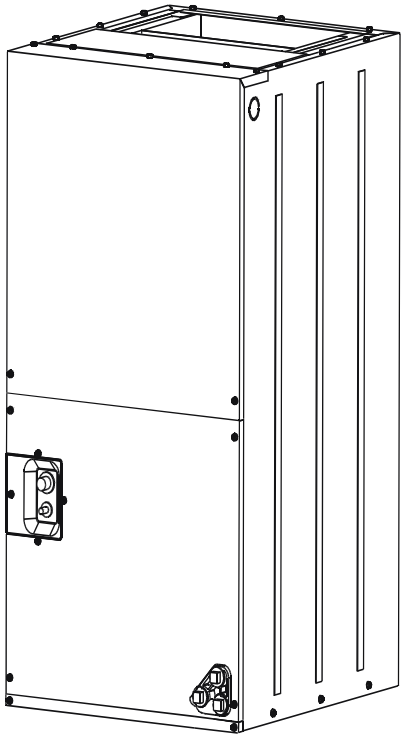
TM_AHU_60R410A_ONOFF_T_SA_NA_171205

AIR HANDLER UNIT
R410A 60HZ ON-OFF CONTROL

2017 TECHNICAL MANUAL



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Specifications

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1. Model Reference

Refer to the following table to determine the specific indoor and outdoor unit model number of your purchased equipment.

Cooling only

Indoor Unit Model	Outdoor Unit Model	Capacity (Btu)	Power Supply
MVB-36CWN1-N	MOV-36CN1-N	36K	1Φ, 220~230V~, 60Hz
MVB-36CWN1-N	MOV-36CN1-D	36K	3ϕ, 220~230V~, 60Hz
MVB-48CWN1-N	MOV-48CN1-N	48K	1Φ, 220~230V~, 60Hz
MVB-48CWN1-N	MOV-48CN1-D	48K	3ϕ, 220~230V~, 60Hz
MVB-60CWN1-N	MOV-60CN1-N	60K	1Φ, 220~230V~, 60Hz
MVB-60CWN1-N	MOV-60CN1-D	60K	3ϕ, 220~230V~, 60Hz

2. General Specifications

Indoor model			MVB-36CWN1-N	MVB-36CWN1-N	MVB-48CWN1-N
Outdoor model			MOV-36CN1-N	MOV-36CN1-D	MOV-48CN1-N
Indoor Power supply		V-Ph-Hz	220-230V,1Ph,60Hz	220-230V,1Ph,60Hz	220-230V,1Ph,60Hz
Outdoor Power Supply		V-Ph-Hz	220-230V,1Ph,60Hz	220-230V,3Ph,60Hz	220-230V,1Ph,60Hz
Max. input consumption		W	5400	5000	6500
Max. current		A	25.5	15.0	30.7
Indoor fan motor	Model		YKS-230-6-18	YKS-230-6-18	YKS-250-6-30
	Old Model		YDK230-6X	YDK230-6X	YDK250-6X-2
	Qty		January-00	January-00	January-00
	Input	W	420.0	420.0	515/-/450
	Capacitor	uF	15	15	12UF/450V
	Speed(Hi/Mi/Lo)	r/min	1100/980	1100/980	830/-/765
Indoor coil	a.Number of rows		3.0	3.0	4.0
	b.Tube pitch(a)x row pitch(b)	mm	21*13.37	21*13.37	21*13.37
	c.Fin spacing	mm	1.3	1.3	1.3
	d.Fin type (code)		Hydrophilic aluminium	Hydrophilic aluminium	Hydrophilic aluminium
	e.Tube outside dia.and type	mm	Φ7,innergroove tube	Φ7,innergroove tube	Φ7,innergroove tube
	f.Coil length x height x width	mm	415X336X40.11	415X336X40.11	444X378X53.48
	g.Number of circuits		6	6	8
Indoor air flow (Hi/Mi/Lo)		m3/h	1648/-/1465	1648/-/1465	1932/-/1816
Sound level (sound pressure)		dB(A)	51.9	51.9	54
Throttle type			Throttle valve	Throttle valve	Throttle valve
Indoor unit	Dimension(W*D*H)	mm	520x460x774	520x460x774	500x550x970
	Packing (W*D*H)	mm	835x520x565	835x520x565	560x595x1030
	Net/Gross weight	Kg	38.2/41.7	38.2/41.7	48/52
Design pressure		MPa	4.2/1.5	4.2/1.5	4.2/1.5
Drainage water pipe dia.		mm	ODΦ25mm	ODΦ25mm	ODΦ25mm
Refrigerant piping	Liquid side/ Gas side	mm(inch)	Φ9.52/Φ19(3/8"/3/4")	Φ9.52/Φ19(3/8"/3/4")	Φ9.52/Φ19(3/8"/3/4")
Operation temperature		℃	17-30	17-30	17-30
Room temperature	Cooling	℃	17~32	17~32	17~32
	Heating	℃	/	/	/
Qty'per 20' /40' /40'HQ		Indoor unit	88/184/275	88/184/275	80/164/164
Compressor	Model		ATH356UN-C9EU	ATH356UG3C9EU	ZP49KUE-PFV-502
	Type		ROTARY	ROTARY	SCROLL
	Brand		HITACHI	HITACHI	EMERSON
	Capacity	W	10450	10350	14300
	Input	W	3480	3400	June-12
	Rated current(RLA)	A	17.0	10.9	25.1
	Locked rotor Amp(LRA)	A	89	81	138.0
	Thermal protector position		INTERNAL	INTERNAL	INTERNAL
	Capacitor	μF	80.0	/	80.0
	Refrigerant oil/oil charge	ml	α68HES-H or equivalent/880	α68HES-H or equivalent/880	3MAF POE/1242
Outdoor fan motor	Model		YKS-160-6-2	YKS-160-6-2	YKS-230-6-3L
	Old Model		YDK160-6B	YDK160-6B	YDK230-6F-1(B)
	Qty		January-00	January-00	January-00
	Input	W	300.0	300.0	318.0
	Capacitor	uF	6	6	12
	Speed	r/min	1100	1100	1095

Outdoor coil	a.Number of rows		1.0	1.0	1.0
	b.Tube pitch(a)x row pitch(b)	mm	21x13.37	21x13.37	21x13.37
	c.Fin spacing	mm	1.3	1.3	1.3
	d.Fin type (code)		Unhydrophilic aluminium	Unhydrophilic aluminium	Unhydrophilic aluminium
	e.Tube outside dia.and type	mm	Φ7,innergroove tube	Φ7,innergroove tube	Φ7,innergroove tube
	f.Coil length x height x width	mm	1588x714x13.37	1588x714x13.37	2030x714x13.37
	g.Number of circuits		5	5	5
Outdoor air flow			4500	4500	7400
Outdoor noise level		dB(A)	65.5	65.5	64.7
Outdoor unit	Dimension(W*D*H)	mm	600x600x759	600x600x759	710x710x759
	Packing (W*D*H)	mm	628x628x794	628x628x794	738x738x794
	Net/Gross weight	Kg	57.8/61.4	56.8/60.6	71.8/76.1
Refrigerant type	Type		R410A	R410A	R410A
	Charged volume	Kg	1.9	1.9	2.2
Design pressure		MPa	4.2/1.5	4.2/1.5	4.2/1.5
Refrigerant piping	Liquid side/ Gas side	mm(inch)	Φ9.52/Φ9(3/8"/3/4")	Φ9.52/Φ9(3/8"/3/4")	Φ9.52/Φ9(3/8"/3/4")
	Max. refrigerant pipe length	m	30	30	50
	Max. difference in level	m	20	20	30
Room temperature	Cooling	℃	18Φ43	18Φ43	18Φ43
	Heating	℃	/	/	/
Qty'per 20' /40' /40'HQ		Outdoor unit	54/114/171	54/114/171	42/96/144

Notes:

1) Capacities are based on the following conditions:

Cooling: - Indoor Temperature 27°C(80.6°F) DB /19 °C(66.2°F) WB

-Outdoor Temperature 35 °C(95°F) DB /24 °C(75.2°F) WB

-Interconnecting Piping Length 5m

- Level Difference of Zero.

2) Capacities are Net Capacities.

3) Due to our policy of innovation some specifications may be changed without notification.

Indoor model			MVB-48CWN1-N	MVB-60CWN1-N	MVB-60CWN1-N
Outdoor model			MOV-48CN1-D	MOV-60CN1-N	MOV-60CN1-D
Indoor Power supply		V-Ph-Hz	220-230V,1Ph,60Hz	220-230V,1Ph,60Hz	220-230V,1Ph,60Hz
Outdoor Power Supply		V-Ph-Hz	220-230V,3Ph,60Hz	220-230V,1Ph,60Hz	220-230V,3Ph,60Hz
Max. input consumption		W	6250	7625	7700
Max. current		A	18.1	34.6	23.4
Indoor fan motor	Model		YKS-250-6-30	YKS-300-6-1	YKS-300-6-1
	Old Model		YDK250-6X-2	YDK300-6X-2	YDK300-6X-2
	Qty		January-00	January-00	January-00
	Input	W	515/-/450	660.0	660.0
	Capacitor	uF	12UF/450V	12	12
	Speed(Hi/Mi/Lo)	r/min	830/-/765	985/760	985/760
Indoor coil	a.Number of rows		4.0	4.0	4.0
	b.Tube pitch(a)x row pitch(b)	mm	21*13.37	21*13.37	21*13.37
	c.Fin spacing	mm	1.3	1.3	1.3
	d.Fin type (code)		Hydrophilic aluminium	Hydrophilic aluminium	Hydrophilic aluminium
	e.Tube outside dia.and type	mm	Φ7,innergroove tube	Φ7,innergroove tube	Φ7,innergroove tube
	f.Coil length x height x width	mm	444X378X53.48	444X378X53.48	444X378X53.48
	g.Number of circuits		8	8	8
Indoor air flow (Hi/Mi/Lo)		m3/h	1932/-/1816	2300.00	2300.00
Sound level (sound pressure)		dB(A)	54.00	54.5/0/0	54.5/0/0
Throttle type			Throttle valve	Throttle valve	Throttle valve
Indoor unit	Dimension(W*D*H)	mm	500x550x970	500x550x970	500x550x970
	Packing (W*D*H)	mm	560x595x1030	1030x560x595	1030x560x595
	Net/Gross weight	Kg	48/52	51/55	51/55
Design pressure		MPa	4.2/1.5	4.2/1.5	4.2/1.5
Drainage water pipe dia.		mm	ODΦ25mm	ODΦ25mm	ODΦ25mm
Refrigerant piping	Liquid side/ Gas side	mm(inch)	Φ9.52/Φ19(3/8"/3/4")	Φ9.52/Φ19(3/8"/3/4")	Φ9.52/Φ19(3/8"/3/4")
Operation temperature		℃	17-30	17-30	17-30
Room temperature	Cooling	℃	17~32	17~32	17~32
	Heating	℃	/	/	/
Qty'per 20' /40' /40'HQ		Indoor unit	80/164/164	80/164/164	80/164/164
Compressor	Model		ZP49KUE-TF5-52E	C-SBP160H16A	C-SBP160H36A
	Type		SCROLL	SCROLL	SCROLL
	Brand		EMERSON	PANASONIC	PANASONIC
	Capacity	W	14400	53910	54933
	Input	W	June-12	June-15	January-15
	Rated current(RLA)	A	18.7	25.8	18
	Locked rotor Amp(LRA)	A	136.8	139.0	153.0
	Thermal protector position		INTERNAL	INTERNAL	INTERNAL
	Capacitor	μF	/	60.0	/
	Refrigerant oil/oil charge	ml	3MAF POE/1242	FV68S or Equivalent/1400	FV68S or Equivalent/1700
Outdoor fan motor	Model		YKS-230-6-3L	YKS-230-6-3L	YKSJ-230-6-2L
	Old Model		YDK230-6F-1(B)	YDK230-6F-1(B)	YKSJ-230-6-2L
	Qty		January-00	January-00	January-00
	Input	W	318.0	318.0	300.0
	Capacitor	uF	12	12	/
	Speed	r/min	1095	1095	1095

Outdoor coil	a.Number of rows		1.0	1.0	1.0
	b.Tube pitch(a)x row pitch(b)	mm	21x13.37	21x13.37	21x13.37
	c.Fin spacing	mm	1.3	1.3	1.3
	d.Fin type (code)		Unhydrophilic aluminium	Unhydrophilic aluminium	Unhydrophilic aluminium
	e.Tube outside dia.and type	mm	Φ7,innergroove tube	Φ7,innergroove tube	Φ7,innergroove tube
	f.Coil length x height x width	mm	2030x714x13.37	2030x798x13.37	2030x798x13.37
	g.Number of circuits		5	5	5
Outdoor air flow			7400	0	6500
Outdoor noise level		dB(A)	64.7	64.4	64.4
Outdoor unit	Dimension(W*D*H)	mm	710x710x759	710x710x843	710x710x843
	Packing (W*D*H)	mm	738x738x794	738x738x872	738x738x872
	Net/Gross weight	Kg	69.7/74	80/85	80/85
Refrigerant type	Type		R410A	R410A	R410A
	Charged volume	Kg	2.3	2.2	2.2
Design pressure		MPa	4.8/1.5	4.2/1.5	4.2/1.5
Refrigerant piping	Liquid side/ Gas side	mm(inch)	Φ9.52/Φ19(3/8"/3/4")	Φ9.52/Φ19(3/8"/3/4")	Φ9.52/Φ19(3/8"/3/4")
	Max. refrigerant pipe length	m	50	50	50
	Max. difference in level	m	30	30	30
Room temperature	Cooling	℃	18~43	18~43	18~43
	Heating	℃	/	/	/
Qty'per 20' /40' /40'HQ		Outdoor unit	42/96/144	42/96/142	42/96/142

Notes:

1) Capacities are based on the following conditions:

Cooling: - Indoor Temperature 27°C(80.6°F) DB /19 °C(66.2°F) WB

-Outdoor Temperature 35 °C(95°F) DB /24 °C(75.2°F) WB

-Interconnecting Piping Length 5m

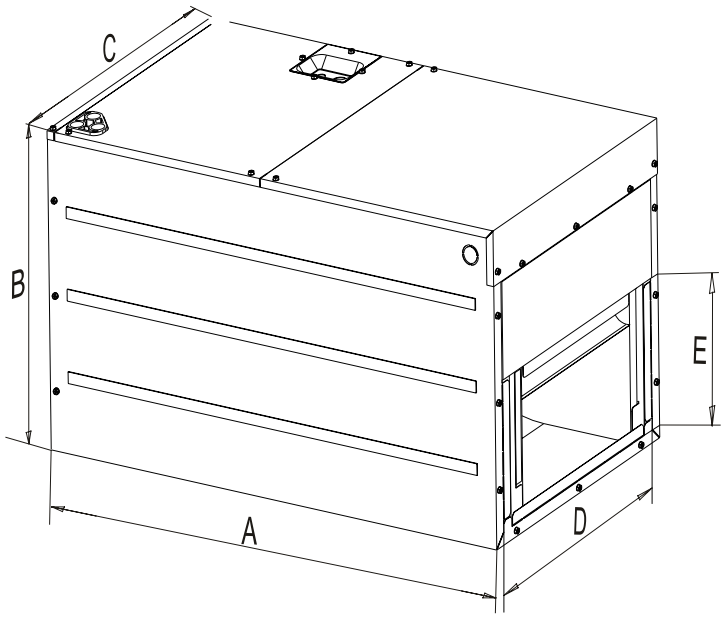
- Level Difference of Zero.

2) Capacities are Net Capacities.

3) Due to our policy of innovation some specifications may be changed without notification.

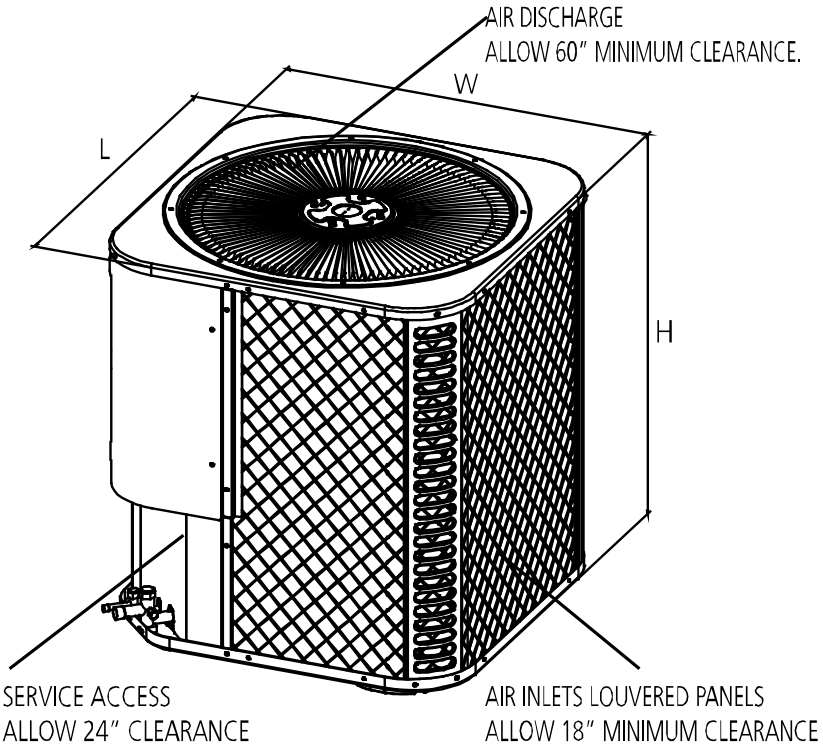
3. Dimensional Drawings

Indoor Unit



Model (KBtu/h)	unit	A	B	C	D	E
36	mm	774	520	460	414	245
	inch	30.4	20.4	18.1	16.3	9.6
48	mm	970	550	500	454	266
	inch	38.1	21.6	19.6	17.8	10.4
60	mm	970	550	500	454	266
	inch	38.1	21.6	19.6	17.8	10.4

Outdoor Unit



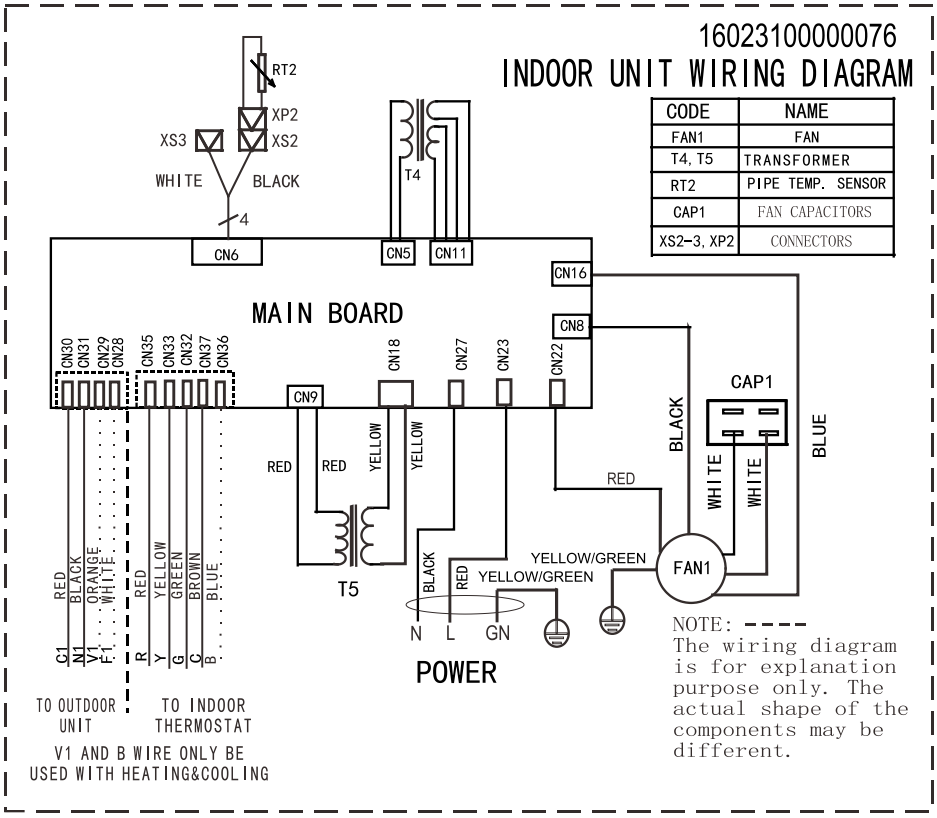
Model (KBtu/h)	unit	Dimensions			Refrigerant Connection Service Valve Size	
		H	W	L	Liquid	Gas
36	mm	759	600	600	9.52	19
	inch	29-7/8	23-5/8	23-5/8	3/8	3/4
48	mm	759	710	710	9.52	19
	inch	29-7/8	28	28	3/8	3/4
60	mm	843	710	710	9.52	19
	inch	33-3/16	28	28	3/8	3/4

