

Energolux

SERVICE MANUAL

DC Inverter Smart Multi R410a



 Designed in
Switzerland

www.energolux.com



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Part 1 General information

1. Nomenclature

Outdoor Unit

SAM18M1-AI/2

S – Swiss

A – Air Conditioner

M – Outdoor AC

18 – Cooling capacity (kBtu/h)

M1– Multi-Split AC

AI – DC Inverter

2 – 1 outdoor drives 2 indoors

Indoor Unit

SAS18M1-AI

S – Swiss

A – Air Conditioner

Indoor unit type:

S – Wall-mounted indoor type

C – Cassete indoor type





D – Duct indoor type



CF– Ceiling&Floor indoor type

M1– Multi-Split AC

AI – DC Inverter

2. Unit Appearance

Series	Picture of the indoor unit
<p>Four-way Cassette SAC09/12/18M1-AI 9K~18K Btu/h</p>	
<p>Ceiling & Floor SACF09/12/18M1-AI 9K~18K Btu/h</p>	
<p>Low ESP Duct SAD07/09/12/18M1-AI 7K~18K Btu/h</p>	
<p>Wall-mounted SAS07/09/12/18M1-AI 7K~18K Btu/h</p>	

Series	Picture of the outdoor unit				
Capacity (Btu)	18000	24000	27000	36000	42000
Outdoor Unit					
	1 drive 2	1 drive 3		1 drive 4	1 drive 5

*Note :

① All of the above indoor unit can be freely matched and combined, but must be installed strictly according to the above table or the cooling capacity and stability would be decreased.

COMBINATIONS

SAM18M1-AI/2						
1 indoor	7	9	12			
2 indoors	7+7	7+9	7+12	9+9	9+12	12+12

SAM24M1-AI/3										
1 indoor	7	9	12	18						
2 indoors	7+7	7+9	7+12	7+18	9+9	9+12	9+18	12+12	12+18	
3 indoors	7+7+7	7+7+9	7+7+12	7+7+18	7+9+9	7+9+12	7+12+12	9+9+9	9+9+12	9+12+12

SAM27M1-AI/3										
1 indoor	7	9	12	18						
2 indoors	7+7	7+9	7+12	7+18	9+9	9+12	9+18	12+12	12+18	
3 indoors	7+7+7	7+7+9	7+7+12	7+7+18	7+9+9	7+9+12	7+12+12	9+9+9	9+9+12	9+12+12

SAM36M1-AI/4								
1 indoor	7	9	12	18				
2 indoors	7+7	7+9	7+12	7+18	9+9	9+12	9+18	12+12
	12+18	18+18						
3 indoors	7+7+7	7+7+9	7+7+12	7+7+18	7+9+9	7+9+12	7+9+18	7+12+12
	7+12+18	7+18+18	9+9+9	9+9+12	9+9+18	9+12+12	9+12+18	9+18+18
	12+12+12	12+12+18						
4 indoors	7+7+7+7	7+7+7+9	7+7+7+12	7+7+7+18	7+7+9+9	7+7+9+12	7+7+9+18	7+7+12+12
	7+7+12+18	7+9+9+9	7+9+9+12	7+9+9+18	7+9+12+12	7+9+12+18	7+12+12+12	7+12+12+18
	9+9+9+9	9+9+9+12	9+9+9+18	9+9+12+12	9+9+12+18	9+12+12+12		

SAM42M1-AI/5								
1 indoor	7	9	12	18				
2 indoors	7+7	7+9	7+12	7+18	9+9	9+12	9+18	
	12+12	12+18	18+18					
3 indoors	7+7+7	7+7+9	7+7+12	7+7+18	7+9+9	7+9+12	7+9+18	
	7+12+12	7+12+18	7+18+18	9+9+9	9+9+12	9+9+18	9+12+12	
	9+12+18	9+18+18	12+12+12	12+12+18	12+18+18	18+18+18		
4 indoors	7+7+7+7	7+7+7+9	7+7+7+12	7+7+7+18	7+7+9+9	7+7+9+12	7+7+9+18	
	7+7+12+12	7+7+12+18	7+7+18+18	7+9+9+9	7+9+9+12	7+9+9+18	7+9+12+12	
	7+9+12+18	7+12+12+12	7+12+12+18	9+9+9+9	9+9+9+12	9+9+9+18	9+9+12+12	
	9+9+12+18	9+9+18+18	9+12+12+12	9+12+12+18	12+12+12+12	12+12+12+18		
5 indoors	7+7+7+7+7	7+7+7+7+9	7+7+7+7+12	7+7+7+7+18	7+7+7+9+9	7+7+7+9+12	7+7+7+9+18	
	7+7+7+12+12	7+7+7+12+18	7+7+9+9+9	7+7+9+9+12	7+7+9+9+18	7+7+9+12+12	7+7+9+12+18	
	7+7+12+12+12	7+7+12+12+18	7+9+9+9+9	7+9+9+9+12	7+9+9+12+18	7+9+12+12+12	7+12+12+12+12	
	9+9+9+9+9	9+9+9+9+12	9+9+9+9+18	9+9+9+12+12	9+9+12+12+12			

Part 2 Indoor unit

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Four-way cassette

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1. Function Introduction

Function	Name	SAC-M1-AI		
		09	12	18
Protection Function	Anti-freeze protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Sensor failure alarm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Error code display function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comfortable Function	Cooling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Heating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	3 fan speed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Auto-restart (optional)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Anti-cold wind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Blow exhaust heat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Timer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Opretating display	Clock display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Operating mode display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Fan speed display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Defrosting display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Timing on/off display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Sleeping display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Operation mode	Auto/Cool/Dry/Heat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Dehumidify operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Auto defrosting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Ventilation function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health function	Removable air filter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Fresh air function preserved	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Installation instruction plate is available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Specification

Model	Indoor	Unit	SAC09M1-AI	SAC12M1-AI	SAC18M1-AI
Capacity	Cooling	Btu/h	9560(5120-12115)	12285(5800-12625)	17060(8530-19107)
		kW	2.80(1.50-3.55)	3.60(1.70-3.70)	5.0(2.50-5.6)
	Heating	Btu/h	10240(5460-13000)	13306(6930-15080)	19107(10340-24000)
		kW	3.00(1.60-3.81)	3.9(2.03-4.42)	5.6(3.03-7.03)
Electric Data	Power Supply	V~,Hz,Ph	220~240,50,1	220~240,50,1	220~240,50,1
	Cooling Power Input	W	70(17.5-109)	70(17.5-109)	70(17.5-109)
	Heating Power Input	W	70(17.5-109)	70(17.5-109)	70(17.5-109)
Fan Motor	Model	/	XD30B	XD30B	XD30B
	Output Power	W	30	30	30
	Capacitor	uF	2.0	2.0	2.0
	Speed (Hi/Mi/Lo)	r/min	839/757/688	839/757/688	839/757/688
Indoor Coil	Number Of Row	/	2	2	2
	Tube Pitchx Row Pitch	mm	20.5x 12.7	20.5x 12.7	20.5x 12.7
	Fin Pitch	mm	1.5	1.5	1.5
	Fin Material	/	Hydrophilic aluminum fin	Hydrophilic aluminum fin	Hydrophilic aluminum fin
	Tube Outside Dia.&Material	mm	φ7 , Inner grooved	φ7 , Inner grooved	φ7 , Inner grooved
	Coil Length x Height x Width	mm	1352x205x 25.4	1352x205x 25.4	1352x205x 25.4
	Heat Exchanging Area	m ²	5.76	5.76	5.76
Performance	Air Flow Volume	m ³ /h	700/600/530	700/600/530	700/600/530
	Sound Pressure Level	dB(A)	45/41/35	45/41/35	45/41/35
Dimension	Net Dim (W*D*H)	mm	570×570×260	570×570×260	570×570×260
	Packing Dim (W*D*H)	mm	635x635x290	635x635x290	635x635x290
	Net(Panel)	mm	650x650x55	650x650x55	650x650x55
	Packing(Panel)	mm	710x710x80	710x710x80	710x710x80
Weight	Net(Body)	kg	18	18	18
	Gross(Body)	kg	21	21	21
	Net(Panel)	kg	3	3	3
	Gross(Panel)	kg	5	5	5
Refrigerant Type		/	R410a	R410a	R410a
Pipe Dia	Liquid Side	mm(inch)	6.35(1/4)	6.35(1/4)	6.35(1/4)
	Gas Side	mm(inch)	12.7(1/2)	12.7(1/2)	12.7(1/2)
	Drainage	mm	20	20	20
Loading Qty	20/40/40H	unit	150/315/354	150/315/354	150/315/354

Note:

- Cooling capacity test Condition:(27°CDB,19°CWB Indoor/35°CDB,24°CWB Outdoor);
Heating capacity test Condition:(20°CDB Indoor/7°CDB,6°CWB Outdoor);
connecting pipe length: 5M.

2. Datas may be changed with unit improvement. We keep the right to change the datas or specifications without prior notice, please follow the datas listed on the nameplate.

3. Capacity Amendment

3.1 Running range

Cooling capacity (Btu/h)		9000	12000	18000
Power supply		220-240V~/50Hz		
Voltage		187~253V		
Ambient temperature	Cooling	-10~52°C		
	Heating	-15~24°C		

3.2 Amendment coefficient of cooling capacity under different indoor/outdoor temperature(K1)

Indoor temperature(°C)		Outdoor temperature(DB)					
DB	WB	25	30	35	40	45	50
22	15	0.97	0.92	0.87	0.96	0.77	0.75
24	17	1.03	0.98	0.94	0.89	0.84	0.80
27	19	1.10	1.05	1	0.95	0.90	0.86
29	21	1.16	1.11	1.06	1.02	0.96	0.91
32	23	1.22	1.17	1.13	1.08	1.02	0.98

Actual cooling capacity calculation:

Actual cooling capacity = amendment coefficient of cooling capacity × nominal cooling capacity

—— nominal cooling capacity could be found from the performance parameters list

—— amendment coefficient of cooling capacity could be found from table above.

3.3 Amendment coefficient of heating capacity under different indoor/outdoor DB/WB temperature K2

Outdoor temperature(°C)		Indoor temperature(DB)		
DB	WB	15	20	25
-15	-16	0.64	0.59	0.55
-10	-12	0.71	0.66	0.62
-7	-8	0.76	0.72	0.67
-1	-2	0.79	0.74	0.70
2	1	0.81	0.76	0.72
7	6	1.04	1	0.96
10	9	1.10	1.06	1.01
15	12	1.16	1.12	1.07

Actual heating capacity calculation:

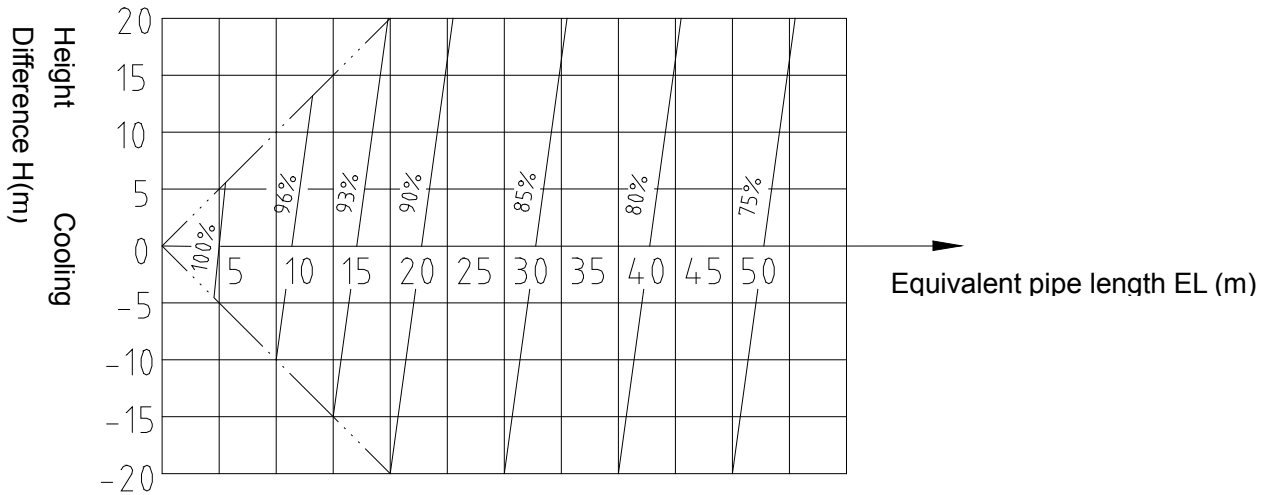
Actual heating capacity = amendment coefficient of heating capacity × nominal heating capacity

—— nominal heating capacity could be found from the performance parameters list

—— amendment coefficient of heating capacity could be found from table above.

3.4 Amendment coefficients of heating and cooling capacity under different height drop K3

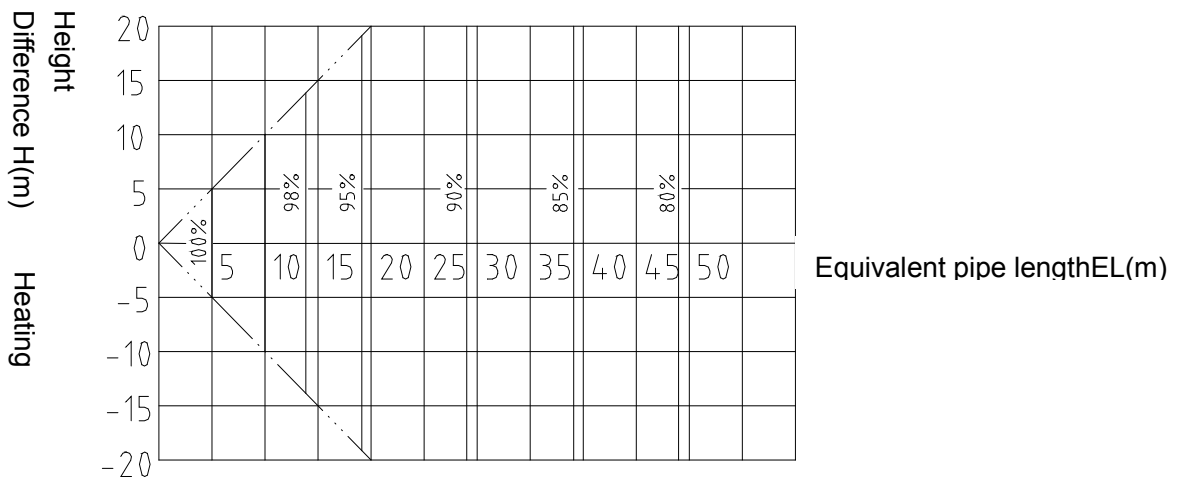
Different Cooling Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit — Height of Indoor Unit

Different Heating Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit — Height of Indoor Unit

3.5 Correction capability

Cooling capacity = nominal cooling capacity xK1xK3

Heating capacity = nominal heating capacity xK2xK3

3.6 Equivalent Pipe length conversion

Equivalent pipe length means converting pipe elbow to straight pipe length after considerate the pressure loss.

Bend and Oil Loop Conversion tablet

Pipe Dia.(mm) \ Type	Bend	Oil Loop
6.35	0.10	0.7
9.52	0.18	1.3
12.70	0.20	1.5
15.88	0.25	2.0
19.05	0.35	2.4
22.02	0.40	3.0

Equivalent Pipe length L = Actual Pipe length L + Bend Qty × Equivalent pipe bend length + Oil Loop Qty × Equivalent Oil Loop length

Sample:

SAC09M1-AI Actual Pipe length is 25 meters, Gas pipe diameter is 9.52mm. If there's 5 bends and 2 oil loops during the installation, then the equivalent pipe length should be:

$$L = 25 + 0.18 \times 5 + 1.3 \times 2 = 28.5(\text{m})$$

◇ Specification of Connection Pipe for Indoor Unit and Outdoor Unit

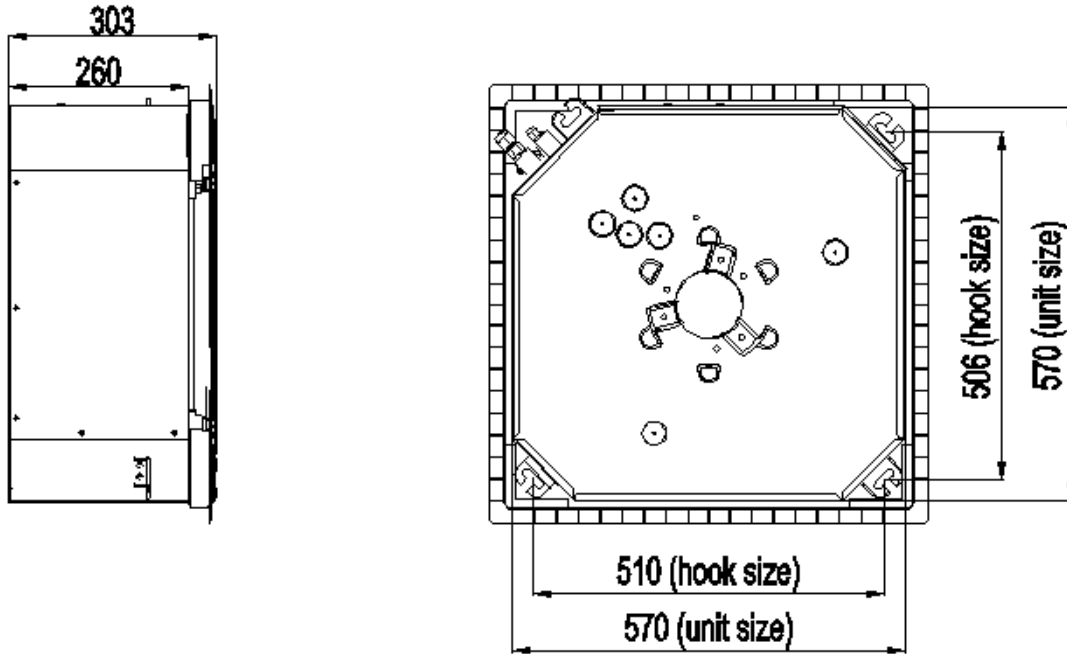
Cooling Capacity(Btu/h)		9000	12000	18000
Connection Pipe (mm)	Liquid Pipe	Φ6.35		
	Gas Pipe	Φ12.7		
Max. Length(Each)		15		
Max. Height (m)		10		
Max. Bend Qty		5		
Extra R410a per meter when the pipe length is more than 5 meter (kg)		0.022		

Caution:

1. The standard Pipe length is 5m, if the pipe length is less than this then no additional charging is necessary. If the pipe length is more than this then you should charge more refrigerant into the system according to the above Charging Data
2. The thickness of the pipe is 0.6-1.0, bearing pressure is 4.2MPa;
3. If the connection pipe is too long, the cooling capacity and stability would be decreased. And the more bend quantity, the resistance in the piping system would be bigger, then the cooling and heating capacity would be decreased even lead to compressor broken. We suggest you to use the shortest connection pipe according to the pipe length parameter in this manual. If the height difference between outdoor and indoor unit is more than 5m, an oil trap should be installed in the gas pipe for every 10 meters.

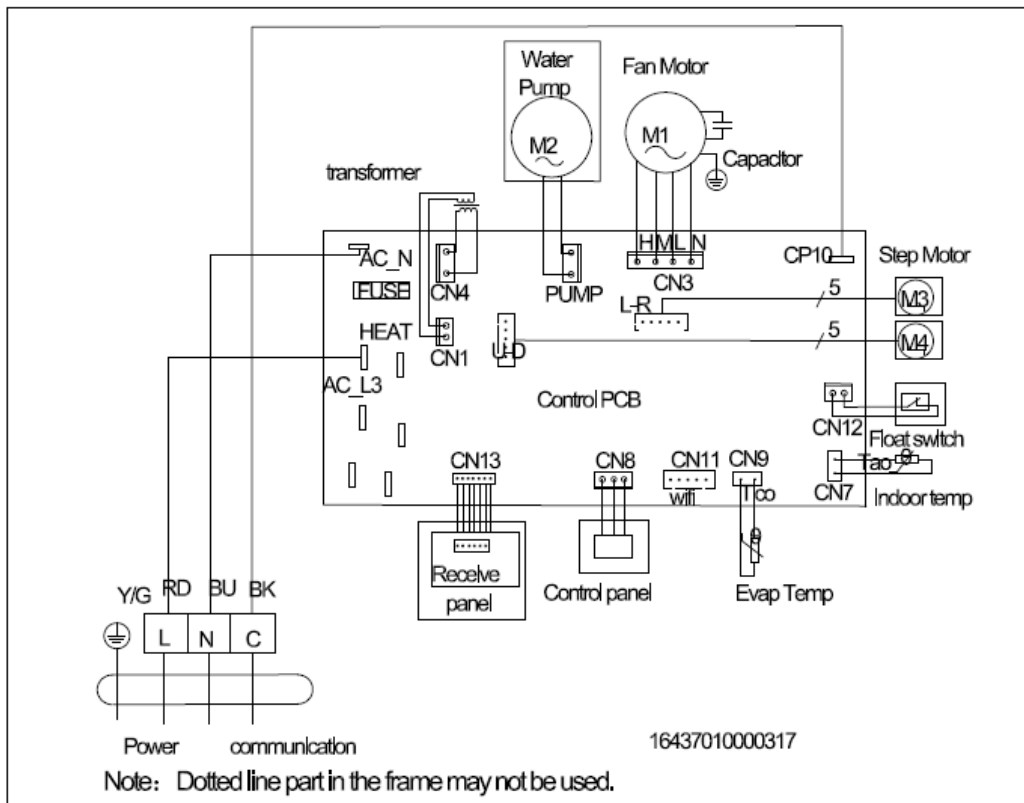
4. Dimension

SAC09M1-AI, SAC12M1-AI, SAC18M1-AI



5. Electrical Diagram

SAC09M1-AI, SAC12M1-AI, SAC18M1-AI



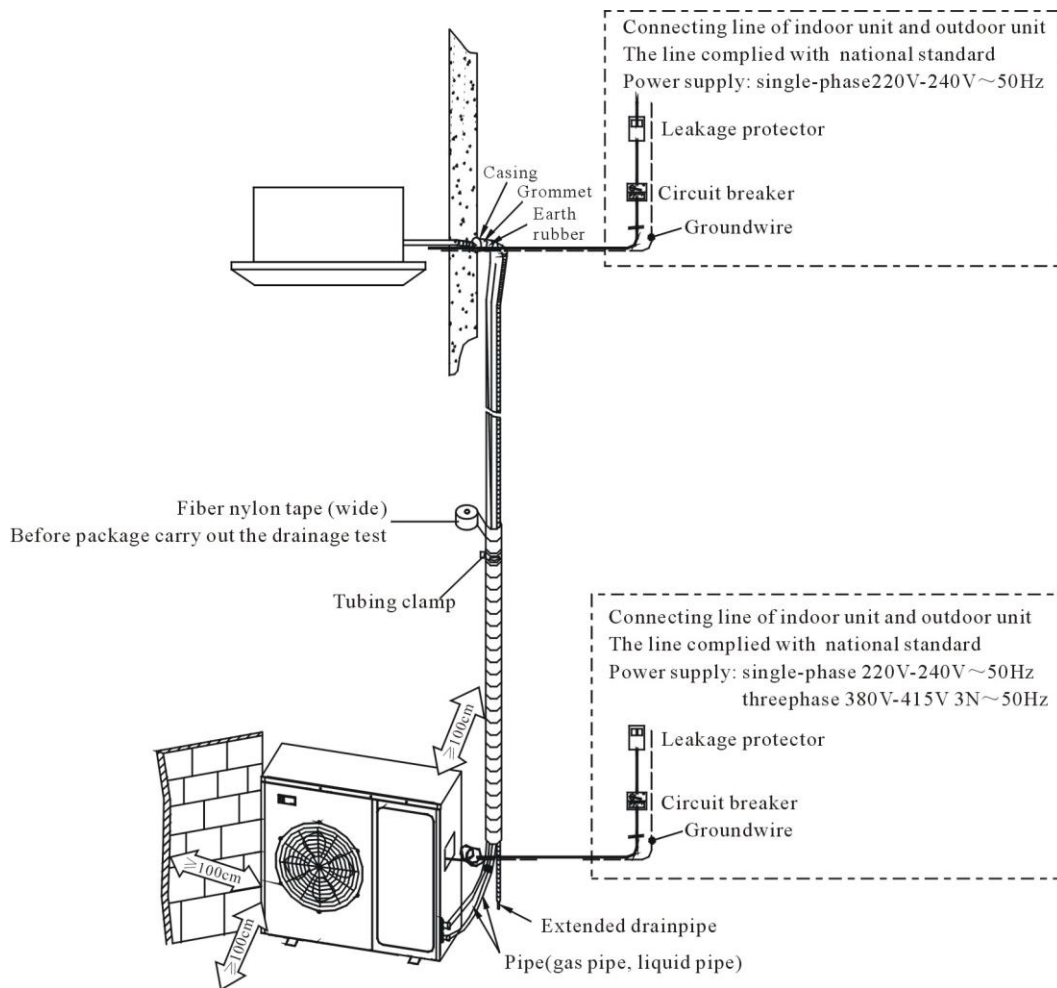
6. Installation

6.1 Preparation before installation

6.1.1 Please buy following spare parts from your local market before installation

1	Hung bolts M12, 4 pcs
2	Drainage pipe PVC
3	Copper pipe
4	Adhesive belt (big size) 5 pcs, (small size) 5 pcs
5	Heat insulation material used to connect copper pipe (PE foam material, its thickness is more than 8mm)
6	Power cable, electrical wire between indoor and outdoor unit(Must be in accordance with the wire diameter in the wiring diagram)
7	Acetylene cylinders, oxygen cylinders (when longer pipe used it should be welded)
8	One set pipe cut machine. (cut copper pipe)
9	Refrigerant cans, electronic balance (when longer pipe used additional gas should be charged)
10	Pressure gauges, pipe clamp, welding torch, 2B silver electrode
11	Wrench 2 pcs, one of them is with adjustable torque wrench(42N.m,65N.m,100N.mm)
12	Nitrogen cylinder (in order to prevent oxidation when welding, using Nitrogen to replace the air)

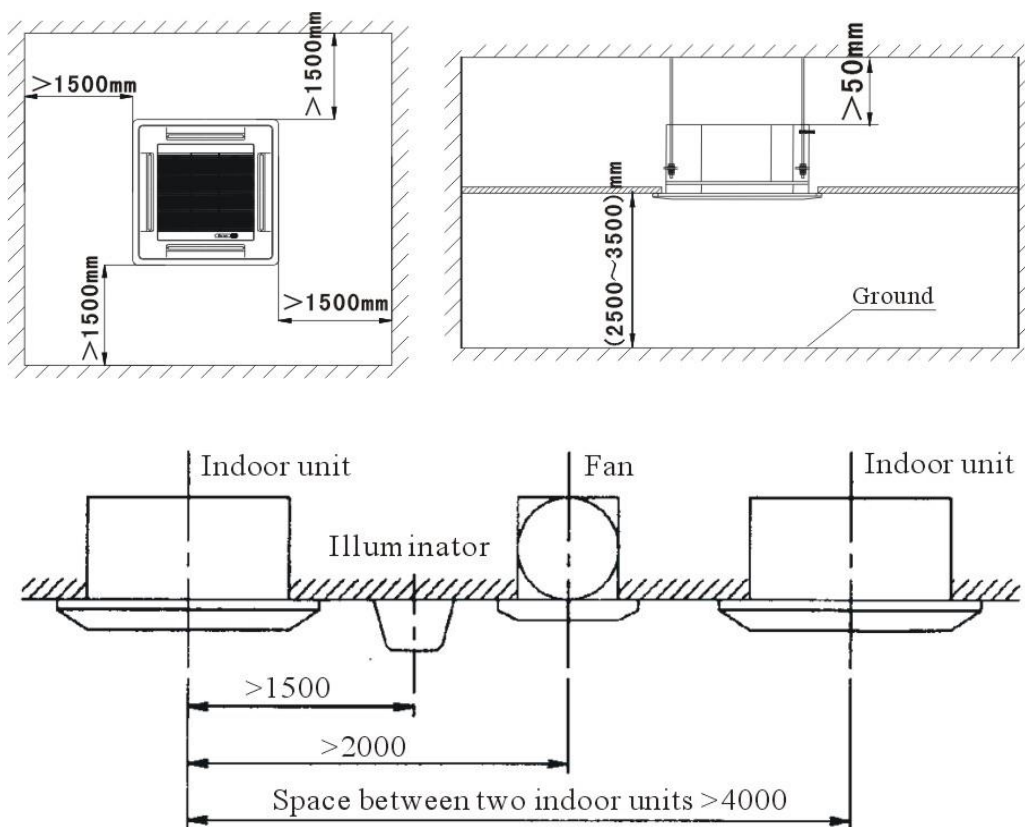
6.2 Installation drawing



6.3 Installation precaution

- ◇ Hanging location should be able to support the unit's weight, there should be no increase in noise and vibration. If the hanging location needs reinforcement, it should be reinforced before installation;
- ◇ Choose the space above the ceiling that can put the indoor unit inside;
- ◇ The location should be easy for drainage;
- ◇ The unit should not be installed in the heat source, steam or oil mist source (such as machine room, kitchen, laundry room, mechanical workshop, etc.)
- ◇ Choose the location at least 1 meter away from TV and radio, in order to avoid interference to them
- ◇ There should be certain distance between indoor unit and obstacles for maintenance;
- ◇ In case of leakage of refrigerant, units should immediately stop running, and contact with maintenance personnel in time. There must be no fire at the site, because the refrigerant will turn to harmful gas when get to the fire.

6.4 The distance between indoor unit and obstacle



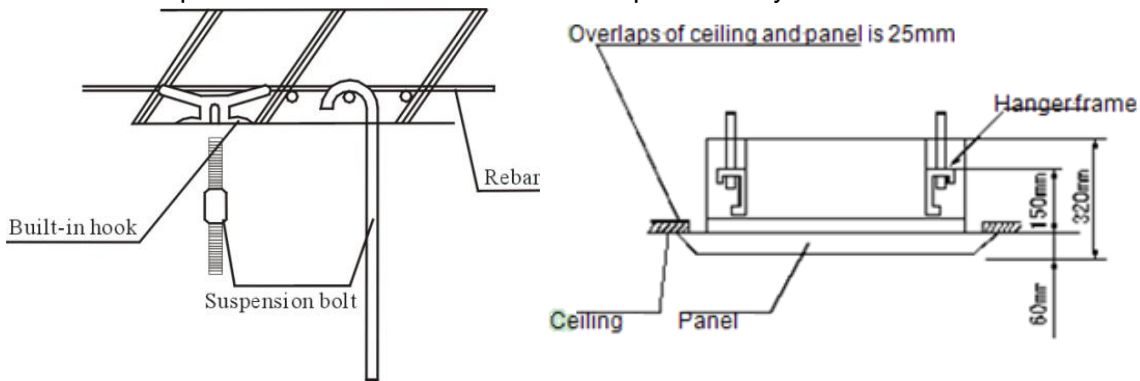
6.5 Indoor unit suspension

- ◇ Select the suspension foundation:

The suspension foundation is a structure of either wooden frame or reinforced concrete. It must be firm and reliable to bear at least 4 times weight of itself and capable of bearing vibration for long periods.

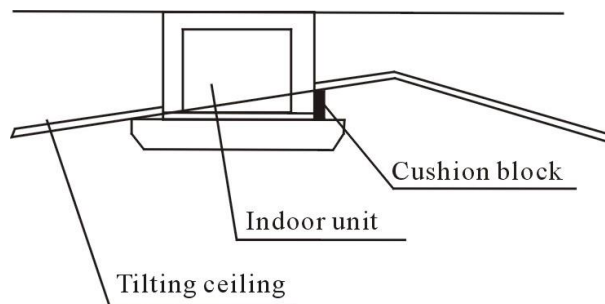
- ◇ Fixing of suspension foundation:

- ◇ Fix the suspension bolts either as shown in the picture or by a steel or wooden bracket.

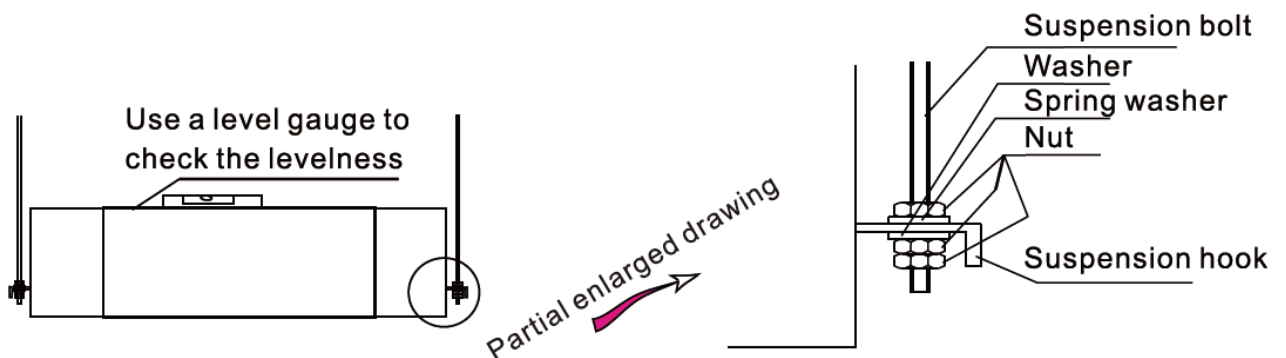


- ◇ If this unit is installed on a sloping ceiling, a cushion block should be installed between the ceiling and the air outlet panel, in order to ensure that the unit is installed on a level surface.

This is as shown in the drawing as follows:

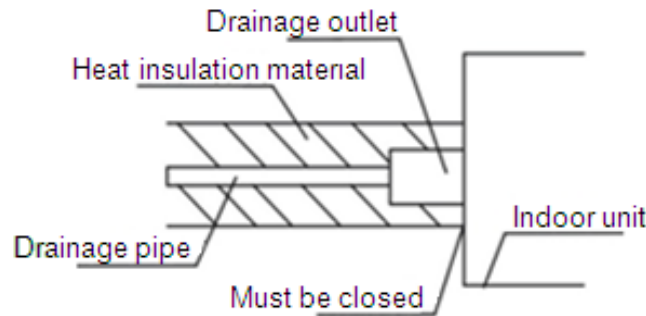


- ◇ Adjust the relative position of the suspension hook on the suspension bolt so that the unit can be in level position in all directions. Check with a level gauge after installation to ensure that the indoor unit is horizontal, otherwise it will cause water leakage, air leakage etc.
- ◇ Tighten the bolt and ensure that four hooks are in close contact with the nuts and washers, to fix the indoor unit under the ceiling.
- ◇ After the unit is installed ensure it is secure and does not shake or sway.
- ◇ Ensure that the centre of the indoor unit is in alignment with the centre of the opening in the ceiling.

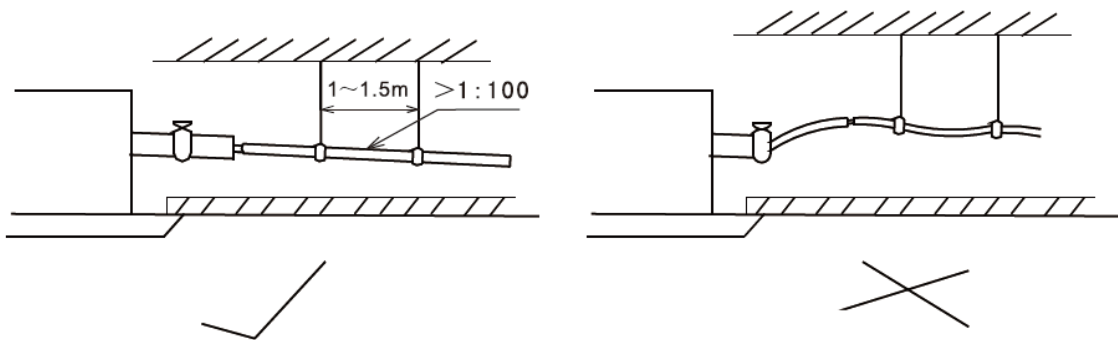


6.6 Drainage pipe installation

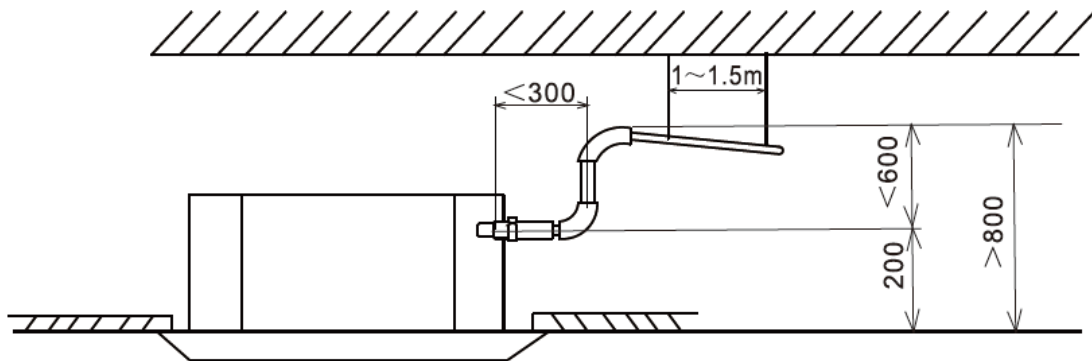
The drainage pipe should be properly insulated to prevent the generation of condensation. Heat insulation material: the thickness of rubber insulation pipe should be more than 8mm



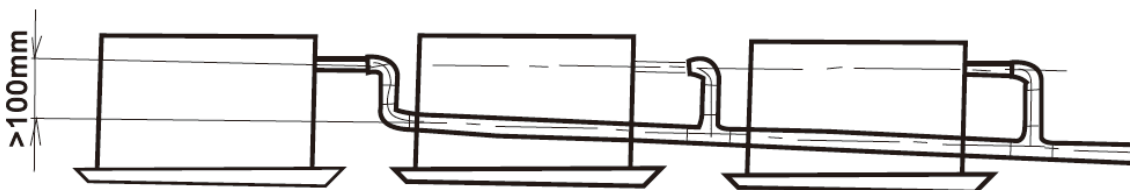
- ◇ Drainage pipe must have a downward gradient (1 / 50 1 / 100) to avoid water backflow or leakage etc.



- ◇ The unit has a drain pump which will lift up to 1200mm. However after the pump stops the water left in the pipe will drain back and may overflow the drain tray causing water leakage. For this reason please install the drain pipe as shown



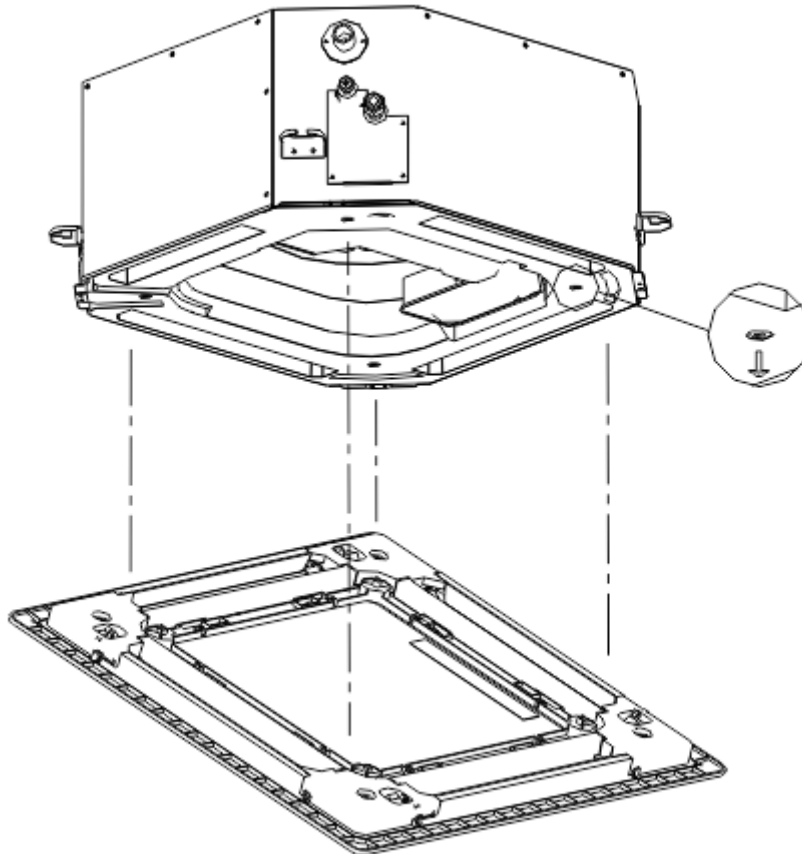
- ◇ When draining multiple units into a common drain line, this common drain should be installed about 100mm below each units drain outlet, as shown in the drawing.



- ◇ When finish installation please carry out the drainage test to ensure that the water flow through the pipeline fluently, and carefully observe the junction to ensure that there is no water leakage. If the unit is installed in the newly built house, strongly recommend that this test taken before the ceiling installation. Even it is the heating only unit, this test is unavoidable.

