13 SEER Condensing Unit

Service Manual

2019 Version

LCAC/201903

Content

2. Model Names of Outdoor Units

2.1 Outdoor Units

COT-36CNR1	29×29×25	66/70	208-230V/1N/60Hz

COT-60CNR1	29×29×33	89/93	208-230V/1N/60Hz

3. External Appearance

3.1 Outdoor units

	 30k-36kBtu/h	 42k-60kBtu/h

4. Features

4.1 Painted galvanized steel cabinet.

4.2 Various coil guard optional, Basic coil guard is louvered steel, it is acceptable to customize plastic or wires netting

4.3 24V low voltage control

4.4 Wide operation temperature range：Cooling range： 64^0F-109^0F Heating range： 19^0F-109^0F

4.5 ARI Certified & ETL Listed.

4.6 Condenser coils constructed with copper tubing and enhanced aluminum fins.

Part 2 Outdoor Units

1.Specifications

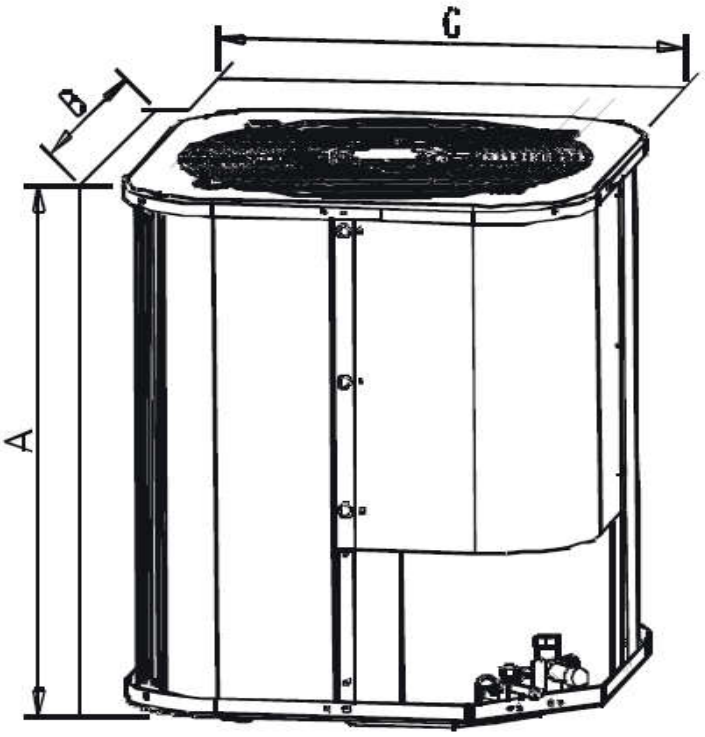
Cooling only type

Model			COT-36CNR1	
Outdoor power supply		V/Ph/Hz	230V/1N/60HZ	
Cooling	Capacity	Btu/h	34500	
	Input	W	2930	
	EER	Btu/h.W	11.70	
	SEER (AHRI Certified)	Btu/h.W	13	
Max. input consumption		W	3662.50	
Max. current		A	16.76	
Compressor	Brand		HITACHI	
	Model		ASH280DG-C8DU	
	Type		rotary	
	Capacity	W	8260	
	Input	W	2700	
	Rated current(RLA)	A	11.9	
	Locked rotor Amp(LRA)	A	60	
	Thermal protector	uf	70	
	Refrigerant oil	ml	570	
Outdoor fan motor	Brand		chigo	
	Model		S.TB-DQ-YDK-110-8P2-AL	
	Input	W	207	
	Output	W	110	
	Capacitor	μF	6.00	
	Speed	rpm	850	
Outdoor coil	Number of row		2	
	Fin spacing	in	0.055	
	Tube outside diameter	in	Φ 0.276	
	Tube material		Inner Grooved	
	Coil length x height x width	in	84.65×23.15×1.05	
	Number of circuit		6	
Outdoor air flow		CFM	1376/1235/1161	
Outdoor noise level		dB(A)	60	
Outdoor dimension	Unit (WxHxD)	in	29×29×25	
	Packing (WxHxD)	in	30×30×26	
Refrigerant	Type		R410A	
	Charge	ozs	123.46	
Refrigerant pipe	Liquid side	in	Φ3/8	
	Gas side	in	Φ3/4	
	Max. refrigerant pipe length	ft	65 39⁄64	
	Max. difference in level	ft	32 13⁄16	
Design pressure		MPa	4.0/1.2	
Max pressure		MPa	4.20	

Model			COT-60CNR1
Outdoor power supply		V/Ph/Hz	230V/1N/60HZ
Cooling	Capacity	Btu/h	57000
	Input	W	4920
	EER	Btu/h.W	11.40
	SEER (AHRI Certified)	Btu/h.W	13
Max. input consumption		W	6150.00
Max. current		A	28.15
Compressor	Brand		LG
	Model		ABG051KAC
	Type		scroll
	Capacity	W	14974
	Input	W	4722
	Rated current(RLA)	A	21.0
	Locked rotor Amp(LRA)	A	128
	Thermal protector	uf	70
	Refrigerant oil	ml	1280
Outdoor fan motor	Brand		xinjun
	Model		S.TB-DQ-YDK-230-6P2
	Input	W	510
	Output	W	230
	Capacitor	μF	12.00
	Speed	rpm	1095
Outdoor coil	Number of row		2.7
	Fin spacing	in	0.055
	Tube outside diameter	in	Φ 0.276
	Tube material		Inner Grooved
	Coil length x height x width	in	84.65×31.48×1.05
	Number of circuit		8
Outdoor air flow		CFM	1695/1574/1434
Outdoor noise level		dB(A)	63
Outdoor dimension	Unit (WxHxD)	in	29×29×33
	Packing (WxHxD)	in	30×30×34
Refrigerant	Type		R410A
	Charge	ozs	178.13
Refrigerant pipe	Liquid side	in	Φ3/8
	Gas side	in	Φ7/8
	Max. refrigerant pipe length	ft	65 39⁄64
	Max. difference in level	ft	32 13⁄16
Design pressure		MPa	4.0/1.2
Max pressure		MPa	4.20

