MITSUBISHI ELECTRIC

Changes for the Better

HOT WATER HEAT PUMP

DATA BOOK

MODEL

CAHV-R136YAU (-BS)

CONTENTS

HOT WATER HEAT PUMP

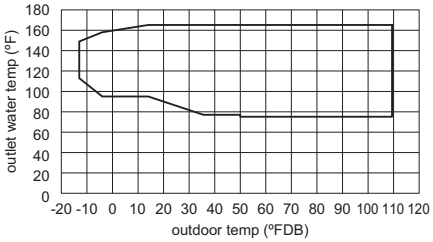
1-1. Specifications

Model			CAHV-R136YAU (-BS)
Power source			3-phase 3-wire 460 V 60 Hz
Capacity (EN14511) *1		kW	40.0
		BTU/h	136,480
	Power input	kW	14.03
	Current input	A	19.6
	COP (kW/kW)		2.85
Maximum current input		A	34.7
Water pressure drop *1		kPa (psi)	10.2 (1.47)
Temperature range *3	Outlet water temperature	°C (°F)	24–74 (75–165)
	Outdoor temperature (D.B.)	°C (°F)	-25–43 (-13–109.4)
Circulating water volume range			4.0 m^3/h-15.0 m^3/h (1056.8 G/h-3963 G/h)
Sound pressure level (measured 1 m below the unit in an anechoic room) *1 *5		dB (A)	65
Sound pressure level (measured 1 m below the unit in an anechoic room) *2 *5		dB (A)	72
Water pipe diameter and type	Inlet	mm (in)	38.1 (1 1/2"), housing type joint
	Outlet	mm (in)	38.1 (1 1/2"), housing type joint
External finish			Acrylic painted steel sheet <Munsell 5Y 8/1 or similar>
External dimensions H × W × D		mm (in)	1650 × 1750 × 740 (64-31/32 × 68-29/32 × 29-5/32)
Net weight		kg (lbs)	372 (820)
Design pressure	R454C	MPa (psi)	3.85 (558)
	Water	MPa (psi)	1.0 (145)
Drawing number	Wiring		KW94L286
	External appearance		KW94L288
Heat exchanger	Water-side		Copper brazed stainless steel sheet
	Air-side		Plate fins and copper tubes
Compressor	Type		Inverter scroll hermetic compressor
	Manufacturer		MITSUBISHI ELECTRIC CORPORATION
	Starting method		Inverter
	Motor output	kW	12.1
	Lubricant		FVC32EA
Fan	Air flow rate	m^3/min	150 × 2
		L/s	2500 × 2
		cfm	5297 × 2
	External static pressure		10 Pa (1 mm H_2O)
	Type and quantity		Propeller fan × 2
	Control and driving mechanism		Inverter control, direct driven by motor
	Motor output	kW	0.92 × 2
HIC (Heat inter-changer) circuit			Copper pipe
Protection devices	High pressure		High-pressure sensor and switch set at 3.85 MPa (643 psi)
	Inverter circuit		Overheat and overcurrent protection
Defrosting method			Auto-defrost mode (Reversed refrigerant cycle)
Refrigerant	Type and factory charge	kg (lbs)	R454C, 9.0 (19.8)
	GWP *4		148
	Flow and temperature control		LEV and HIC circuit

*1 Under normal heating conditions at the outdoor temperature of 7ºCDB/6ºCWB (44.6ºFDB/42.8ºFWB), the outlet water temperature of 45ºC (113ºF) and the inlet water temperature of 40ºC (104ºF)
Tolerance of capacity and COP is based on AHRI 551/591.

*2 Under normal heating conditions at the outdoor temperature of 7ºCDB/6ºCWB (44.6ºFDB/42.8ºFWB) when the unit is set to the "Capacity Priority" mode through the dry NC-contact.

*3



Outdoor temp. -25ºCDB/Outlet water temp. 45~65ºC
(Outdoor temp. -13ºFDB/Outlet water temp. 113~149ºF)
Outdoor temp. -20ºCDB/Outlet water temp. 35~70ºC
(Outdoor temp. -4ºFDB/Outlet water temp. 95~158ºF)
Outdoor temp. -10ºCDB/Outlet water temp. 35~74ºC
(Outdoor temp. 14ºFDB/Outlet water temp. 95~165ºF)
Outdoor temp. 43ºCDB/Outlet water temp. 24~74ºC
(Outdoor temp. 109ºFDB/Outlet water temp. 75.2~165ºF)

* Stops operation at the outdoor temperature of -28ºC (-18ºF) or below
* Stops operation at the inlet temperature of 72ºC (161.6ºF) or above

*4 IPCC 4th assessment report

*5 The sound pressure level is a value measured in an anechoic room in accordance with the conventional method in JRA4060.

- Due to continuing improvements, specifications may be subject to change without notice.
- Do not use steel pipes as water pipes.
- Keep the water circulated at all times. Blow the water out of the pipes if the unit will not be used for an extended period of time.
- Do not use ground water or well water.
- Do not install the unit in an environment where the wet bulb temperature exceeds 32ºC (90°F).
- The water circuit must be a closed circuit.

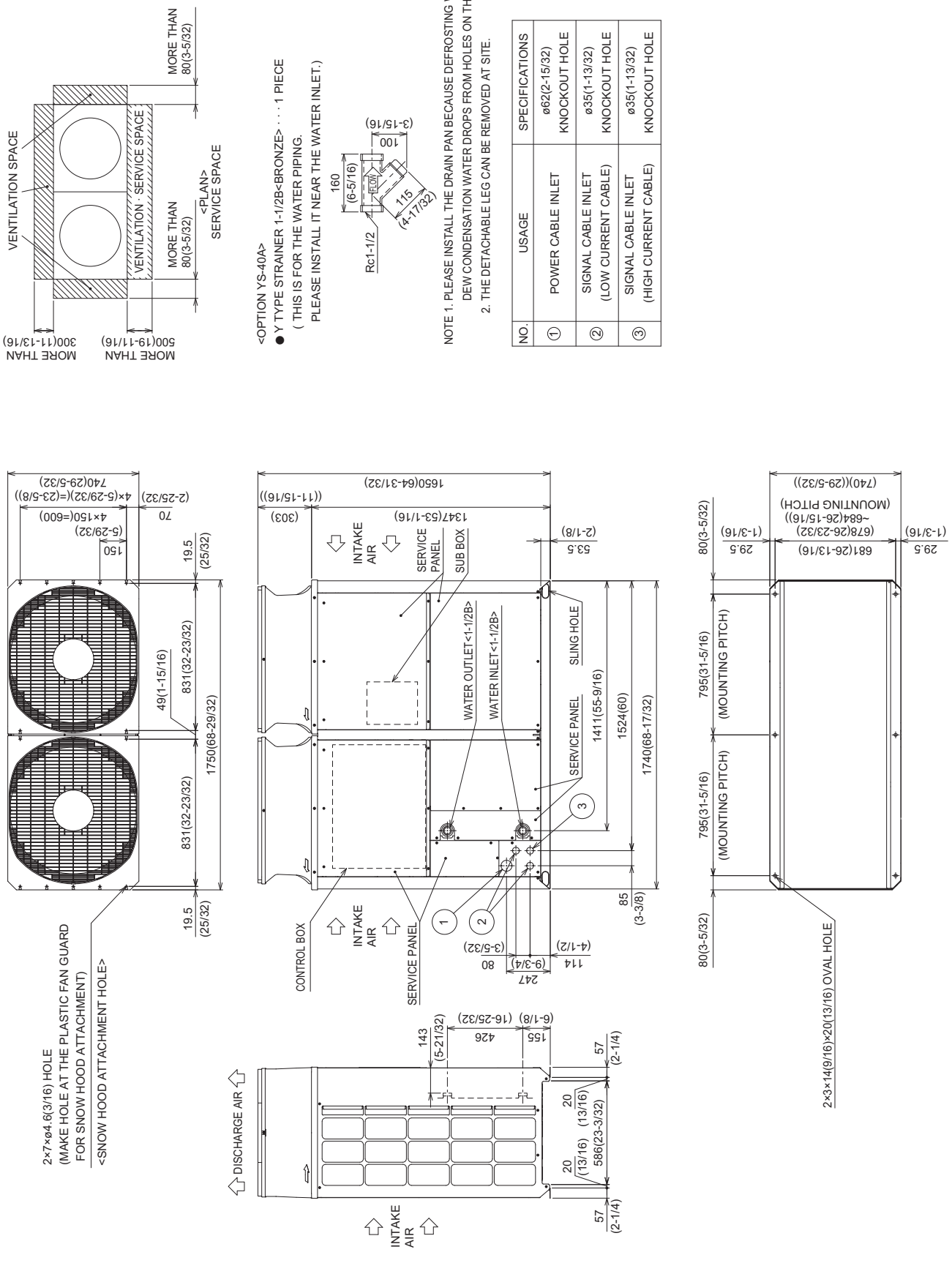
Unit converter

Kcal = kW x 860
BTU/h= kW × 3,412
cfm= m^3/min × 35.31
lbs= kg/0.4536

1-2. External Dimensions

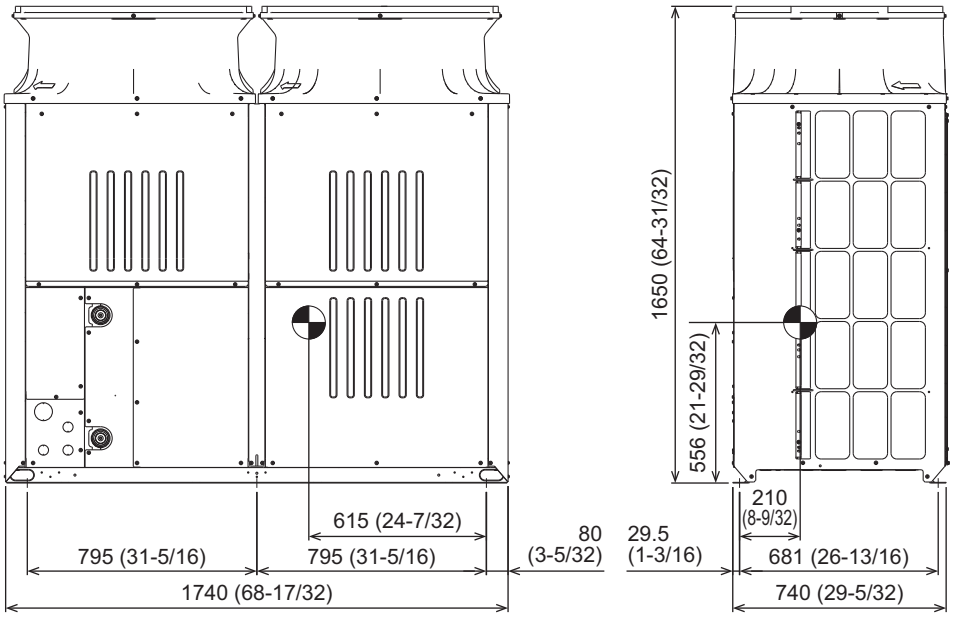
CAHV-R136YAU (-BS)

Unit: mm (in.)



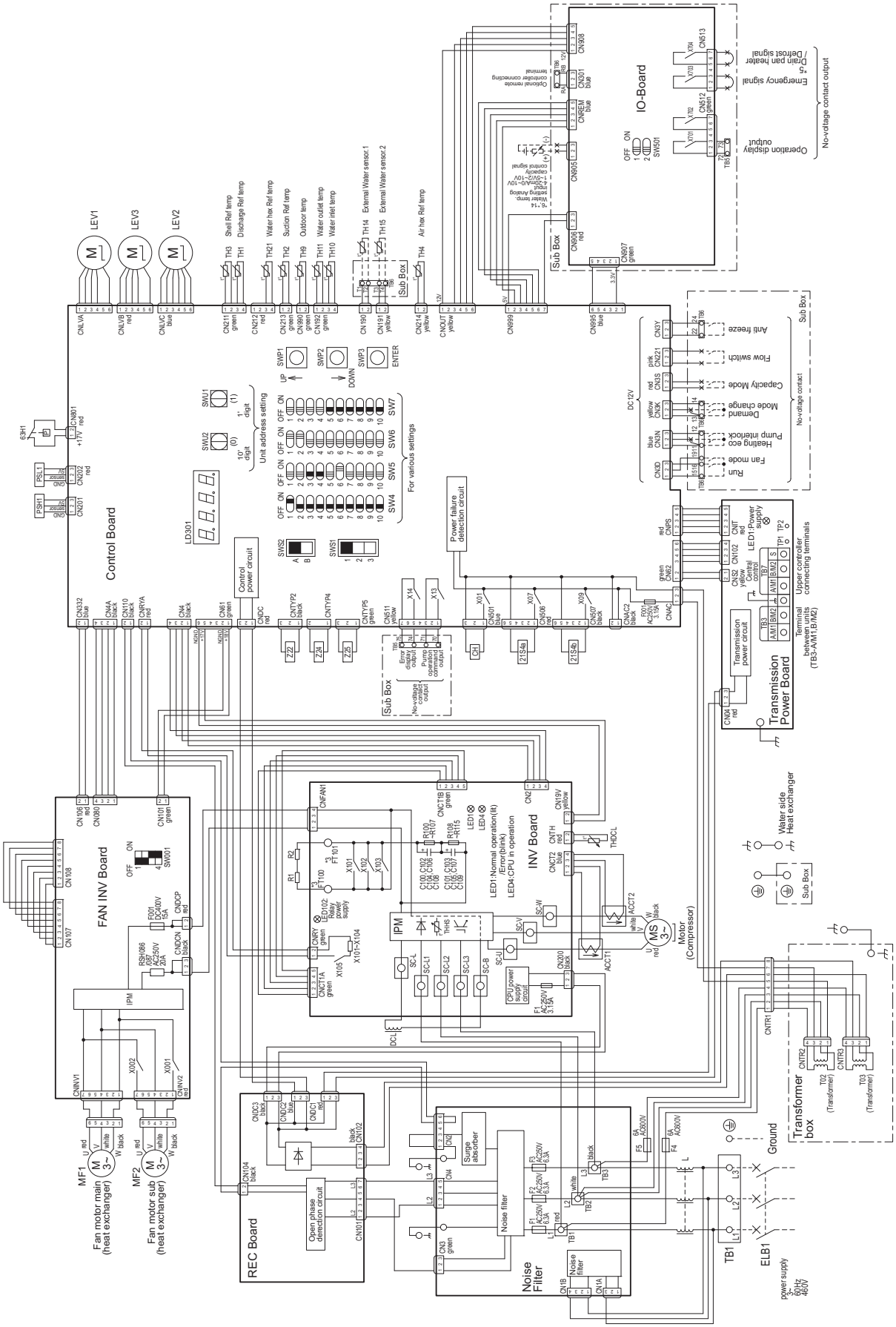
1-3. Center of Gravity

Unit: mm (in)



1-4. Electrical Wiring Diagrams

CAHV-R136YAU (-BS)



Note 1. The broken lines indicate the optional parts,field-supplied parts,and field work.
2. Dashed lines indicate Sub box.
3. Faston terminals have a locking function.
Press the tab in the middle of the terminals to remove them.
Check that the terminals are securely locked in place after insertion.
4. The symbols of the field connecting terminals are as follows.
○:Terminal block ×:Connection by cutting the short circuit wire
5. Selects either Drain pan signal or Defrost signal by SW5 and SW6 settings.
(Item code 1056)
6. Selects either Water temperature setting input signal or Capacity control input signal by SW5 and SW6 settings. (Item code 1051)
7. Make sure to connect a pump interlock contact.
A short-circuit may cause abnormal stop or malfunctions.
8. The preset temperature setting can be switched from the no-voltage contact or by setting time ranges.
9. The method of input signal of operation can be either one of optional remote controller or no-voltage input.
10. Leave a space of at least 5 cm between the low voltage external wiring (no-voltage contact input and remote controller wiring) and wiring of 100V or greater.Do not place them in the same conduit tube or cabtyre cable as this will damage the circuit board.
11. When cabtyre cable is used for the control cable wiring, use a separate cabtyre cable for the following wiring.
Using the same cabtyre cable may cause malfunctions and damage to the unit.
(a) Optional remote controller wiring
(b) No-voltage contact input wiring
(c) No-voltage contact output wiring
(d) Remote water temperature setting
12. Use a contact that takes 12VDC 1mA for no-voltage contact input.
13. Need to selects Water temperature setting input signal.
Set the SW501 as shown in the table below.