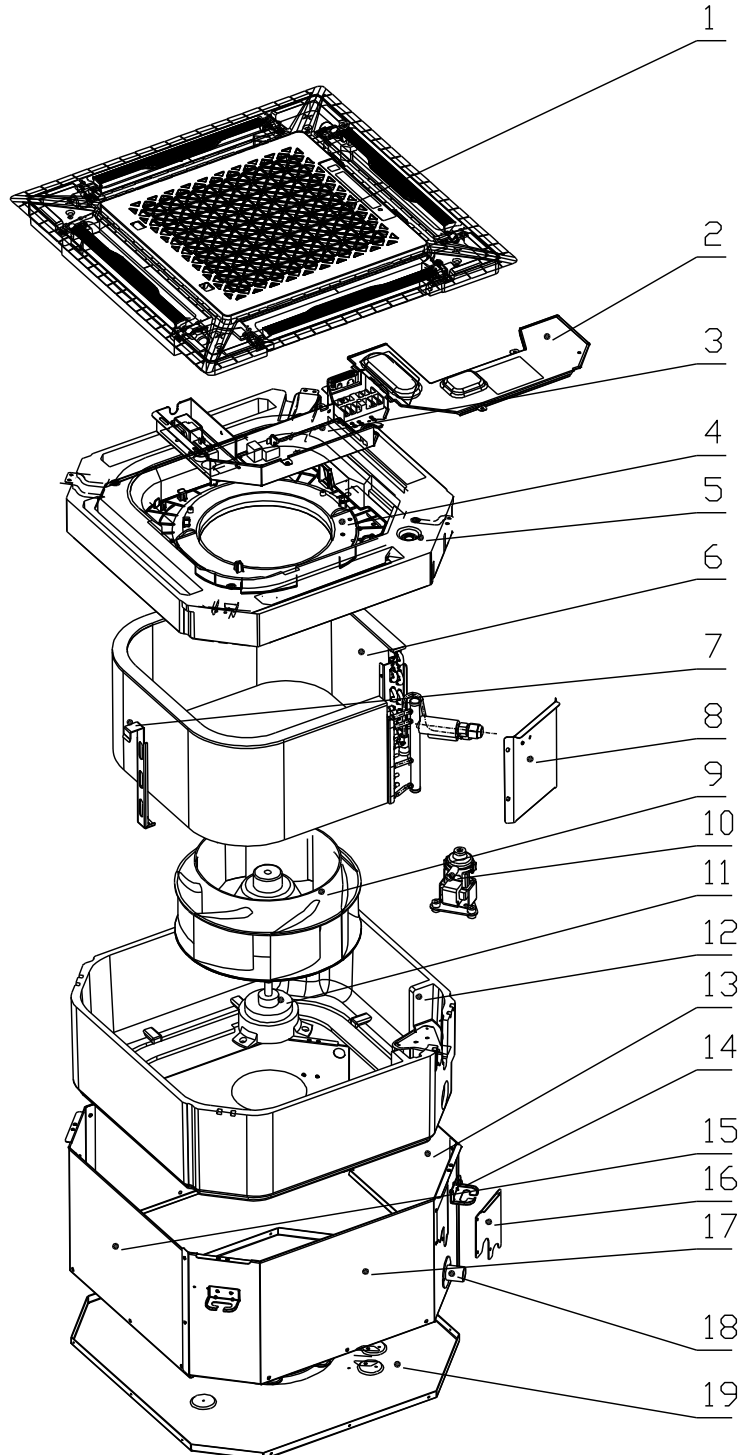
6.7 Panel installation

As to the MB13 panel please refer to the following picture, the panel has four hooks which attach to corresponding hangers on the unit and the panel should be positioned using these first. The panel is then fixed into position by four bolts which are accessed through the four corner panels on the grille.



7. Explode view

SAC09M1-AI, SAC12M1-AI, SAC18M1-AI



No.	BOM Code	Part Name	Qty	Remark
1	16108022000016	Panel MB13 new	1	
1.1	16420010000015	Return-air grille assembly	1	
1.2	16420012000012	Air filter net	1	
1.3	16420007000023	guide wind vane	4	
1.4	16430001000133	Step motor	4	24BYJ48-2
1.5	16422015000007	Display board	1	SX-DISP-01
1.6	16420014000035	Panel frame assembly	1	
2	16321005000025	Cover for electric components	1	
3	16330001000016	Electric assembly	1	
3.1	11330010000089	capacitance	1	2.5 μ F/450V a.c
3.2	11222542000029	PCB board	1	QRD-SN3F(18-60)K(485)-SYE1(SY)
3.3	16422005000017	Transformer	1	TDB-14-B4B(PTC)
3.4	16427001000064	Terminal board	1	600V 2.5mm ²
3.5	16430007000007	Sensor 1	1	20K3950 XH2
3.6	16430007000003	Sensor 2	1	15K3950 XH2
4	16320005000040	Water pan	1	
5	16432016000037	Rubber plug	1	
6	16324005000082	Evap assembly	1	
6.1	16325005000086	Evap part	1	
6.2	16325005000087	Evap outlet tube assembly	1	
6.3	16421024000110	Evap inlet tube assembly	1	
7	16421007000143	Evap Pothook	2	
8	16444001000037	Evaporator connect board	1	
9	16330005000017	Wind wheel	1	Φ 283 \times 166
10	16421026000368	Drain pump	1	PLD-700
10.1	16430001000638	Bodder switch	1	
10.2	16421040000053	Drain pump support	1	
11	16430001000638	Fan motor	1	XD30B
12	16421040000042	Water pan holder	1	
13	16421010000073	Air Blower EPS	4	
14	16421014000089	Pothook	4	
15	16421010000072	Boarding A	1	
15.1	16432019000008	Boarding B	1	
16	16321001000071	Valve board	1	
17	16108022000016	Boarding B	1	
18	16420010000015	Plastic drainage pipe	1	
19	16420012000012	Chassis	1	

Ceiling & floor type

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1. Function Introduction

Function	Name	SACF-M1AI		
		09	12	18
Protection Function	Anti-freeze protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Sensor failure alarm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Error code display function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comfortable Function	Cooling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Heating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	3 fan speed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Auto-restart (optional)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Anti-cold wind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Blow exhaust heat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Timer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Opretating display	clock display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	operating mode display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	fan speed display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	defrosting display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	timing on/off display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	sleeping display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Operation mode	Auto operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Dehumidify operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Auto defrosting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Ventilation function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health function	Removable air filter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Specification

Model	Indoor	Unit	SACF09M1-AI	SACF12M1-AI	SACF18M1-AI
Capacity	Cooling	Btu/h	9560(5120-12115)	12285(5800-12625)	18080(8530-19107)
		kW	2.80(1.50-3.55)	3.60(1.70-3.70)	5.3(2.50-5.6)
	Heating	Btu/h	10240(5460-13000)	13306(6930-15080)	19790(10340-24000)
		kW	3.00(1.60-3.81)	3.9(2.03-4.42)	5.8(3.03-7.03)
Electric Data	Power Supply	V~,Hz,Ph	220~240,50,1	220~240,50,1	220~240,50,1
	Cooling Power Input	W	80(20-125)	80(20-125)	80(20-125)
	Heating Power Input	W	80(20-125)	80(20-125)	80(20-125)
Fan Motor	Model	/	YSK-25W-4	YSK-25W-4	YSK-40W-4
	Output Power	W	25	25	40
	Capacitor	uF	1.5	1.5	2.5
	Speed (Hi/Mi/Lo)	r/min	1030/866/735	1030/866/735	1250/1100/900
Indoor Coil	Number Of Row	/	2	2	3
	Tube Pitchx Row Pitch	mm	20.5x 12.7	20.5x 12.7	20.5x 12.7
	Fin Pitch	mm	1.6	1.6	1.6
	Fin Material	/	Hydrophilic aluminum	Hydrophilic aluminum	Hydrophilic aluminum
	Tube Outside Dia.& Material	mm	φ7 , Inner grooved	φ7 , Inner grooved	φ7 , Inner grooved
	Coil L x H x W	mm	599x246x 25.4	599x246x 25.4	599x246x 38.1
	Heat Exchanging Area	m ²	4.21	4.21	6.32
Air Flow volume		m ³ /h	620/504/441	620/504/441	850/680/595
Sound Pressure Level		dB(A)	39/36/30	39/36/30	43/39/36
Dimension	Net Dim(W*D*H)	mm	929×660×205	929×660×205	929×660×205
	Packing Dim(W*D*H)	mm	1010×720×290	995×710×280	995×710×280
Weight	Net	kg	24	24	25
	Gross	kg	27	27	28
Refrigerant Type		/	R410a	R410a	R410a
Pipe Dia	Liquid Side	mm(inch)	6.35(1/4)	6.35(1/4)	6.35(1/4)
	Gas Side	mm(inch)	12.7(1/2)	12.7(1/2)	12.7(1/2)
	Drainage	mm	20	20	20
Loading Qty	20/40/40H	unit	136/280/315	136/280/315	136/280/315

Note:

- Cooling capacity test Condition:(27°CDB,19°CWB Indoor/35°CDB,24°CWB Outdoor);
Heating capacity test Condition:(20°CDB Indoor/7°CDB,6°CWB Outdoor);
connecting pipe length: 5M.
- Datas may be changed with unit improvement. We keep the right to change the datas or specifications without prior notice, please follow the datas listed on the nameplate.

3. Capacity amendment

3.1 Running range

Cooling capacity (Btu/h)	9000	12000	18000
Power supply	220-240V~/50Hz		
Voltage	187~253V		
Ambient temperature	Cooling	-10~52℃	
	Heating	-15~24℃	

3.2 Amendment coefficient of cooling capacity under different indoor/outdoor temperature(K1)

Indoor temperature(℃)		Outdoor temperature(DB)					
DB	WB	25	30	35	40	45	50
22	15	0.97	0.92	0.87	0.96	0.77	0.75
24	17	1.03	0.98	0.94	0.89	0.84	0.80
27	19	1.10	1.05	1	0.95	0.90	0.86
29	21	1.16	1.11	1.06	1.02	0.96	0.91
32	23	1.22	1.17	1.13	1.08	1.02	0.98

Actual cooling capacity calculation:

Actual cooling capacity=amendment coefficient of cooling capacity × nominal cooling capacity

——nominal cooling capacity could be found from the performance parameters list

——amendment coefficient of cooling capacity could be found from table above.

3.3 Amendment coefficient of heating capacity under different indoor/outdoor temperature K2

Outdoor temperature(℃)		Indoor temperature(DB)		
DB	WB	15	20	25
-15	-16	0.64	0.59	0.55
-10	-12	0.71	0.66	0.62
-7	-8	0.76	0.72	0.67
-1	-2	0.79	0.74	0.70
2	1	0.81	0.76	0.72
7	6	1.04	1	0.96
10	9	1.10	1.06	1.01
15	12	1.16	1.12	1.07

Actual heating capacity calculation:

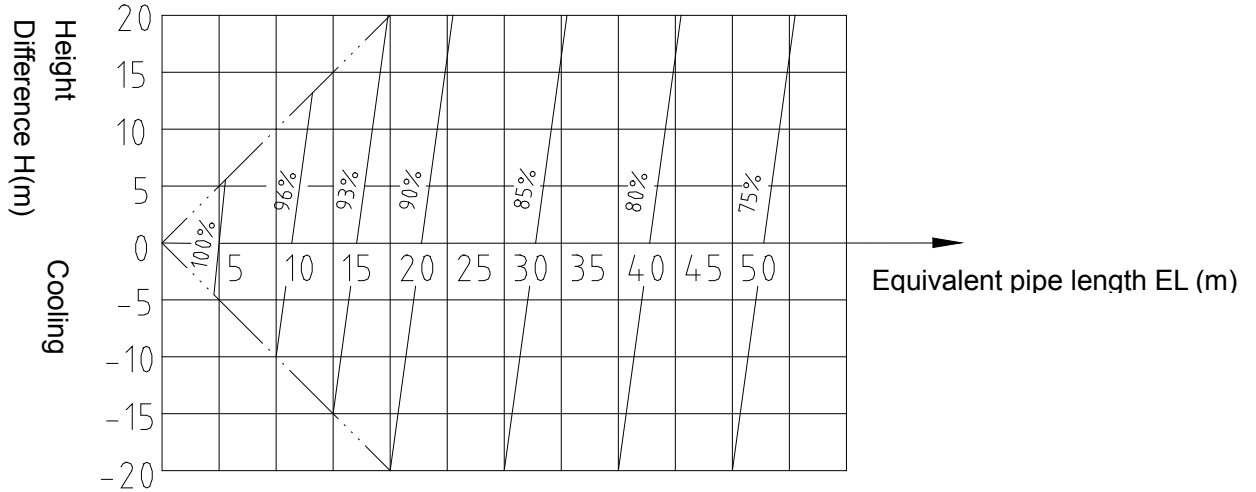
Actual heating capacity=amendment coefficient of heating capacity × nominal heating capacity

——nominal heating capacity could be found from the performance parameters list

——amendment coefficient of heating capacity could be found from table above.

3.4 Amendment coefficients of heating and cooling capacity under different height dropK3

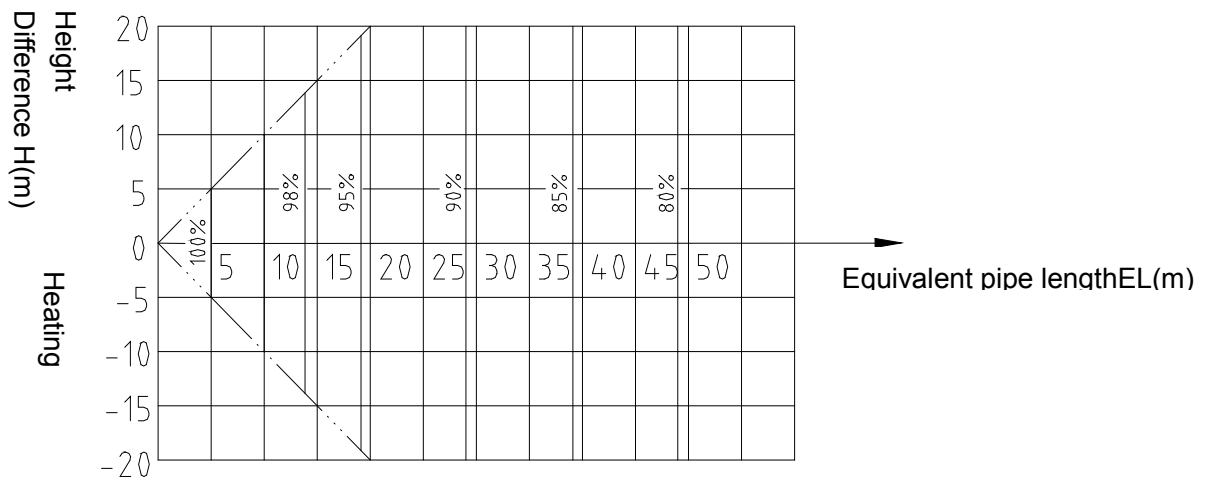
Different Cooling Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit — Height of Indoor Unit

Different Heating Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit — Height of Indoor Unit

3.5 Correction capability

Cooling capacity = nominal cooling capacity xK1xK3

Heating capacity = nominal heating capacity xK2xK3

3.6 Equivalent Pipe length conversion

Equivalent pipe length means converting pipe elbow to straight pipe length after considerate the pressure loss.

Bend and Oil Loop Conversion tablet

Pipe Dia.(mm) \ Type	Bend	Oil Loop
6.35	0.10	0.7
9.52	0.18	1.3
12.70	0.20	1.5
15.88	0.25	2.0
19.05	0.35	2.4
22.02	0.40	3.0

Equivalent Pipe length $L = \text{Actual Pipe length } L + \text{Bend Qty} \times \text{Equivalent pipe bend length} + \text{Oil Loop Qty} \times \text{Equivalent Oil Loop length}$

Sample:

SACF09M1-AI

Actual Pipe length is 25 meters, Gas pipe diameter is 9.52mm. If there's 5 bends and 2 oil loops during the installation, then the equivalent pipe length should be:

$$L = 25 + 0.18 \times 5 + 1.3 \times 2 = 28.5(\text{m})$$

◇ Specification of Connection Pipe for Indoor Unit and Outdoor Unit

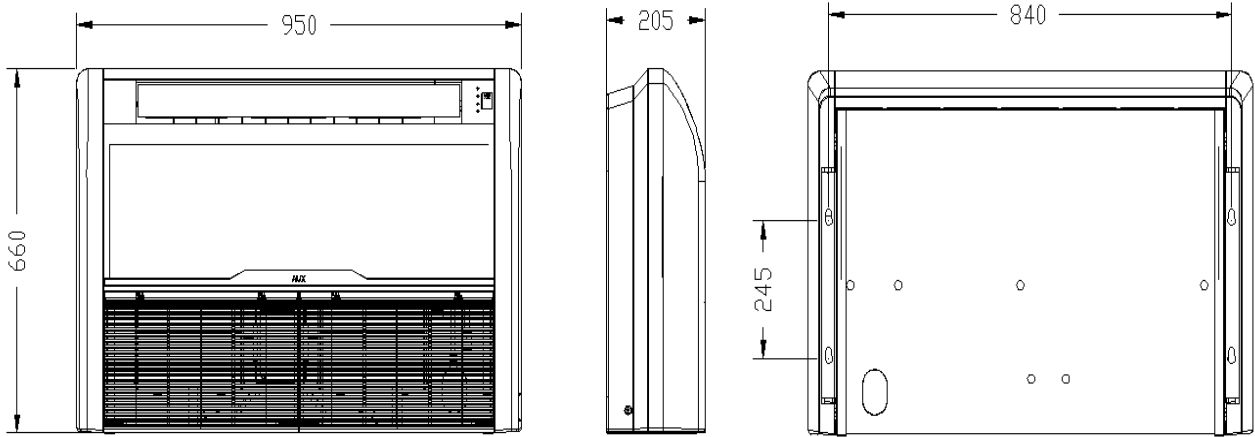
Cooling Capacity(Btu/h)		9000	12000	18000
Connection Pipe (mm)	Liquid Pipe	Φ6.35		
	Gas Pipe	Φ12.7		
Max. Length(Each)		15		
Max. Height (m)		10		
Max. Bend Qty		5		
Extra R410a per meter when the pipe length is more than 5 meter (kg)		0.022		

Caution:

1. The standard Pipe length is 5m, if the pipe length is less than this then no additional charging is necessary. If the pipe length is more than this then you should charge more refrigerant into the system according to the above Charging Data
2. The thickness of the pipe is 0.6-1.0, bearing pressure is 4.2MPa;
3. If the connection pipe is too long, the cooling capacity and stability would be decreased. And the more bend quantity, the resistance in the piping system would be bigger, then the cooling and heating capacity would be decreased even lead to compressor broken. We suggest you to use the shortest connection pipe according to the pipe length parameter in this manual. If the height difference between outdoor and indoor unit is more than 5m, an oil trap should be installed in the gas pipe for every 10 meters.

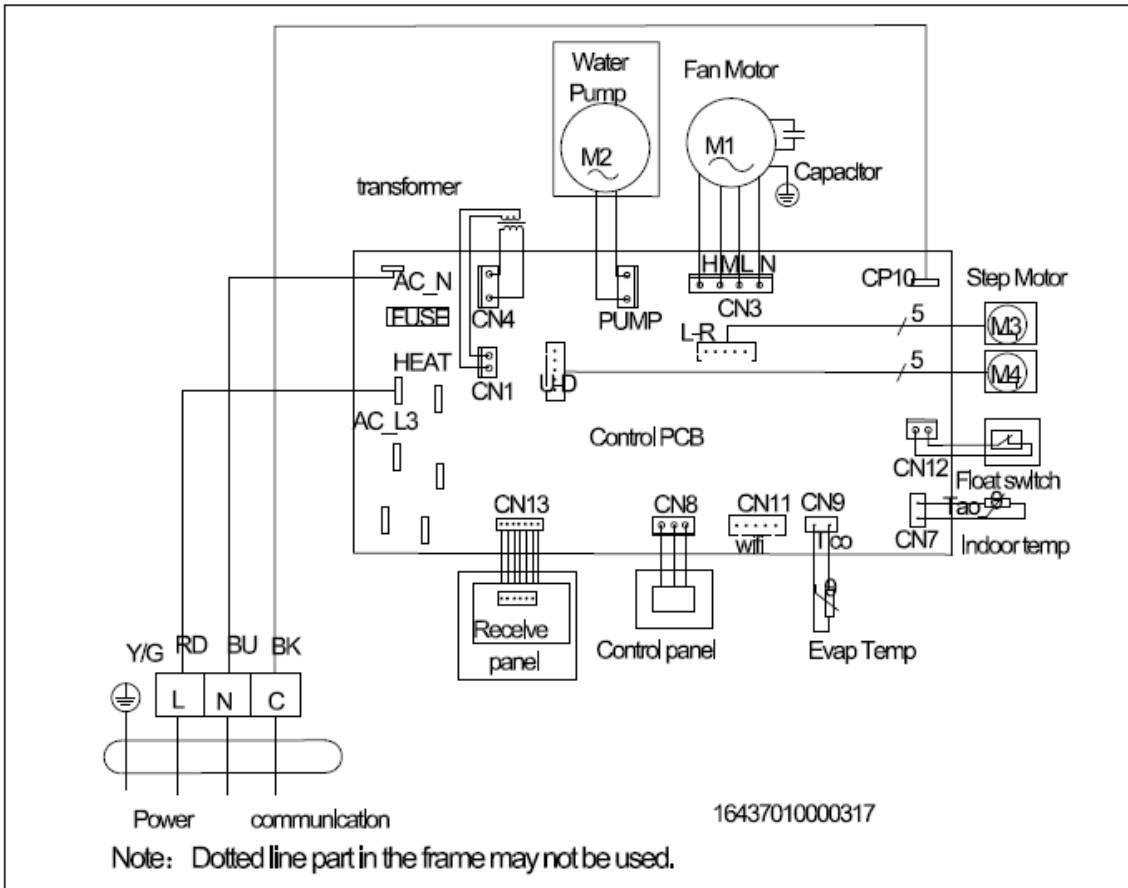
4. Dimension

SACF09M1-AI, SACF12M1-AI, SACF18M1-AI



5. Electrical Diagram

SACF09M1-AI, SACF12M1-AI, SACF18M1-AI



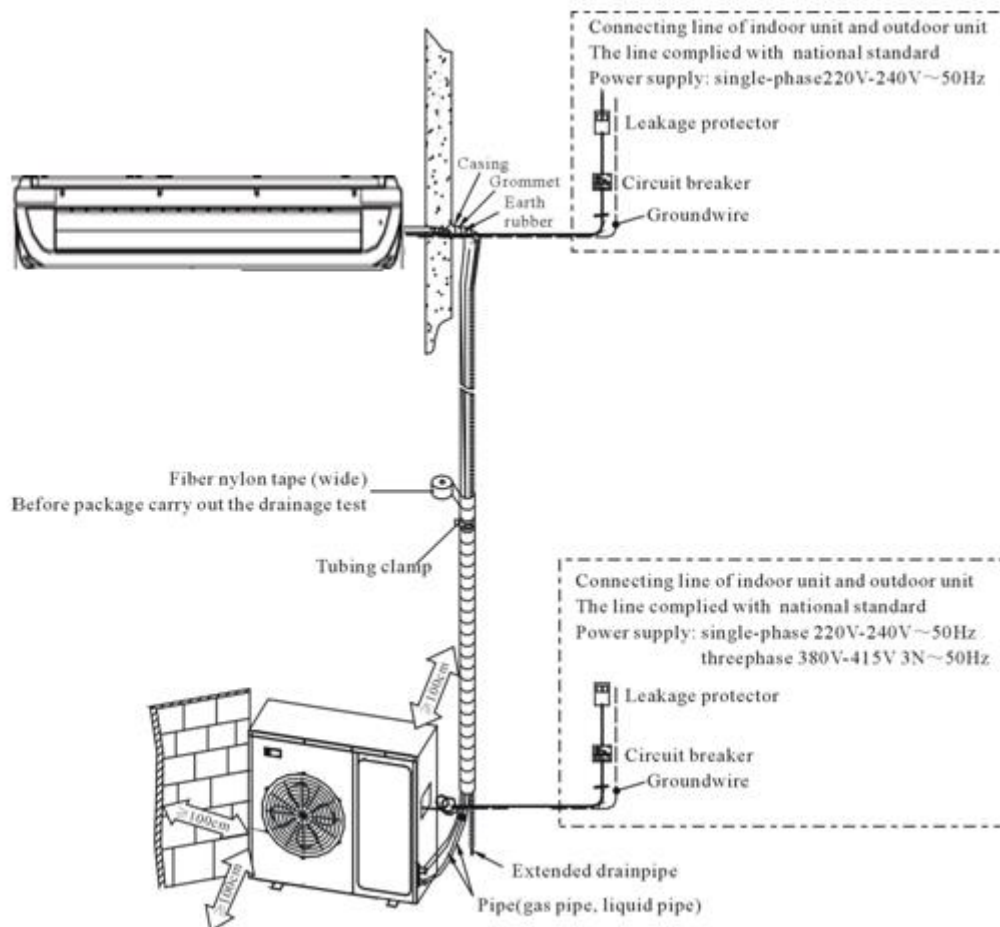
6. Installation

6.1 Preparation and equipments before installation

6.1.1 Please buy following spare parts from your local market before installation

1	Hung bolts M12, 4 pcs
2	Drainage pipe PVC
3	Copper pipe
4	Adhesive belt (big size) 5 pcs, (small size) 5 pcs
5	Heat insulation material used to connect copper pipe (PE foam material, its thickness is more than 8mm)
6	Power cable, electrical wire between indoor and outdoor unit(Must be in accordance with the wire diameter in the wiring diagram)
7	Acetylene cylinders, oxygen cylinders (when longer pipe used it should be welded)
8	One set pipe cut machine. (cut copper pipe)
9	Refrigerant cans, electronic balance (when longer pipe used additional gas should be charged)
10	Pressure gauges, pipe clamp, welding torch, 2B silver electrode
11	Wrench 2 pcs, one of them is with adjustable torque wrench(42N.m,65N.m,100N.mm)
12	Nitrogen cylinder (in order to prevent oxidation when welding, using Nitrogen to replace the air)

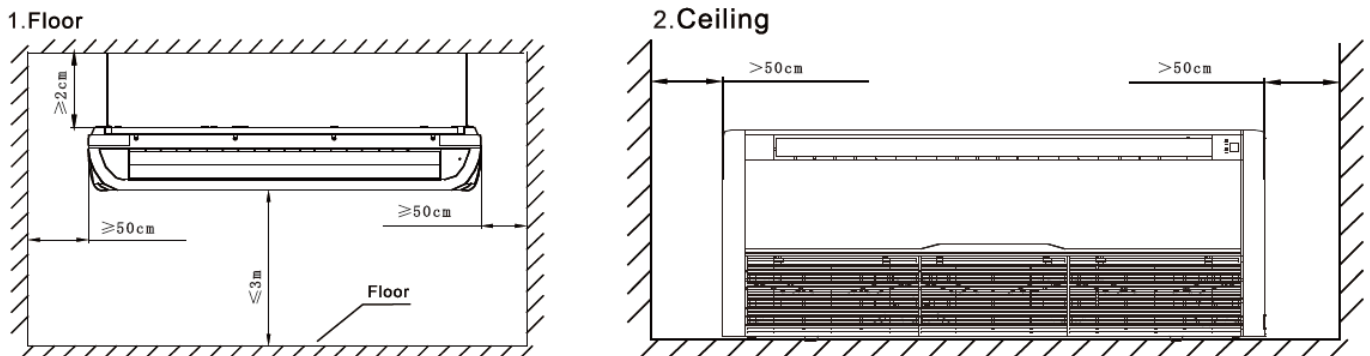
6.2 Installation drawing



6.3 Installation precaution

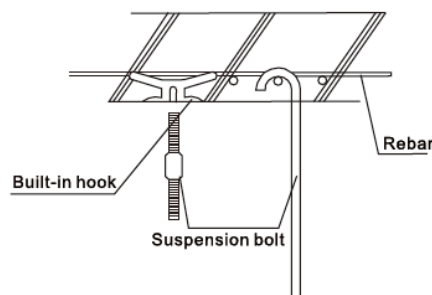
- ◇ Hanging location should be able to support the unit's weight, there should be no increase in noise and vibration. If the hanging location needs reinforcement, it should be reinforced before installation;
- ◇ Choose the space above the ceiling that can put the indoor unit inside;
- ◇ The location should be easy for drainage;
- ◇ The unit should not be installed in the heat source, steam or oil mist source (such as machine room, kitchen, laundry room, mechanical workshop, etc.)
- ◇ Choose the location at least 1 meter away from TV and radio, in order to avoid interference to them
- ◇ There should be certain distance between indoor unit and obstacles for maintenance;
- ◇ In case of leakage of refrigerant, units should immediately stop running, and contact with maintenance personnel in time. There must be no fire at the site, because the refrigerant will turn to harmful gas when get to the fire.

6.4 The distance between indoor unit and obstacle

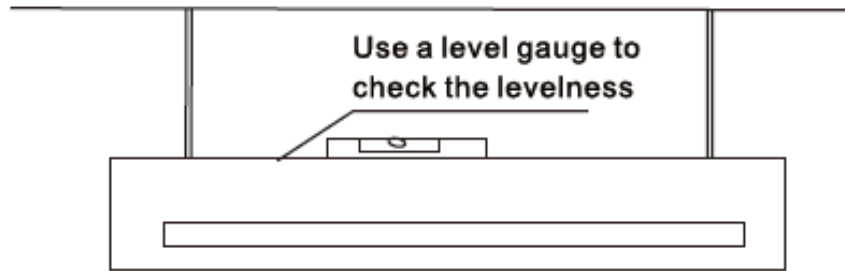


6.5 Indoor unit suspension

- ◇ Select the suspension foundation
- ◇ The suspension foundation is a structure of either wooden frame or reinforced concrete. It must be firm and reliable to bear at least 4 times weight of itself and capable of bearing vibration for long periods;
Fixing of suspension foundation
- ◇ Fix the suspension bolts either as shown in the picture or by a steel or wooden bracket;



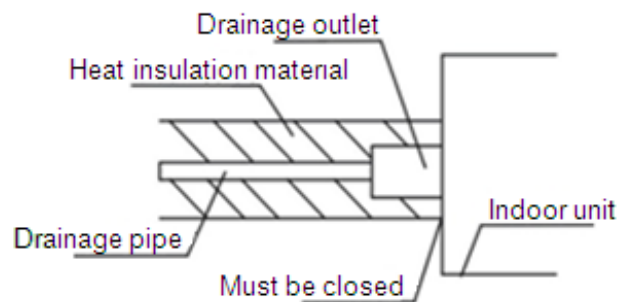
- ◇ Adjust the relative position of the suspension hook on the suspension bolt so that the unit can be in level position in all directions. Check with a level gauge after installation to ensure that the indoor unit is horizontal, otherwise it will cause water leakage, air leakage etc.



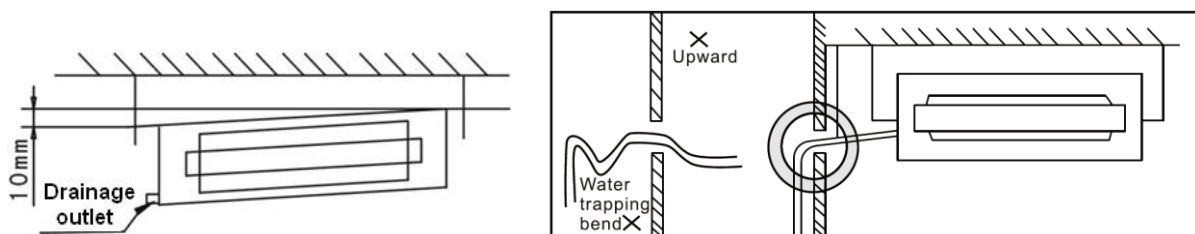
- ◇ Tighten the bolt and ensure that four hooks are in close contact with the nuts and washers, to fix the indoor unit under the ceiling.
- ◇ After the unit is installed ensure it is secure and does not shake or sway.

6.6 Drainage pipe installation

The drainage pipe should be properly insulated to prevent the generation of condensation. Heat insulation material: the thickness of rubber insulation pipe should be more than 8mm



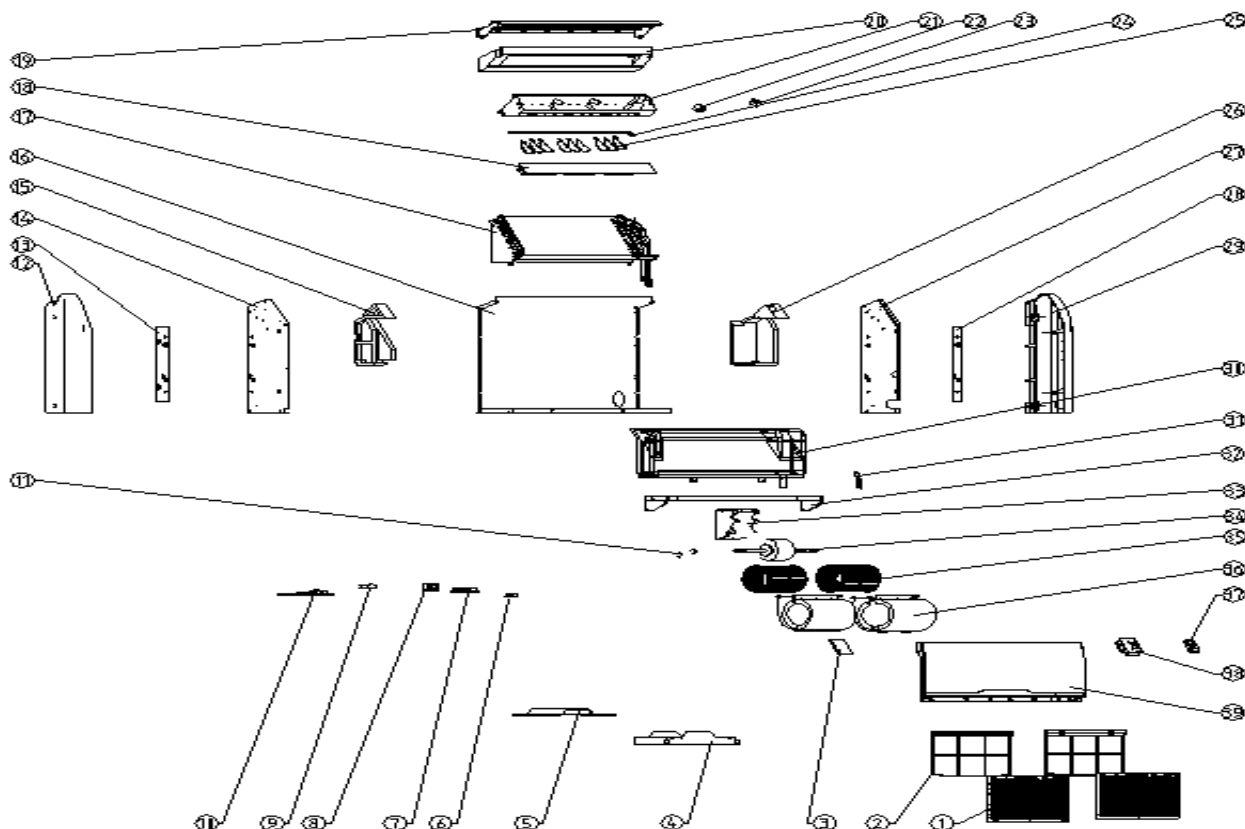
- ◇ Drainage pipe must have a downward gradient (1 / 50 1 / 100) to avoid water backflow or leakage etc.



- ◇ When finish installation please carry out the drainage test to ensure that the water flow through the pipeline fluently, and carefully observe the junction to ensure that there is no water leakage at the junction. If the unit is installed in the newly built house, strongly recommend that this test taken before the Ceiling installation. Even it is the heating only unit, this test is unavoidable.

7. Explode view

SACF09M1-AI, SACF12M1-AI, SACF18M1-AI



No.	Material Code	Part Name	Qty	Remark
1	16420012000002	Air-inlet filter	2	
2	16420010000002	Air-inlet grill(white)	2	
3	16420015000002	Left side adornment plank	1	
4	16421038000207	The electricity controls a box	1	
5	16421038000208	The electricity controls a box of cover	1	
6	11220544000008	Compress tightly electric wire seat	1	
7	16427001000064	Terminal board	1	
8	16422005000033	Transformer	1	
9	11330010000088	Capacitor	1	
10	11222542000029	PCB board	1	
11	16430001000196	Motor	1	YSK-40W-4
12	16420014000007	The left side covers	1	
13	16421001000029	Left suspend plate	1	
14	16321006000005	Bracket board welding assembly of left-hand	1	
15	16428001000034	Left foam	1	
16	16421018000004	Chassis welding assembly	1	
17	16324006000014	Evaporator assembly	1	
17.1	16325006000018	Evaporator tube kit	1	
17.2	16325006000017	Evaporator outlet assembly	1	
17.3	16325006000016	Evaporator inlet pipe assembly	1	

18	16420005000005	Sway a breeze leaf	1	
19	16420014000016	The crest covers plank	1	
20	16428001000023	Topmost foam	1	
21	16320006000007	Air guide louver assembly	1	
22	16430001000022	Step motor	1	
23	16430001000018	Step motor	1	
24	16420008000003	Connect a pole	1	
25	16420007000008	Perpendicular blade	9	
26	16428001000035	Right foam	1	
27	16321006000006	Bracket board welding assembly of right-hand	1	
28	16421001000030	Right suspend plate	1	
29	16420014000008	The Right side covers	1	
30	16321006000008	Draining tray	1	
30.1	16421002000191	The collection plate fixed plate	1	
31	16432019000021	Drain pipe	1	
32	16421002000190	Volute fixing board	1	
35	16321006000024	Centrifugal fan assembly	2	
36	16432019000009	Top Blower	2	
	16432019000007	Btm Blower	2	
37	11222023000333	Display board	1	
38	16420017000002	Display board cover	1	
39	16420013000019	Front panel	1	

Low ESP Ducted Type

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1. Function Introduction

Function	Name	SAD-M1-AI			
		07	09	12	18
Protection Function	Anti-freeze protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Sensor failure alarm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Error code display function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comfortable Function	Cooling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Heating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	3 fan speed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	static pressure adjustable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Auto-restart (optional)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Anti-cold wind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Blow exhaust heat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Timer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Opretating display	clock display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	operating mode display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	fan speed display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	defrosting display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	timing on/off display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	sleeping display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Operation mode	Auto operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Dehumidify operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Auto defrosting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Ventilation function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health function	Removable air filter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	fresh air function preserved	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Specification

Model	Indoor	Unit	SAD07M1-AI	SAD09M1-AI	SAD12M1-AI	SAD18M1-AI
Capacity	Cooling	Btu/h	7506(3855-9220)	8872(5120-12115)	12280(5835-13135)	17400(8530-19790)
		kW	2.20(1.13-2.70)	2.60(1.50-3.55)	3.60(1.71-3.85)	5.10(2.50-5.80)
	Heating	Btu/h	8530(4575-10820)	9895(5800-12450)	13650(6480-13375)	19790(9690-21835)
		kW	2.50(1.34-3.17)	2.9(1.70-3.65)	4.00(1.90-3.92)	5.8(2.84-6.40)
Electric Data	Power Supply	V~,Hz,P h	220~240,50,1	220~240,50,1	220~240,50,1	220~240,50,1
	Cooling Power Input	W	45	45	75	137
	Heating Power Input	W	45	45	75	137
Fan Motor	Model	/	FP20A	FP20A	FP25A	FP40A
	Output Power	W	20	20	25	40
	Capacitor	uF	1.5	1.5	2	3
	Speed (Hi/Mi/Lo)	r/min	1060/790/610/510	1060/790/610/510	1060/890/800/700	1160/1070/940/800
Indoor Coil	Number Of Row	/	2	2	2	2
	Tube x Row Pitch	mm	20.5x 12.7	20.5x 12.7	20.5x 12.7	20.5x 12.7
	Fin Pitch	mm	1.4	1.4	1.4	1.4
	Fin Material	/	Hydrophilic aluminum	Hydrophilic aluminum	Hydrophilic aluminum	Hydrophilic aluminum
	Tube Dia.& Material	mm	φ7 , Inner grooved	φ7 , Inner grooved	φ7 , Inner grooved	φ7 , Inner grooved
	Coil L x H x W	mm	640x205x 25.4	640x205x 25.4	640x205x 25.4	960x205x 25.4
	Heat Exchange Area	m ²	4.24	4.24	4.24	6.36
Air Volume		m ³ /h	420/336/294	420/336/294	580/464/406	860/688/602
Sound Pressure Noise Level		dB(A)	30/26/23	30/26/23	32/28/25	38/35/32
Dimension	Net Dim (W*D*H)	mm	840×460×185	840×460×185	840×460×185	1160×460×185
	Packing Dim(W*D*H)	mm	1030×545×250	1030×545×250	1030×545×250	1350×545×250
Weight	Net	kg	16.5	16.5	17.5	21
	Gross	kg	20	20	21	26
Refrigerant Type		/	R410a	R410a	R410a	R410a
Pipe Dia	Liquid Side	mm(inch)	6.35(1/4)	6.35(1/4)	6.35(1/4)	6.35(1/4)
	Gas Side	mm(inch)	9.52(3/8)	9.52(3/8)	12.7(1/2)	12.7(1/2)
	Drainage	mm	16.5	16.5	16.5	16.5
Loading Qty	20/40/40H	unit	198/396/440	198/396/440	198/396/440	144/297/330

- Note:**
- Cooling capacity test Condition:(27°CDB,19°CWB Indoor/35°CDB,24°CWB Outdoor); Heating capacity test Condition:(20°CDB Indoor/7°CDB,6°CWB Outdoor); connecting pipe length: 5M.
 - Datas may be changed with unit improvement. We keep the right to change the datas or specifications without prior notice, please follow the datas listed on the nameplate.

3. Capacity amendment

3.1 Running range

Cooling capacity (Btu/h)		7000	9000	12000	18000
Power supply		220-240V~/50Hz			
Voltage		187~253V			
Ambient temperature	Cooling	-10~52℃			
	Heating	-15~24℃			

3.2 Amendment coefficient of cooling capacity under different indoor/outdoor temperature K1

Indoor temperature(℃)		Outdoor temperature(DB)					
DB	WB	25	30	35	40	45	50
22	15	0.97	0.92	0.87	0.96	0.77	0.75
24	17	1.03	0.98	0.94	0.89	0.84	0.80
27	19	1.10	1.05	1	0.95	0.90	0.86
29	21	1.16	1.11	1.06	1.02	0.96	0.91
32	23	1.22	1.17	1.13	1.08	1.02	0.98

Actual cooling capacity calculation:

Actual cooling capacity=amendment coefficient of cooling capacity × nominal cooling capacity

——nominal cooling capacity could be found from the performance parameters list

——amendment coefficient of cooling capacity could be found from table above.