4. Electrical Wiring Diagrams

4.1 Indoor unit

Abbreviation	Paraphrase
Y/G	Yellow-Green Conductor
CAP1	Indoor Fan Capacitor
FAN1	Indoor Fan
RT2	Coil Temperature of Indoor Heat Exchanger
T4, T5	Transformer
GM1, GM3	Horizontal Swing Motor

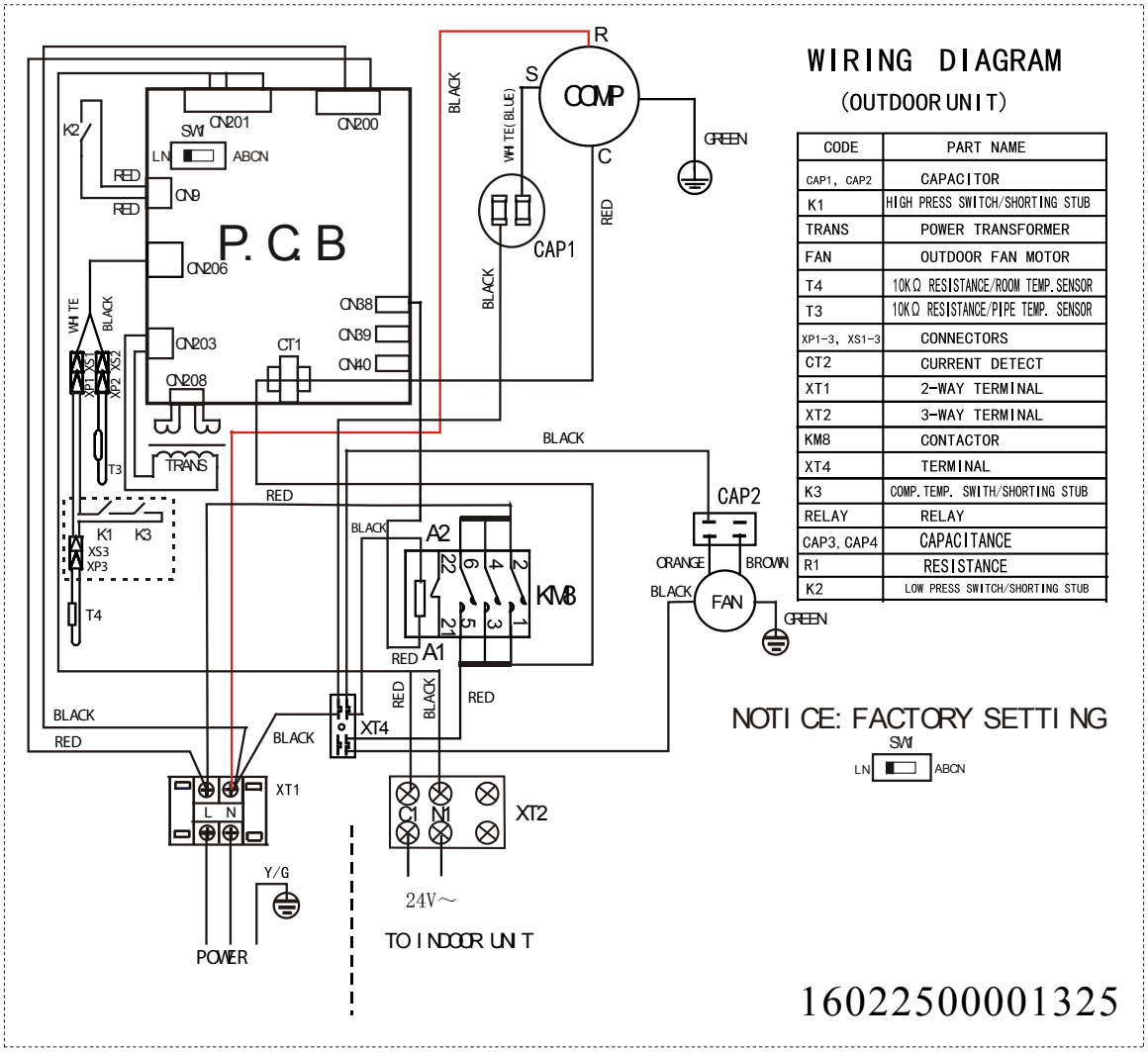
MVB-36CWN1-N, MVB-48CWN1-N, MVB-60CWN1-N



4.2 Outdoor Unit

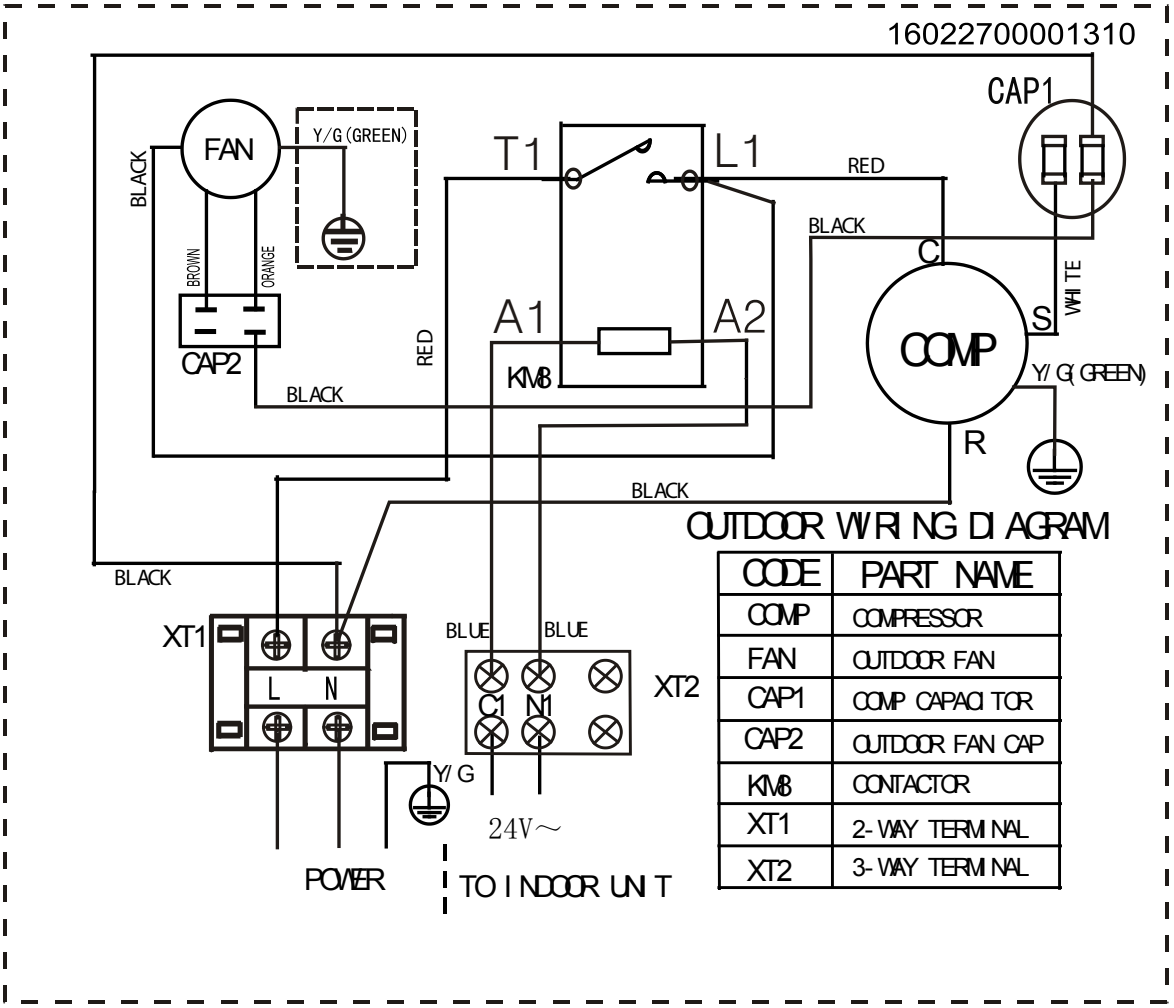
Abbreviation	Paraphrase
CAP1, CAP2, CAP3,CAP4	Capacitor
FAN	Outdoor Fan Motor
KM8	Contactor
CT1, CT2	AC Current Detector
COMP	Compressor
L-PRO, K2	Low Pressure Switch/Shorting Stub
K1	High Pressure Switch/Shorting Stub
TRANS	Power Transformer
T4	10KΩ RESISTANCE/Outdoor Ambient Temperature
T3	10KΩ RESISTANCE/Coil Temperature of Condenser
XT1	2-Way Terminal/4-Way Terminal
XT2	3-Way Terminal
XT4	Terminal
K3	Compressor Discharge Temperature/Shorting Stub
R1	Resistance
XP1~XP5,XS1~XS5	Connectors

MOV-36CN1-N, MOV-60CN1-N



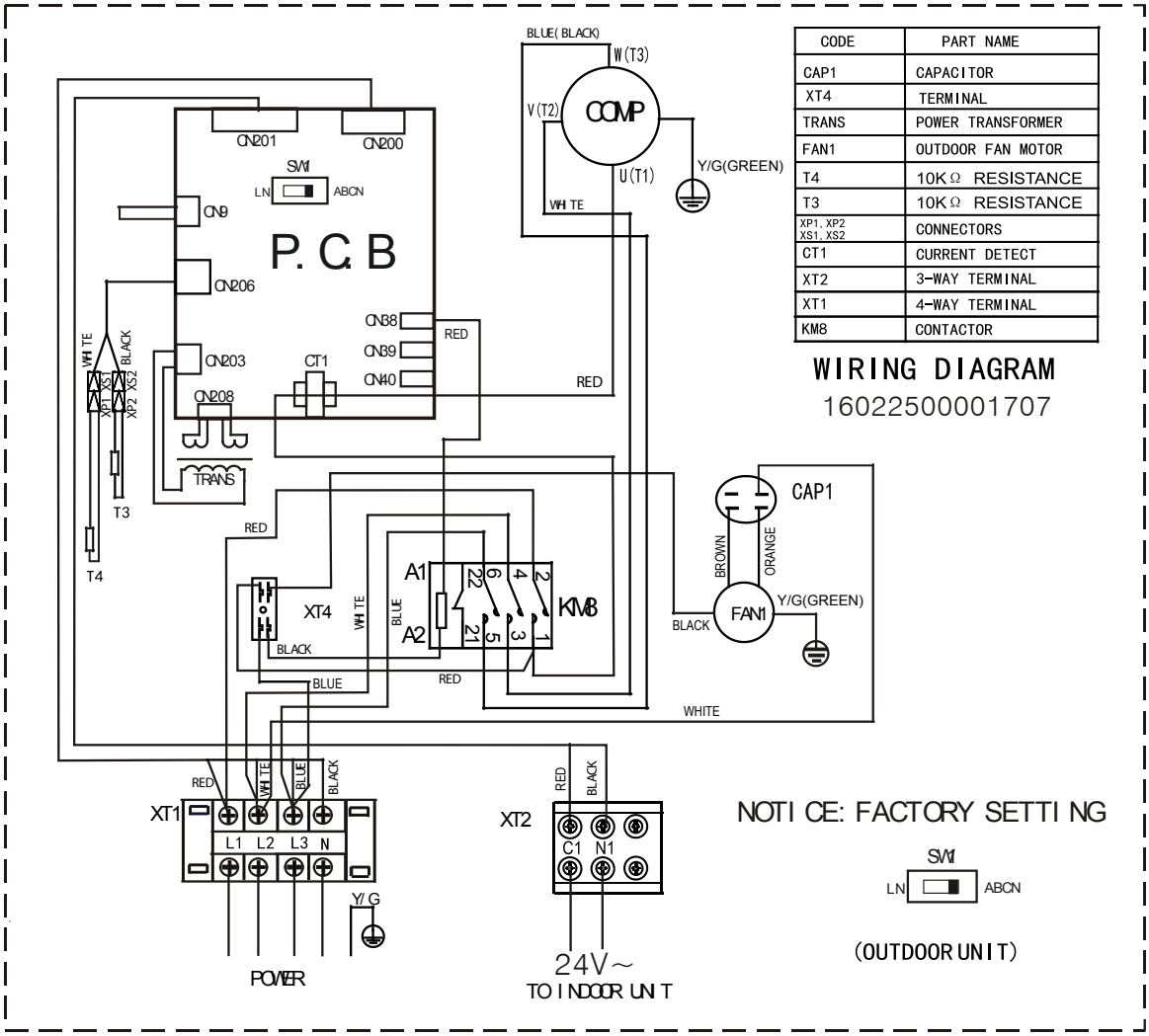
CODE	PART NAME
CAP1, CAP2	CAPACITOR
K1	HIGH PRESS SWITCH/SHORTING STUB
TRANS	POWER TRANSFORMER
FAN	OUTDOOR FAN MOTOR
T4	10KΩ RESISTANCE/ROOM TEMP.SENSOR
T3	10KΩ RESISTANCE/PIPE TEMP. SENSOR
XP1-3, XS1-3	CONNECTORS
CT2	CURRENT DETECT
XT1	2-WAY TERMINAL
XT2	3-WAY TERMINAL
KM8	CONTACTOR
XT4	TERMINAL
K3	COMP.TEMP. SWITH/SHORTING STUB
RELAY	RELAY
CAP3, CAP4	CAPACITANCE
R1	RESISTANCE
K2	LOW PRESS SWITCH/SHORTING STUB

MOV-48CN1-N



CODE	PART NAME
COMP	COMPRESSOR
FAN	OUTDOOR FAN
CAP1	COMP CAPACITOR
CAP2	OUTDOOR FAN CAP
KM8	CONTACTOR
XT1	2-WAY TERMINAL
XT2	3-WAY TERMINAL

MOV-36CN1-D, MOV-48CN1-D

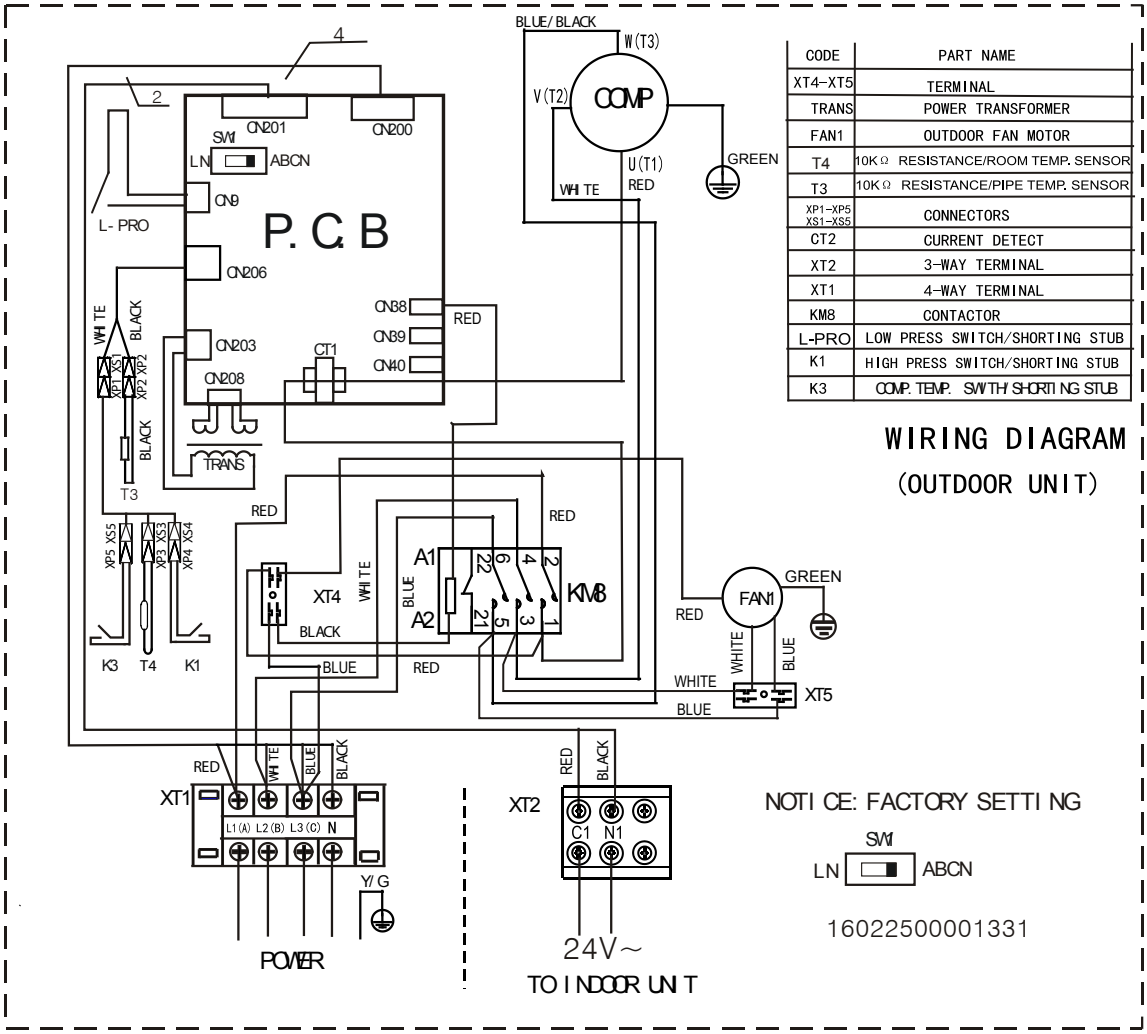


CODE	PART NAME
CAP1	CAPACITOR
XT4	TERMINAL
TRANS	POWER TRANSFORMER
FAN1	OUTDOOR FAN MOTOR
T4	10KΩ RESISTANCE
T3	10KΩ RESISTANCE
XP1, XP2 XS1, XS2	CONNECTORS
CT1	CURRENT DETECT
XT2	3-WAY TERMINAL
XT1	4-WAY TERMINAL
KM8	CONTACTOR