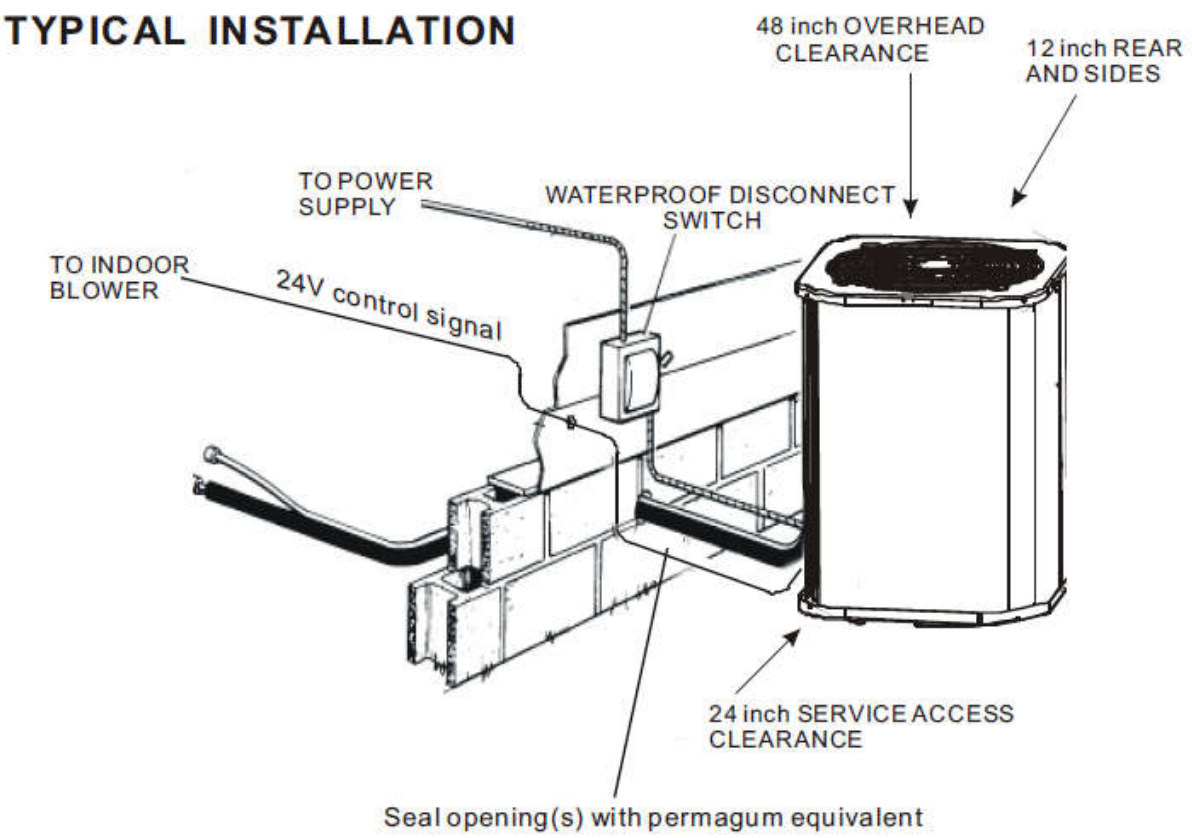
2.Dimensions

Applicable for 18-60 series



Unit Model	Dimensions(mm)			Refrigerant Connection Line Size(mm)			
	A	B	C	Liquid(Φ)		Vapor(Φ)	
				LF	RF	LF	RF
18	633	554	554	9.52		15.88	
24	633	554	554				
30	633	740	740				
36	633	740	740			19.05	
42	835	740	740				
48	835	740	740				
60	835	740	740			22	

