MITSUBISHI ELECTRIC

Changes for the Better

AIR CONDITIONING SYSTEMS

HYBRID CITY MULTI

DATA BOOK

MODEL

PQRY-P200-500YLM-A1

GENERAL LINE-UP

Heat Recovery WR2-Series

PQRY-P200YLM-A1
PQRY-P300YLM-A1

PQRY-P250YLM-A1

8, 10, 12HP

PQRY-P350YLM-A1
PQRY-P450YLM-A1

PQRY-P400YLM-A1
PQRY-P500YLM-A1

14, 16, 18, 20HP

PQRY-P-YLM-A1

Model			PQRY-P200YLM-A1	PQRY-P250YLM-A1
Power source			3-phase 4-wire 380-400-415 V 50/60 Hz	3-phase 4-wire 380-400-415 V 50/60 Hz
Cooling capacity *1		kW	22.4	28.0
(Nominal) *1		BTU/h	76,400	95,500
	Power input	kW	3.97	5.44
	Current input	A	6.7-6.3-6.1	9.1-8.7-8.4
	EER	kW/kW	5.64	5.14
Temp. range of	Indoor	W.B.	15.0~24.0°C (59~75°F)	15.0~24.0°C (59~75°F)
cooling	Circulating water	°C	10.0~45.0°C (50~113°F)	10.0~45.0°C (50~113°F)
Heating capacity *2		kW	25.0	31.5
(Nominal) *2		BTU/h	85,300	107,500
	Power input	kW	4.04	5.41
	Current input	A	6.8-6.4-6.2	9.1-8.6-8.3
	COP	kW/kW	6.18	5.82
Temp. range of	Indoor	D.B.	15.0~27.0°C (59~81°F)	15.0~27.0°C (59~81°F)
heating	Circulating water	°C	10.0~45.0°C (50~113°F)	10.0~45.0°C (50~113°F)
Indoor unit	Total capacity		50~150% of heat source unit capacity	50~150% of heat source unit capacity
connectable	Model/Quantity		W/WP/WL10~125/1~30	W/WP/WL10~125/1~37
Sound pressure level (measured in anechoic room)		dB <A>	46	48
Sound power level (measured in anechoic room)		dB <A>	60	62
Refrigerant	High pressure	mm (in.)	15.88 (5/8) Brazed	19.05 (3/4) Brazed
piping diameter	Low pressure	mm (in.)	19.05 (3/4) Brazed	22.2 (7/8) Brazed
Circulating water	Water flow rate	m^3/h	5.76	5.76
		L/min	96	96
		cfm	3.4	3.4
	Pressure drop	kPa	24	24
	Operating volume range	m^3/h	3.0 ~ 7.2	3.0 ~ 7.2
Compressor	Type		Inverter scroll hermetic compressor	Inverter scroll hermetic compressor
	Manufacture		AC&R Works, MITSUBISHI ELECTRIC CORPORATION	AC&R Works, MITSUBISHI ELECTRIC CORPORATION
	Starting method		Inverter	Inverter
	Motor output	kW	4.8	6.2
	Case heater	kW	-	-
	Lubricant		MEL32	MEL32
External finish			Galvanized steel sheets	Galvanized steel sheets
External dimension H x W x D		mm	1,100 x 880 x 550	1,100 x 880 x 550
		in.	43-5/16 x 34-11/16 x 21-11/16	43-5/16 x 34-11/16 x 21-11/16
Protection devices	High pressure protection		High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)
	Inverter circuit (COMP.)		Over-heat protection, Over-current protection	Over-heat protection, Over-current protection
	Compressor		Over-heat protection	Over-heat protection
Refrigerant	Type x original charge		R410A x 5.0 kg (12 lbs)	R410A x 5.0 kg (12 lbs)
	Control		HBC controller	HBC controller
Net weight		kg (lbs)	173 (382)	173 (382)
Heat exchanger			plate type	plate type
	Water volume in plate	l	5.0	5.0
	Water pressure Max.	MPa	2.0	2.0
HIC circuit (HIC: Heat Inter-Changer)			-	-
Drawing	External		WKL94C183	WKL94C183
	Wiring		WKE94G420	WKE94G420
Standard attachment	Document		Installation Manual	Installation Manual
	Accessory		Refrigerant conn. pipe	Refrigerant conn. pipe
Optional parts			Main HBC controller: CMB-WM108,1016V-AA Sub HBC controller: CMB-WM108,1016V-BB	Main HBC controller: CMB-WM108,1016V-AA Sub HBC controller: CMB-WM108,1016V-BB
Remarks			Details on foundation work, duct work, insulation work, electrical wiring, power source switch, and other items shall be referred to the Installation Manual. Due to continuing improvement, above specifications may be subject to change without notice. The ambient temperature of the heat source unit needs to be kept below 40°C D.B. The ambient relative humidity of the heat source unit needs to be kept below 80%. The heat source unit should not be installed at outdoor. Be sure to mount a strainer (more than 50 meshes) at the water inlet piping of the unit. Be sure to provide interlocking for the unit operation and water circuit. Install the supplied insulation material to the unused drain-socket. When installing insulation material around both water and refrigerant piping, follow the installation manual.	

Notes:

1.Nominal cooling conditions (subject to JIS B8615-2)
Indoor: 27°CD.B./19°CW.B. (81°FD.B./66°FW.B.), Water temperature: 30°C (86°F)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)
2.Nominal heating conditions (subject to JIS B8615-2)
Indoor: 20°CD.B. (68°FD.B.), Water temperature: 20°C (68°FD.B.)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)

Unit converter	
BTU/h	=kW x 3,412
cfm	$=m^3/min$ x 35.31
lbs	=kg/0.4536

*Above specification data is subject to rounding variation.

Model			PQRY-P300YLM-A1	
Number of HBC controller			Single HBC	Double HBC
Power source			3-phase 4-wire 380-400-415 V 50/60 Hz	
Cooling capacity *1		kW	33.5	
(Nominal) *1		BTU/h	114,300	
	Power input	kW	7.55	6.71
	Current input	A	12.7-12.1-11.6	11.3-10.7-10.3
	EER	kW/kW	4.43	4.99
Temp. range of	Indoor	W.B.	15.0~24.0°C (59~75°F)	
cooling	Circulating water	°C	10.0~45.0°C (50~113°F)	
Heating capacity *2		kW	37.5	
(Nominal) *2		BTU/h	128,000	
	Power input	kW	7.13	6.79
	Current input	A	12.0-11.4-11.0	11.4-10.8-10.4
	COP	kW/kW	5.25	5.52
Temp. range of	Indoor	D.B.	15.0~27.0°C (59~81°F)	
heating	Circulating water	°C	10.0~45.0°C (50~113°F)	
Indoor unit	Total capacity		50~150% of heat source unit capacity	
connectable	Model/Quantity		W/WP/WL10~125/2~45	
Sound pressure level (measured in anechoic room)		dB <A>	54	
Sound power level (measured in anechoic room)		dB <A>	68	
Refrigerant	High pressure	mm (in.)	19.05 (3/4) Brazed	
piping diameter	Low pressure	mm (in.)	22.2 (7/8) Brazed	
Circulating water	Water flow rate	m^3/h	5.76	
		L/min	96	
		cfm	3.4	
	Pressure drop	kPa	24	
	Operating volume range	m^3/h	3.0 ~ 7.2	
Compressor	Type		Inverter scroll hermetic compressor	
	Manufacture		AC&R Works, MITSUBISHI ELECTRIC CORPORATION	
	Starting method		Inverter	
	Motor output	kW	7.7	
	Case heater	kW	-	
	Lubricant		MEL32	
External finish			Galvanized steel sheets	
External dimension H x W x D		mm	1,100 x 880 x 550	
		in.	43-5/16 x 34-11/16 x 21-11/16	
Protection devices	High pressure protection		High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	
	Inverter circuit (COMP.)		Over-heat protection, Over-current protection	
	Compressor		Over-heat protection	
Refrigerant	Type x original charge		R410A x 5.0 kg (12 lbs)	
	Control		HBC controller	
Net weight		kg (lbs)	173 (382)	
Heat exchanger			plate type	
	Water volume in plate	l	5.0	
	Water pressure Max.	MPa	2.0	
HIC circuit (HIC: Heat Inter-Changer)			-	
Drawing	External		WKL94C183	
	Wiring		WKE94G420	
Standard attachment	Document		Installation Manual	
	Accessory		Refrigerant conn. pipe	
Optional parts			Main HBC controller: CMB-WM108,1016V-AA Sub HBC controller: CMB-WM108,1016V-BB	
Remarks			Details on foundation work, duct work, insulation work, electrical wiring, power source switch, and other items shall be referred to the Installation Manual. Due to continuing improvement, above specifications may be subject to change without notice. The ambient temperature of the heat source unit needs to be kept below 40°C D.B. The ambient relative humidity of the heat source unit needs to be kept below 80%. The heat source unit should not be installed at outdoor. Be sure to mount a strainer (more than 50 meshes) at the water inlet piping of the unit. Be sure to provide interlocking for the unit operation and water circuit. Install the supplied insulation material to the unused drain-socket. When installing insulation material around both water and refrigerant piping, follow the installation manual.	

Notes:

1.Nominal cooling conditions (subject to JIS B8615-2)
Indoor: 27°CD.B./19°CW.B. (81°FD.B./66°FW.B.), Water temperature: 30°C (86°F)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)
2.Nominal heating conditions (subject to JIS B8615-2)
Indoor: 20°CD.B. (68°FD.B.), Water temperature: 20°C (68°FD.B.)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)

Unit converter

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

*Above specification data is subject to rounding variation.

Model			PQRY-P350YLM-A1	
Number of HBC controller			Single HBC	Double HBC
Power source			3-phase 4-wire 380-400-415 V 50/60 Hz	
Cooling capacity *1		kW	40.0	
(Nominal) *1		BTU/h	136,500	
	Power input	kW	9.98	8.72
	Current input	A	16.8-16.0-15.4	14.7-13.9-13.4
	EER	kW/kW	4.00	4.58
Temp. range of	Indoor	W.B.	15.0~24.0°C (59~75°F)	
cooling	Circulating water	°C	10.0~45.0°C (50~113°F)	
Heating capacity *2		kW	45.0	
(Nominal) *2		BTU/h	153,500	
	Power input	kW	8.87	8.25
	Current input	A	14.9-14.2-13.7	13.9-13.2-12.7
	COP	kW/kW	5.07	5.45
Temp. range of	Indoor	D.B.	15.0~27.0°C (59~81°F)	
heating	Circulating water	°C	10.0~45.0°C (50~113°F)	
Indoor unit	Total capacity		50~150% of heat source unit capacity	
connectable	Model/Quantity		W/WP/WL10~125/2~50	
Sound pressure level (measured in anechoic room)		dB <A>	52	
Sound power level (measured in anechoic room)		dB <A>	66	
Refrigerant	High pressure	mm (in.)	22.2 (7/8) Brazed	
piping diameter	Low pressure	mm (in.)	28.58 (1-1/8) Brazed	
Circulating water	Water flow rate	m^3/h	7.20	
		L/min	120	
		cfm	4.2	
	Pressure drop	kPa	44	
	Operating volume range	m^3/h	4.5 ~ 11.6	
Compressor	Type		Inverter scroll hermetic compressor	
	Manufacture		AC&R Works, MITSUBISHI ELECTRIC CORPORATION	
	Starting method		Inverter	
	Motor output	kW	9.5	
	Case heater	kW	-	
	Lubricant		MEL32	
External finish			Galvanized steel sheets	
External dimension H x W x D		mm	1,450 x 880 x 550	
		in.	57-1/8 x 34-11/16 x 21-11/16	
Protection devices	High pressure protection		High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	
	Inverter circuit (COMP.)		Over-heat protection, Over-current protection	
	Compressor		Over-heat protection	
Refrigerant	Type x original charge		R410A x 6.0 kg (14 lbs)	
	Control		HBC controller	
Net weight		kg (lbs)	217 (479)	
Heat exchanger			plate type	
	Water volume in plate	l	5.0	
	Water pressure Max.	MPa	2.0	
HIC circuit (HIC: Heat Inter-Changer)			-	
Drawing	External		WKL94C184	
	Wiring		WKE94G420	
Standard attachment	Document		Installation Manual	
	Accessory		Refrigerant conn. pipe	
Optional parts			Main HBC controller: CMB-WM108,1016V-AA Sub HBC controller: CMB-WM108,1016V-BB	
Remarks			Details on foundation work, duct work, insulation work, electrical wiring, power source switch, and other items shall be referred to the Installation Manual. Due to continuing improvement, above specifications may be subject to change without notice. The ambient temperature of the heat source unit needs to be kept below 40°C D.B. The ambient relative humidity of the heat source unit needs to be kept below 80%. The heat source unit should not be installed at outdoor. Be sure to mount a strainer (more than 50 meshes) at the water inlet piping of the unit. Be sure to provide interlocking for the unit operation and water circuit. Install the supplied insulation material to the unused drain-socket. When installing insulation material around both water and refrigerant piping, follow the installation manual.	

Notes:

1.Nominal cooling conditions (subject to JIS B8615-2)
Indoor: 27°CD.B./19°CW.B. (81°FD.B./66°FW.B.), Water temperature: 30°C (86°F)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)
2.Nominal heating conditions (subject to JIS B8615-2)
Indoor: 20°CD.B. (68°FD.B.), Water temperature: 20°C (68°FD.B.)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)

Unit converter	
BTU/h	=kW x 3,412
cfm	$=m^3/min$ x 35.31
lbs	=kg/0.4536

*Above specification data is subject to rounding variation.