WIRING DIAGRAM

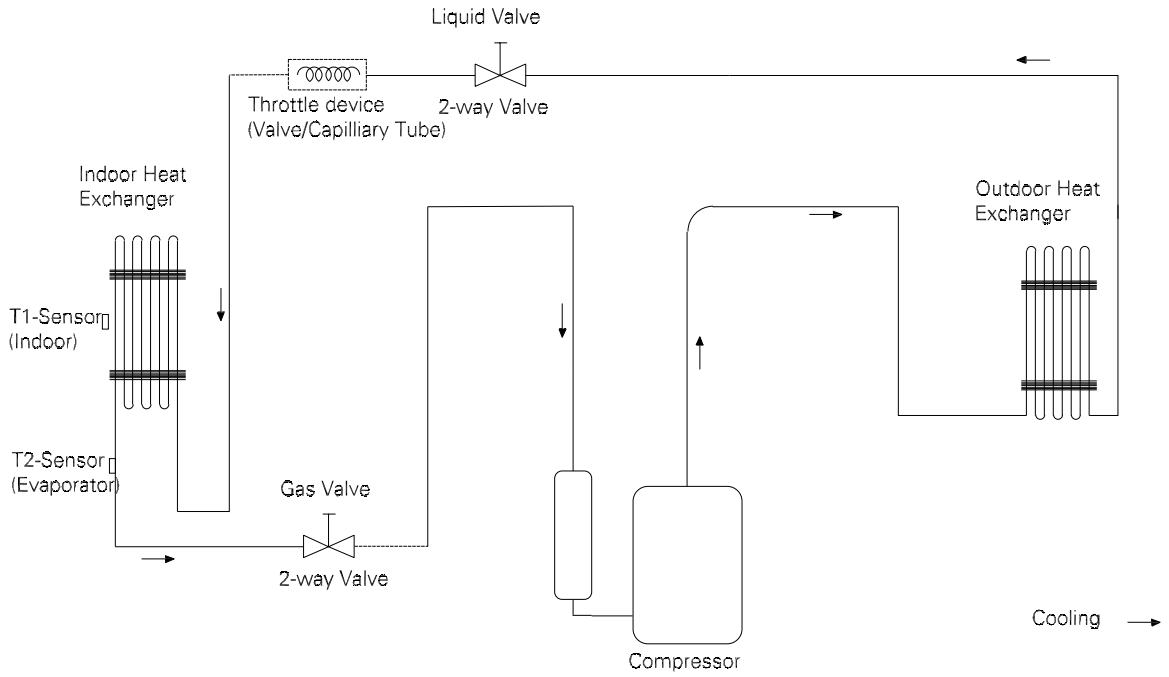
16022500001707

MOV-60CN1-D

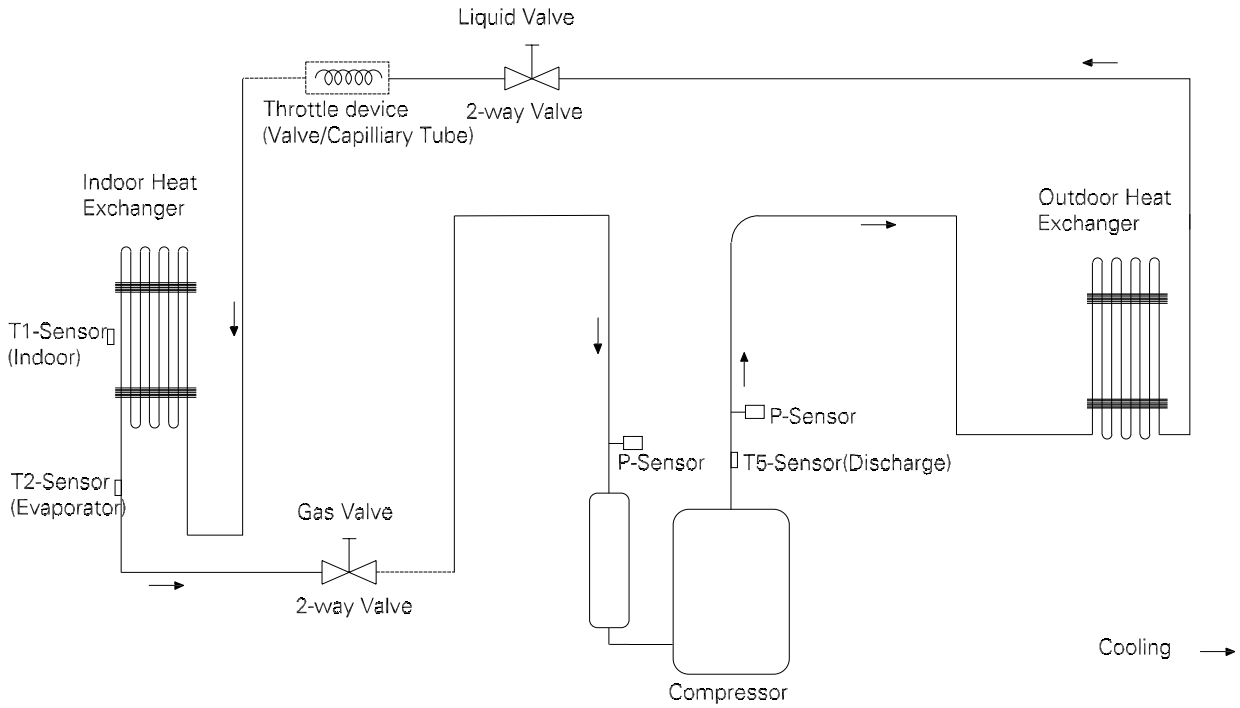


CODE	PART NAME
XT4–XT5	TERMINAL
TRANS	POWER TRANSFORMER
FAN1	OUTDOOR FAN MOTOR
T4	10KΩ RESISTANCE/ROOM TEMP. SENSOR
T3	10KΩ RESISTANCE/PIPE TEMP. SENSOR
XP1–XP5 XS1–XS5	CONNECTORS
CT2	CURRENT DETECT
XT2	3-WAY TERMINAL
XT1	4-WAY TERMINAL
KM8	CONTACTOR
L-PRO	LOW PRESS SWITCH/SHORTING STUB
K1	HIGH PRESS SWITCH/SHORTING STUB
K3	COMP. TEMP. SWITH SHORTING STUB

5. Refrigerant Cycle Diagrams



Model No.	Pipe Size (Diameter:ø) inch		Piping length (m/ft)		Elevation (m/ft)		Additional Refrigerant
	Gas	Liquid	Rated	Max.	Rated	Max.	
MOV-36CN1-N MOV-36CN1-D	3/4	3/8	5/16.4	30/98	0	20/66	65g/m (0.69oz/ft)
MOV-48CN1-N MOV-48CN1-D	3/4	3/8	5/16.4	50/164	0	30/98	65g/m (0.69oz/ft)
MOV-60CN1-N	3/4	3/8	5/16.4	50/164	0	30/98	65g/m (0.69oz/ft)



Model No.	Pipe Size (Diameter:ø) inch		Piping length (m/ft)		Elevation (m/ft)		Additional Refrigerant
	Gas	Liquid	Rated	Max.	Rated	Max.	
MOV-60CN1-D	3/4	3/8	5/16.4	50/164	0	30/98	65g/m (0.69oz/ft)

6. Capacity Tables

Cooling

TC:Total Cooling Capacity (kW) ; S/T:Sensible Cooling Capacity Ratio ; PI:Power Input(kW)

36K																		
Air Flow	Out-door Air Temp DB(°C)	ID WB(°C)	16.0				18.0				19.0				22.0			
		ID DB(°C)	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0
1648	27.0	TC	10.6	10.6	10.7	10.8	11.1	11.1	11.1	11.2	11.5	11.5	11.5	11.5	12.3	12.3	12.3	12.3
		S/T	0.71	0.85	0.93	1.00	0.59	0.72	0.81	0.95	0.51	0.64	0.72	0.87	0.33	0.46	0.53	0.67
		PI	3.48	3.48	3.48	3.48	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.49	3.50	3.50	3.50	3.50
	30.0	TC	10.3	10.3	10.4	10.6	10.8	10.8	10.8	10.9	11.1	11.1	11.1	11.1	12.0	12.0	12.0	12.0
		S/T	0.72	0.86	0.95	1.00	0.59	0.73	0.81	0.97	0.51	0.65	0.73	0.88	0.33	0.46	0.53	0.67
		PI	3.68	3.68	3.68	3.68	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.71	3.71	3.71	3.71
	32.0	TC	10.1	10.1	10.2	10.3	10.6	10.6	10.6	10.7	10.9	10.9	10.9	11.0	11.8	11.8	11.8	11.8
		S/T	0.72	0.87	0.96	1.00	0.59	0.74	0.82	0.98	0.51	0.65	0.73	0.89	0.33	0.46	0.54	0.68
		PI	3.81	3.81	3.81	3.81	3.82	3.82	3.82	3.82	3.83	3.83	3.83	3.83	3.85	3.85	3.85	3.85
	35.0	TC	9.8	9.8	9.9	10.0	10.3	10.3	10.3	10.4	10.6	10.6	10.8	10.9	11.4	11.4	11.4	11.4
		S/T	0.73	0.88	0.97	1.00	0.60	0.74	0.83	0.99	0.52	0.66	0.74	0.89	0.33	0.46	0.54	0.69
		PI	4.02	4.02	4.02	4.02	4.04	4.04	4.04	4.04	4.04	4.04	4.05	4.04	4.07	4.07	4.07	4.07
	43.0	TC	8.9	9.0	9.1	9.1	9.3	9.3	9.4	9.5	9.6	9.6	9.7	9.8	10.4	10.4	10.4	10.4
		S/T	0.75	0.92	1.00	1.00	0.61	0.77	0.87	1.00	0.52	0.68	0.77	0.94	0.32	0.47	0.55	0.90
		PI	4.69	4.69	4.69	4.69	4.71	4.71	4.71	4.71	4.72	4.72	4.72	4.72	4.75	4.75	4.75	4.75
	46.0	TC	8.6	8.6	8.7	8.8	9.0	9.0	9.1	9.1	9.3	9.3	9.3	9.3	10.1	10.1	10.1	10.1
		S/T	0.77	0.94	1.00	1.00	0.62	0.79	0.88	1.00	0.53	0.69	0.79	0.97	0.32	0.47	0.56	0.92
		PI	4.94	4.94	4.94	4.94	4.96	4.96	4.96	4.96	4.97	4.97	4.97	4.97	5.01	5.01	5.01	5.01
	52.0	TC	7.7	7.8	7.9	8.0	8.1	8.1	8.2	8.3	8.4	8.4	8.4	8.5	9.1	9.1	9.1	9.1
		S/T	0.80	0.99	1.00	1.00	0.64	0.82	0.93	1.00	0.54	0.72	0.82	1.00	0.31	0.48	0.58	0.97
		PI	5.57	5.57	5.57	5.57	5.59	5.59	5.59	5.59	5.61	5.61	5.61	5.61	5.65	5.65	5.65	5.65
1465	27.0	TC	10.2	10.2	10.3	10.4	10.7	10.7	10.7	10.8	11.0	11.0	11.0	11.0	11.9	11.9	11.9	11.9
		S/T	0.69	0.83	0.90	1.00	0.58	0.70	0.78	0.92	0.51	0.63	0.70	0.84	0.34	0.45	0.52	0.65
		PI	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.36	3.36	3.36	3.36
	30.0	TC	9.9	9.9	10.0	10.1	10.4	10.4	10.4	10.5	10.7	10.7	10.7	10.7	11.5	11.5	11.5	11.5
		S/T	0.70	0.83	0.91	1.00	0.58	0.71	0.79	0.93	0.51	0.63	0.71	0.85	0.34	0.45	0.52	0.65
		PI	3.53	3.53	3.53	3.53	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.56	3.56	3.56	3.56
	32.0	TC	9.7	9.7	9.8	9.9	10.2	10.2	10.2	10.3	10.5	10.5	10.5	10.5	11.3	11.3	11.3	11.3
		S/T	0.70	0.84	0.92	1.00	0.58	0.72	0.79	0.94	0.51	0.64	0.71	0.86	0.34	0.45	0.53	0.66
		PI	3.66	3.66	3.66	3.66	3.67	3.67	3.67	3.67	3.68	3.68	3.68	3.68	3.70	3.70	3.70	3.70
	35.0	TC	9.4	9.4	9.5	9.6	9.9	9.9	9.9	10.0	10.2	10.2	10.3	10.2	11.0	11.0	11.0	11.0
		S/T	0.71	0.85	0.93	1.00	0.59	0.72	0.81	0.95	0.51	0.64	0.72	0.87	0.33	0.46	0.53	0.67
		PI	3.87	3.87	3.87	3.87	3.88	3.88	3.88	3.88	3.88	3.88	3.89	3.88	3.91	3.91	3.91	3.91
	43.0	TC	8.6	8.6	8.7	8.8	9.0	9.0	9.0	9.1	9.3	9.3	9.3	9.3	10.0	10.0	10.0	10.0
		S/T	0.73	0.88	0.97	1.00	0.60	0.75	0.84	1.00	0.52	0.66	0.75	0.91	0.33	0.46	0.54	0.69
		PI	4.51	4.51	4.51	4.51	4.52	4.52	4.52	4.52	4.53	4.53	4.54	4.53	4.56	4.56	4.56	4.56
	46.0	TC	8.2	8.3	8.4	8.5	8.6	8.6	8.6	8.7	8.9	8.9	8.9	9.0	9.6	9.6	9.6	9.6
		S/T	0.74	0.90	0.99	1.00	0.61	0.76	0.85	1.00	0.52	0.67	0.76	0.93	0.32	0.46	0.55	0.70
		PI	4.75	4.75	4.75	4.75	4.76	4.76	4.76	4.76	4.78	4.78	4.78	4.78	4.81	4.81	4.81	4.81
	52.0	TC	7.4	7.5	7.6	7.7	7.9	7.9	7.9	8.0	8.1	8.1	8.1	8.2	8.8	8.8	8.8	8.8
		S/T	0.77	0.95	1.00	1.00	0.62	0.79	0.89	1.00	0.53	0.69	0.79	0.97	0.32	0.47	0.56	0.73
			5.35	5.35	5.35	5.35	5.37	5.37	5.37	5.37	5.38	5.38	5.38	5.38	5.43	5.43	5.43	5.43

TC:Total Cooling Capacity (kW)

S/T:Sensible Cooling Capacity Ratio

PI:Power Input(kW)

48K																		
Air Flow (m^3/h)	Out-door Air Temp DB(°C)	ID WB(°C)	16.0				18.0				19.0				22.0			
		ID DB(°C)	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0
1932	27.0	TC	48.4	48.4	48.9	49.4	50.6	50.6	50.6	51.1	52.2	52.2	52.2	52.2	56.2	56.2	56.2	56.2
		S/T	0.69	0.81	0.88	1.00	0.58	0.69	0.77	0.90	0.51	0.62	0.69	0.82	0.35	0.45	0.52	0.64
		PI	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.76	4.76	4.76	4.76
	30.0	TC	47.0	47.0	47.5	48.0	49.2	49.2	49.2	49.7	50.7	50.7	50.7	50.7	54.6	54.6	54.6	54.6
		S/T	0.69	0.82	0.89	1.00	0.58	0.70	0.77	0.91	0.51	0.62	0.70	0.83	0.34	0.45	0.52	0.64
		PI	5.01	5.01	5.01	5.01	5.02	5.02	5.02	5.02	5.03	5.03	5.03	5.03	5.05	5.05	5.05	5.05
	32.0	TC	46.1	46.1	46.6	47.1	48.3	48.3	48.3	48.8	49.7	49.7	49.7	49.7	53.6	53.6	53.6	53.6
		S/T	0.69	0.83	0.90	1.00	0.58	0.70	0.78	0.91	0.51	0.63	0.70	0.84	0.34	0.45	0.52	0.65
		PI	5.20	5.20	5.20	5.20	5.21	5.21	5.21	5.21	5.22	5.22	5.22	5.22	5.24	5.24	5.24	5.24
	35.0	TC	44.7	44.7	45.1	45.6	46.8	46.8	46.8	47.3	48.3	48.3	49.0	48.3	52.1	52.1	52.1	52.1
		S/T	0.70	0.84	0.91	1.00	0.58	0.71	0.79	0.93	0.51	0.63	0.70	0.85	0.34	0.45	0.52	0.65
		PI	5.49	5.49	5.49	5.49	5.50	5.50	5.50	5.50	5.51	5.51	5.52	5.51	5.55	5.55	5.55	5.55
	43.0	TC	40.6	40.6	41.0	41.4	42.5	42.5	42.5	42.9	43.9	43.9	44.1	44.2	47.4	47.4	47.4	47.4
		S/T	0.72	0.87	0.95	1.00	0.59	0.73	0.82	0.97	0.51	0.65	0.73	0.88	0.33	0.46	0.53	0.90
		PI	6.39	6.39	6.39	6.39	6.42	6.42	6.42	6.42	6.43	6.43	6.44	6.43	6.48	6.48	6.48	6.48
	46.0	TC	39.0	39.0	39.4	39.8	40.9	40.9	40.9	41.3	42.2	42.2	42.2	42.6	45.7	45.7	45.7	45.7
		S/T	0.73	0.88	0.97	1.00	0.60	0.75	0.83	1.00	0.52	0.66	0.74	0.90	0.33	0.46	0.54	0.92
		PI	6.73	6.73	6.73	6.73	6.76	6.76	6.76	6.76	6.78	6.78	6.78	6.78	6.83	6.83	6.83	6.83
	52.0	TC	35.3	35.7	36.1	36.5	37.1	37.1	37.1	37.5	38.4	38.4	38.4	38.8	41.7	41.7	41.7	41.7
		S/T	0.76	0.92	1.00	1.00	0.61	0.78	0.87	1.00	0.52	0.68	0.78	0.95	0.32	0.47	0.55	0.97
			7.60	7.60	7.60	7.60	7.62	7.62	7.62	7.62	7.64	7.64	7.64	7.64	7.70	7.70	7.70	7.70
1816	27.0	TC	46.4	46.4	46.4	46.9	48.6	48.6	48.6	49.1	50.0	50.0	50.0	50.0	53.9	53.9	53.9	53.9
		S/T	0.68	0.80	0.88	1.00	0.57	0.69	0.76	0.89	0.50	0.62	0.69	0.81	0.35	0.45	0.51	0.63
		PI	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.56	4.57	4.57	4.57	4.57
	30.0	TC	45.1	45.1	45.6	46.1	47.2	47.2	47.2	47.7	48.6	48.6	48.6	48.6	52.4	52.4	52.4	52.4
		S/T	0.69	0.81	0.88	1.00	0.58	0.70	0.77	0.90	0.51	0.62	0.69	0.82	0.34	0.45	0.52	0.64
		PI	4.81	4.81	4.81	4.81	4.82	4.82	4.82	4.82	4.83	4.83	4.83	4.83	4.85	4.85	4.85	4.85
	32.0	TC	44.2	44.2	44.6	45.0	46.3	46.3	46.3	46.8	47.7	47.7	47.7	47.7	51.4	51.4	51.4	51.4
		S/T	0.69	0.82	0.89	1.00	0.58	0.70	0.77	0.91	0.51	0.62	0.70	0.83	0.34	0.45	0.52	0.64
		PI	4.99	4.99	4.99	4.99	5.00	5.00	5.00	5.00	5.01	5.01	5.01	5.01	5.04	5.04	5.04	5.04
	35.0	TC	42.8	42.8	43.2	43.6	44.9	44.9	44.9	45.3	46.3	46.3	47.0	46.3	49.9	49.9	49.9	49.9
		S/T	0.70	0.83	0.91	1.00	0.58	0.71	0.78	0.92	0.51	0.63	0.70	0.84	0.34	0.45	0.52	0.65
		PI	5.27	5.27	5.27	5.27	5.28	5.28	5.28	5.28	5.29	5.29	5.30	5.29	5.33	5.33	5.33	5.33
	43.0	TC	38.9	38.9	39.3	39.7	40.8	40.8	40.8	41.2	42.1	42.1	42.3	42.4	45.5	45.5	45.5	45.5
		S/T	0.72	0.86	0.94	1.00	0.59	0.73	0.81	0.96	0.51	0.65	0.73	0.88	0.33	0.46	0.53	0.67
		PI	6.14	6.14	6.14	6.14	6.16	6.16	6.16	6.16	6.18	6.18	6.18	6.18	6.22	6.22	6.22	6.22
	46.0	TC	37.4	37.4	37.8	38.2	39.2	39.2	39.2	39.6	40.5	40.5	40.5	40.9	43.9	43.9	43.9	43.9
		S/T	0.73	0.88	0.96	1.00	0.60	0.74	0.83	0.98	0.52	0.65	0.74	0.89	0.33	0.46	0.54	0.68
		PI	6.47	6.47	6.47	6.47	6.49	6.49	6.49	6.49	6.51	6.51	6.51	6.51	6.56	6.56	6.56	6.56
	52.0	TC	33.9	34.2	34.5	34.8	35.6	35.6	35.6	36.0	36.8	36.8	36.8	37.2	40.0	40.0	40.0	40.0
		S/T	0.75	0.91	1.00	1.00	0.61	0.77	0.86	1.00	0.52	0.68	0.77	0.94	0.32	0.46	0.55	0.71
			7.30	7.30	7.30	7.30	7.32	7.32	7.32	7.32	7.34	7.34	7.34	7.34	7.39	7.39	7.39	7.39