	SW501-1	SW501-2
4~20mA	ON	ON
0~10V	OFF	OFF
1~ 5V	OFF	ON
2~10V	OFF	OFF

14. Use a 4-20mA signal output device with insulation.
Feeding 30mA or more current may damage the circuit board.
15. The SW4-SW7 switches indicated with ▭ can be set on site.
Do not change the other SW4-SW7 switch settings.

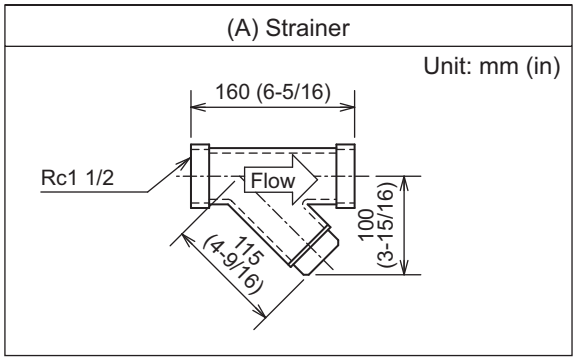
Symbol explanation

Symbol	Explanation
ACCT1	AC current sensor
ACCT2	
CH	Crankcase heater(for heating the compressor)
DCL	DC reactor
F1~3(Noise Filter)	Fuse
F4,5(Transformer)	
F001(FAN INV Board)	
F001(Control Board)	
F1(INV Board)	
LEV1,3	Electronic expansion valve (Main circuit)
LEV2	Electronic expansion valve (Injection)
MF1,2	Fan motor
MS	Compressor motor
PSH1	High pressure sensor
PSL1	Low pressure sensor
R1,R2	Electrical resistance
21S4a	4-way valve Cooling/Heating switching
21S4b	
THL	DC reactor temperature
TH1~4,9~11,21	Thermistor
Z22,24,25	Function setting connector
63H1	High pressure switch
72C	Electromagnetic relay (Inverter main circuit)
*TH14,15	Thermistor
<ELB1>	Earth leakage breaker

* of symbol item is the optional parts, <> is field-supplied parts.

1-5. Optional parts

YS-40A



(A) Install the strainer at the water pipe inlet.

1-6. External-water temperature sensor TW-TH16

1. Parts that are required to install an external water temperature sensor

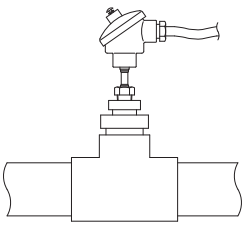
A) External water temperature sensor
B) Wiring to connect the sensor and the unit*
C) Wiring terminals to connect the wiring to the sensor and the terminal block on the unit
(Four for M4 screws)*
* Items B) and C) are field supplied.

Wiring specifications

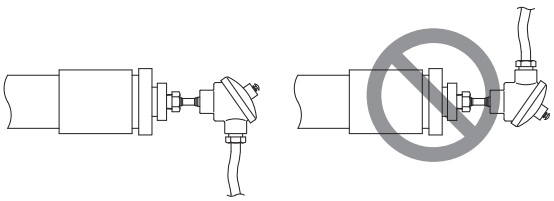
Size	2-core cable (Min.1.25 mm^2 (AWG 16))
Type	CVVS or CPEVS
Maximum length	20 m (66 ft)

2. Installing the external water temperature sensor

- Install the external water temperature sensor where the water pipes merge or on the load-side tank.
- Install horizontally or vertically on top of the pipe.
- When installing horizontally, make sure the wiring faces down.



Vertical installation

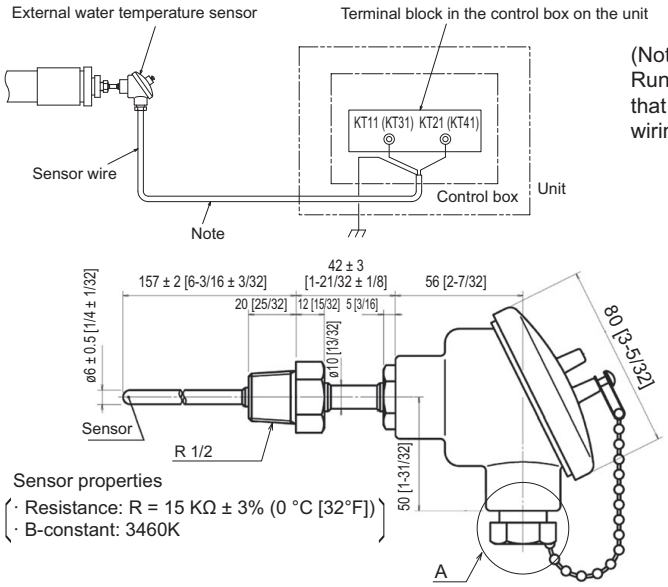


Horizontal installation

3. Wiring the external water temperature sensor

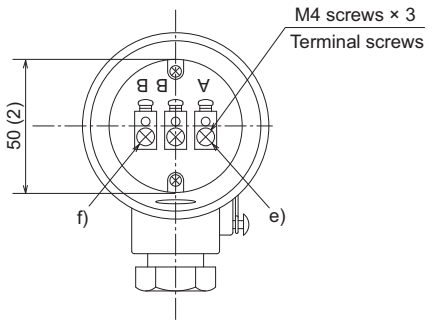
Connect the external water temperature sensor wiring to the terminal block in the control box on the unit as shown in the figure below.

Unit: mm (in.)



Sensor properties
- Resistance: R = 15 KΩ ± 3% (0 °C [32°F])
- B-constant: 3460K

(Note)
Run the sensor wiring at least 5 cm (2 in.) away from any wire that carries a voltage of 100 V or more, and do not put the sensor wiring in the same conduit tube with it.



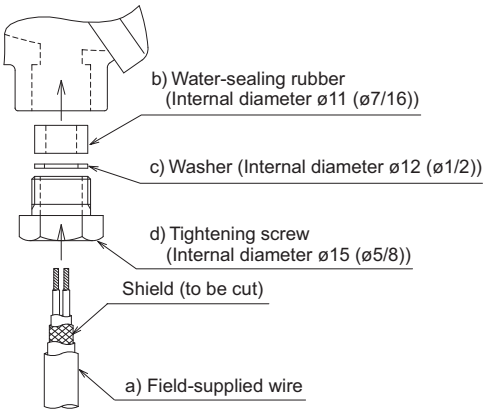
Terminal block for connection to the sensor

Connect the sensor wiring to terminals T1 and T2 of the 12-pin terminal block in the control box on the unit.

Connect the shield to the earth terminal.

Thread the wiring to the external water temperature sensor through parts b) through d) as shown in the figure at right. Attach M4 terminals (not supplied) to the wirings, and connect them to e) and f) (terminals A and B).

After the wiring is connected, securely tighten the tightening screw d), and then caulk the gap between the wiring a) and the tightening screw to keep water from entering.



Detailed view of the area labeled "A" in the figure above

*1 In a multiple module connection system, install the temperature sensor where the cold/hot water from each module is sufficiently mixed to provide a representative temperature.

*2 The temperature sensor must be installed on a pipe between the outlet of the unit and the entrance to the load-side system.

2-1. Capacity tables

2-1-1. Correction by temperature

CAHV-R136YAU (-BS)

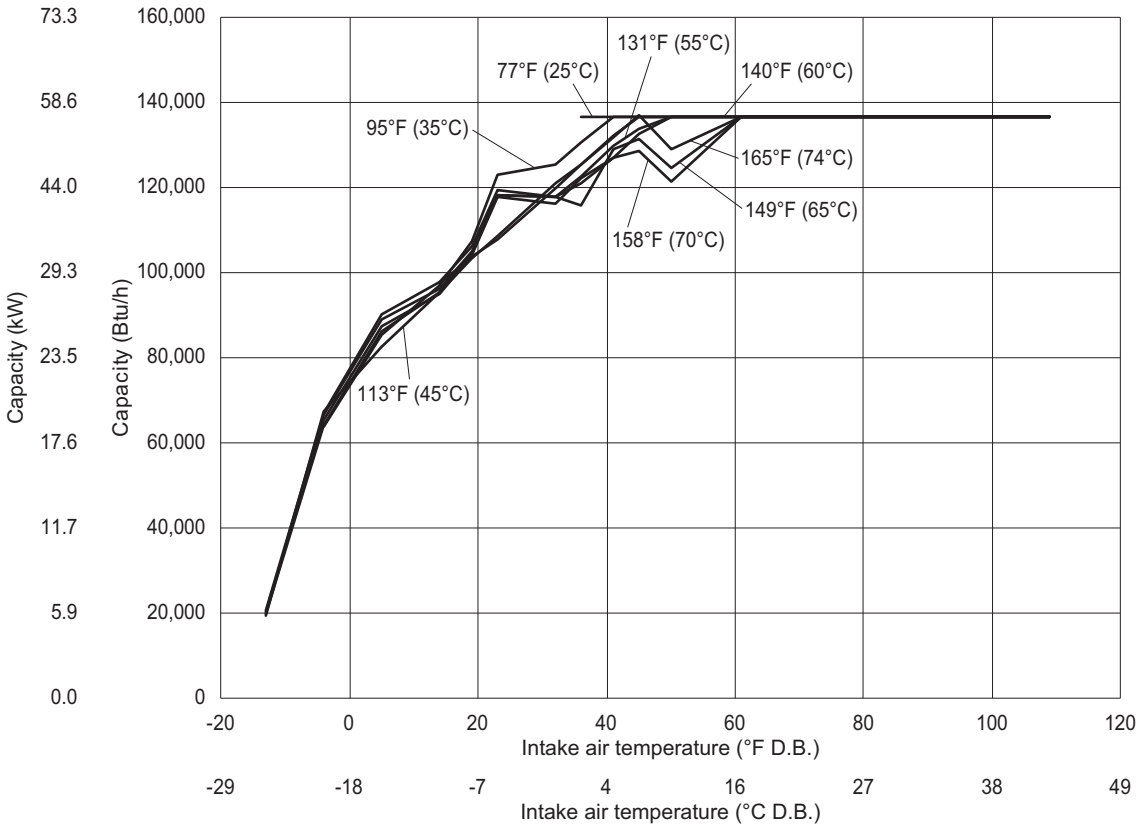
(1) Efficiency Priority Mode (Operating capacity: 100% = 136,480 Btu/h (40.0 kW))

Capacity

		Intake air temp. °C																	
		-25	-20	-15	-10	-7	-5	0	2	5	7	10	16	20	25	30	35	40	43
Outlet water temp. °C	25	–	–	–	–	–	–	–	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	35	–	18.7	25.0	28.4	31.5	36.1	36.8	38.3	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	45	5.7	19.8	24.2	28.0	30.3	31.8	35.5	36.8	38.7	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	55	5.8	18.8	25.2	28.0	30.7	34.6	34.5	35.9	38.0	39.2	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	60	5.9	19.1	25.6	27.8	30.5	34.5	34.1	35.8	37.2	38.9	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	65	6.0	19.5	26.1	28.2	30.7	34.6	34.5	33.9	37.8	38.5	36.5	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	70	–	19.7	26.4	28.6	31.1	34.9	34.5	35.5	37.2	37.7	35.5	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	74	–	–	–	28.6	30.3	31.6	35.1	36.7	38.7	40.2	37.8	40.0	40.0	40.0	40.0	40.0	40.0	40.0

		Intake air temp. °F																	
		-13	-4	5	14	19	23	32	36	41	45	50	61	68	77	86	95	104	109
Outlet water temp. °F	77	–	–	–	–	–	–	–	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480
	95	–	63,750	85,190	96,820	107,370	123,110	125,440	130,570	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480
	113	19,350	67,420	82,610	95,530	103,290	108,460	121,140	125,530	132,100	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480
	131	19,630	64,290	86,070	95,500	104,630	118,220	117,650	122,630	129,570	133,810	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480
	140	20,070	65,220	87,310	94,950	104,050	117,810	116,330	121,990	126,960	132,670	136,480	136,480	136,480	136,480	136,480	136,480	136,480	136,480
	149	20,410	66,690	88,970	96,260	104,910	118,180	117,850	115,560	129,090	131,350	124,540	136,480	136,480	136,480	136,480	136,480	136,480	136,480
	158	–	67,080	90,010	97,720	106,100	119,180	117,830	120,970	126,820	128,650	121,170	136,480	136,480	136,480	136,480	136,480	136,480	136,480
	165	–	–	–	97,540	103,550	107,920	119,920	125,150	131,930	137,100	129,120	136,480	136,480	136,480	136,480	136,480	136,480	136,480

These tables show the power input when the relative humidity is 85%.
The intake wet-bulb temperature is fixed to 90°F (32°C) when the intake dry-bulb temperature is 95°F (35°C) or higher.
The difference between the outlet water temperature and the inlet water temperature is 9°F (5°C).
However, if a difference of 9°F (5°C) cannot be secured, the lower limit flow rate shall be used.

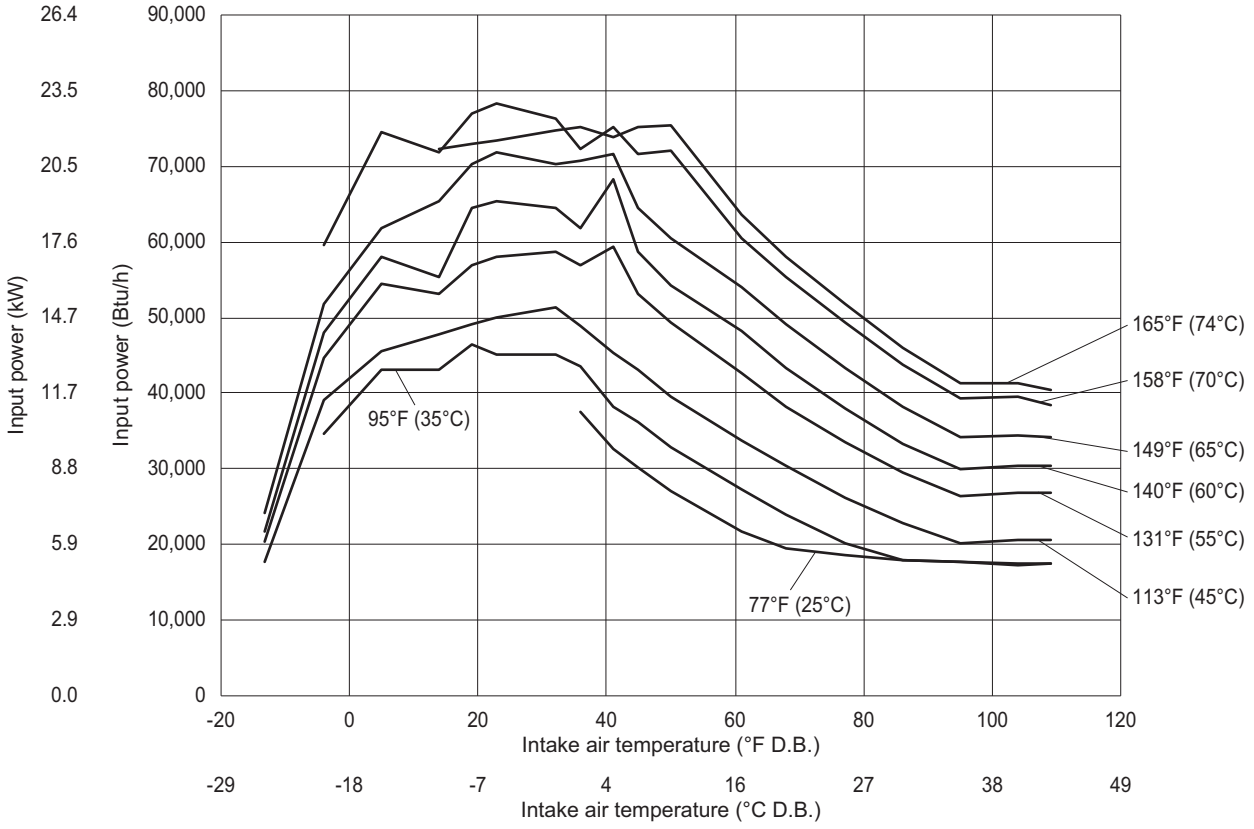


Power input

		Intake air temp. °C																		
		-25	-20	-15	-10	-7	-5	0	2	5	7	10	16	20	25	30	35	40	43
Outlet water temp. °C	25	–	–	–	–	–	–	–	11.0	9.5	8.9	7.9	6.4	5.7	5.5	5.2	5.2	5.1	5.1
	35	–	10.1	12.6	12.6	13.6	13.3	13.2	12.8	11.2	10.6	9.6	8.0	7.0	5.9	5.3	5.1	5.1	5.1
	45	5.2	11.5	13.3	14.0	14.4	14.7	15.0	14.3	13.3	12.6	11.6	9.9	8.9	7.7	6.7	5.9	6.0	6.0
	55	5.9	13.1	15.9	15.6	16.7	17.0	17.2	16.7	17.4	15.6	14.5	12.5	11.2	9.8	8.6	7.7	7.8	7.9
	60	6.4	14.0	17.0	16.2	18.9	19.2	18.9	18.1	20.0	17.2	15.9	14.1	12.7	11.1	9.8	8.8	8.9	8.9
	65	7.1	15.2	18.1	19.2	20.6	21.1	20.6	20.8	21.0	18.9	17.7	15.9	14.4	12.7	11.2	10.0	10.1	10.0
	70	–	17.4	21.8	21.1	22.5	23.0	22.4	21.2	22.0	21.0	21.1	17.8	16.2	14.4	12.8	11.5	11.6	11.3
	74	–	–	–	21.2	21.4	21.5	21.9	22.0	21.6	22.0	22.1	18.6	17.0	15.1	13.5	12.1	12.1	11.8