Model			PQRY-P400YLM-A1	PQRY-P450YLM-A1
Power source			3-phase 4-wire 380-400-415 V 50/60 Hz	3-phase 4-wire 380-400-415 V 50/60 Hz
Cooling capacity *1		kW	45.0	50.0
(Nominal) *1		BTU/h	153,500	170,600
	Power input	kW	10.05	12.05
	Current input	A	16.9-16.1-15.5	20.3-19.3-18.6
	EER	kW/kW	4.47	4.14
Temp. range of	Indoor	W.B.	15.0~24.0°C (59~75°F)	15.0~24.0°C (59~75°F)
cooling	Circulating water	°C	10.0~45.0°C (50~113°F)	10.0~45.0°C (50~113°F)
Heating capacity *2		kW	50.0	56.0
(Nominal) *2		BTU/h	170,600	191,100
	Power input	kW	9.45	11.11
	Current input	A	15.9-15.1-14.6	18.7-17.8-17.1
	COP	kW/kW	5.29	5.04
Temp. range of	Indoor	D.B.	15.0~27.0°C (59~81°F)	15.0~27.0°C (59~81°F)
heating	Circulating water	°C	10.0~45.0°C (50~113°F)	10.0~45.0°C (50~113°F)
Indoor unit	Total capacity		50~150% of heat source unit capacity	50~150% of heat source unit capacity
connectable	Model/Quantity		W/WP/WL10~125/2~50	W/WP/WL10~125/2~50
Sound pressure level (measured in anechoic room)		dB <A>	52	54
Sound power level (measured in anechoic room)		dB <A>	66	70
Refrigerant	High pressure	mm (in.)	22.2 (7/8) Brazed	22.2 (7/8) Brazed
piping diameter	Low pressure	mm (in.)	28.58 (1-1/8) Brazed	28.58 (1-1/8) Brazed
Circulating water	Water flow rate	m^3/h	7.20	7.20
		L/min	120	120
		cfm	4.2	4.2
	Pressure drop	kPa	44	44
	Operating volume range	m^3/h	4.5 ~ 11.6	4.5 ~ 11.6
Compressor	Type		Inverter scroll hermetic compressor	Inverter scroll hermetic compressor
	Manufacture		AC&R Works, MITSUBISHI ELECTRIC CORPORATION	AC&R Works, MITSUBISHI ELECTRIC CORPORATION
	Starting method		Inverter	Inverter
	Motor output	kW	10.7	11.6
	Case heater	kW	-	-
	Lubricant		MEL32	MEL32
External finish			Galvanized steel sheets	Galvanized steel sheets
External dimension H x W x D		mm	1,450 x 880 x 550	1,450 x 880 x 550
		in.	57-1/8 x 34-11/16 x 21-11/16	57-1/8 x 34-11/16 x 21-11/16
Protection devices	High pressure protection		High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)
	Inverter circuit (COMP.)		Over-heat protection, Over-current protection	Over-heat protection, Over-current protection
	Compressor		Over-heat protection	Over-heat protection
Refrigerant	Type x original charge		R410A x 6.0 kg (14 lbs)	R410A x 6.0 kg (14 lbs)
	Control		HBC controller	HBC controller
Net weight		kg (lbs)	217 (479)	217 (479)
Heat exchanger			plate type	plate type
	Water volume in plate	l	5.0	5.0
	Water pressure Max.	MPa	2.0	2.0
HIC circuit (HIC: Heat Inter-Changer)			-	-
Drawing	External		WKL94C184	WKL94C184
	Wiring		WKE94G420	WKE94G420
Standard attachment	Document		Installation Manual	Installation Manual
	Accessory		Refrigerant conn. pipe	Refrigerant conn. pipe
Optional parts			Main HBC controller: CMB-WM108,1016V-AA Sub HBC controller: CMB-WM108,1016V-BB	Main HBC controller: CMB-WM108,1016V-AA Sub HBC controller: CMB-WM108,1016V-BB
Remarks			Details on foundation work, duct work, insulation work, electrical wiring, power source switch, and other items shall be referred to the Installation Manual. Due to continuing improvement, above specifications may be subject to change without notice. The ambient temperature of the heat source unit needs to be kept below 40°C D.B. The ambient relative humidity of the heat source unit needs to be kept below 80%. The heat source unit should not be installed at outdoor. Be sure to mount a strainer (more than 50 meshes) at the water inlet piping of the unit. Be sure to provide interlocking for the unit operation and water circuit. Install the supplied insulation material to the unused drain-socket. When installing insulation material around both water and refrigerant piping, follow the installation manual.	

Notes:

1.Nominal cooling conditions (subject to JIS B8615-2)
Indoor: 27°CD.B./19°CW.B. (81°FD.B./66°FW.B.), Water temperature: 30°C (86°F)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)
2.Nominal heating conditions (subject to JIS B8615-2)
Indoor: 20°CD.B. (68°FD.B.), Water temperature: 20°C (68°FD.B.)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)

Unit converter

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

*Above specification data is subject to rounding variation.

Model			PQRY-P500YLM-A1	
Power source			3-phase 4-wire 380-400-415 V 50/60 Hz	
Cooling capacity *1		kW	56.0	
(Nominal) *1		BTU/h	191,100	
	Power input	kW	14.58	
	Current input	A	24.6-23.3-22.5	
	EER	kW/kW	3.84	
Temp. range of	Indoor	W.B.	15.0~24.0°C (59~75°F)	
cooling	Circulating water	°C	10.0~45.0°C (50~113°F)	
Heating capacity *2		kW	63.0	
(Nominal) *2		BTU/h	215,000	
	Power input	kW	13.07	
	Current input	A	22.0-20.9-20.2	
	COP	kW/kW	4.82	
Temp. range of	Indoor	D.B.	15.0~27.0°C (59~81°F)	
heating	Circulating water	°C	10.0~45.0°C (50~113°F)	
Indoor unit	Total capacity		50~150% of heat source unit capacity	
connectable	Model/Quantity		W/WP/WL10~125/2~50	
Sound pressure level (measured in anechoic room)		dB <A>	54	
Sound power level (measured in anechoic room)		dB <A>	70.5	
Refrigerant	High pressure	mm (in.)	22.2 (7/8) Brazed	
piping diameter	Low pressure	mm (in.)	28.58 (1-1/8) Brazed	
Circulating water	Water flow rate	m^3/h	7.20	
		L/min	120	
		cfm	4.2	
	Pressure drop	kPa	44	
	Operating volume range	m^3/h	4.5 ~ 11.6	
Compressor	Type		Inverter scroll hermetic compressor	
	Manufacture		AC&R Works, MITSUBISHI ELECTRIC CORPORATION	
	Starting method		Inverter	
	Motor output	kW	13.0	
	Case heater	kW	-	
	Lubricant		MEL32	
External finish			Galvanized steel sheets	
External dimension H x W x D		mm	1,450 x 880 x 550	
		in.	57-1/8 x 34-11/16 x 21-11/16	
Protection devices	High pressure protection		High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	
	Inverter circuit (COMP.)		Over-heat protection, Over-current protection	
	Compressor		Over-heat protection	
Refrigerant	Type x original charge		R410A x 6.0 kg (14 lbs)	
	Control		HBC controller	
Net weight		kg (lbs)	217 (479)	
Heat exchanger			plate type	
	Water volume in plate	l	5.0	
	Water pressure Max.	MPa	2.0	
HIC circuit (HIC: Heat Inter-Changer)			-	
Drawing	External		WKL94C184	
	Wiring		WKE94G420	
Standard attachment	Document		Installation Manual	
	Accessory		Refrigerant conn. pipe	
Optional parts			Main HBC controller: CMB-WM108,1016V-AA Sub HBC controller: CMB-WM108,1016V-BB	
Remarks			Details on foundation work, duct work, insulation work, electrical wiring, power source switch, and other items shall be referred to the Installation Manual. Due to continuing improvement, above specifications may be subject to change without notice. The ambient temperature of the heat source unit needs to be kept below 40°C D.B. The ambient relative humidity of the heat source unit needs to be kept below 80%. The heat source unit should not be installed at outdoor. Be sure to mount a strainer (more than 50 meshes) at the water inlet piping of the unit. Be sure to provide interlocking for the unit operation and water circuit. Install the supplied insulation material to the unused drain-socket. When installing insulation material around both water and refrigerant piping, follow the installation manual.	

Notes:

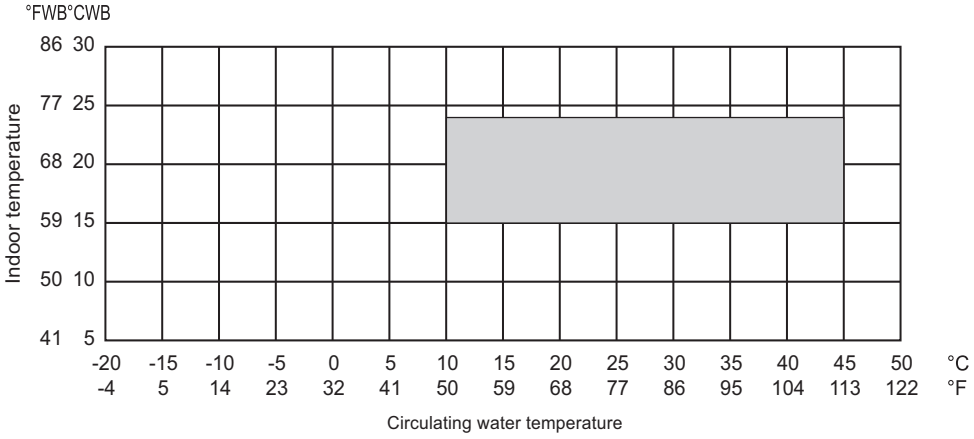
1.Nominal cooling conditions (subject to JIS B8615-2)
Indoor: 27°CD.B./19°CW.B. (81°FD.B./66°FW.B.), Water temperature: 30°C (86°F)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)
2.Nominal heating conditions (subject to JIS B8615-2)
Indoor: 20°CD.B. (68°FD.B.), Water temperature: 20°C (68°FD.B.)
Pipe length: 7.5 m (24-9/16 ft.), Level difference: 0 m (0 ft.)

Unit converter

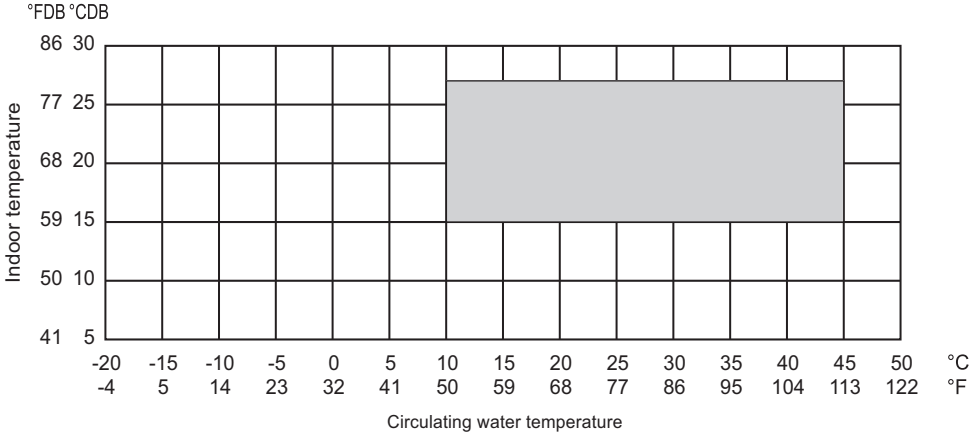
BTU/h	=kW x 3,412
cfm	$=m^3/min$ x 35.31
lbs	=kg/0.4536

*Above specification data is subject to rounding variation.

• Cooling



• Heating



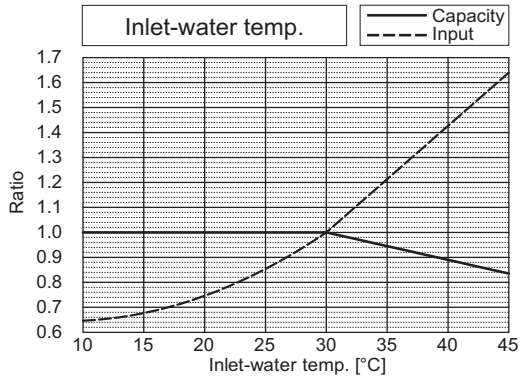
• Combination of cooling/heating operation (Cooling main or Heating main)

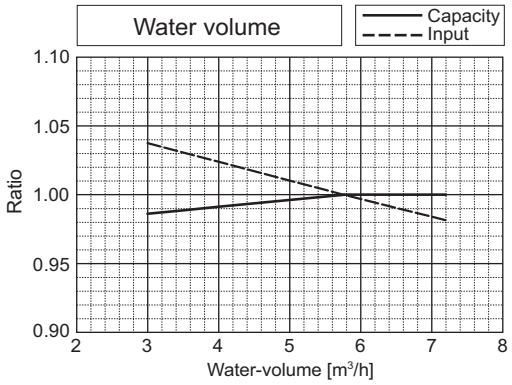
Water temperature	Indoor temperature	
	Cooling	Heating
10 to 45˚C (50 to 113˚F)	15 to 24˚CWB (59 to 75˚FWB)	15 to 27˚CDB (59 to 81˚FDB)

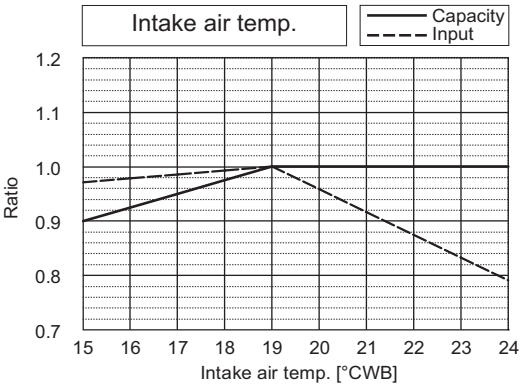
3-1. Correction by temperature

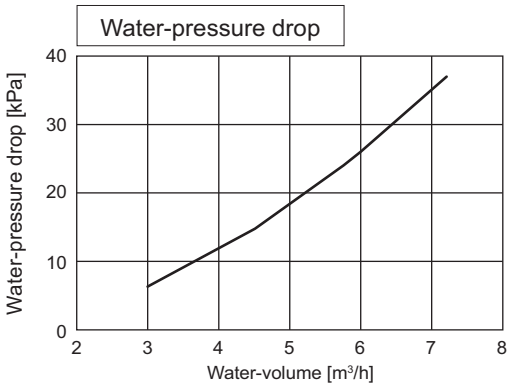
HYBRID CITY MULTI could have varied capacity at different designing temperature. Using the nominal cooling/heating capacity value and the ratio below, the capacity can be observed at various temperature.