TC:Total Cooling Capacity (kW)

S/T:Sensible Cooling Capacity Ratio

PI:Power Input(kW)

60K																		
Air Flow	Out-door Air Temp DB(°C)	ID WB(°C)	16.0				18.0				19.0				22.0			
		ID DB(°C)	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0	23.0	25.0	27.0	30.0
2300	27.0	TC	17.7	17.7	17.7	17.9	18.5	18.5	18.5	18.5	19.1	19.1	19.1	19.1	20.5	20.5	20.5	20.5
		S/T	0.68	0.80	0.87	1.00	0.57	0.68	0.75	0.88	0.50	0.61	0.68	0.80	0.35	0.45	0.51	0.63
		PI	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.96	5.96	5.96	5.96
	30.0	TC	17.2	17.2	17.2	17.4	18.0	18.0	18.0	18.2	18.6	18.6	18.6	18.6	20.0	20.0	20.0	20.0
		S/T	0.68	0.80	0.88	1.00	0.57	0.69	0.76	0.89	0.50	0.62	0.69	0.81	0.35	0.45	0.51	0.63
		PI	6.27	6.27	6.27	6.27	6.28	6.28	6.28	6.28	6.29	6.29	6.29	6.29	6.31	6.31	6.31	6.31
	32.0	TC	16.9	16.9	17.0	17.2	17.7	17.7	17.7	17.8	18.2	18.2	18.2	18.2	19.6	19.6	19.6	19.6
		S/T	0.69	0.81	0.88	1.00	0.58	0.69	0.77	0.90	0.51	0.62	0.69	0.82	0.35	0.45	0.52	0.64
		PI	6.50	6.50	6.50	6.50	6.51	6.51	6.51	6.51	6.52	6.52	6.52	6.52	6.56	6.56	6.56	6.56
	35.0	TC	16.4	16.4	16.5	16.7	17.1	17.1	17.1	17.3	17.7	17.7	17.9	17.7	19.1	19.1	19.1	19.1
		S/T	0.69	0.82	0.89	1.00	0.58	0.70	0.77	0.91	0.51	0.62	0.69	0.83	0.34	0.45	0.52	0.64
		PI	6.86	6.86	6.86	6.86	6.88	6.88	6.88	6.88	6.89	6.89	6.90	6.89	6.93	6.93	6.93	6.93
	43.0	TC	14.8	14.8	15.0	15.1	15.6	15.6	15.6	15.7	16.1	16.1	16.1	16.1	17.4	17.4	17.4	17.4
		S/T	0.71	0.85	0.93	1.00	0.59	0.72	0.80	0.95	0.51	0.64	0.72	0.87	0.34	0.46	0.53	0.90
		PI	7.99	7.99	7.99	7.99	8.02	8.02	8.02	8.02	8.04	8.04	8.04	8.04	8.10	8.10	8.10	8.10
	46.0	TC	14.3	14.3	14.4	14.6	15.0	15.0	15.0	15.1	15.5	15.5	15.5	15.5	16.7	16.7	16.7	16.7
		S/T	0.72	0.87	0.95	1.00	0.59	0.73	0.82	0.97	0.51	0.65	0.73	0.88	0.33	0.46	0.53	0.92
		PI	8.42	8.42	8.42	8.42	8.45	8.45	8.45	8.45	8.47	8.47	8.47	8.47	8.54	8.54	8.54	8.54
	52.0	TC	12.9	13.0	13.2	13.3	13.6	13.6	13.6	13.7	14.0	14.0	14.0	14.2	15.2	15.2	15.2	15.2
		S/T	0.74	0.90	0.99	1.00	0.61	0.76	0.85	1.00	0.52	0.67	0.76	0.92	0.32	0.46	0.55	0.97
		PI	9.50	9.50	9.50	9.50	9.53	9.53	9.53	9.53	9.55	9.55	9.55	9.55	9.62	9.62	9.62	9.62

TC:Total Cooling Capacity (kW)

S/T:Sensible Cooling Capacity Ratio

PI:Power Input(kW)

7. Capacity Correction Factor for Height Difference

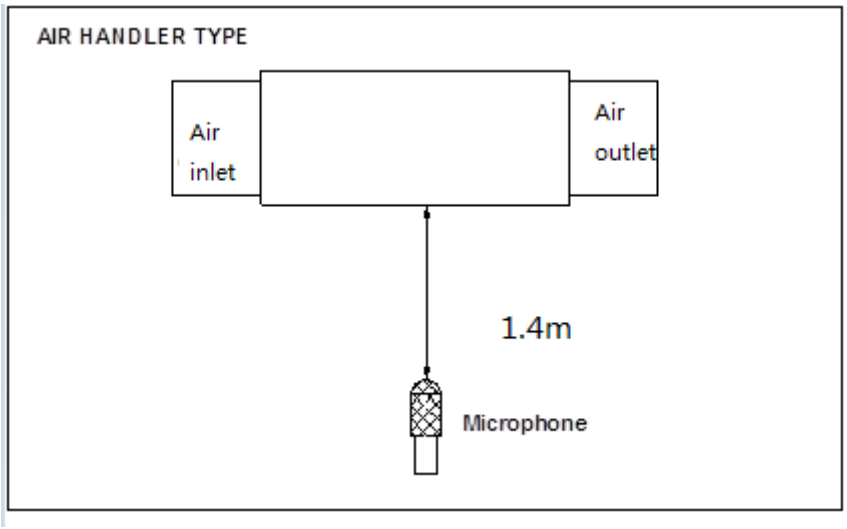
Model	36k		Pipe Length (m)					
Cooling			5	10	20	30	40	50
Height difference H (m)	Indoor Upper than Outdoor	30				0.830	0.780	0.729
		20			0.894	0.843	0.791	0.740
		10		0.959	0.907	0.855	0.803	0.752
		5	0.995	0.969	0.916	0.864	0.812	0.759
		0	1.000	0.974	0.921	0.868	0.816	0.763
	Outdoor Upper than Indoor	-5	1.000	0.974	0.921	0.868	0.816	0.763
		-10		0.974	0.921	0.868	0.816	0.763
		-20			0.921	0.868	0.816	0.763
		-30				0.868	0.816	0.763

Model	48K		Pipe Length (m)					
Cooling			5	10	20	30	40	50
Height difference H (m)	Indoor Upper than Outdoor	30				0.808	0.749	0.690
		20			0.880	0.820	0.760	0.701
		10		0.955	0.894	0.833	0.772	0.711
		5	0.995	0.964	0.903	0.841	0.780	0.718
		0	1.000	0.969	0.907	0.846	0.784	0.722
	Outdoor Upper than Indoor	-5	1.000	0.969	0.907	0.846	0.784	0.722
		-10		0.969	0.907	0.846	0.784	0.722
		-20			0.907	0.846	0.784	0.722
		-30				0.846	0.784	0.722

Model	60K		Pipe Length (m)					
Cooling			5	10	20	30	40	50
Height difference H (m)	Indoor Upper than Outdoor	30				0.786	0.719	0.651
		20			0.867	0.798	0.730	0.661
		10		0.950	0.880	0.810	0.741	0.671
		5	0.995	0.960	0.889	0.819	0.748	0.678
		0	1.000	0.965	0.894	0.823	0.752	0.681
	Outdoor Upper than Indoor	-5	1.000	0.965	0.894	0.823	0.752	0.681
		-10		0.965	0.894	0.823	0.752	0.681
		-20			0.894	0.823	0.752	0.681
		-30				0.823	0.752	0.681

8. Noise Criterion Curves

Indoor Unit



Notes:

-Sound measured at 1.4m away from the center of the unit.

-Data is valid at free field condition

-Data is valid at nominal operation condition

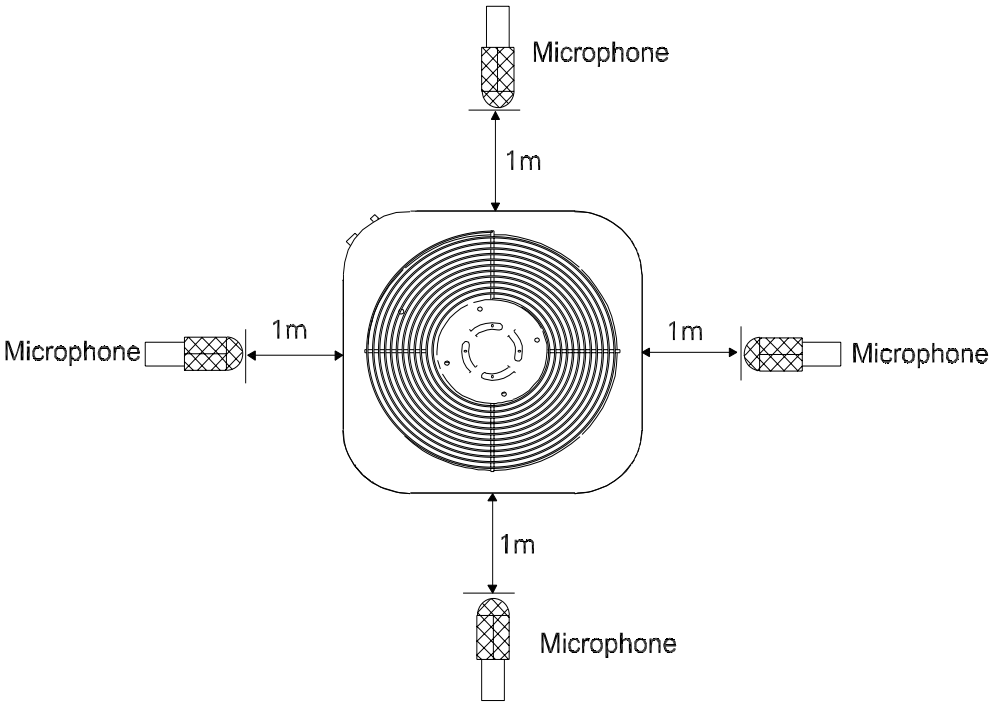
-Reference acoustic pressure OdB = 20μPa

-Sound level will vary depending on a range of factors such as the construction -(acoustic absorption coefficient) of particular room in which the equipment is installed.

-The operating conditions are assumed to be standard.

Model	Noise level dB(A)
	H
MVB-36CWN1-N	51.9
MVB-48CWN1-N	54
MVB-60CWN1-N	54.5

Outdoor Unit



Notes:

-Sound measured at 1.0m away from the center of the unit, height of microphone is 0.5x(height of outdoor unit+1).

-Data is valid at free field condition

-Data is valid at nominal operation condition

-Reference acoustic pressure OdB=20μPa

-Sound level will vary depending on arrange off actors such as the construction (acoustic absorption coefficient) of particular room in which the equipment is installed.

-The operating conditions are assumed to be standard.

Model	Noise level dB(A)
MOV-36CN1-N	65.5
MOV-36CN1-D	65.5
MOV-48CN1-N	64.7
MOV-48CN1-D	64.7
MOV-60CN1-N	64.4
MOV-60CN1-D	64.4

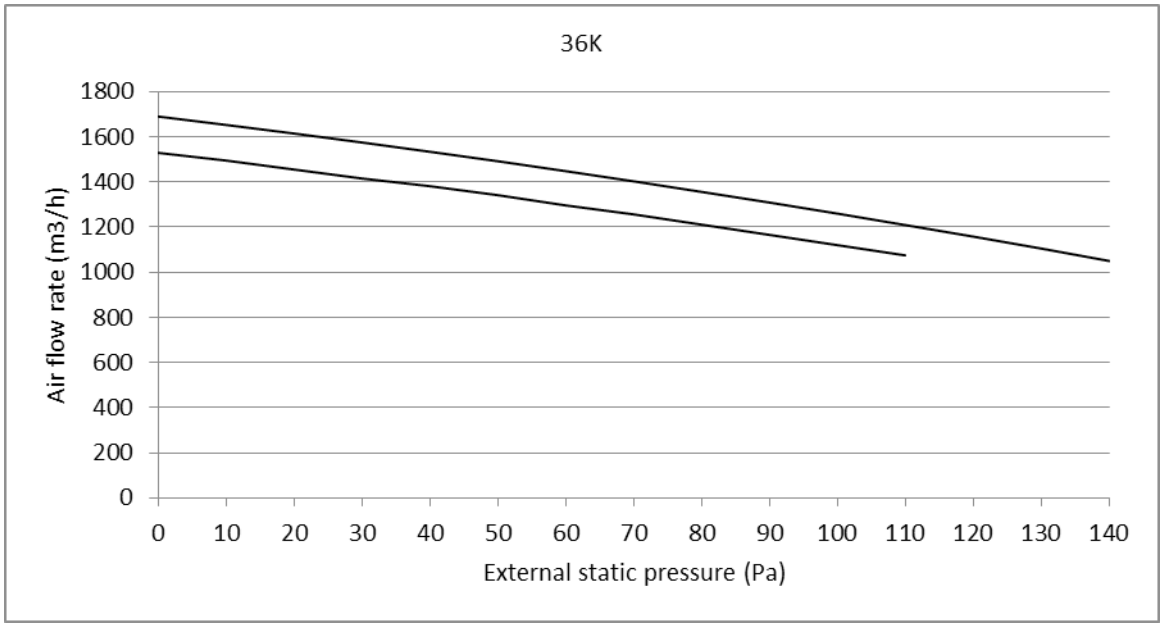
9. Electrical Characteristics

Type (Cooling only)			36000 Btu/h	48000 Btu/h	60000 Btu/h
Power	Indoor unit	Phase	1 - Phase	1 - Phase	1 - Phase
		Frequency and Voltage	220-230V~,60Hz	220-230V~,60Hz	220-230V~,60Hz
	Outdoor unit	Phase	1 - Phase	1 - Phase	1 - Phase
		Frequency and Voltage	220-230V~,60Hz	220-230V~,60Hz	220-230V~,60Hz
Input Current Fuse		Indoor unit(A)/ outdoor unit(A)	5A	5A	5A
Lines Gauge	Indoor Unit Power Line	Line Quantity	3	3	3
		Line Diameter(AWG)	18/1.0mm²	18/1.0mm²	18/1.0mm²
	Outdoor Unit Power Line	Line Quantity	3	3	3
		Line Diameter(AWG)	12/4.0mm²	10/6.0mm²	10/6.0mm²
	Outdoor-Indoor Signal Line	Lines Quantity	2	2	2
		Line Diameter(AWG)	18/1.0mm²	18/1.0mm²	18/1.0mm²
	Thermostat Signal Line	Lines Quantity	4	4	4
		Line Diameter(AWG)	18/1.0mm²	18/1.0mm²	18/1.0mm²

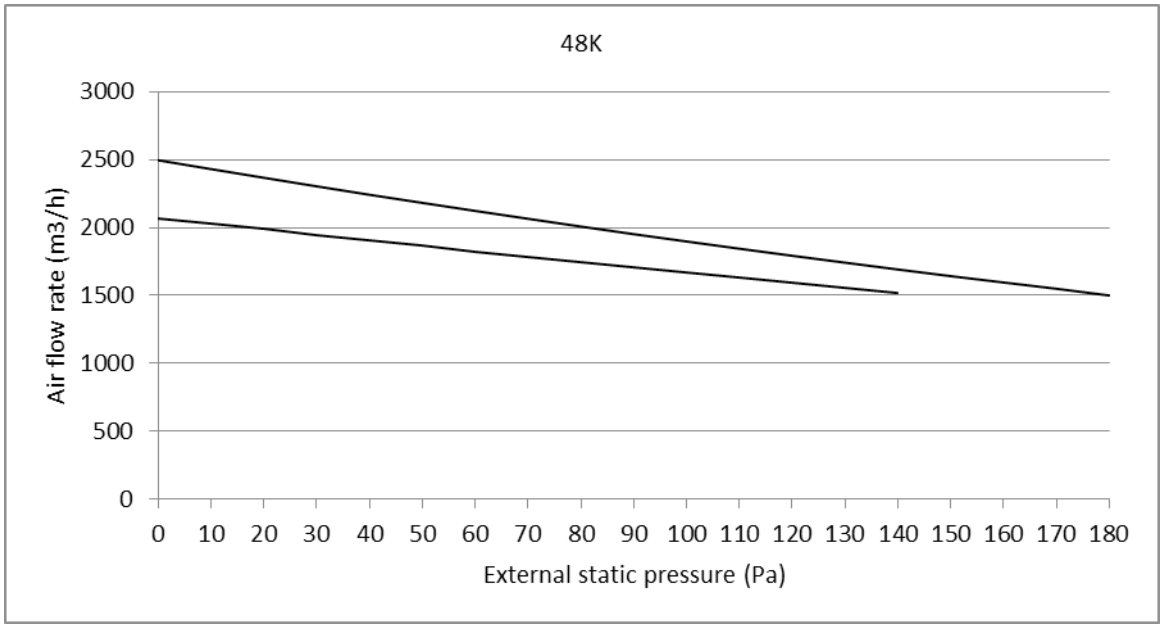
Type (Cooling only)			36000 Btu/h	48000 Btu/h	60000 Btu/h
Power	Indoor unit	Phase	1 - Phase	1 - Phase	1 - Phase
		Frequency and Voltage	220-230V~,60Hz	220-230V~,60Hz	220-230V~,60Hz
	Outdoor unit	Phase	3 - Phase	3 - Phase	3 - Phase
		Frequency and Voltage	220-230V~,60Hz	220-230V~,60Hz	220-230V~,60Hz
Input Current Fuse		Indoor unit(A)/ outdoor unit(A)	5A	5A	5A
Lines Gauge	Indoor Unit Power Line	Line Quantity	3	3	3
		Line Diameter(AWG)	18/1.0mm²	18/1.0mm²	18/1.0mm²
	Outdoor Unit Power Line	Line Quantity	5	5	5
		Line Diameter(AWG)	12/4.0mm²	12/4.0mm²	10/6.0mm²
	Outdoor-Indoor Signal Line	Lines Quantity	2	2	2
		Line Diameter(AWG)	18/1.0mm²	18/1.0mm²	18/1.0mm²
	Thermostat Signal Line	Lines Quantity	4	4	4
		Line Diameter(AWG)	18/1.0mm²	18/1.0mm²	18/1.0mm²

10. Static Pressure

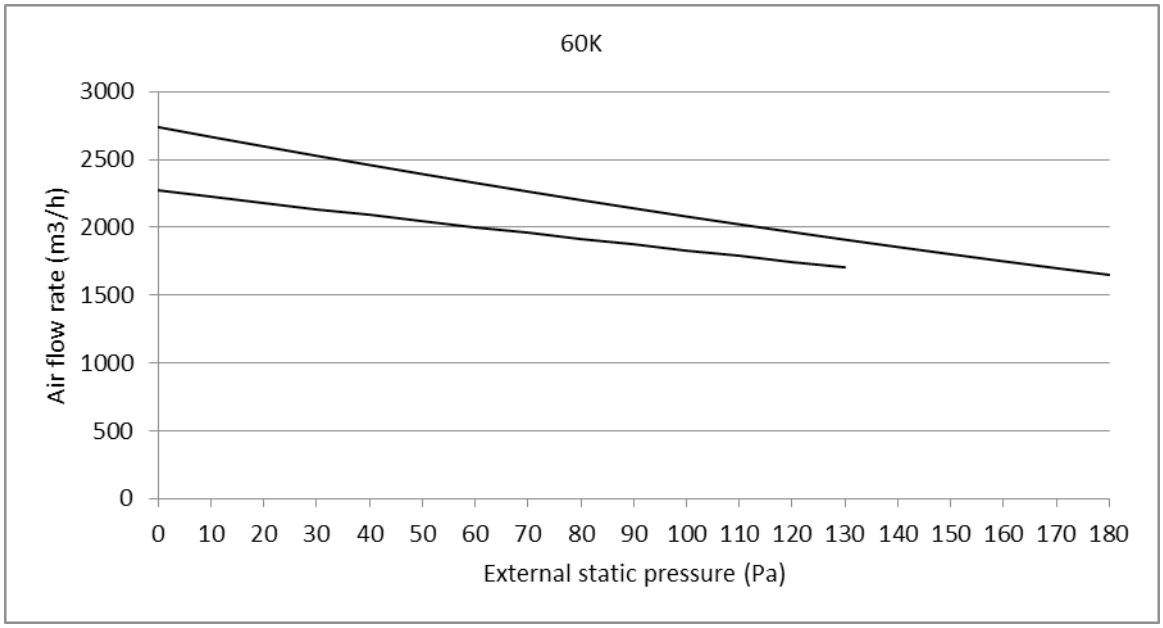
36K



48K



60K


60K
3000
2500
2000
1500
1000
500
0
Air flow rate (m3/h)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
External static pressure (Pa)

Product Features

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1. Operation Modes and Functions

1.1 Abbreviation

Unit element abbreviations

Abbreviation	Element
T1	Indoor room temperature
T2	Coil temperature of evaporator
T5	Compressor discharge temperature

1.2 Safety Features

Compressor three-minute delay at restart

Compressor functions are delayed for up to one minute upon the first startup of the unit, and are delayed for up to three minutes upon subsequent unit restarts.