3.Typical Installation

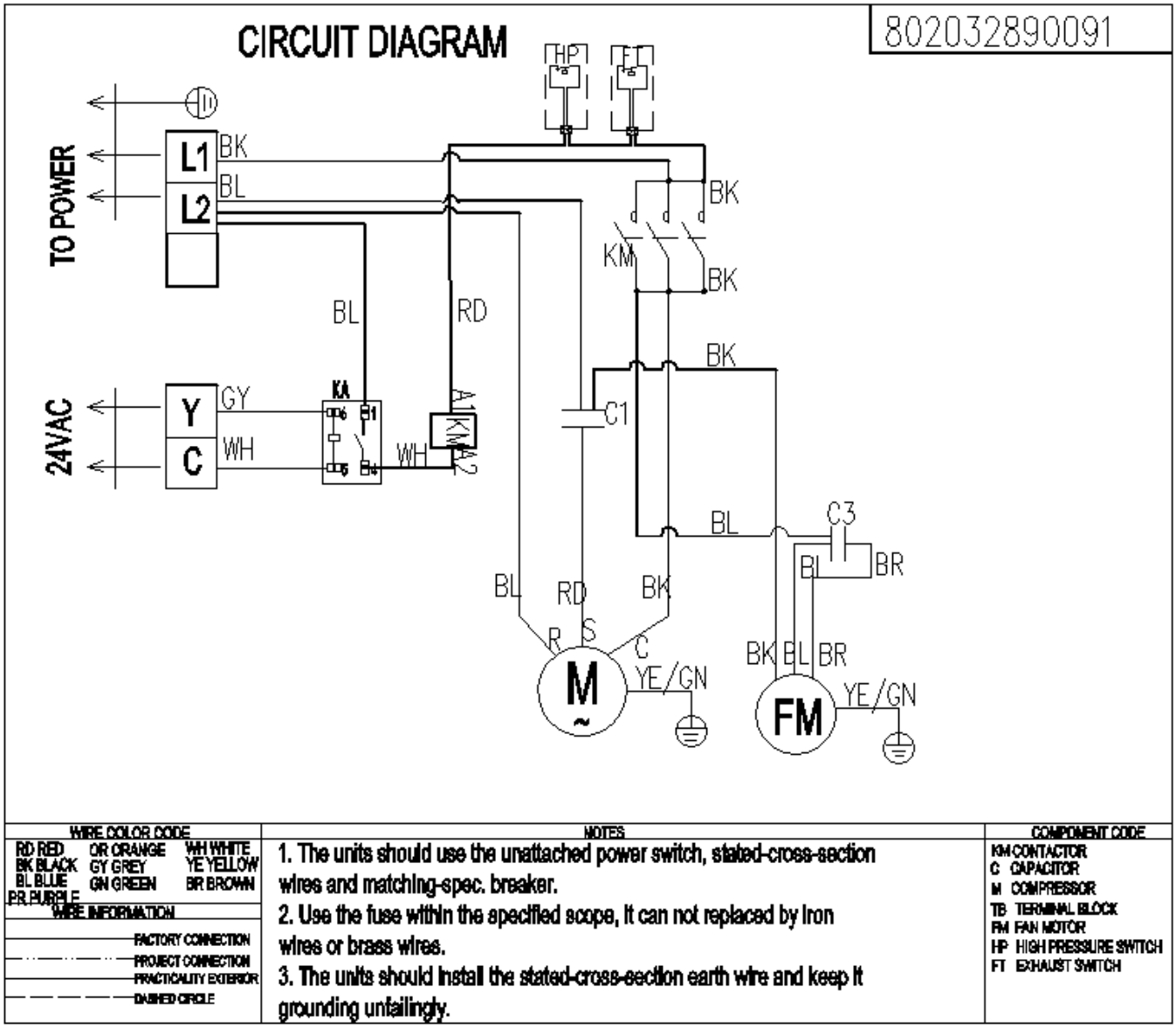


NOTE

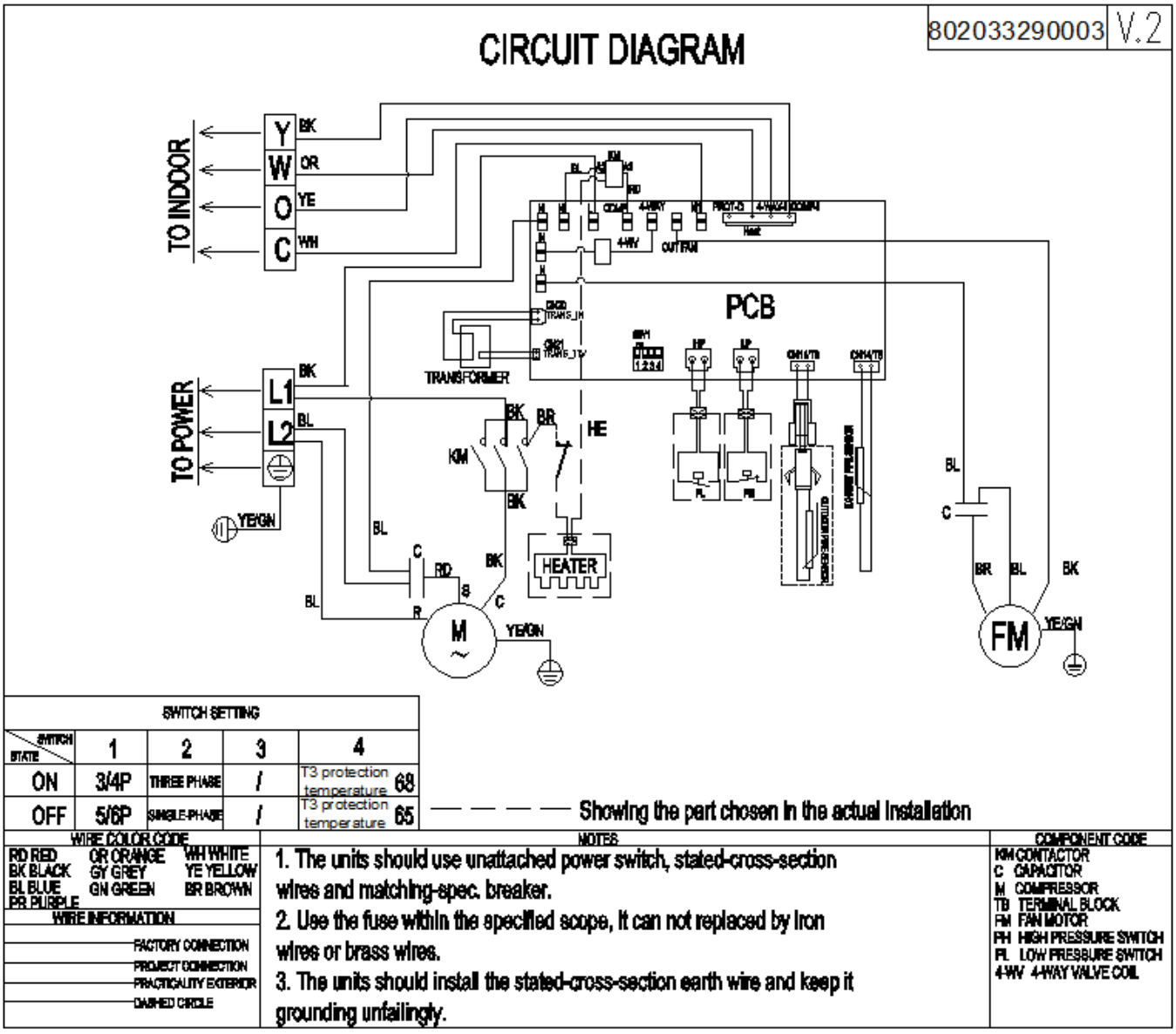
All outdoor wiring must be weatherproof. The part of installing the connecting pipe and wiring can be found in the installation manual of ceiling and floor type.

4.Wiring Diagrams

Cooling only type



Heat pump type

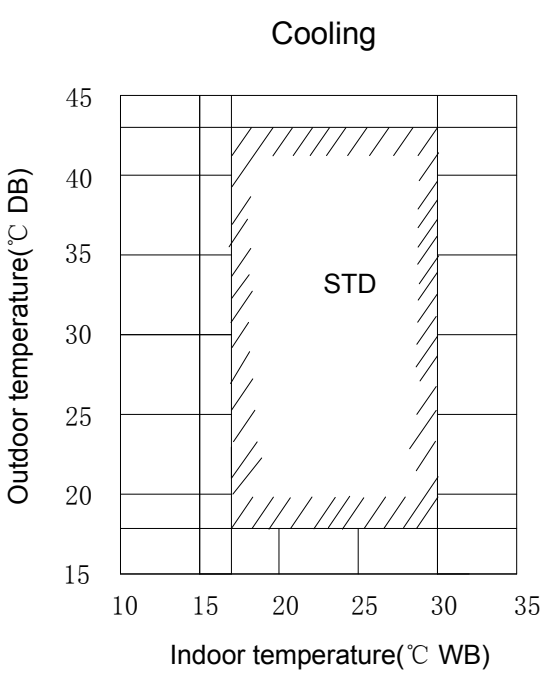


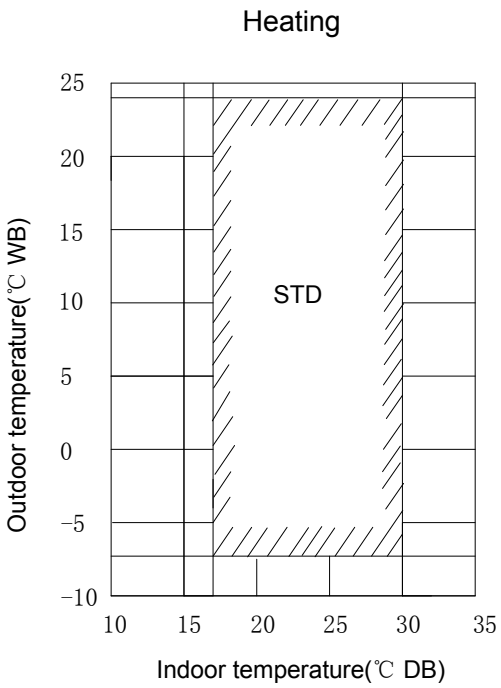
5.Electric Characteristics

Model	Outdoor Unit			
	Hz	Voltage	Min.	Max.
COT-36CNR1	60	208-230V	187V	244V
COT-60CNR1	60	208-230V	187V	244V