		PQRY-P200YLM-A1
Nominal Cooling Capacity	kW	22.4
	BTU/h	76,400
Input	kW	3.97

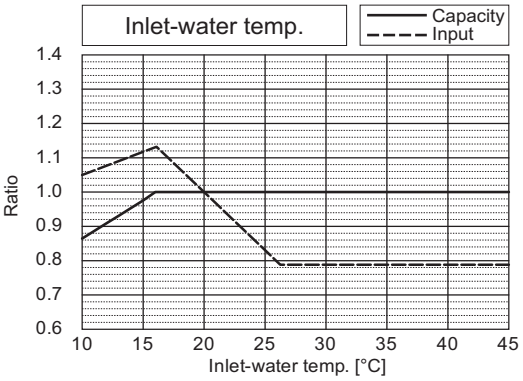


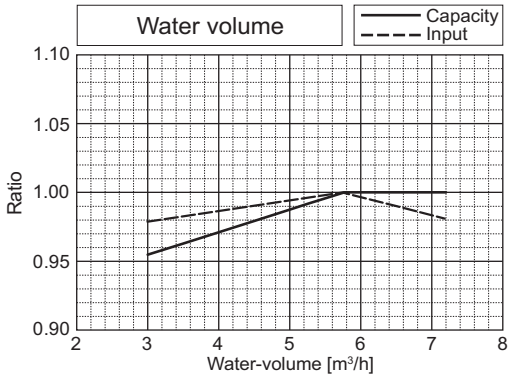


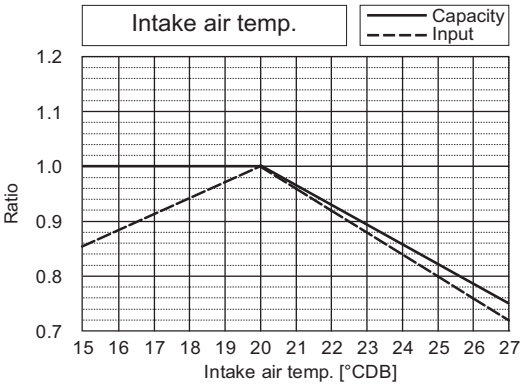


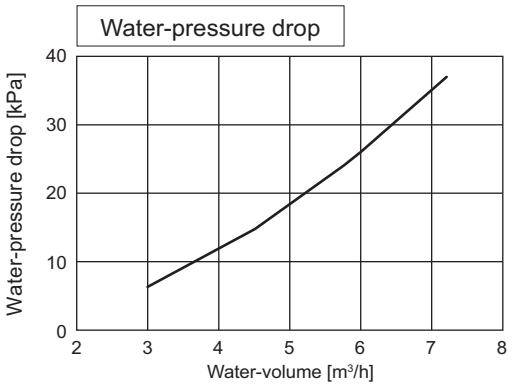


		PQRY-P200YLM-A1
Nominal Heating Capacity	kW	25.0
	BTU/h	85,300
Input	kW	4.04

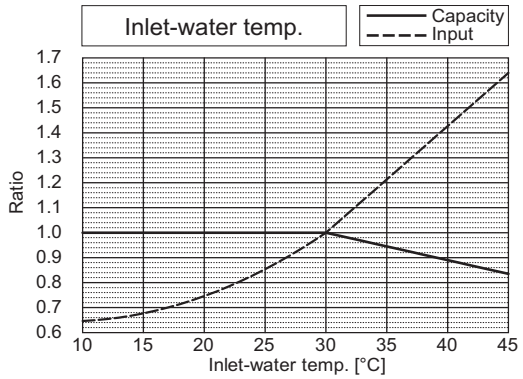


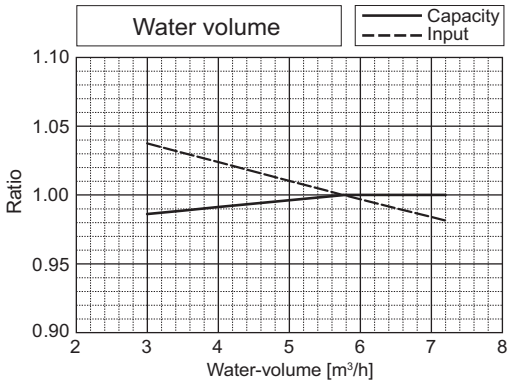


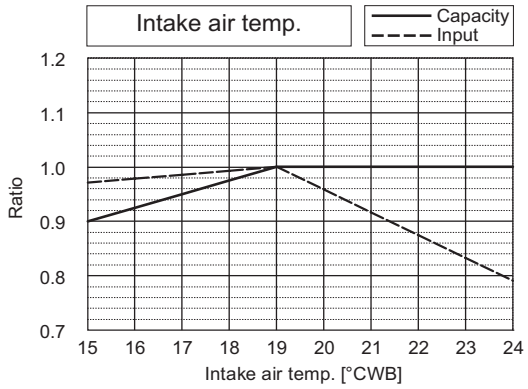


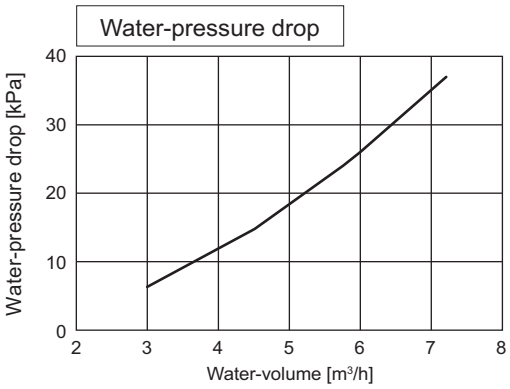


		PQRY-P250YLM-A1
Nominal Cooling Capacity	kW	28.0
	BTU/h	95,500
Input	kW	5.44

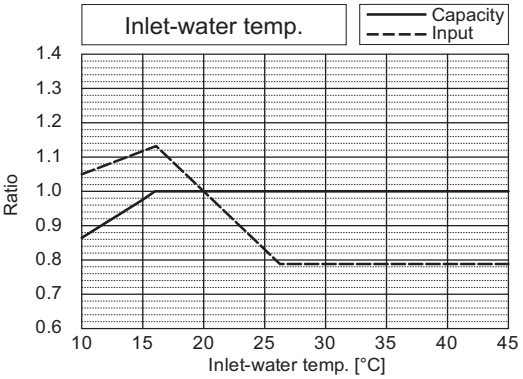


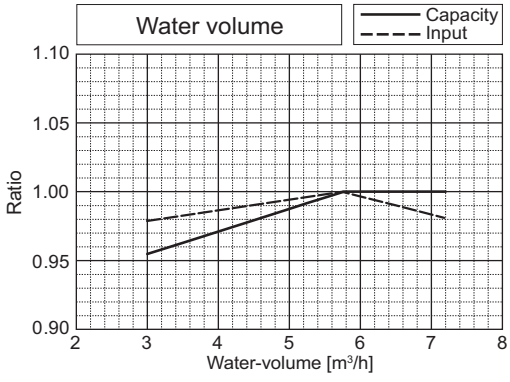


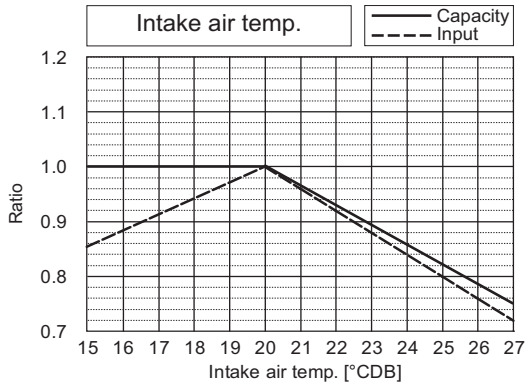


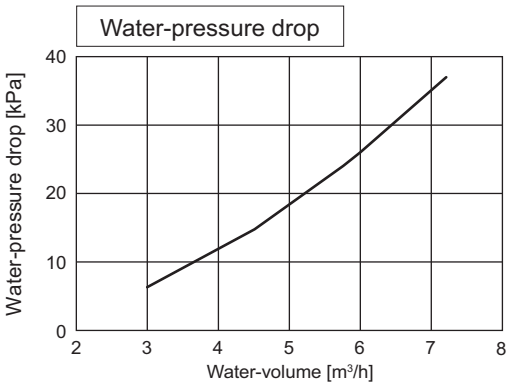


		PQRY-P250YLM-A1
Nominal Heating Capacity	kW	31.5
	BTU/h	107,500
Input	kW	5.41

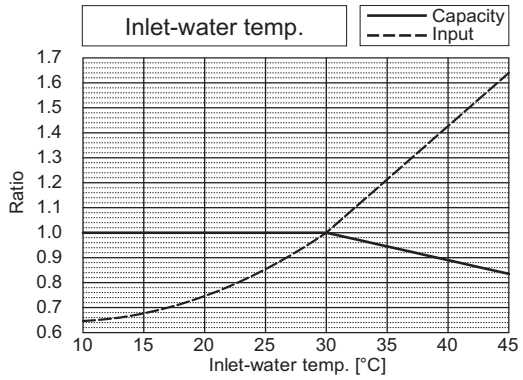


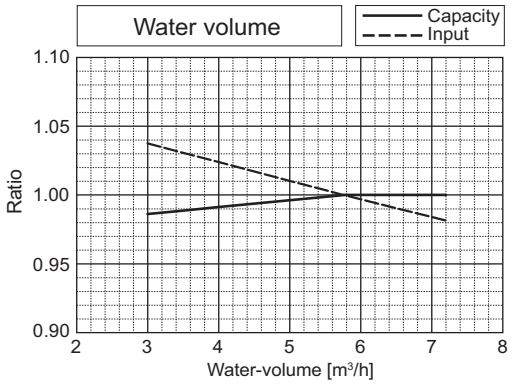


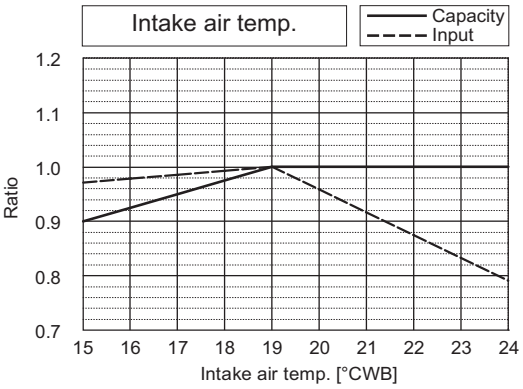


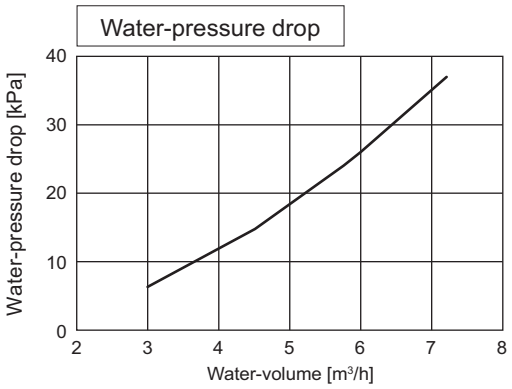


		PQRY-P300YLM-A1
Nominal Cooling Capacity	kW	33.5
	BTU/h	114,300
Input	kW	7.55

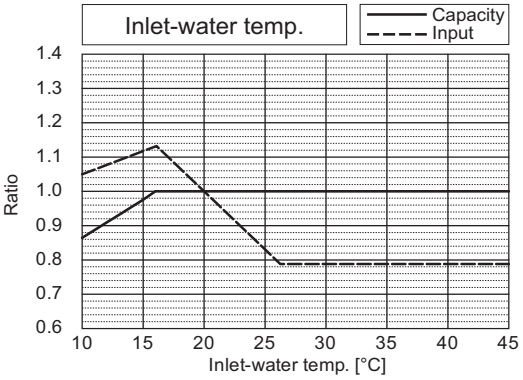


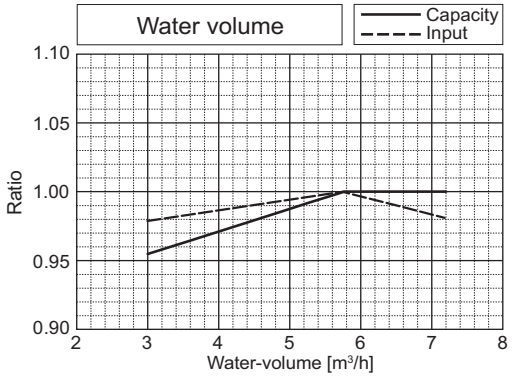


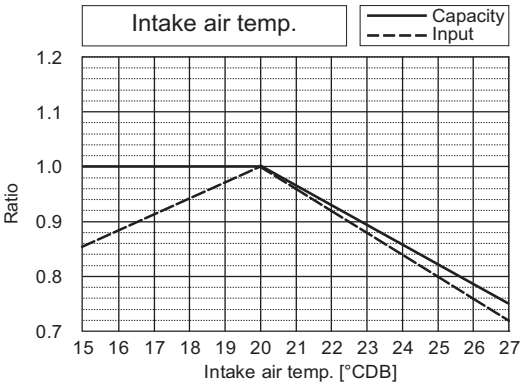


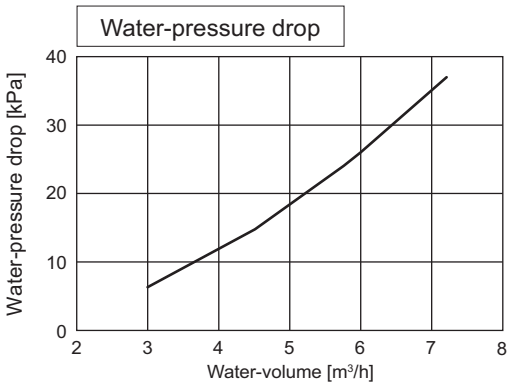