Phase Check Function(for 3 phase models)

If the phase sequence is detected wrong or lack of 1 or 2 phase, the unit won't start and there is error code displayed on outdoor PCB.

Low Pressure Check Function(for MOV-60CN1-D)

The low pressure switch should be always closed. If it is open, the system will stop until the fault is cleared. During defrosting procedure , 4 minutes after defrosting ends and 5 minutes after compressor is on in heating mode, low pressure switch won't be checked.

Note: The system will not check if the protection could be cleared in 30 seconds after the protection occurs. If this protection occurs 3 times, it won't recover automatically until the main power is cut off.

Over-current protection

When compressor is running, if the current is over twice of the rated for 3 seconds, the compressor will stop and an error code will be displayed on the outdoor PCB. If the current becomes normal, the indoor sends signal to the outdoor, the outdoor will display normally.

Open Circuit/Disconnection Sensor Protection

1.3 Display Function

- There are 3 LEDs on indoor PCB, which can display some information.
- When the unit is powered on, all LED will flash for 1 second. When the unit is standby, LED1 flashes at 0.5 Hz. When the unit is running normally, LED1 will be always on and LED2, LED3 are off.
- When there is an error, LEDs displays as following:

No.	Malfunction	LED1	LED2	LED3
1	Open or short circuit of T2 temperature sensor	Off	flash at 2.5Hz	Off
2	Input signal of wired remote controller	flash at 2.5Hz	Off	flash at 2.5Hz

1.4 Fan

- When AC receives only signal G from wired remote controller, it operates in fan mode.
- When fan mode is activated, the outdoor fan and compressor are stopped, the indoor fan operates continuously

1.5 Cooling Mode

- When AC receives signal G and Y from wired remote controller, it operates in cooling mode.
- When fan mode is activated, the indoor fan operates continuously and compressor is controlled by signal Y.

The outdoor fan runs following the compressor except when AC is in evaporator high temperature protection in heating mode.

1.5.1 Evaporator Temperature Protection

When evaporator temperature drops below a configured value for some time, the compressor and outdoor fan cease operations.

Installation

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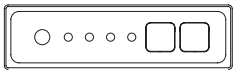
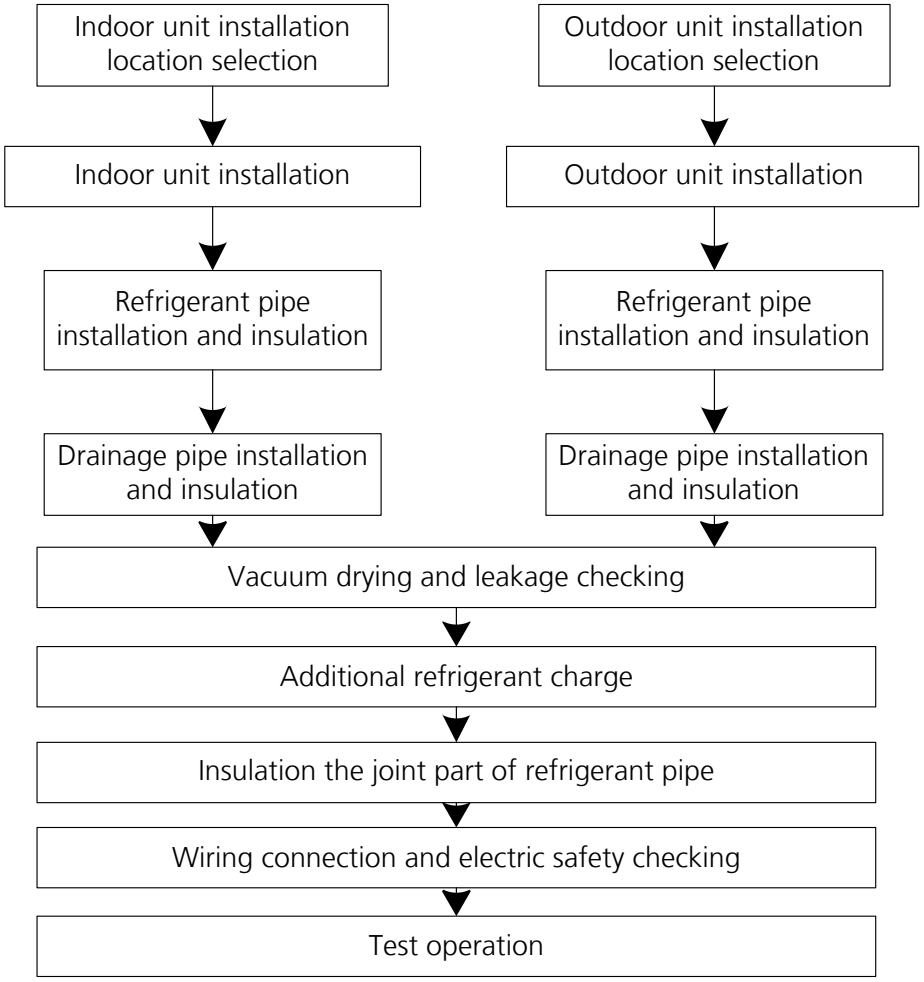
7. Vacuum Drying and Leakage Checking 56
8. Additional Refrigerant Charge 57
9. Engineering of Insulation 58
10. Engineering of Electrical Wiring 59

Accessories

Name	Shape	Quantity
Pass line rubber ring		2
Owner's and Installation manual	-	1
Display panel *Just for testing purposes only		1(on some models)

1. Installation Procedure



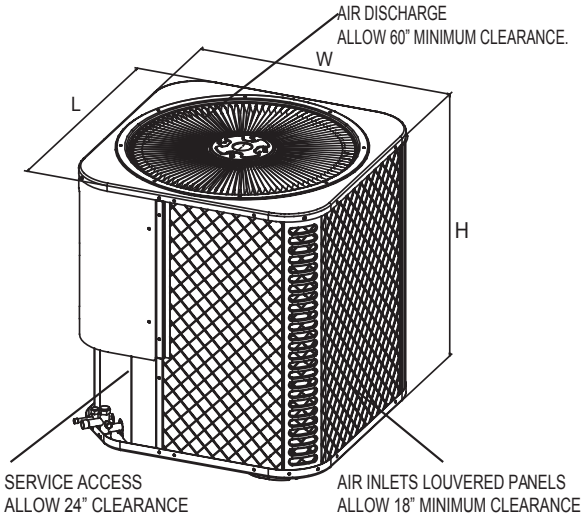
2. Location selection

2.1 Unit location selection can refer to installation manual.

2.2 DO NOT install the unit in the following locations:

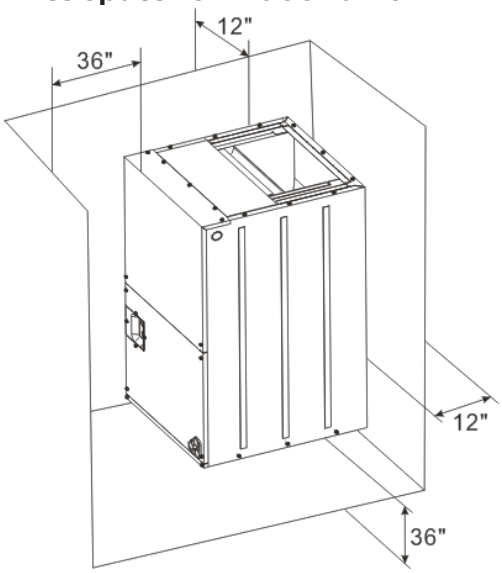
- Where oil drilling or fracking is taking place.
- Coastal areas with high salt content in the air.
- Areas with caustic gases in the air, such as near hot springs.
- Areas with power fluctuations, such as factories.
- Enclosed spaces, such as cabinets.
- Areas with strong electromagnetic waves.
- Areas that store flammable materials or gas.
- Rooms with high humidity, such as bathrooms or laundry rooms.
- If possible, DO NOT install the unit where it is exposed to direct sunlight.

2.3 The minimum distance between the outdoor unit and walls described in the installation guide does not apply to airtight rooms. Be sure to keep the unit unobstructed in at least two of the three directions (M, N, P)

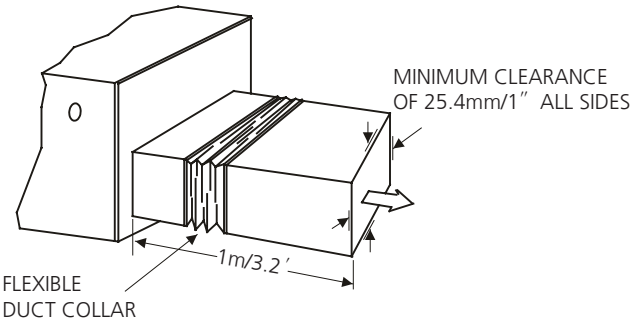


3. Indoor Unit Installation

3.1 Service space for indoor unit

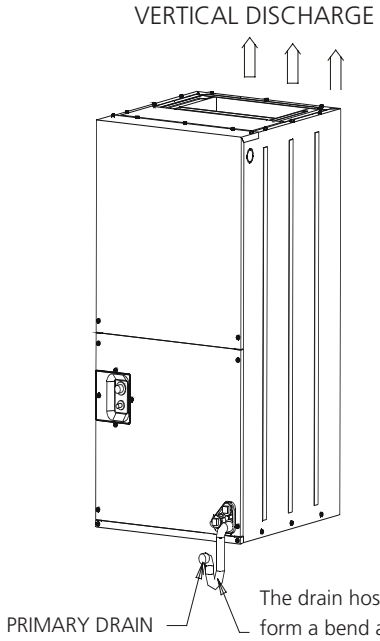


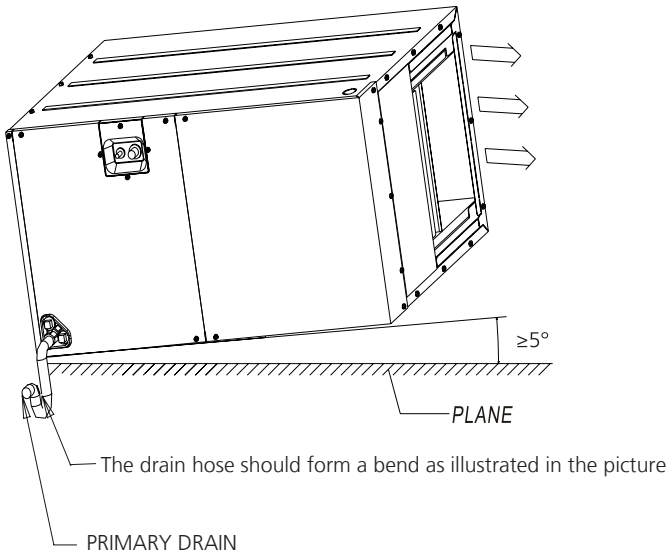
Plenum Clearances:



3.2 Install the main body

You can choose vertical or horizontal installation in accordance with the applications.



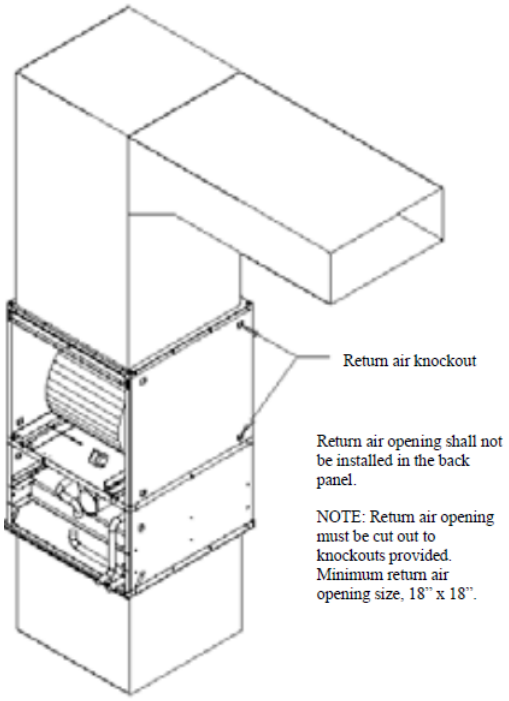


Note: For drain the condensate out of the unit smoothly, please place the unit with a small angle when horizontal installation..

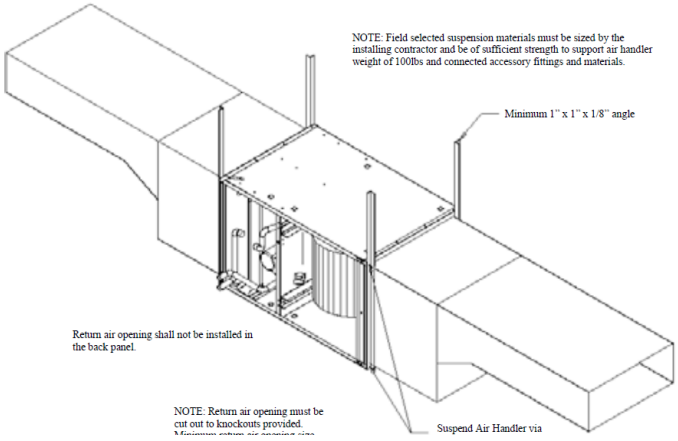
3.3 Install the air duct

Typical air duct design:

1. Vertical Installation

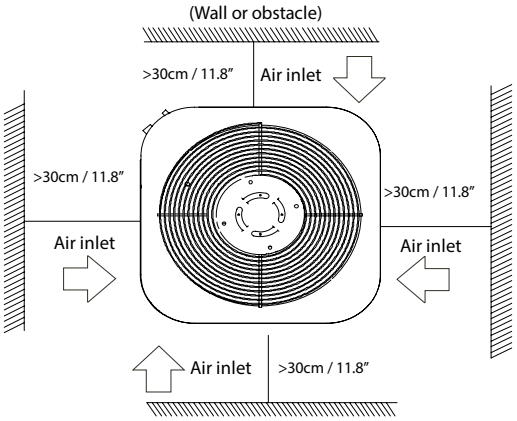


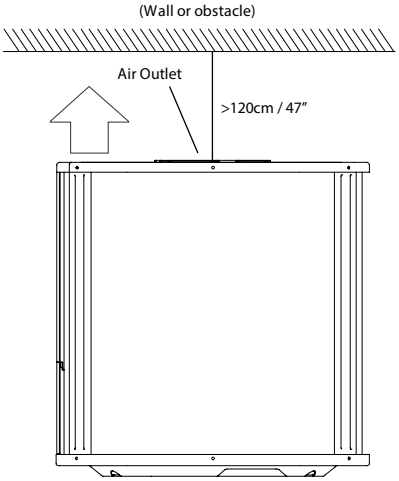
2. Horizontal Installation



4. Outdoor unit installation (Vertical Discharge Unit)

4.1 Service space for outdoor unit





4.2 Install Outdoor Unit

-On ground installation

- The unit may be installed at ground level on a solid base that will not shift or settle, causing strain on the refrigerant lines and possible leaks. Maintain the clearances shown in Fig.5 and install the unit in a level position.
- Normal operating sound levels may be objectionable if the unit is placed directly under windows of certain rooms (bedrooms, study, etc.).
- Top of unit discharge area must be unrestricted for at least 6 feet above the unit.

Warning: The outdoor unit should not be installed in an area where mud or ice could cause personal injury.

Elevate the unit sufficiently to prevent any blockage of the air entrances by snow in areas where there will be snow accumulation. Check the local weather bureau for the expected snow accumulation in your area. Isolate the unit from rain gutters to avoid any possible wash out of the foundation.

-On roof installation

- When installing units on a roof, the structure must be capable of supporting the total weight of the unit, including a padded frame unit, rails, etc., which should be used to minimize the transmission of sound or vibration into the conditioned space.

4.3 Factory-approved tie-down method

IMPORTANT NOTE:

These instructions are intended as a method to tie down systems to cement slabs as a securing procedure for high and windy areas. It is recommended that you check local codes for tie-down methods and protocols.

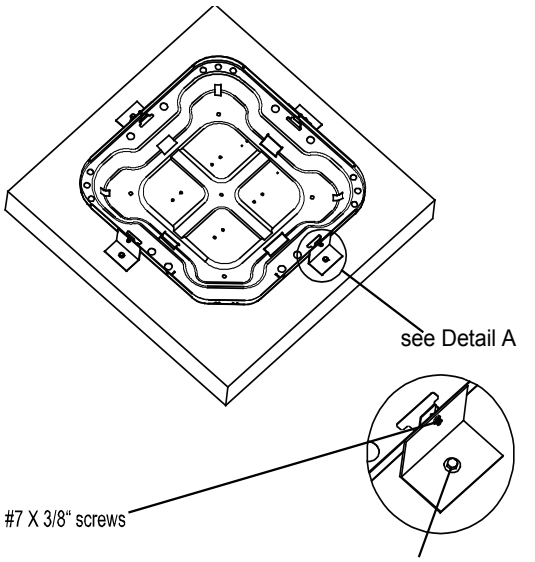
Step 1: Prior to installation, clear the pad of debris.

Step 2: Ensure that the cement pad is level.

IMPORTANT: The cement pad must be composed of HVAC-approved materials and be of the proper thickness to accommodate fasteners.

Step 3: Center unit onto pad.

Step 4: Fasten 4 L-shaped stainless steel braces onto the cabinet base using 4 1/4" * 1/2" hex washer head stainless steel self-tapping screws where indicated by Detail A in following figure.



FACTORY-APPROVED TIE-DOWN METHOD

IMPORTANT:

Do not use screws longer than the indicated 1/4" * 2/3" and make sure that the brace is attached on the center of the base ban as indicated in Fig. 7. Damage to the system may otherwise occur .

Step 5: Drill 4 holes into the cement base ensuring holes are 2 1/2"dp.

Step 6: Assemble unit on cement pad using 4 1/4" * 2" hex washer head cement screws. Make sure not to over-tighten.

Step 7: Finish unit assembly process as indicated in the installation manual.