3.3 Amendment coefficient of heating capacity under different indoor/outdoor temperature K2

Outdoor temperature(℃)		Indoor temperature(DB)		
DB	WB	15	20	25
-15	-16	0.64	0.59	0.55
-10	-12	0.71	0.66	0.62
-7	-8	0.76	0.72	0.67
-1	-2	0.79	0.74	0.70
2	1	0.81	0.76	0.72
7	6	1.04	1	0.96
10	9	1.10	1.06	1.01
15	12	1.16	1.12	1.07

Actual heating capacity calculation:

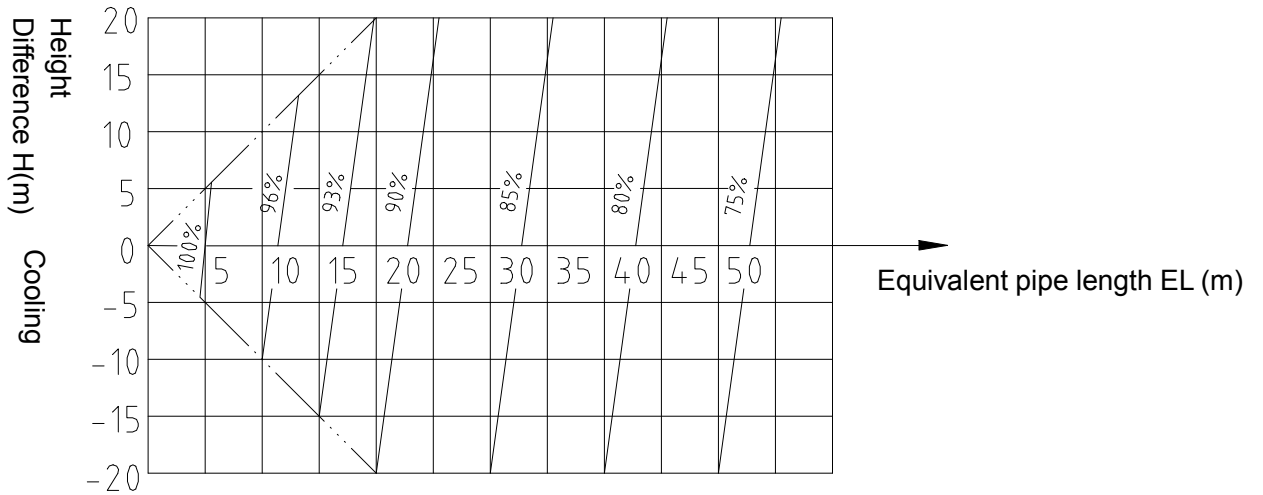
Actual heating capacity=amendment coefficient of heating capacity × nominal heating capacity

——nominal heating capacity could be found from the performance parameters list

——amendment coefficient of heating capacity could be found from table above.

3.4 Amendment coefficients of heating and cooling capacity under different height drop K3

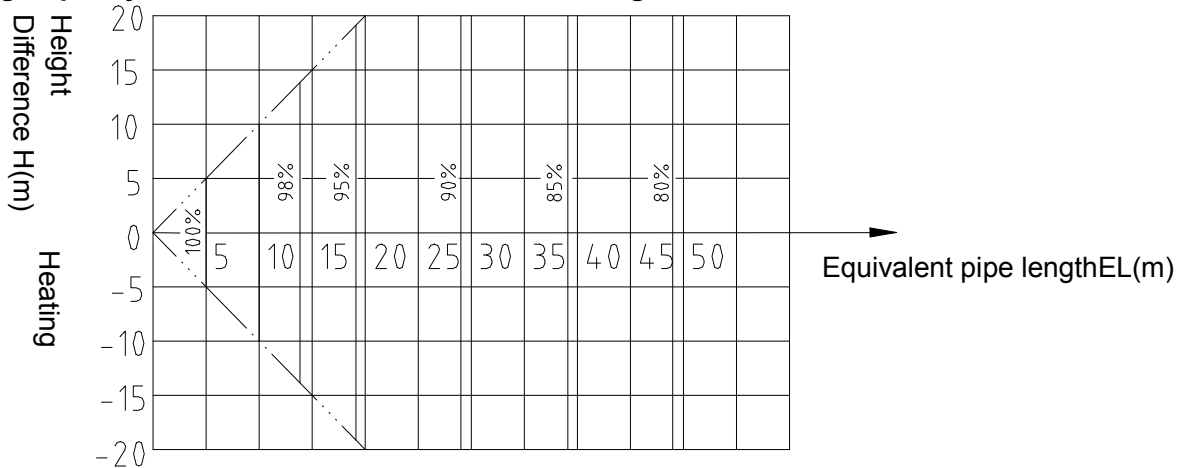
Different Cooling Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit — Height of Indoor Unit

Different Heating Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit — Height of Indoor Unit

3.5 Correction capability

Cooling capacity = nominal cooling capacity xK1xK3

Heating capacity = nominal heating capacity xK2xK3

3.6 Equivalent Pipe length conversion

Equivalent pipe length means converting pipe elbow to straight pipe length after considerate the pressure loss.

1. Bend and Oil Loop Conversion tablet

Pipe Dia.(mm)	Type	Bend	Oil Loop
6.35		0.10	0.7
9.52		0.18	1.3
12.70		0.20	1.5
15.88		0.25	2.0
19.05		0.35	2.4
22.02		0.40	3.0

Equivalent Pipe length $L = \text{Actual Pipe length} + \text{Bend Qty} \times \text{Equivalent pipe bend length} + \text{Oil Loop Qty} \times \text{Equivalent Oil Loop length}$

Sample:

SAD09M1-AI

Actual Pipe length is 25 meters, Gas pipe diameter is 9.52mm. If there's 5 bends and 2 oil loops during the installation, then the equivalent pipe length should be:

$$L = 25 + 0.18 \times 5 + 1.3 \times 2 = 28.5(m)$$

◇ Specification of Connection Pipe for Indoor Unit and Outdoor Unit

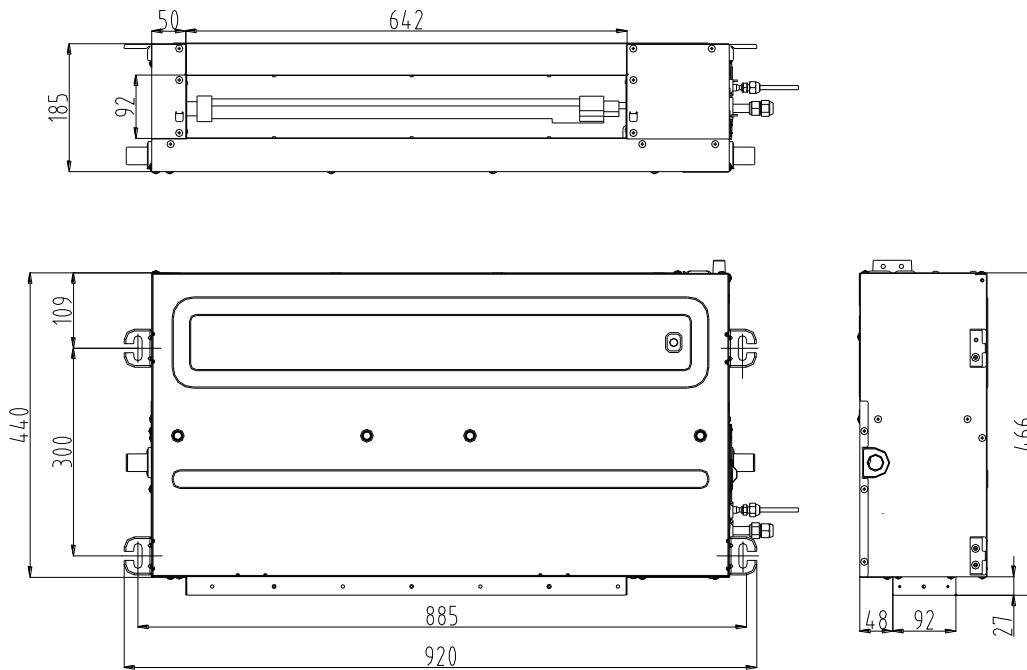
Cooling Capacity(Btu/h)		7000	9000	12000	18000
Connection Pipe (mm)	Liquid Pipe	Φ6.35			
	Gas Pipe	Φ9.52		Φ12.7	
Max. Length(Each)		15			
Max. Height (m)		10			
Max. Bend Qty		5			
Extra R410a per meter when the pipe length is more than 5 meter (kg)		0.022			

Caution:

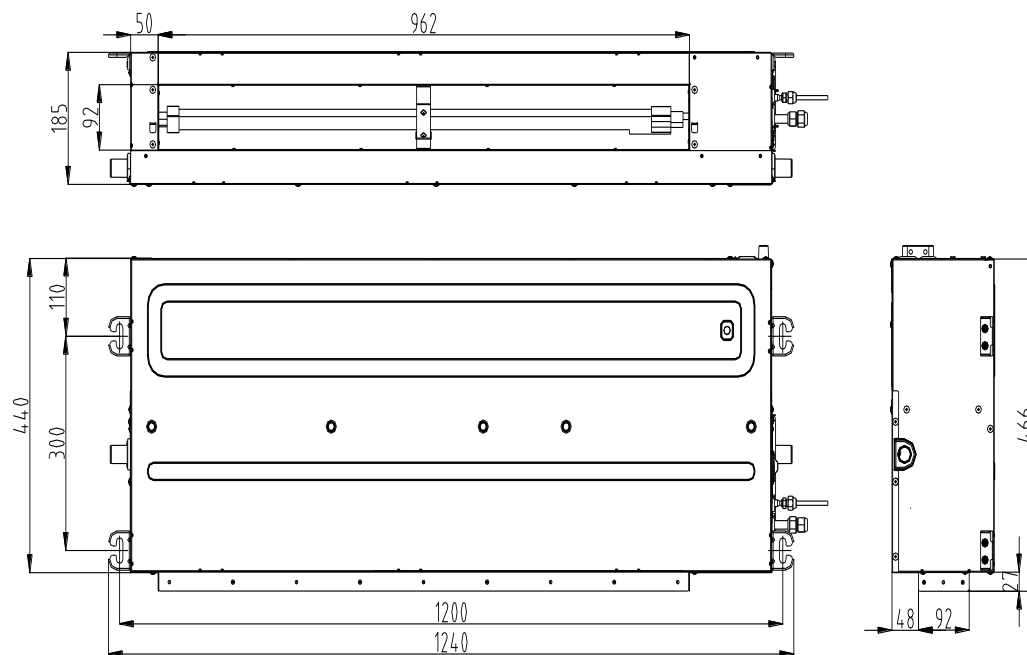
1. The standard Pipe length is 5m, if the pipe length is less than this then no additional charging is necessary. If the pipe length is more than this then you should charge more refrigerant into the system according to the above Charging Data
2. The thickness of the pipe is 0.6-1.0, bearing pressure is 4.2MPa;
3. If the connection pipe is too long, the cooling capacity and stability would be decreased. And the more bend quantity, the resistance in the piping system would be bigger, then the cooling and heating capacity would be decreased even lead to compressor broken. We suggest you to use the shortest connection pipe according to the pipe length parameter in this manual. If the height difference between outdoor and indoor unit is more than 5m, an oil trap should be installed in the gas pipe for every 10 meters.

4. Dimension

SAD07M1-AI, SAD09M1-AI, SAD12M1-AI

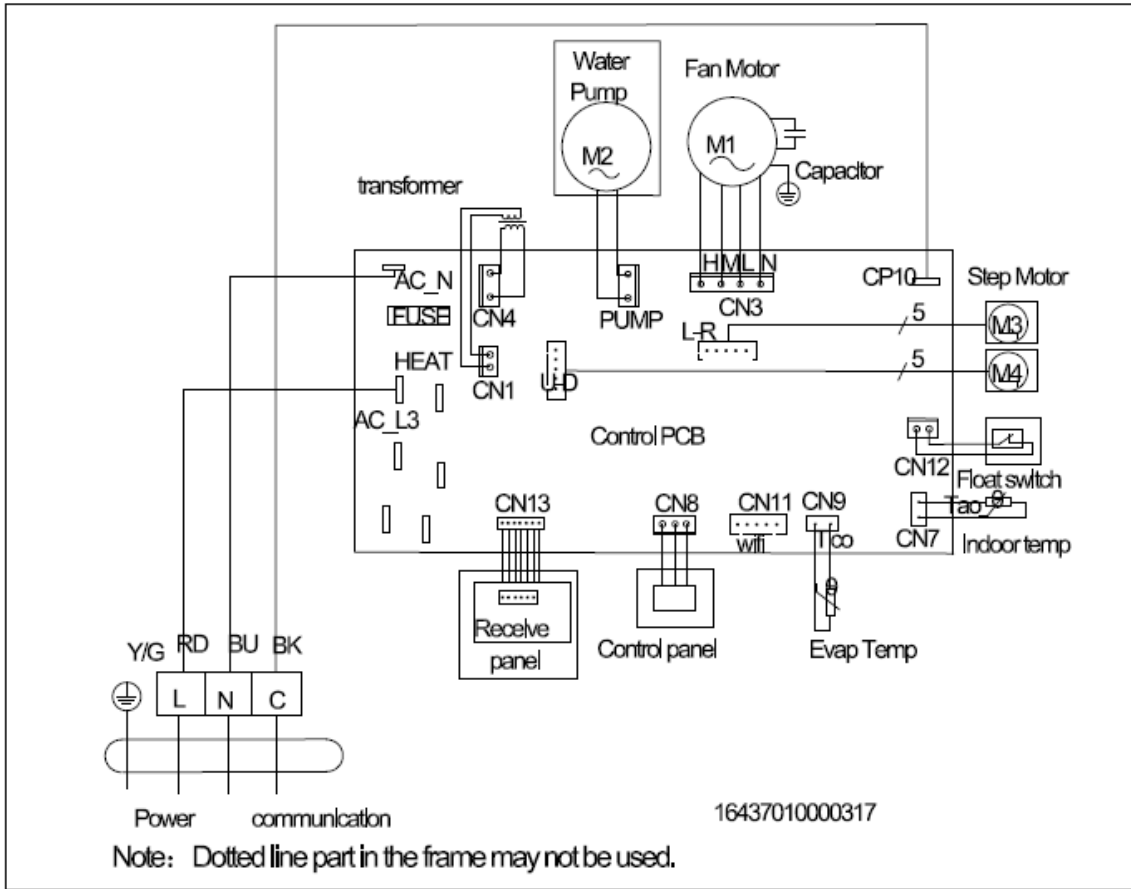


SAD18M1-AI



5. Electrical wiring and connection

SAD07M1-AI, SAD09M1-AI, SAD12M1-AI, SAD18M1-AI



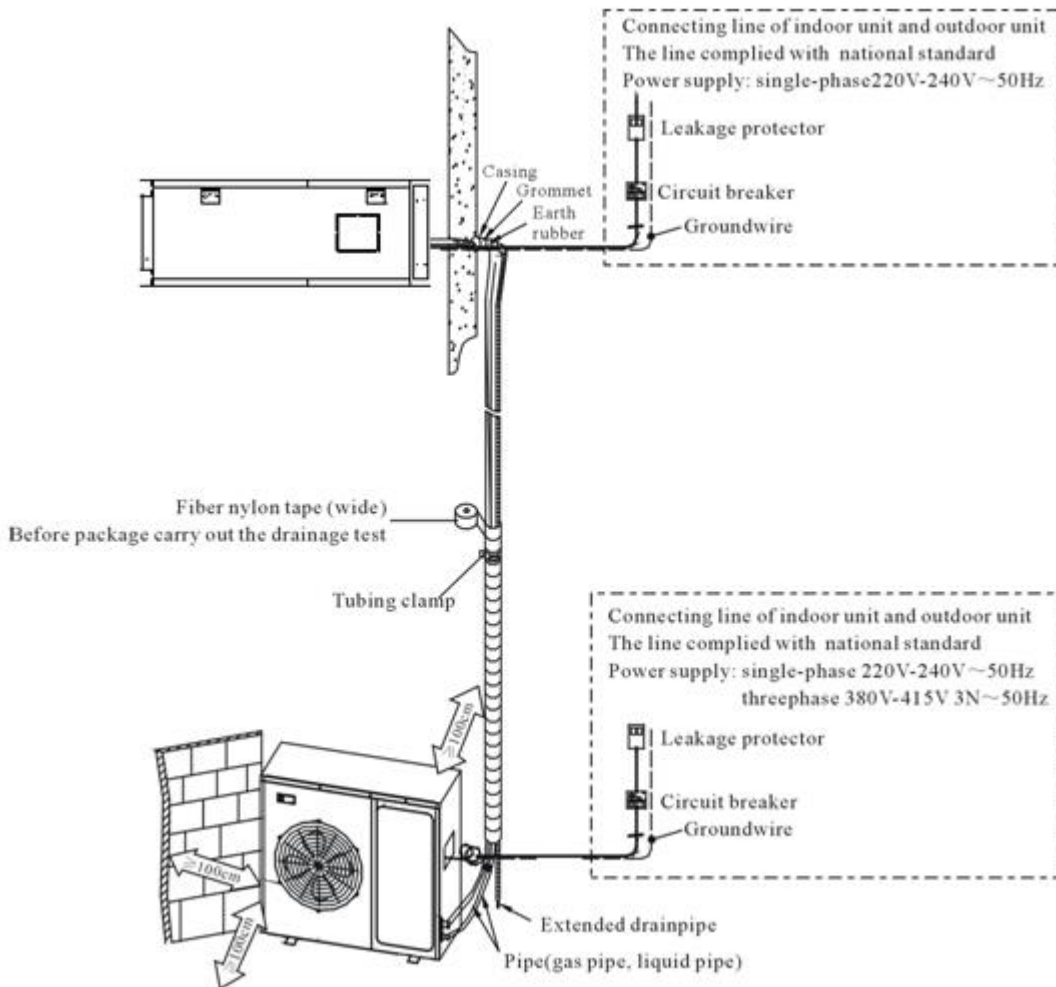
6. Installation

6.1 Preparation and equipments before installation

6.1.1 Please buy following spare parts from your local market before installation

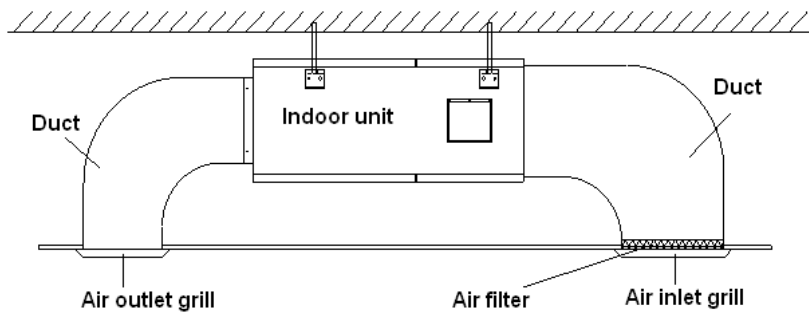
1	Hung bolts M12, 4 pcs
2	Drainage pipe PVC
3	Copper pipe
4	Adhesive belt (big size) 5 pcs, (small size) 5 pcs
5	Heat insulation material used to connect copper pipe (PE foam material, its thickness is more than 8mm)
6	Power cable, electrical wire between indoor and outdoor unit(Must be in accordance with the wire diameter in the wiring diagram)
7	Acetylene cylinders, oxygen cylinders (when longer pipe used it should be welded)
8	One set pipe cut machine. (cut copper pipe)
9	Refrigerant cans, electronic balance (when longer pipe used additional gas should be charged)
10	Pressure gauges, pipe clamp, welding torch, 2B silver electrode
11	Wrench 2 pcs, one of them is with adjustable torque wrench(42N.m,65N.m,100N.mm)
12	Nitrogen cylinder (in order to prevent oxidation when welding, using Nitrogen to replace the air)

6.2 Installation diagram



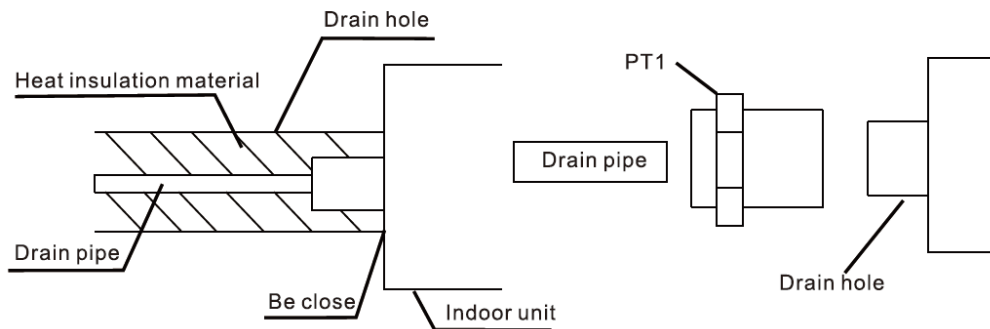
6.3 Installation precaution

- ◇ Hanging location should be able to support the unit's weight, there should be no increase in noise and vibration. If the hanging location needs reinforcement, it should be reinforced before installation;
- ◇ Choose the space above the ceiling that can put the indoor unit inside;
- ◇ The location should be easy for drainage;



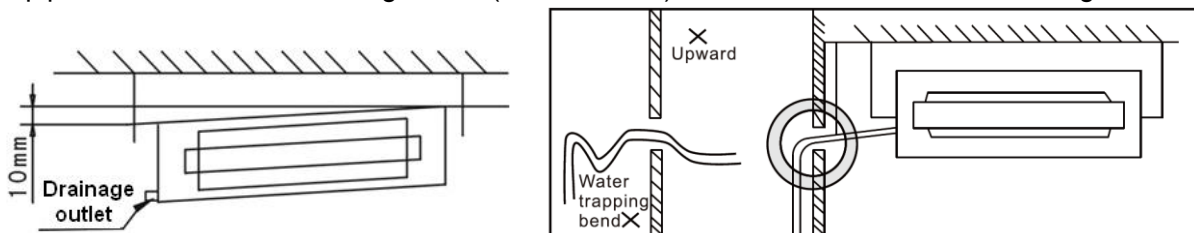
6.7 Drainage pipe

◇ Drainage pipes must be wrapped with heat insulation materials, otherwise it will cause frost or droplets, see picture as follows:



Heat insulation material: rubber insulation pipe with the thickness of more than 8mm

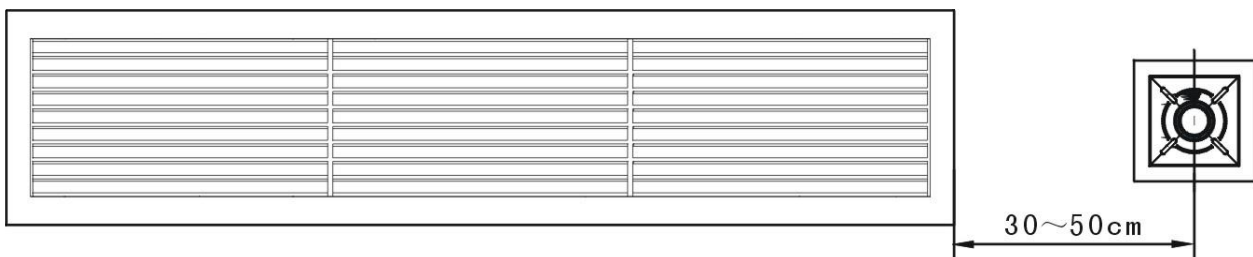
◇ Drainage pipe must have a downward gradient (1 / 50 1 / 100) to avoid water backflow or leakage etc.



◇ When finish installation please carry out the drainage test to ensure that the water flow through the pipeline fluently, and carefully observe the junction to ensure that there is no water leakage at the junction. If the unit is installed in the newly built house, strongly recommend that this test taken before the CFiling installation. Even it is the heating only unit, this test is unavoidable.

6.8 Remote controller receiver

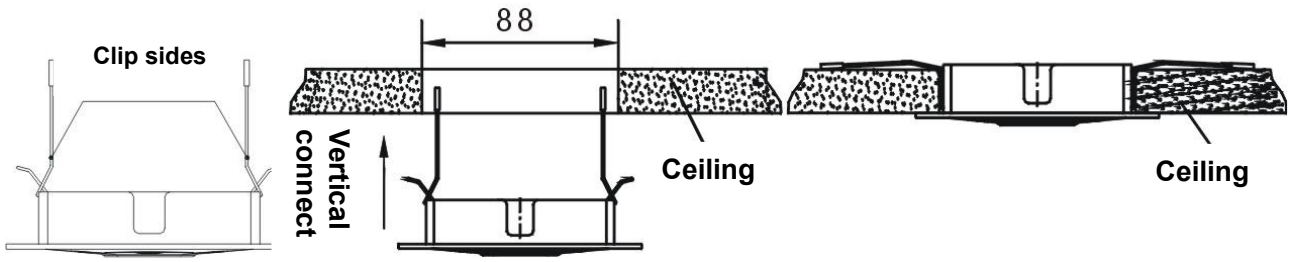
◇ Installation site: recommend that the receiver is mounted with the distance of 30~50 cm to the indoor unit air outlet(on your choice as well), while must ensure that the receiver can get the signal that the remote controller sends, please refer to the following installation picture:



◇ Mounting hole set up: please use certain instrument to dig a square hole with 88*88mm on the ceiling

◇ Remote controller receiver installation.

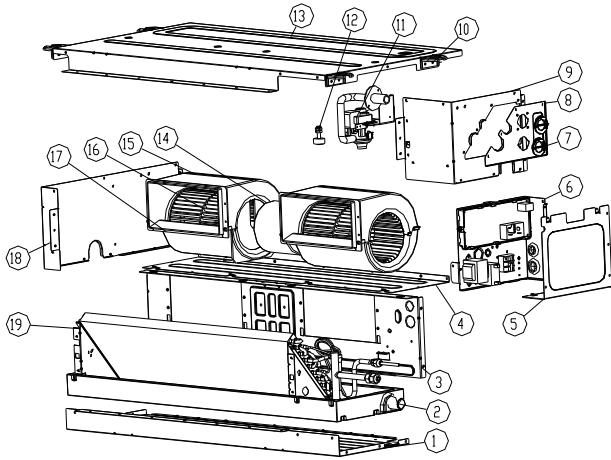
Hold the two sides (with clip sides) of the receiver, set the spring clip in the vertical way then put it into the mounting hole, if the two sides of the receiver is in the same level with the ceiling the installation is finished.



- ◇ Signal line connection: connect the wire of remote controller receiver to the CN-DISP terminal board on PCB of indoor unit wire box then fix it.

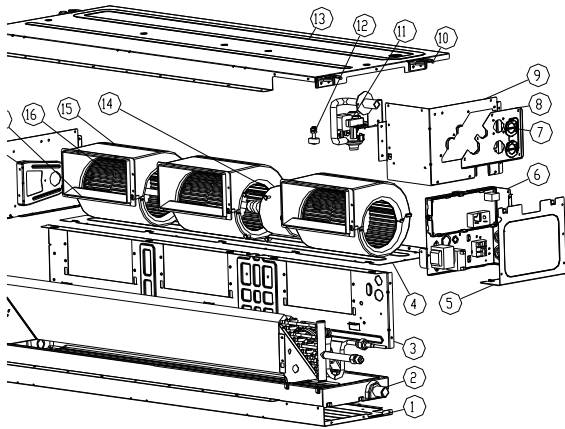
7. Explode view

SAD07M1-AI, SAD09M1-AI, SAD12M1-AI



N0.	Material code	Part Name	Qty	Remark
1	16421028000132	Btm pan A	1	
2	16320009000001	Drip tray asm	1	
3	16421002000295	Bracket fan blower	1	
4	16421028000133	Btm pan B	1	
5	16421038000171	Cover elec Box	1	
6	16330001000013	Asm control box	1	
6.1	11222542000029	Main PCB	1	
6.2	16427001000064	Terminal block	1	
6.3	16422005000002	Transformer	1	
6.4	11330010000052	Fan capacitor	1	
6.5	16430007000003	Air sensor 15K3950 XH2 0.5m	1	
6.6	16430007000007	Coil sensor 20K3950 XH2 0.5m	1	
6.7	11220544000008	Wire clip	1	
7	16420011000010	Knob	2	
8	16421014000060	Plate valve	1	
9	16421001000554	Plate right Side	1	
10	16421040000042	Plate hanging	4	
11	16440001000017	Drain pump	1	optional
12	16445034000012	Switch floating sensor	1	optional
13	16421005000439	Plate top cover	1	
14	16430001000510	Fan motor	1	
15	16444002000016	Top blower housing	2	
16	16444001000033	Fan blower	2	
17	16444002000017	Btm blower housing	2	
18	16421001000555	Plate left Side	1	
19	16324009000169	Evap asm	1	

SAD18M1-AI



N0.	Material code	Part Name	Qty	Remark
1	16421028000134	Btm pan A	1	
2	16320009000005	Drip tray asm	1	
3	16421002000296	Bracket fan blower	1	
4	16421028000135	Btm pan B	1	
5	16421038000171	Cover elec Box	1	
6	16330001000013	Asm control box	1	
6.1	11222542000029	Main PCB	1	
6.2	16427001000064	Terminal block	1	
6.3	16422005000002	Transformer	1	
6.4	11330010000052	Fan capacitor	1	
6.5	16430007000003	Air sensor 15K3950 XH2 0.5m	1	
6.6	16430007000007	Coil sensor 20K3950 XH2 0.5m	1	
6.7	11220544000008	Wire clip	1	
7	16420011000010	Knob	2	
8	16421014000060	Plate valve	1	
9	16421001000554	Plate right Side	1	
10	16421040000042	Plate hanging	4	
11	16440001000017	Drain pump	1	optional
12	16445034000012	Switch floating sensor	1	optional
13	16421005000440	Plate top cover	1	
14	16430001000593	Fan motor	1	
15	16444002000016	Top blower housing	3	
16	16444001000033	Fan blower	3	
17	16444002000017	Btm blower housing	3	
18	16421026000270	Bracket bearing	1	
19	16421001000555	Plate left Side	1	
20	16324009000175	Evap asm	1	

Wall Mounted Type

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1. Function Introduction



Anti-cold-air (Heat pump only)

When starting the heating operation, the fan speed is regulated automatically from the lowest grade to the preset level, according to the temperature rising of evaporator. The function can prevent cold air blowing out at the beginning of the operation, which avoids the discomfort to the user.



Self-diagnosis function

Monitoring some abnormal operations or parts failures, which happens microcomputer of the air conditioner which switch off and protect the system automatically. Meanwhile, the error or protection code will be displayed on the indoor unit.



24-hour timer

User can set on the timer to turn on or off the air conditioner any time within 24 hours.



Force cooling

This function is convenient when user can't find the remote controller.



Intelligent defrosting

Normal defrost function can only be operated in certain time, but ENERGOLUX commercial air conditioner's intelligent defrost can start automatically according to the surrounding condition.



Auto restart

If the machine is suddenly shut down during operation, the unit will record the operating mode, and restore to it when the power is on.



Sleep Mode

User can select mode after pressing time-off button, this function will adjust temperature automatically, which makes a comfortable sleep environment and save energy.



Low ambient cooling

The air conditioner with a special built-in low ambient cooling component can be used in temperature as low as -15C for cooling operation.

Function	Name	SAS-M1-AI			
		07	09	12	18
Protection Function	Anti-freeze protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Sensor failure alarm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Error code display function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comfortable Function	Cooling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Heating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	3 fan speed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Auto-restart (optional)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Anti-cold wind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Blow exhaust heat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Timer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Opretating display	clock display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	operating mode display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	fan speed display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	defrosting display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	timing on/off display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	sleeping display	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Operation mode	Auto operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Dehumidify operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Auto defrosting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Ventilation function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health function	Removable air filter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	fresh air function preserved	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Specification

Model	Indoor	Unit	SAS07M1-AI	SAS09M1-AI	SAS12M1-AI	SAS18M1-AI
Capacity	Cooling	Btu/h	7165(3855-9220)	8870(4780-11260)	12285(5800-12625)	17745(8530-19790)
		kW	2.05(1.13-2.70)	2.55(1.40-3.30)	3.60(1.70-3.70)	5.20(2.50-5.80)
	Heating	Btu/h	7510(3340-8530)	9215(4095-10240)	12625(5120-12625)	18085(7680-19790)
		kW	2.15(0.98-2.50)	2.65(1.20-3.00)	3.70(1.50-3.70)	5.0(2.25-5.80)
Electric Data	Power Supply	V~,Hz ,Ph	220~240,50,1	220~240,50,1	220~240,50,1	220~240,50,1
	Cooling Power	W	40(12~68)	40(12~68)	40(12~68)	63(16~88)
	Heating Power	W	40(12~68)	40(12~68)	40(12~68)	63(16~88)
Indoor Fan Motor	Model	/	YYK19-4	YYK19-4	YYK19-4	YYK30-4
	Output Power	W	19	19	19	30
	Capacitor	uF	1.5	1.5	1.5	3
	Speed (Hi/Mi/Lo)	r/min	1030/900/850	1030/900/850	1030/900/850	1230/1080/970
Indoor Coil	Number Of Row	/	2	2	2	2
	Tube x Row Pitch	mm	20.5x 12.7	20.5x 12.7	20.5x 12.7	20.5x 12.7
	Fin Pitch	mm	1.4	1.4	1.4	1.4
	Fin Material	/	Hydrophilic aluminum fin			
	Tube Material	mm	φ7 , Inner grooved			
	Coil L x H x W	mm	602x164x 25.4	602x164x 25.4	602x164x 25.4	722x164x 25.4
	Heat Exchange Area	m ²	5.58	5.58	5.58	5.58
Performance	Air Flow Volume	CFM	969/765/672	969/765/672	969/765/672	1700/1462/1170
		m ³ /h	570/450/395	570/450/395	570/450/395	1000/860/688
	Sound Pressure	dB(A)	40/38/34	40/38/34	42/40/36	45/42/35
Dimension	Net Dim (W*D*H)	mm	800×300×198	800×300×198	800×300×198	970×315×235
	Pack Dim (W*D*H)	mm	835×355×255	835×355×255	835×355×255	1010×370×290
Weight	Net	kg	10	10	10	13
	Gross	kg	11.5	11.5	11.5	16
Refrigerant Type	/		R410a	R410a	R410a	R410a
Pipe Dia	Liquid Side	mm(in ch)	6.35(1/4)	6.35(1/4)	6.35(1/4)	6.35(1/4)
	Gas Side	mm(in ch)	9.52(3/8)	9.52(3/8)	9.52(3/8)	12.7(1/2)
	Drainage	mm	16.5	16.5	16.5	16.5
Loading Qty	20/40/40H	unit	422/830/948	422/830/948	422/830/948	286/588/675

Note:

- Cooling capacity test Condition:(27°CDB,19°CWB Indoor/35°CDB,24°CWB Outdoor);
Heating capacity test Condition:(20°CDB Indoor/7°CDB,6°CWB Outdoor);
connecting pipe length: 5M.
- Datas may be changed with unit improvement. We keep the right to change the datas or specifications without prior notice, please follow the datas listed on the nameplate.

3. Capacity amendment

3.1 Running range

Cooling capacity (Btu/h)	7000	9000	12000	18000
Power supply	220-240V~/50Hz			
Voltage	187~253V			
Ambient temperature	Cooling	-10~52℃		
	Heating	-15~24℃		

3.2 Amendment coefficient of cooling capacity under different indoor/outdoor temperature K1

Indoortemperature(℃)		Outdoor temperature(DB)					
DB	WB	25	30	35	40	45	50
22	15	0.97	0.92	0.87	0.96	0.77	0.75
24	17	1.03	0.98	0.94	0.89	0.84	0.80
27	19	1.10	1.05	1	0.95	0.90	0.86
29	21	1.16	1.11	1.06	1.02	0.96	0.91
32	23	1.22	1.17	1.13	1.08	1.02	0.98

Actual cooling capacity calculation:

Actual cooling capacity=amendment coefficient of cooling capacity × nominal cooling capacity

——nominal cooling capacity could be found from the performance parameters list

——amendment coefficient of cooling capacity could be found from table above.

3.3 Amendment coefficient of heating capacity under different indoor/outdoor temperature K2

Outdoor temperature(℃)		Indoor temperature(DB)		
DB	WB	15	20	25
-15	-16	0.64	0.59	0.55
-10	-12	0.71	0.66	0.62
-7	-8	0.76	0.72	0.67
-1	-2	0.79	0.74	0.70
2	1	0.81	0.76	0.72
7	6	1.04	1	0.96
10	9	1.10	1.06	1.01
15	12	1.16	1.12	1.07

Actual heating capacity calculation:

Actual heating capacity=amendment coefficient of heating capacity × nominal heating capacity

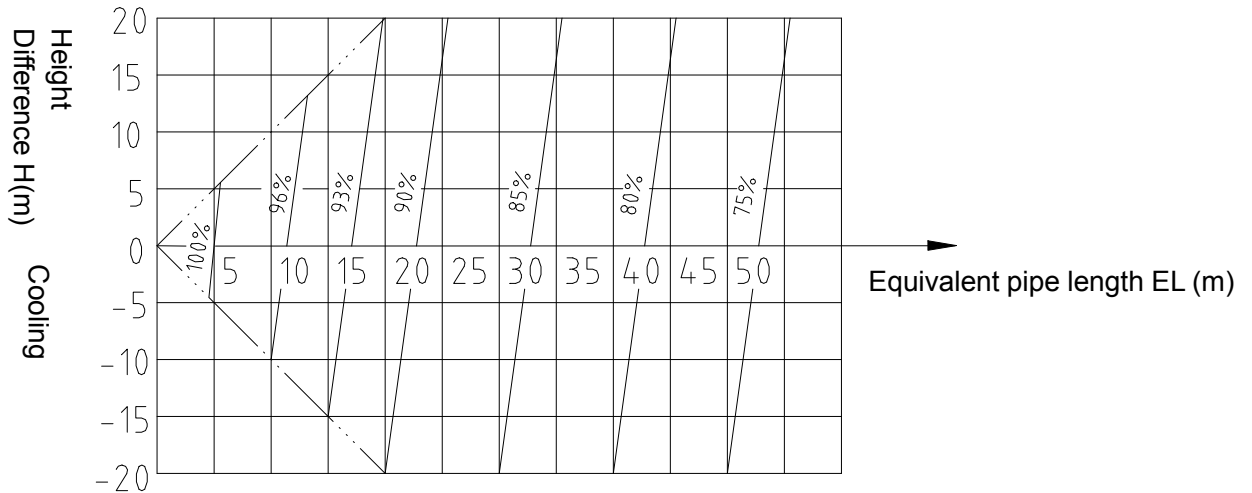
——nominal heating capacity could be found from the performance parameters list

——amendment coefficient of heating capacity could be found from table above.

3.4 Amendment coefficients of heating and cooling capacity under different height drop

K3

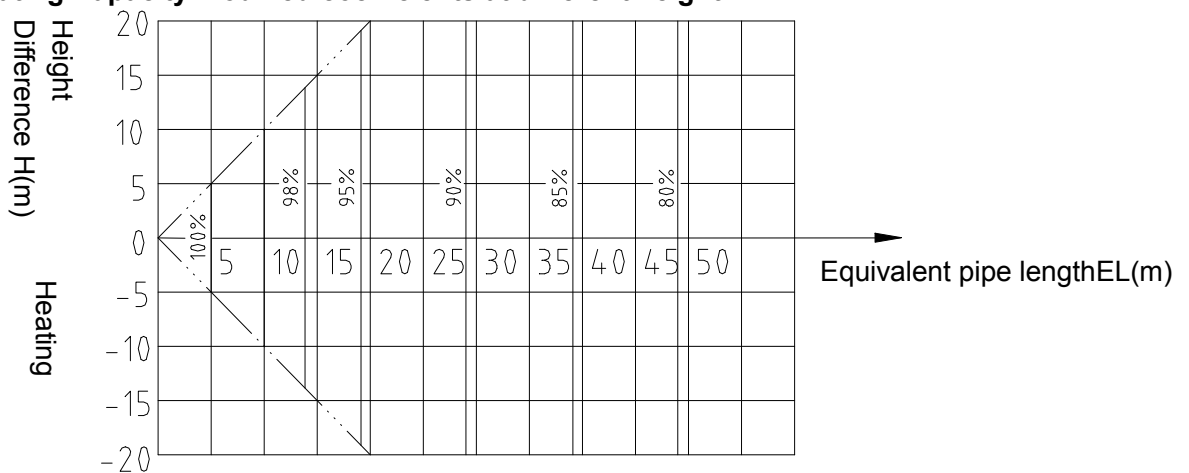
Different Cooling Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit — Height of Indoor Unit

Different Heating Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit — Height of Indoor Unit

3.5 Correction capability

Cooling capacity = nominal cooling capacity xK1xK3

Heating capacity = nominal heating capacity xK2xK3

3.6 Equivalent Pipe length conversion

Equivalent pipe length means converting pipe elbow to straight pipe length after considerate the pressure loss.

Bend and Oil Loop Conversion tablet

Pipe Dia.(mm)	Type	Bend	Oil Loop
6.35		0.10	0.7
9.52		0.18	1.3
12.70		0.20	1.5

15.88	0.25	2.0
19.05	0.35	2.4
22.02	0.40	3.0

Equivalent Pipe length $L = \text{Actual Pipe length } L + \text{Bend Qty} \times \text{Equivalent pipe bend length} + \text{Oil Loop Qty} \times \text{Equivalent Oil Loop length}$

Sample:

SAS09M1-AI

Actual Pipe length is 25 meters, Gas pipe diameter is 9.52mm. If there's 5 bends and 2 oil loops during the installation, then the equivalent pipe length should be:

$$L = 25 + 0.18 \times 5 + 1.3 \times 2 = 28.5(\text{m})$$

◇ Specification of Connection Pipe for Indoor Unit and Outdoor Unit

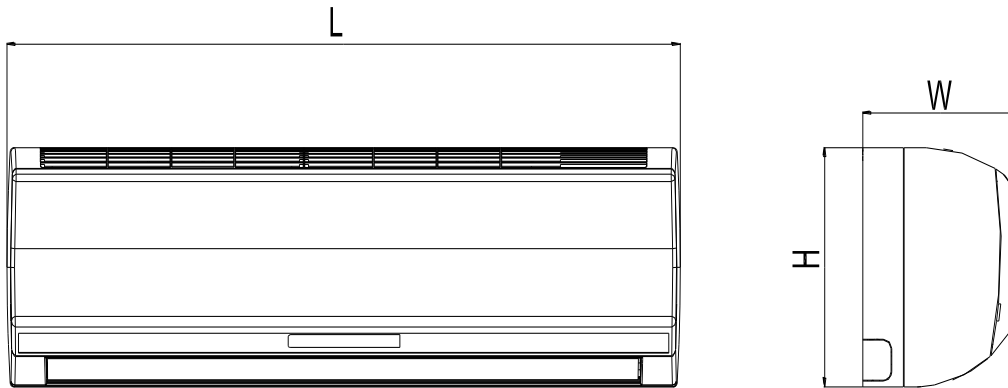
Cooling Capacity(Btu/h)		7000	9000	12000	18000
Connection Pipe (mm)	Liquid Pipe	Φ6.35			
	Gas Pipe	Φ9.52		Φ12.7	
Max. Length(Each)		15			
Max. Height (m)		10			
Max. Bend Qty		5			
Extra R410a per meter when the pipe length is more than 5 meter (kg)		0.022			

Caution:

1. The standard Pipe length is 5m, if the pipe length is less than this then no additional charging is necessary. If the pipe length is more than this then you should charge more refrigerant into the system according to the above Charging Data
2. The thickness of the pipe is 0.6-1.0, bearing pressure is 4.2MPa;
3. If the connection pipe is too long, the cooling capacity and stability would be decreased. And the more bend quantity, the resistance in the piping system would be bigger, then the cooling and heating capacity would be decreased even lead to compressor broken. We suggest you to use the shortest connection pipe according to the pipe length parameter in this manual. If the height difference between outdoor and indoor unit is more than 5m, an oil trap should be installed in the gas pipe for every 10 meters.