		PQRY-P300YLM-A1
Nominal Heating Capacity	kW	37.5
	BTU/h	128,000
Input	kW	7.13

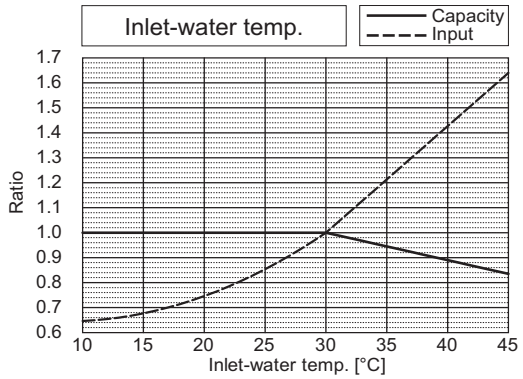


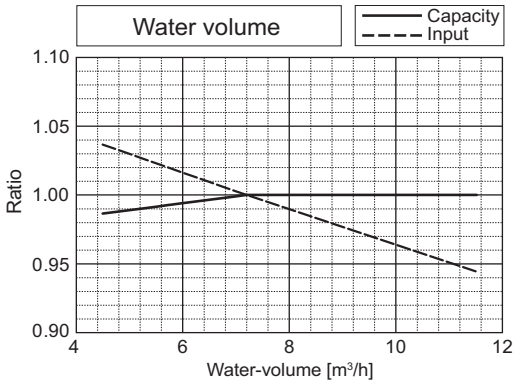


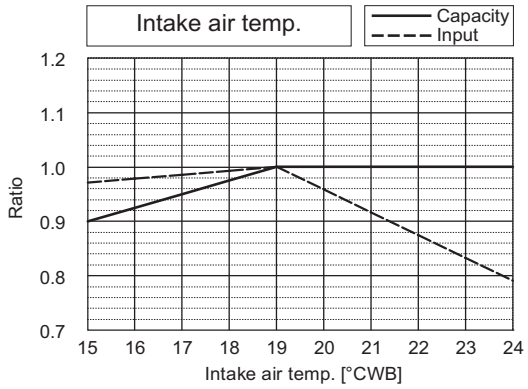


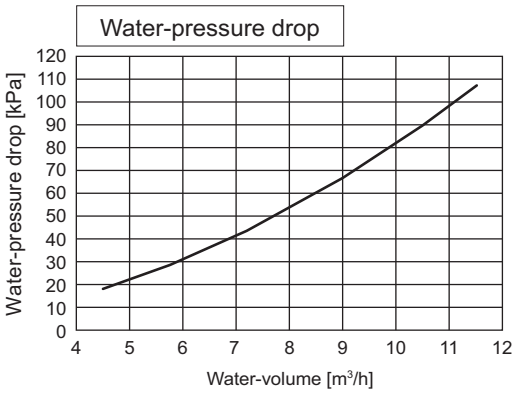


		PQRY-P350YLM-A1
Nominal Cooling Capacity	kW	40.0
	BTU/h	136,500
Input	kW	9.98

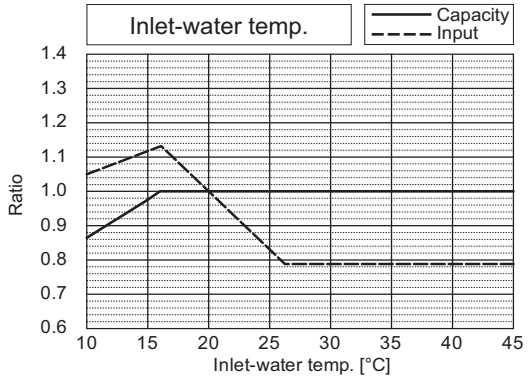


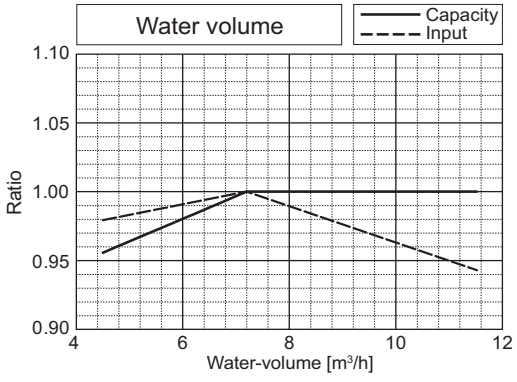


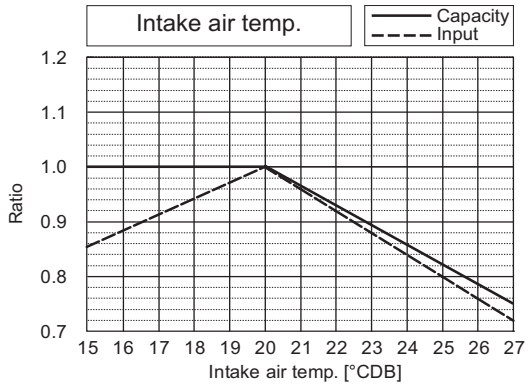


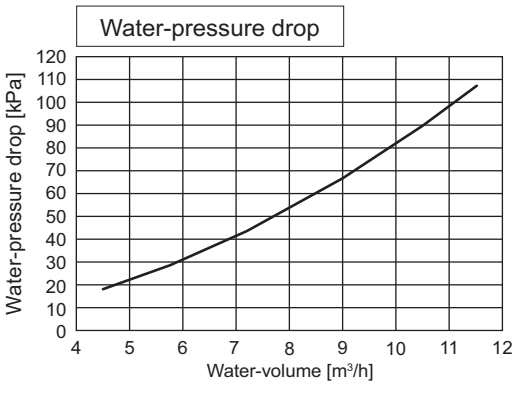


		PQRY-P350YLM-A1
Nominal Heating Capacity	kW	45.0
	BTU/h	153,500
Input	kW	8.87

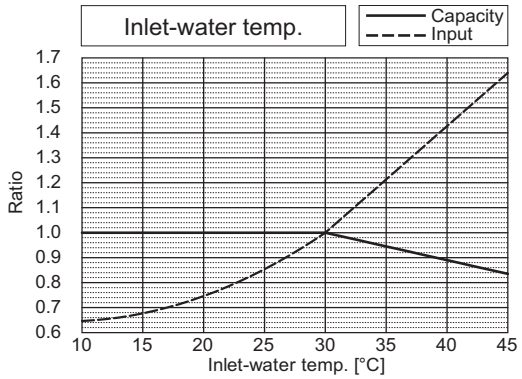


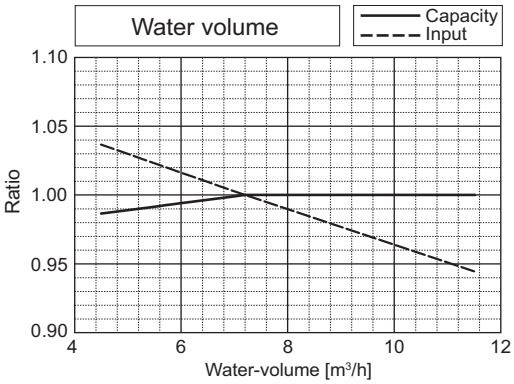


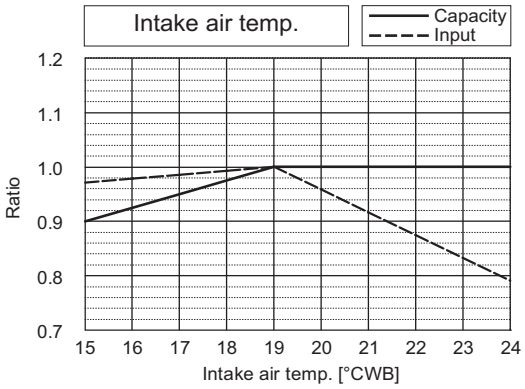


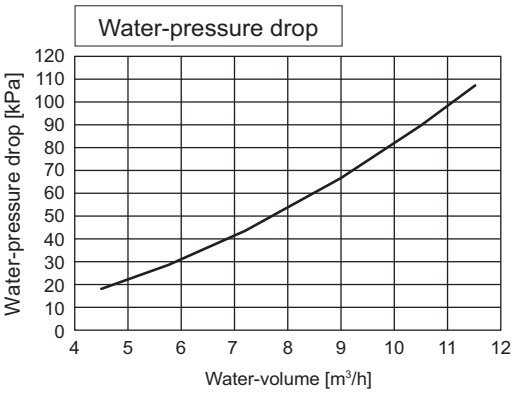


		PQRY-P400YLM-A1
Nominal Cooling Capacity	kW	45.0
	BTU/h	153,500
Input	kW	10.05

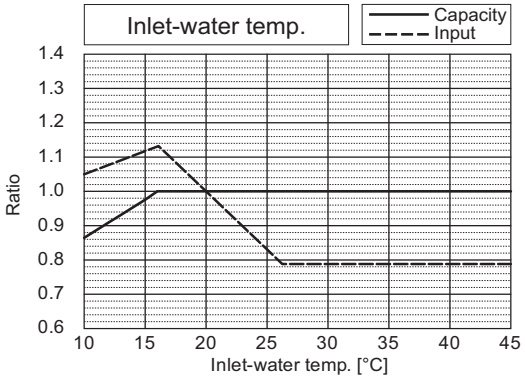


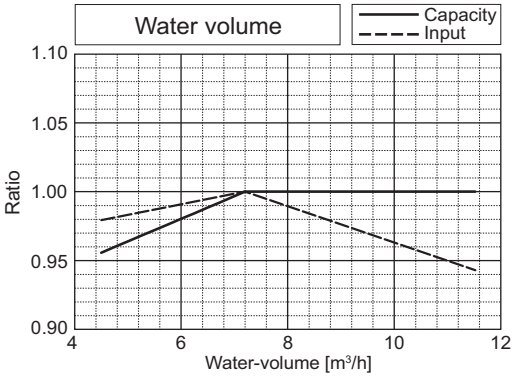


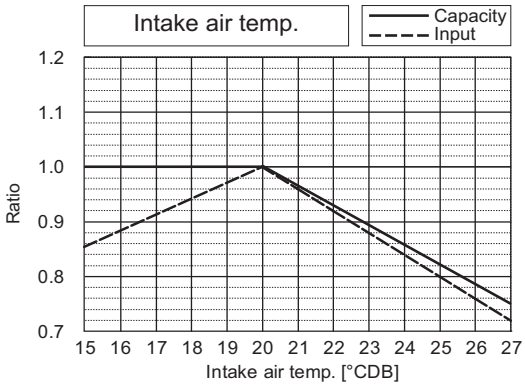


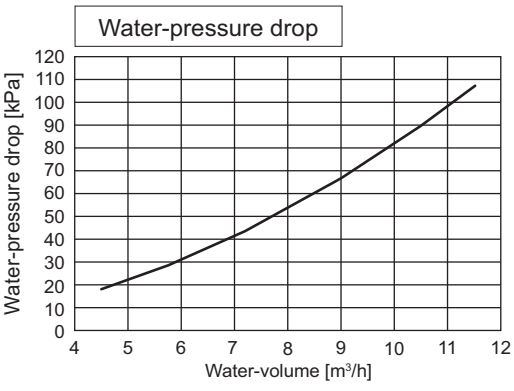


		PQRY-P400YLM-A1
Nominal Heating Capacity	kW	50.0
	BTU/h	170,600
Input	kW	9.45

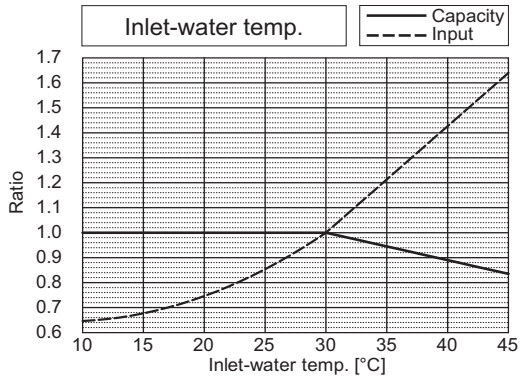


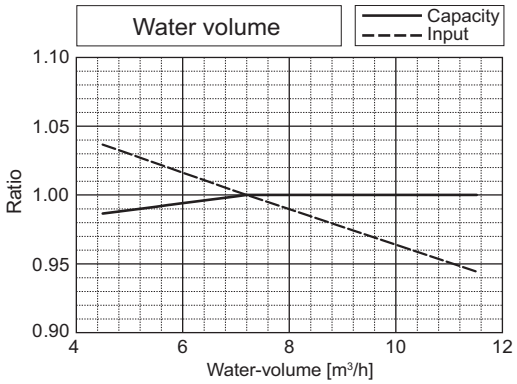


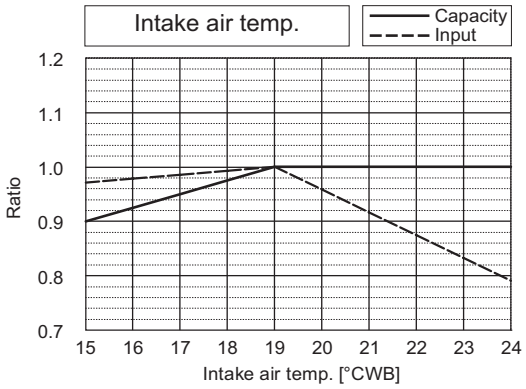