6.Operation Limits

Operation mode	Outdoor temperature(℃)	Room temperature(℃)
Cooling operation	18~43	17~30
Heating operation	-7~43	17~30





7. Exploded View

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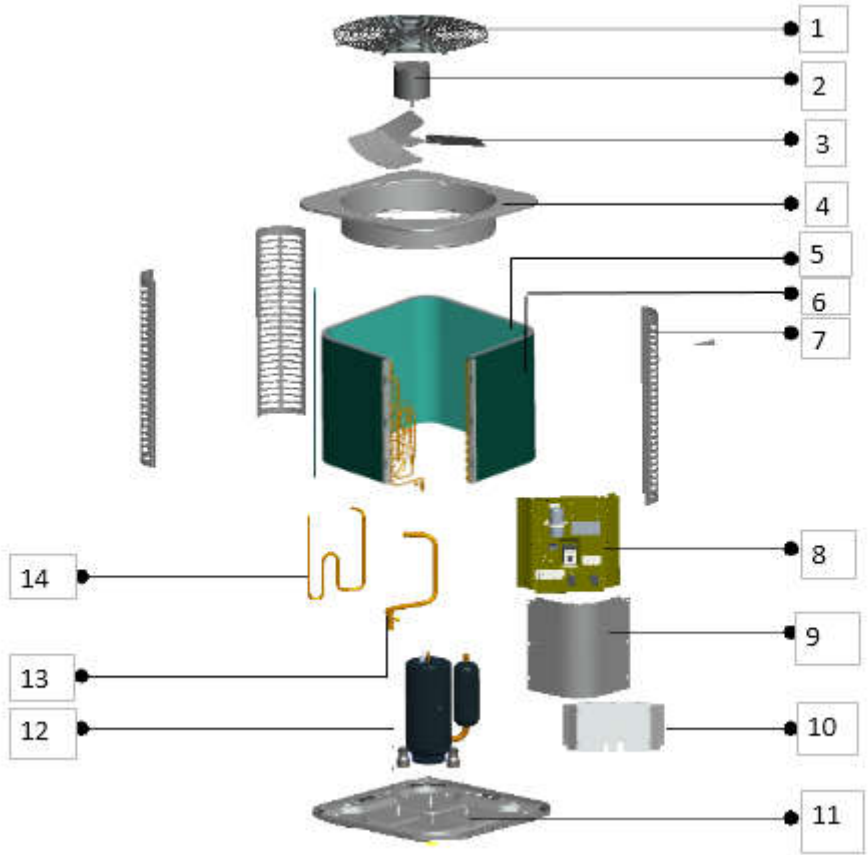
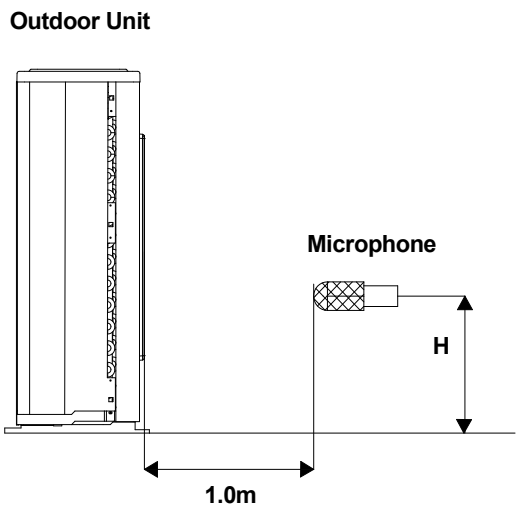


No.	Part Name	Quantity	No.	Part Name	Quantity
1	Cover net	1	8.1	Electric install board weld assembly	1
2	Outdoor motor	1	8.2	Electric waterproof box	2
3	Axial-flow fan	1	8.3	Terminal board	1
4	Top cover assembly	1	8.4	Terminal board	1
5	Condenser assembly	1	8.5	Contactor	1
5.1	Condenser	1	8.6	Fan capacitor	1
5.1.1	Condenser left-side board	1	8.7	Compressor Capacitor	1
5.1.2	Condenser right-side board	1	9	Top panel	1
5.2	Condenser input pipe assembly	1	10	Under side panel	1
5.3	Condenser output pipe assembly	1	11	Chassis assembly	1
5.3.1	High-pressure valves weld assembly	1	12	Compressor	1
5.3.1.1	High-pressure valves connecting pipe	1	13	Suction pipe weld assembly	1
5.3.1.2	Block valve body （A02）	1	13.1	Compressor suction pipe	1
6	Protection grill	1	13.2	Block valve body （A08）	1
7	Support board	3	14	Compressor discharge pipe	1
8	Electronic components	1			

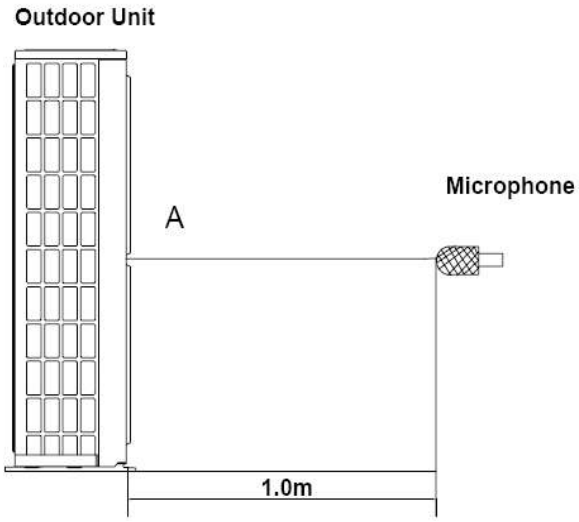
8.Sound Levels

12000Btu/h~24000Btu/h



Note: H= 0.5 × height of outdoor unit

48000Btu/h~60000Btu/h



Note: The point A is in the middle of the whole outdoor panel.