4. Dimension

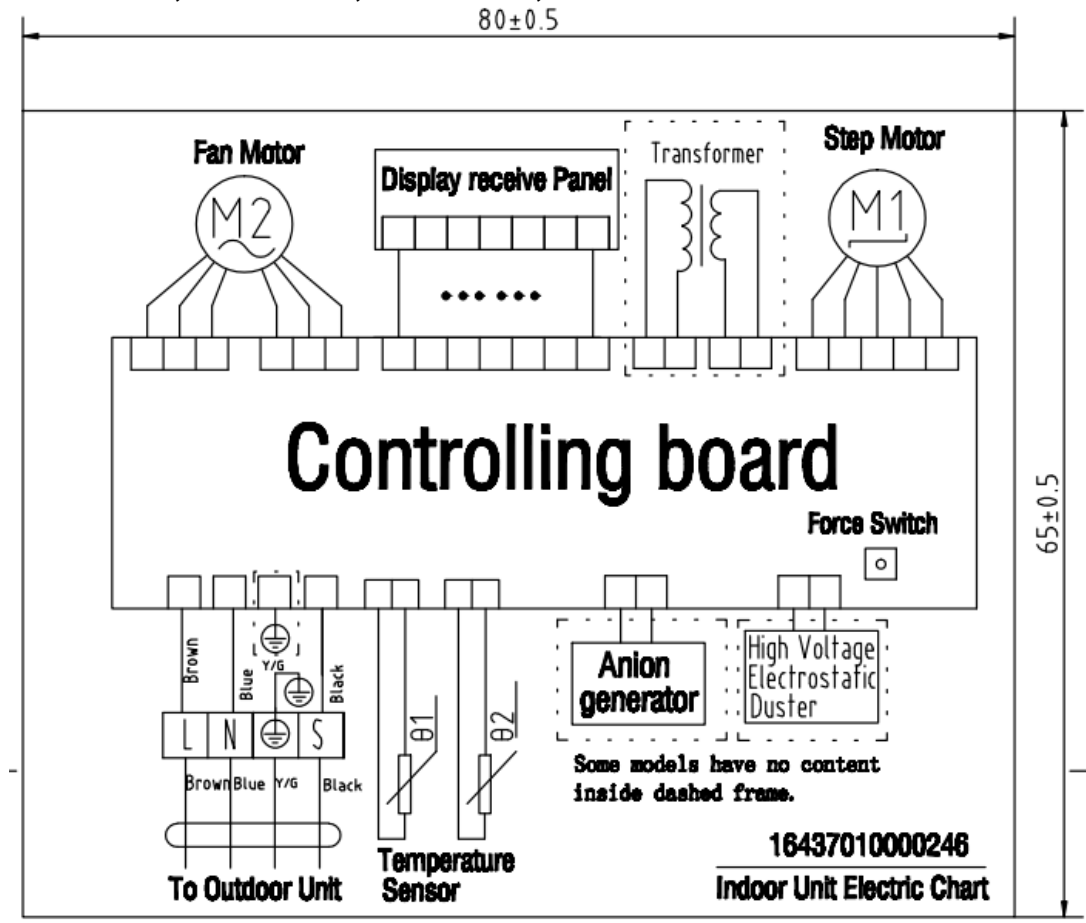
SAS07M1-AI, SAS09M1-AI, SAS12M1-AI, SAS18M1-AI



Physical Dimension		SAS07M1-AI	SAS09M1-AI	SAS12M1-AI	SAS18M1-AI
Length	mm	800	800	800	970
Height	mm	300	300	300	315
Width	mm	198	198	198	235

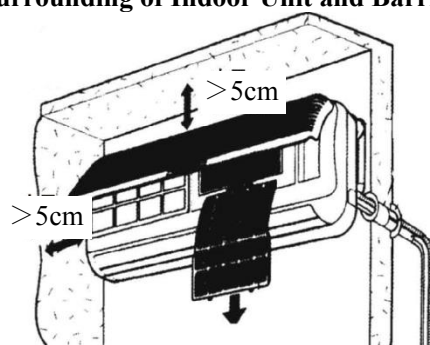
5. Electrical Diagram

SAS07M1-AI, SAS09M1-AI, SAS12M1-AI, SAS18M1-AI

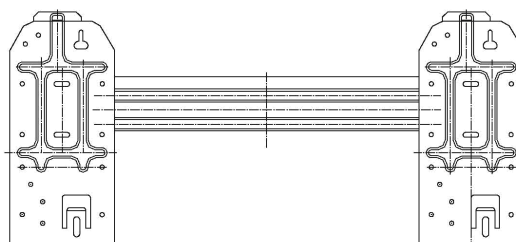


6. Installation

6.1 Spacing Reserved Between the Surrounding of Indoor Unit and Barrier



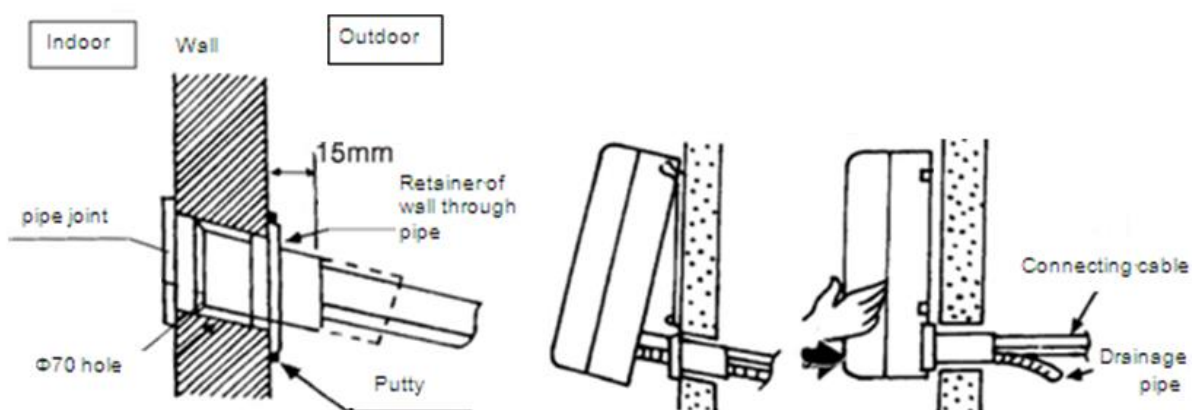
6.2 Hoisting of Indoor Unit



- ◇ The wall for installing indoor unit should be firm to prevent vibration. Horizontally install hanging plate on the wall with four cruciform screws to keep laterally horizontal and longitudinally vertical.
- ◇ Drill a $\Phi 70$ Energoluxiliary pipeline hole on lower left side or lower right side of hanging plate. The position of hole should slightly incline downwards.
- ◇ Hang indoor unit on hanging plate and move the unit to left or right to ensure hanging hook is correctly positioned on the hanging plate.

6.3 Installation of Sterilization Net

- ◇ Uplift panel of indoor unit, pull out the bulge in the middle of air filter downwards after uplifting;
- ◇ Completely snap sterilization net inside accessory bag into sterilization mounting support on air filter;
- ◇ Put back air filter in the original way, close the panel of indoor unit and tightly clamp;
- ◇ Push the lower left side and lower right side of indoor unit towards hanging plate until hanging hook inserts into groove and sends click sound.

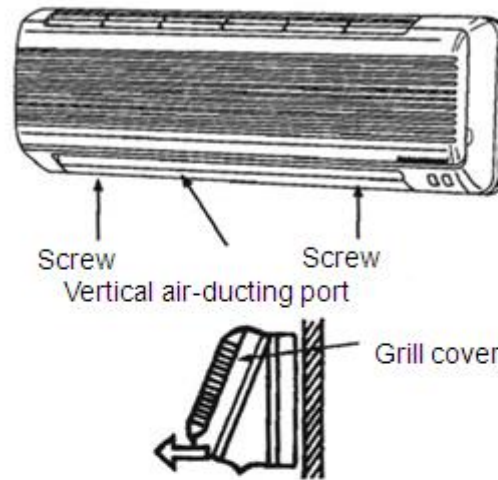


6.4 Drainage Checking

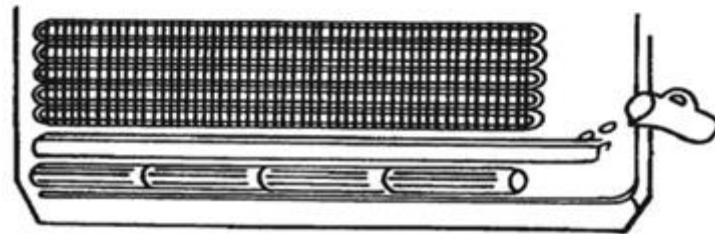
In case of maintenance, remove grille from casing of the unit according to the following procedures:

- ◇ As shown in right diagram, remove two screw caps on both sides of the front grille and then screw down two fixing screws.
- ◇ Pull the lower end of grille cover towards oneself to remove it.

- ◇ Reinstall grille cover, then install the grille cover to proper position according to the reverse sequence of the above.
- ◇ Pour a glass of water into plastic drainage groove;
- ◇ Confirm if the water flows through the drainage outlet of indoor unit.

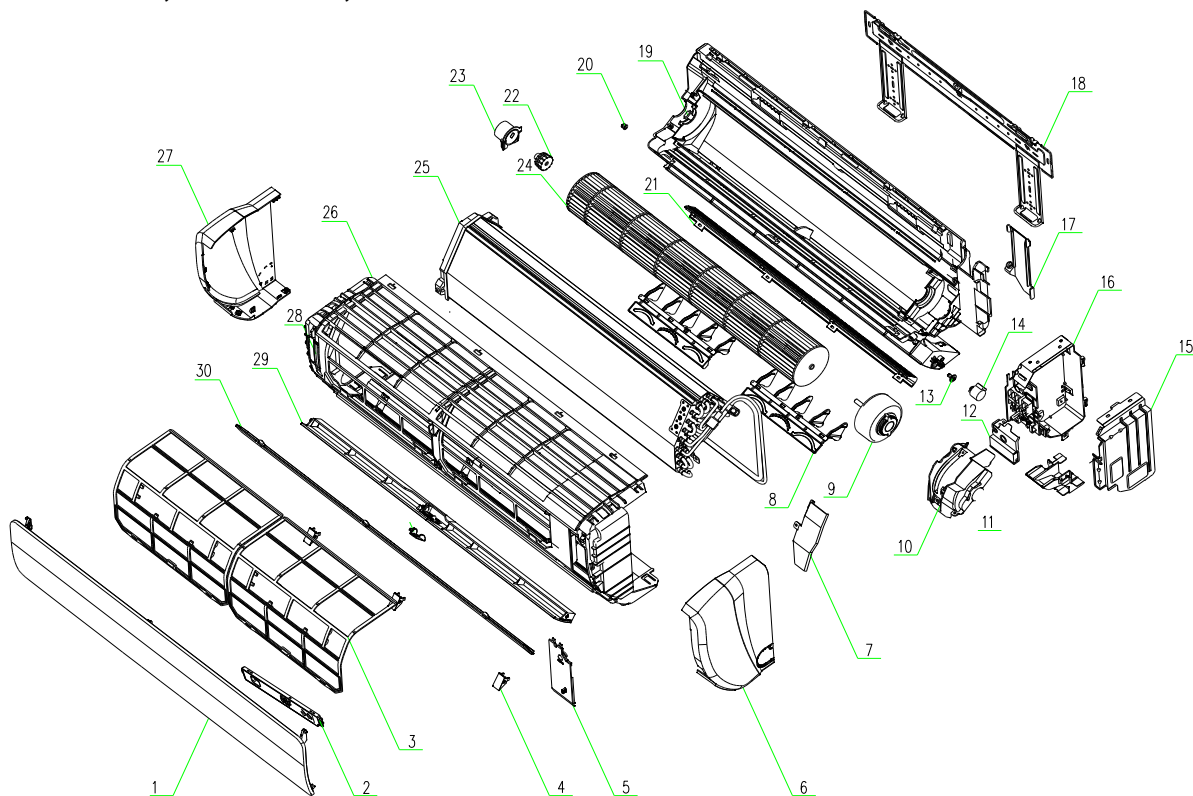


Pull the lower end of front grille towards oneself to remove the front grille



7. Explode view

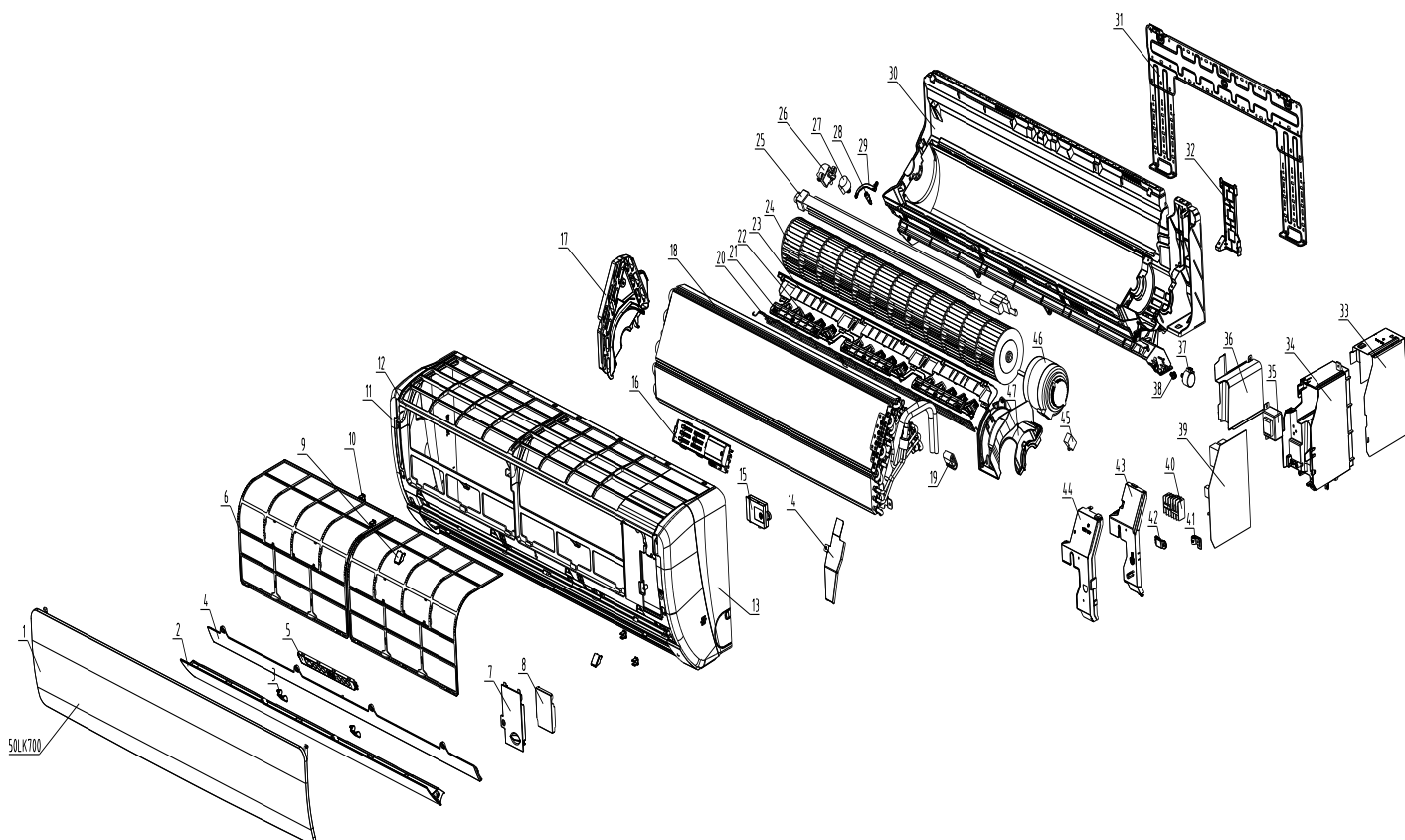
SAS07M1-AI, SAS09M1-AI, SAS12M1-AI



NO.	Material code	Part name	Qty	remarks
1	11320003001172	Panel	1	
2	11222014000521	Display board assembly	1	
3	11220508000117	Filter	2	
4	11320096000041	Screw cover	3	
5	11220509000047	Medium frame wiring cover	1	
6	11320078000008	Right-side cover	1	
7	11320065000020	Breakwater	1	
8	11320017000118	Air blade	2	
9	11230003000139	Indoor motor	1	
10	11320052000032	Motor cover	1	
11	11320104000008	Chassis supporting board	1	
12	11221526000003	Cover of electric controller box	1	
13	11320079000013	Step motor shaft sleeve	1	
14	11230002000058	Step motor	1	
15	11321012000005	Controller box sheet-metal A	1	
16	112220090002506	Main PCB	1	
17	11320084000015	Pipe clamp	1	
18	11321003000028	Mounting plate assembly	1	
19	11220500000165	Chassis	1	
20	11320079000010	Protecting bush	1	
21	11320135000015	Volute	1	
22	11220551000003	Cross flow fan rubber bearing	1	

23	11320062000028	Pubber bearing fixing peg	1	
24	11220513000055	Cross flow fan assembly	1	
25	11224003000547	Evaporator assembly	1	
26	11320002000164	Medium frame	1	
27	11320078000007	Left-side cover	1	
28	11320043000015	Supporting plate	1	
29	11220534000058	Air louver	1	
30	11320061000275	Decoration board	1	BDR model doesn't have this part
/	11222001000724	Remote controller	1	

SAS18M1-AI



NO.	Material code	Part Name	Qty	remarks
1	11320003001846	Panel	1	
2	11320005000225	Air louver	1	
3	11320080000007	Air louver fixing peg	2	
4	11320094000054	Decoration board	1	BDR doesn't have this part
5	11222014000487	Display board assembly	1	
6	11220508000101	Filter	2	
7	11320076000057	Medium frame wiring cover	1	
8	11321071000006	Medium frame wiring cover scaleboard	1	
9	11320096000047	Screw cover	2	
10	11320106000008	Panel clamp	4	
11	11320078000011	Left-side cover	1	
12	11320002000176	Medium frame	1	
13	11320078000012	Right-side cover	1	

14	11320065000020	Breakwater	1	
17	11320015000122	Evaporator left side support board	1	
18	11224003000541	Evaporator assembly	1	
21	11320017000107	Air blade	3	
23	11320135000007	Volute	1	
24	11220513000058	Cross flow fan assembly	1	
26	11320001000194	Motor chassis	1	optional
27	11230002000071	Step motor	1	optional
30	11320001000191	Chassis	1	
31	11221500000028	Mounting plate assembly	1	
32	11320084000015	Pipe clamp	1	
33	11321035000022	Controller box sheet-metal A	1	
34	11320058000055	Electric controller box	1	
35	11329009000014	Transformer	1	
36	11321035000023	Controller box sheet-metal B	1	
37	11230002000071	Step motor	1	
38	11320079000012	Step motor shaft sleeve	1	
39	11222009002500	Main PCB	1	
40	11330037000136	Terminal board	1	
41	11321001000009	Clamp	1	
42	11320010000039	Cable clamp	1	
43	11320058000055	Cover of electric controller box	1	
44	11321020000029	Controller box metal plate	1	
45	11330016000016	Anion generator	1	
46	11230003000145	Indoor motor	1	
47	11320052000034	Motor cover	1	
/	11222001000724	Remote controller	1	

Part 3 Smart Multi outdoor unit

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8. Installation	87

1. Function Introduction

- ◇Energolux DC Inverter Air Conditioner adopts the advanced 180 sine wave DC Inverter driving technology.
- ◇Energolux DC Inverter Air Conditioner adopts PD frequency control technology to well control the room temperature.
- ◇Adjusting with EXV, the whole unit could achieve quick cooling/heating and the minimum temperature fluctuation of indoor unit.
- ◇Defrost Control: Energolux DC Inverter Air Conditioner adopts intelligent defrosting technology that detect the frosting thickness, promotes the comfort when heating.
- ◇Auto-restart;
- ◇The universal series using L-N communication control between indoor and outdoor units, more reliable and easy to install, no need to special training for installation workers.
- ◇With multiple protection, the compressor could well run in reasonable operation range.
- ◇After adding the self-diagnose function and digital tube display function, the outdoor unit could be easily identify the reason of the fault.

2. Specification

DC INVERTER	Model		SAM18M1-AI/2	SAM24M1-AI/3	SAM27M1-AI/3
System Format			1 drive 2	1 drive 3	1 drive 3
Capacity	Cooling	Btu/h	17060(7530-19790)	24050(6824~25760)	25660(7524~27600)
		kW	5.0(2.2-5.8)	7.05(2.0~7.55)	7.52(2.2~8.1)
	Heating	Btu/h	18766(9385-21770)	26440(8138~28150)	27125(8138~29900)
		kW	5.5(2.75-6.38)	7.75(2.2~8.25)	7.95(2.39~8.75)
Electric Data	Power Supply	V~,Hz, Ph	220~240,50,1	220~240,50,1	220~240,50,1
	Cooling Power Input	W	1540(280-2100)	2280(550-3100)	2350(580-3200)
	Heating Power Input	W	1530(280-2100)	2380(510-2750)	2480(560-2830)
	Rated Current (cooling&heating)	A	6.6/6.5	10.5/10.9	11.0/11.5
Performance DC Inv.Compressor	SEER/SCOP	W/W	6.20/4.03	6.15/4.08	6.14/4.10
	Energy Rate		A++/A+	A++/A+	A++/A+
	Model		DA150S1C-20KZ	DA250S2C-30MT	DA250S2C-30MT
	Quantity		1	1	1
	Type		Twin Rotary	Twin Rotary	Twin Rotary
	Brand		GMCC	GMCC	GMCC
	Capacity	W	4590	7690	7690
	Input	W	1205	2120	2120
	Power Supply	V~,Hz, Ph	220~240,50,1	220~240,50,1	220~240,50,1
	Rated Current	A	8.35	8.85	8.85
	Operating Frequency	Hz	60	60	60
	Frequency Range		12~120 S ⁻¹	12~120 S ⁻¹	12~120 S ⁻¹
	Refrigerant Oil	ml	500(VG74)	820(VG74)	820(VG74)
	Outdoor DC Inverter Fan Motor	Model		CW70B-ZL	CW70B-ZL
Type			DC Inverter	DC Inverter	DC Inverter
Brand			Panasonic	Panasonic	Panasonic
Quantities			1	1	1
Insulation Class			B	B	B
Safe Class			IP44	IP44	IP44
Input Power		W	90	90	90
Output Power		W	70	70	70
Capacitor		uF	/	/	/
Speed		r/min	900-200	900-200	900-200
Outdoor Fan	Material		Plastic	Plastic	Plastic
	Diameter	mm	Φ470×140	Φ470×140	Φ470×140
	Fan Quantity		1	1	1
Outdoor Coil	a.Number Of Row		1.5	2.5	2.5

	b.Tube Pitch(a)x Row Pitch(b)	mm	20.5×12.7	20.5×12.7	20.5×12.7
	c.Fin Pitch	mm	1.5	1.5	1.5
	d.Fin Material		Hydrophilic aluminum fin	Hydrophilic aluminum fin	Hydrophilic aluminum fin
	e.Tube Outside Dia.And Material	mm	φ7 , Inner grooved	φ7 , Inner grooved	φ7 , Inner grooved
	f.Coil Length x Height x Width	mm	779×615×12.7+493×615×12.7	763×615×25.4+450×615×12.7	763×615×25.4+450×615×12.7
Air Flow Volume		CFM	1706	2118	2118
		m ³ /h	2900	3600	3600
Noise Level	Sound Pressure Noise Level	dB(A)	56	56	56
	Sound Power Noise Level	dB(A)	65	65	65
Dimension	Net Dimension (W*D*H)	mm	822×302×655	822×302×655	822×302×655
	Packing Dimension (W*D*H)	mm	945×430×725	945×430×725	945×430×725
Weight	Net	kg	42	52	52
	Gross	kg	45	55	55
Refrigerant type/Quantity	Type		R410a	R410a	R410a
	Charged Volume	kg	1.3	1.6	1.6
Piping	Liquid Side	mm(inc h)	2×6.35(1/4)	3×6.35(1/4)	3×6.35(1/4)
	Gas Side	mm(inc h)	2×9.52(3/8)	3×9.52(3/8)	3×9.52(3/8)
	Max. Length (Each)	m	15	15	15
	Max. Height	m	10	10	10
Ambient Temp (Cooling/Heating)		°C	-10~52°C/-15~24°C	-10~52°C/-15~24°C	-10~52°C/-15~24°C
Stuffing Quantity	20/40/40H	unit	102/210/280	102/210/210	102/210/210

DC INVERTER	Model		SAM36M1-AI/4	SAM42M1-AI/5
System Format			1 drive 4	1 drive 5
Capacity	Cooling	Btu/h	35826(8560~37600)	40944(9450~43150)
		kW	10.5(2.5~11.0)	12(2.77~12.7)
	Heating	Btu/h	37532(9100~38120)	44356(10100~44800)
		kW	11(2.67~11.2)	13(2.96~12.8)
Electric Data	Power Supply	V~,Hz, Ph	220~240,50,1	220~240,50,1
	Cooling Power Input	W	3200	3600
	Heating Power Input	W	3250	3650
	Rated Current (cooling&heating)	A	14.5/15.0	16/16.5
Performance	SEER/SCOP	W/W	5.93/4.17	6.02/4.28

DC Inv.Compressor	Energy Rate		A+/A+	A+/A+
	Model		QXAS-D32zX090B	QXAS-D32zX090B
	Quantity		1	1
	Type		Birotory DC Inverter	Birotory DC Inverter
	Brand		LANDA	LANDA
	Capacity	W	10060	10060
	Input	W	3360	3360
	Power Supply	V~,Hz, Ph	220~240,50,1	220~240,50,1
	Rated Current	A	6.7	6.7
	Operating Frequency	Hz	60	60
	Frequency Range		12~120 S ⁻¹	12~120 S ⁻¹
	Refrigerant Oil	ml	950(VG74)	950(VG74)
Outdoor DC Inverter Fan Motor	Model		CW85C CW85D	CW85C CW85D
	Type		AC	AC
	Brand		Xinjun	Xinjun
	Quantities		2	2
	Insulation Class		B	B
	Safe Class		IP44	IP44
	Input Power	W	142×2	141×2
	Output Power	W	85×2	85×2
	Capacitor	uF	4×2uF	4×2uF
	Speed	r/min	860/710/570	860/710/570
Outdoor Fan	Material		Plastic	Plastic
	Diameter	mm	φ528×165	φ528×165
	Fan Quantity		2	2
Outdoor Coil	a.Number Of Row		1.5	1.5
	b.Tube Pitch(a)x Row Pitch(b)	mm	22×19.05	22×19.05
	c.Fin Pitch	mm	1.6	1.6
	d.Fin Material		Hydrophilic aluminum fin	Hydrophilic aluminum fin
	e.Tube Outside Dia.And Material	mm	φ7.94 , Inner grooved	φ7.94 , Inner grooved
	f.Coil Length x Height x Width	mm	954×1320×19.05+400×1320×19.05	954×1320×19.05+400×1320×19.05
	g.Heat Exchanging Area	m ²	27.42	27.42
Air Flow Volume		CFM	3765	3765
			m ³ /h	6400
Noise Level	Sound Pressure Noise Level	dB(A)	57	57
	Sound Power Noise Level	dB(A)	65	65

Energolux DC Inverter Smart Multi 50HZ R410A

Smart Multi outdoor unit

Dimension	Net Dimension (W*D*H)	mm	940×368×1366	940×368×1366
	Packing Dimension (W*D*H)	mm	1080×460×1500	1080×460×1500
Weight	Net	kg	96	97
	Gross	kg	109	110
Refrigerant type/Quantity	Type		R410a	R410a
	Charged Volume	kg	3.4	3.4
Piping	Liquid Side	mm(inc h)	4×6.35(1/4)	5×6.35(1/4)
	Gas Side	mm(inc h)	4×9.52(3/8)	5×9.52(3/8)
	Max. Length(Each)	m	15	15
	Max. Height	m	10	10
Ambient Temp (Cooling/Heating)		°C	-10~52°C/-15~24°C	-10~52°C/-15~24°C
Stuffing Quantity	20/40/40H	unit	27/55/55	27/55/55

Note:

- Cooling capacity test Condition:(27°CDB,19°CWB Indoor/35°CDB,24°CWB Outdoor);
Heating capacity test Condition:(20°CDB Indoor/7°CDB,6°CWB Outdoor);
connecting pipe length: 5M.
- Datas may be changed with unit improvement. We keep the right to change the datas or specifications without prior notice, please follow the datas listed on the nameplate.

3. Capacity Amendment

3.1 Running range

Cooling capacity (Btu/h)		18000	24000	27000	36000	42000
Power supply		220-240V~/50Hz				
Voltage		187~253V				
Ambient temperature	Cooling	-10~52℃				
	Heating	-15~24℃				

3.2 Amendment coefficient of cooling capacity under different indoor/outdoor temperature K1

Indoor temperature(℃)		Outdoor temperature(DB)					
DB	WB	25	30	35	40	45	50
22	15	0.97	0.92	0.87	0.96	0.77	0.75
24	17	1.03	0.98	0.94	0.89	0.84	0.80
27	19	1.10	1.05	1	0.95	0.90	0.86
29	21	1.16	1.11	1.06	1.02	0.96	0.91
32	23	1.22	1.17	1.13	1.08	1.02	0.98

Actual cooling capacity calculation:

Actual cooling capacity=amendment coefficient of cooling capacity × nominal cooling capacity

——nominal cooling capacity could be found from the performance parameters list

——amendment coefficient of cooling capacity could be found from table above.

3.3 Amendment coefficient of heating capacity under different indoor/outdoor temperature K2

Outdoor temperature(℃)		Indoor room temperature(℃)		
DB	WB	15	20	25
-15	-16	0.64	0.59	0.55
-10	-12	0.71	0.66	0.62
-7	-8	0.76	0.72	0.67
-1	-2	0.79	0.74	0.70
2	1	0.81	0.76	0.72
7	6	1.04	1	0.96
10	9	1.10	1.06	1.01
15	12	1.16	1.12	1.07

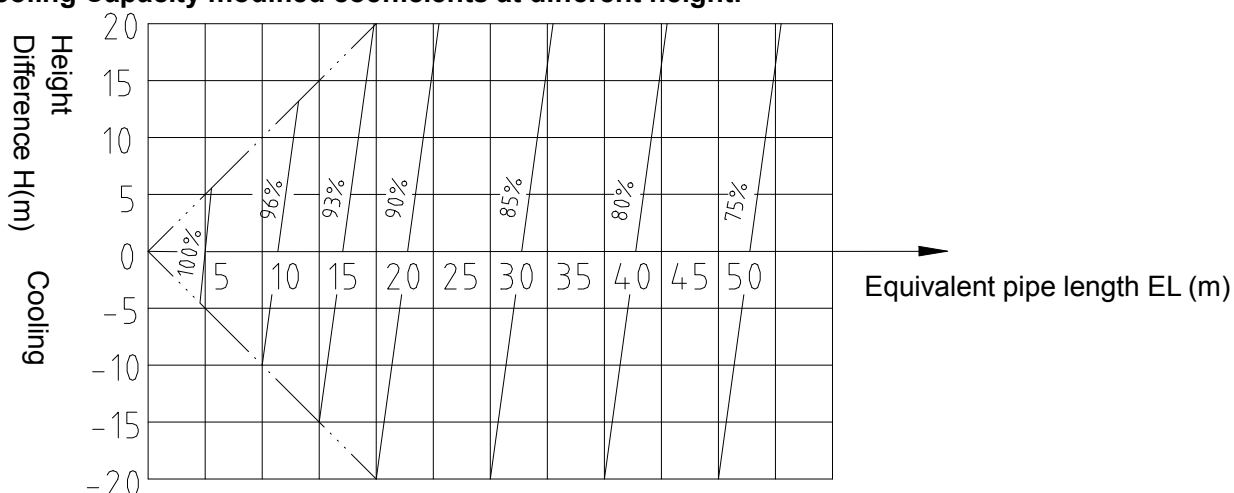
Actual heating capacity calculation:

Actual heating capacity=amendment coefficient of heating capacity × nominal heating capacity

——nominal heating capacity could be found from the performance parameters list

——amendment coefficient of heating capacity could be found from table above.

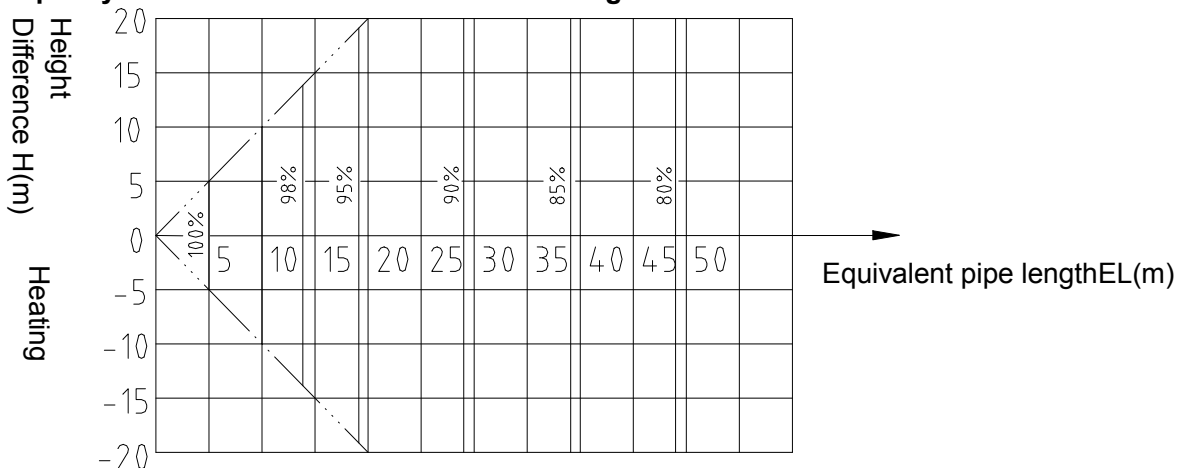
3.4 Amendment coefficients of heating and cooling capacity under different height drop K3 Different Cooling Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit – Height of Indoor Unit

Different Heating Capacity modified coefficients at different height:



Note:

H = Height of Outdoor Unit – Height of Indoor Unit

3.5 Correction capability

Cooling capacity = nominal cooling capacity xK1xK3

Heating capacity = nominal heating capacity xK2xK3

3.6 Equivalent Pipe length conversion

Equivalent pipe length means converting pipe elbow to straight pipe length after considerate the pressure loss.

Bend and Oil Loop Conversion tablet

Pipe Dia.(mm)	Type	Bend	Oil Loop
6.35		0.10	0.7
9.52		0.18	1.3
12.70		0.20	1.5
15.88		0.25	2.0
19.05		0.35	2.4
22.02		0.40	3.0

Equivalent Pipe length $L = \text{Actual Pipe length } L + \text{Bend Qty} \times \text{Equivalent pipe bend length} + \text{Oil Loop Qty} \times \text{Equivalent Oil Loop length}$

Sample:

SAM18M1-AI/2

Actual Pipe length is 25 meters, Gas pipe diameter is 9.52mm. If there's 5 bends and 2 oil loops during the installation, then the equivalent pipe length should be:

$$L = 25 + 0.18 \times 5 + 1.3 \times 2 = 28.5(\text{m})$$

◇ Specification of Connection Pipe for Indoor Unit and Outdoor Unit

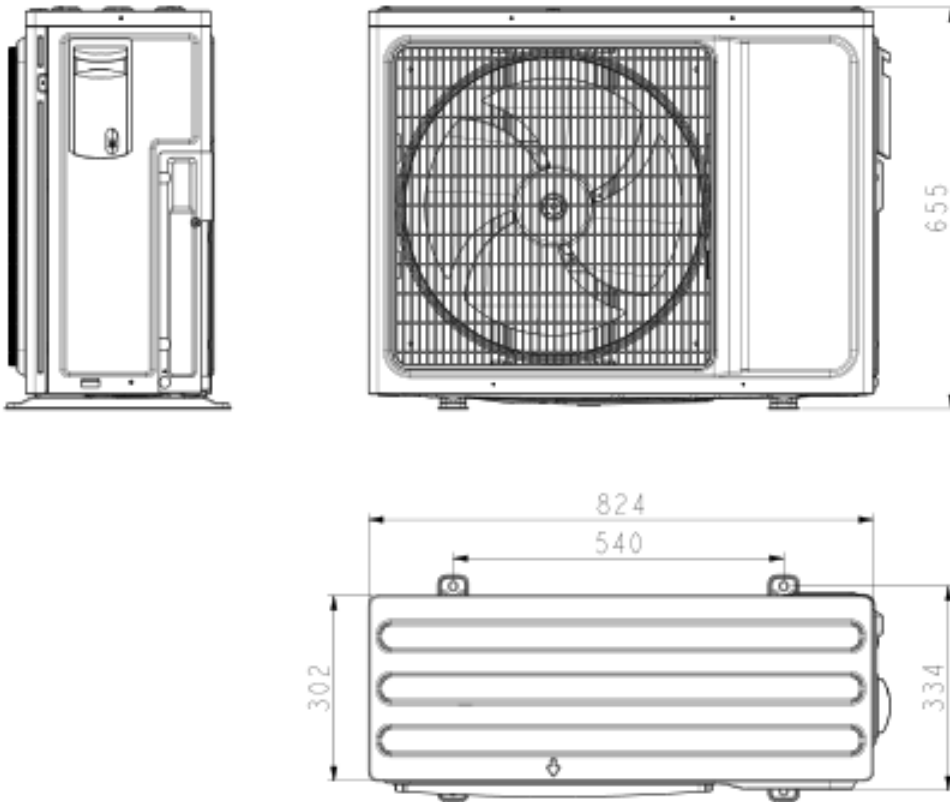
Cooling Capacity(Btu/h)		18000	24000	27000	36000	42000
Connection Pipe (mm)	Liquid Pipe	Φ6.35				
	Gas Pipe	Φ9.52				
Max. Length(Each)		15				
Max. Height (m)		10				
Max. Bend Qty		5				
Extra R410a per meter when the pipe length is more than 5 meter (kg)		0.022				

Caution:

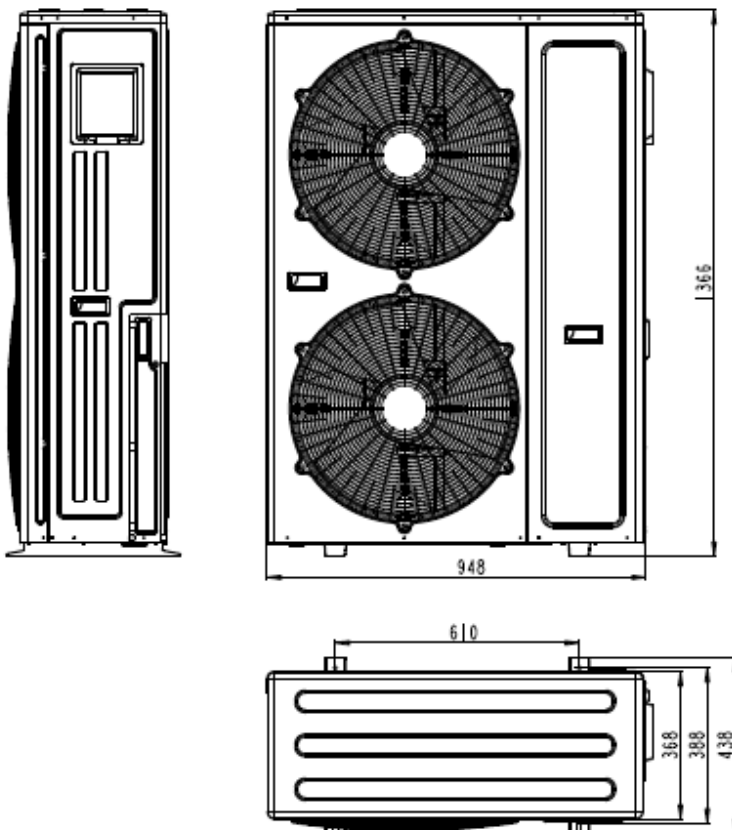
1. The standard Pipe length is 5m, if the pipe length is less than this then no additional charging is necessary. If the pipe length is more than this then you should charge more refrigerant into the system according to the above Charging Data
2. The thickness of the pipe is 0.6-1.0, bearing pressure is 4.2MPa;
3. If the connection pipe is too long, the cooling capacity and stability would be decreased. And the more bend quantity, the resistance in the piping system would be bigger, then the cooling and heating capacity would be decreased even lead to compressor broken. We suggest you to use the shortest connection pipe according to the pipe length parameter in this manual. If the height difference between outdoor and indoor unit is more than 5m, an oil trap should be installed in the gas pipe for every 10 meters.