		Intake air temp. °F																	
		-13	-4	5	14	19	23	32	36	41	45	50	61	68	77	86	95	104	109
Outlet water temp. °F	77	–	–	–	–	–	–	–	37,570	32,570	30,210	27,080	21,740	19,530	18,660	17,900	17,790	17,300	17,440
	95	–	34,590	43,080	43,110	46,380	45,250	45,140	43,520	38,310	36,260	32,920	27,310	23,900	20,240	18,030	17,570	17,500	17,500
	113	17,830	39,220	45,500	47,780	49,140	50,050	51,260	48,900	45,360	43,000	39,620	33,820	30,370	26,230	22,790	20,180	20,480	20,570
	131	20,300	44,650	54,410	53,150	56,980	58,110	58,640	57,010	59,420	53,080	49,340	42,750	38,220	33,470	29,490	26,390	26,770	26,820
	140	21,780	47,910	57,980	55,320	64,430	65,410	64,350	61,840	68,340	58,640	54,300	48,200	43,430	37,960	33,350	30,010	30,440	30,410
	149	24,240	51,760	61,910	65,350	70,350	71,830	70,230	70,820	71,710	64,420	60,550	54,120	49,140	43,310	38,220	34,110	34,500	34,290
	158	–	59,490	74,490	71,830	76,930	78,440	76,270	72,440	75,150	71,730	71,990	60,600	55,420	49,300	43,810	39,360	39,460	38,530
	165	–	–	–	72,270	72,970	73,470	74,750	75,120	73,870	75,170	75,450	63,510	58,080	51,670	45,920	41,250	41,360	40,380

These tables show the power input when the relative humidity is 85%.
The intake wet-bulb temperature is fixed to 90°F (32°C) when the intake dry-bulb temperature is 95°F (35°C) or higher.
The difference between the outlet water temperature and the inlet water temperature is 9°F (5°C).
However, if a difference of 9°F (5°C) cannot be secured, the lower limit flow rate shall be used.



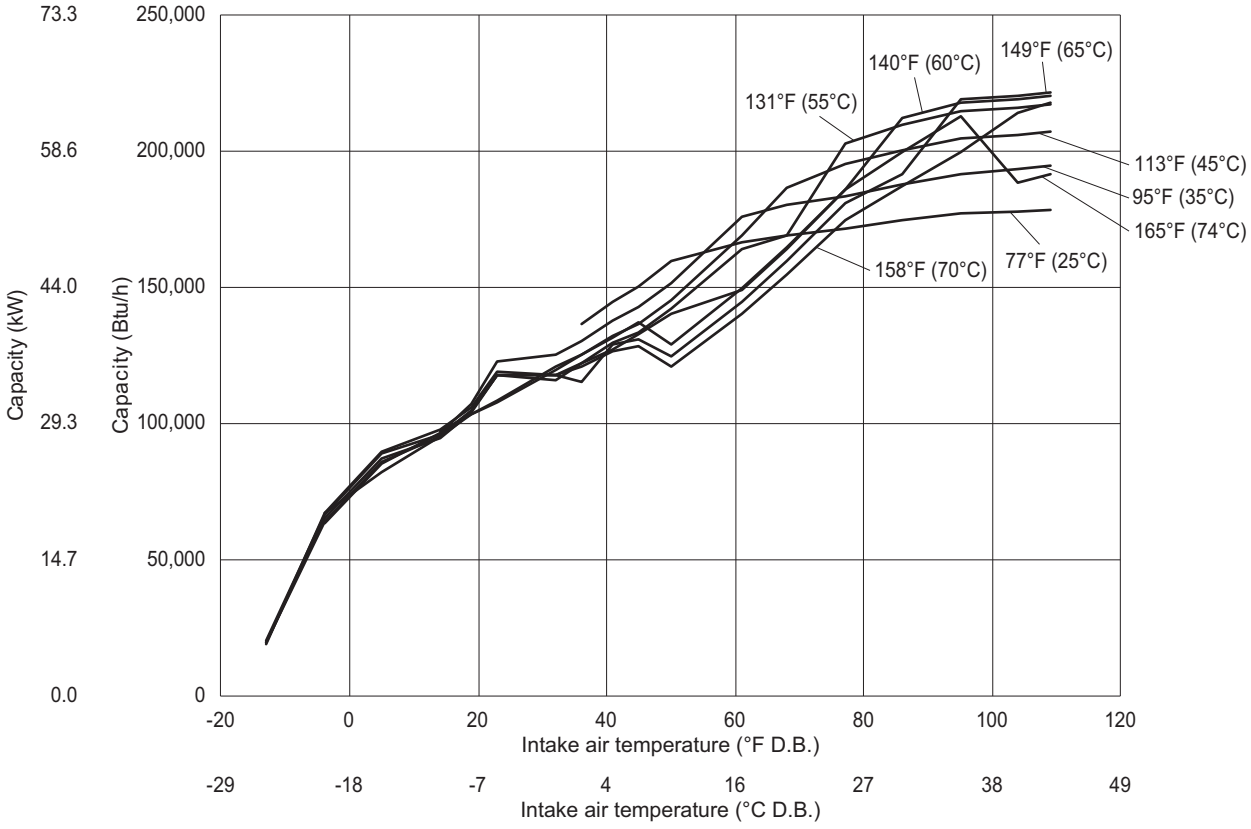
(2) Capacity Priority Mode

Capacity

		Intake air temp. °C																		
		-25	-20	-15	-10	-7	-5	0	2	5	7	10	16	20	25	30	35	40	43
Outlet water temp. °C	25	–	–	–	–	–	–	–	40.1	42.5	44.0	46.7	48.9	49.5	50.4	51.2	52.0	52.2	52.3
	35	–	18.7	25.0	28.4	31.5	36.1	36.8	38.3	40.4	41.8	44.4	51.6	52.8	53.9	55.1	56.2	56.7	57.1
	45	5.7	19.8	24.2	28.0	30.3	31.8	35.5	36.8	38.7	40.0	42.5	49.7	54.7	57.2	58.7	60.0	60.4	60.8
	55	5.8	18.8	25.2	28.0	30.7	34.6	34.5	35.9	38.0	39.2	41.7	48.2	49.5	59.5	61.4	63.0	63.3	63.7
	60	5.9	19.1	25.6	27.8	30.5	34.5	34.1	35.8	37.2	38.9	41.2	43.6	48.1	54.6	62.2	63.9	64.2	64.6
	65	6.0	19.5	26.1	28.2	30.7	34.6	34.5	33.9	37.8	38.5	36.5	42.4	46.8	53.0	56.2	64.2	64.6	64.9
	70	–	19.7	26.4	28.6	31.1	34.9	34.5	35.5	37.2	37.7	35.5	41.2	45.3	51.2	54.9	58.6	62.8	63.8
	74	–	–	–	28.6	30.3	31.6	35.1	36.7	38.7	40.2	37.8	43.9	48.2	54.6	58.5	62.4	55.2	56.1

		Intake air temp. °F																	
		-13	-4	5	14	19	23	32	36	41	45	50	61	68	77	86	95	104	109
Outlet water temp. °F	77	–	–	–	–	–	–	–	136,890	144,980	150,280	159,500	166,700	169,020	171,890	174,730	177,300	178,110	178,450
	95	–	63,750	85,190	96,820	107,370	123,110	125,440	130,570	137,900	142,770	151,520	176,160	180,290	183,840	188,000	191,890	193,410	194,670
	113	19,350	67,420	82,610	95,530	103,290	108,460	121,140	125,530	132,100	136,480	145,130	169,430	186,780	195,260	200,140	204,600	206,060	207,310
	131	19,630	64,290	86,070	95,500	104,630	118,220	117,650	122,630	129,570	133,810	142,140	164,360	168,970	203,060	209,660	214,790	216,130	217,270
	140	20,070	65,220	87,310	94,950	104,050	117,810	116,330	121,990	126,960	132,670	140,570	148,900	164,270	186,270	212,140	217,940	219,190	220,260
	149	20,410	66,690	88,970	96,260	104,910	118,180	117,850	115,560	129,090	131,350	124,540	144,790	159,530	180,990	191,730	219,210	220,570	221,580
	158	–	67,080	90,010	97,720	106,100	119,180	117,830	120,970	126,820	128,650	121,170	140,420	154,480	174,790	187,180	199,950	214,150	217,670
	165	–	–	–	97,540	103,550	107,920	119,920	125,150	131,930	137,100	129,120	149,640	164,620	186,270	199,470	213,080	188,440	191,540

These tables show the power input when the relative humidity is 85%.
The intake wet-bulb temperature is fixed to 90°F (32°C) when the intake dry-bulb temperature is 95°F (35°C) or higher.
The difference between the outlet water temperature and the inlet water temperature is 9°F (5°C).
However, if a difference of 9°F (5°C) cannot be secured, the lower limit flow rate shall be used.

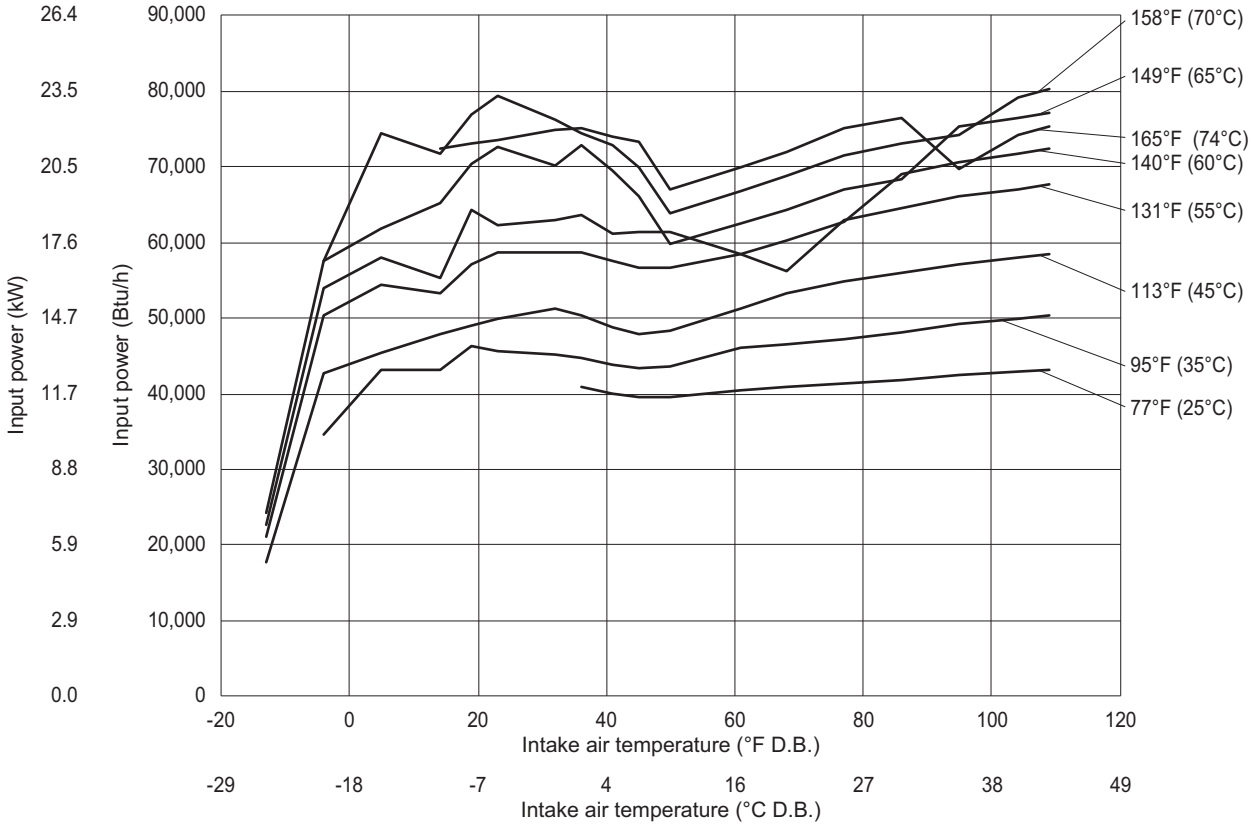


Power input

		Intake air temp. °C																	
		-25	-20	-15	-10	-7	-5	0	2	5	7	10	16	20	25	30	35	40	43
Outlet water temp. °C	25	–	–	–	–	–	–	–	12.0	11.7	11.6	11.6	11.9	11.9	12.1	12.3	12.5	12.6	12.6
	35	–	10.1	12.6	12.6	13.6	13.4	13.2	13.1	12.9	12.7	12.8	13.5	13.7	13.9	14.1	14.4	14.6	14.8
	45	5.2	12.5	13.3	14.0	14.4	14.7	15.0	14.7	14.3	14.0	14.2	15.0	15.6	16.1	16.4	16.7	17.0	17.1
	55	6.2	14.8	15.9	15.6	16.7	17.2	17.2	17.2	16.9	16.6	16.6	17.1	16.5	18.4	18.9	19.4	19.6	19.8
	60	6.6	15.8	17.0	16.2	18.9	18.3	18.4	18.6	17.9	18.0	18.0	17.1	17.6	18.4	20.2	20.7	21.0	21.2
	65	7.1	16.9	18.1	19.2	20.6	21.3	20.6	21.3	20.4	19.4	17.5	18.3	18.9	19.7	20.0	22.1	22.4	22.6
	70	–	16.9	21.8	21.1	22.5	23.2	22.4	21.8	21.3	20.5	18.7	19.5	20.1	21.0	21.4	21.8	23.2	23.5
	74	–	–	–	21.2	21.4	21.5	21.9	22.0	21.6	21.5	19.6	20.5	21.1	22.0	22.4	20.4	21.8	22.1