Model	Noise level dB(A)
COT-36CNR1	60
COT-60CNR1	63

Part 3 Installation

1.Precaution on Installation

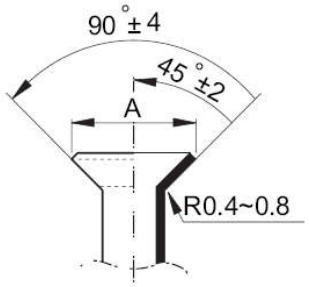
1.1. Measure the necessary length of the connecting pipe, and make it by the following way.

a. Connect the indoor unit at first, then the outdoor unit.
Bend the tubing in proper way. Do not harm them.

CAUTIONS:

- Daub the surfaces of the flare pipe and the joint nuts with frozen oil, and wrench it for 3~4 rounds
- With hands before fasten the flare nuts.

Be sure to use two wrenches simultaneously when you connect or disconnect the pipes.

Pipe gauge	Tightening torque	Flare dimension A Min (mm) Max		Flare shape
Φ6.4	15～16N.m (153～163 kgf.cm)	8.3	8.7	
Φ9.5	25～26N.m (255～265kgf.cm)	12.0	12.4	
Φ12.7	35～36N.m (357～367kgf.cm)	15.4	15.8	
Φ15.9	45～47N.m (459～480 kgf.cm)	18.6	19.1	
Φ19.1	65～67N.m (663～684kgf.cm)	22.9	23.3	

b. The stop value of the outdoor unit should be closed absolutely (as original state). Every time you connect it, first loosen the nuts at the part of stop value, then connect the flare pipe immediately (in 5 minutes). If the nuts have been loosened for a long time, dusts and other impurities may enter the pipe system and may cause malfunction later. So please expel the air out of the pipe with refrigerant before connection.

c. Expel the air after connecting the refrigerant pipe with the indoor unit and the outdoor unit. Then fasten the nuts at the repair-points.

1.2. Locate The Pipe

a. Drill a hole in the wall (suitable just for the size of the wall conduit), then set on the fittings such as the wall conduit and its cover.

b. Bind the connecting pipe and the cables together tightly with binding tapes. Do not let air in, which will cause water leakage by condensation.

c. Pass the bound connecting pipe through the wall conduit from outside. Be careful of the pipe allocation to do no damage to the tubing.

1.3. Connect the pipes.

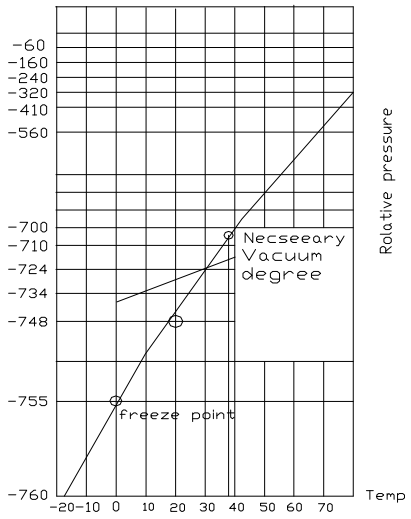
1.4. Then, open the stem of stop values of the outdoor unit to make the refrigerant pipe connecting the indoor unit with the outdoor unit in fluent flow.

1.5. Be sure of no leakage by checking it with leak detector or soap water.

1.6. Cover the joint of the connecting pipe to the indoor unit with the soundproof / insulating sheath (fittings), and bind it well with the tapes to prevent leakage.

2.Vacuum Dry and Leakage Checking

2.1 Vacuum Dry: use vacuum pump to change the moisture (liquid) into steam (gas) in the pipe and discharge it out of the pipe to make the pipe dry. Under one atmospheric pressure, the boiling point of water(steam temperature) is 100℃. Use vacuum pump to make the pressure in the pipe near vacuum state, the boiling point of water falls relatively. When it falls under outdoor temperature, the moisture in the pipe will be vaporized.



2.2 Vacuum dry procedure

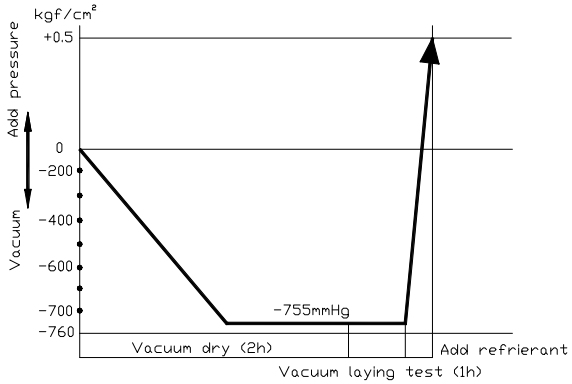
There are two methods of vacuum dry due to different construction environment: common vacuum dry, special vacuum dry.

①. Common vacuum dry procedure

- Vacuum dry (for the first time)---connect the all-purpose detector to the inlet of liquid pipe and gas pipe, and run the vacuum pump more than two hours (the vacuum pump should be below -755mmHg)
- If the pump can't achieve below -755mmHg after pumping 2 hours, moisture or leakage point will still exist

in the pipe. At this time, it should be pumped 1 hour more.

- If the pump can't achieve -755mmHg after pumping 3 hours, please check if there are some leakage points.
- Vacuum placement test: place 1 hour when it achieves -755mmHg, pass if the vacuum watch shows no rising. If it rises, it shows there's moisture or leakage point.
- Vacuuming from liquid pipe and gas pipe at the same time.
- Sketch map of common vacuum dry procedure.



②. Special vacuum dry procedure

- This vacuum dry method is used in the following conditions:
- There's moisture when flushing the refrigerant pipe.
- Rainwater may enter into the pipe.
- Vacuum dry for the first time …… 2h pumping

③. Vacuum destroy for the second time …… Fill nitrogen to 0.5Kgf/cm²

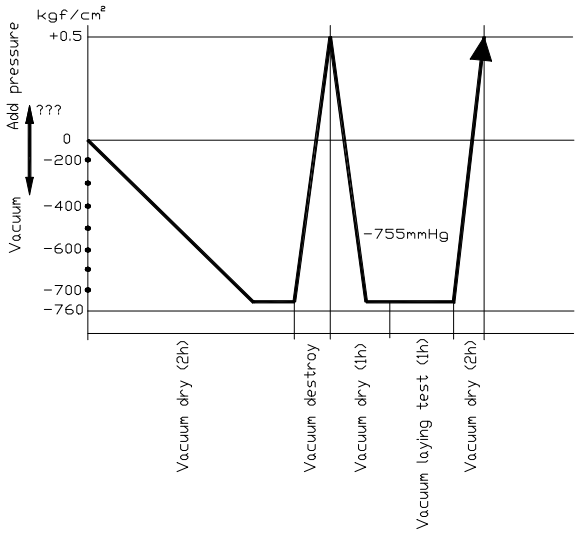
Because nitrogen is for drying gas, it has vacuum drying effect during vacuum destroy. But if the moisture is too much, this method can't dry thoroughly. So, please pay more attention to prevent water entering and forming condensation water.