4. Dimension

SAM18M1-AI/2、SAM24M1-AI/3、SAM27M1-AI/3



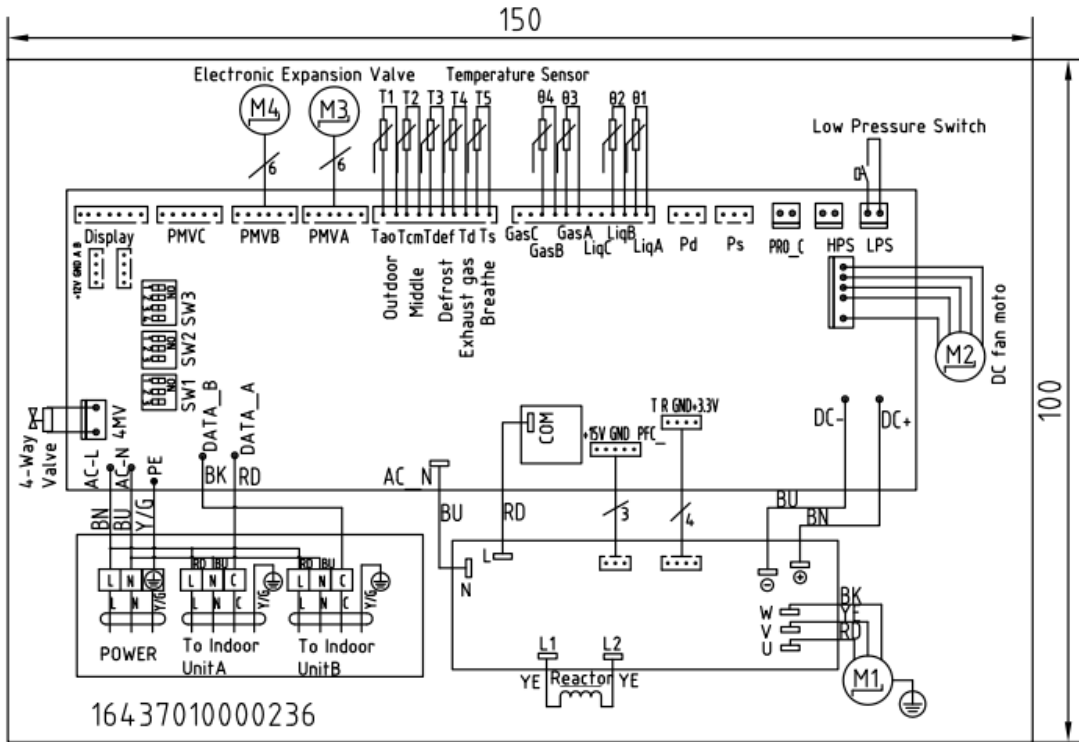
SAM36M1-AI/4、SAM42M1-AI/5



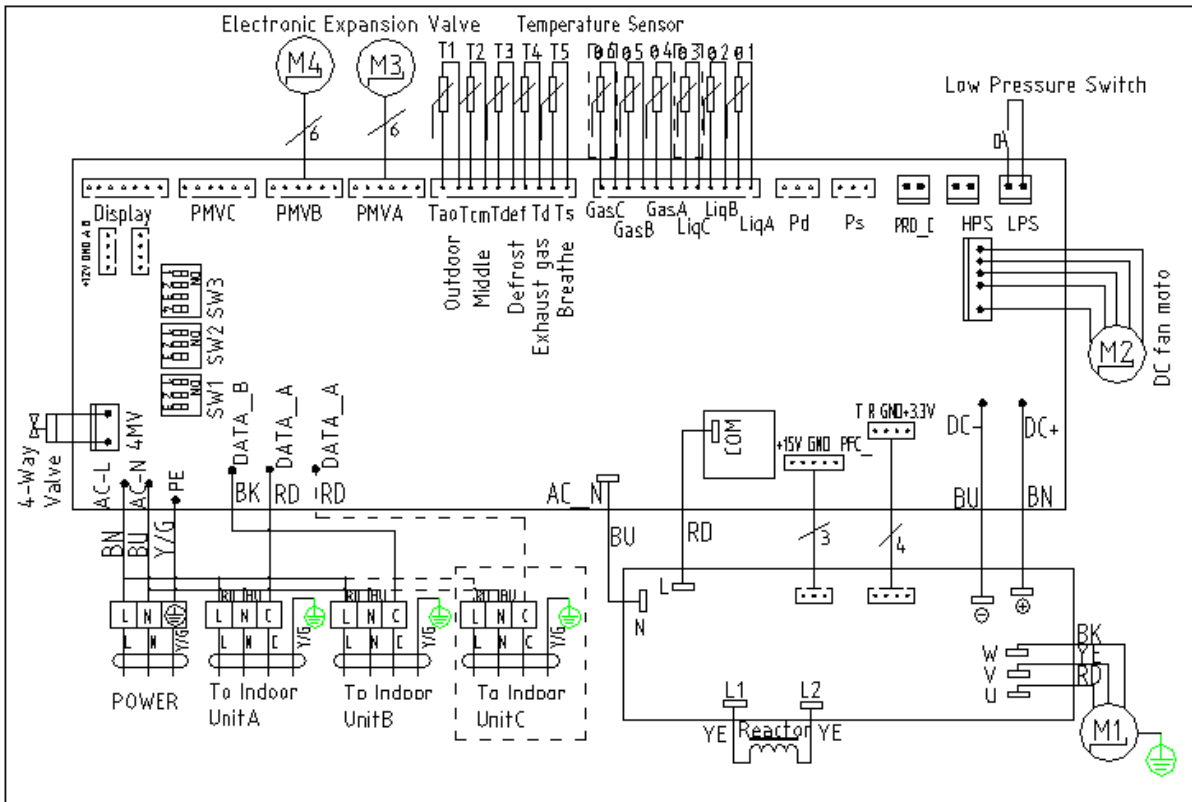
5. Electrical Diagram and connection

Electrical Diagram

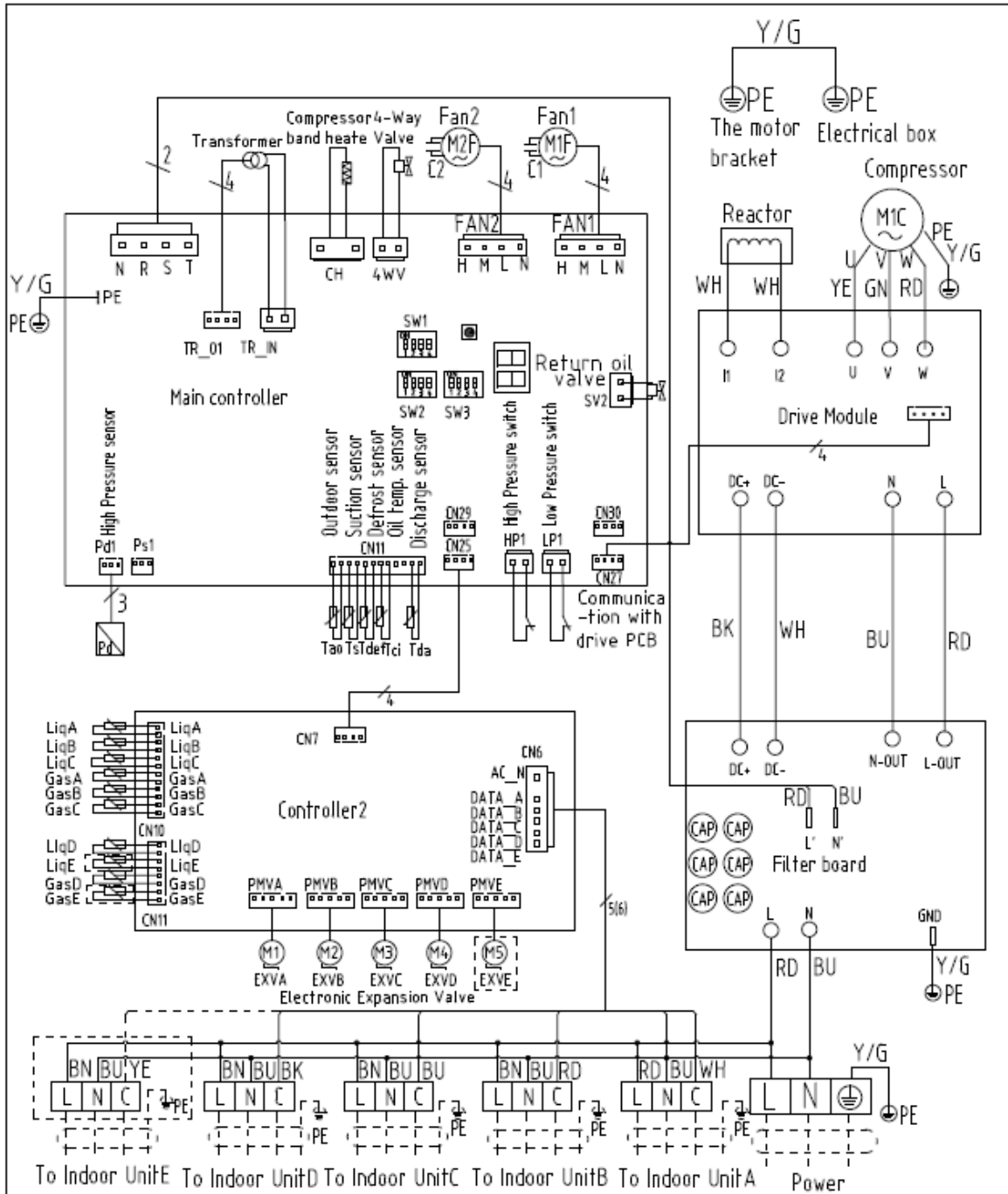
SAM18M1-AI/2



SAM24M1-AI/3、SAM27M1-AI/3



SAM36M1-AI/4 SAM42M1-AI/5



SW1 function definition:
the unit capacity setting

	36K(T4)
	42K(T5)

SW2 function definition:
Special function Selection

	Reserved
	Reserved
	ON:The minority obeying the majority OFF:First match wins(default)
	ON :AC motor OFF:DC motor(default)

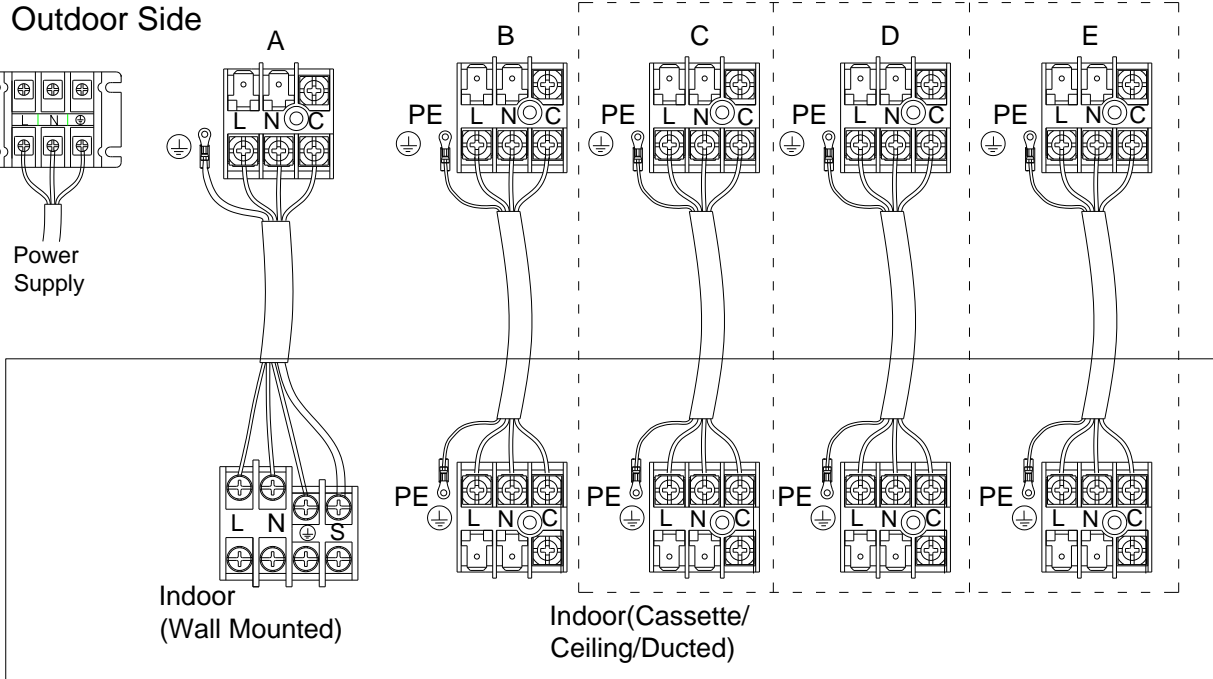
SW3 function definition:
Special function Selection

	Reserved
	ON:without electricity 6 hours heating OFF:electricity 6 hours heating (default)
	ON:Quiet mode OFF:No quiet mode(default)
	Reserved

Note: " " refers to ON,
" " refers to OFF.

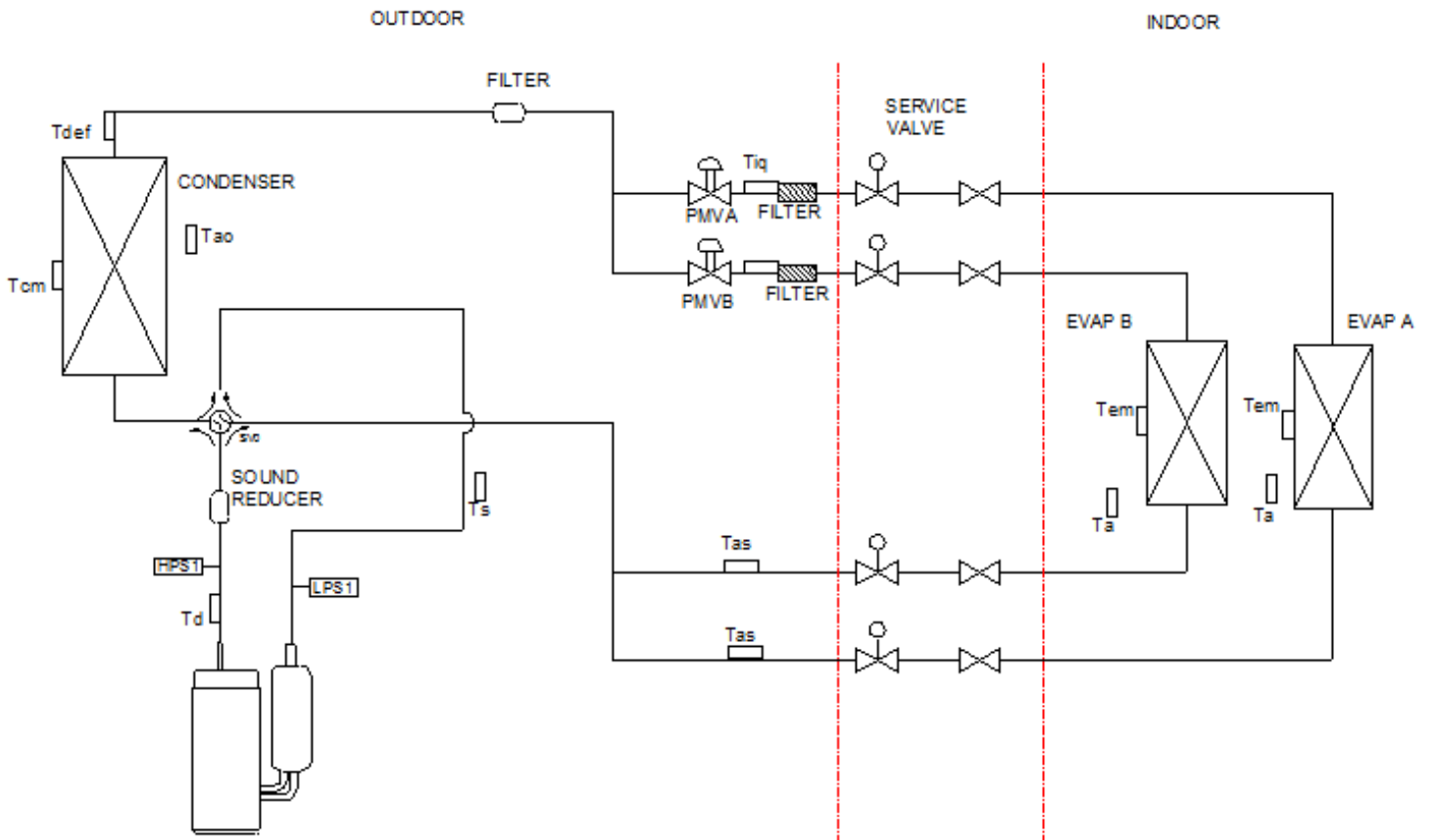
Electrical Wiring Connection

SAM18M1-AI/2 SAM24M1-AI/3 SAM27M1-AI/3 SAM36M1-AI/4 SAM42M1-AI/5

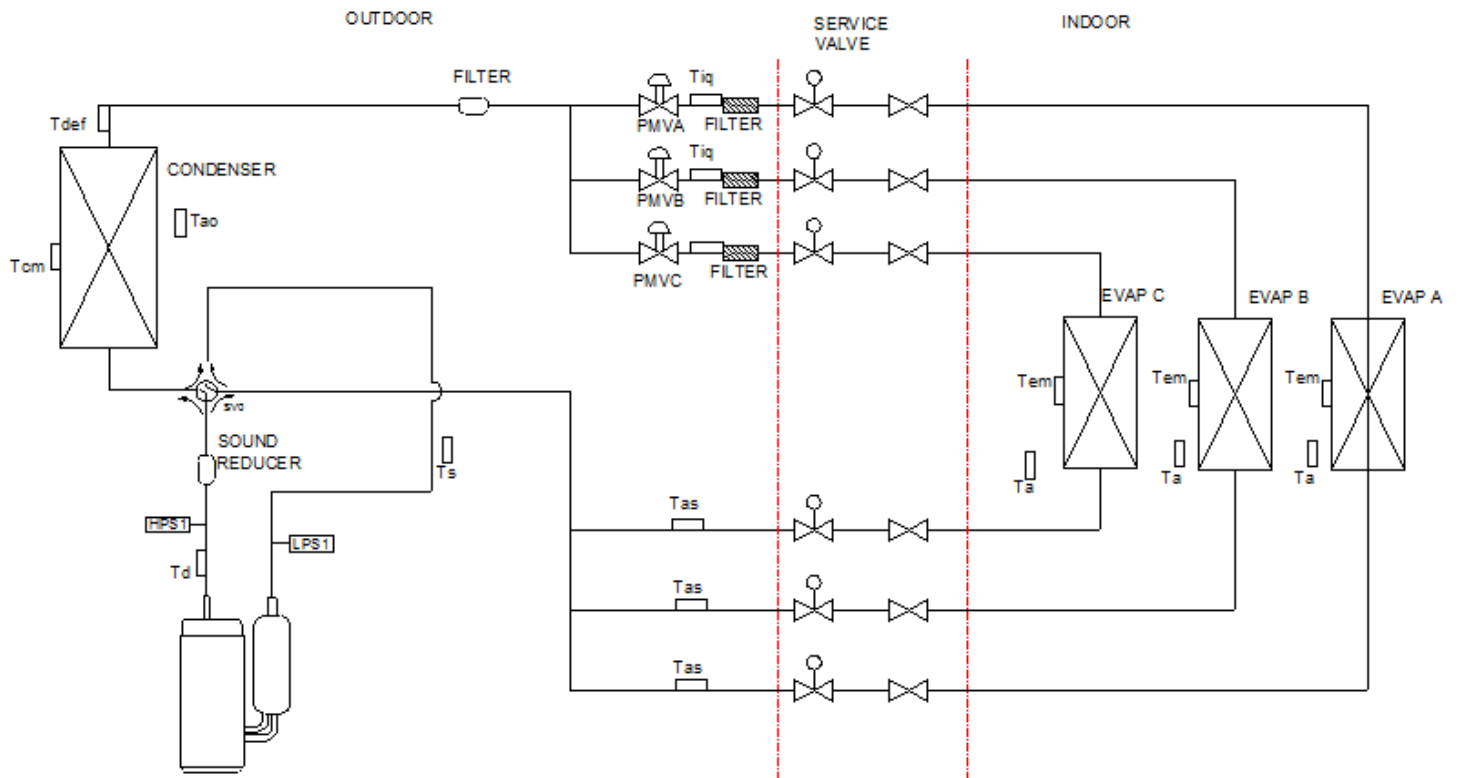


6. System Diagram

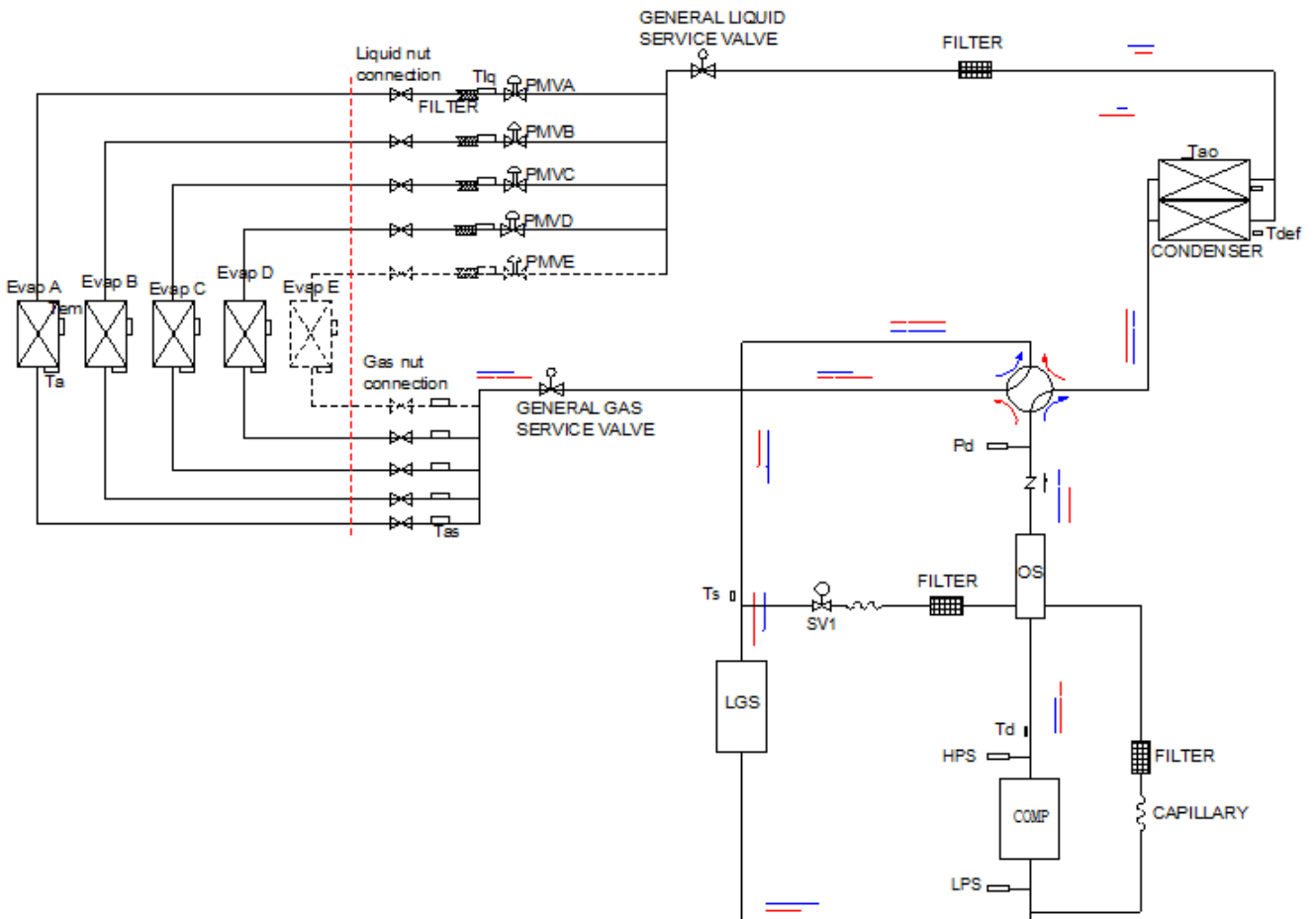
SAM18M1-AI/2



SAM24M1-AI/3 SAM27M1-AI/3

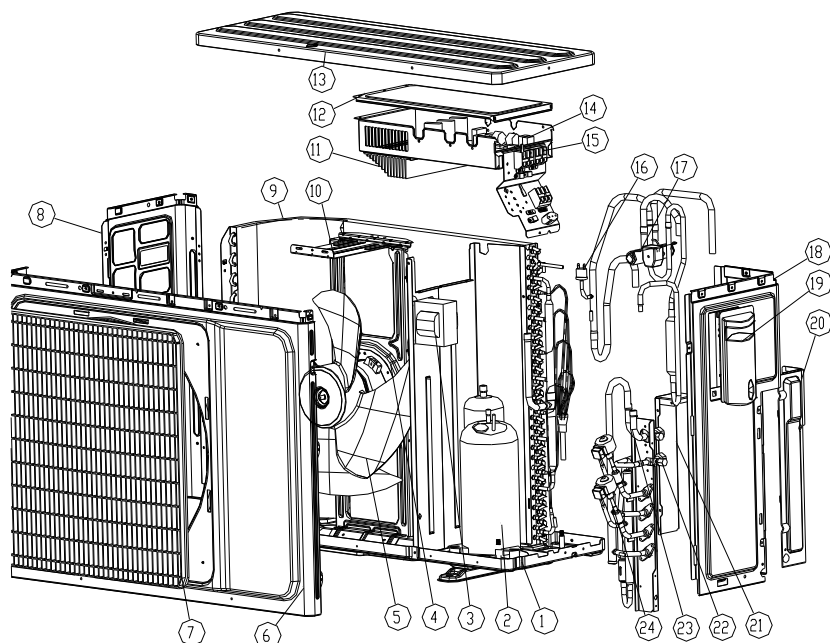


SAM36M1-AI/4 SAM42M1-AI/5



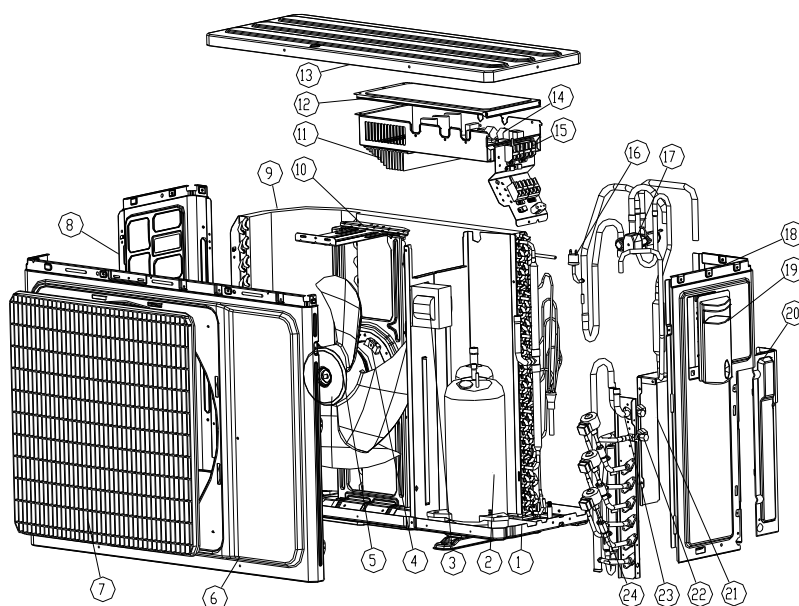
7. Exploded View

SAM18M1-AI/2



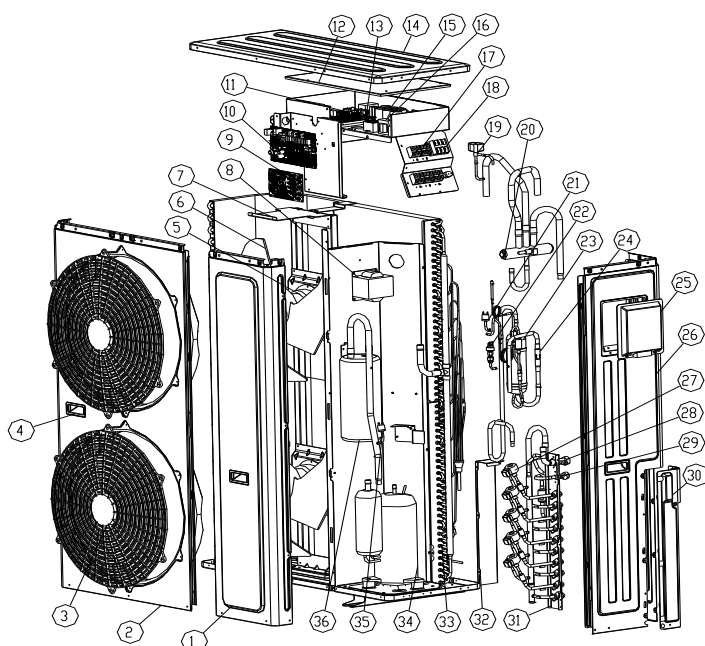
No.	Part code	Part name	Qty/Per	Remarks
1	16321002000140	Btm pan asm	1	
2	16438003000031	Compressor	1	DA150S1C-20KZ
3	11330034000012	Resistor	1	DK20-5d2-50
4	16430001000619	Fan motor	1	CW70B-ZL
5	11320009000057	Fan blade	1	470*140
6	16421004000355	Dec front panel	1	
7	11320026000052	Grille front panel	1	
8	16421001000736	Left side panel	1	
9	16324002000091	Condenser asm	1	
10	11321002000036	Motor bracket	1	
11	11222543000004	Driving PCB compressor	1	
12	11321020000002	Control box cover	1	
13	11321009000052	Top cover	1	
14	11222031000382	Main PCB	1	
15	16427001000064	Terminal block	3	
16	16442024000005	Low pressure switch	1	
17	11225509000069	4-way valve	1	

18	16421001000739	Right side panel	1	
19	11320068000009	Electrical cover	1	
20	16420014000034	Check valve cover	1	
21	16421001000738	Back side panel	1	
22	16441004000074	Serive valve 3/8"	1	
23	16441004000096	Service valve 1/2"	1	
24	16441014000030	E-expensive valve	2	DPF(Q)1.5(R410a)

SAM24M1-AI/3 SAM27M1-AI/3

No.	Part code	Part name	Qty/Per	Remarks
1	16321002000141	Btm pan asm	1	
2	11223003000019	Compressor	1	DA250S2C-30MT
3	11330034000016	Resistor	1	DK25-5-50
4	16430001000619	Fan motor	1	CW70B-ZL
5	11320009000057	Fan blade	1	470*140
6	16421004000355	Dec front panel	1	
7	11320026000052	Grille front panel	1	
8	16421001000736	Left side panel	1	
9	16324002000092	Condenser asm	1	
10	11321002000036	Motor bracket	1	
11	11222030000007	Driving PCB compressor	1	
12	11321020000002	Control box cover	1	

13	11321009000052	Top cover	1	
14	11222542000009	Main PCB	1	
15	16427001000064	Terminal block	4	
16	16442024000005	Low pressure switch	1	
17	11225509000069	4-way valve	1	
18	16421001000739	Right side panel	1	
19	11320068000009	Electrical cover	1	
20	16420014000034	Check valve cover	1	
21	16421001000738	Back side panel	1	
22	16441004000074	Serve valve 3/8"	1	
23	16441004000096	Service valve 1/2"	1	
24	16441014000030	E-expensive valve	3	DPF(Q)1.5(R410a)

SAM36M1-AI/4 SAM42M1-AI/5

NO.	Material code	Part name	Qty	remarks
1	16421004000023	Front panel small	1	
2	16421004000226	Front panel big	1	
3	16420020000025	Plastic grille	2	
4	11320097000003	Handle	3	
5	16430001000624	Fan motor	2	CW85C、CW85D
6	11320009000052	Fan blade	2	528*165
7	16421026000016	Motor bracket	1	
8	16430013000007	Resistor	1	DK-5mH-30A
9	11222544000008	Pcb extension	1	
10	11222542000061	Main pcb	1	

11	16422012000027	Driving pcb comp	1	
12	16421038000288	Control box cover	1	
13	11330010000057	Fan capacitor	2	4.0μF/450VAC/70/2000h
14	16421005000028	Top cover	1	
15	16422007000004	Capacitor board	1	
16	16422005000008	Transformer	1	
17	16427001000064	Terminal block 3p	4 or 5	
18	16427001000020	Terminal block power	1	
19	16441012000039	Magnetism valve	1	
20	11225509000067	4-way valve	1	
21	16442024000006	High pressure switch	1	4.2/3.3
22	16442026000006	High pressure sensor	1	2HMP6-5 L=600
23	16442021000020	Oil seperator	1	VR160WH
24	16441003000020	Check valve	1	
25	16421038000288	Electrical cover	1	
26	16421001000701	Right side panel	1	
27	16441014000030	E-exp valve	4 or 5	DPF(Q)1.5(R410a)
28	16441004000088	Service valve 5/8"	1	
29	16441004000074	Service valve 3/8"	1	
30	16420014000033	Service valve cover	1	
31	11320015000073	Valve bracket	1	
32	16421001000684	Back side panel	1	
33	16324002000078	Cond asm		
34	16438003000036	Compressor	1	QXAS-D32zX090B
35	16442024000005	Low pressure switch	1	0.3/0.1
36	16421016000077	Middle panel	1	

8. Installation

8.1 Preparation and equipments before installation

1	Please buy following spare parts from your local market before installation
2	Hung bolts M12, 4 pcs
3	Drainage pipe PVC
4	Copper connecting pipe
5	Adhesive belt (big size) 5 pcs, (small size) 5 pcs
6	Heat insulation material used to connect copper pipe (PE foam material, its thickness is more than 8mm)
7	Power cable, electrical wire between indoor and outdoor unit(Must be in accordance with the wire diameter in the wiring diagram)
8	Acetylene cylinders, oxygen cylinders (when longer pipe used it should be welded)
9	One set pipe cut machine. (cut copper pipe)
10	Refrigerant cans, electronic balance (when longer pipe used additional gas should be charged)
11	Pressure gauges, pipe clamp, welding torch, 2B silver electrode
12	Wrench 2 pcs, one of them is with adjustable torque wrench(42N.m,65N.m,100N.m)
13	Nitrogen cylinder (in order to prevent oxidation when welding, using Nitrogen to replace the air)

Select installation position of outdoor unit

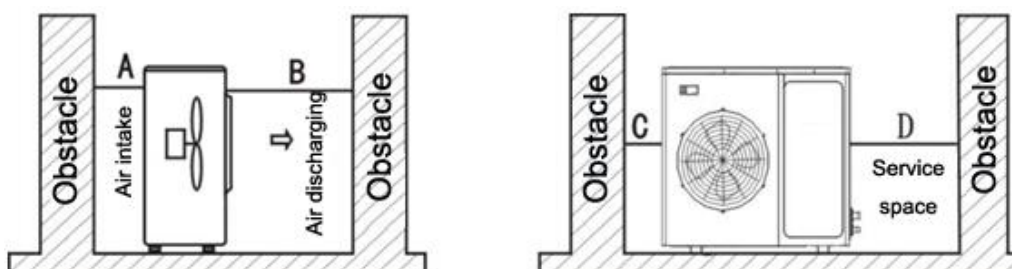
- ◇The site shall be strong enough to bear its weight, prevent noise and vibration.
- ◇The site shall be ensured to avoid direct sunshine, if necessary set a Havelock above the outdoor unit.
- ◇The site shall be easy to drainage the rain water and the frost water.
- ◇The site shall be ensured that the outdoor unit will not be covered by snow LDring the winter season.
- ◇The site shall be ensured that the outlet is not facing the strong wind.
- ◇The site shall be ensured that outlet air and operation noise will not affect the neighbors' daily life.
- ◇The site shall be ensured that the outdoor unit will not be affected by the garbage and oil mist.

Warning :

If outdoor unit working under such environment which contains oil (including machine oil) salt(marine areas), sulfide gas (hot springs and oil refinery areas), those substance may lead to the failure work of the outdoor unit.

Maintenance and ventilation space

- ◇The site shall be easy for ventilation then the outdoor unit can inhale and discharge air easily. What's more please reserve enough space for maintenance.



Note: Require $A > 300\text{mm}$; $B > 1500\text{mm}$; $C > 300\text{mm}$; $D > 500\text{mm}$;

Outdoor unit installation

- ◇Use size M10 bolt and nut to fasten the outdoor unit tightly on the bracket, keep it in the horizontal level. The suitable length for bolt shall 20mm over the base level, in order to minimize vibration please do set a rubber shock absorber.



- ◇If the outdoor unit is mounted on the wall or on the rooftop, in order to prevent earthquake and strong wind please fasten it as tightly as possible.
- ◇Set a drainage channel to ensure the condensing water can drain out smoothly.

◇ Avoid that only four angles metal sheet to support the outdoor unit.

Transport

When the outdoor unit is to be lifted, please use two slings longer than 8m and insert cushioning material between the slings and outdoor unit to avoid damaging the casing.

8.2 Connection piping installation

Piping installation precaution

Please choose copper pipe as the piping.

◇ If the piping installation needs welding:

Please welding before fasten the nut, when welding using nitrogen gas to replace the air in the pipe in order to prevent oxidation.

◇ If there are many points to be welded ,please set a filter in the pipe(buy from local market)

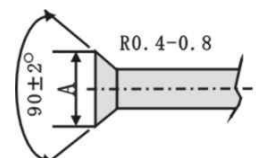
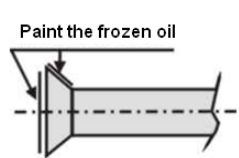
◇ Please use nitrogen gas or air to remove the dust and water in the pipe,

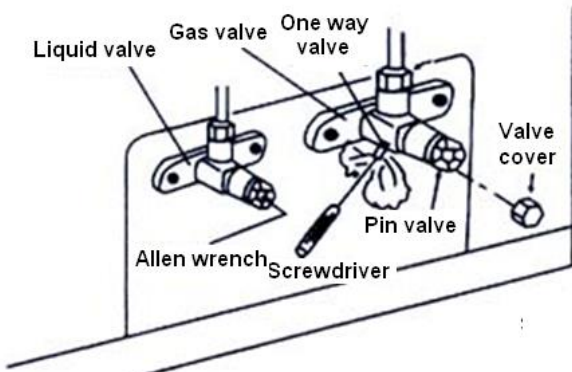
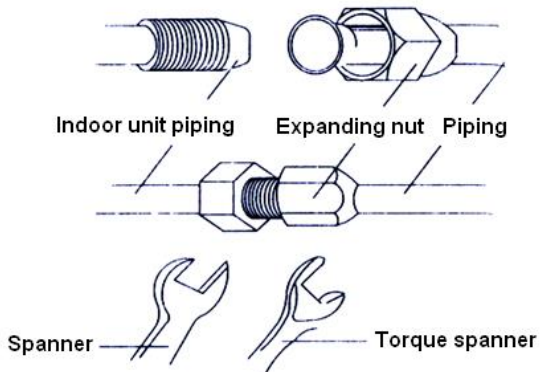
◇ Please lay out the piping according to the tend towards of the piping, but it is not allowed more than 3 times curved at the same point of the pipe(if do like this the pipe will become rigid)

◇ When using pipe bending machine, the curvature shall not be too small or it will affect the refrigerant flow.

Piping specification selection

As to the detail selection please take reference to the cooling capacity adjust index figure during different installation situations.

Piping diameter	Tighten torque	Expanding size (A)	Expanding shape	Paint the frozen oil
1/4in(φ6.35mm)	15-19(N·m)	8.3-8.7mm		
3/8in(φ9.52mm)	35-40(N·m)	12.0-12.4mm		
1/2in(φ12.7mm)	50-60(N·m)	15.4-15.8mm		
5/8in(φ15.88mm)	62-76(N·m)	18.6-19.0mm		
3/4in(φ19.05mm)	70-75(N·m)	22.9-23.3mm		



Piping connection

◇ Using expanding machine to expand accessories, the size of horn shown in the above figure:

◇ Paint a thin layer of frozen oil at both inside and outside part of the expanding.

◇ Make the expanding right to the screw thread shape connection of the indoor unit, using hands to tighten the nut then using a wrench to tighten the nut again.

◇ Take out the cover of the indoor unit gas valve and liquid valve, make the expanding right to the stop valve of outdoor unit, using hands to tighten the nut then using a wrench to tighten the nut again.

Equivalent pipe length conversion

Equivalent pipe length means converting pipe elbow to straight pipe length after considering the pressure loss.

Elbow and Oil loop conversion table

Pipe Dia.(mm)	Type	Bend	Oil Loop
6.35		0.10	0.7
9.52		0.18	1.3
12.70		0.20	1.5
15.88		0.25	2.0
19.05		0.35	2.4
22.02		0.40	3.0

Equivalent pipe length $L = \text{Actual Pipe length} + \text{Bend Qty} \times \text{Equivalent pipe bend length} + \text{Oil Loop Qty} \times \text{Equivalent Oil Loop length}$

Sample:

SAC09M1-AI

Actual Pipe length is 25 meters, Gas pipe diameter is 9.52mm. If there's 5 bends and 2 oil loops during the installation, then the equivalent pipe length should be:

$$L = 25 + 0.18 \times 5 + 1.3 \times 2 = 28.5(\text{m})$$

◇ Specification of connection pipe for indoor unit and outdoor unit

Cooling Capacity(Btu/h)		18000	24000	27000	36000	42000
Connection Pipe (mm)	Liquid Pipe	Φ6.35				
	Gas Pipe	Φ9.52				
Max. Length(Each)		15				
Max. Height (m)		10				
Max. Bend Qty		5				
Extra R410a per meter when the pipe length is more than 5 meter (kg)		0.022				

Emptying or vacuum

Before charging the refrigerant to the system, to ensure that there is no impurities, water or non-condensable gas. So, emptying and vacuum operation should be carried out.

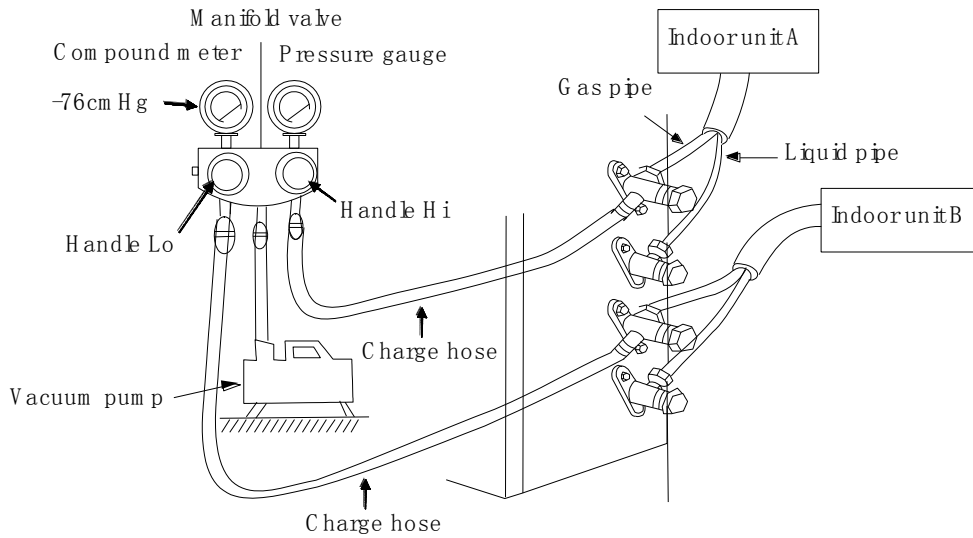
◇ Vacuum: when process this operation please be sure that the connection pipe is tightened up.

1. Screw off the cover of maintenance valve connection, connect the pressure gauge to the connection of maintenance valve
2. Connect the vacuum pump to the pressure gauge, turn on the vacuum pump and pressure gauge to process the vacuum operation toward the indoor unit and piping, while to ensure that the absolute pressure is no less than 50Pa after this operation.
3. Turn off the pressure gauge and vacuum pump to keep the pressure in the same level in 20 minutes.

◇ Emptying: when process this operation, please disconnect the high pressure valve with liquid valve.

1. Connect the gas valve of the stop valve to the thimble side of the rubber hoses, the other side of rubber hoses should be connected to the refrigerant tank.
2. Open the refrigerant tank valve, using the refrigerant inside the tank with high speed to empty the air in the indoor unit and the connection piping. When the outlet air becomes mist (it feels cold by touching it), then the air is emptied.
3. When ensure that the air is emptied, connect and tighten the high pressure valve of outdoor unit stop valve and liquid side connection pipe, keep this state more than 10 seconds.
4. Use soapy what to test each connection junctions (including lengthen piping welding junction)
5. Confirmed that there is no leakage, turn off the valve of refrigerant tank, take down the rubber hose as well.