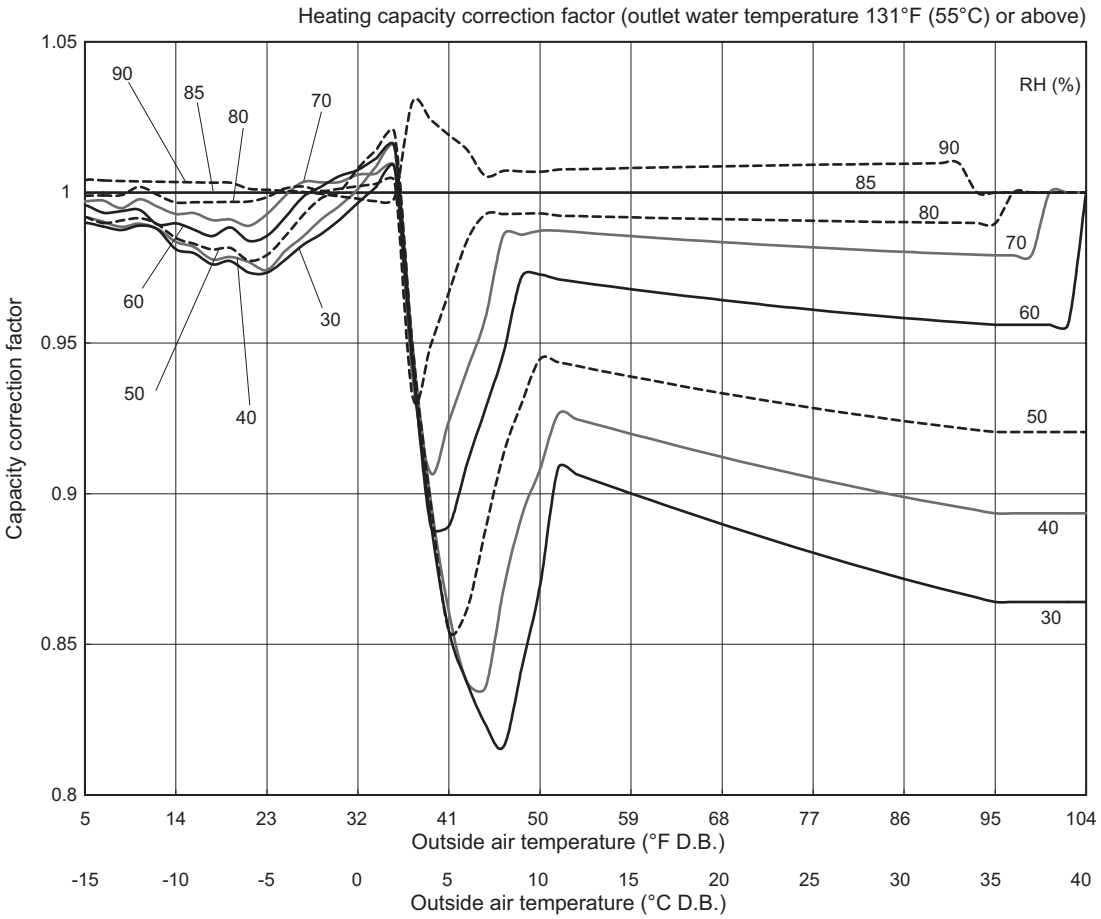
		Intake air temp. °F																	
		-13	-4	5	14	19	23	32	36	41	45	50	61	68	77	86	95	104	109
Outlet water temp. °F	77	–	–	–	–	–	–	–	40,790	39,870	39,470	39,640	40,460	40,770	41,310	41,900	42,510	42,930	43,070
	95	–	34,590	43,080	43,110	46,380	45,720	45,140	44,750	43,850	43,350	43,610	46,050	46,590	47,260	48,210	49,180	49,880	50,350
	113	17,830	42,670	45,500	47,780	49,140	50,050	51,260	50,290	48,840	47,870	48,360	51,310	53,340	54,760	55,910	57,070	57,880	58,430
	131	21,030	50,340	54,410	53,150	56,980	58,720	58,670	58,630	57,580	56,560	56,650	58,400	56,230	62,900	64,600	66,030	66,970	67,590
	140	22,570	54,020	57,980	55,320	64,430	62,300	62,870	63,600	61,160	61,360	61,290	58,440	60,190	62,750	68,980	70,700	71,710	72,380
	149	24,240	57,600	61,910	65,350	70,350	72,590	70,230	72,840	69,480	66,100	59,860	62,500	64,360	67,110	68,270	75,430	76,420	77,140
	158	–	57,560	74,490	71,830	76,930	79,270	76,270	74,500	72,820	69,920	63,910	66,700	68,670	71,540	72,960	74,270	79,240	80,330
	165	–	–	–	72,270	72,970	73,470	74,750	75,120	73,870	73,270	66,980	69,900	71,970	74,970	76,470	69,630	74,300	75,310

These tables show the power input when the relative humidity is 85%.
The intake wet-bulb temperature is fixed to 90°F (32°C) when the intake dry-bulb temperature is 95°F (35°C) or higher.
The difference between the outlet water temperature and the inlet water temperature is 9°F (5°C).
However, if a difference of 9°F (5°C) cannot be secured, the lower limit flow rate shall be used.



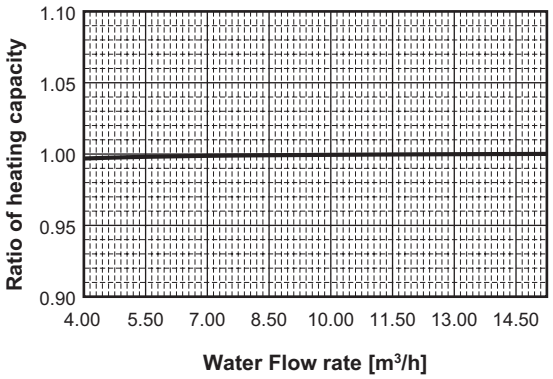
2-1-2. Correction by relative humidity

CAHV-R136YAU (-BS)

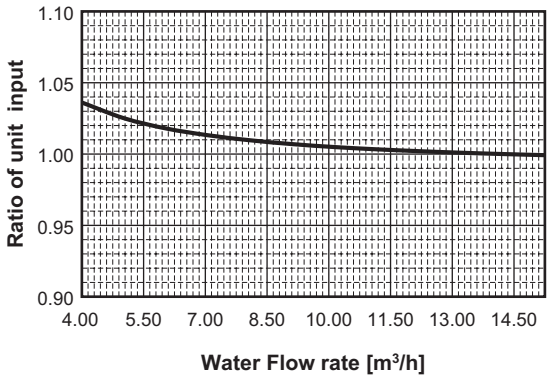


2-1-3. Correction by water flow rate

CAHV-R136YAU (-BS)



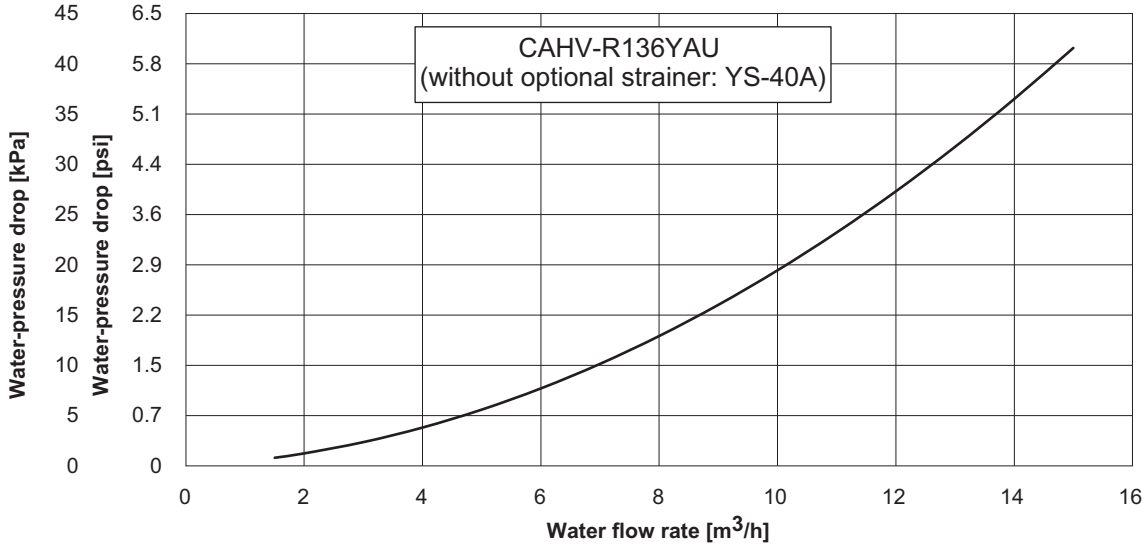
*Conditions Outdoor temperature 32°F (0°C)
Intake water temperature 122°F (50°C)
Frequency of compressor 100Hz

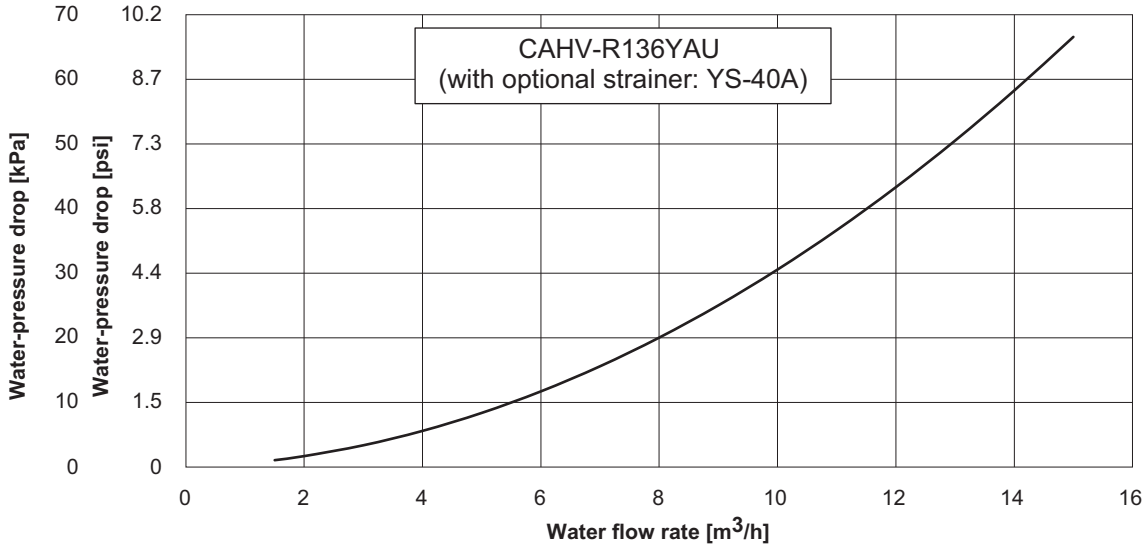


*Conditions Outdoor temperature 32°F (0°C)
Intake water temperature 122°F (50°C)
Frequency of compressor 100Hz

2-1-4. Water pressure drop

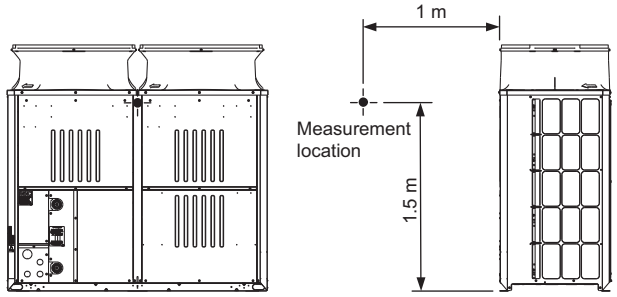
CAHV-R136YAU (-BS)



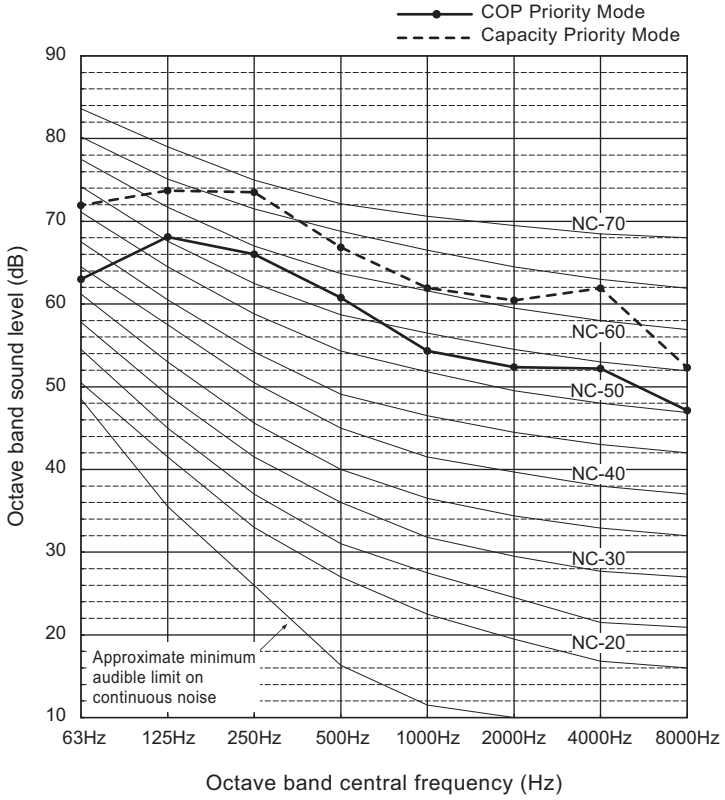


2-2. Sound pressure levels

Measurement condition
CAHV-R136YAU (-BS)

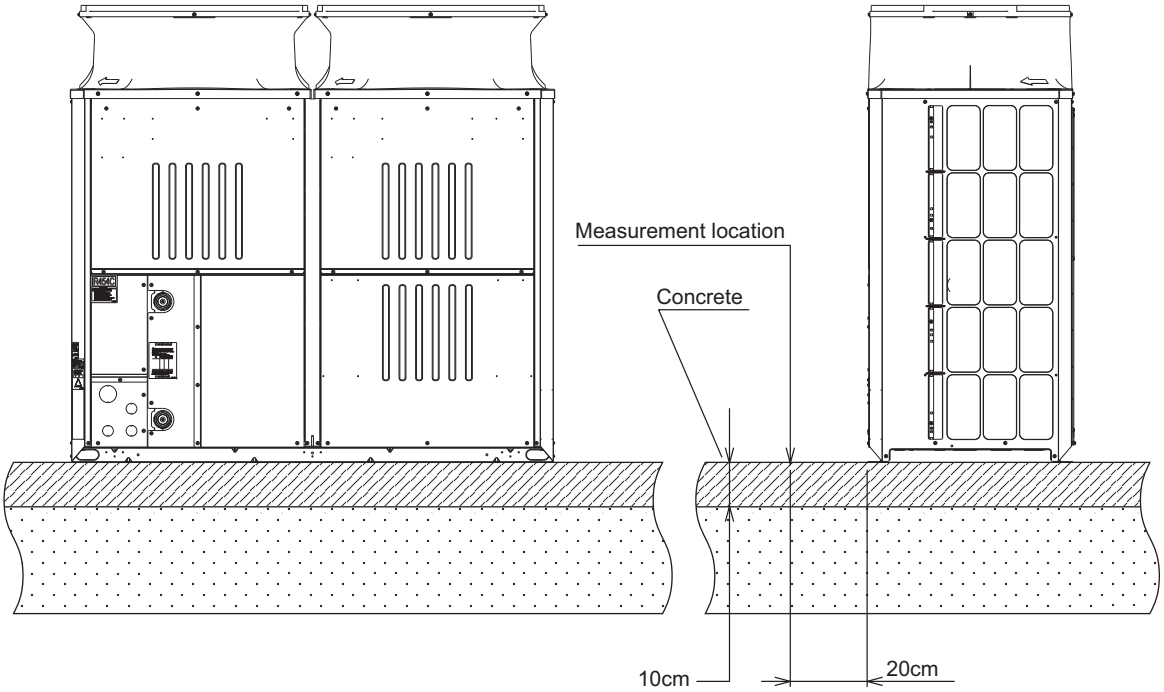


Sound Pressure Level: 65/72 dB (COP Priority Mode/Capacity Priority Mode)
Opetation condition… COP Priority Mode: 7°C (44.6°F)DB/6°C (42.8°F)WB, Inlet water temp.: 40°C (104°F), Outlet water temp. 45°C (113°F)
Capacity Priority Mode: 7°C (44.6°F)DB/6°C (42.8°F)WB, Inlet water temp.: 69°C (156°F), Outlet water temp. 74°C (165°F)



2-3. Vibration levels

CAHV-R136YAU (-BS)



Model	Vibration Levels [dB]
CAHV-R136YAU (-BS)	47 or less

3-1. Selecting the Installation Site

3-1-1. Installation Conditions

Select the installation site in consultation with the client.

Select a site to install the outdoor unit that meets the following conditions:

- The unit will not be subject to heat from other heat sources.
- The noise from the unit will not be a problem.
- The unit will not be exposed to strong winds.
- Water from the unit can be drained properly.
- Appliance shall not accessible to the public.
- The space requirements (specified on pages 18 through 20) are met.

There is possibility of injury due to contact with the unit, so abide by following contents.

1) Appliances not accessible to the general public.

2) Limit the installation to a place where the general public cannot touch the product.

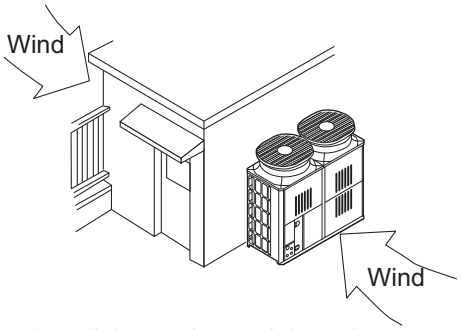
(For example, please install the unit in the area where the general public cannot enter, install a fence around the unit, etc.)

<1> Providing protection against winds

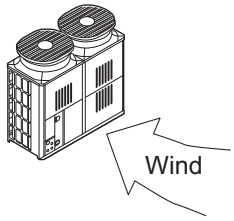
Using the figures at right as a reference, provide adequate protection against winds.

A unit installed alone is vulnerable to strong winds. Select the installation site carefully to minimize the effect of winds.

When installing a unit in a place where the wind always blows from the same direction, install the unit so that the outlet faces away from the direction of the wind.