④. Vacuum dry for the second time……1h pumping

Determinant: Pass if achieving below -755mmHg. If -755mmHg can't be achieved in 2h, repeat procedure ③ and ④.

⑤. Vacuum placing test …… 1h

⑥. Sketch map of special vacuum dry procedure



3.Additional Refrigerant Charge

Caution

● Refrigerant cannot be charged until field wiring has been completed.

● Refrigerant may only be charged after performing the leak test and the vacuum pumping.

● When charging a system, care shall be taken that its maximum permissible charge is never exceeded, in view of the danger of liquid hammer.

● Charging with an unsuitable substance may cause explosions and accidents, so always ensure that the appropriate refrigerant is charged.

● Refrigerant containers shall be opened slowly.

● Always use protective gloves and protect your eyes when charging refrigerant.

The outdoor unit is factory charged with refrigerant. Calculate the added refrigerant according to the diameter and the length of the liquid side pipe of the outdoor unit/indoor unit

R(g) D(mm) / L(m)	ϕ6.4	Φ9.5	Φ12.7
Less than 5m (One-way)	—	—	—
Added Refrigerant When Over 5m(One-way)	30g/m×(L-5)	65g/m×(L-5)	120g/m×(L-5)

Remark:

R (g): Additional refrigerant to be charged

L (m): The length of the refrigerant pipe (one-way)

D (mm): Liquid side piping diameter

4.Water Drainage

4.1 Gradient and Supporting

4.1.1 Keep the drainpipe sloping downwards at a gradient of at least 1/100. Keep the drainpipe as short as possible and eliminate the air bubble.

4.1.2 The horizontal drainpipe should be short. When the pipe is too long, a prop stand must be installed to keep the gradient of 1/100 and prevent bending. Refer to the following table for the specification of the prop stand.

	Diameter	Distance between the prop stands
Hard PVC pipe	25~40mm	1~1.5m

4.1.3. Precautions

① The diameter of drainpipe should meet the drainage requirement at least.

② The drainpipe should be heat-insulated to prevent atomization.

③ Drainpipe should be installed before installing indoor unit. After powering on, there is some water in water-receiver plate. Please check if the drain pump can operate correctly.

④ All connection should be firm.

⑤ Wipe color on PVC pipe to note connection.

⑥ Climbing, horizontal and bending conditions are prohibited.

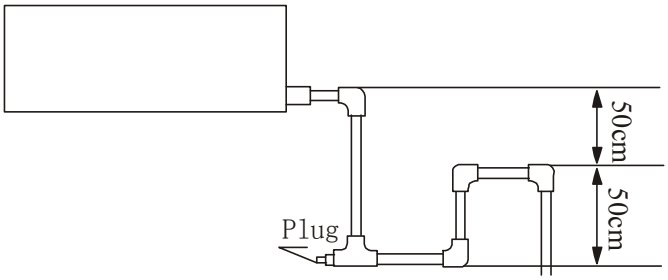
⑦ The dimension of drainpipe can't less than the connecting dimension of indoor drainpipe.

⑧ Heat-insulation should be done well to prevent condensation.

⑨ Indoor units with different drainage type can't share one convergent drainpipe.

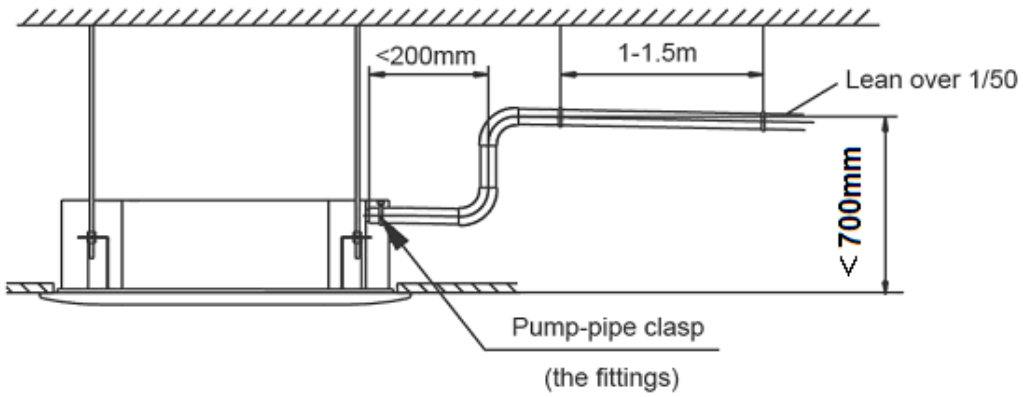
4.2 Drainpipe Trap

4.2.1. If the pressure at the connection of the drainpipe is negative, it needs to design drainpipe trap.
4.2.2. Every indoor unit needs one drainpipe trap.
4.2.3. A plug should be designed to do cleaning.

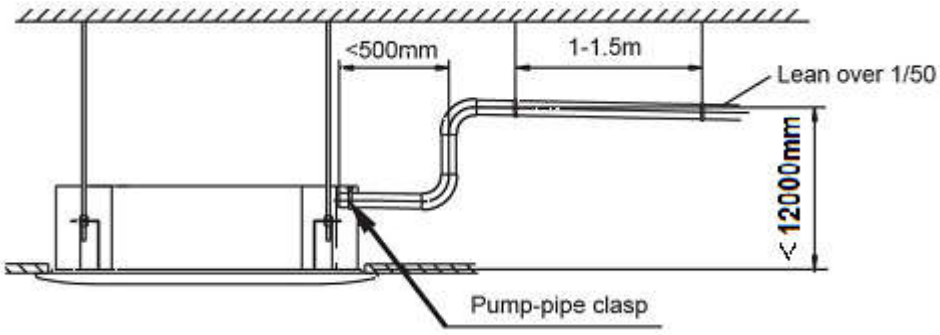


4.3 Upwards drainage (drain pump)

Ceiling cassette (compact)

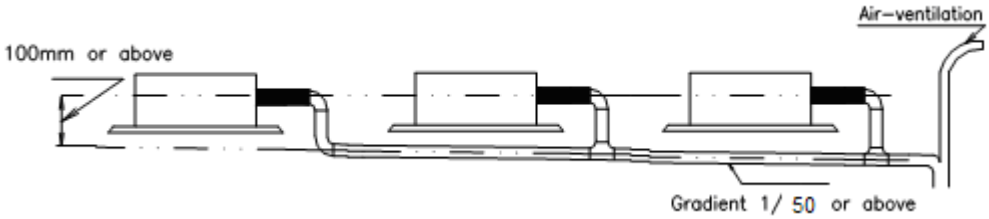


Ceiling cassette



4.4 Convergent drainage

4.4.1. The number of indoor units should be as small as possible to prevent the traverse main pipe overlong.
4.4.2. Indoor unit with drain pump and indoor unit without drain pump should be in different drainage system.