◇ Turn on the high-low pressure valve of the outdoor unit.
 After vacuum and emptying, screw back the cover of the maintenance valve of outdoor unit low pressure valve, screw off the high-low pressure valve of the outdoor unit (note: shall totally turned off). Connect the refrigerant to the system.



Heat insulation package of piping

◇ Use heat insulation material with good insulation performance to wrap the pipe.

Incorrect	Correct		
<ul style="list-style-type: none"> Gas pipe and liquid pipe can't be insulated together 	<ul style="list-style-type: none"> Only gas pipe insulation (Cooling-only) 	<ul style="list-style-type: none"> Gas and liquid pipe insulation 	<ul style="list-style-type: none"> Insulation support
<ul style="list-style-type: none"> Piping joints should be insulated 			

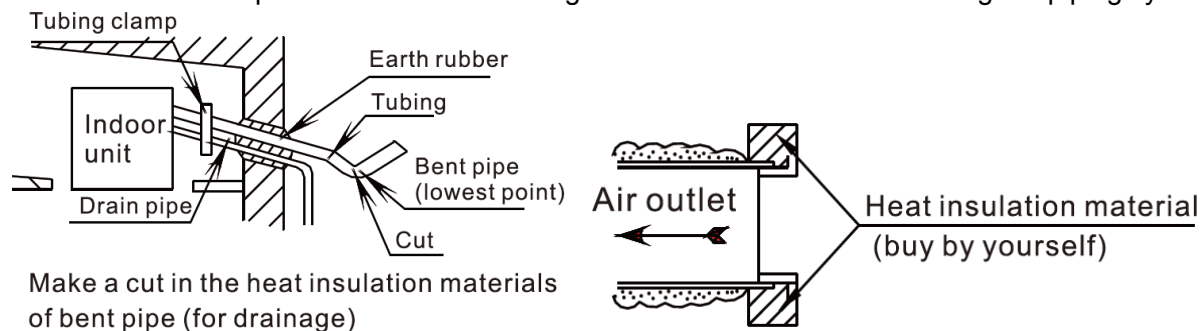
Notes
 Drainage pipe and connection piping should be wrapped by heat insulation material respectively lift the air conditioner is proved my dew conditioner experiment. But if it keeps on working in high humidity (the dew temperature is more than 23°C) environment which may lead to water leakage, please use following additional insulation material:

◇ Glass fiber insulation material with the thickness between 10~20mm can be used.

- ◇The part of indoor unit which get in touch with the back side of ceiling should be pasted with insulation material.
- ◇Besides the previous more than 8mm thick insulation material, connection piping (both gas pipe and liquid pipe), drainage pipe should be wrapped by additional 10~30 mm thick insulation material.

Seal the hole on the wall.

- ◇To prevent rainwater or other foreign bodies from entering the room and air-conditioner, the gap between wall hole and tubing, drain pipe and electric wire should be sealed with mastic, sealant rubber or putty.
- ◇If the outdoor unit is higher than indoor unit, tubing should be bent to ensure that the lowest point of the tubing is lower than the wall hole to prevent rainwater entering the room or air-conditioner along the piping system.



Additional refrigerant charge

When pipe length exceeds 5m, please add refrigerant according to the table below:

Connection piping	Piping size		Additional refrigerant charge amount (kg/m)
	Gas pipe	Liquid pipe	
Piping between indoor and outdoor unit	φ9.52×0.75mm	φ6.35×0.75mm	0.022
	φ12.7×1mm	φ6.35×0.75mm	0.022
	φ15.88×1mm	φ9.52×0.75mm	0.050
	φ19.05×1mm	φ9.52×0.75mm	0.070
	φ19.05×1mm	φ12.7×1mm	0.090

Oil grade and standard oil-filled volume of Compressor

Outdoor unit model	Brand	Compressor model	Oil type	Oil volume (cm ³)
SAM18M1-AI/2	GMCC	DA150S2C-30KZ	VG74	500
SAM24M1-AI/3	GMCC	DA250S2C-30MT	VG74	820
SAM27M1-AI/3	GMCC	DA250S2C-30MT	VG74	820
SAM36M1-AI/4	LANDA	QXAS-D32zX090B	VG74	950
SAM42M1-AI/5	LANDA	QXAS-D32zX090B	VG74	950

Others

Make sure that the oil can return to the unit smoothly.

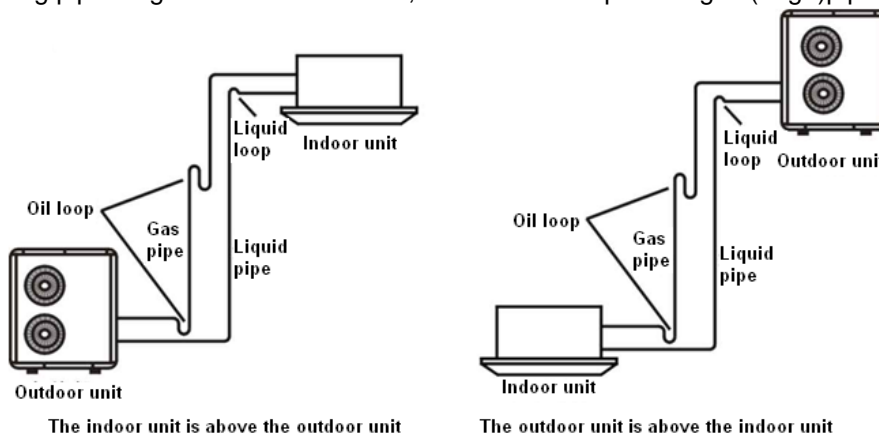
- ◇Horizontal pipes should incline toward the outdoor unit using a 20:1 slope.
- ◇If there is a height difference(ΔH) between the indoor and outdoor unit, oil loops should be installed in the inter connecting gas (large) pipe;

When ΔH ≤ 5 meters, an oil loop should be installed at the bottom of the gas (large) pipe; if the constant rise distance is too long, an oil loop should be installed in the gas (large) pipe every 10 meters.

When ΔH > 5 meters, then for every 5 meters an oil loop must be installed at the bottom of the gas (large) pipe, and a short loop (liquid ring) should be installed at the exit of the indoor unit liquid (small) pipe;

- ◇When the outdoor and indoor units are at the same elevation, If the horizontal connecting pipe length is less than 10 m, the oil deposit bend and liquid ring do not need to be installed.

If the horizontal connecting pipe length is more than 10 m, install an oil loop in the gas (large) pipe every 10 metres.



Note:
 This chart is for explanation purposes. An actual installation will differ from this according to the site conditions. When making an oil loop the radius of the bend should be between 1.5 and 2 times the pipe diameter.

8.3 Electrical connection

8.3.1 Electrical connection precaution

Warning	Installation of electric items must be carried out by qualified, professional technicians.
	An isolated circuitry should be fixed with whole-pole disconnection devices, which is with at least 3mm gap of touch point . Power supply and indoor to outdoor connection wire should use special cable.
	Providing the necessity of installation or replacement, the professional technician of service store appointed by manufacturer must be required, while self-operation by users is prohibited.
	In case of any electric shock accident, the creepage protection devices /power supply on-off switch and breaker must be required with.
	The specification of fuse for single phase control board is F5AL 250V, while for 3 phase control board, both indoor and outdoor unit, it is F3.15AL 250V.
	Machine must be earthed surely. or it'll be probably cause creepage.
Notice	The earth line is neither allowed to connect to gas pipe, water pipe ,circuitry of telephone or lighting rod, nor to the earth line of other devices.
Others	Please fix power supply cord and connection wires of indoor and outdoor, in accordance with circuit diagram Fix the cords into terminal boards properly and safely with cable fixation tools to avoid any danger caused by the power cord under outside forces. After fixation, use bind tape (affixed) to bind wires avoiding any collision with other components like compressor, copper pipes...etc

8.3.2 Electrical connection

Wiring diagram of indoor & outdoor, refer to the section of part 1

Recommendation of power supply cord

Power supply:220~240V,50Hz

Capacity (BTU)	Model	Power supply	Indoor power cable
7000	SAS07M1-AI SAD07M1-AI	Outdoor unit 220-240V~50Hz Indoor Unit 220-240V~50Hz	3×1mm ²
9000	SAS09M1-AI SAC09M1-AI SACF09M1-AI SAD09M1-AI		3×1mm ²
12000	SAS12M1-AI SAC12M1-AI SACF12M1-AI SAD12M1-AI		3×1mm ²
18000	SAS18M1-AI SAC18M1-AI SACF18M1-AI SAD18M1-AI		3×1mm ²

Power supply	Series	Max. Current (Normal)		
		Rated cooling (35/24 27/19)	Maximum frequency operation (39/26 32/23)	Maximum capacity operation (43/26 32/23)
Outdoor unit 220-240V~50Hz	1 drive 2(18K)	10.9	11.6	9.50
	1 drive 3(24K)	15.4	16.9	14.8
	1 drive 3(27K)	15.6	17.1	15.0
	1 drive 4(36K)	22.4	24.1	21.9
	1 drive 5(42K)	23.0	24.7	22.6

Notice:

- ◇ Above mentioned power supply cord is the cable which connect air on-off of indoor to indoor/outdoor unit. Power supply cord of indoor/outdoor unit is the power supply cable connecting indoor and outdoor unit
- ◇ The section area of power supply cord core is minimized one. To avoid voltage pressure dropped down, while longer power supply cord needed, the section area should be enlarged for one gauge.
- ◇ The connection wires to indoor unit is the cable of 27IEC53(RVV) type, 300/500V; while the connection wires to outdoor unit and the connection wires from outdoor to indoor unit is the multi-end of cable (neoprene)of 245IEC57(YZW)type,300/500V. if the single core with double skin type of cable is chosen for installation,, please choose 1# gauge of section area and wrapped with special jacket for electrician.
- ◇ All of the ceiling/floor type unit is without accessorial electric heating

8.3.3 Wire connection

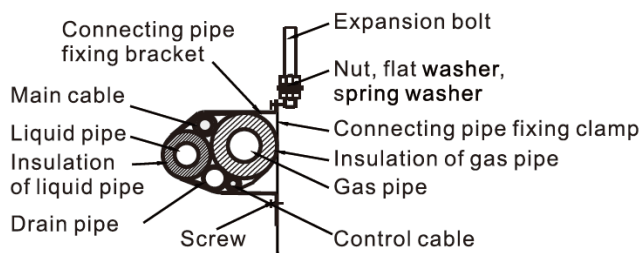
Indoor wire connection

Remove electric control box cover of indoor unit, connect the wires in accordance with the electric diagram mentioned on the back of the cover. The wire ends must be tightly fixed into terminal boards. The earth wire must be fixed into appointed position.

Outdoor wire connection

- ◇ Remove the electric item cover, which is positioned in the right side of outdoor unit, connect the wires in accordance with the electric diagram on the back of the cover.

- ◇ Be sure that pressing the wires tightly with the terminal boards while it through the board, the wire ends must be tightly fixed into terminal boards. The earth wire must be fixed into appointed position.
- ◇ After all the wire connected, bundle connection pipe, connection wires and drainage pipewith strips like mentioned drawing below:



Notice:

- ◇ **Be sure don't make the drainage pipe flat while bundled.**

8.4 Commissioning

Check installation condition

- ◇ Check indoor/outdoor unit installation and wire connection in accordance with the requirement of service manual.
- ◇ Check the power supplying, diameter of wires, air on-off switch and make sure that the items can be matched with machines, earth wire connection safety.
- ◇ Check air inlet/outlet duct and make sure that the items is clean, operating smoothly.

Commissioning

- ★ The system should be power on for 8 hours for preheat before the first time start up.
- ★ During winter, while after 8 hours power off, the performance test should be 2.5 and half hours power on later:
- ◇ Power on the system and start up in cooling mode.
- ◇ After 3 minutes compressor protection, check whether there is normal cooling air come from indoor unit and if there is abnormal noise come from indoor/outdoor units
- ◇ Configure the mode with "fan" and check whether there is high speed airflow come from indoor unit.
- ◇ Operate "swing" mode, check whether the louver is properly swaying.
- ◇ Press the other buttons on the remote controller and check whether the complete unit is on proper working condition
- ◇ Keep on running for 1 hour with "cooling" mode and check if the drainage system is on proper condition
- ◇ Switch the mode for "heating" and check whether there is warm airflow come from indoor unit, whether there is abnormal noise come from indoor/outdoor units
- ◇ After confirmation of normal working condition, press the "on-off" button to stop the system.
- ◇ At last, train the end users with operation, maintaining and special notice.

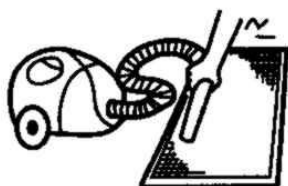
8.5 Daily maintenance

Clean filter net

- ◇ Before cleaning the filter, ensure the unit is switched off and the power is off.
- ◇ Forbidden to use water clean the filter , it will hurt PCB or get an electric shock.
- ◇ When cleaning filter net, be sure to stand steadily, and please be careful using a lift or others.

Washing filter net

- ◇ Use vacuum or water to clean the net.
- ◇ In order to ensure the best performance of your air conditioner, clean the air filter regularly, We recommend cleaning once a month or more frequently if required.
- ◇ When the filter is very dirty it can be washed in detergent and hot water (below 45°C).
- ◇ Ensure the filter is fully dry before reinstallation to avoid risk of electric shock or short circuiting.
- ◇ Do not dry the filter using direct sunlight.



Check at the beginning of each season

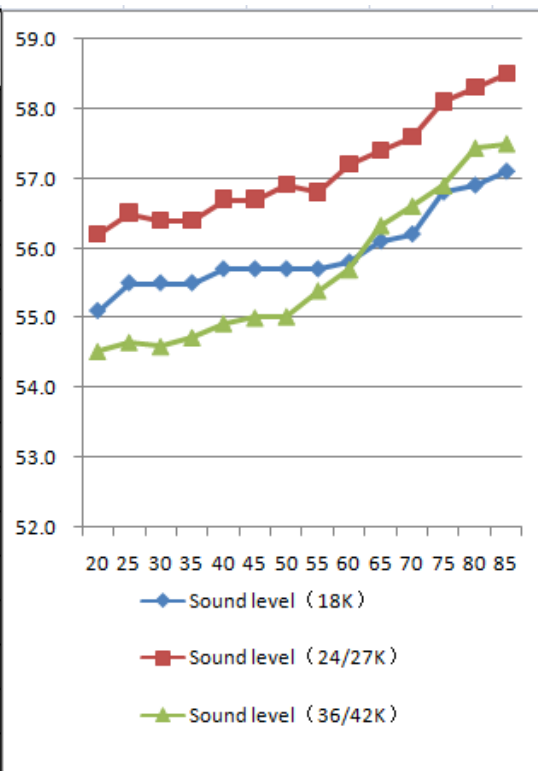
- ◇ Check whether there are no physical obstructions at the air inlet or outlet of either indoor or outdoor unit.
- ◇ Check whether there are garbage at the water outlet.
- ◇ Check whether electrical cables are in good condition, particularly the earth cable.
- ◇ When power on, check weather letters display on the screen of the wired controller.
- ◇ When working in winter, the system must be power on for 8 hours before the first time start up.

Check at the end of service season

- ◇ Operate for 2~3 hours under the ventilation condition; remove the moisture of the indoor unit..
- ◇ If not use air conditioner in a long time, please cut off the power to save energy, the letter will disappear on wired controller.
- ◇ Take the batteries out of remote controller.
- ◇ Use dustproof to cover the **outdoor unit**.

8.6 Sound level of different running status

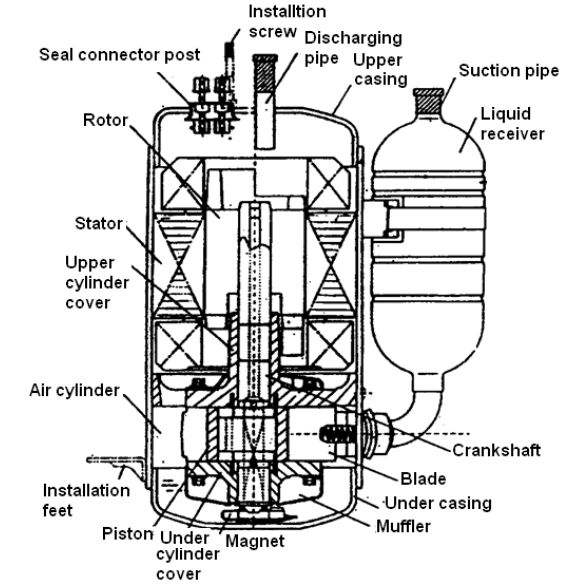
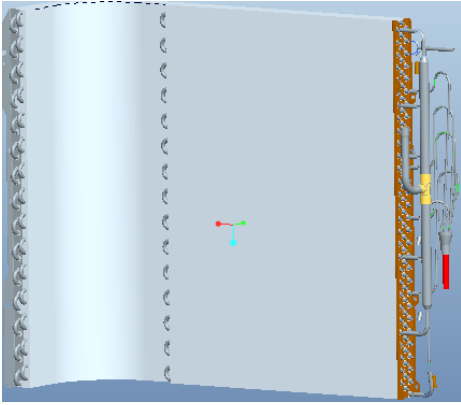
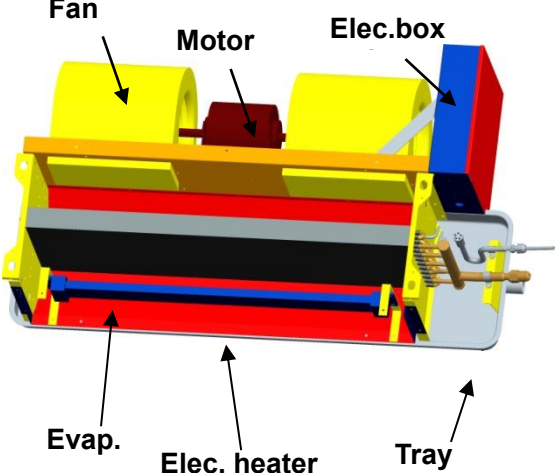
frequency (Hz)	SAM18M1-AI/2	SAM24M1-AI/3 SAM27M1-AI/3	SAM36M1-AI/4 SAM42M1-AI/5
	Sound Pressure Level (dB)	Sound Pressure Level (dB)	Sound Pressure Level (dB)
20	55.1	56.2	54.5
25	55.5	56.5	54.7
30	55.5	56.4	54.6
35	55.5	56.4	54.7
40	55.7	56.7	54.9
45	55.7	56.7	55.0
50	55.7	56.9	55.0
55	55.7	56.8	55.4
60	55.8	57.2	55.7
65	56.1	57.4	56.3
70	56.2	57.6	56.6
75	56.8	58.1	56.9
80	56.9	58.3	57.4
85	57.1	58.5	57.5

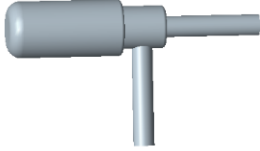
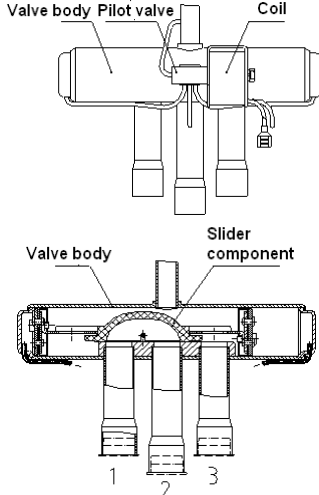
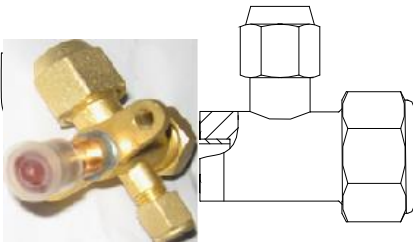
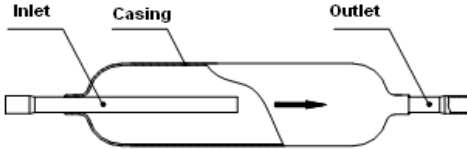
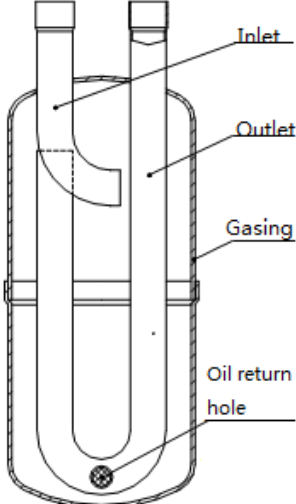


Part 4 Trouble shooting


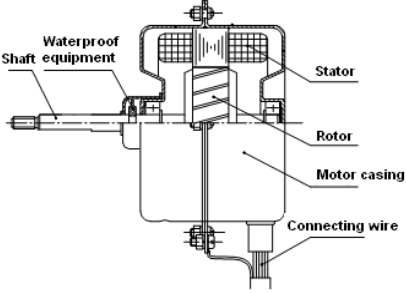

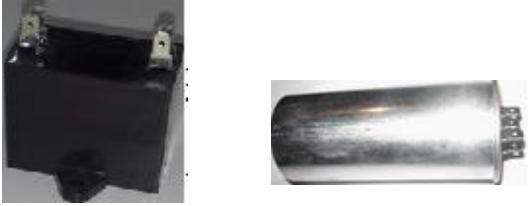
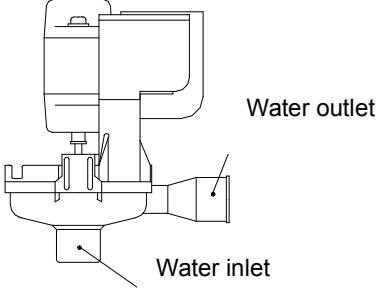
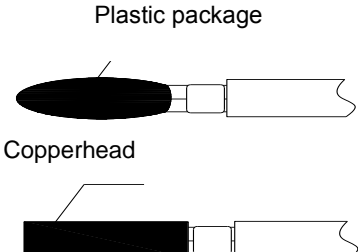
1. Main components of air conditioner	97
2. Electrical system main components	100
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1. Main components of air conditioner

Appellation	Figuration and inner configuration	Instruction
Compressor		<p>The function of compressor: after refrigerant evaporate in evaporator, compress the low temp and low pressure refrigerant gas, make the gas become high temp and high pressure gas, and then send the gas to condenser, make the refrigerant cycle.</p>
Condenser (heat exchanger)		<p>The function of condenser: Make the high temp and high pressure refrigerant gas discharged by compressor become liquid [make the gas heat exchange with air], (Remark: when heating, condenser will become evaporator)</p>
Evaporator (heat exchanger)		<p>Function of evaporator: Make the low pressure refrigerant liquid from capillary or expansion valve become gas(make the liquidheat exchange with air)</p>

<p>EXV (Electronic expansion valve)</p>		<p>Function of EXV: Utilize aperture and length change bring pressure gap, control refrigerant flow quantity and pressure. EXV is controlled by PCB, more precisely.</p>
<p>Four way valve</p>		<p>Function of 4 way valve: When change cooling mode into heating mode, it will change the flow direction of refrigerant; When heating, the valve get electricity(cooling without electricity), the slip assembly move to the right connect pipe 2 and 3, so change the flow direction.</p>
<p>Stop valve</p>		<p>Function: To stop or release refrigerant, only on/off, can't adjust or throttle</p>
<p>Muffler</p>		<p>Function: Eliminate the system noise</p>
<p>Gas and liquid separator</p>		<p>Function: Separate liquid and gas refrigerant, to protect the compressor</p>

2. Electrical system main components

Appellation	Figuration and inner configuration	Instruction
PCB		<p>Function: Via program to control the relay, make every components on/off according to temperature and pressure variety, so to realize automatic control</p>
Fan motor		<p>Function: Drive the fan, make the indoor and outdoor unit have heat exchange with air.</p>
Pressure switch		<p>Function: To avoid the air conditioner work in a abnormal pressure, making the air conditioner work safety.</p>
Capacitor		<p>Induce the single-phase motor produce gyre magnetic field, connect with the accessory winding, and participate in the operation.</p>
Condensate pump		<p>Only for Cassette, the pump head is 1.2 meter, the condensate pipe must have over 1/100 descend angle, after unit cooling or dehumidify stops running, the pump will still work 3 minutes to clean the condensate.</p>
Sensor		<p>Physical properties will change along with the temperature, pressure change, used for check temperature and pressure.</p>

3. Poor efficiency explanation

During the process of using air conditioner, some phenomenon seems to be malfunction but actually not. Thus when cooling or heating effect does not achieve to your expectation, the following factors have to be ruled out

Phenomenon	Causing explanation
High outside temperature and too many people in the room, even air conditioner runs at full-load operation, the wind blowing out from air outlet is cold, but it is difficult to lower the indoor temperature, this is not malfunction.	When the outdoor temperature is higher, more heat penetrates into indoor space, which increases the cooling load of AC. If there are too many people(for example 10) and each person gives off 120W, totally 1200W, this will running out of half of AC cooling capacity, and the unit's cooling capacity this time is far from enough, indoor temperature is hard to lower down. It is normal phenomenon and do not mean useless of AC.
Power voltage is too low, causing AC uneasy to start and shut down after starting, or fuse be burned out etc.	If the electricity net voltage is too low, user should load a power manostat to keep voltage between 220V-380V for AC normally running
Select high wind speed but indoor temperature still at high side, air flow from the air outlet is too weak.	It is because air filter is too dirty or blocked making cooling capacity fail to be brought by air flow, causing cooling capacity inadequate. Take out filter and wash, the problem will be solved.
Select high wind speed, the vibration and sound of unit are severe.	Fan runs at high speed, severe vibration and sound of unit is normal phenomenon
Temperature controller adjusts improper and max cooling capacity is not utilized completely, thus indoor temperature can't lower down.	Check the temperature controller, and problem will be solved.
As for Heat pump air conditioner heating effect is not ideal during cold winter, this is normal phenomenon.	The lowest temperature is -7°C when heating, below this temperature unit cannot heat effectively.

4. Failure phenomenon

Phenomenon	Causing explanation
Mirage comes out from indoor unit	The humidity of the room is too high, the moisture in the air becomes vapour when in the cold airflow from AC
Noise	<ol style="list-style-type: none"> 1. When air conditioner stops running, there will be some noise, and this is because the refrigerant flows contrarily. Refrigerant expands or shrinks according to temperature change. 2. Liquid sound is from refrigerant flowing
Sometimes, the room is smelly	<ol style="list-style-type: none"> 1. The AC itself will not be smelly, if it is smelly, it is because environment smell accumulated 2. Solution: clean the filter of indoor unit.
when heating, there is no wind at the beginning of starting unit	It is to prevent cold air blowing, please be patient

5. Electric components malfunction inspection

No	Component name	Inspection methods
1	Compressor	Using multi-meter ohm phase, there is correct resistance value among windings (single phase compressor refers to specification, three phase compressor resistance approximately equal), resistance of winding should be infinite.
2	Control board	Check whether any connection part of PCB loosen or drop off, printed tinsel and components have any burn, fade, breaking off or aging phenomenon, all joints exist short circuit phenomenon etc. Test the circuit board system in the term of voltage, pulse on, resistance variation, by using testing meter. Judge the output and input is normal or not according to electric principle diagram
3	Contactors	Press the contactor by hand, the contactor reacts immediately The contacting point of contactor has no burn and melt phenomenon The winding has resistance value below 1000 Ω , but cannot be nil or infinite
4	4-ways valve winding	The winding has resistance value below 1000 Ω , but cannot be nil or infinite
5	Capacitor	No expansion phenomenon apparently Measure capacitor by using capacitor phase of multi-meter
6	Sensor	Using multi-meter to measure resistance, find out temperature according to resistance table, the temperature should accord with sensor temperature. Resistance cannot be nil or infinite
7	Motor	No burning trace apparently Using multi-meter ohm phase, there is correct resistance value among windings (single phase compressor refers to specification, three phase compressor resistance approximately equal), resistance of winding should be infinite.

6. Failure code display

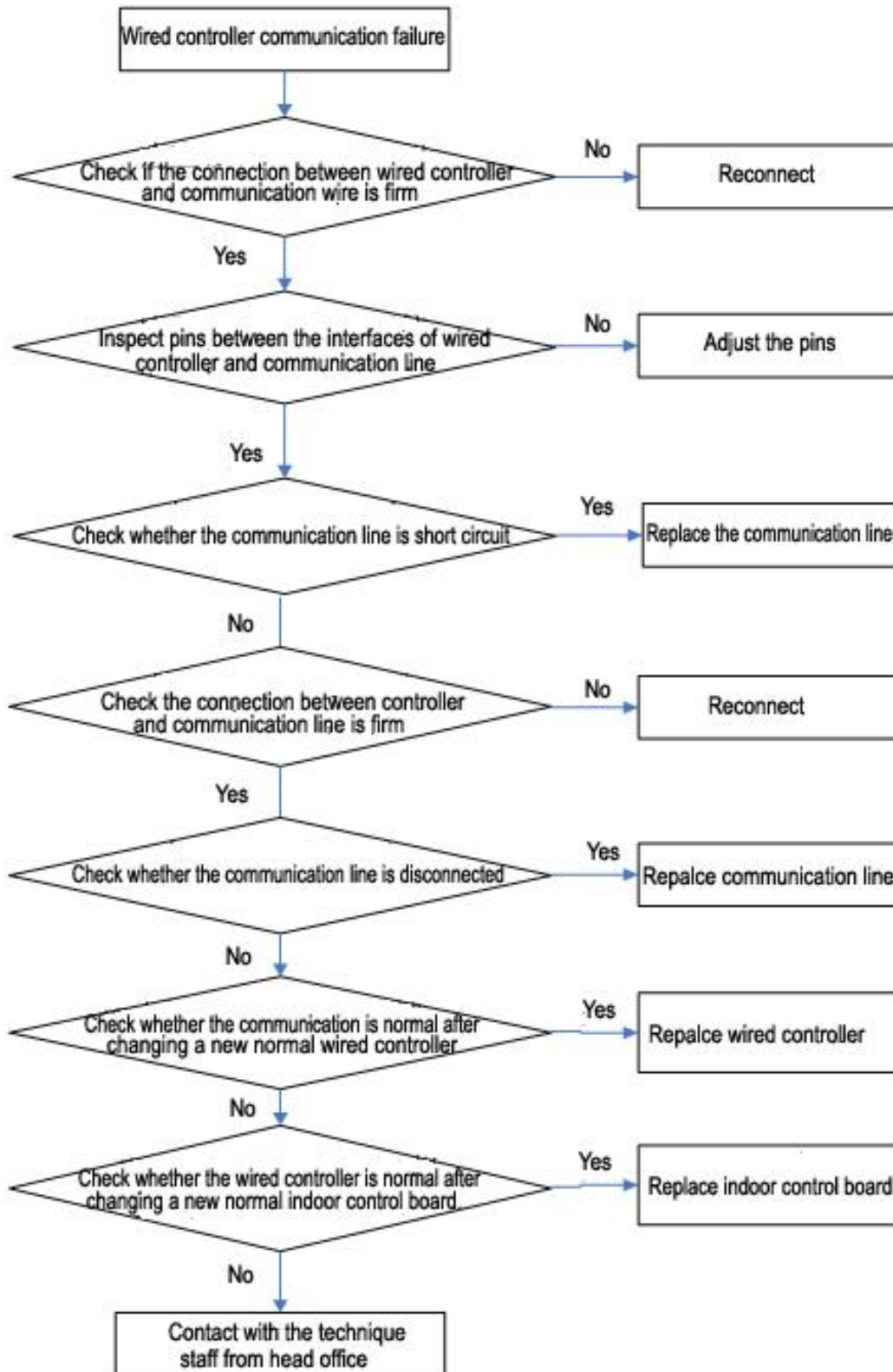
When air condition has failure, the timing lamp on light board of indoor unit or the wired controller will display different code according to different failure case.

No.	Default	INDICATOR/FLASH (TIMES)	ERROR CODE ON WIRE CONTROLLER	COMMUNICATION CODE (SERIES)
1	Air Temp fault(Tao)	1	E1	11
2	Tcm or Tdef fault	2	E2	5
3	Tem fault	3	E3	12
4	Indoor Fan Motor fault	4	E4	13
5	I/O Communication fault	5	E5	7
6	Outdoor Fan Motor fault	10	F0	10
7	Comp Driver fault	11	F1	1
8	PFC fault	12	F2	2
9	Failure start of compressor	13	F3	3
10	Td fault	14	F4	4
11	Outdoor air temp sensor fault	16	F6	6
12	Over of less volt protection	17	F7	24
13	Com fault of main pcb&driver	18	F8	8
14	Outdoor EEPROM fault	19	F9	9
15	Refrigerant leak protection	20	J3/P3	15
16	Ts temp sensor fault	21	FA	16
17	Outdoor unit over current protection	22	J8/P8	18
18	Compressor high exhaust temperature protection	23	J5/P5	19
19	High pressure protection failure (cooling / heating)	24	J4/P4	20
20	Four way valve fault	25	H8	53
21	Drainage failure	26	H1	57
22	Remote control (manipulator) communication fault	27	H2	58
23	Compressor exhaust temperature is too low	28	H5	50
24	Low voltage switch fault	29	H6	51
25	Low pressure protection	30	H7	52
26	Evaporator inlet temperature sensor fault (Te2)	31	H3	54
27	Evaporator outlet temperature sensor fault (Te1)	32	H4	55
28	Inside and outside communication line fault dislocation	33	H9	56
29	Anti-freezing protection in cooling mode	/	/	21

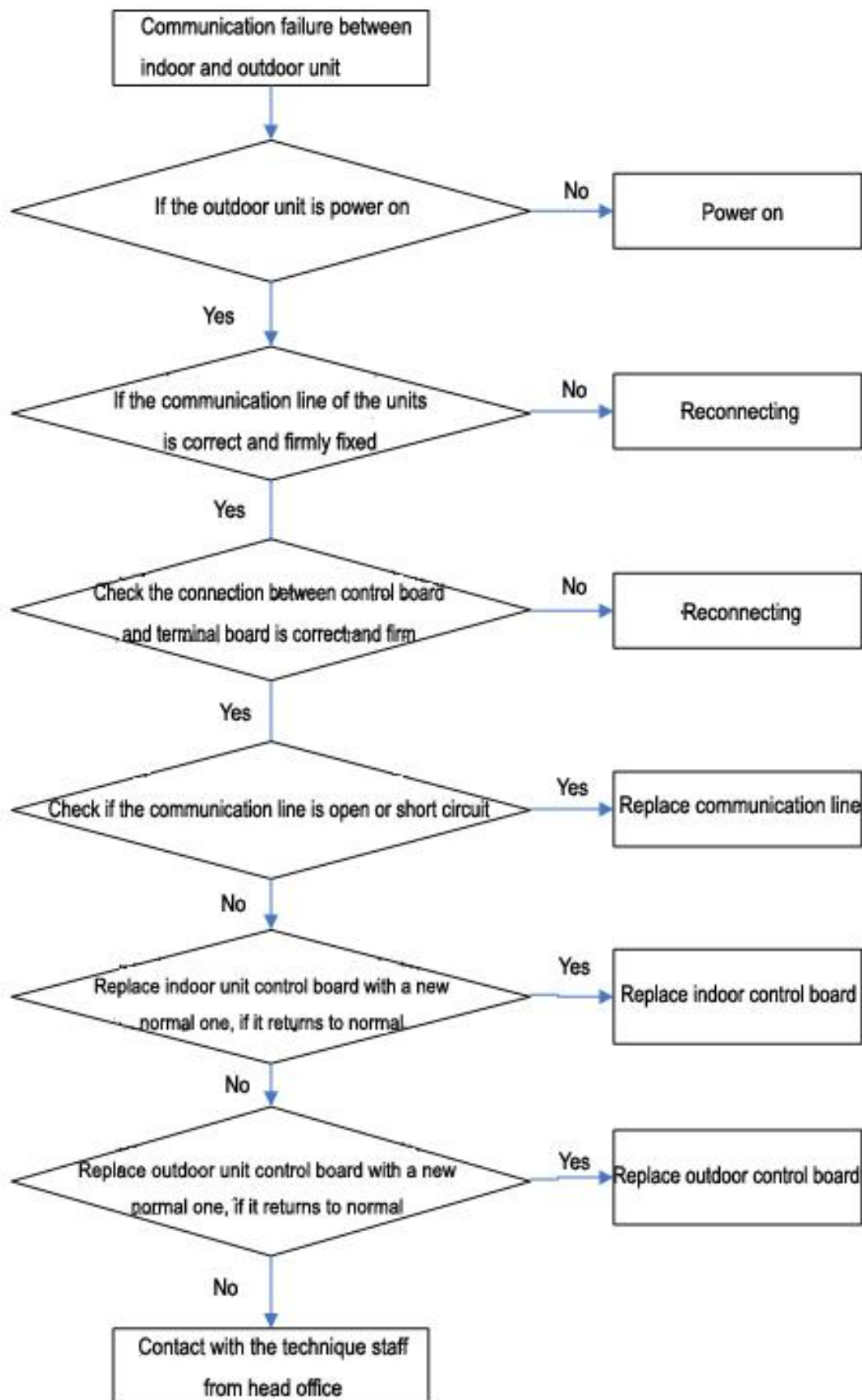
7. Failure analysis

7.1 Anylisis and Solution for Failure without Failure Code

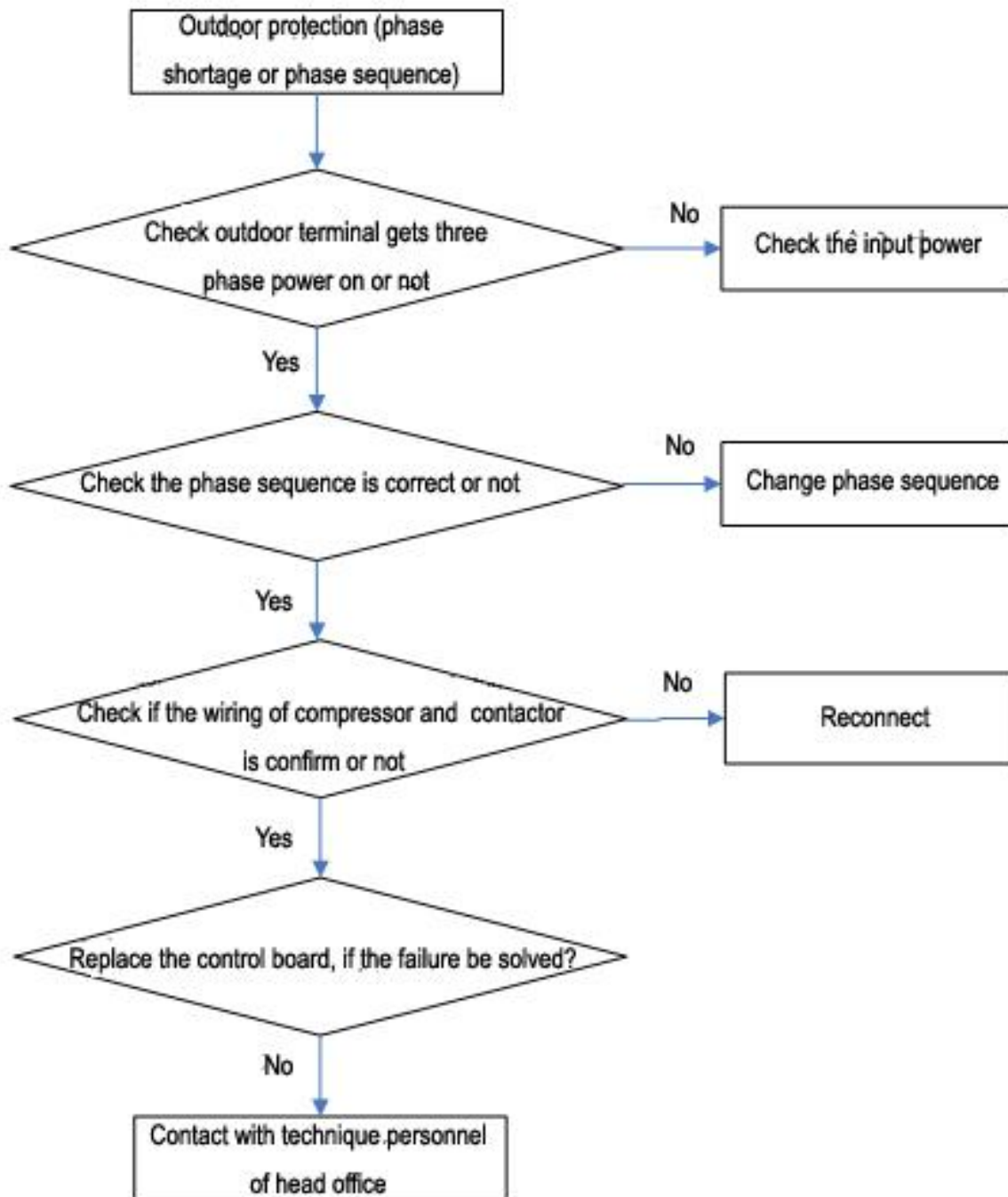
Wired controller communication failure



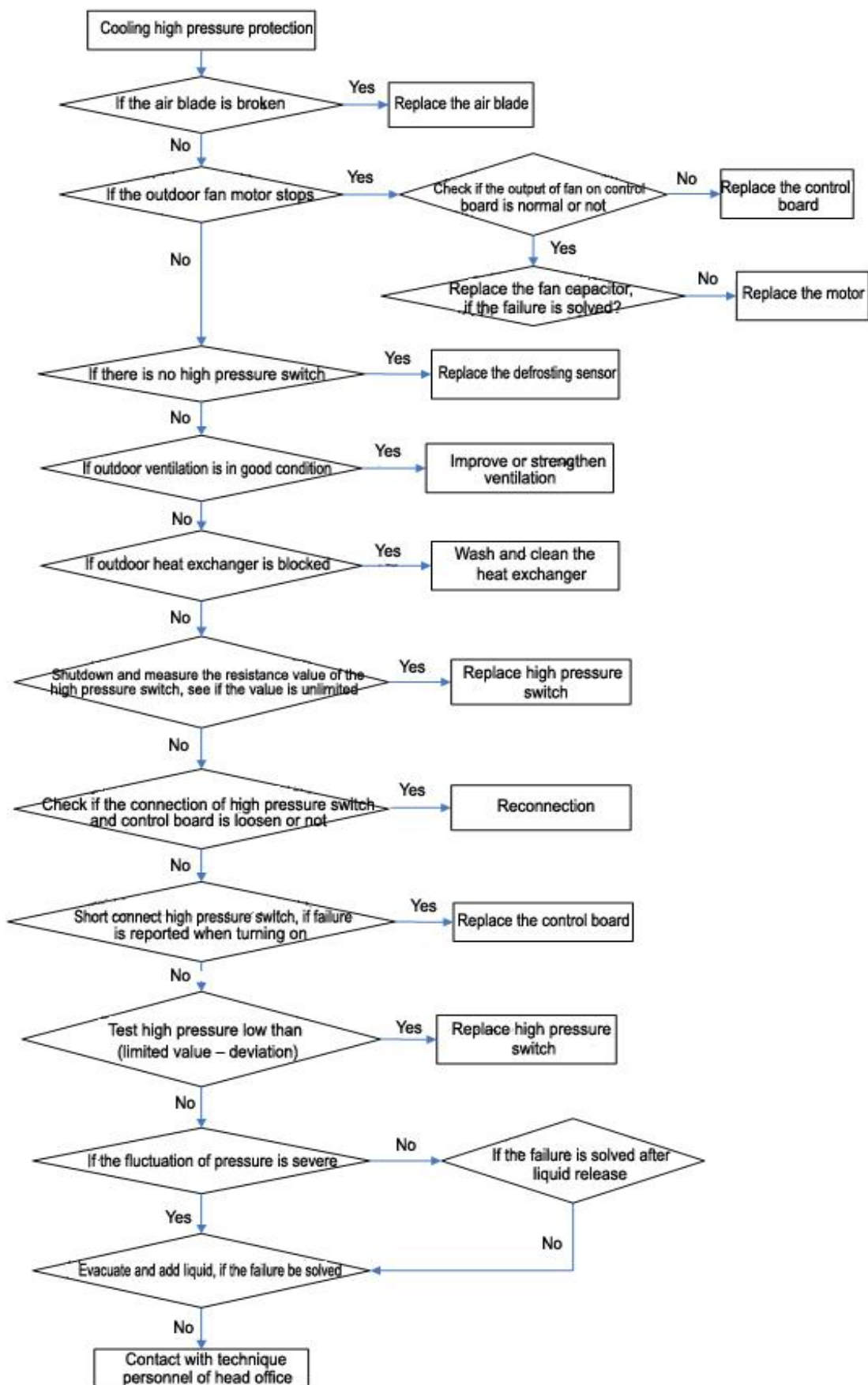
Communication failure between indoor and outdoor unit