- Install the outdoor unit in a place where it is not exposed to direct wind, such as behind a building.



- Install the outdoor unit so that the outlet/inlet faces away from the wind.

<2> Cold Climate Installation

Observe the following when installing the units in areas where snow or strong winds prevail.

- Avoid direct exposure to rain, winds, and snow.
- Icicles that may form under the foundation can fall and inflict personal injury or property damage. Select the installation site carefully to reduce these risks, especially when installing the unit on a roof.
- If the units are installed in the direct line of rain, winds, or snow, install snow hoods (on both the discharge and suction ducts). Use a snow net or snow fence as necessary to protect the unit.
- Install the unit on a base approximately twice as high as the expected snowfall.
- If the unit is continuously operated for a long time with the outside air temperature below the freezing point, install a heater at the base of the unit to prevent the water from freezing at the unit bottom.
- Install snow hoods in regions where the outdoor temperature is -10°C (14ºF) or below.

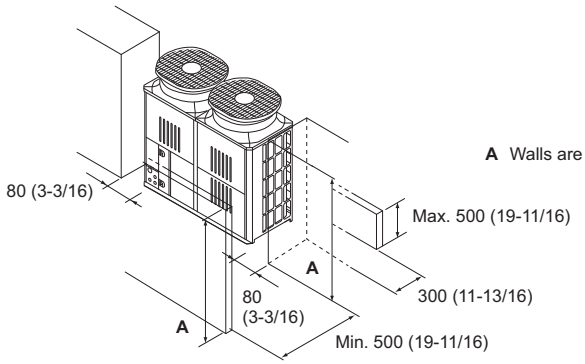
3-1-2. Installation space requirements

<1> Single unit installation

Secure enough space around the unit as shown in the figures below.

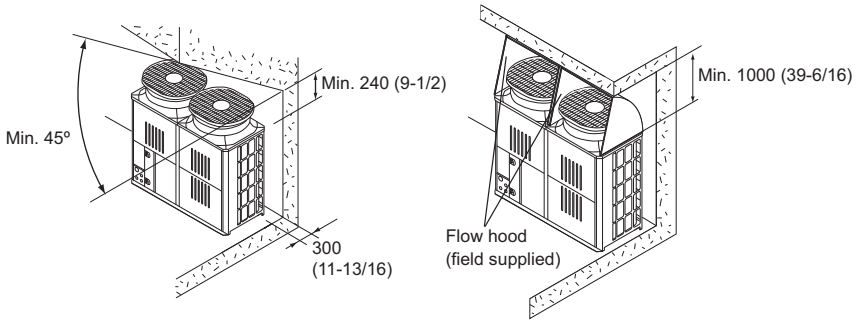
Unit: mm (in)

(1) Walls around the unit do not exceed the height limit.

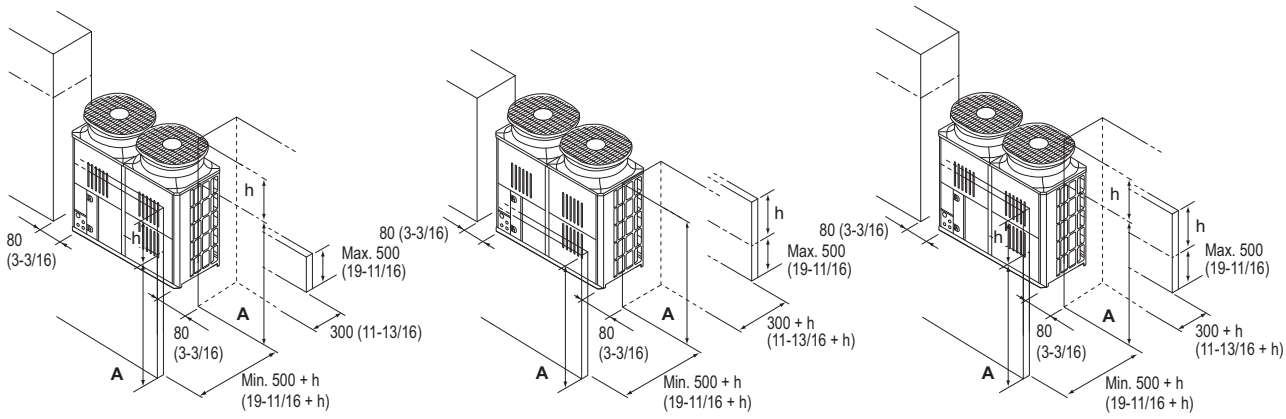


A Walls are lower than the unit's height.

(2) There is a wall above the unit.

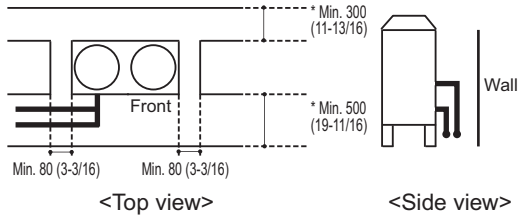


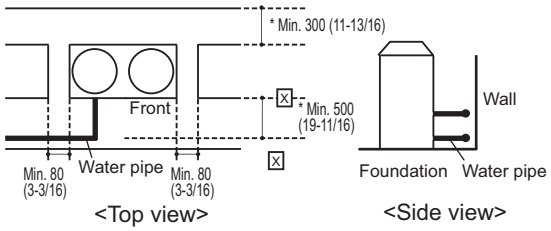
(3) One or more of the walls around the unit are taller than the maximum allowable height <h>.



A Walls are lower than the unit's height.

(4) Water pipe installation





Leave a space of at least 500 (19-11/16) between the unit and the water pipe if it is not possible to install the unit on a raised foundation. (See X in the figure.)

<2> Grouped and side-by-side installation

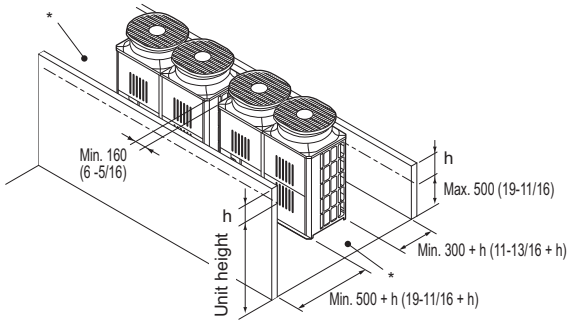
When multiple units are installed adjacent to each other, allow enough space for air circulation and a walk way between groups of units as shown in the figures below.

* Leave both sides of each group of units open.

As with individual installation, if the wall height exceeds the height limit, widen the space in the front and the back of a given group of units by the amount that exceeds the limit (labeled <h> in the figure).

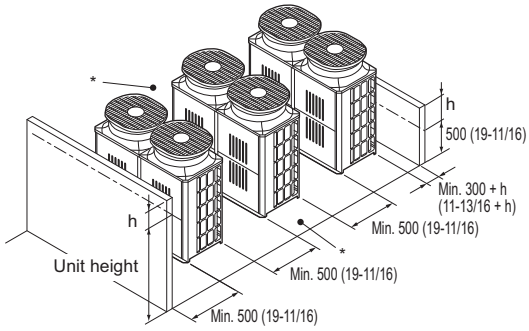
Unit: mm (in)

(1) Side-by-side installation

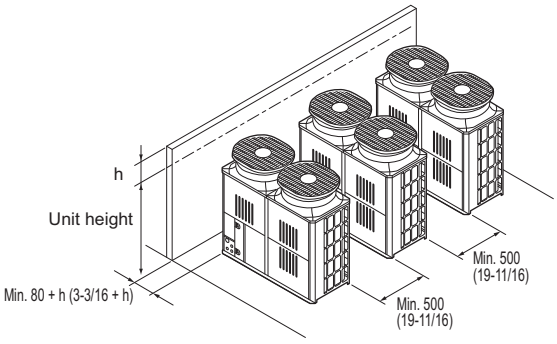


(2) Face-to-face installation

- There are walls in the back and the front of a given group of units.

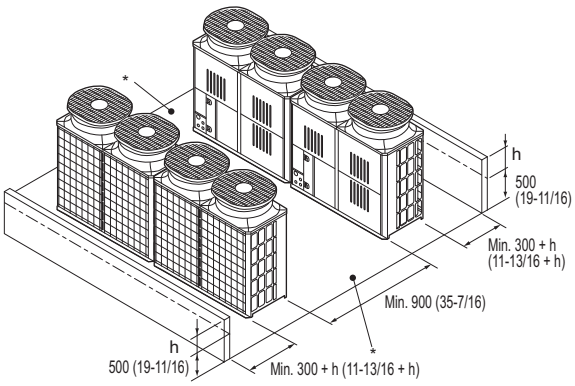


- There is a wall on one side.

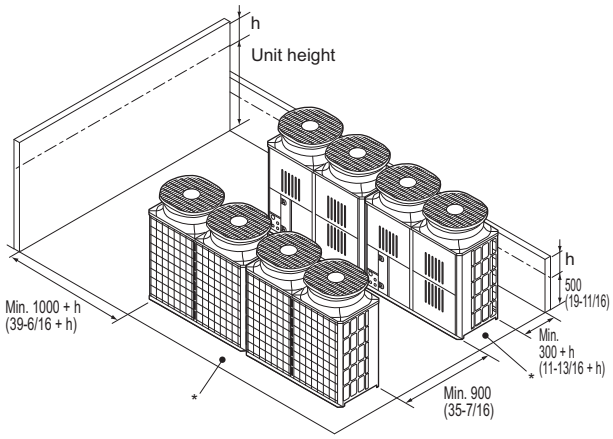


(3) Combination of face-to-face and side-by-side installations

- There are walls in the back and the front of a given group of units.

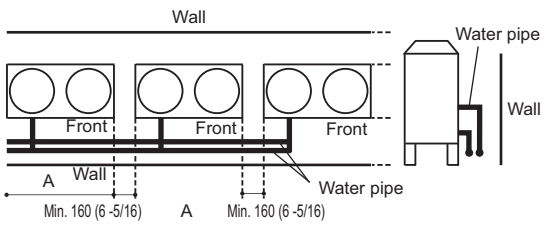


- There is a wall on one side and either the front or the back of a given group of unit.



(4) Water pipe installation

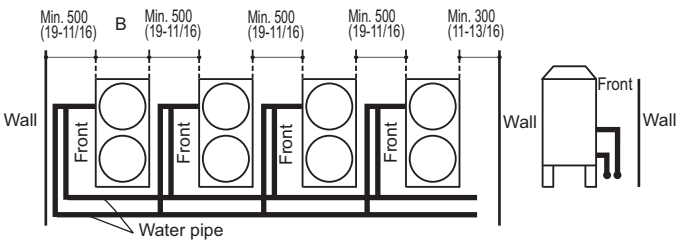
Pattern A



<Top view> <Side view>

If the product width (labeled A in the figure) times the number of units that are installed side by side exceeds 6 m (19-5/8 ft), leave a space of 1000 mm (39-6/16 in) between each block. Each block is defined as a group of units that fit within 6 m (19-5/8 ft).

Pattern B

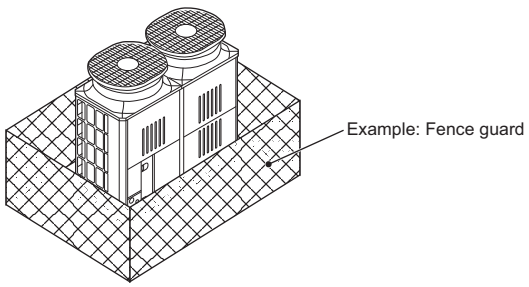


<Top view> <Side view>

If the product depth (labeled B in the figure) times the number of units that are installed in rows exceeds 6 m (19-5/8 ft), leave a space of 1000 mm (39-6/16 in) between each block. Each block is defined as a group of units that fit within 6 m (19-5/8 ft).

(5) Restricted access

- Appliance shall install to secured location with restricted access
  (e.g. location of not accessible to the general public, like a rooftop and fence guard etc...)



- Provide sufficient space around the unit for effective operation, efficient air movement, and ease of access for maintenance.
- Do not install the unit inside a building such as the basement or machine room, where the refrigerant may stagnate.

3-2. Unit Installation

Units should be installed only by personnel certified by Mitsubishi Electric.

- Securely fix the unit with bolts to keep the unit from falling down during earthquakes or due to strong winds.
- Install the unit on a foundation made of concrete or iron.
- Noise and vibrations from the unit may be transmitted through the floor and walls. Provide adequate protection against noise and vibration.
- Build the foundation in such way that the corners of the installation legs are securely supported as shown in the figure below. When using rubber vibration isolators, make sure they are large enough to cover the entire width of the unit's legs. If the corners of the legs are not firmly seated, the legs may bend.
- The projecting length of the anchor bolt should be less than 30 mm (1-3/16 in).
- This unit is not designed to be installed using hole-in anchor bolts unless brackets are used to support the four corners of the unit.
- Loosen the three screws on the legs to detach each leg (two each in the front and back). If the finish coat becomes damaged when detaching the legs, be sure to touch it up.
- With some types of installation, unit vibration and sound will be transmitted to the floors and walls. Excessive vibrations can damage the pipes, resulting in refrigerant gas leakage. Take measures to prevent vibration (such as using anti-vibration rubber pads).

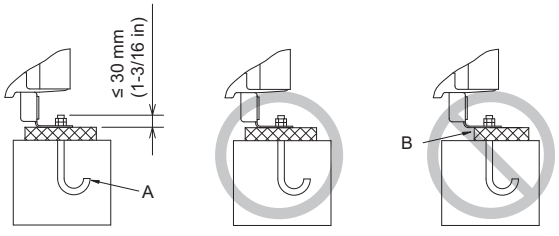
⚠ Warning:

- **Install the unit in accordance with the instructions to minimize the risk of damage from earthquakes and strong winds.**
  - Improper installation will cause the unit to topple, resulting in serious injury. To reduce the vibration of the unit operation, irrespective of the cause of the vibration such as earthquakes and strong winds, perform the foundation work in accordance with the installation instructions (including the instructions for installing anti-vibration rubber pads) provided in this section.
- **The unit must be securely installed on a structure that can sustain its weight.**
  - Failure to do so will cause the unit to fall, resulting in serious injury. Abnormal vibrations that result from improper installation can generate abnormal sound and damage the pipes, resulting in refrigerant gas leakage. Take adequate measures against typhoon winds and earthquakes so that the unit will not fall or tip over. Consult the local specialists for safety measures to be taken.

When building the foundation, take the floor strength, water drainage during operation, and piping and wiring routes into consideration.

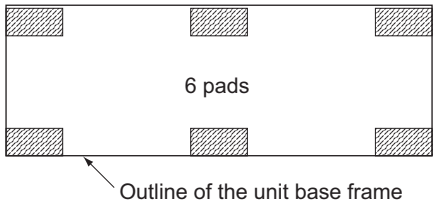
Precautions for routing the pipes and wires underneath the unit

When routing the pipes and wires underneath the unit, make sure that the foundation will not block the piping access holes. Also, make sure the foundation is at least 100 mm (3-15/16 in) high so that the piping can pass under the unit.



A: M10 anchor bolt (field supply)
B: Corner is not seated.