Required Parts List NOTE: All parts are available through local hardware supplier.	
Description	Quantity
1/4"x3/8" hex washer head concrete screws	4
1/8"x 1-1/2"x W (width of unit +4") metal straps	4
3/8" washers	4

5. Drainage Pipe Installation

Install the drainage pipe as shown below and take measures against condensation. Improperly installation could lead to leakage and eventually wet furniture and belongings.

5.1 Installation principle

- Ensure at least 1/100 slope of the drainage pipe
- Adopt suitable pipe diameter
- Adopt nearby condensate water discharge

5.2 Key points of drainage water pipe installation

1. Considering the pipeline route and elevation.
   - Before installing condensate water pipeline, determine its route and elevation to avoid intersection with other pipelines and ensure slope is straight.
2. Drainage pipe selection
   - The drainage pipe diameter shall not small than the drain hose of indoor unit
   - According to the water flowrate and drainage pipe slope to choose the suitable pipe, the water flowrate is decided by the capacity of indoor unit.

Relationship between water flowrate and capacity of indoor unit

Capacity (kBtu)	Water flowrate (l/h)
36	8
48	12
60	14

According to the above table to calculate the total water flowrate for the confluence pipe selection.

For horizontal drainage pipe (The following table is for reference)

PVC pipe	Reference value of inner diameter of pipe (mm)	Allowable maximum water flowrate (l/h)		Remark
		Slope 1/50	Slope 1/100	
PVC25	20	39	27	For branch pipe
PVC32	25	70	50	
PVC40	31	125	88	Could be used for confluence pipe
PVC50	40	247	175	
PVC63	51	473	334	

Attention: Adopt PVC40 or bigger pipe to be the main pipe.

For Vertical drainage pipe (The following table is for reference)

PVC pipe	Reference value of inner diameter of pipe (mm)	Allowable maximum water flowrate (l/h)	Remark
PVC25	20	220	For branch pipe
PVC32	25	410	
PVC40	31	730	Could be used for confluence pipe
PVC50	40	1440	
PVC63	51	2760	
PVC75	67	5710	
PVC90	77	8280	

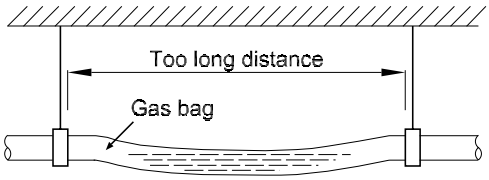
Attention: Adopt PVC40 or bigger pipe to be the main pipe.

3. Individual design of drainage pipe system

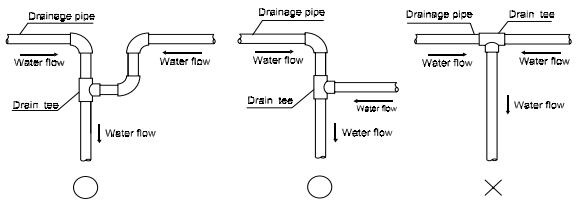
- The drainage pipe of air conditioner shall be installed separately with other sewage pipe, rainwater pipe and drainage pipe in building.
- The drainage pipe of the indoor unit with water pump should be apart from the one without water pump.

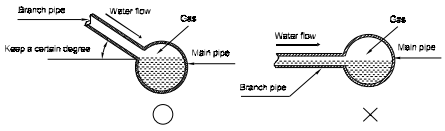
4. Supporter gap of drainage pipe

- In general, the supporter gap of the drainage pipe horizontal pipe and vertical pipe is respectively 1m~1.5m and 1.5m~2.0m.
- Each vertical pipe shall be equipped with not less than two hangers.
- Overlarge hanger gap for horizontal pipe shall create bending, thus leading to air block.



5. The horizontal pipe layout should avoid converse flow or bad flow

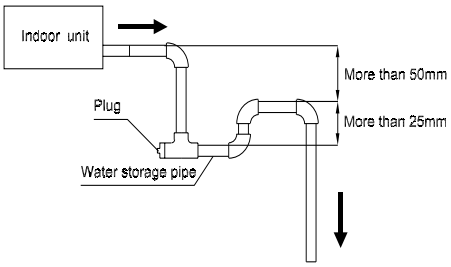




- The correct installation will not cause converse water flow and the slope of the branch pipes can be adjusted freely
- The false installation will cause converse water flow and the slope of the branch pipe can not be adjusted.

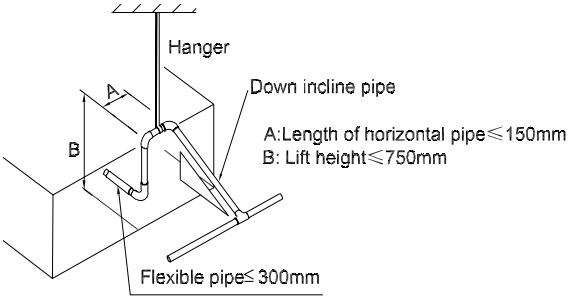
6. Water storage pipe setting

- If the indoor unit has high extra static pressure and without water pump to elevate the condensate water, such as high extra static pressure duct unit , the water storage pipe should be set to avoid converse flow or blow water phenomena.



7. Lifting pipe setting of indoor unit with water pump

- The length of lifting pipe should not exceed 750mm.
- The drainage pipe should be set down inclined after the lifting pipe immediately to avoid wrong operation of water level switch.
- Refer the following picture for installation reference.

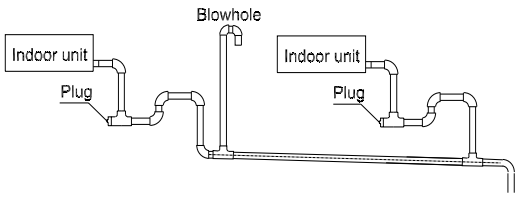


8. Blowhole setting

- For the concentrated drainage pipe system, there should design a blowhole at the highest point of main pipe to ensure the condensate water discharge smoothly.
- The air outlet shall face down to prevent dirt enter-

ing pipe.

- Each indoor unit of the system should be installed it.
- The installation should be considering the convenience for future cleaning.



9. The end of drainage pipe shall not contact with ground directly.

5.4 Insulation work of drainage pipe

Refer the introduction to the insulation engineering parts.

6. Refrigerant Pipe Installation

6.1 Maximum length and drop height

Ensure that the length of the refrigerant pipe, the number of bends, and the drop height between the indoor and outdoor units meets the requirements shown in the following table.

Capacity(kBtu/h)	Max. Length (m/ft)	Max. Elevation (m/ft)
12	15/49	8/26
18~24	25/82	15/49
30~36	30/98.4	20/65.6
42~60	50/164	30/98.4

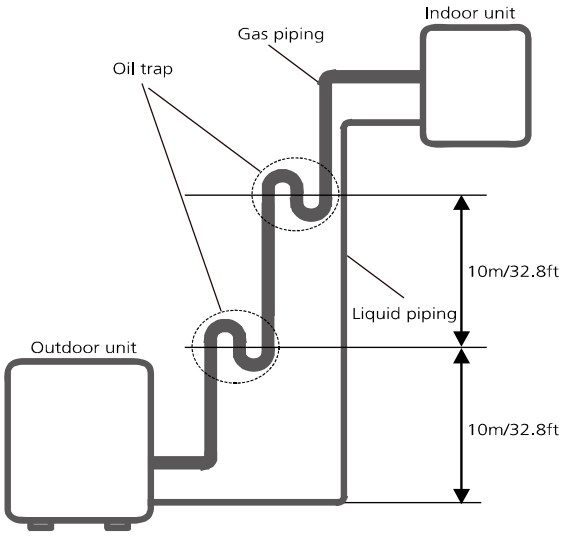
caution:

- The capacity test is based on the standard length and the maximum permissive length is based on the system reliability.
- Oil traps

If the indoor unit is installed higher than the outdoor unit:

-If oil flows back into the outdoor unit's compressor, this might cause liquid compression or deterioration of oil return. Oil traps in the rising gas piping can prevent this.

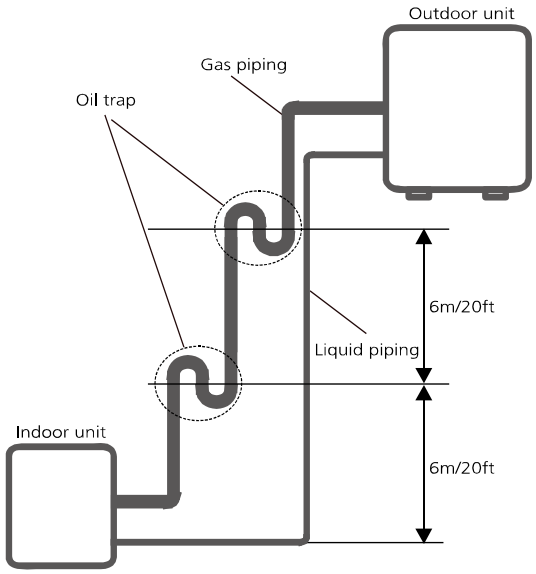
An oil trap should be installed every 10m(32.8ft) of vertical suction line riser.



The indoor unit is installed higher than the outdoor unit

If the outdoor unit is installed higher than the indoor unit:

-It is recommended that vertical suction risers not be upsized. Proper oil return to the compressor should be maintained with suction gas velocity. If velocities drop below 7.62m/s(1500fpm (feet per minute)), oil return will be decreased. An oil trap should be installed every 6m(20ft) of vertical suction line riser.



The outdoor unit is installed higher than the indoor unit.

5.2 The procedure of connecting pipes

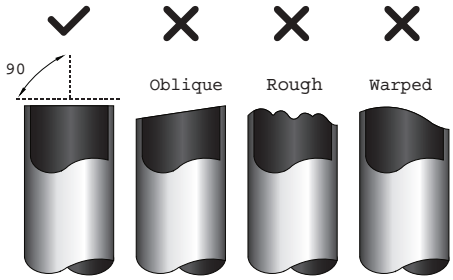
1.Choose the pipe size according to the specification table.

2.Confirm the cross way of the pipes.

3.Measure the necessary pipe length.

4.Cut the selected pipe with pipe cutter

- Make the section flat and smooth.

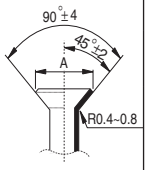


5. Insulate the copper pipe

- Before test operation, the joint parts should not be heat insulated.

6. Flare the pipe

- Insert a flare nut into the pipe before flaring the pipe
- According to the following table to flare the pipe.

Pipe diameter (inch(mm))	Flare dimension A (mm/inch)		Flare shape
	Min	Max	
1/4" (6.35)	8.3/0.3	8.3/0.3	
3/8" (9.52)	12.4/0.48	12.4/0.48	
1/2" (12.7)	15.4/0.6	15.8/0.6	
5/8" (15.9)	18.6/0.7	19/0.74	
3/4" (19)	22.9/0.9	23.3/0.91	
7/8" (22)	27/1.06	27.3/1.07	

- After flared the pipe, the opening part must be seal by end cover or adhesive tape to avoid duct or exogenous impurity come into the pipe.

7. Drill holes if the pipes need to pass the wall.

8. According to the field condition to bend the pipes so that it can pass the wall smoothly.

9. Bind and wrap the wire together with the insulated pipe if necessary.

10. Set the wall conduit

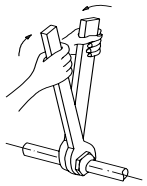
11. Set the supporter for the pipe.

12. Locate the pipe and fix it by supporter

- For horizontal refrigerant pipe, the distance between supporters should not be exceed 1m.
- For vertical refrigerant pipe, the distance between supporters should not be exceed 1.5m.

13. Connect the pipe to indoor unit and outdoor unit by using two spanners.

- Be sure to use two spanners and proper torque to fasten the nut, too large torque will damage the bellmouthing, and too small torque may cause leakage. Refer the following table for different pipe connection.

Pipe Diameter	Torque N.m(lb.ft)	Sketch map
1/4" (6.35)	15~16 (11~11.8)	
3/8" (9.52)	25~26 (18.4~19.18)	
1/2" (12.7)	35~36 (25.8~26.55)	
5/8" (15.9)	45~47 (33.19~34.67)	
3/4" (19)	65~67 (47.94~49.42)	
7/8" (22)	75-85 (55.3-62.7)	

7. Vacuum Drying and Leakage Checking

7.1 Purpose of vacuum drying

- Eliminating moisture in system to prevent the phenomena of ice-blockage and copper oxidation.

  Ice-blockage shall cause abnormal operation of system, while copper oxide shall damage compressor.

- Eliminating the non-condensable gas (air) in system to prevent the components oxidizing, pressure fluctuation and bad heat exchange during the operation of system.

7.2 Selection of vacuum pump

- The ultimate vacuum degree of vacuum pump shall be -756mmHg or above.
- Precision of vacuum pump shall reach 0.02mmHg or above.

7.3 Operation procedure for vacuum drying

Due to different construction environment, two kinds of vacuum drying ways could be chosen, namely ordinary vacuum drying and special vacuum drying.

7.3.1 Ordinary vacuum drying

1. When conduct first vacuum drying, connect pressure gauge to the infusing mouth of gas pipe and liquid pipe, and keep vacuum pump running for 1hour (vacuum degree of vacuum pump shall be reached -755mmHg).

2. If the vacuum degree of vacuum pump could not reach -755mmHg after 1 hour of drying, it indicates that there is moisture or leakage in pipeline system and need to go on with drying for half an hour.

3. If the vacuum degree of vacuum pump still could not reach -755mmHg after 1.5 hours of drying, check whether there is leakage source.

4 . Leakage test: After the vacuum degree reaches -755mmHg, stop vacuum drying and keep the pressure for 1 hour. If the indicator of vacuum gauge does not go up, it is qualified. If going up, it indicates that there is moisture or leak source.

7.3.2 Special vacuum drying

The special vacuum drying method shall be adopted when:

1. Finding moisture during flushing refrigerant pipe.

2. Conducting construction on rainy day, because rain water might penetrated into pipeline.

3. Construction period is long, and rain water might penetrated into pipeline.

4. Rain water might penetrate into pipeline during construction.

Procedures of special vacuum drying are as follows:

1. Vacuum drying for 1 hour.

2. Vacuum damage, filling nitrogen to reach 0.5Kgf/cm2 .

Because nitrogen is dry gas, vacuum damage could achieve the effect of vacuum drying, but this method could not achieve drying thoroughly when there is too much moisture. Therefore, special attention shall be drawn to prevent the entering of water and the formation of condensate water.

3. Vacuum drying again for half an hour.

If the pressure reached -755mmHg, start to pressure leakage test. If it cannot reached the value, repeat vacuum damage and vacuum drying again for 1 hour.

4. Leakage test: After the vacuum degree reaches -755mmHg, stop vacuum drying and keep the pressure for 1 hour. If the indicator of vacuum gauge does not go up, it is qualified. If going up, it indicates that there is moisture or leak source.

8. Additional Refrigerant Charge

- After the vacuum drying process is carried out, the additional refrigerant charge process need to be performed.
- The outdoor unit is factory charged with refrigerant. The additional refrigerant charge volume is decided by the diameter and length of the liquid pipe between indoor and outdoor unit. Refer the following formula to calculate the charge volume.

Diameter of liquid pipe (mm)	Formula
6.35	V=30g/m×(L-5)
9.52	V=65g/m×(L-5)
12.7	V=115g/m×(L-5)

V: Additional refrigerant charge volume (g).

L : The length of the liquid pipe (m).

Note:

- Refrigerant may only be charged after performed the vacuum drying process.
- Always use gloves and glasses to protect your hands and eyes during the charge work.
- Use electronic scale or fluid infusion apparatus to weight refrigerant to be recharged. Be sure to avoid extra refrigerant charged, it may cause liquid hammer of the compressor or protections.
- Use supplementing flexible pipe to connect refrigerant cylinder, pressure gauge and outdoor unit. And The refrigerant should be charged in liquid state. Before recharging, The air in the flexible pipe and manifold gauge should be exhausted.
- After finished refrigerant recharge process, check whether there is refrigerant leakage at the connection joint part.(Using gas leakage detector or soap water to detect).

9. Engineering of Insulation

9.1 Insulation of refrigerant pipe

1. Operational procedure of refrigerant pipe insulation

Cut the suitable pipe → insulation (except joint section) → flare the pipe → piping layout and connection→ vacuum drying → insulate the joint parts

2. Purpose of refrigerant pipe insulation

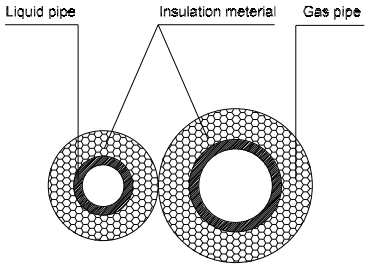
- During operation, temperature of gas pipe and liquid pipe shall be over-heating or over-cooling extremely. Therefore, it is necessary to carry out insulation; otherwise it shall debase the performance of unit and burn compressor.
- Gas pipe temperature is very low during cooling. If insulation is not enough, it shall form dew and cause leakage.
- Temperature of gas pipe is very high (generally 50-100℃) during heating. Insulation work must be carried out to prevent hurt by carelessness touching.

3. Insulation material selection for refrigerant pipe

- The burning performance should over 120℃
- According to the local law to choose insulation materials
- The thickness of insulation layer shall be above 10mm.If in hot or wet environment place, the layer of insulation should be thicker accordingly.

4. Installation highlights of insulation construction

- Gas pipe and liquid pipe shall be insulated separately, if the gas pipe and liquid pipe were insulated together; it will decrease the performance of air conditioner.



- The insulation material at the joint pipe shall be 5~10cm longer than the gap of the insulation material.
- The insulation material at the joint pipe shall be inserted into the gap of the insulation material.
- The insulation material at the joint pipe shall be banded to the gap pipe and liquid pipe tightly.
- The linking part should be use glue to paste together
- Be sure not bind the insulation material over-tight, it may extrude out the air in the material to cause bad

insulation and cause easy aging of the material.

9.2 Insulation of drainage pipe

1. Operational procedure of refrigerant pipe insulation

Select the suitable pipe → insulation (except joint section) → piping layout and connection→ drainage test→ insulate the joint parts

2. Purpose of drainage pipe insulation

The temperature of condensate drainage water is very low. If insulation is not enough, it shall form dew and cause leakage to damage the house decoration.

3. Insulation material selection for drainage pipe

- The insulation material should be flame retardant material, the flame retardancy of the material should be selected according to the local law.
- Thickness of insulation layer is usually above 10mm.
- Use specific glue to paste the seam of insulation material, and then bind with adhesive tape. The width of tape shall not be less than 5cm. Make sure it is firm and avoid dew.

4. Installation and highlights of insulation construction

- The single pipe should be insulated before connecting to another pipe, the joint part should be insulated after the drainage test.
- There should be no insulation gap between the insulation material.

10. Engineering of Electrical Wiring

1. Highlights of electrical wiring installation

- All field wiring construction should be finished by qualified electrician.
- Air conditioning equipment should be grounded according to the local electrical regulations.
- Current leakage protection switch should be installed.
- Do not connect the power wire to the terminal of signal wire.
- When power wire is parallel with signal wire, put wires to their own wire tube and remain at least 300mm gap.
- According to table in indoor part named "the specification of the power" to choose the wiring, make sure the selected wiring not small than the date showing in the table.
- Select different colors for different wire according to relevant regulations.
- Do not use metal wire tube at the place with acid or alkali corrosion, adopt plastic wire tube to replace it.
- There must be not wire connect joint in the wire tube If joint is a must, set a connection box at the place.
- The wiring with different voltage should not be in one wire tube.
- Ensure that the color of the wires of outdoor and the terminal No. are same as those of indoor unit respectively.
- You must first choose the right cable size before preparing it for connection. Be sure to use H07RN-F cables.