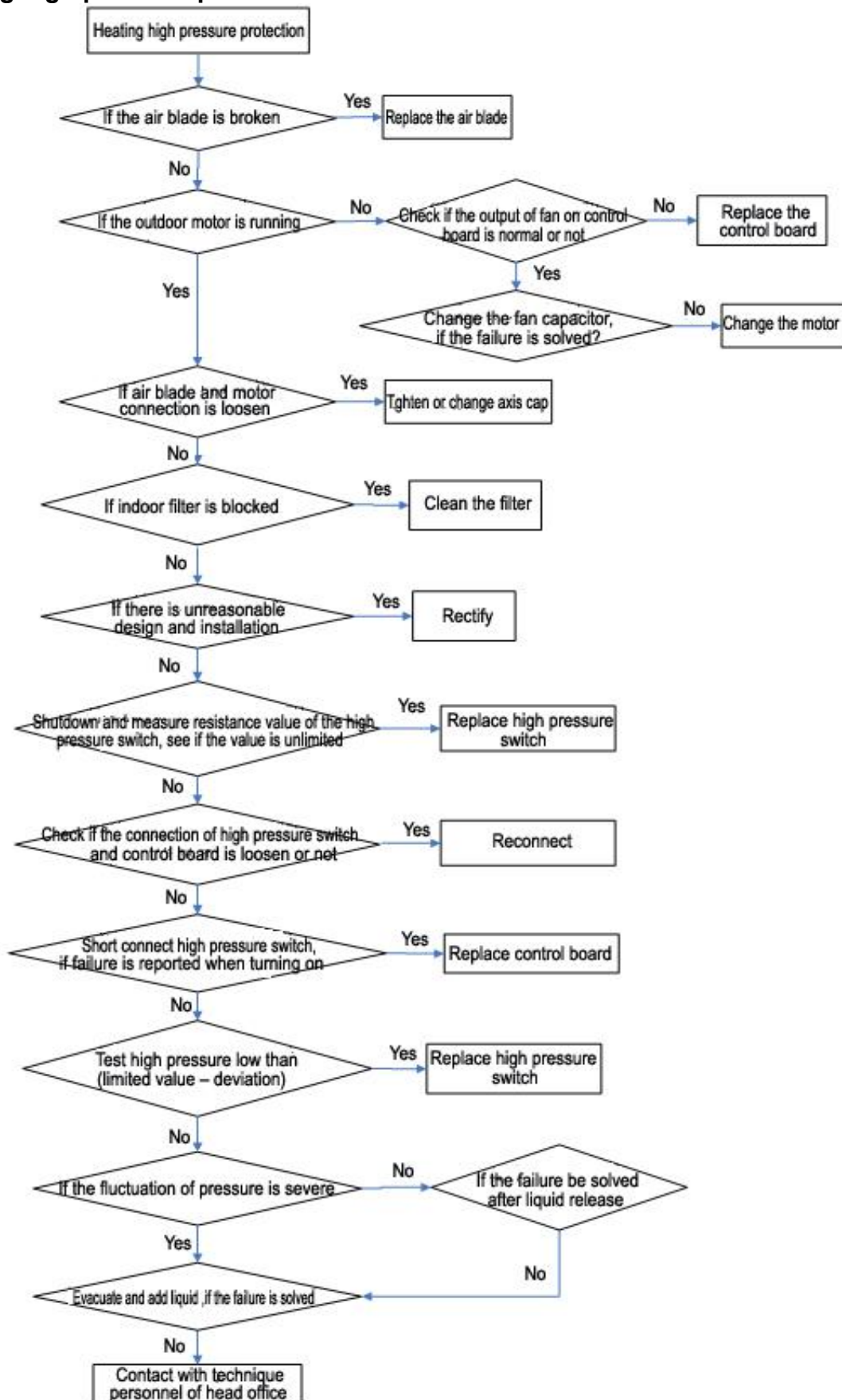
Outdoor protection(phase sequence)



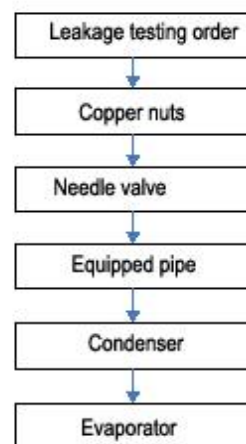
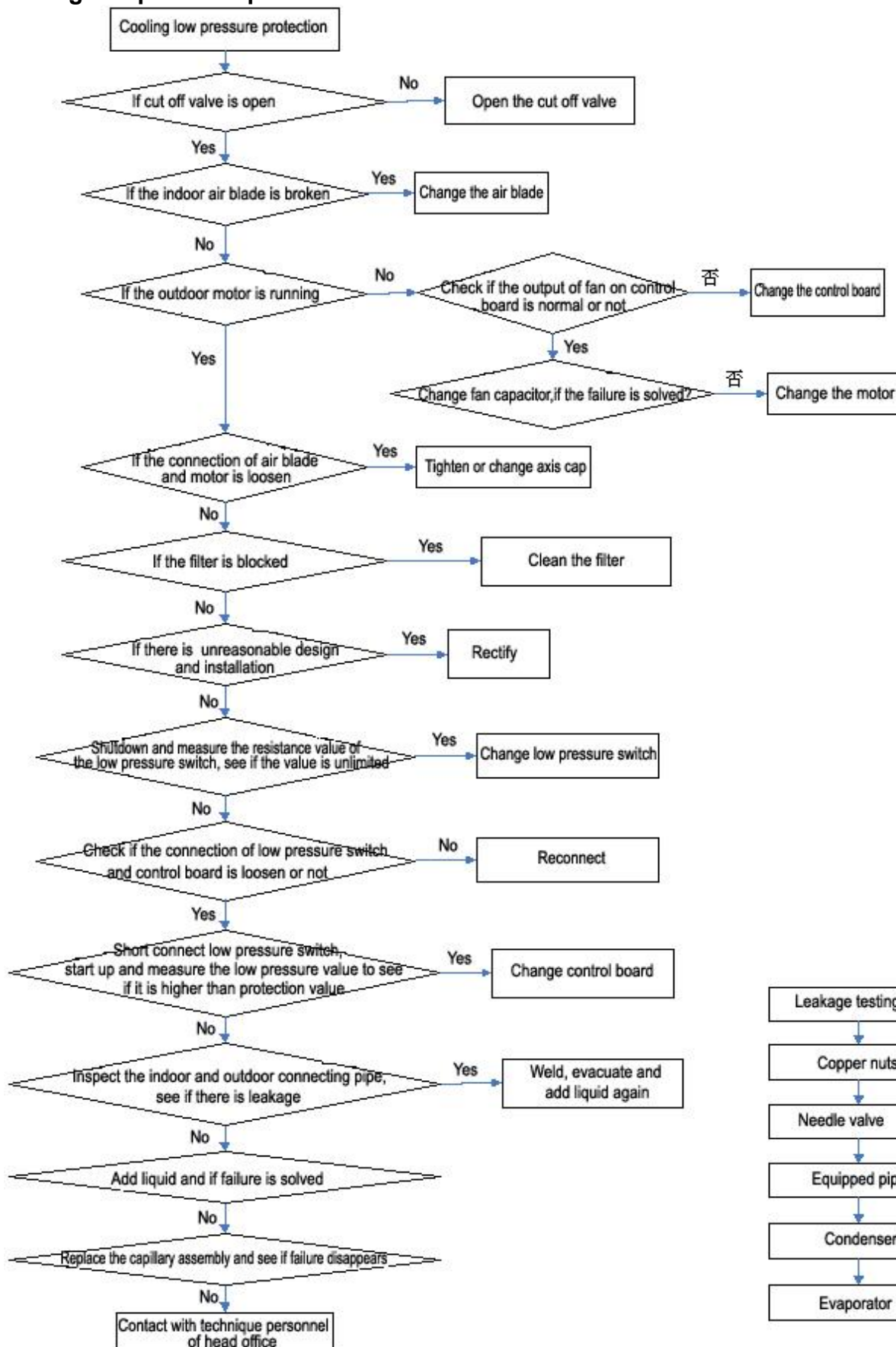
Cooling high pressure protection



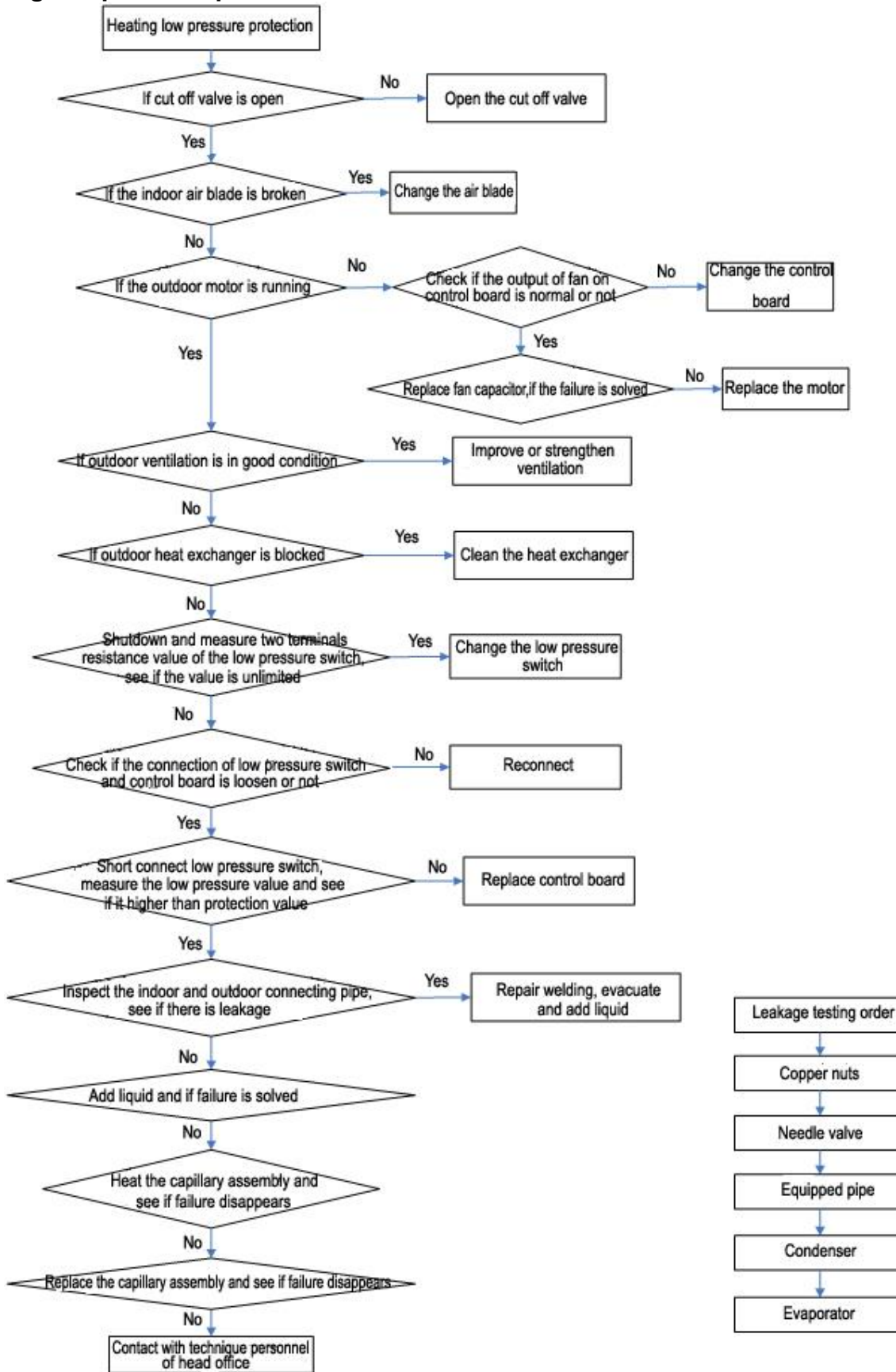
Heating high pressure protection



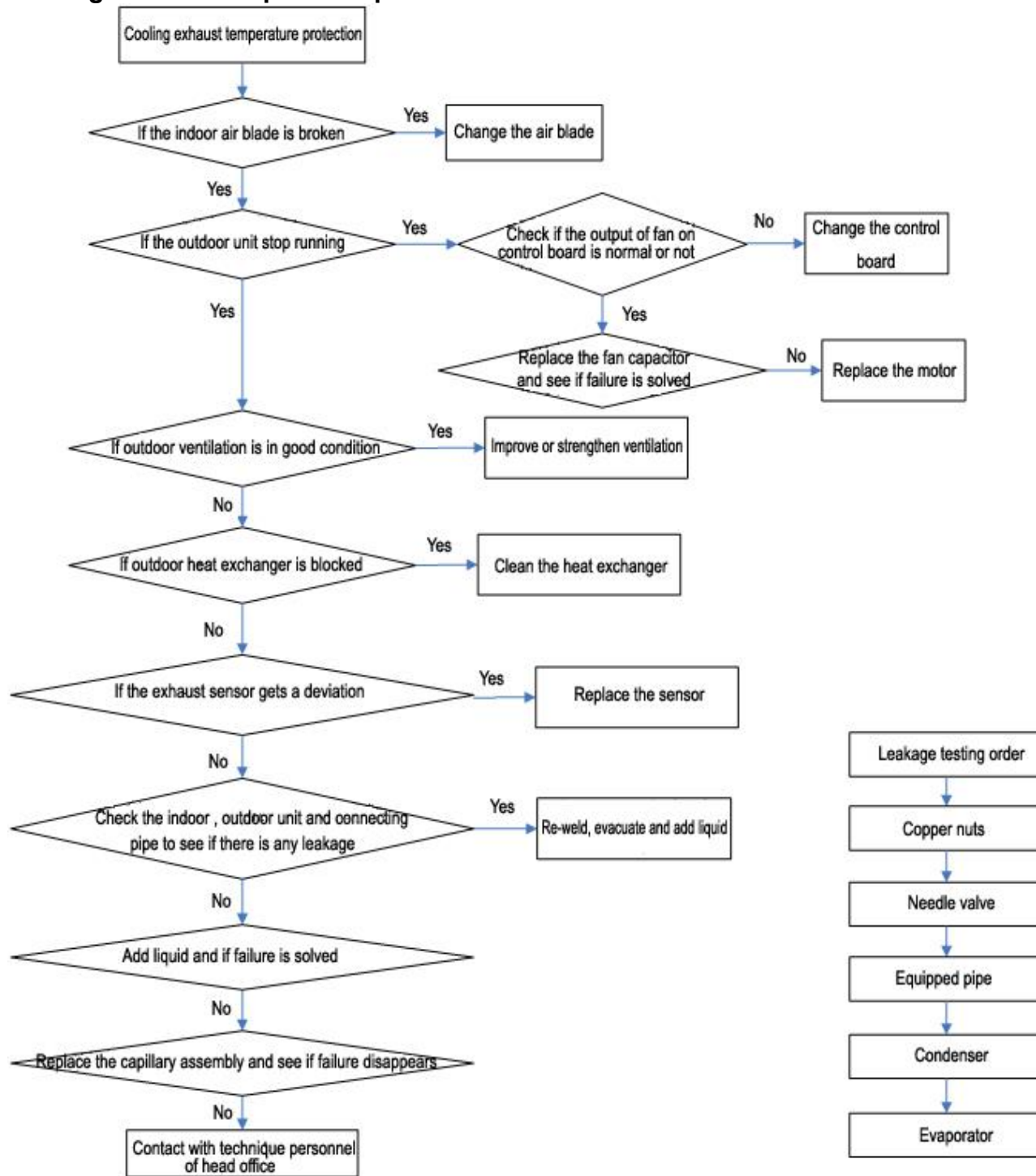
Cooling low pressure protection



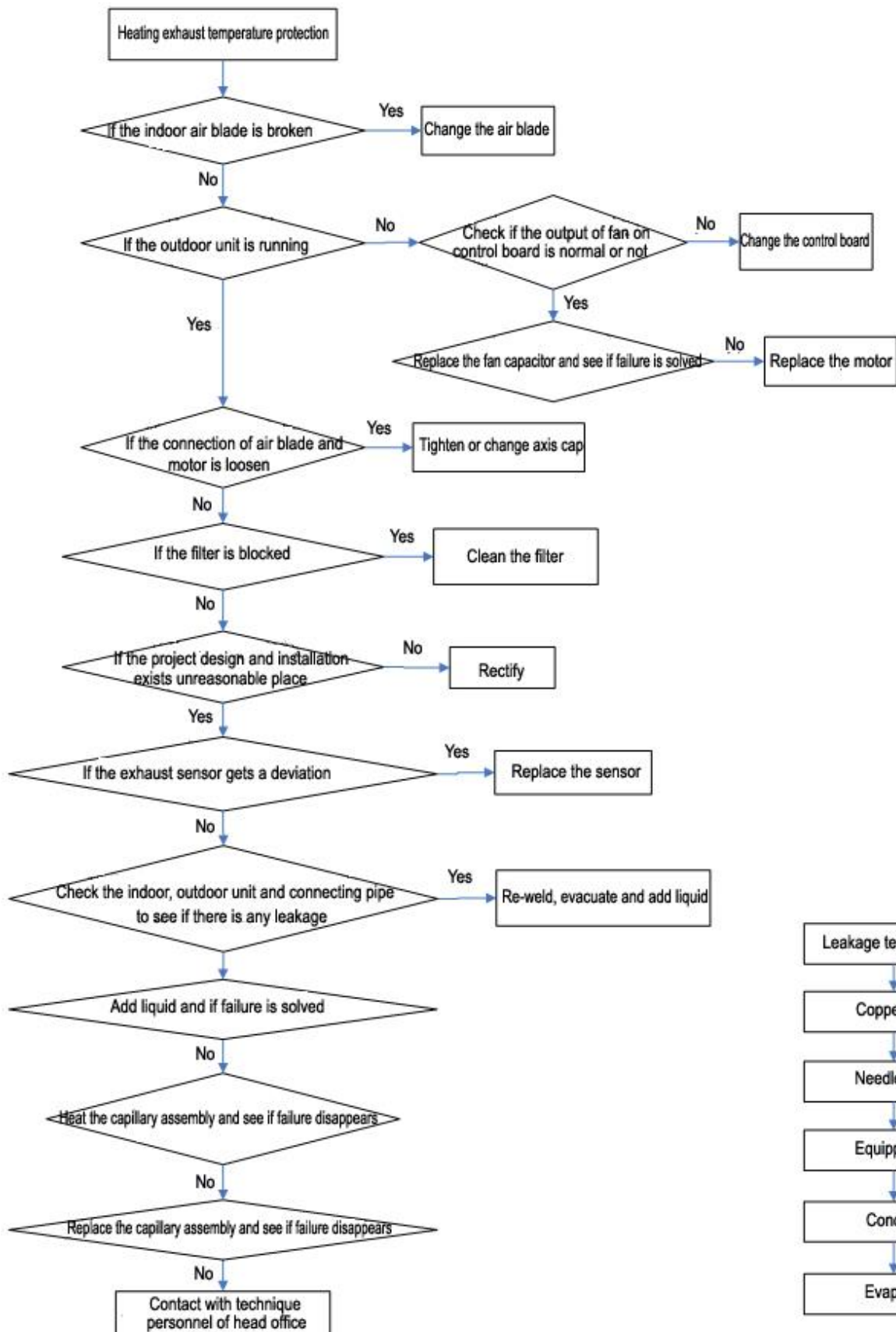
Heating low pressure protection



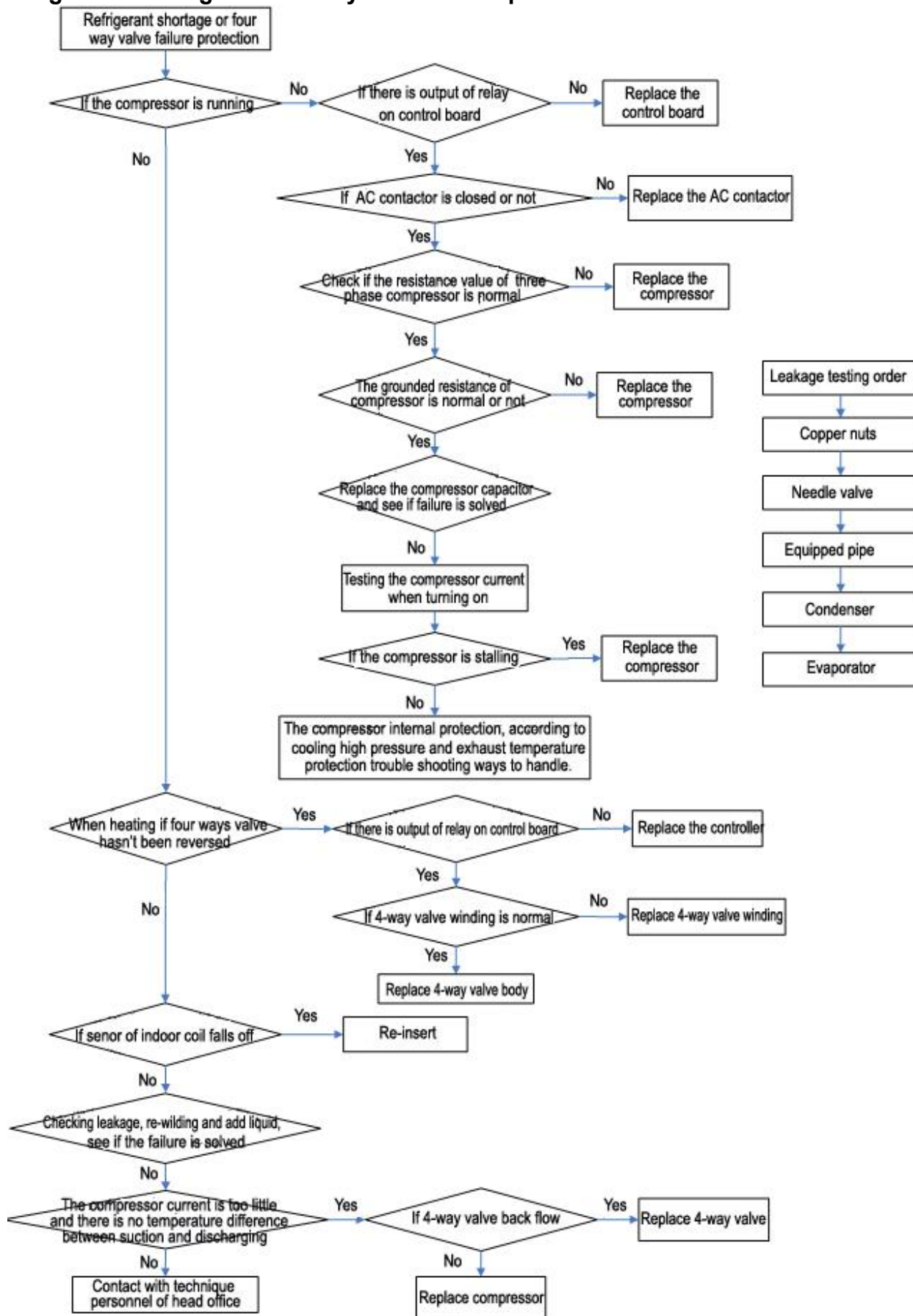
Cooling exhaust temperature protection



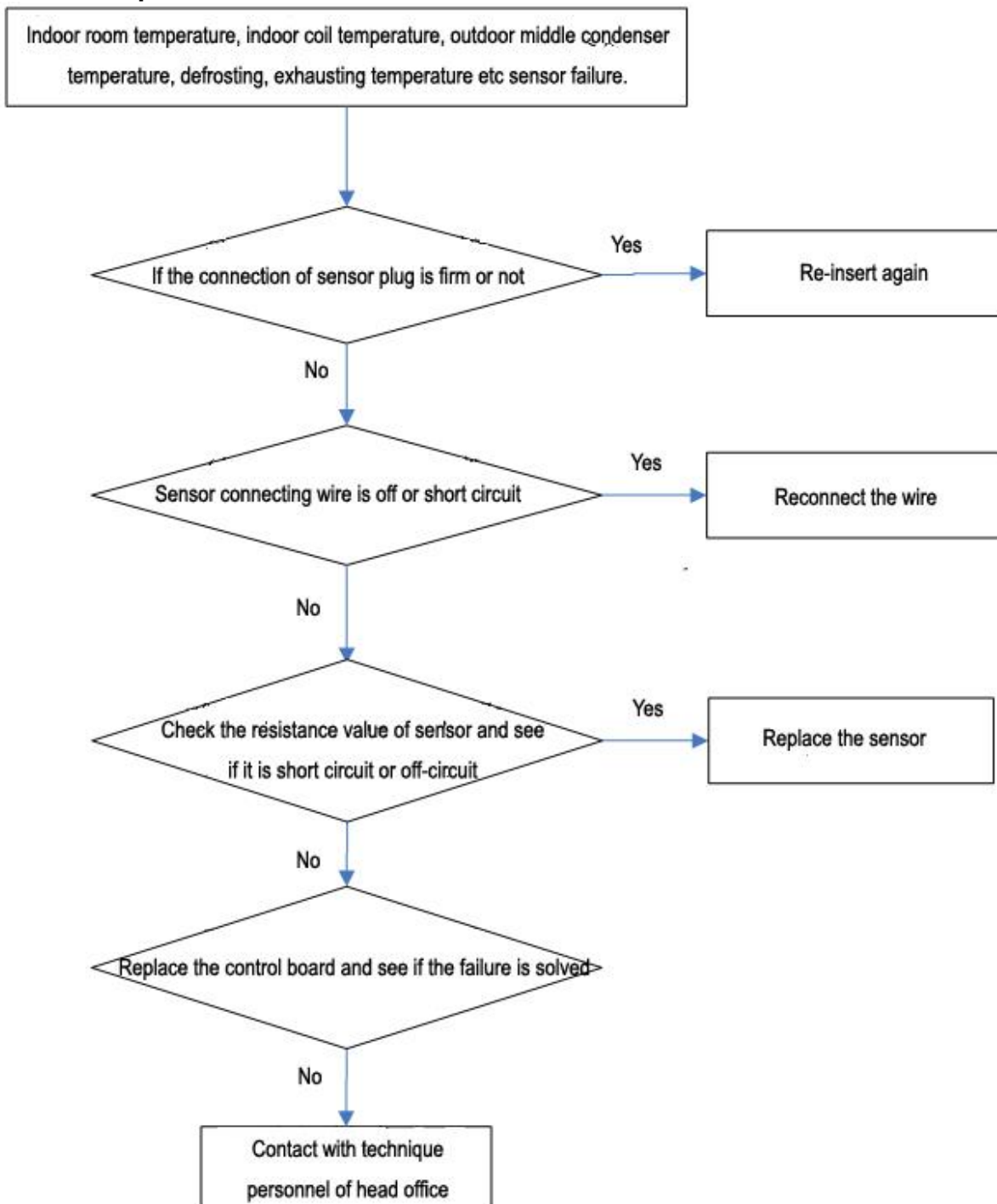
Heating exhaust temperature protection



Refrigerant shortage or four way valve failure protection

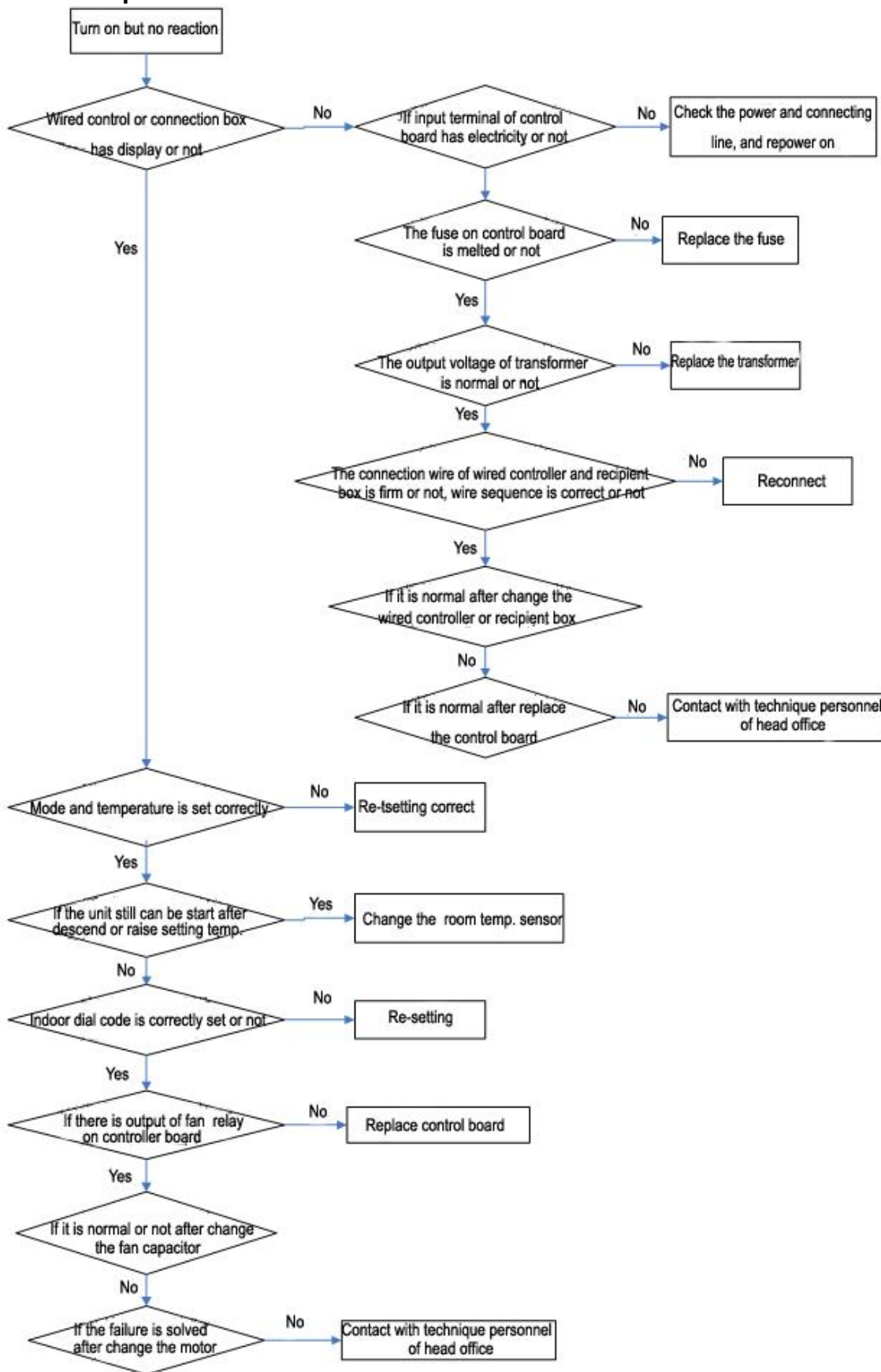


Sensor failure protection

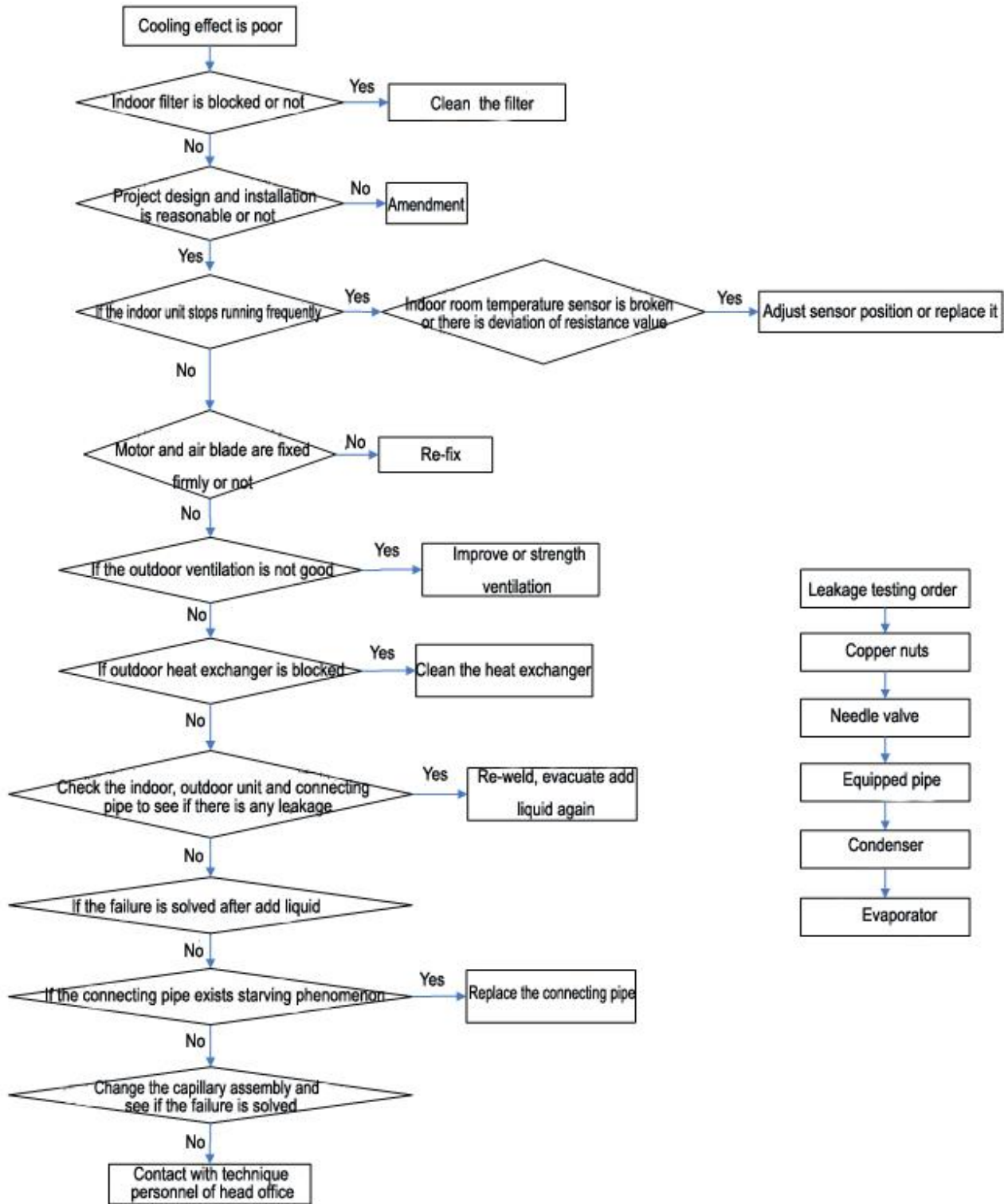


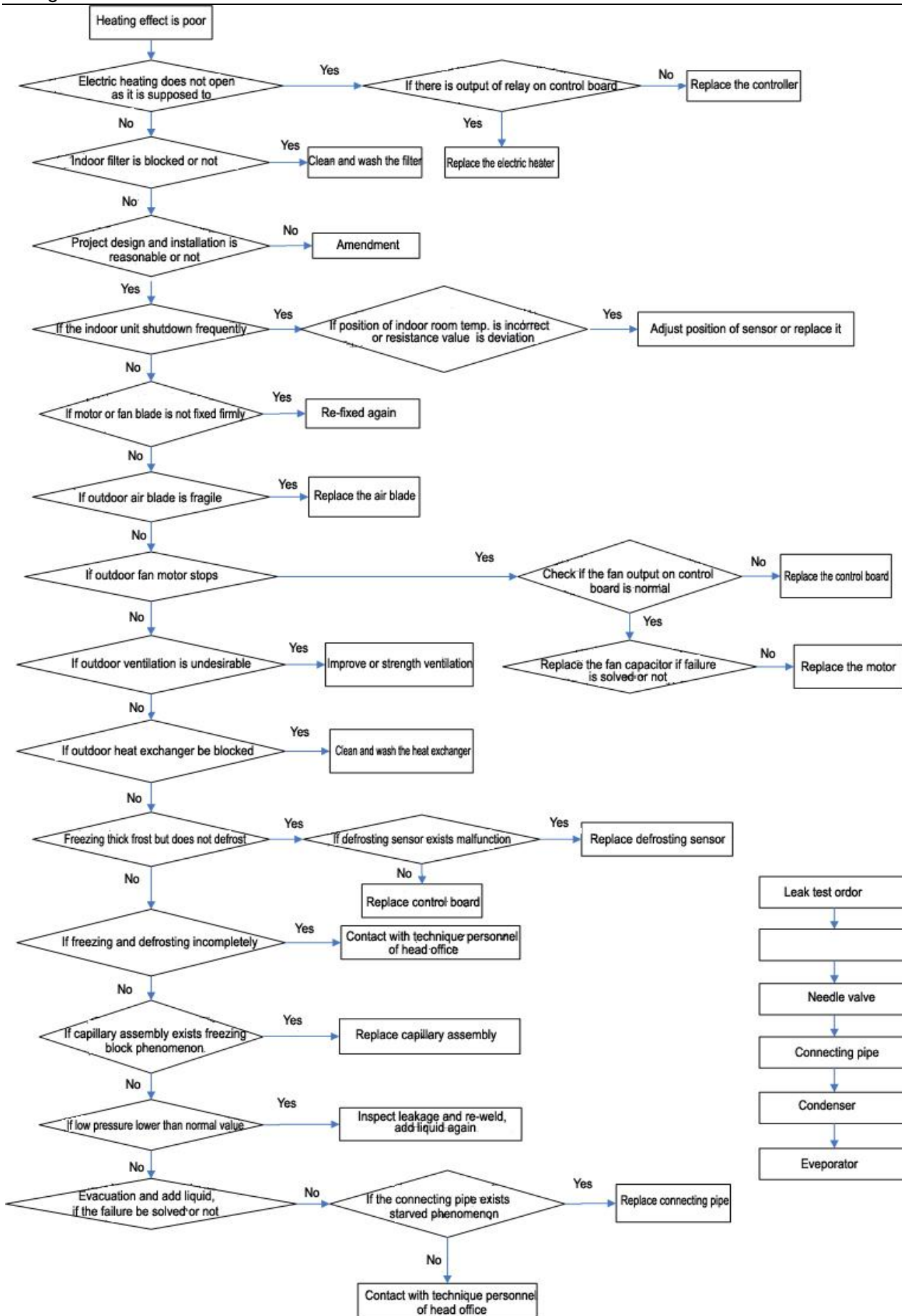
7.2 Anlysis and Solution for Failure without Failure Code