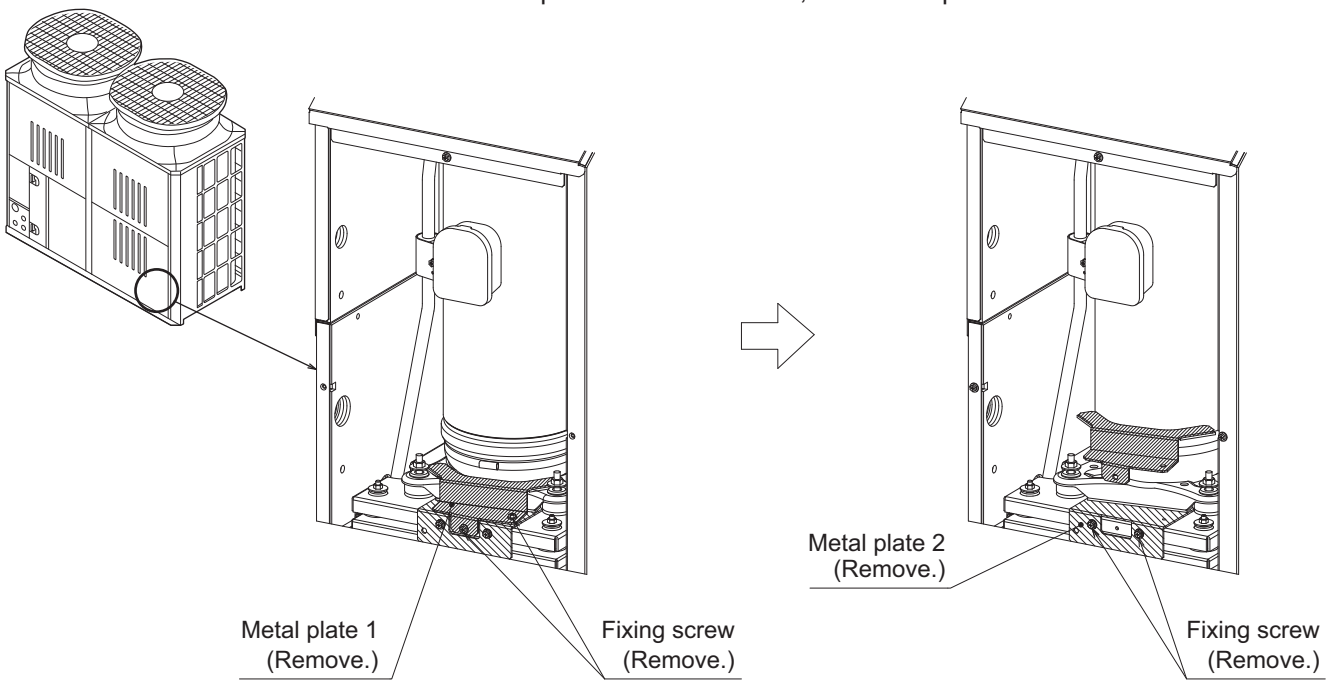
(1) Position of anti-vibration pads



3-3. Removing the metal plates and saddles around the compressor

The metal plates and saddles are used only for transportation. Remove the metal plates and saddles before operating the unit to keep the unit from vibrating excessively.

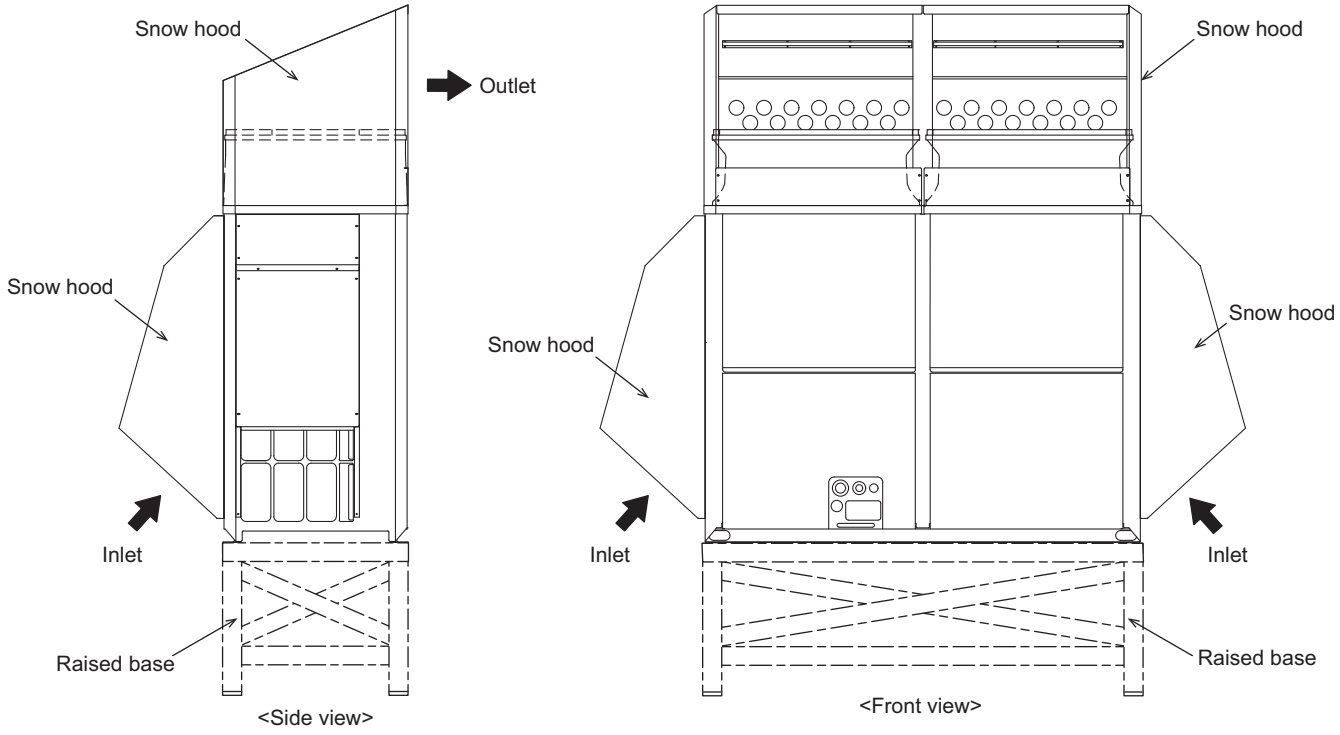
Note. Make sure which part must be removed, and which part must not.



3-4. Installing the unit in a snow area

In snowy areas, sufficient protection against snow and winds should be provided to ensure proper operation.
Even in other areas, appropriate measures should be taken to minimize the effects of winds and snow to ensure normal operation.
If the units are installed in the direct line of rain, winds, or snow, install snow hoods (on both the discharge and suction ducts).
Use a snow net or snow fence as necessary to protect the unit.
Install snow hoods in regions where the outdoor temperature is -10°C (14ºF) or below.

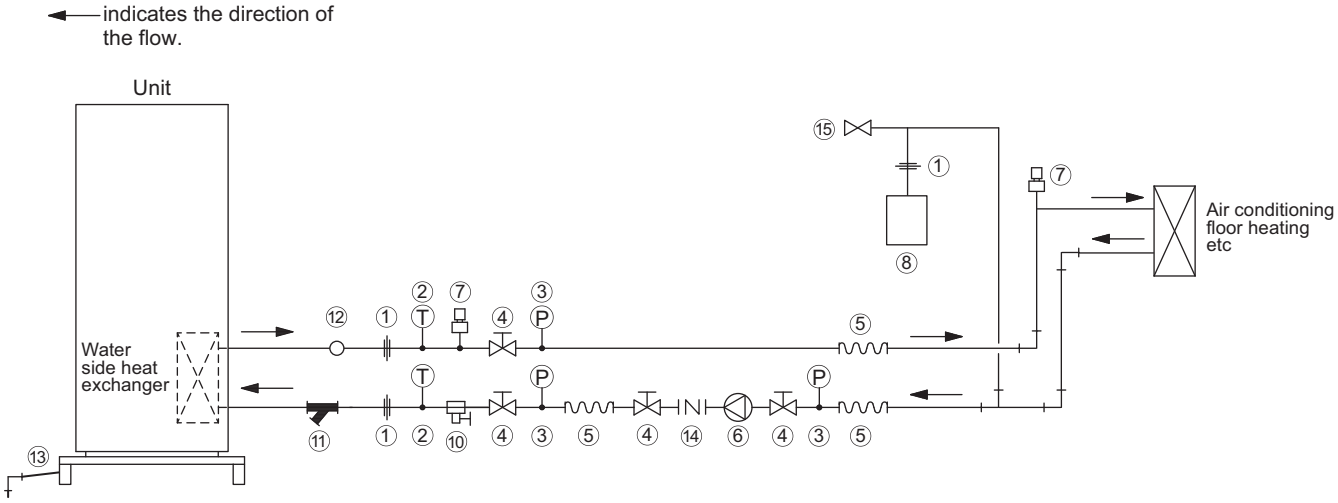
(Note)
- Install the unit on a base approximately twice as high as the expected snowfall. The base must be made of angle steel or something to let snow and wind slip through the structure. The base width must not exceed the unit size, otherwise snow will accumulate on the base.
- Install the unit so that the outlet/inlet faces away from the wind.



(Note)
1. Install the unit so that the outlet/inlet faces away from the wind. Secure enough space around the unit to avoid a short cycle.
2. Do not install the unit in a place where snow may fall from the roof. Also, remove the snow on the unit before it accumulates.
3. Refer to the figure above when installing the base on site.

4-1. Water Pipe Installation

4-1-1. Schematic Piping Diagram and Piping System Components



① Union joints/flange joints	Required to allow for a replacement of equipment.
② Thermometer	Required to check the performance and monitor the operation of the units.
③ Water pressure gauge	Recommended for checking the operation status.
④ Valve	Required to allow for a replacement or cleaning of the flow adjuster.
⑤ Flexible joint	Recommended to prevent the noise and vibration from the pump from being transmitted.
⑥ Pump	Use a pump that is large enough to compensate for the total water pressure loss and supply sufficient water to the unit.
⑦ Automatic air vent valve	Install automatic air vent valves where air accumulates. Even in the case of a failure of the water-side heat exchanger in the unit, the refrigerant may leak from the automatic air vent valve. To prevent accidents resulted from refrigerant leakage, install the unit where leaked refrigerant will not accumulate, such as outdoors.
⑧ Closed expansion tank	Install a closed expansion tank to accommodate expanded water and to supply water.
⑨ Water pipe	Use pipes that allow for easy air purging, and provide adequate insulation.
⑩ Drain valve	Install drain valves so that water can be drained for servicing.
⑪ Strainer	Install a strainer near the unit to keep foreign materials from entering the water-side head exchanger.
⑫ Flow switch	Required to protect the unit.
⑬ Drain pipe	Install the drain pipe with a downward inclination of between 1/100 and 1/200. To prevent drain water from freezing in winter, install the drain pipe as steep an angle as practically possible and minimize the straight line. For cold climate installation, take an appropriate measure (e.g., drain heater) to prevent the drain water from freezing.
⑭ Check valve	Required to prevent the backward flow.
⑮ Safety valve	Install a safety valve near the closed expansion tank. Even in the case of a failure of the water-side heat exchanger in the unit, the refrigerant may leak from the safety valve. To prevent accidents resulted from refrigerant leakage, install the unit where leaked refrigerant will not accumulate, such as outdoors.

4-1-2. Notes on pipe corrosion

Water treatment and water quality control

Poor-quality circulating water can cause the water-side heat exchanger to scale up or corrode, reducing heat-exchange performance. Properly control the quality of the circulating water.

- Removing foreign objects and impurities in the pipes
  During installation, keep foreign objects, such as welding and sealant fragments and rust, out of the pipes.

- Water Quality Control

(1) Poor-quality water can corrode or scale up the heat exchanger. Regular water treatment is recommended.
Water circulation systems using open heat storage tanks are particularly prone to corrosion.
When using an open heat storage tank, install a water-to-water heat exchanger, and use a closed-loop circuit on the hot water heat pump unit side. If a water supply tank is installed, keep contact with air to a minimum, and keep the level of dissolved oxygen in the water no higher than 1 mg/ℓ.

(2) Water quality standard

Items			Lower mid-range temperature water system Water Temp. ≤ 60ºC (140ºF)		Higher mid-range temperature water system Water Temp. > 60ºC (140ºF)		Tendency	
			Recirculating water	Make-up water	Recirculating water	Make-up water	Corrosive	Scale-forming
Standard items	pH (25°C) (77°F)		7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Electric conductivity	(mS/m) (25°C) (77°F)	30 or less	30 or less	30 or less	30 or less	○	○
		(μs/cm) (25°C) (77°F)	[300 or less]	[300 or less]	[300 or less]	[300 or less]		
	Chloride ion	(mg Cl^-/ℓ)	50 or less	50 or less	30 or less	30 or less	○	
	Sulfate ion	(mg $SO4^{2-}$/ℓ)	50 or less	50 or less	30 or less	30 or less	○	
	Acid consumption	(pH4.8) (mg $CaCO_3$/ℓ)	50 or less	50 or less	50 or less	50 or less		○
	Total hardness	(mg $CaCO_3$/ℓ)	70 or less	70 or less	70 or less	70 or less		○
	Calcium hardness	(mg $CaCO_3$/ℓ)	50 or less	50 or less	50 or less	50 or less		○
	Ionic silica	(mg SiO_2/ℓ)	30 or less	30 or less	30 or less	30 or less		○
Reference items	Iron	(mg Fe/ℓ)	1.0 or less	0.3 or less	1.0 or less	0.3 or less	○	○
	Copper	(mg Cu/ℓ)	1.0 or less	0.1 or less	1.0 or less	0.1 or less	○	
	Sulfide ion	(mg S^{2-}/ℓ)	Not to be detected	Not to be detected	Not to be detected	Not to be detected	○	
	Ammonium ion	(mg NH_4^+/ℓ)	0.3 or less	0.1 or less	0.1 or less	0.1 or less	○	
	Residual chlorine	(mg Cl/ℓ)	0.25 or less	0.3 or less	0.1 or less	0.3 or less	○	
	Free carbon dioxide	(mg CO_2/ℓ)	0.4 or less	4.0 or less	0.4 or less	4.0 or less	○	
	Ryzner stability index		—	—	—	—	○	○

Reference: Guideline of Water Quality for Refrigeration and Air Conditioning Equipment. (JRA GL02E-1994)

(3) Please consult with a water quality control specialist about water quality control methods and water quality calculations before using anti-corrosive solutions for water quality management.

(4) When replacing a hot water heat pump unit (including when only the heat exchanger is replaced), first analyze the water quality and check for possible corrosion.
Corrosion can occur in water systems in which there has been no signs of corrosion. If the water quality level has dropped, adjust the water quality before replacing the unit.

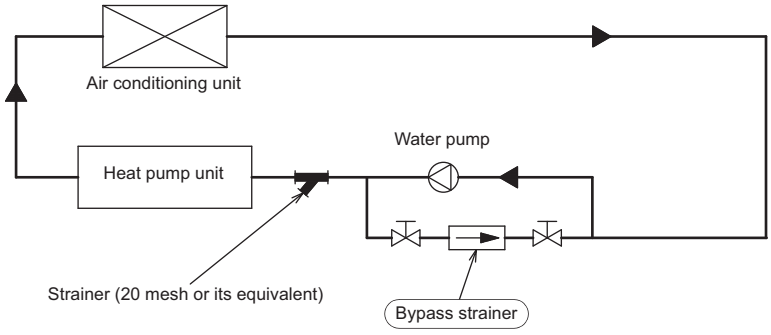
(5) Suspended solids in the water

Sand, pebbles, suspended solids, and corrosion products in water can damage the heating surface of the heat exchanger and cause corrosion. Install a good quality strainer (20 mesh or better) at the inlet of the unit to filter out suspended solids.

Removing foreign substances from the water system

Consider installing a settlement tank or a bypass strainer to remove foreign substances from the water system.

Select a strainer capable of handling two to three percent of the circulating water. The figure below shows a sample system with a bypass strainer.



(6) Connecting pipes made from different materials

If different types of metals are placed in direct contact with each other, the contact surface will corrode.

Install an insulating material between pipes that are made of different materials to keep them out of direct contact with each other.

4-1-3. Installing the water pipes

<1> Installing the strainer YS-40A

Install the optional strainer on the inlet water pipe near the unit to filter out suspended solids and prevent clogging or corrosion of the heat exchanger.

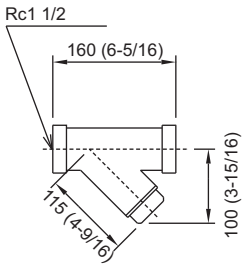
Install the strainer in a way that allows for easy access for cleaning, and instruct the user to clean it regularly.

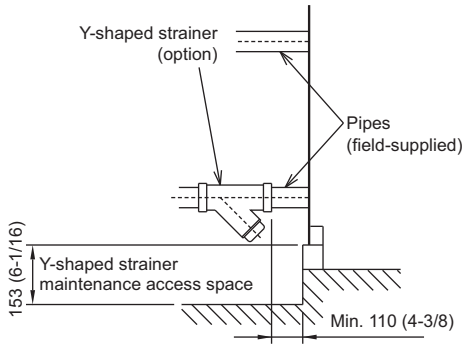
Operating the units with a clogged strainer may cause the units to make an abnormal stop.

Select a location to install a strainer, taking into consideration the installation angle, insulation thickness, and maintenance space.

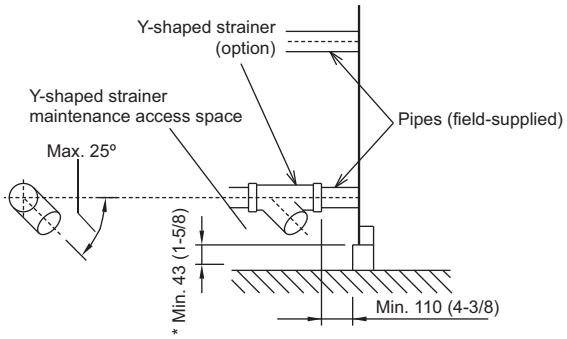
* The dimensions given below indicate the amount of space necessary when screwing in a Y-shaped strainer.