Table: Minimum Cross-Sectional Area able of Power and Signal Cables

Rated Current of Appliance (A)	Nominal Cross-Sectional Area(mm^2)
≤ 6	0.75
6 - 10	1
10 - 16	1.5
16 - 25	2.5
25 - 32	4
32 - 45	6

11. Test Operation

1. The test operation must be carried out after the entire installation has been completed.

2. Please confirm the following points before the test operation.

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

3. Test operation

1. Open both the liquid and gas stop valves.

2. Turn on the main power switch and allow the unit to warm up.

3. Set the air conditioner to COOL mode, and check the following points.

Indoor unit

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

Outdoor unit

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

4. Drainage Test

a. Ensure the drainpipe flows smoothly. New buildings should perform this test before finishing the ceiling.

b. Remove the test cover. Add 2000ml of water to the tank through the attached tube.

c. Turn on the main power switch and run the air conditioner in COOL mode.

d. Listen to the sound of the drain pump to see if it makes any unusual noises.

e. Check to see that the water is discharged. It may take up to one minute before the unit begins to drain depending on the drainpipe.

f. Make sure that there are no leaks in any of the piping.

g. Stop the air conditioner. Turn off the main power switch and reinstall the test cover.

Static Pressure Design

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2. Charts for friction losses in round ducts 47
3. Dynamic losses 48
4. Corresponding relation between Rectangular duct and Round duct 49
5. Method for duct calculation 50
6. Unit conversion 50
7. Recommended outlet velocity for different occasions 50

1. Introduction

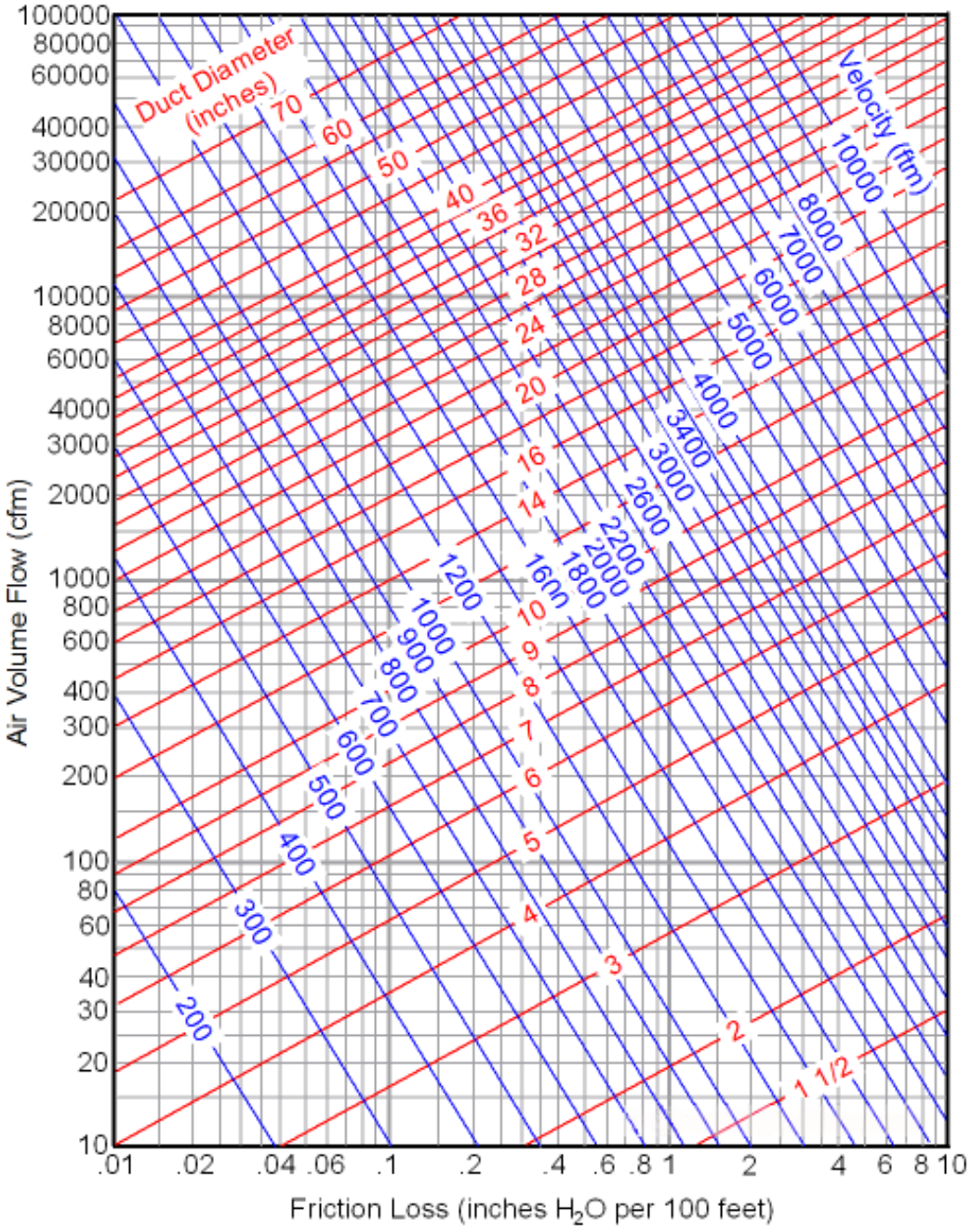
Duct system losses are the irreversible transformation of mechanical energy into heat. The two types of losses are (1) friction losses and (2) dynamic losses.

Friction losses are due to fluid viscosity and result from momentum exchange between molecules (in laminar flow) or between individual particles of adjacent fluid layers moving at different velocities (in turbulent flow). Friction losses occur along the entire duct length.

Dynamic losses result from flow disturbances caused by duct mounted equipment and fittings (e.g., entries, exits, elbows, transitions, and junctions) that change the airflow path's direction or area.

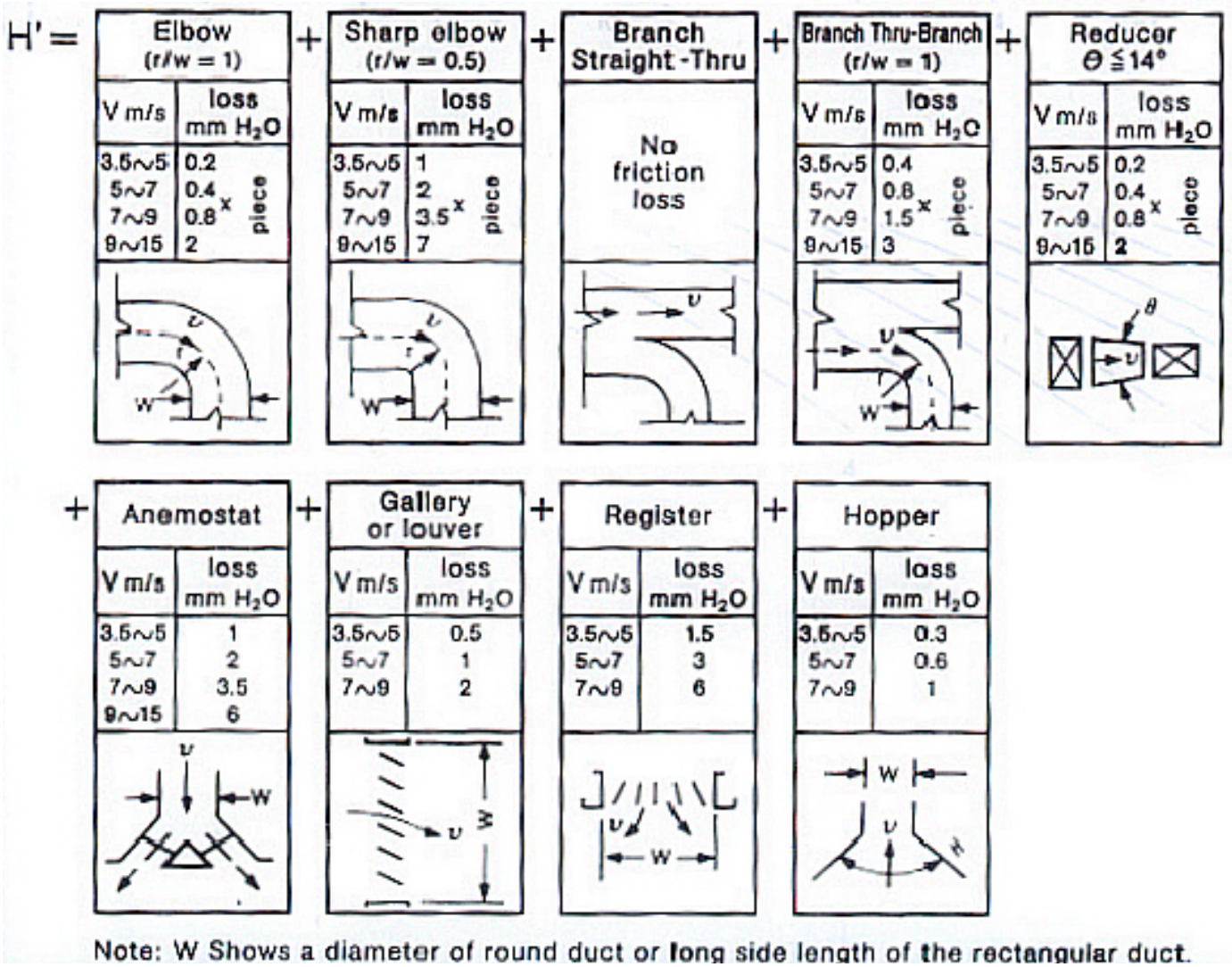
2. Charts for friction losses in round ducts

Fluid resistance caused by friction in round ducts can be determined by the friction chart. (based on galvanized sheet)



3. Dynamic losses

For dynamic losses, please refer to below image.



Note: W Shows a diameter of round duct or long side length of the rectangular duct.

4. Corresponding relation between Rectangular duct and Round duct

Circular Duct Diameter, in.	Length of One Side of Rectangular Duct a, in.																			
	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30	32	34	36
	Length Adjacent Side of Rectangular Duct b, in.																			
5	5																			
5.5	6	5																		
6	8	6																		
6.5	9	7	6																	
7	11	8	7																	
7.5	13	10	8	7																
8	15	11	9	8																
8.5	17	13	10	9																
9	20	15	12	10	8															
9.5	22	17	13	11	9															
10	25	19	15	12	10	9														
10.5	29	21	16	14	12	10														
11	32	23	18	15	13	11	10													
11.5		26	20	17	14	12	11													
12		29	22	18	15	13	12													
12.5		32	24	20	17	15	13													
13		35	27	22	18	16	14	12												
13.5		38	29	24	20	17	15	13												
14			32	26	22	19	17	14												
14.5			35	28	24	20	18	15												
15			38	30	25	22	19	16	14											
16			45	36	30	25	22	18	15											
17				41	34	29	25	20	17	16										
18				47	39	33	29	23	19	17										
19				54	44	38	33	26	22	19	18									
20					50	43	37	29	24	21	19									
21					57	48	41	33	27	23	20									
22					64	54	46	36	30	26	23	20								
23						60	51	40	33	28	25	22								
24						66	57	44	36	31	27	24	22							
25							63	49	40	34	29	26	24							
26							69	54	44	37	32	28	26	24						
27							76	59	48	40	35	31	28	25						
28								64	52	43	38	33	30	27	26					
29								70	56	47	41	36	32	29	27					
30								76	61	51	44	39	35	31	29	28				
31								82	66	55	47	41	37	34	31	29				
32								89	71	59	51	44	40	36	33	31				
33								96	76	64	54	48	42	38	35	33	30			
34									82	68	58	51	45	41	37	35	32			
35									88	73	62	54	48	44	40	37	34	32		
36									95	78	67	58	51	46	42	39	36	34		
37									101	83	71	62	55	49	45	41	38	36	34	
38									108	89	76	66	58	52	47	44	40	38	36	
39										95	80	70	62	55	50	46	43	40	37	36
40										101	85	74	65	58	53	49	45	42	39	37
41										107	91	78	69	62	56	51	47	44	41	39
42										114	96	83	73	65	59	54	50	46	44	41
43										120	102	88	77	69	62	57	53	49	46	43
44											107	93	81	73	66	60	55	51	48	45
45											113	98	86	76	69	63	58	54	50	47
46											120	103	90	80	72	66	61	56	53	49
47											126	108	95	84	76	69	64	59	55	52
48											133	114	100	89	80	73	67	62	58	54
49											140	120	105	93	84	76	70	65	60	56
50											147	126	110	98	88	80	73	68	63	59
51												132	115	102	92	83	76	71	66	61
52												139	121	107	96	87	80	74	69	64
53												145	127	112	100	91	83	77	71	67
54												152	133	117	105	95	87	80	74	70
55													139	123	110	99	91	84	78	72
56													145	128	114	104	95	87	81	75
57													151	134	119	108	98	91	84	78
58													158	139	124	112	102	94	87	81
59													165	145	130	117	107	98	91	85
60													172	151	135	122	111	102	94	88

5. Method for duct calculation (equal friction method)

1)Draw schematic view of the duct system.

1)Make notes for air volume and mark clearly the elbow, the branch parts, the air discharge outlet.

1)Select one main ducting route (where the maximum static pressure loss occurs).

1)Select the air velocity for the main duct in accordance with the desirable air velocity.

	Typical design velocity (m/s)		
Main duct	Residence	Public building	Factory
	3.5~6.0	5.0~8.0	6.0~11.0

1)Since the velocity and air volume are fixed for main duct, then use the Friction loss chart to find standard friction loss.

1)Use air volume and friction loss to find corresponding duct size and velocity for each part of main duct through frictions loss chart.

1)Find the dynamic loss of main ducting route according to the velocity. and type of special fittings (elbows, junctions, regulating flaps, etc.)

1)Obtain the duct size and velocity of each branch duct based on the air volume and the same standard friction loss as for the main duct.

1)Find the dynamic loss of branch duct.

1)Calculate the total pressure loss.

6. Unit conversion

- 1 inch water=248.8 N/m^2 (Pa)=0.0361 lb/in^2 (psi)=25.4 kg/cm^2=0.0739 in mercury
- 1 ft^3/min (cfm)=1.7 m^3/h
- 1 ft/min=5.08*10-3 m/s
- 1 inch=2.54 cm=0.0254m=0.08333ft

7. Recommended outlet velocity for different occasion

The permissible sound level and correspondingly maximum air velocity, is determined by the occasion.

Noise / dB(A)	Occasion	Maximum velocity / m/s
25	Studio, recording room	2
35	Cinema, hospital, library	3
40	Office, school, hotel	4
46	Bank, public hall	5
50	Store, post office	6
70	Factory	10

Troubleshooting

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1. General Troubleshooting

1.1 Error Display (Indoor Unit)

When the indoor unit encounters a recognized error, the indicator light will flash in a corresponding series, the timer display may turn on or begin flashing, and an error code will be displayed. These error codes are described in the following table:

LED1	LED2	LED3	Error Information	Solution
OFF	FLASH	OFF	T2 temperature sensor open or short circuit	Page 60
FLASH	OFF	FLASH	Wire control input error	-

For other errors:

The display board may show a garbled code or a code undefined by the service manual. Ensure that this code is not a temperature reading.

Troubleshooting:

Test the unit using the remote control. If the unit does not respond to the remote, the indoor PCB requires replacement. If the unit responds, the display board requires replacement.

1.2 Error Display (Outdoor Unit Excluding MOV-48CN1-N)

LED1	LED2	LED3	Error Information	Solution
FLASH	OFF	OFF	Phase sequence	Page 61
FLASH	OFF	OFF	Lack of phase(A,B)	Page 62
OFF	OFF	OFF	Lack of phase(C)	Page 62
FLASH	FLASH	OFF	Protection of low pressure(only for MOV-60CN1-D)	Page 64
OFF	OFF	FLASH	Overload current protection	Page 63
OFF	FLASH	OFF	High temperature or protection of high pressure(only for MOV-60CN1-D)	Page 64

2. Error Diagnosis and Troubleshooting Without Error Code

WARNING

Be sure to turn off unit before any maintenance to prevent damage or injury.

2.1 Remote maintenance

SUGGESTION: When troubles occur, please check the following points with customers before field maintenance.

	Problem	Solution
1	Unit will not start	Page 55-56
2	The power switch is on but fans will not start	Page 55-56
3	The temperature on the display board cannot be set	Page 55-56
4	Unit is on but the wind is not cold(hot)	Page 55-56
5	Unit runs, but shortly stops	Page 55-56
6	The unit starts up and stops frequently	Page 55-56
7	Unit runs continuously but insufficient cooling(heating)	Page 55-56
8	Cool can not change to heat	Page 55-56
9	Unit is noisy	Page 55-56

2.2 Field maintenance

	Problem	Solution
1	Unit will not start	Page 57-58
2	Compressor will not start but fans run	Page 57-58
3	Compressor and condenser (outdoor) fan will not start	Page 57-58
4	Evaporator (indoor) fan will not start	Page 57-58
5	Condenser (Outdoor) fan will not start	Page 57-58
6	Unit runs, but shortly stops	Page 57-58
7	Compressor short-cycles due to overload	Page 57-58
8	High discharge pressure	Page 57-58
9	Low discharge pressure	Page 57-58
10	High suction pressure	Page 57-58
11	Low suction pressure	Page 57-58
12	Unit runs continuously but insufficient cooling	Page 57-58
13	Too cool	Page 57-58
14	Compressor is noisy	Page 57-58
15	Horizontal louver can not revolve	Page 57-58

1.Remote Maintenance	Electrical Circuit							Refrigerant Circuit						
Possible causes of trouble	Power failure	The main power tripped	Loose connections	Faulty transformer	The voltage is too high or too low	The remote control is powered off	Broken remote control	Dirty air filter	Dirty condenser fins	The setting temperature is higher/lower than the room's(cooling/heating)	The ambient temperature is too high/low when the mode is cooling/heating	Fan mode	SILENCE function is activated(optional function)	Frosting and defrosting frequently
Unit will not start	☆	☆	☆	☆										
The power switch is on but fans will not start			☆	☆	☆									
The temperature on the display board cannot be set						☆	☆							
Unit is on but the wind is not cold(hot)										☆	☆	☆		
Unit runs, but shortly stops					☆					☆	☆			
The unit starts up and stops frequently					☆						☆			☆
Unit runs continuously but insufficient cooling(heating)								☆	☆	☆	☆		☆	
Cool can not change to heat														
Unit is noisy														
Test method / remedy	Test voltage	Close the power switch	Inspect connections - tighten	Change the transformer	Test voltage	Replace the battery of the remote control	Replace the remote control	Clean or replace	Clean	Adjust the setting temperature	Turn the AC later	Adjust to cool mode	Turn off SILENCE function.	Turn the AC later

Others

Heavy load condition							☆			Check heat load
Loosen hold down bolts and / or screws									☆	Tighten bolts or screws
Bad airproof							☆			Close all the windows and doors
The air inlet or outlet of either unit is blocked						☆	☆			Remove the obstacles
Interference from cell phone towers and remote boosters		☆								Reconnect the power or press **ON/OFF** button on remote control to restart
Shipping plates remain attached									☆	Remove them

2.Field Maintenance	Electrical Circuit														
Possible causes of trouble	Power failure	Blown fuse or varistor	Loose connections	Shorted or broken wires	Safety device opens	Faulty thermostat / room temperature sensor	Wrong setting place of temperature sensor	Faulty transformer	Shorted or open capacitor	Faulty magnetic contactor for compressor	Faulty magnetic contactor for fan	Low voltage	Faulty stepping motor	Shorted or grounded compressor	Shorted or grounded fan motor
Unit will not start	☆	☆	☆	☆	☆			☆							
Compressor will not start but fans run				☆		☆			☆	☆				☆	
Compressor and condenser (outdoor) fan will not start				☆		☆				☆					
Evaporator (indoor) fan will not start				☆					☆		☆				☆
Condenser (Outdoor) fan will not start				☆		☆			☆		☆				☆
Unit runs, but shortly stops										☆		☆			
Compressor short-cycles due to overload										☆		☆			
High discharge pressure															
Low discharge pressure															
High suction pressure															
Low suction pressure															
Unit runs continuously but insufficient cooling															
Too cool						☆	☆								
Compressor is noisy															
Horizontal louver can not revolve			☆	☆									☆		
Test method / remedy	Test voltage	Inspect fuse type & size	Inspect connections - tighten	Test circuits with tester	Test continuity of safety device	Test continuity of thermostat / sensor & wiring	Place the temperature sensor at the central of the air inlet grille	Check control circuit with tester	Check capacitor with tester	Test continuity of coil & contacts	Test continuity of coil & contacts	Test voltage	Replace the stepping motor	Check resistance with multimeter	Check resistance with multimeter

Refrigerant Circuit	Compressor stuck		☆														Replace the compressor
	Shortage of refrigerant						☆	☆		☆		☆	☆				Leak test
	Restricted liquid line						☆					☆	☆				Replace restricted part
	Dirty air filter											☆	☆				Clean or replace
	Dirty evaporator coil											☆	☆				Clean coil
	Insufficient air through evaporator coil											☆	☆				Check fan
	Overcharge of refrigerant						☆	☆	☆		☆				☆		Change charged refrigerant volume
	Dirty or partially blocked condenser						☆	☆	☆				☆				Clean condenser or remove obstacle
	Air or incompressible gas in refrigerant cycle								☆				☆				Purge, evacuate and recharge
	Short cycling of condensing air								☆				☆				Remove obstruction to air flow
	High temperature condensing medium								☆								Remove obstruction in air or water flow
	Insufficient condensing medium								☆								Remove obstruction in air or water flow
	Broken compressor internal parts														☆		Replace compressor
	Inefficient compressor									☆	☆		☆				Test compressor efficiency
	Expansion valve obstructed											☆					Replace valve
	Expansion valve or capillary tube closed completely						☆					☆					Replace valve
	Leaking power element on expansion valve						☆					☆					Replace valve
	Poor installation of feeler bulb										☆						Fix feeler bulb
Others	Heavy load condition										☆		☆				Check heat load
	Loosen hold down bolts and / or screws														☆		Tighten bolts or screws
	Shipping plates remain attached														☆		Remove them
	Poor choices of capacity												☆				Choose AC of lager capacity or add the number of AC
	Contact of piping with other piping or external plate														☆		Rectify piping so as not to contact each other or with external plate

3. Troubleshooting

3.1 Common Check Procedures

3.1.1 Temperature Sensor Check

Disconnect the temperature sensor from PCB, measure the resistance value with a tester.