No action after power-on

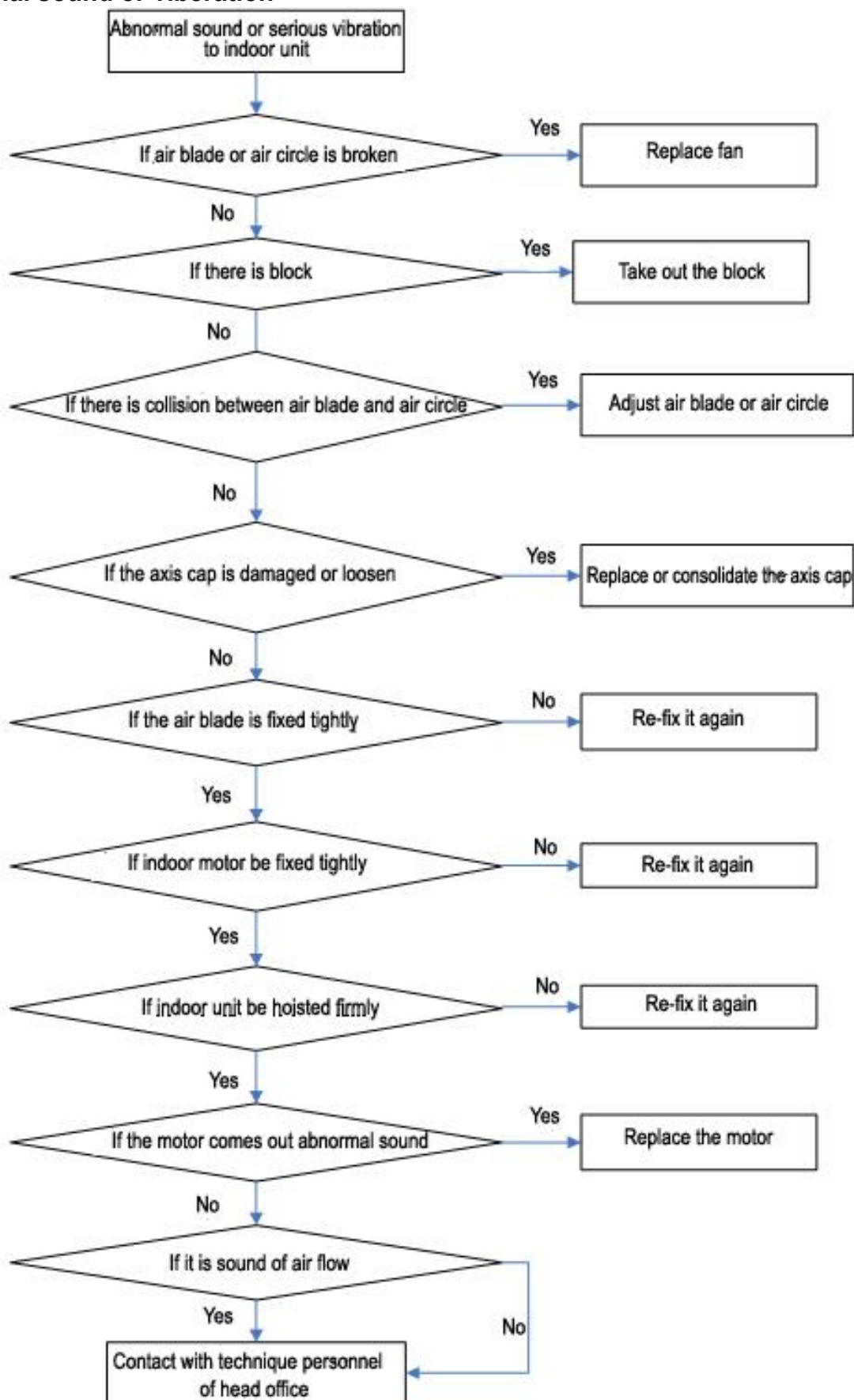


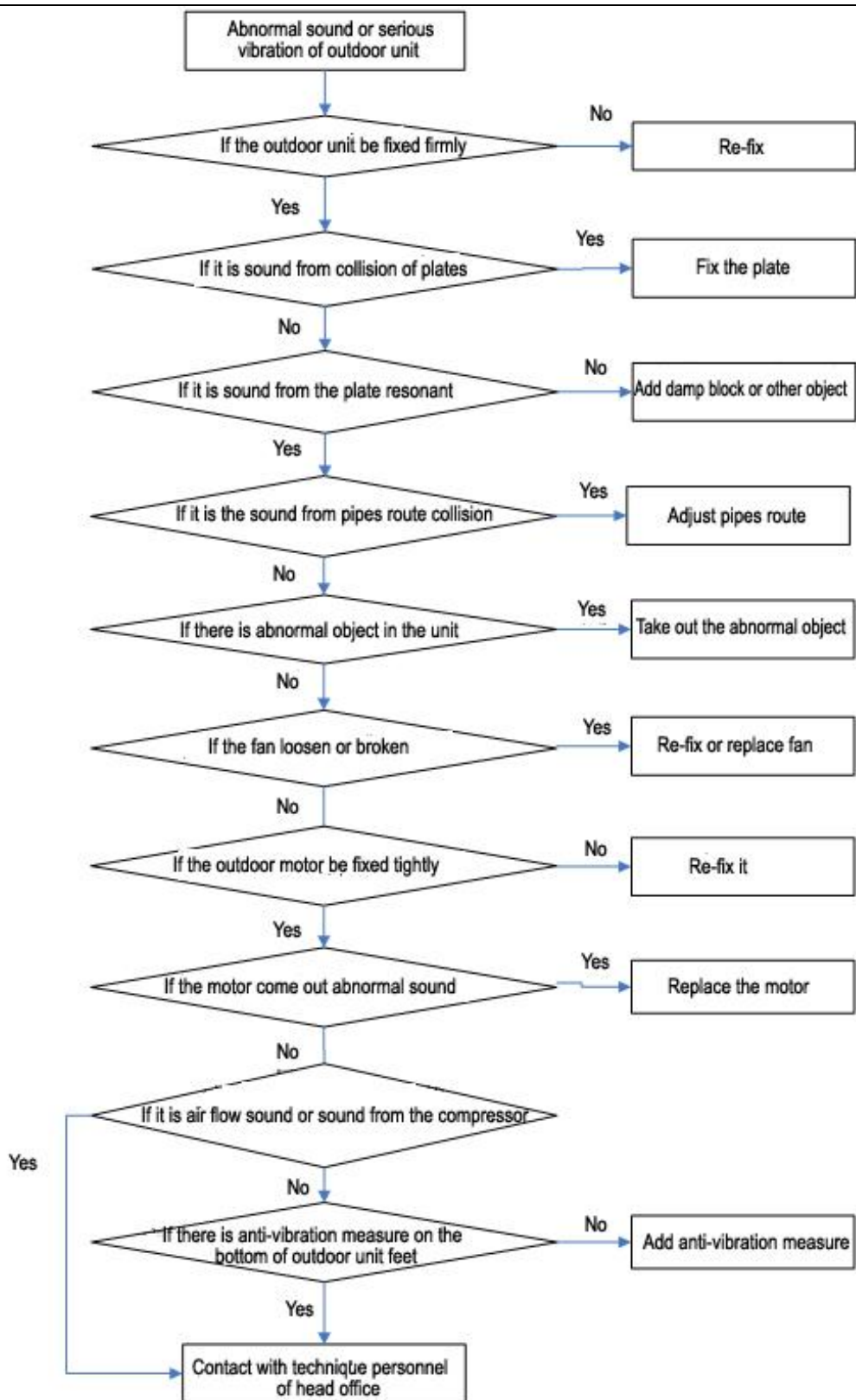
Poor effect



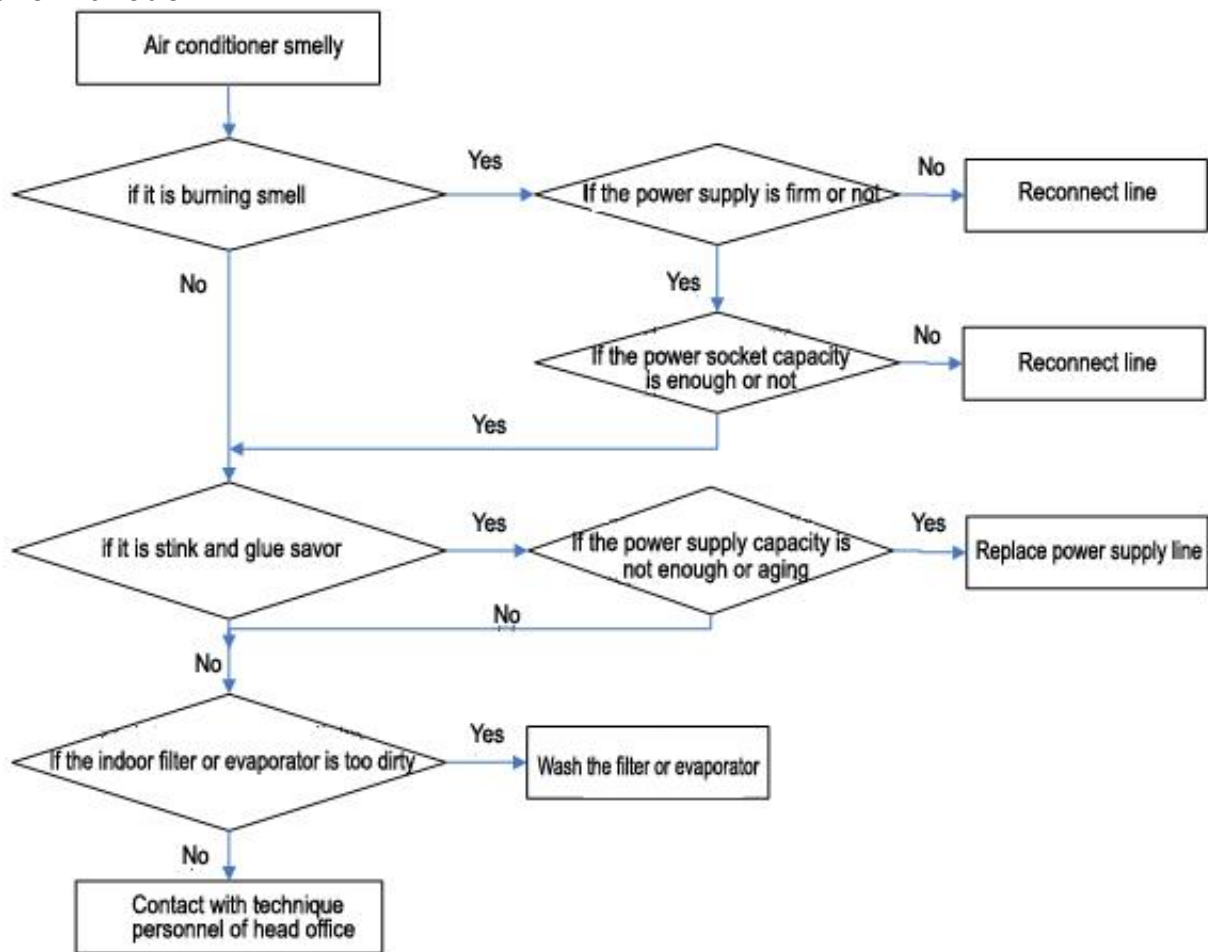


Abnormal sound or vibration

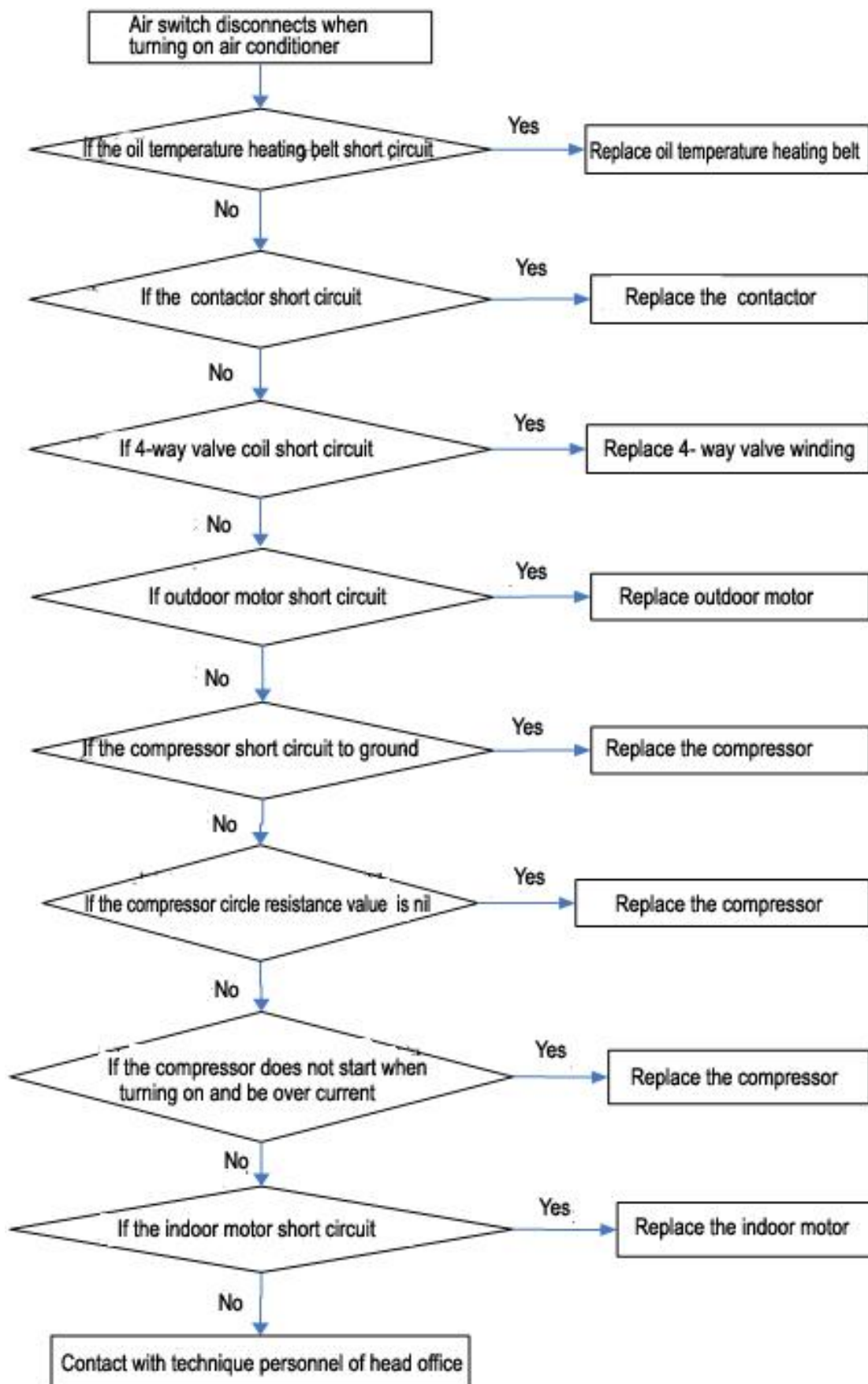




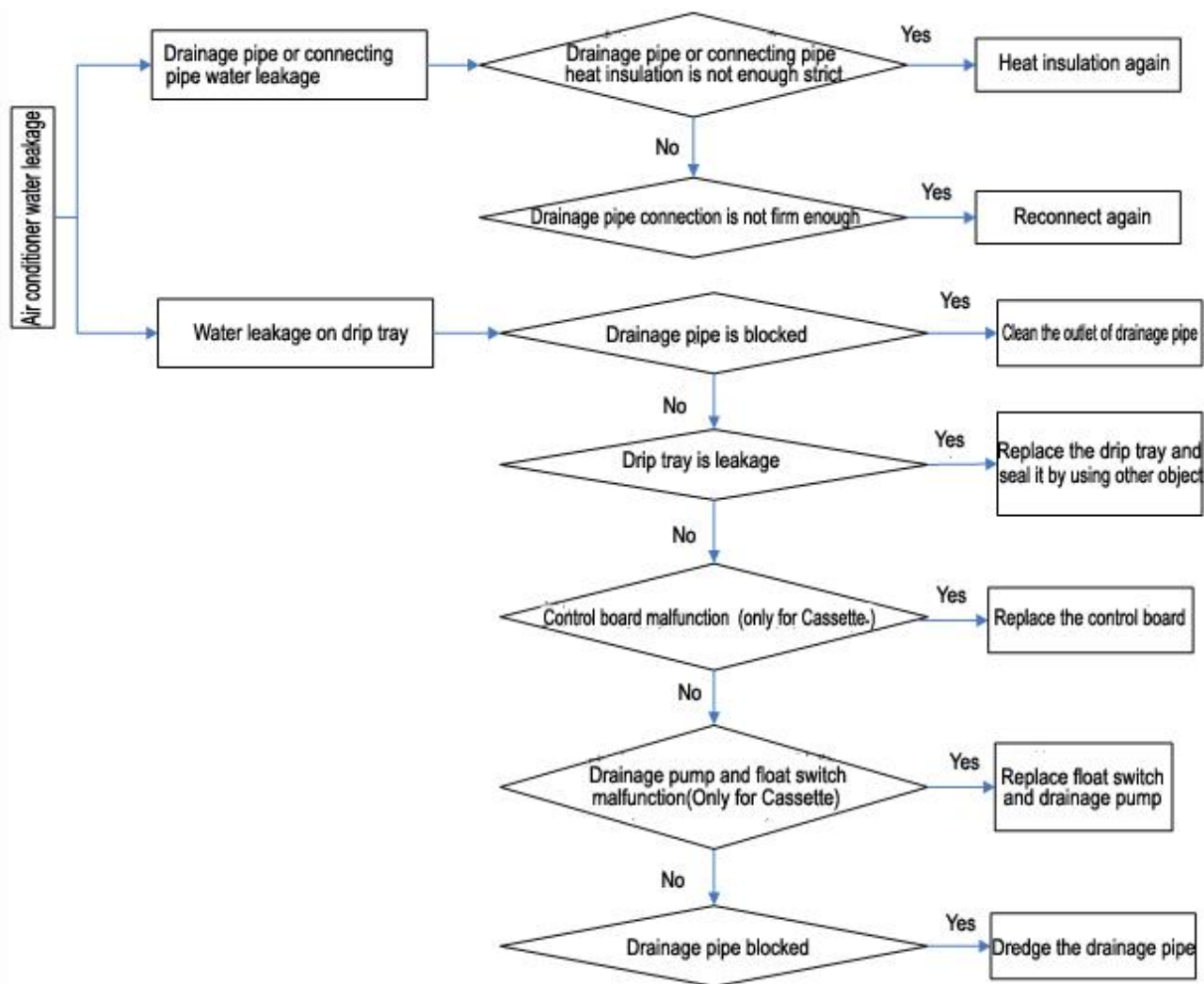
Abnormal odor



Air switch action when air conditioner starting up



Air conditioner water leakage



Part 5. Sensor resistance table

1.Coil temperature sensor resistance reference table

R25=20KΩ±1%							
B25/50=3950K ±1%							
Temp	resistance (KΩ)			(resist.tol)		(temp.tol)°C	
(°C)	Rmax	R (t) Normal	Rmin	MAX(+)	MIN(-)	MAX(+)	MIN(-)
-30	377.571	347.000	318.338	8.81	8.26	1.36	1.36
-29	354.642	326.228	299.608	8.71	8.16	1.35	1.35
-28	333.353	306.927	282.189	8.61	8.06	1.33	1.33
-27	313.547	288.957	265.927	8.51	7.97	1.32	1.32
-26	295.088	272.196	250.774	8.41	7.87	1.31	1.31
-25	277.860	256.541	236.582	8.31	7.78	1.30	1.30
-24	261.761	241.901	223.323	8.21	7.68	1.29	1.29
-23	246.699	228.193	210.873	8.11	7.59	1.27	1.27
-22	232.598	215.349	199.219	8.01	7.49	1.26	1.26
-21	219.385	203.304	188.260	7.91	7.40	1.25	1.25
-20	206.995	192.000	177.984	7.81	7.30	1.24	1.24
-19	195.360	181.376	168.317	7.71	7.20	1.23	1.23
-18	184.441	171.398	159.212	7.61	7.11	1.21	1.21
-17	174.193	162.025	150.667	7.51	7.01	1.20	1.20
-16	164.568	153.215	142.613	7.41	6.92	1.19	1.19
-15	155.527	144.932	135.048	7.31	6.82	1.17	1.18
-14	147.029	137.141	127.911	7.21	6.73	1.16	1.17
-13	138.912	129.812	121.205	7.01	6.63	1.15	1.15
-12	131.406	122.913	114.874	6.91	6.54	1.14	1.14
-11	124.346	116.418	108.921	6.81	6.44	1.12	1.13
-10	117.701	110.300	103.307	6.71	6.34	1.11	1.12
-9	111.446	104.536	98.003	6.61	6.25	1.10	1.11
-8	105.556	99.104	93.009	6.51	6.15	1.08	1.09
-7	100.007	93.983	88.288	6.41	6.06	1.07	1.08
-6	94.780	89.154	83.840	6.31	5.96	1.06	1.07
-5	89.852	84.598	79.632	6.21	5.87	1.05	1.06
-4	85.124	80.298	75.665	6.01	5.77	1.03	1.05
-3	80.746	76.240	71.910	5.91	5.68	1.02	1.03
-2	76.615	72.408	68.368	5.81	5.58	1.01	1.02
-1	72.717	68.789	65.019	5.71	5.48	1.00	1.01
0	69.037	65.370	61.847	5.61	5.39	0.98	1.00
1	65.563	62.139	58.852	5.51	5.29	0.97	0.99
2	62.280	59.084	56.012	5.41	5.2	0.96	0.97
3	59.180	56.196	53.330	5.31	5.1	0.94	0.96
4	56.248	53.463	50.785	5.21	5.01	0.93	0.95
5	53.428	50.879	48.381	5.01	4.91	0.92	0.94
6	50.810	48.432	46.098	4.91	4.82	0.91	0.93
7	48.335	46.117	43.940	4.81	4.72	0.89	0.91

8	45.993	43.924	41.895	4.71	4.62	0.88	0.90
9	43.776	41.847	39.951	4.61	4.53	0.87	0.89
10	41.678	39.879	38.112	4.51	4.43	0.86	0.88
11	39.691	38.015	36.365	4.41	4.34	0.84	0.87
12	37.809	36.247	34.710	4.31	4.24	0.83	0.85
13	36.026	34.571	33.136	4.21	4.15	0.82	0.84
14	34.338	32.982	31.646	4.11	4.05	0.80	0.83
15	32.736	31.474	30.228	4.01	3.96	0.79	0.82
16	31.218	30.043	28.883	3.91	3.86	0.78	0.81
17	29.778	28.685	27.606	3.81	3.76	0.77	0.79
18	28.411	27.395	26.390	3.71	3.67	0.75	0.78
19	27.115	26.170	25.236	3.61	3.57	0.74	0.77
20	25.885	25.007	24.137	3.51	3.48	0.73	0.76
21	24.717	23.902	23.094	3.41	3.38	0.72	0.75
22	23.607	22.851	22.099	3.31	3.29	0.70	0.73
23	22.554	21.853	21.156	3.21	3.19	0.69	0.72
24	21.553	20.903	20.255	3.11	3.1	0.68	0.71
25	20.600	20.000	19.400	3.00	3.00	0.66	0.70
26	19.734	19.141	18.549	3.10	3.09	0.69	0.72
27	18.909	18.323	17.739	3.20	3.19	0.72	0.75
28	18.123	17.545	16.970	3.30	3.28	0.74	0.78
29	17.374	16.804	16.238	3.40	3.37	0.77	0.80
30	16.660	16.098	15.541	3.49	3.46	0.80	0.83
31	15.979	15.426	14.879	3.59	3.55	0.82	0.85
32	15.329	14.785	14.248	3.68	3.63	0.85	0.88
33	14.709	14.175	13.647	3.77	3.72	0.88	0.91
34	14.117	13.593	13.075	3.86	3.80	0.90	0.93
35	13.553	13.038	12.531	3.95	3.89	0.93	0.96
36	13.013	12.508	12.012	4.04	3.97	0.95	0.98
37	12.499	12.003	11.517	4.13	4.05	0.98	1.01
38	12.007	11.521	11.045	4.21	4.13	1.01	1.04
39	11.537	11.062	10.595	4.30	4.21	1.03	1.06
40	11.088	10.622	10.166	4.38	4.29	1.06	1.09
41	10.659	10.203	9.757	4.46	4.37	1.09	1.11
42	10.248	9.803	9.367	4.55	4.45	1.11	1.14
43	9.856	9.420	8.994	4.63	4.52	1.14	1.17
44	9.480	9.054	8.638	4.71	4.60	1.17	1.19
45	9.121	8.705	8.298	4.79	4.67	1.19	1.22
46	8.778	8.371	7.973	4.86	4.75	1.22	1.24
47	8.449	8.051	7.663	4.94	4.82	1.24	1.27
48	8.134	7.745	7.367	5.02	4.89	1.27	1.30
49	7.832	7.453	7.083	5.09	4.96	1.30	1.32
50	7.543	7.173	6.812	5.16	5.03	1.32	1.35
51	7.267	6.905	6.553	5.24	5.10	1.35	1.37
52	7.002	6.649	6.305	5.31	5.17	1.38	1.40
53	6.747	6.403	6.068	5.38	5.24	1.40	1.43

54	6.504	6.168	5.841	5.45	5.30	1.43	1.45
55	6.270	5.942	5.623	5.52	5.37	1.46	1.48
56	6.046	5.726	5.415	5.59	5.43	1.48	1.50
57	5.831	5.519	5.216	5.66	5.50	1.51	1.53
58	5.625	5.321	5.025	5.72	5.56	1.53	1.56
59	5.428	5.131	4.842	5.79	5.62	1.56	1.58
60	5.238	4.948	4.667	5.86	5.69	1.59	1.61
61	5.055	4.773	4.499	5.92	5.75	1.61	1.63
62	4.880	4.605	4.338	5.98	5.81	1.64	1.66
63	4.712	4.444	4.183	6.05	5.87	1.67	1.68
64	4.551	4.289	4.035	6.11	5.93	1.69	1.71
65	4.396	4.140	3.893	6.17	5.98	1.72	1.74
66	4.247	3.998	3.756	6.23	6.04	1.75	1.76
67	4.103	3.861	3.625	6.29	6.10	1.77	1.79
68	3.966	3.729	3.500	6.35	6.15	1.80	1.81
69	3.833	3.603	3.379	6.41	6.21	1.82	1.84
70	3.706	3.481	3.263	6.46	6.26	1.85	1.87
71	3.583	3.364	3.152	6.52	6.32	1.88	1.89
72	3.466	3.252	3.045	6.58	6.37	1.90	1.92
73	3.352	3.144	2.942	6.63	6.42	1.93	1.94
74	3.243	3.040	2.843	6.68	6.47	1.96	1.97
75	3.138	2.940	2.748	6.74	6.53	1.98	2.00
76	3.037	2.844	2.657	6.79	6.58	2.01	2.02
77	2.940	2.751	2.569	6.84	6.63	2.04	2.05
78	2.846	2.662	2.485	6.89	6.67	2.06	2.07
79	2.756	2.577	2.403	6.95	6.72	2.09	2.10
80	2.669	2.494	2.325	7.00	6.77	2.11	2.13
81	2.585	2.415	2.250	7.04	6.82	2.14	2.15
82	2.504	2.338	2.178	7.09	6.86	2.17	2.18
83	2.426	2.264	2.108	7.14	6.91	2.19	2.20
84	2.351	2.193	2.041	7.19	6.96	2.22	2.23
85	2.279	2.125	1.976	7.24	7.00	2.25	2.26
86	2.209	2.059	1.914	7.28	7.04	2.27	2.28
87	2.142	1.995	1.854	7.33	7.09	2.30	2.31
88	2.077	1.934	1.796	7.37	7.13	2.33	2.33
89	2.014	1.875	1.740	7.42	7.17	2.35	2.36
90	1.954	1.818	1.687	7.46	7.22	2.38	2.39
91	1.895	1.763	1.635	7.50	7.26	2.41	2.41
92	1.839	1.710	1.585	7.55	7.30	2.43	2.44
93	1.785	1.659	1.537	7.59	7.34	2.46	2.46
94	1.732	1.609	1.490	7.63	7.38	2.48	2.49
95	1.681	1.561	1.446	7.68	7.43	2.51	2.52
96	1.632	1.515	1.402	7.72	7.47	2.54	2.54
97	1.585	1.471	1.360	7.76	7.51	2.56	2.57
98	1.539	1.428	1.320	7.80	7.55	2.59	2.59
99	1.495	1.386	1.281	7.85	7.59	2.62	2.62

100	1.452	1.346	1.243	7.89	7.63	2.64	2.64
101	1.411	1.307	1.207	7.93	7.68	2.67	2.67
102	1.371	1.270	1.172	7.98	7.72	2.70	2.70
103	1.332	1.233	1.137	8.02	7.76	2.72	2.72
104	1.295	1.198	1.104	8.07	7.81	2.75	2.75
105	1.258	1.164	1.070	8.11	8.11	2.77	2.77

2. Environment temperature sensor resistance reference table

R25 = 15.0 KΩ ± 3%							
B25/50 = 3950K ± 2%							
T [°C]	Rmin [KΩ]			T [°C]	Rmin [KΩ]		
-25.0	183.4	199.1	216.0	-8.0	70.54	75.10	79.88
-24.5	178.0	193.1	209.4	-7.5	68.69	73.10	77.71
-24.0	172.8	187.4	203.0	-7.0	66.90	71.15	75.61
-23.5	167.8	181.8	196.9	-6.5	65.17	69.27	73.57
-23.0	162.9	176.5	190.9	-6.0	63.48	67.44	71.59
-22.5	158.2	171.3	185.2	-5.5	61.84	65.67	69.66
-22.0	153.7	166.2	179.6	-5.0	60.25	63.95	67.80
-21.5	149.3	161.4	174.3	-4.5	58.71	62.27	65.99
-21.0	145.0	156.7	169.1	-4.0	57.21	60.65	64.24
-20.5	140.9	152.1	164.1	-3.5	55.75	59.08	62.54
-20.0	136.9	147.7	159.2	-3.0	54.34	57.55	60.89
-19.5	133.0	143.4	154.6	-2.5	52.96	56.06	59.29
-19.0	129.2	139.3	150.0	-2.0	51.63	54.62	57.73
-18.5	125.6	135.3	145.6	-1.5	50.33	53.22	56.22
-18.0	122.1	131.4	141.4	-1.0	49.07	51.86	54.76
-17.5	118.7	127.7	137.3	-0.5	47.84	50.54	53.33
-17.0	115.4	124.1	133.3	0.0	46.65	49.25	51.95
-16.5	112.2	120.6	129.5	0.5	45.49	48.00	50.61
-16.0	109.1	117.2	125.7	1.0	44.37	46.79	49.31
-15.5	106.1	113.9	122.1	1.5	43.27	45.61	48.04
-15.0	103.1	110.7	118.6	2.0	42.21	44.47	46.81
-14.5	100.3	107.6	115.3	2.5	41.17	43.36	45.62
-14.0	97.59	104.6	112.0	3.0	40.17	42.28	44.46
-13.5	94.94	101.7	108.8	3.5	39.19	41.23	43.33
-13.0	92.37	98.88	105.8	4.0	38.24	40.20	42.24
-12.5	89.87	96.16	102.8	4.5	37.31	39.21	41.17
-12.0	87.45	93.52	99.92	5.0	36.41	38.25	40.14
-11.5	85.11	90.96	97.13	5.5	35.53	37.31	39.13
-11.0	82.83	88.48	94.43	6.0	34.68	36.39	38.16
-10.5	80.63	86.07	91.81	6.5	33.85	35.51	37.21
-10.0	78.48	83.74	89.27	7.0	33.05	34.64	36.29
-9.5	76.41	81.48	86.82	7.5	32.26	33.80	35.39
-9.0	74.39	79.29	84.43	8.0	31.50	32.99	34.52
-8.5	72.43	77.16	82.12	8.5	30.75	32.19	33.67
9.0	30.03	31.42	32.84	32.0	10.69	11.09	11.49
9.5	29.33	30.67	32.04	32.5	10.47	10.86	11.26

10.0	28.64	29.94	31.26	33.0	10.24	10.63	11.03
10.5	27.97	29.22	30.50	33.5	10.03	10.41	10.80
11.0	27.32	28.53	29.77	34.0	9.816	10.20	10.59
11.5	26.69	27.86	29.05	34.5	9.609	9.987	10.37
12.0	26.07	27.20	28.35	35.0	9.408	9.782	10.16
12.5	25.47	26.56	27.67	35.5	9.211	9.581	9.957
13.0	24.89	25.94	27.01	36.0	9.019	9.385	9.758
13.5	24.32	25.33	26.37	36.5	8.831	9.194	9.563
14.0	23.76	24.74	25.74	37.0	8.648	9.007	9.372
14.5	23.22	24.17	25.13	37.5	8.469	8.824	9.185
15.0	22.69	23.61	24.54	38.0	8.294	8.645	9.003
15.5	22.18	23.06	23.96	38.5	8.123	8.471	8.825
16.0	21.68	22.53	23.40	39.0	7.957	8.300	8.651
16.5	21.19	22.02	22.85	39.5	7.794	8.134	8.481
17.0	20.72	21.51	22.32	40.0	7.635	7.971	8.315
17.5	20.26	21.02	21.80	40.5	7.479	7.812	8.152
18.0	19.80	20.55	21.30	41.0	7.328	7.657	7.993
18.5	19.36	20.08	20.80	41.5	7.179	7.505	7.838
19.0	18.94	19.63	20.33	42.0	7.034	7.356	7.686
19.5	18.52	19.19	19.86	42.5	6.893	7.211	7.537
20.0	18.11	18.75	19.40	43.0	6.755	7.069	7.391
20.5	17.71	18.33	18.96	43.5	6.619	6.930	7.249
21.0	17.33	17.93	18.53	44.0	6.487	6.795	7.110
21.5	16.95	17.53	18.11	44.5	6.358	6.662	6.974
22.0	16.58	17.14	17.70	45.0	6.232	6.532	6.841
22.5	16.22	16.76	17.30	45.5	6.108	6.405	6.711
23.0	15.87	16.39	16.91	46.0	5.988	6.282	6.584
23.5	15.53	16.03	16.53	46.5	5.870	6.160	6.459
24.0	15.19	15.68	16.16	47.0	5.755	6.042	6.337
24.5	14.87	15.33	15.80	47.5	5.642	5.926	6.218
25.0	14.55	15.00	15.45	48.0	5.532	5.812	6.101
25.5	14.23	14.67	15.12	48.5	5.424	5.701	5.987
26.0	13.91	14.36	14.80	49.0	5.319	5.593	5.875
26.5	13.61	14.05	14.49	49.5	5.216	5.486	5.766
27.0	13.31	13.74	14.18	50.0	5.115	5.382	5.659
27.5	13.02	13.45	13.88	50.5	5.016	5.280	5.553
28.0	12.73	13.16	13.59	51.0	4.919	5.180	5.450
28.5	12.45	12.88	13.31	51.5	4.825	5.083	5.350
29.0	12.18	12.60	13.03	52.0	4.732	4.987	5.251
29.5	11.92	12.34	12.76	52.5	4.642	4.894	5.155
30.0	11.66	12.08	12.49	53.0	4.553	4.802	5.060
30.5	11.41	11.82	12.23	53.5	4.467	4.713	4.968
31.0	11.17	11.57	11.98	54.0	4.382	4.625	4.877
31.5	10.93	11.33	11.73	54.5	4.300	4.540	4.789
55.0	4.219	4.457	4.703	78.0	1.857	1.993	2.138
55.5	4.139	4.374	4.618	78.5	1.826	1.961	2.103

56.0	4.061	4.293	4.534	79.0	1.796	1.929	2.070
56.5	3.985	4.214	4.452	79.5	1.766	1.898	2.037
57.0	3.911	4.137	4.373	80.0	1.737	1.867	2.005
57.5	3.839	4.062	4.295	80.5	1.709	1.837	1.973
58.0	3.767	3.988	4.218	81.0	1.681	1.808	1.942
58.5	3.698	3.916	4.143	81.5	1.653	1.779	1.912
59.0	3.630	3.845	4.070	82.0	1.626	1.750	1.882
59.5	3.563	3.776	3.998	82.5	1.600	1.722	1.852
60.0	3.498	3.708	3.927	83.0	1.574	1.695	1.824
60.5	3.434	3.642	3.859	83.5	1.548	1.668	1.795
61.0	3.371	3.577	3.791	84.0	1.524	1.642	1.767
61.5	3.310	3.513	3.725	84.5	1.499	1.616	1.740
62.0	3.250	3.450	3.660	85.0	1.475	1.590	1.713
62.5	3.191	3.389	3.596	85.5	1.451	1.565	1.687
63.0	3.134	3.329	3.534	86.0	1.428	1.541	1.661
63.5	3.077	3.271	3.473	86.5	1.406	1.517	1.636
64.0	3.022	3.213	3.413	87.0	1.383	1.493	1.611
64.5	2.968	3.157	3.354	87.5	1.361	1.470	1.586
65.0	2.915	3.102	3.297	88.0	1.340	1.447	1.562
65.5	2.863	3.048	3.241	88.5	1.319	1.425	1.538
66.0	2.813	2.995	3.185	89.0	1.298	1.403	1.515
66.5	2.763	2.943	3.131	89.5	1.278	1.381	1.492
67.0	2.714	2.892	3.078	90.0	1.258	1.360	1.470
67.5	2.666	2.842	3.026	90.5	1.238	1.340	1.448
68.0	2.620	2.793	2.975	91.0	1.219	1.319	1.426
68.5	2.574	2.745	2.925	91.5	1.200	1.299	1.405
69.0	2.529	2.698	2.876	92.0	1.181	1.279	1.384
69.5	2.485	2.652	2.828	92.5	1.163	1.260	1.364
70.0	2.442	2.607	2.781	93.0	1.145	1.241	1.343
70.5	2.399	2.563	2.734	93.5	1.128	1.222	1.324
71.0	2.358	2.519	2.689	94.0	1.110	1.204	1.304
71.5	2.317	2.477	2.645	94.5	1.093	1.186	1.285
72.0	2.278	2.435	2.601	95.0	1.077	1.168	1.266
72.5	2.239	2.394	2.558	95.5	1.060	1.151	1.248
73.0	2.200	2.354	2.516	96.0	1.044	1.134	1.229
73.5	2.163	2.315	2.475	96.5	1.028	1.117	1.212
74.0	2.126	2.276	2.435	97.0	1.013	1.100	1.194
74.5	2.090	2.238	2.395	97.5	0.9976	1.084	1.177
75.0	2.055	2.201	2.356	98.0	0.9826	1.068	1.160
75.5	2.020	2.165	2.318	98.5	0.9679	1.052	1.143
76.0	1.986	2.129	2.280	99.0	0.9535	1.037	1.127
76.5	1.953	2.094	2.244	99.5	0.9392	1.022	1.110
77.0	1.920	2.060	2.208	100.0	0.9252	1.007	1.095
77.5	1.888	2.026	2.172	100.5	0.9115	0.9922	1.079
101.0	0.8981	0.9778	1.064	103.5	0.8339	0.9093	0.9906
101.5	0.8848	0.9636	1.049	104.0	0.8218	0.8963	0.9767

102.0	0.8717	0.9497	1.034	104.5	0.8098	0.8835	0.9631
102.5	0.8589	0.9360	1.019	105.0	0.7981	0.8710	0.9497
103.0	0.8463	0.9225	1.005				

3.Exhaust temperature sensor 6.339K3954

R25=50K Ω ±1%							
B25/50=3950K ±1%							
T [°C]	Rmin [K Ω]	T [°C]	Rmin [K Ω]	T [°C]	Rmin [K Ω]	T [°C]	Rmin [K Ω]
-20	449.9	464.7	479.9	20	61.68	62.44	63.20
-19	425.7	439.5	453.6	21	59.00	59.70	60.40
-18	402.9	415.7	428.8	22	56.44	57.09	57.74
-17	381.5	393.4	405.6	23	54.02	54.61	55.20
-16	361.3	372.3	383.6	24	51.70	52.25	52.80
-15	342.2	352.5	363.0	25	49.50	50.00	50.50
-14	324.3	333.9	343.7	26	47.37	47.87	48.37
-13	307.5	316.4	325.5	27	45.34	45.84	46.34
-12	291.5	299.8	308.3	28	43.41	43.91	44.41
-11	276.6	284.3	292.2	29	41.59	42.08	42.57
-10	262.4	269.6	276.9	30	39.84	40.33	40.82
-9	249.0	255.7	262.5	31	38.18	38.66	39.15
-8	236.5	242.7	249.0	32	36.59	37.07	37.55
-7	224.5	230.3	236.2	33	35.07	35.55	36.03
-6	213.3	218.7	224.2	34	33.64	34.11	34.58
-5	202.7	207.7	212.8	35	32.27	32.73	33.20
-4	192.7	197.3	202.0	36	30.95	31.41	31.87
-3	183.2	187.5	191.9	37	29.70	30.15	30.61
-2	174.3	178.3	182.4	38	28.50	28.95	29.40
-1	165.8	169.5	173.3	39	27.37	27.81	28.25
0	157.7	161.2	164.7	40	26.29	26.72	27.16
1	150.2	153.4	156.7	41	25.24	25.67	26.10
2	142.9	145.9	148.9	42	24.25	24.67	25.09
3	136.1	138.9	141.7	43	23.31	23.72	24.14
4	129.7	132.3	134.9	44	22.41	22.81	23.22
5	123.6	126.0	128.4	45	21.53	21.93	22.33
6	117.8	120.0	122.3	46	20.71	21.10	21.50
7	112.2	114.3	116.4	47	19.92	20.30	20.69
8	107.1	109.0	111.0	48	19.16	19.54	19.92
9	102.1	103.9	105.7	49	18.44	18.81	19.18
10	97.42	99.08	100.8	50	17.75	18.11	18.48
11	92.97	94.51	96.06	51	17.08	17.44	17.80
12	88.74	90.17	91.61	52	16.44	16.79	17.14
13	84.73	86.05	87.38	53	15.84	16.18	16.53
14	80.92	82.14	83.37	54	15.26	15.59	15.93
15	77.29	78.42	79.56	55	14.69	15.02	15.35
16	73.84	74.89	75.95	56	14.16	14.48	14.81
17	70.57	71.54	72.51	57	13.65	13.96	14.28
18	67.46	68.35	69.25	58	13.15	13.46	13.77
19	64.49	65.32	66.15	59	12.69	12.99	13.30
60	12.23	12.53	12.83	90	4.474	4.628	4.787
61	11.80	12.09	12.39	91	4.338	4.489	4.645
62	11.39	11.67	11.96	92	4.207	4.354	4.506
63	10.98	11.26	11.54	93	4.081	4.225	4.374
64	10.60	10.87	11.15	94	3.958	4.099	4.245

65	10.23	10.50	10.77	95	3.840	3.978	4.121
66	9.880	10.14	10.41	96	3.726	3.861	4.001
67	9.537	9.792	10.05	97	3.616	3.748	3.885
68	9.211	9.460	9.715	98	3.509	3.639	3.773
69	8.897	9.141	9.391	99	3.407	3.534	3.665
70	8.595	8.834	9.078	100	3.308	3.432	3.560
71	8.306	8.539	8.778	101	3.212	3.333	3.459
72	8.028	8.256	8.490	102	3.119	3.238	3.361
73	7.759	7.983	8.212	103	3.030	3.146	3.267
74	7.501	7.720	7.944	104	2.942	3.056	3.174
75	7.254	7.468	7.687	105	2.858	2.970	3.086
76	7.016	7.225	7.440	106	2.778	2.887	3.000
77	6.786	6.991	7.201	107	2.699	2.806	2.917
78	6.565	6.765	6.971	108	2.623	2.728	2.837
79	6.352	6.548	6.749	109	2.549	2.652	2.758
80	6.147	6.339	6.536	110	2.479	2.579	2.683
81	5.950	6.138	6.331	111	2.410	2.508	2.610
82	5.761	5.944	6.133	112	2.343	2.439	2.539
83	5.578	5.757	5.942	113	2.279	2.373	2.471
84	5.401	5.577	5.758	114	2.216	2.308	2.404
85	5.231	5.403	5.580	115	2.156	2.246	2.340
86	5.069	5.237	5.410	116	2.097	2.186	2.278
87	4.912	5.076	5.245	117	2.040	2.127	2.217
88	4.760	4.921	5.087	118	1.985	2.070	2.158
89	4.615	4.772	4.934	119	1.932	2.015	2.102
				120	1.880	1.962	2.047