Unit: mm (in)





Sample installation 1



Sample installation 2

<2> Installing a flow switch

Install a flow switch (field supplied) that meets the following specifications on the water pipe.

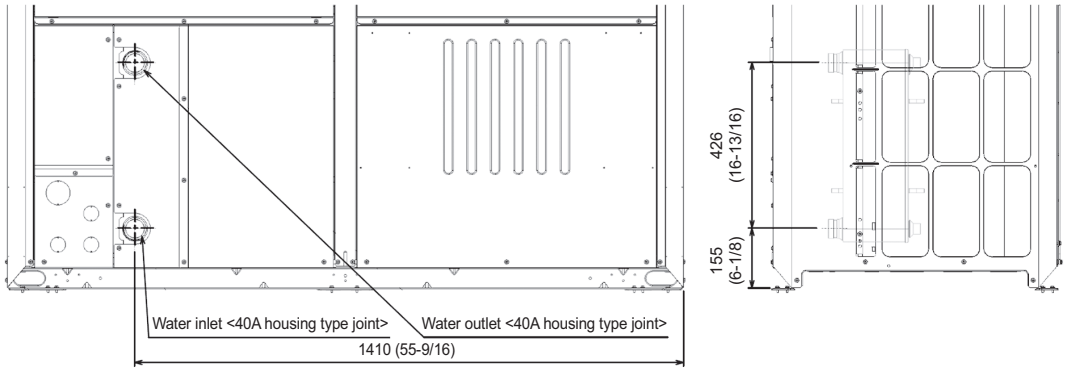
Connect the flow switch to the flow switch contact on the unit.

Minimum flow rate= 4.0 m³/h (66 L/min) (1056.8 G/h (17.6 G/m))

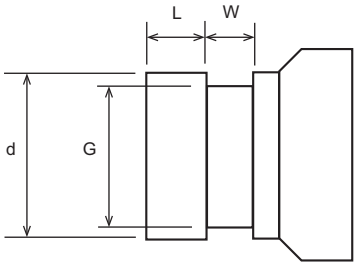
Unit usage range (water flow rate): 4.0 - 15.0 m³/h (1056.8 - 3963 G/h) *

4-1-4. Water pipe hole size and location

Unit: mm (in)



Water pipe groove specifications

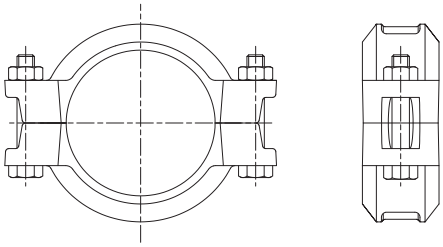


Unit: mm (in)

	Pipe size
	1-1/2B (40A)
d	ø48.3±0.3 (1-15/16)
G	$ø45^{0}_{-0.3}$ (1-13/16)
W	8±0.3 (3/8)
L	15.9±0.3 (11/16)

Housing joint (Field supply)

- Use to connect unit to local piping.



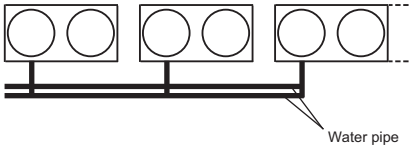
4-2. Ensuring enough water in the water circuit

1. Required amount of water

If the amount of water in the water circuit (circulating water circuit) is insufficient, the unit operation hours may become shorter or the amount of water temperature change to be controlled may become extremely large. Also, the defrost operation during the heating mode may not function properly. Refer to the table below for the minimum amount of water required in the circuit. If the water pipe is too short to keep enough amount of water, install a cushion tank in the water pipe to ensure enough amount of water.

Model	Minimum amount of water [ℓ (gal)]
CAHV-R136YAU (-BS)	525 (138.7)

* When multiple units are installed consecutively with the outlet water temperature of 55ºC (131°F) or higher, the minimum amount of water is <360 × number of units>.



Minimum amount of water = 360 × 3 = 1080 ℓ (95.1 × 3 = 285.3 gal)

2. Calculating the required amount of water in the water circuit

The required amount of water in the water circuit can be obtained from the following formula.

(Required amount of water in the water circuit) = (Amount of water that can be held in the water pipe) + (Amount of water that can be held in the heat source unit) + (Amount of water that can be held in the load-side unit)

The amount of water that can be held per meter of the water pipe [ℓ/min (gal/min)]

Pipe size					
3/4B (20A)	1B (25A)	1 1/4B (32A)	1 1/2B (40A)	2B (50A)	2 1/2B (65A)
0.37 (0.10)	0.60 (0.16)	0.99 (0.26)	1.36 (0.36)	2.20 (0.58)	3.62 (0.96)

The amount of water that can be held in the heat source unit [ℓ (gal)]

CAHV-R136YAU (-BS)
4.3 (1.13)

4-3. Inlet/Outlet pipe connection size and material

The table below shows the inlet/outlet pipe connection size.

Inlet/Outlet pipe connection size

Model	Inlet pipe connection	Outlet pipe connection
CAHV-R136YAU (-BS)	R1 - 1/2 Housing type joint	R1 - 1/2 Housing type joint

5-1. System Configurations

1. Types of control cables

Remote controller cable	Size	0.3 - 1.25 mm² (AWG 22-16) (Max. 200 m (656 ft) total) *2
	Recommended cable types	CVV
M-NET cable between units *1	Size	Min. 1.25 mm² (AWG 16) (Max. 120 m (393 ft) total)
	Recommended cable types	Shielded cable CVVS, CPEVS or MVVS
External input wire size *2	Size	Min. 0.3 mm² (AWG 22)
	Recommended cable types	Shielded cable CVVS, CPEVS or MVVS
External output wire size *2	Size	1.25 mm² (AWG 16)
	Recommended cable types	Shielded cable CVVS, CPEVS or MVVS

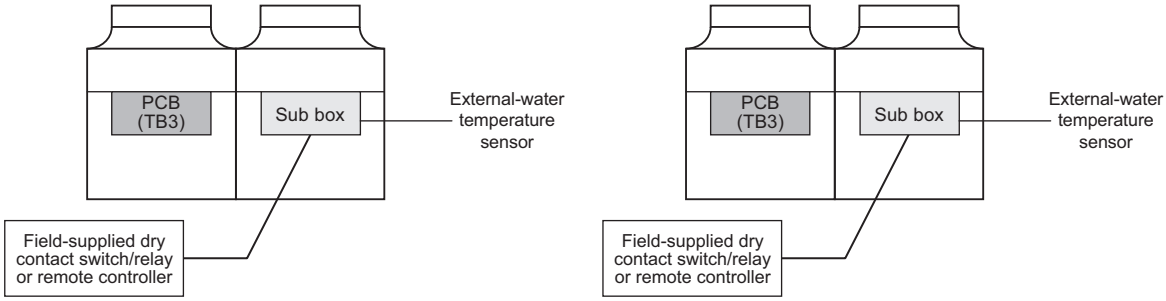
*1. Use a CVVS or CPEVS cable (Max. total length of 200 m (656 ft)) if there is a source of electrical interference near by (e.g., factory) or the total length of control wiring exceeds 120 m (393 ft).

*2 At least 1 mm (0.039 in) thickness of supplementary insulation shall be provided.

2. System Configuration

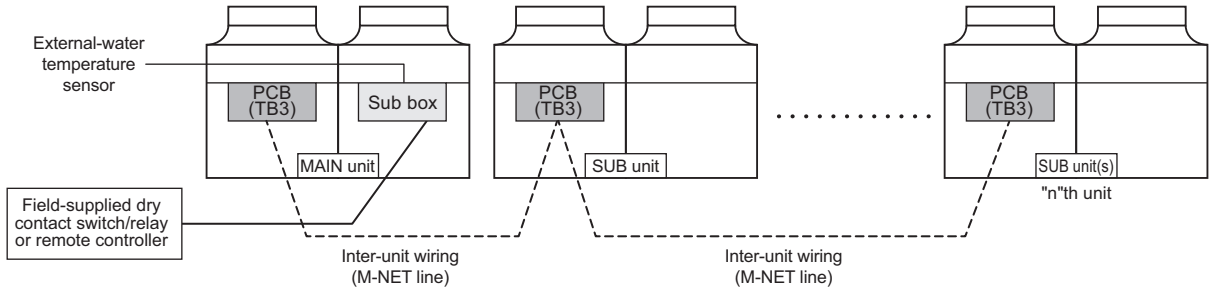
(1) Individual system

* Each unit is operated individually by connecting a dry contact switch/relay to each unit.



(2) Multiple system (2-16 units)

* A group of unit that consists of one main unit and up to 15 sub units is operated collectively by connecting an external water temperature sensor and a dry contact switch/relay to the main unit.

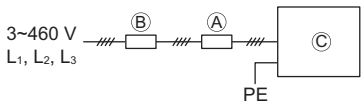


5-2. Electrical Wiring Installation

5-2-1. Main Power Supply Wiring and Switch Capacity

Schematic Drawing of Wiring (Example)

Ⓐ: Switch (with current breaking capability)
Ⓑ: Earth leakage breaker
Ⓒ: Hot water heat pump



Main power supply wire size, switch capacities, and system impedance

Model	Minimum wire thickness (mm²)			Earth leakage breaker	Local switch (A)		Overcurrent breaker (A)	MCA (A)	MOP (A)
	Main cable	Branch	Ground		Capacity	Fuse			
CAHV-R136YAU	16.77 mm² (AWG 5)	-	16.77 mm² (AWG 5)	60 A 100 mA 0.1 sec. or less	60	60	60	41	60

1) Use a dedicated power supply for each unit. Ensure that each unit is wired individually.
2) When installing wiring, consider ambient conditions (e.g., temperature, sunlight, rain).
3) The wire size is the minimum value for metal conduit wiring. If voltage drop is a problem, use a wire that is one size thicker. Make sure the power-supply voltage does not drop more than 10%.
4) Specific wiring requirements should adhere to the wiring regulations of the region.
5) Power supply cords of appliances for outdoor use shall not be lighter than polychloroprene sheathed flexible cord (design 60245 IEC57).
6) Do not install a phase advancing capacitor on the motor. Doing so may damage the capacitor and result in fire.
7) Use the breakers that match the unit capacity (leakage current limit, current breaking threshold, etc.).
8) Select the type of breaker for an inverter circuit as an earth leakage breaker. (Mitsubishi Electric NV-S series or its equivalent)
9) A breaker with at least 3.0 mm (2/16 in) contact separation in each pole shall be provided.
10) When using an earth leakage breaker without an overcurrent breaker, use a local switch and a moldedcase circuit breaker in combination.
11) If the power cable is damaged, it must be replaced by qualified personnel in order to avoid a hazard.
12) The appliance shall be installed in accordance with national wiring regulations. However, the local standards and/or regulations is applicable at a higher priority.
13) When the power cable is connected, the grounding wire must be longer than the power wire.

⚠WARNING

- All electric work must be performed by a qualified electrician according to the local regulations, standards, and the instructions detailed in the Installation Manual.
- Be sure to use specified wires and ensure no external force is imparted to terminal connections. Loose connections may cause overheating and fire.
- Proper grounding must be provided by a qualified personnel. Do not connect the grounding wire to gas pipe, water pipe, lightning rod, or telephone wire.
  - Improper grounding may result in electric shock, smoke, fire, or malfunction due to electrical noise interference.
- Include some slack in the power cables.
  - Failure to do so may break or overheat the cables, resulting in smoke or fire.
- Install an earth leakage breaker on the power supply of each unit.
  - Failure to do so may result in electric shock or fire.
- Only use properly rated breakers (an earth leakage breaker, local switch <a switch + fuse that meets local electrical codes>, or overcurrent breaker).
  - Failure to do so may result in electric shock, malfunction, smoke, or fire.
- Only use standard power cables of sufficient capacity.
  - Failure to do so may result in current leakage, overheating, smoke, or fire.
- Tighten all terminal screws to the specified torque.
  - Loose screws and contact failure may result in smoke or fire.

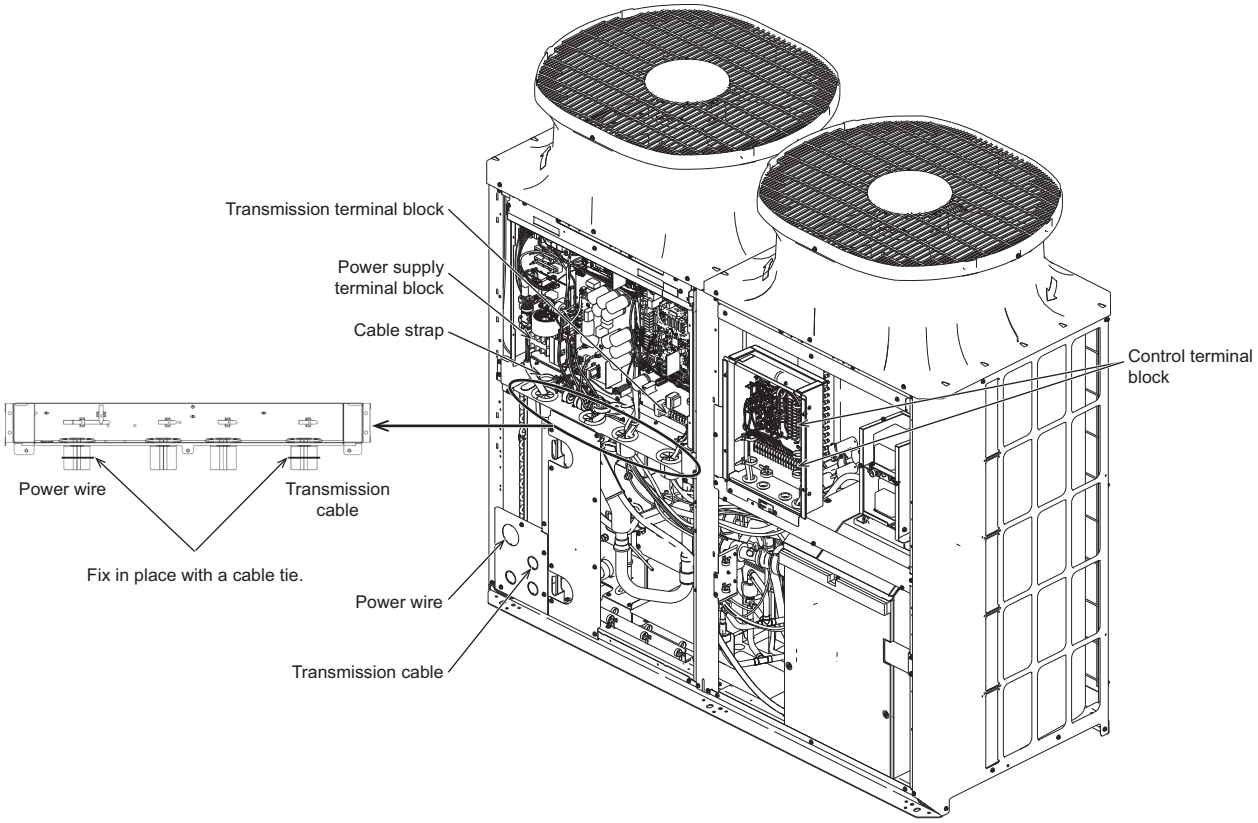
⚠CAUTION

- Some installation sites may require an installation of an earth leakage breaker for the inverter. If no earth leakage breaker is installed, there is a danger of electric shock.
- Only use properly rated breakers and fuses. Using a fuse or wire of the wrong capacity may cause malfunction or fire.
- If a large electric current flows due to a malfunction or faulty wiring, earth-leakage breakers on the unit side and on the upstream side of the power supply system could both operate.
  Depending on the importance of the system, separate the power supply system or take protective coordination of breakers.