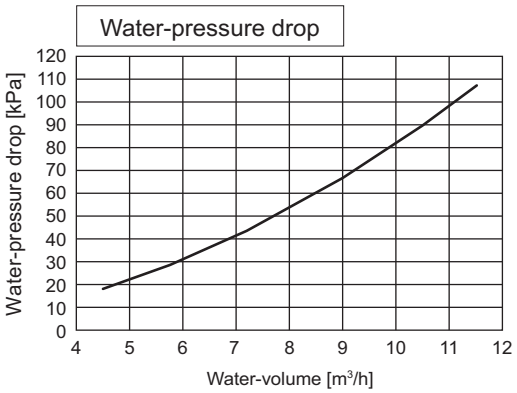


		PQRY-P450YLM-A1
Nominal Cooling Capacity	kW	50.0
	BTU/h	170,600
Input	kW	12.05

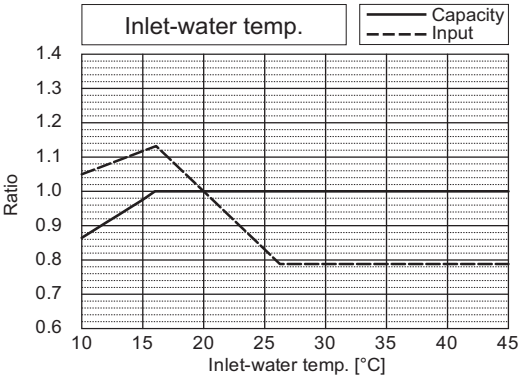


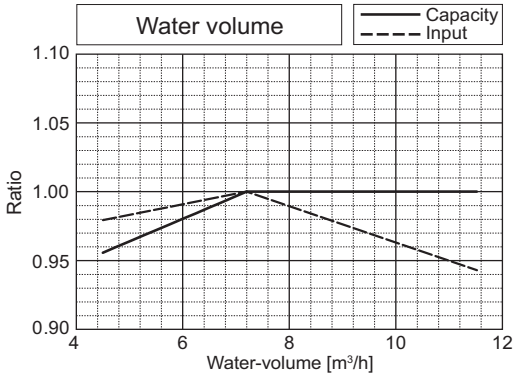


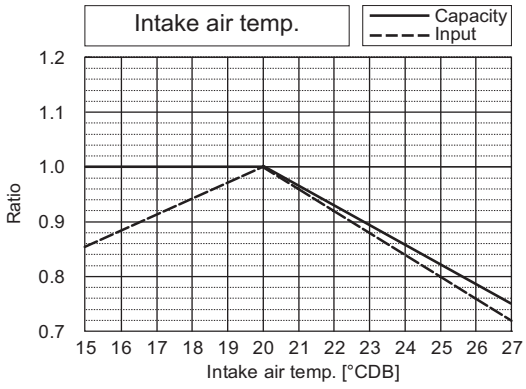


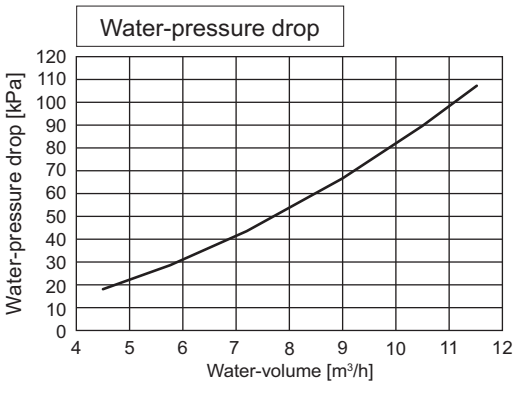


		PQRY-P450YLM-A1
Nominal Heating Capacity	kW	56.0
	BTU/h	191,100
Input	kW	11.11

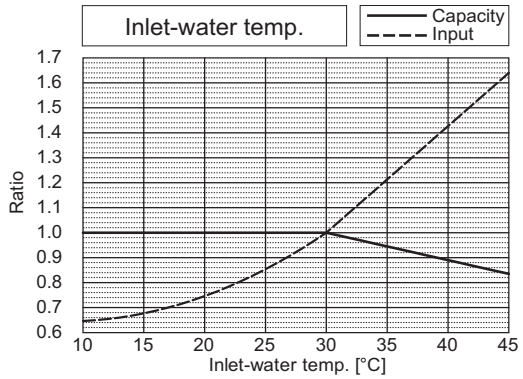


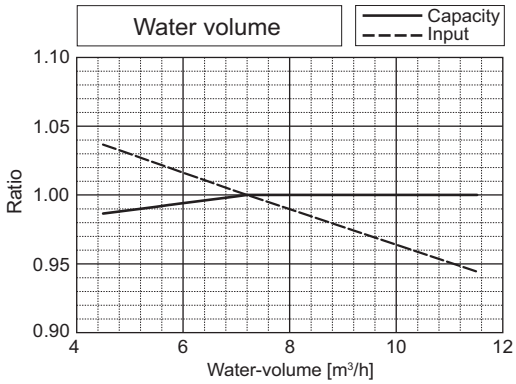


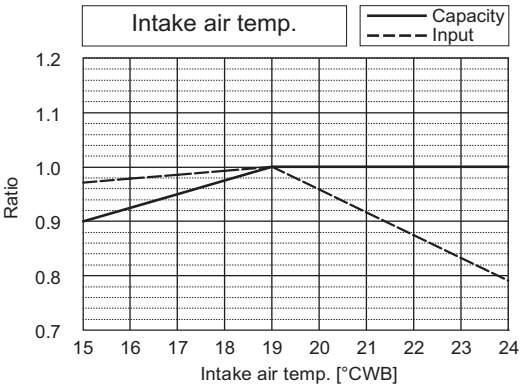


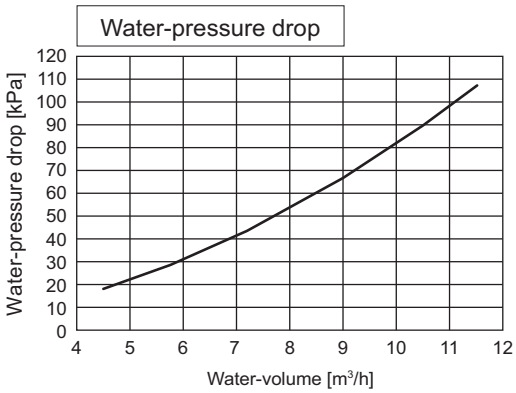


		PQRY-P500YLM-A1
Nominal Cooling Capacity	kW	56.0
	BTU/h	191,100
Input	kW	14.58

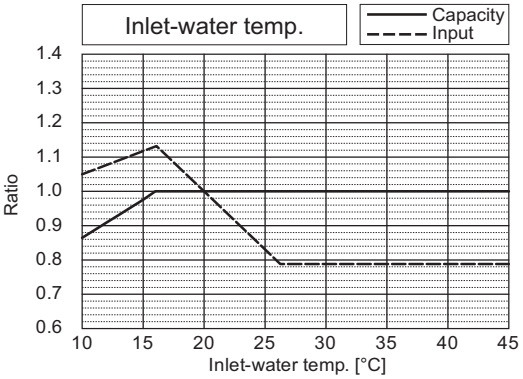


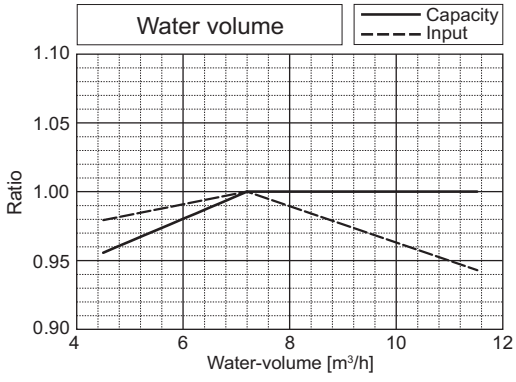


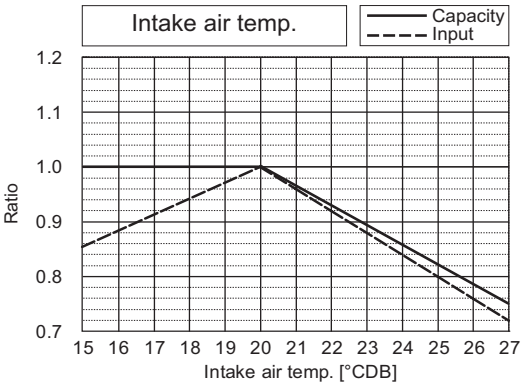


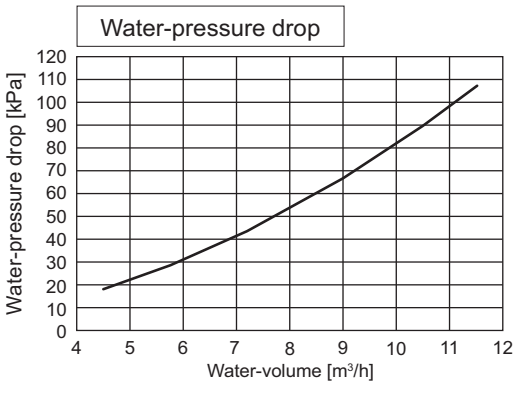


		PQRY-P500YLM-A1
Nominal Heating Capacity	kW	63.0
	BTU/h	215,000
Input	kW	13.07









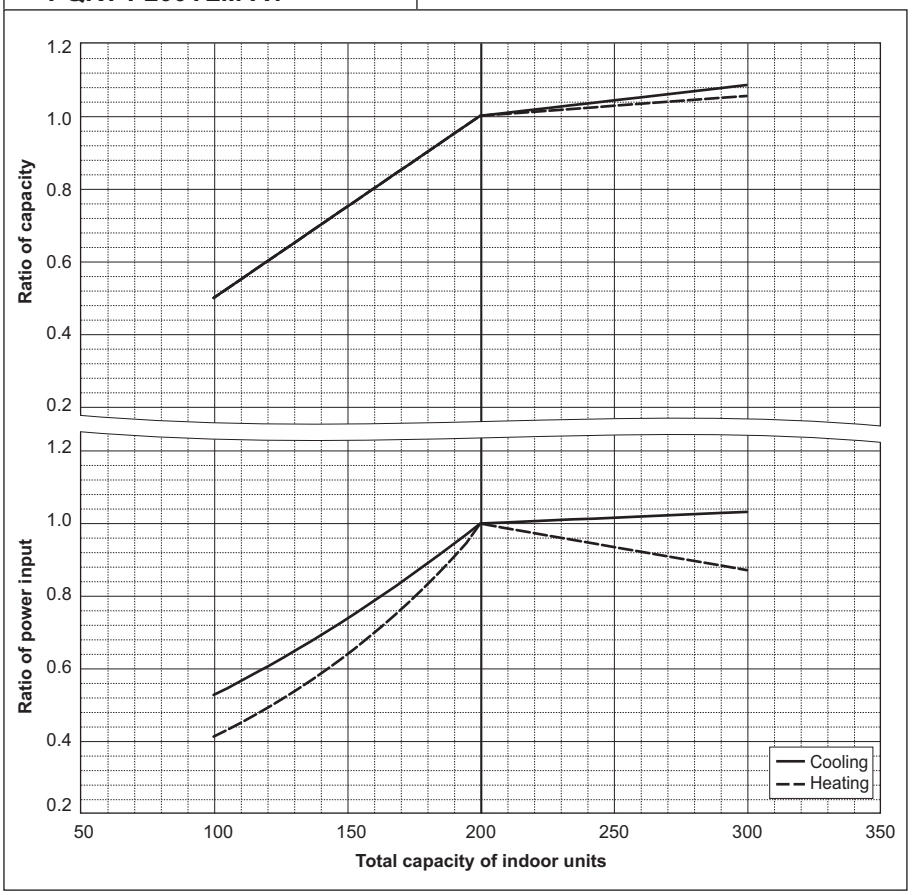
3-2. Correction by total indoor

HYBRID CITY MULTI system has different capacities and inputs when many combinations of indoor units with different total capacities are connected. Using following tables, the maximum capacity can be found to ensure the system is installed with enough capacity for a particular application.