4.4.3. Selecting the diameter

Number of connecting indoor units→Calculate drainage volume→Select the diameter
Calculate allowed volume =Total cooling capacity of indoor units(HP)×2 (l/ hr)

	Allowed volume(lean 1/50) (l/ hr)	I.D. (mm)	Thick
Hard PVC	∽≤14	¢25	3.0
Hard PVC	14＜∽≤88	¢30	3.5
Hard PVC	88＜∽≤334	¢40	4.0
Hard PVC	175＜∽≤334	¢50	4.5
Hard PVC	334＜∽	¢80	6.0

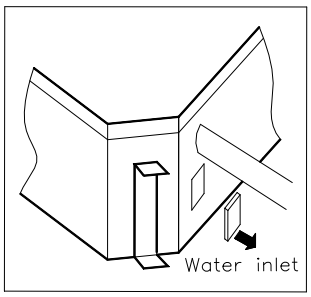
4.5 Drainage test

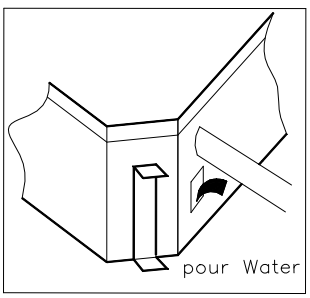
4.5.1Drainage without drain pump

After finishing drainpipe installation, pour some water into the water receiver plate to check if the water flows smoothly.

4.5.2 Drainage with drain pump

① Poke the Water Level Switch, remove the cover, use water pipe to pour 2000ml water into the water receipt plate through the water inlet.





② Turn on the power to Cooling operation. Check the pump's operation and switch on the Water Level Switch. Check the pump's sound and look into the transparent hard pipe in the outlet at the same time to check if the water can discharge normally.

③ Stop the air conditioner running, turn off the power, and put back the cover.

- Stop the air conditioner. After 3 minutes, check if it has abnormity. If the collocation of drainpipes is illogical, the water will flow back overfull, which will cause the alarm lamp flashes, even overflow from the water receipt plate.
- Keep on pouring water until it gives an alarm signal for high water level, check if the pump drains water at once. If the water level can't fall below the alarmed water level after 3 minutes, the air conditioner will stop. Turn off the power and drain the remained water, and then turn on the air conditioner.

Note: the drain stuff in the main water receipt plate is for maintenance. Stuff up the drain stuff to prevent water leakage.

5.Insulation Work

5.1 Insulation material and thickness

5.1.1. Insulation material

Insulation material should adopt the material which is able to endure the pipe's temperature: no less than 70℃ in the high-pressure side, no less than 120℃ in the low-pressure side(For the cooling type machine, no requirements at the low-pressure side.)

◆ Example: Heat pump type----Heat-resistant Polyethylene foam (withstand above 120℃)
Cooling only type----Polyethylene foam (withstand above 100℃)

5.1.2. Thickness choice for insulation material

Insulation material thickness is as follows:

	Pipe diameter (mm)	Adiabatic material thickness
Refrigerant pipe	Φ6.4—Φ25.4	10mm
	Φ28.6—Φ38.1	15mm
Drainage pipe	Inner diameterΦ20—Φ32	6mm

5.2 Refrigerant pipe insulation

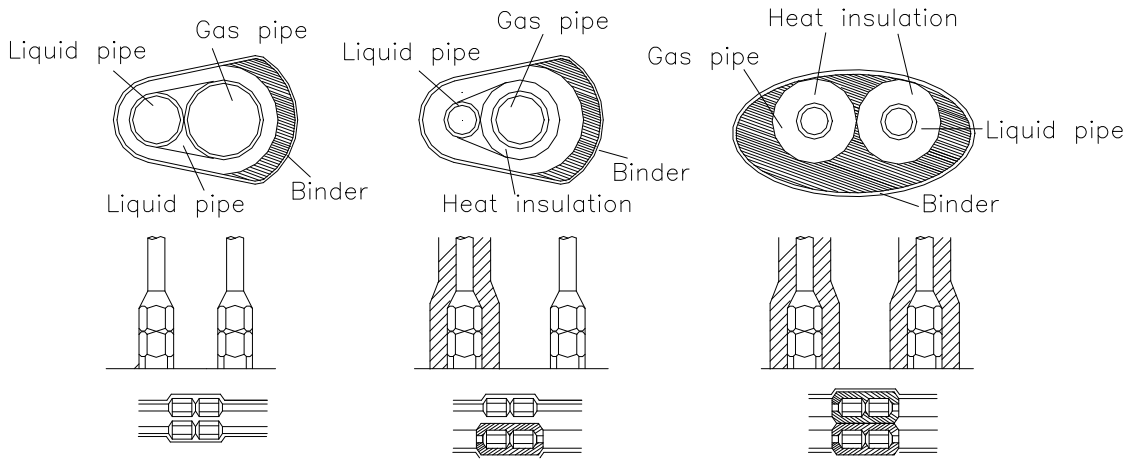
5.2.1. Work Procedure

① Before laying the pipes, the non-jointing parts and non-connection parts should be heat insulated.

② When the gas proof test is eligible, the jointing area, expanding area and the flange area should be heat insulated

5.2.2. Insulation for non-jointing parts and non-connection parts

wrong	right	
Gas pipe and liquid pipe should not be put together to insulate	Insulate the gas pipe (cooling only)	Insulate the gas pipe and liquid pipe

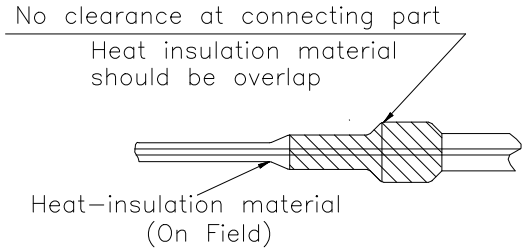


For construction convenience, before laying pipes, use insulation material to insulate the pipes to be deal with, at the same time, at two ends of the pipe, remain some length not to be insulated, in order to be welded and check the leakage after laying the pipes.