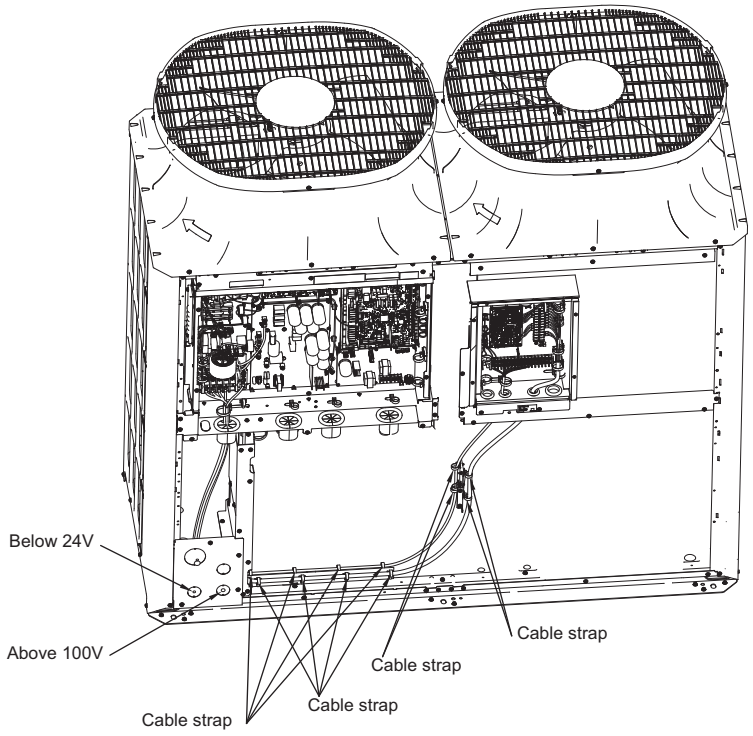
5-2-2. Cable Connections

(1) Schematic Diagram of a Unit and Terminal Block Arrangement

To remove the front panel of the control box, unscrew the four screws and pull the panel forward and then down.

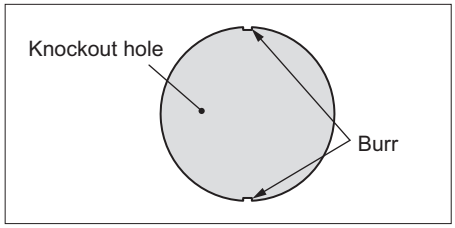


Important: Power supply cables larger than 21.15 mm^2 (AWG 4) in diameter are not connectable to the power supply terminal block (TB1). Use a pull box to connect them.



(2) Installing the conduit tube

- Punch out the knockout hole for wire routing at the bottom of the front panel with a hammer.
- When putting wires through knockout holes without protecting them with a conduit tube, deburr the holes and protect the wires with protective tape.
- If damage from animals is a concern, use a conduit tube to narrow the opening.



(3) Control box and connecting position of wiring

Supplied parts

This unit includes the following parts.
Band ··· 2 pcs.

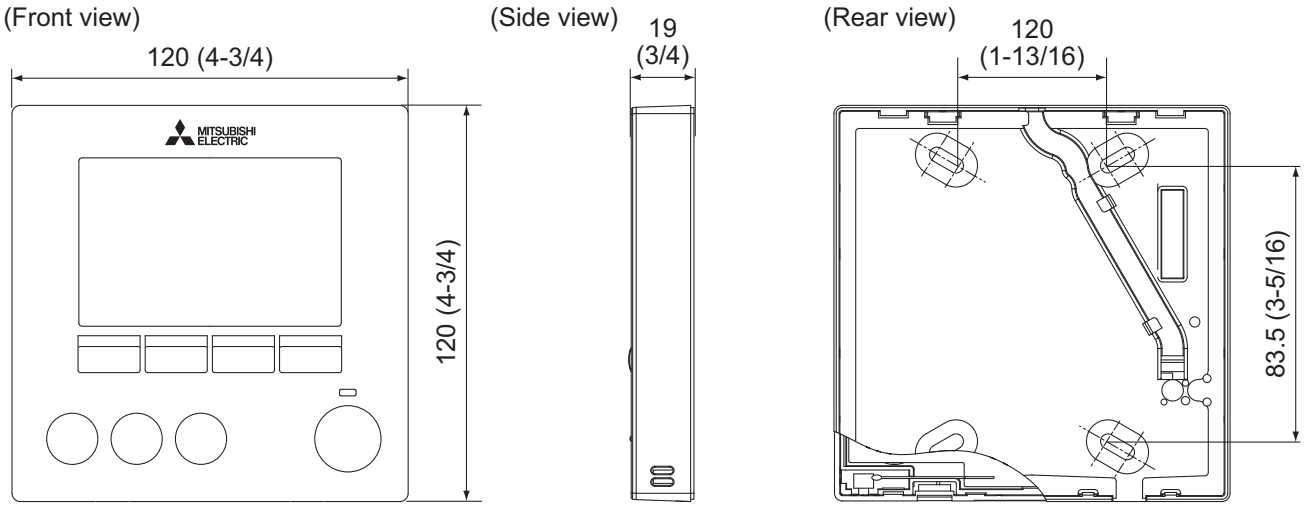
Preparation for installation

- Check that the main power on the outdoor unit is turned off.
- After turning off the main power, leave it turned off for at least 10 minutes before proceeding the installation work.

6-1. PAR-W31MAA specifications

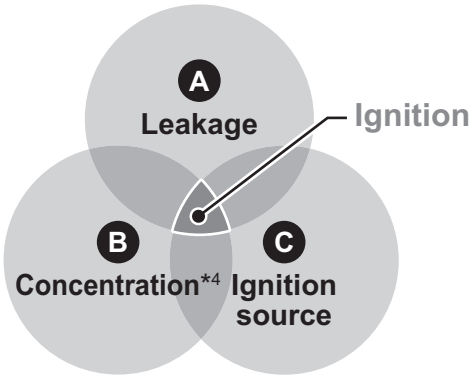
Item	Description	Operations	Display
ON/OFF	Runs and stops the operation of a group of units	○	○
Operation mode switching	Switches between Hot Water/Heating/Heating ECO/Anti-freeze/Cooling * Available operation modes vary depending on the unit to be connected. * Switching limit setting can be made via a remote controller.	○	○
Water temperature setting	Temperature can be set within the ranges below. (in increments of 0.5°C or 0.5°F) 24°C ~ 70°C (75°F ~ 158°F) * The settable range varies depending on the unit to be connected.	○	○
Water temperature display	10°C ~ 90°C (50°F ~ 194°F) (in increments of 0.5°C or 0.5°F) * The settable range varies depending on the unit to be connected.	×	○
Permit/Prohibit local operation	Individually prohibits operations of each local remote control function: ON/OFF, Operation modes, water temperature setting, Circulating water replacement warning reset. * Upper level controller may not be connected depending on the unit to be connected.	×	○
Weekly scheduler	ON/OFF/Water temperature setting can be done up to 8 times one day in the week. (in increments of a minute)	○	○
Error	When an error is currently occurring on a unit, the afflicted unit and the error code are displayed.	×	○
Self check (Error history)	Searches the latest error history by selecting "CHECK" from the Main menu.	○	○
LANGUAGE setting	The language on the dot matrix LCD can be changed. (11 languages) English/French/German/Swedish/Spanish/Italian/Danish/Dutch/Finnish /Norwegian/Portuguese	○	○

Unit: mm (in)



7-1. R454C refrigerant properties

Under the conditions shown below, there is a possibility that R454C could burn.



	R454C	R407C
Chemical formula	$CH_2F_2/C_3H_2F_4$	$CH_2F_2/CHF_2CF_3/CH_2FCF_3$
Composition (blend ratio wt. %)	R32/R1234yf (21.5/78.5 wt%)	R32/R125/R134a (23/25/52 wt%)
Ozone depletion potential (ODP)	0	0
Global warming potential (GWP) *1	148	1770
LFL (kg/m3) *2	0.293	–
Flammability *3	Lower flammability (2L)	No flame propagation (1)

*1 IPCC 4th assessment report
*2 LFL: Lower flammable limit EN 378-1: 2016+A1: 2020
*3 IEC60335-2-40: 2018
*4 R454C consistency is higher than LFL and lower than UFL.

Be sure to observe the following three points to use R454C safely.

⚠ WARNING

A Do not leak refrigerant.

<Installation>
• Vacuum drying should be done. Do not release refrigerant into the atmosphere unnecessarily.
<Repair/Removal>
• Refrigerant should be recovered.

B Prevent concentration.

• Follow “Installation restrictions.”

C Keep ignition sources away from the unit.

• Do not braze pipes that contain refrigerant. Before brazing, refrigerant should be recovered.
• Do not install the unit while electricity is on. Turn off electricity and check using a tester.
• Do not smoke during work and transportation.

Note: R454C emit toxic gas when exposed to naked flame.

7-2. Installation restrictions

General restrictions

WARNING

Do not install the unit where combustible gas may leak.
- If combustible gas accumulates around the unit, fire or explosion may result.

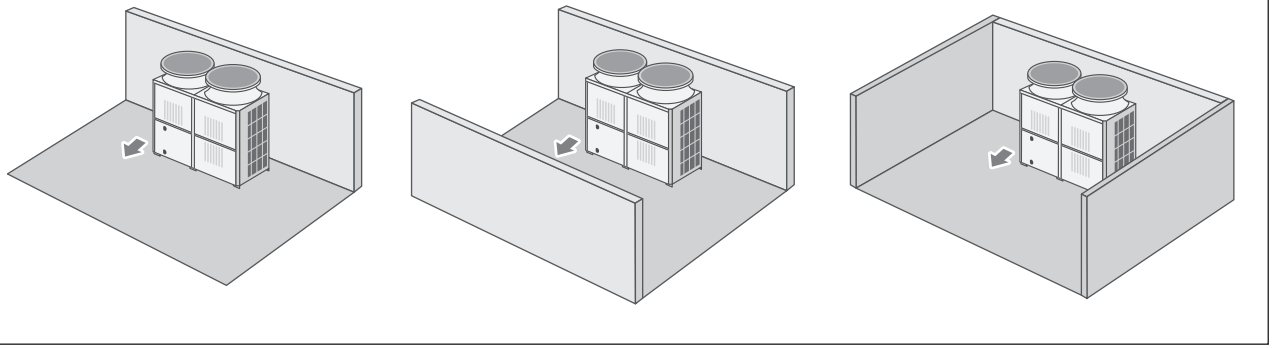
- Provide sufficient space around the unit for effective operation, efficient air movement, and ease of access for maintenance.
- All restrictions mentioned in this manual apply not only to new installations but also to relocations and layout changes.
- Refer to the Installation manual for other precautions on installation.

Installation space requirement

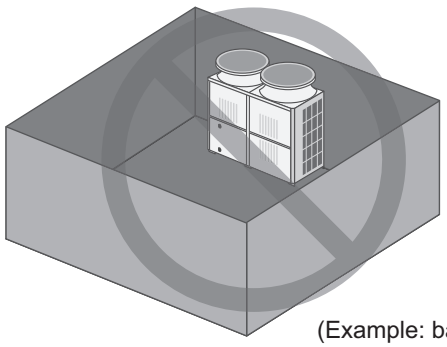
- Do not install the unit inside a building such as the basement or machine room, where the refrigerant may stagnate.
- Install the unit in a place where at least one of four sides is open.

Figure 1

Correct installation



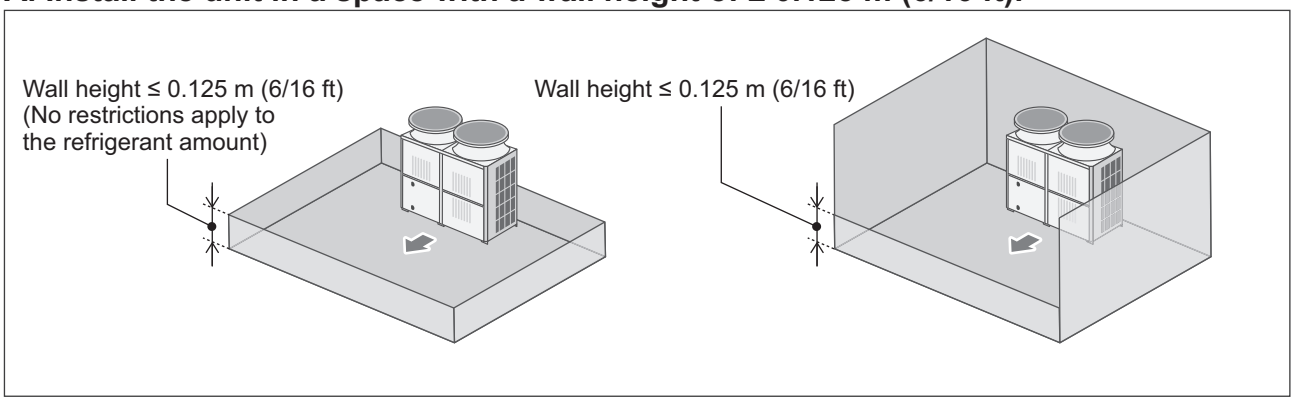
Incorrect installation



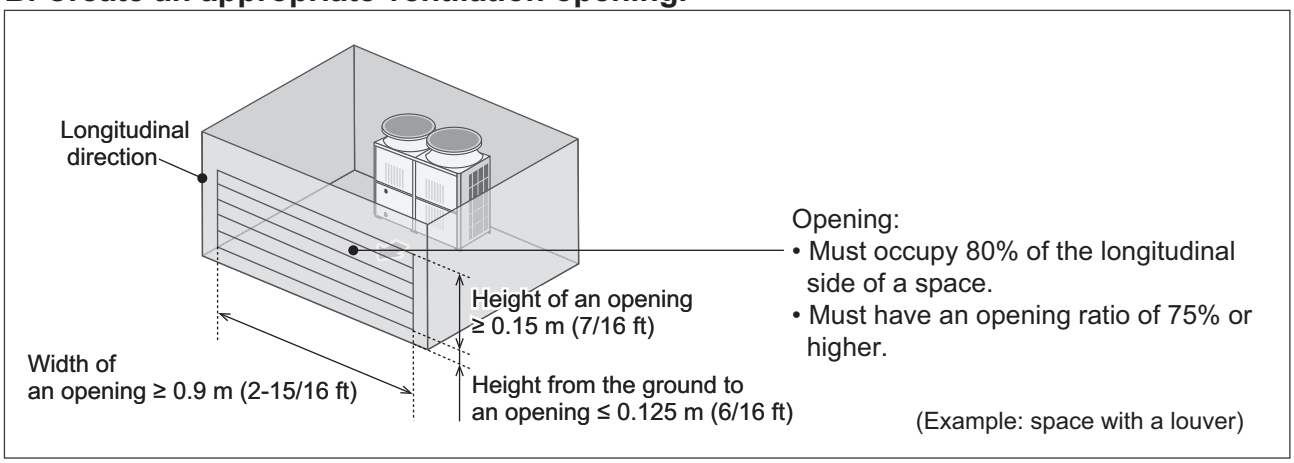
(Example: basement)

If the unit needs to be installed in a space where all four sides are blocked, confirm that one of the following situations (A or B) is satisfied.

A. Install the unit in a space with a wall height of ≤ 0.125 m (6/16 ft).



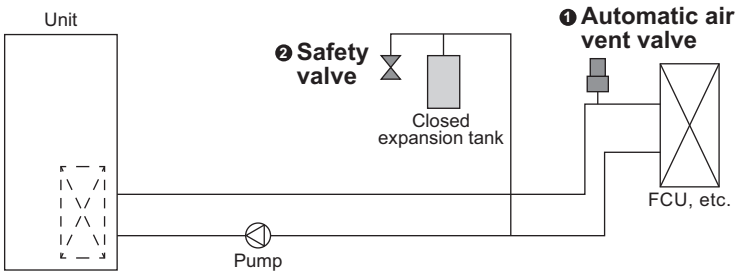
B. Create an appropriate ventilation opening.



7-3. Regulatory requirements for safety

See below for information on installing a safety device on hot water heat pump system.

* Safety devices shall be regularly inspected, maintained, and replaced in accordance with relevant laws, regulations, and the instructions of the manufacturers.
* The requirements listed below were established based on IEC60335-2-40 (Edition 6.0) G.G.6. See the original standards for further information on selecting a safety device.



Required items

❶ Automatic air vent valve
❷ Safety valve

Note
* In the event of a failure of the waterside heat exchanger in the unit, the refrigerant may leak from the automatic air vent valve or safety valve, so install it in a place where the refrigerant will not accumulate, such as outdoors.

⚠Warning

■ Do not use refrigerant other than the type indicated in the manuals provided with the unit and on the nameplate.
- Doing so may cause the unit or pipes to burst, or result in explosion or fire during use, repair, or at the time of disposal of the unit.
- It may also be in violation of applicable laws.
- MITSUBISHI ELECTRIC CORPORATION cannot be held responsible for malfunctions or accidents resulting from the use of the wrong type of refrigerant.

■ Our air conditioning equipment and heat pumps contain a fluorinated greenhouse gas, R454C.

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