PQRY-P200YLM-A1		
Nominal Cooling Capacity	kW	22.4
	BTU/h	76,400
Input	kW	3.97

PQRY-P200YLM-A1		
Nominal Heating Capacity	kW	25.0
	BTU/h	85,300
Input	kW	4.04

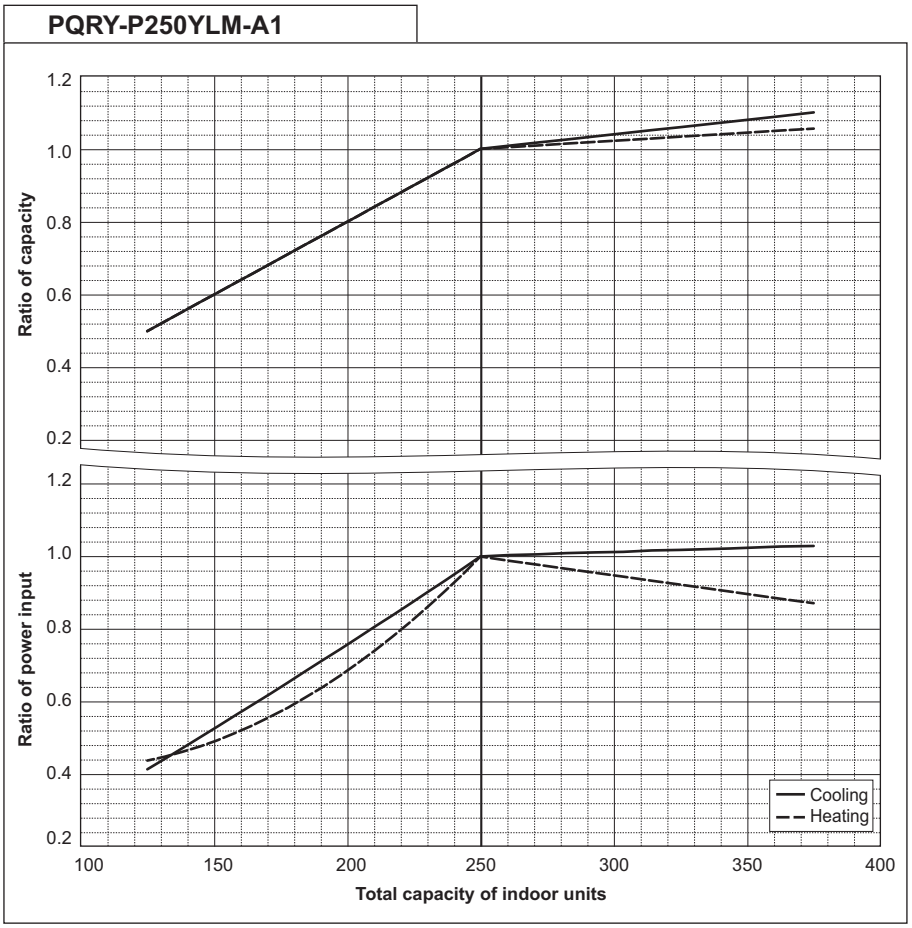
PQRY-P200YLM-A1



PQRY-P250YLM-A1		
Nominal Cooling Capacity	kW	28.0
	BTU/h	95,500
Input	kW	5.44

PQRY-P250YLM-A1		
Nominal Heating Capacity	kW	31.5
	BTU/h	107,500
Input	kW	5.41

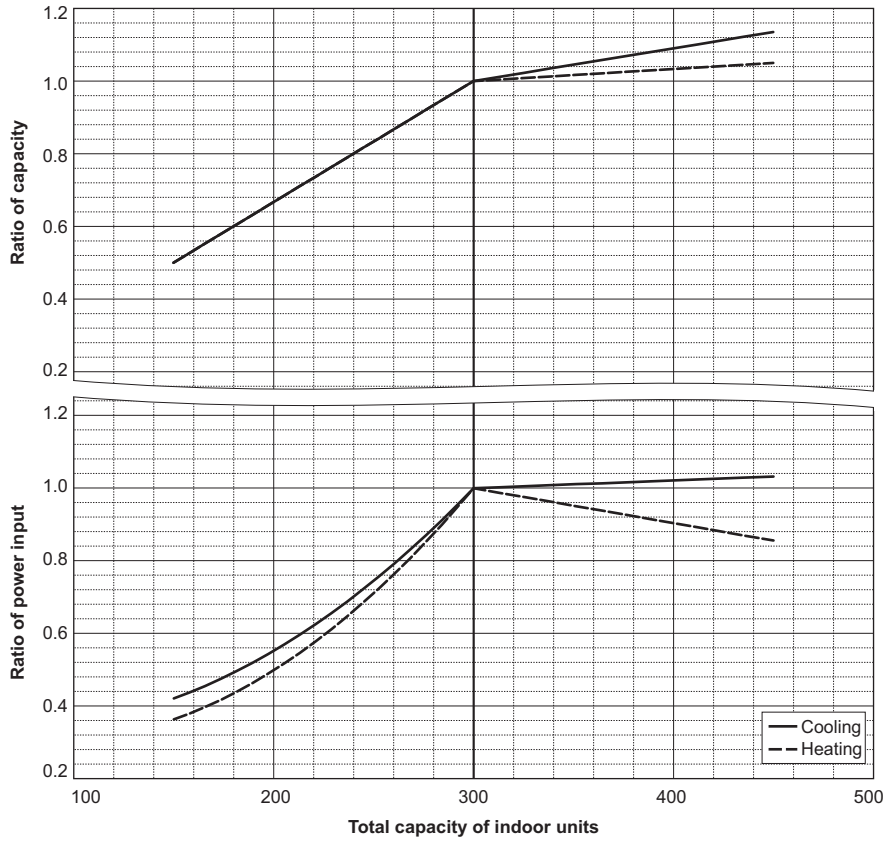
PQRY-P250YLM-A1



PQRY-P300YLM-A1		
Nominal Cooling Capacity	kW	33.5
	BTU/h	114,300
Input	kW	7.55

PQRY-P300YLM-A1		
Nominal Heating Capacity	kW	37.5
	BTU/h	128,000
Input	kW	7.13

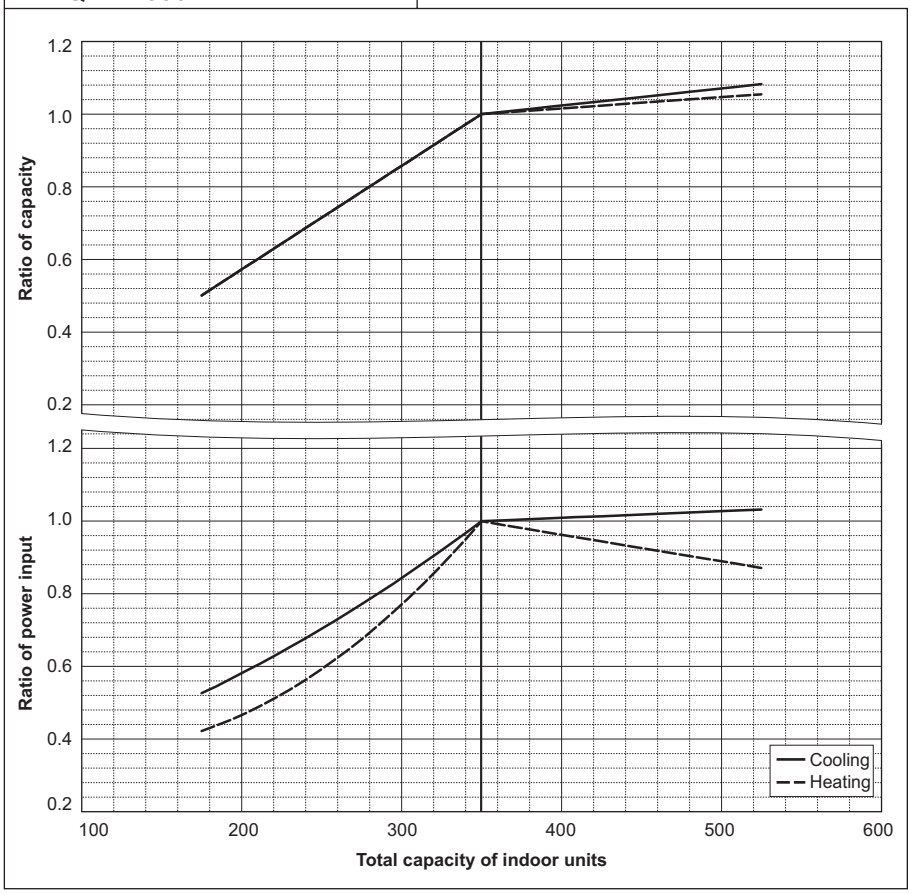
PQRY-P300YLM-A1



PQRY-P350YLM-A1		
Nominal Cooling Capacity	kW	40.0
	BTU/h	136,500
Input	kW	9.98

PQRY-P350YLM-A1		
Nominal Heating Capacity	kW	45.0
	BTU/h	153,500
Input	kW	8.87

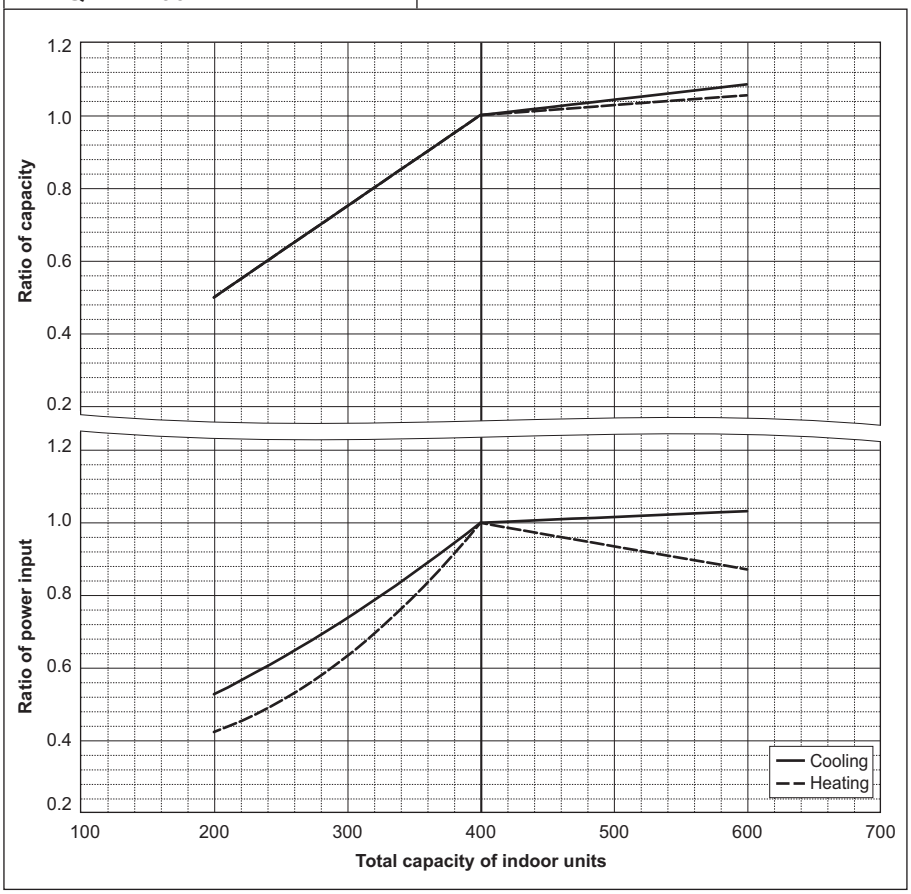
PQRY-P350YLM-A1



PQRY-P400YLM-A1		
Nominal Cooling Capacity	kW	45.0
	BTU/h	153,500
Input	kW	10.05

PQRY-P400YLM-A1		
Nominal Heating Capacity	kW	50.0
	BTU/h	170,600
Input	kW	9.45

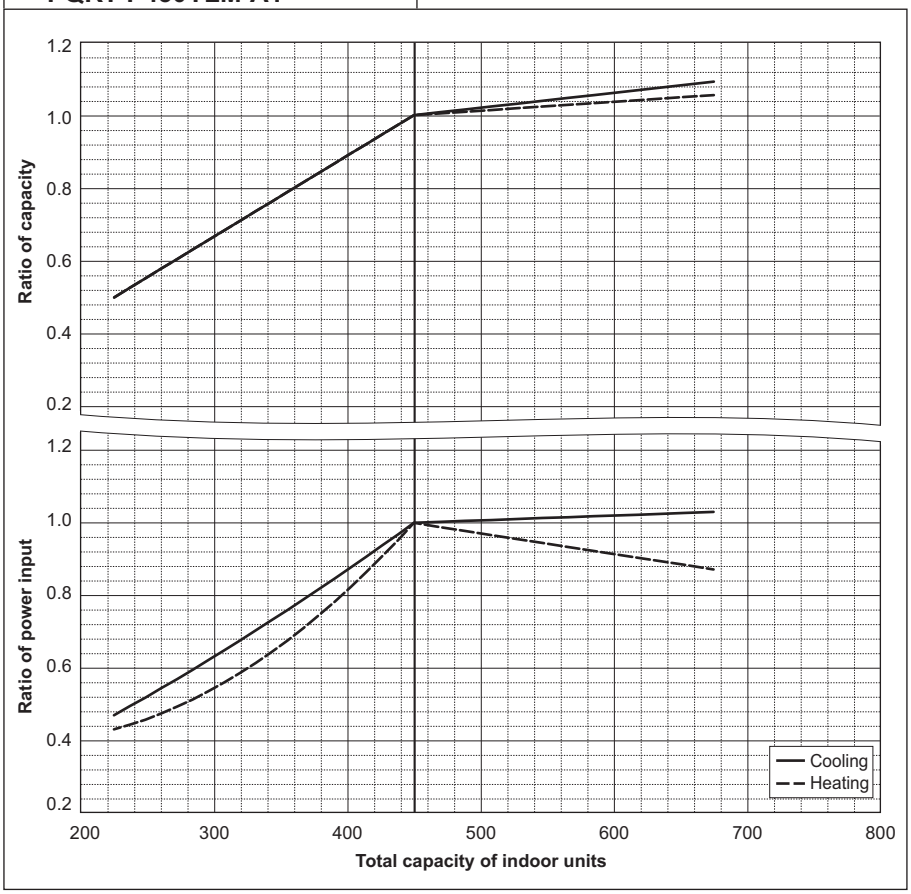
PQRY-P400YLM-A1



PQRY-P450YLM-A1		
Nominal Cooling Capacity	kW	50.0
	BTU/h	170,600
Input	kW	12.05

PQRY-P450YLM-A1		
Nominal Heating Capacity	kW	56.0
	BTU/h	191,100
Input	kW	11.11

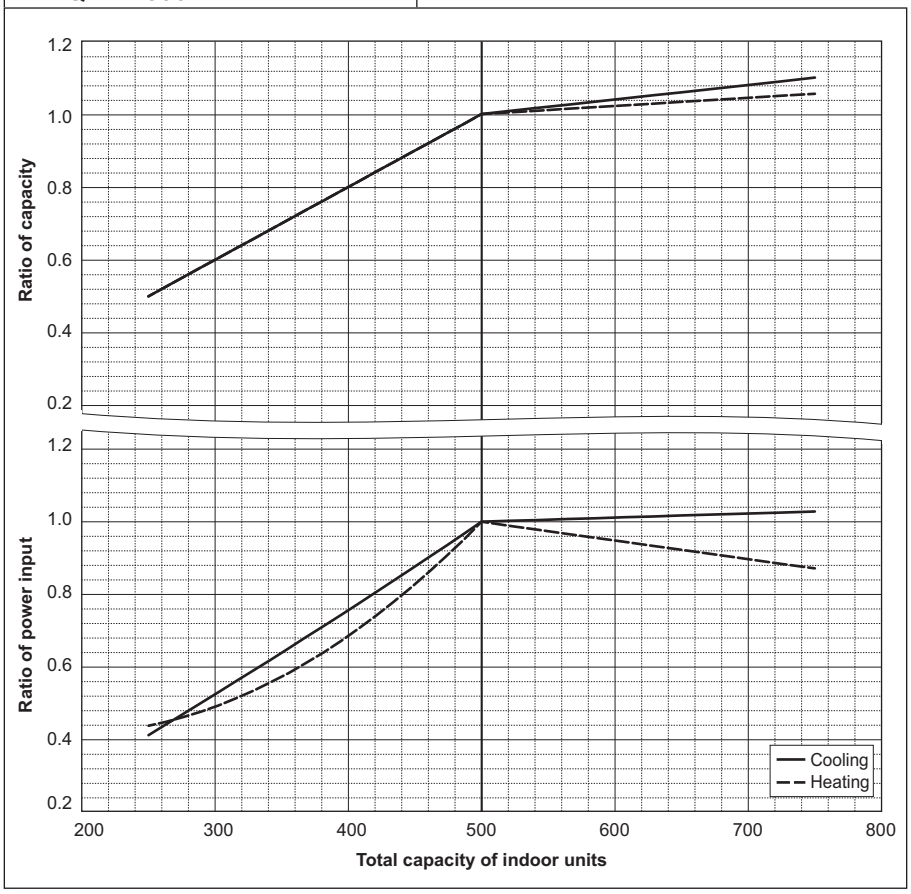
PQRY-P450YLM-A1



PQRY-P500YLM-A1		
Nominal Cooling Capacity	kW	56.0
	BTU/h	191,100
Input	kW	14.58

PQRY-P500YLM-A1		
Nominal Heating Capacity	kW	63.0
	BTU/h	215,000
Input	kW	13.07

PQRY-P500YLM-A1

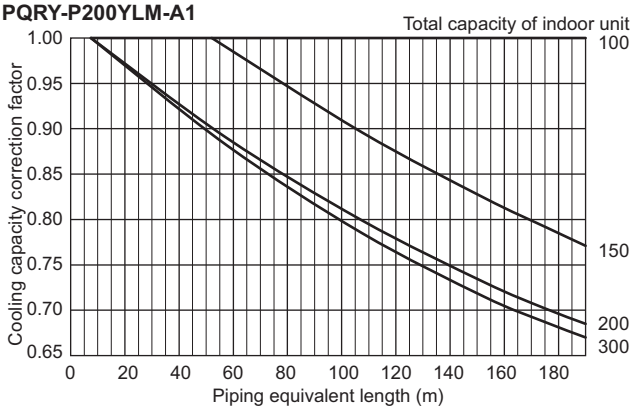


3-3. Correction by piping length

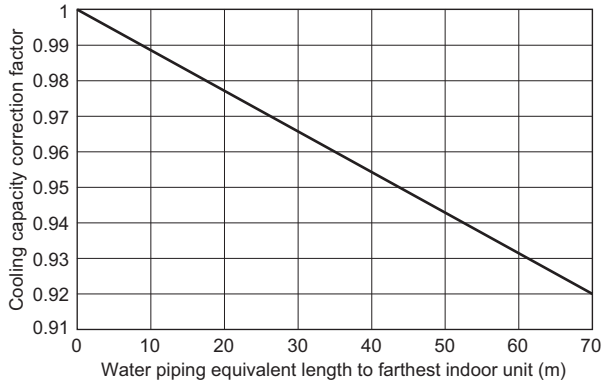
A decrease in cooling/heating capacity will occur due to piping length increase. Using the following correction factors according to the equivalent length of the piping shown at 3-3-1 and 3-3-2 the capacity can be calculated. 3-3-3 shows how to obtain the equivalent length of piping. Refrigerant piping and water piping have separate correction factors.