Temperature Sensors.

Room temp.(T1) sensor,

Indoor coil temp.(T2) sensor,

Outdoor coil temp.(T3) sensor,

Outdoor ambient temp.(T4) sensor,

Compressor discharge temp.(Tp) sensor.

Measure the resistance value of each winding by using the multi-meter.

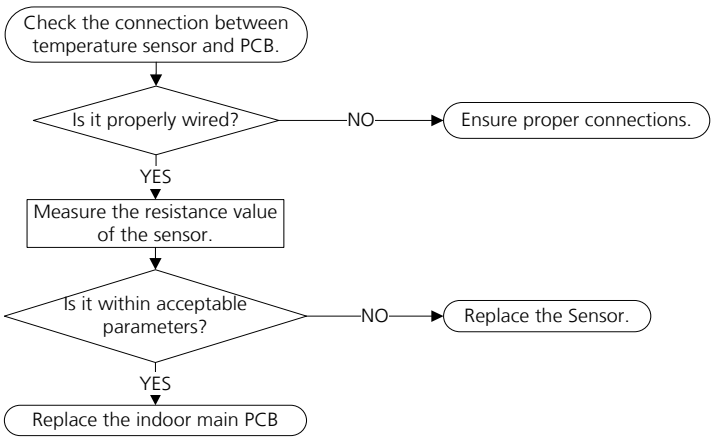
3.2 Open circuit or short circuit of temperature sensor diagnosis and solution

Description: If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED will display the failure.

Recommended parts to prepare:

- Wiring mistake
- Faulty sensor
- Faulty PCB

Troubleshooting and repair:



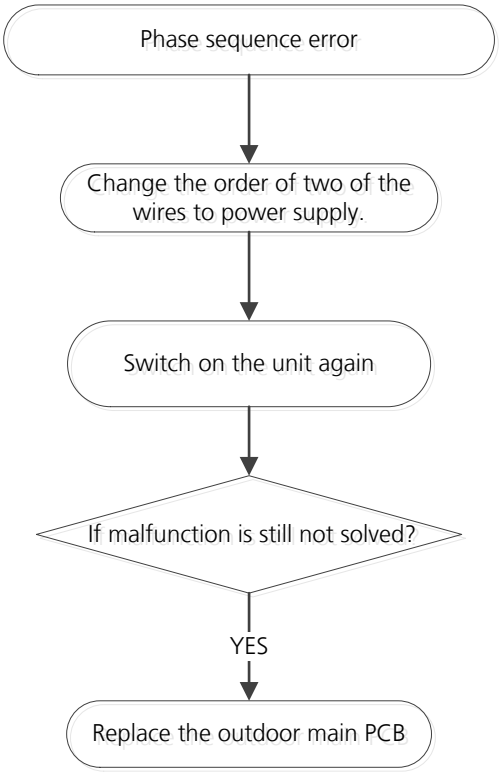
3.3 Phase sequence error diagnosis and solution

Description: Outdoor PCB detects the wrong phase sequence of 3-phase power supply.

Recommended parts to prepare:

- Wiring mistake of 3-phase power supply
- Faulty outdoor PCB

Troubleshooting and repair:



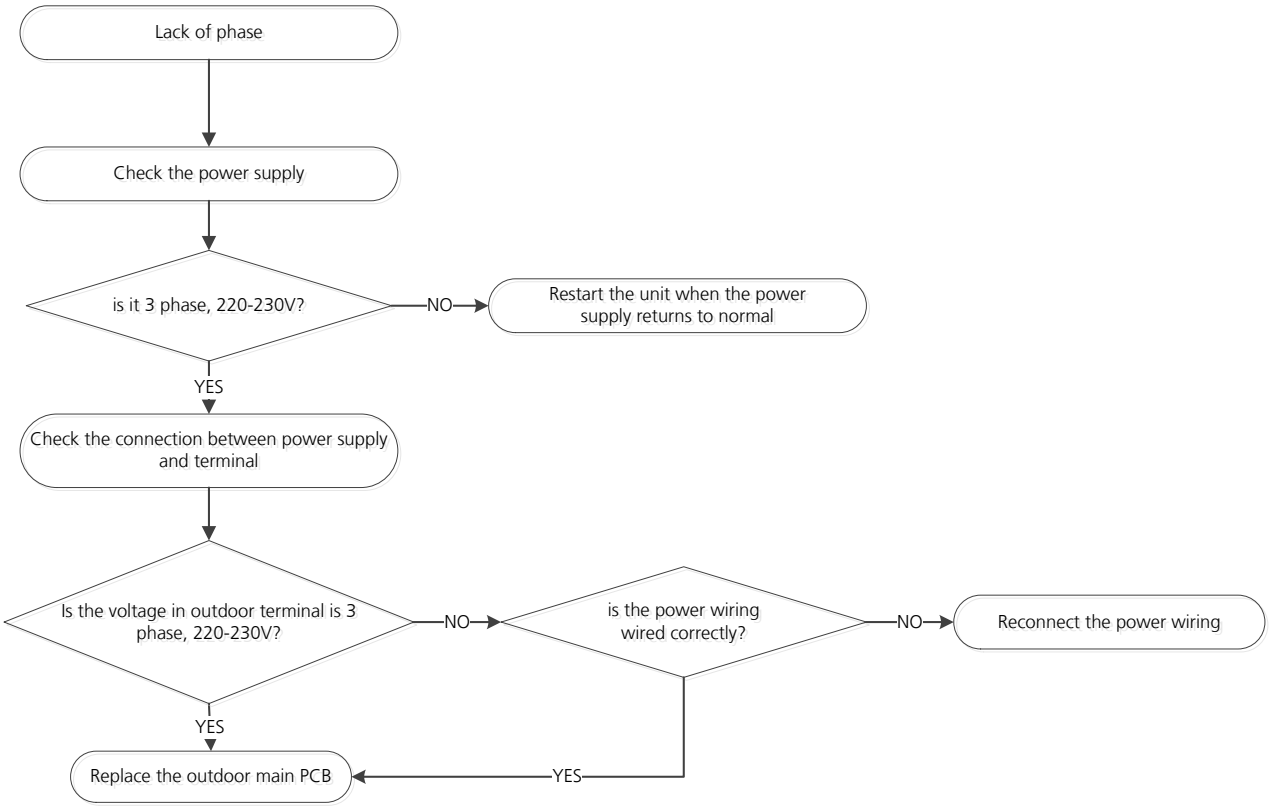
3.4 Lack of Phase diagnosis and solution

Description: Outdoor PCB detects the voltage of one or two phase are very low.

Recommended parts to prepare:

- Problems of 3-phase power supply
- Wiring mistake of 3-phase power supply
- Faulty outdoor PCB

Troubleshooting and repair:



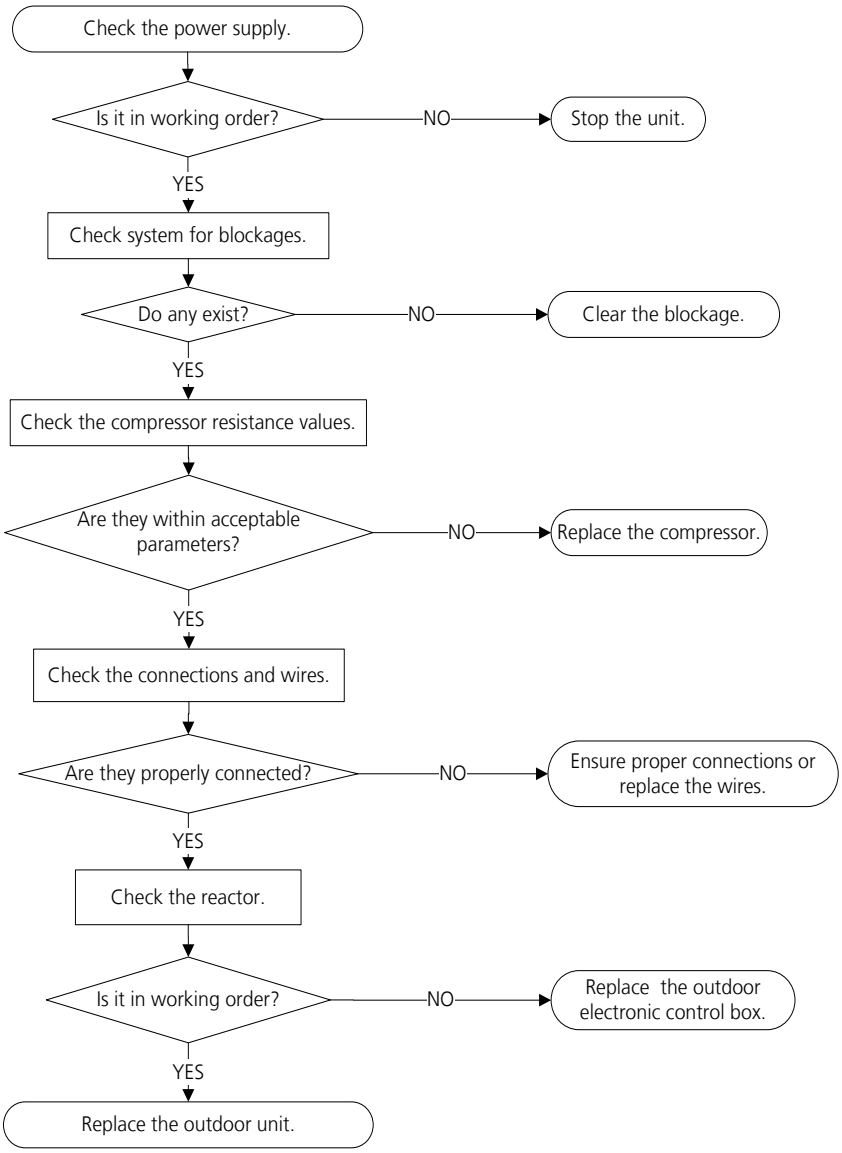
3.5 Overload current protection diagnosis and solution

Description: An abnormal current rise is detected by checking the specified current detection circuit.

Recommended parts to prepare:

- Power supply problems.
- System blockage
- Faulty PCB
- Wiring mistake
- Compressor malfunction

Troubleshooting and repair:



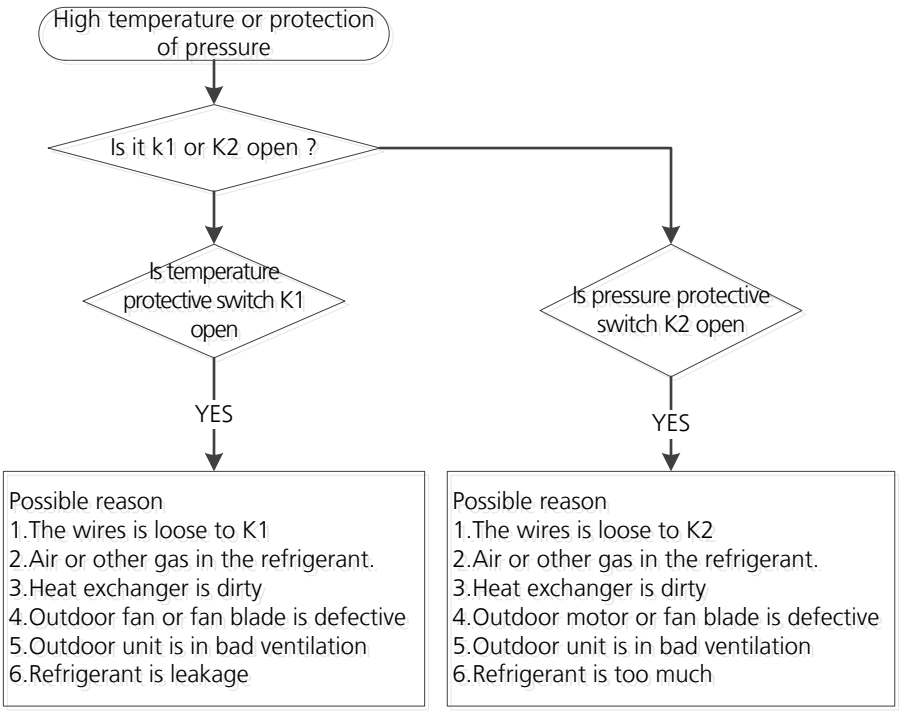
3.6 High temperature or protection of pressure diagnosis and solution

Description: The High pressure switch detects a ultra high pressure or the Low pressure switch detects a ultra low switch, which could damage the system.

Recommended parts to prepare:

- Bad wiring of the pressure switches
- Faulty pressure switches
- Refrigeration system is over load or blocked or lack of refrigerant

Troubleshooting and repair:



Appendix

i) Temperature Sensor Resistance Value Table for T1, T2, T3, and T4 (°C – K) 66

ii) Pressure On Service Port 67

i) Temperature Sensor Resistance Value Table for T1,T2,T3 and T4 (°C – K)

°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm	°C	°F	K Ohm
-20	-4	115.266	20	68	12.6431	60	140	2.35774	100	212	0.62973
-19	-2	108.146	21	70	12.0561	61	142	2.27249	101	214	0.61148
-18	0	101.517	22	72	11.5	62	144	2.19073	102	216	0.59386
-17	1	96.3423	23	73	10.9731	63	145	2.11241	103	217	0.57683
-16	3	89.5865	24	75	10.4736	64	147	2.03732	104	219	0.56038
-15	5	84.219	25	77	10	65	149	1.96532	105	221	0.54448
-14	7	79.311	26	79	9.55074	66	151	1.89627	106	223	0.52912
-13	9	74.536	27	81	9.12445	67	153	1.83003	107	225	0.51426
-12	10	70.1698	28	82	8.71983	68	154	1.76647	108	226	0.49989
-11	12	66.0898	29	84	8.33566	69	156	1.70547	109	228	0.486
-10	14	62.2756	30	86	7.97078	70	158	1.64691	110	230	0.47256
-9	16	58.7079	31	88	7.62411	71	160	1.59068	111	232	0.45957
-8	18	56.3694	32	90	7.29464	72	162	1.53668	112	234	0.44699
-7	19	52.2438	33	91	6.98142	73	163	1.48481	113	235	0.43482
-6	21	49.3161	34	93	6.68355	74	165	1.43498	114	237	0.42304
-5	23	46.5725	35	95	6.40021	75	167	1.38703	115	239	0.41164
-4	25	44	36	97	6.13059	76	169	1.34105	116	241	0.4006
-3	27	41.5878	37	99	5.87359	77	171	1.29078	117	243	0.38991
-2	28	39.8239	38	100	5.62961	78	172	1.25423	118	244	0.37956
-1	30	37.1988	39	102	5.39689	79	174	1.2133	119	246	0.36954
0	32	35.2024	40	104	5.17519	80	176	1.17393	120	248	0.35982
1	34	33.3269	41	106	4.96392	81	178	1.13604	121	250	0.35042
2	36	31.5635	42	108	4.76253	82	180	1.09958	122	252	0.3413
3	37	29.9058	43	109	4.5705	83	181	1.06448	123	253	0.33246
4	39	28.3459	44	111	4.38736	84	183	1.03069	124	255	0.3239
5	41	26.8778	45	113	4.21263	85	185	0.99815	125	257	0.31559
6	43	25.4954	46	115	4.04589	86	187	0.96681	126	259	0.30754
7	45	24.1932	47	117	3.88673	87	189	0.93662	127	261	0.29974
8	46	22.5662	48	118	3.73476	88	190	0.90753	128	262	0.29216
9	48	21.8094	49	120	3.58962	89	192	0.8795	129	264	0.28482
10	50	20.7184	50	122	3.45097	90	194	0.85248	130	266	0.2777
11	52	19.6891	51	124	3.31847	91	196	0.82643	131	268	0.27078
12	54	18.7177	52	126	3.19183	92	198	0.80132	132	270	0.26408
13	55	17.8005	53	127	3.07075	93	199	0.77709	133	271	0.25757
14	57	16.9341	54	129	2.95896	94	201	0.75373	134	273	0.25125
15	59	16.1156	55	131	2.84421	95	203	0.73119	135	275	0.24512
16	61	15.3418	56	133	2.73823	96	205	0.70944	136	277	0.23916
17	63	14.6181	57	135	2.63682	97	207	0.68844	137	279	0.23338
18	64	13.918	58	136	2.53973	98	208	0.66818	138	280	0.22776
19	66	13.2631	59	138	2.44677	99	210	0.64862	139	282	0.22231

ii) Pressure On Service Port

Cooling chart:

°F(°C)	ODT / IDT	75 (23.89)	85 (29.44)	95 (35)	105 (40.56)	115 (46.11)
BAR	70/59	8.2	7.8	8.1	8.6	10.1
BAR	75/63	8.6	8.3	8.7	9.1	10.7
BAR	80/67	9.3	8.9	9.1	9.6	11.2

°F(°C)	ODT / IDT	75 (23.89)	85 (29.44)	95 (35)	105 (40.56)	115 (46.11)
PSI	70/59	119	113	117	125	147
PSI	75/63	124	120	126	132	155
PSI	80/67	135	129	132	140	162

°F(°C)	ODT / IDT	75 (23.89)	85 (29.44)	95 (35)	105 (40.56)	115 (46.11)
MPA	70/59	0.82	0.78	0.81	0.86	1.01
MPA	75/63	0.86	0.83	0.87	0.91	1.07
MPA	80/67	0.93	0.89	0.91	0.96	1.12