembly and assembly for easy maintenance/repair.
- 2) It should have a beautiful exterior and it should be insulated to prevent dew condensation.
- 3) It should have the structure preventing vibration and abnormal noise.
- 4) It should have the structure that can be grounded.

2. Compressor

- 1) R410A refrigerant should be used, case shape should be sealed type, format should be the combination of two inverter scroll compressors, it should be flexible to respond to load, and it should be a high efficiency system that can optimize energy efficiency through inverter control.
- 2) Vibration prevention rubber should be used to prevent transfer of noise and vibration during operation.

- 3) The frequency variable boundary of inverter scroll compressor should be minimum 15Hz and maximum 125Hz.

- 4) Alternating operation should be possible to have the uniform average operation time of the compressors.

3. Condenser

- 1) Condenser heat pipe should use purity 99.9 % or above Phosphorus Deoxidized Copper without joint, and it should have the structure with Al fin attached to increase the heating area. (Cross fin & Tube type)
- 2) Use wide louver fin for Al fin, and pipe extension should be carried out for efficient heat transfer.
- 3) Condenser air cooled type heat exchanger arrangement should be 3 rows 48 levels 15FPI.
- 4) The pressure endurance test for high pressure part refrigerant side should be carried out at 4.18 MPa or above (designed pressure 3.8 MPa), and there should be problems such as leakage or deformation.
- 5) The condensing coil that passed pressure endurance test should be vacuumed to completely remove moisture inside.
- 6) Use propeller type Fan, and it should be able to give sufficient wind amount required for condensing.
Also, it should have sufficient strength for the number of rotations, and it should be operated silently through balance test.
- 7) Motor should be BLDC type that can increase efficiency.
- 8) Fan and Motor should be connected directly.

4. Electronic Expansion Valve

- 1) It is the part that insulates and expands high pressure fluid refrigerant at condenser exit in low temperature • low pressure state, and during cooling operation, line shape electronic expansion valve should be activated to adjust adequate refrigerant amount according to the evaporator load.
- 2) Based on data of various sensors installed in the freezer, microcomputer unit should be able to analyze operation status of the system and compressor to control the most adequate refrigerant amount linearly.
- 3) By applying electric pulse signal to stepping motor, it should be able to play the role of adjusting the refrigerant flow amount.

5. Evaporator

- 1) Evaporator should be shell & tube type heat exchanger, and the material should be carbon steel and copper tube.
- 2) There should be no water leakage, and the durability should be guaranteed.
- 3) It should have the structure that can connect to chilled water pipe.
- 4) Heat exchanger should be sensible heat exchange structure that the refrigerant and coolant are not mixed.
- 5) It should be a structure that each of coolant and refrigerant

are flown into countercurrent structure heat exchanger and after heat is exchanged with each other through the thin valve inside heat exchanger, discharged outside heat exchanger.

6. Control equipment

- 1) It is the controller to operate overall system in optimal condition with the microcomputer unit installed in the freezer, and based on the 4 measurement values including intake refrigerant gas pressure, discharged refrigerant gas pressure, discharged refrigerant gas temperature, and heat exchanger refrigerant temperature, it should be able to control electronic expansion valve, compressor(inverter), etc.
- 2) There should be a function that can check all sensors connected to the freezer and various operation statuses.
- 3) It should be equipped with self protection equipment and system protection function.
- 4) Module type control interface should be applied so that simple product control is possible in series installation, and relocation and re-installation of HMI controller should be possible without separate control equipment.

7. Ref. Piping

- 1) Refrigerant pipe should be purity 99.9% or above Phosphorus Deoxidized Copper without joint, and it should be piped for fluent refrigerant flow between each component.
- 2) Install check valve at compressor discharge side to prevent reverse flow of the discharged refrigerant.
- 3) Install strainer in the pipe to absorb moisture inside the pipe and to filter foreign objects.
- 4) The pipe from expansion valve to evaporator should be insulated to prevent moisture condensation on the surface of the pipe and to prevent flash gas generation of refrigerant fluid at the same time.

8. Safety devices

- 1) Refrigerant pressure (Normal refrigerant pressure)
 - A. High pressure switch
 - B. High voltage protection (Sensor)
- 2) Temperature
 - A. compressor discharge temperature overheating detection (Sensor)
 - B. IPM temperature detection (Sensor)
 - C. Freeze and burst protection (Sensor)
 - D. Power Module application (Sensor)
- 3) Chilled water flow
 - A. Chilled water flow switch
- 4) Voltage and current (control logic)
 - A. Reverse phase detection and protection (Voltage monitoring system)
 - B. Compressor over-current protection
 - C. Fan motor over-current protection
- 5) Fuse

Memo

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LG Electronics, Home appliance & Air solution company

Two IFC, 10 Gukjegeumyung-ro, Yeongdeungpo-gu, Seoul, 150-945, Korea.

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