3-3-1. Cooling capacity correction

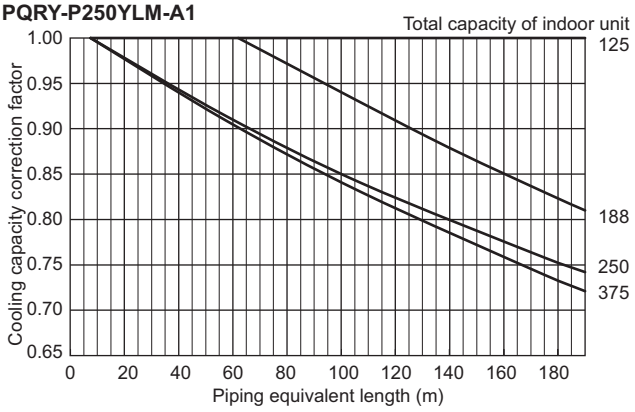
PQRY-P200YLM-A1



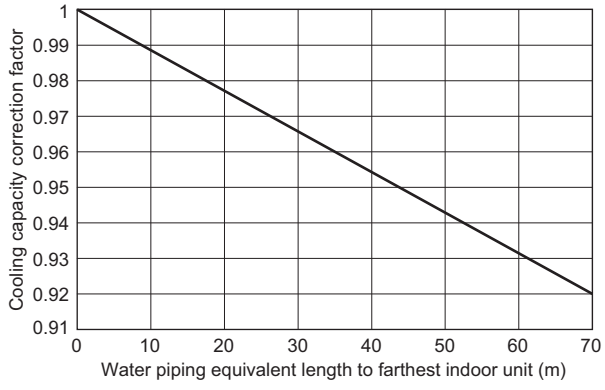
PQRY-P200YLM-A1



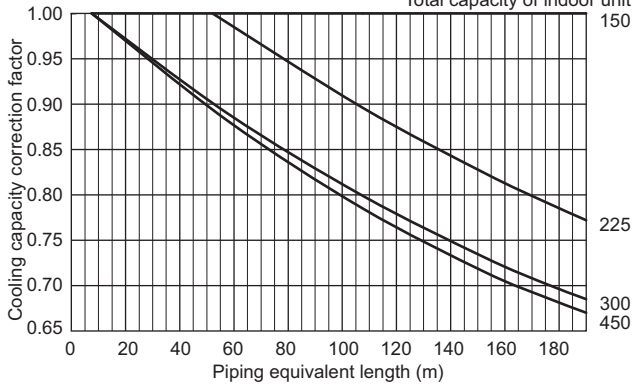
PQRY-P250YLM-A1



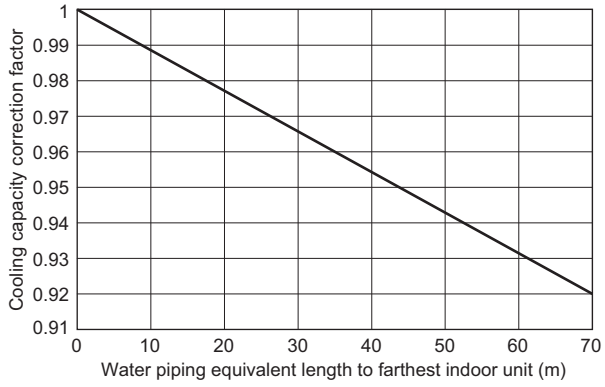
PQRY-P250YLM-A1



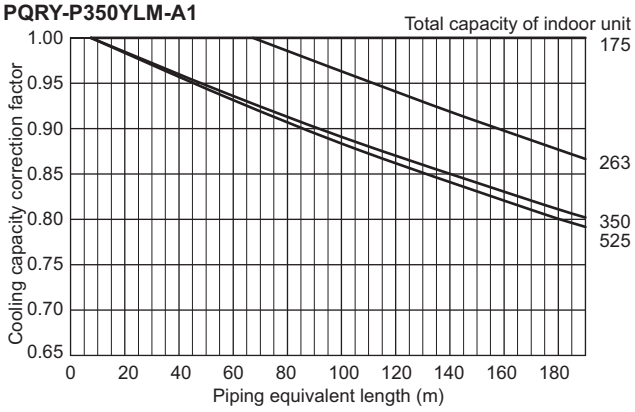
PQRY-P300YLM-A1



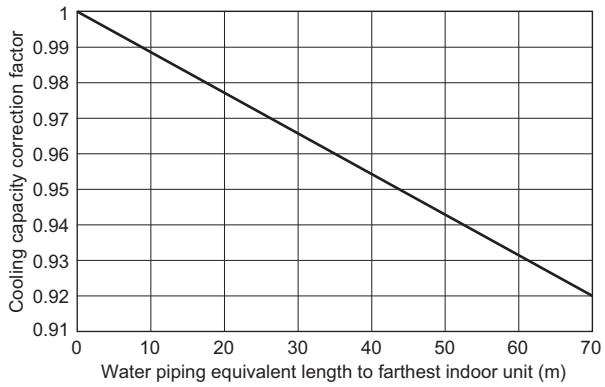
PQRY-P300YLM-A1



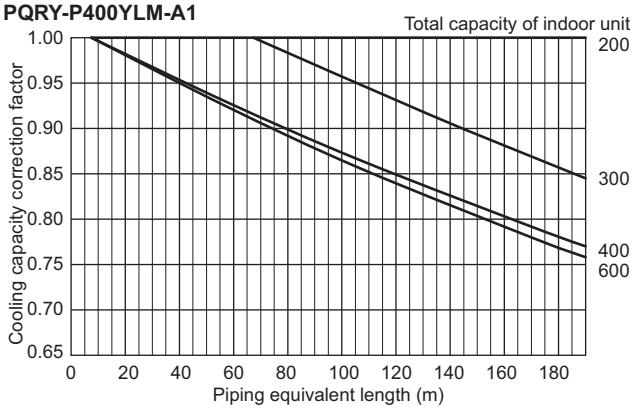
PQRY-P350YLM-A1



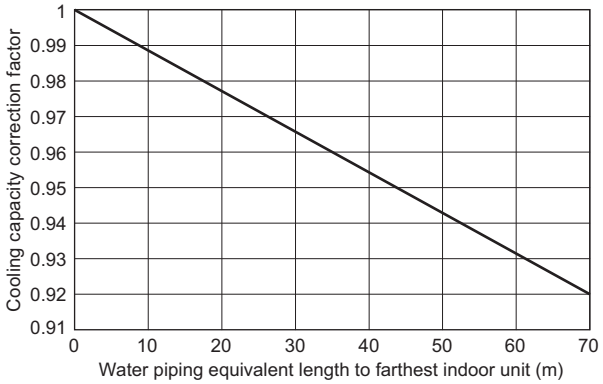
PQRY-P350YLM-A1



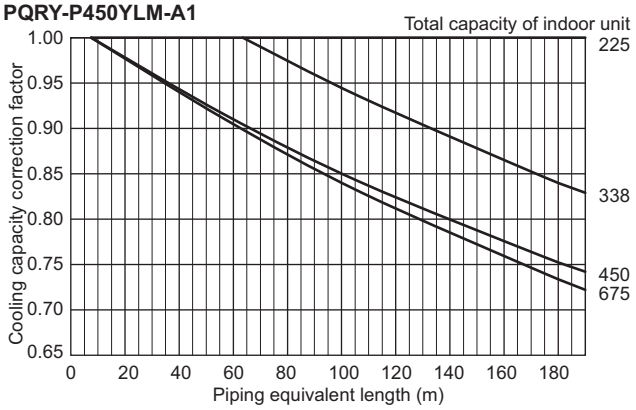
PQRY-P400YLM-A1



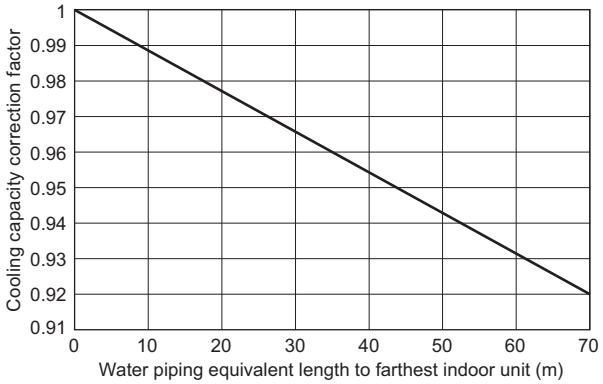
PQRY-P400YLM-A1



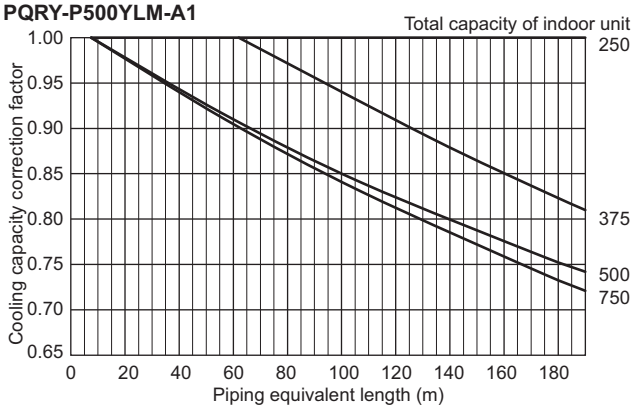
PQRY-P450YLM-A1



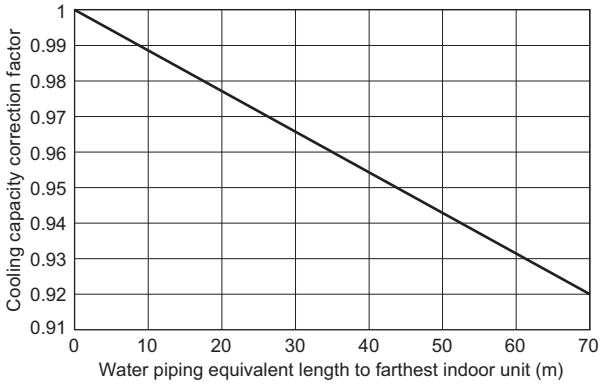
PQRY-P450YLM-A1



PQRY-P500YLM-A1

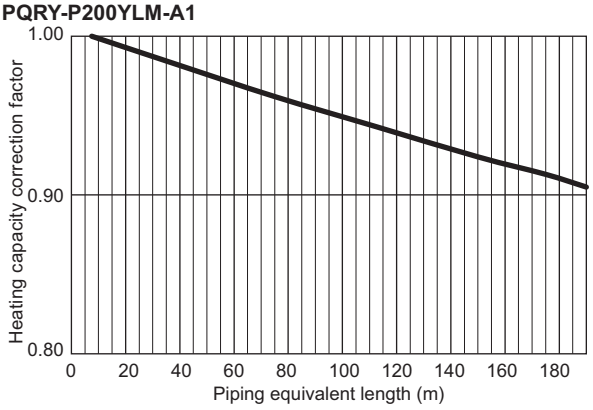


PQRY-P500YLM-A1

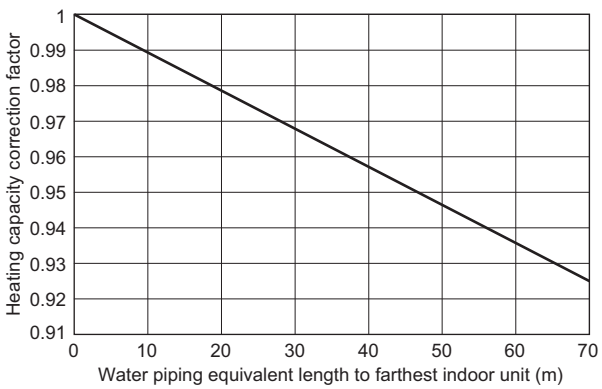


3-3-2. Heating capacity correction

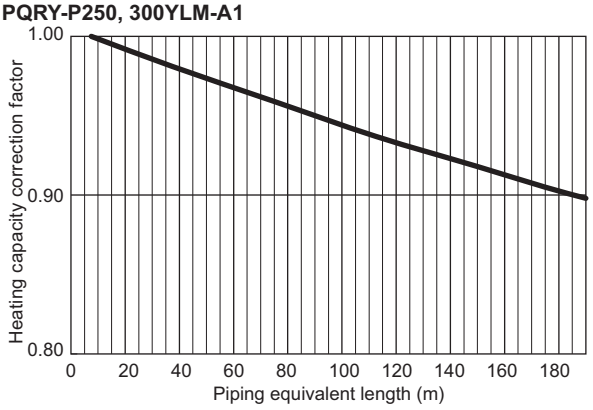
PQRY-P200YLM-A1



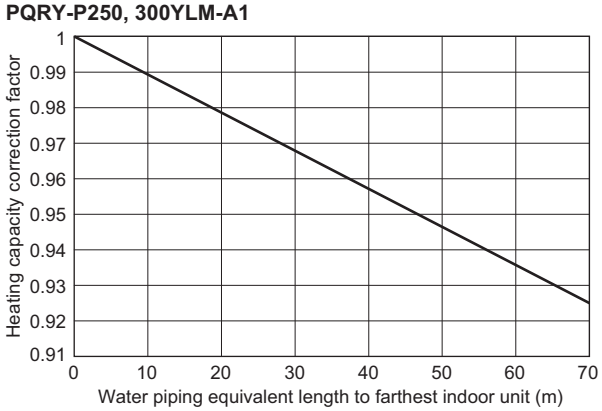
PQRY-P200YLM-A1



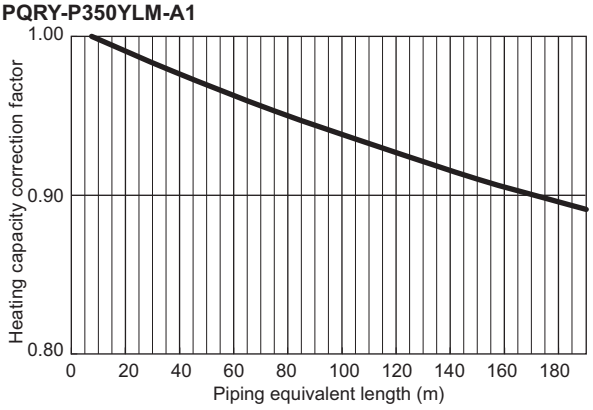
PQRY-P250, 300YLM-A1



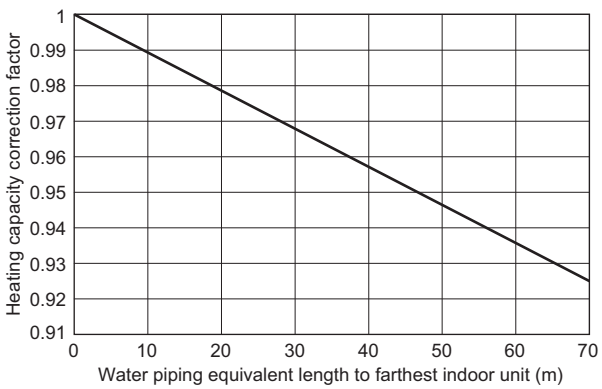
PQRY-P250, 300YLM-A1



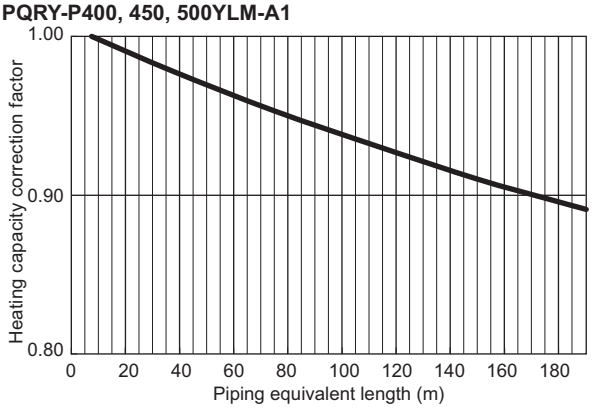
PQRY-P350YLM-A1



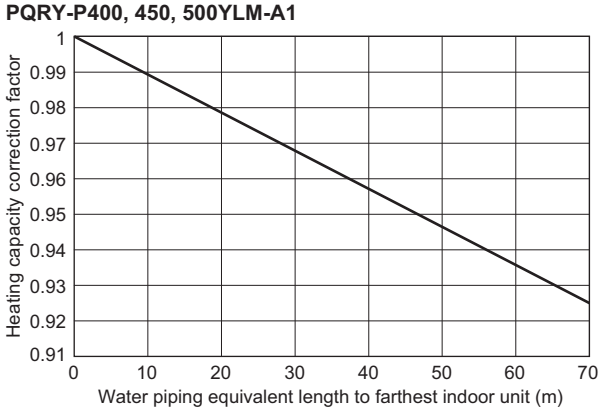
PQRY-P350YLM-A1



PQRY-P400, 450, 500YLM-A1



PQRY-P400, 450, 500YLM-A1



3-3-3. How to obtain the equivalent piping length

Refrigerant pipe

1. PQRY-P200YLM

Equivalent length = (Actual piping length to the farthest indoor unit) + (0.35 × number of bends in the piping) [m]

2. PQRY-P250, 300YLM

Equivalent length = (Actual piping length to the farthest indoor unit) + (0.42 × number of bends in the piping) [m]

3. PQRY-P350YLM

Equivalent length = (Actual piping length to the farthest indoor unit) + (0.47 × number of bends in the piping) [m]

4. PQRY-P400, 450, 500YLM

Equivalent length = (Actual piping length to the farthest indoor unit) + (0.50 × number of bends in the piping) [m]

Water pipe

Equivalent length = (Actual piping length to the farthest indoor unit) + (0.55 × number of bends in the piping) [m]

3-4. Correction by antifreeze solution concentration

In HYBRID CITY MULTI system, antifreeze solution should be used to prevent the system from freezing. Refer to the following graphs for the capacity correction by antifreeze solution. Refer to 3-4-1 for antifreeze solution concentration, 3-4-2 and 3-4-3 for capacity correction by antifreeze solution concentration.

3-4-1. Antifreeze solution concentration

Use propylene glycol solution for antifreeze.
Refer to the following graph to estimate the antifreeze solution concentration required for freeze protection.