5.2.3. Insulate for the jointing area, expanding area and the flange area

① Insulate for the jointing area, expanding area and the flange area should be done after checking leakage of the pipes

② Make sure there's no clearance in the joining part of the accessorial insulation material and local preparative insulation material.



5.3 Drainage pipe insulation

The connection part should be insulated, or else water will be condensing at the non-insulation part.

5.4 Note

5.4.1 The jointing area, expanding area and the flange area should be heat insulated after passing the pressure test

5.4.2 The gas and liquid pipe should be heat insulated individually, the connecting part should be heat insulated individually.

5.4.3 Use the attached heat-insulation material to insulate the pipe connections (pipes' tie-in ,expand nut) of the indoor unit

6.Test Operation

The indoor unit and outdoor unit are installed properly.

- Tubing and wiring are correctly completed.
- The refrigerant pipe system is leakage-checked.
- The drainage is unimpeded.
- The ground wiring is connected correctly.
- The length of the tubing and the added stow capacity of the refrigerant have been recorded.
- The power voltage fits the rated voltage of the air conditioner.
- There is no obstacle at the outlet and inlet of the outdoor and indoor units.
- The gas-side and liquid-side stop values are both opened.
- The air conditioner is pre-heated by turning on the power.

(3) According to the user's requirement, install the remote controller when the remote controller's signal can reach the indoor unit smoothly.

(4) Test operation

Set the air conditioner under the mode of "COOLING" with the remote controller, and check the following points.

Indoor unit

- Whether the switch on the remote controller works well.
- Whether the buttons on the remote controller works well.
- Whether the air flow louver moves normally.
- Whether the room temperature is adjusted well.
- Whether the indicator lights normally.
- Whether the temporary buttons works well.
- Whether the drainage is normal.
- Whether there is vibration or abnormal noise during operation.

Outdoor unit

- Whether there is vibration or abnormal noise during operation.
- Whether the generated wind, noise, or condensed of by the air conditioner have influenced your neighborhood.
- Whether any of the refrigerant is leaked.

Part 4 Troubleshooting

Fault code

Indoor unit fault is displayed

Fault Description	4LED fault indication	Digital display	Wired remote display
Three-phase power phase sequence fault		E0	E0
Indoor and outdoor unit communication failure	Timing lights flash	E1	E1
Temperature sensor (T1) fault	Running lights flash	E2	E2
Pipe temperature sensor in the evaporator (T2) fault	Running lights flash	E3	E3
Pipe temperature sensor in the evaporator (T2B) fault	Running lights flash	E4	E4
Outdoor unit failure	Warning lights flash slowly	E5	E5
The indoor unit EEPROM fault	Defrost lights flash slowly	E7	E7
Water over protection	Warning lights flash	EE	EE
Indoor unit with line controller communication failure		E9	E9
Note: The flash frequency for each of the above indicator is 2.5Hz, slow flashing frequency is 1Hz			

Outdoor unit fault display

Display content	Definition of fault or protection	Remark:
E1	Three-phase power phase sequence fault	
E2	Communication fault between the outdoor unit and the mast	Communication is interrupted for more than 2 minutes 20 minutes after the initial power-on or within 20 minutes
E4	Temperature sensor fault	
E6	Condenser tube temperature sensor fault	
E9	AC over-voltage / under-voltage protection	
E10	EEPROM fault	
H0	0513 and DSP communication fault	
H4	Display P6 protection for 3 times within 30 minutes	Unable to restore unless a second power-on
H5	Display P2 protection for 3 times within 30 minutes	Unable to restore unless a second power-on
H6	Display P4 protection for 3 times within 100 minutes	Unable to restore unless a second power-on
H9	Display P9 protection for 2 times within 10 minutes	Unable to restore unless a second power-on
H10	3 times of P3 protection occurs within 60 minutes	Unable to restore unless a second power-on
P1	High voltage protection	
P2	Low-voltage protection	Display H5 after 3 times of P2 protection within 30 minutes
P3	Primary / secondary overcurrent protection	
P4	Exhaust overheating protection	3 time of P4 protection appears within 100 minutes and then H6 occurs

P5	High tube temperature protection	
P6	Module protection	3 times of P6 protection appears within 30 minutes and then H4 occurs
P9	DC fan fault	Display H9 after 2 times of P9 protection within 10 minutes
P10	Anti-typhoon protection	
P11	Refrigeration T2 overheating protection	
P12	5 minutes continuous fault on hot air system at area A	
L0	DC compressor module fault	
L1	DC bus low voltage protection	
L2	DC bus high voltage protection	
L4	MCE fault / sync / closed loop	
L5	Zero speed protection	
L7	Phase sequence error protection	
L8	15Hz protection	
L9	Hz Protection	

Parameter table for outdoor unit check and maintenance

The digital tube displays the indoor unit quantity connected

and communicated with during standby;The digital tube Displays the frequency value during operation of compressor; The digital tube displays “dF” during defrosting.

No.		Display content	Remark:
0	Normal display	Current frequency / Indoor unit quantity	Quantity at power on displayed on standby
1	1-	Outdoor unit local capacity	
2	2-	Total capacity needs of indoor unit	
3	3-	Total capacity of the outdoor unit after correction;	
4	4-	Operation mode (0: Off / air supply; 2: cooling; 3: heating; 4: forced refrigeration);	0: Shutdown / air supply; 2: Cooling; 3 heating; 4: Forced cooling
5	5-	Actual operating capacity of the outdoor unit	
6	6-	Fan status	0-7
7	7-	T2/T2B on average	
8	8-	T3 pipe temperature	
9	9-	T4 environmental temperature	
10	10-	T5 exhaust temperature	
11	11-	Opening of the electronic expansion valve	Actual value= Displayed value on inspection × 8

12	12-	Primary current	
13	13-	Secondary circuit current	
14	14-	Primary voltage	
15	15-	Secondary voltage	Actual value= Displayed value on inspection × 4
16	16-	Sets of indoor units	
17	17-	Number of working indoor units	
18	18-	Last fault or protection code	No protection or fault display __
19	19-	---	Spot check over