DipSW setting (SW5-4 and 5-5) is required in HBC unit depending on the antifreeze solution concentration.
Refer the table A for the setting.

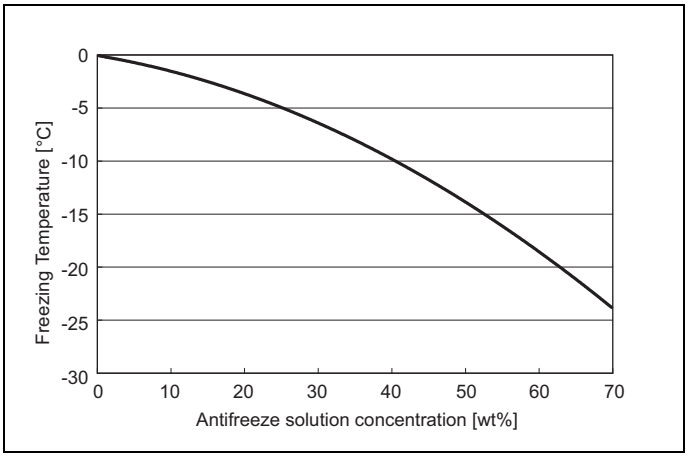
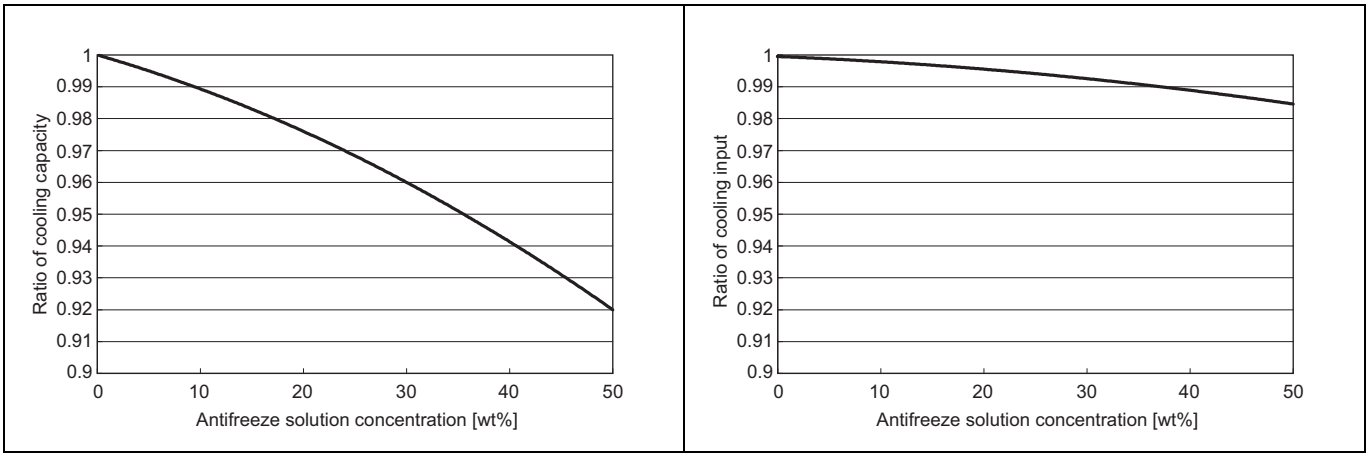


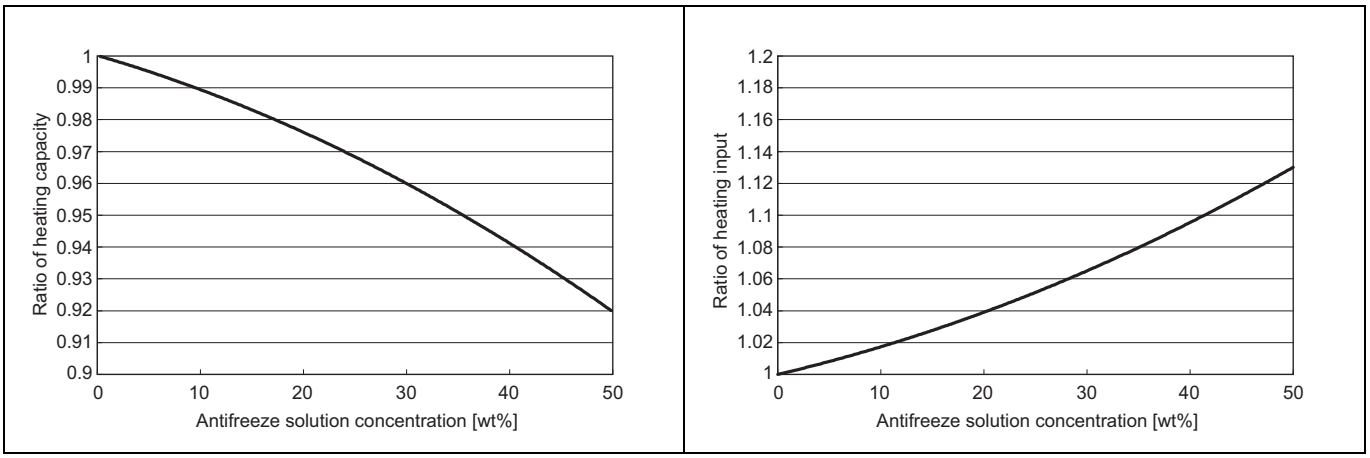
Table A

Brine concentration [%]		0 to 29%	30 to 49%	50 to 59%	60 to 70%
DipSW5-4		OFF	OFF	ON	ON
DipSW5-5		OFF	ON	OFF	ON
7seg LED	LD2	OFF	OFF	1	1
	LD3	OFF	1	OFF	1

3-4-2. Capacity correction by antifreeze solution concentration (cooling)



3-4-3. Capacity correction by antifreeze solution concentration (heating)

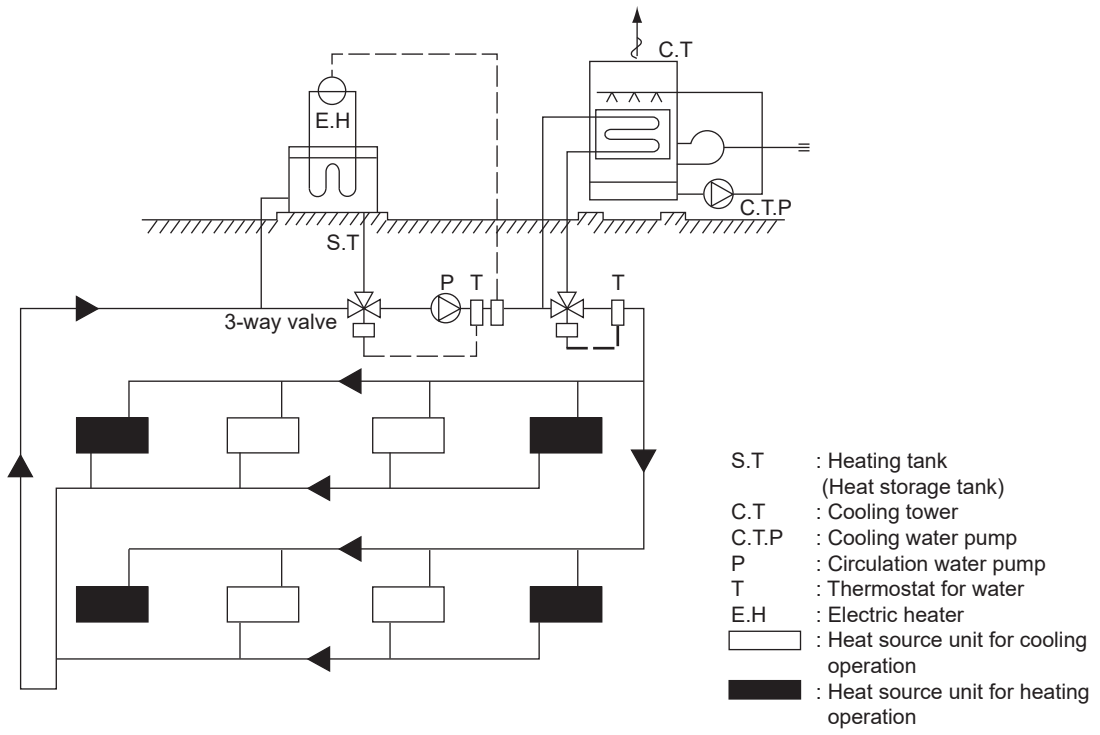


4-1. Designing of water circuit system

1) Example of basic water circuit

The water circuit of the water heat source HYBRID CITY MULTI connects the heat source unit with the cooling tower/auxiliary heat source/heat storage tank/circulation pump with a single system water piping as shown in the figure below. The selector valve automatically controls to circulate water toward the cooling tower in the cooling season, while toward the heat storage tank in the heating season. If the circulation water temperature is kept in a range of 10~45°C [50~113°F] regardless of the building load, the water heat source HYBRID CITY MULTI can be operated for either cooling or heating. Therefore in the summer when only cooling load exists, the temperature rise of circulation water will be suppressed by operating the cooling tower. While in the winter when heating load increases, the temperature of circulation water may be dropped below 10°C [50°F]. Under such situation, the circulation water will be heated with the auxiliary heat source if it drops below a certain temperature.
When the thermal balance between cooling and heating operation is in a correct proportion, the operation of the auxiliary heat source and cooling tower is not required.
In order to control the above thermal balance properly and use thermal energy effectively, utilizing of heat storage tanks, and night-time discounted electric power as a auxiliary heat source will be economical.
Meantime as this system uses plural sets of heat source unit equipped with water heat exchangers, water quality control is important. Therefore it is recommended to use closed type cooling towers as much as possible to prevent the circulation water from being contaminated.
When open type cooling towers are used, it is essential to provide proper maintenance control such as that to install water treatment system to prevent troubles caused by contaminated circulation water.

Example of basic water circuit for water heat source HYBRID CITY MULTI



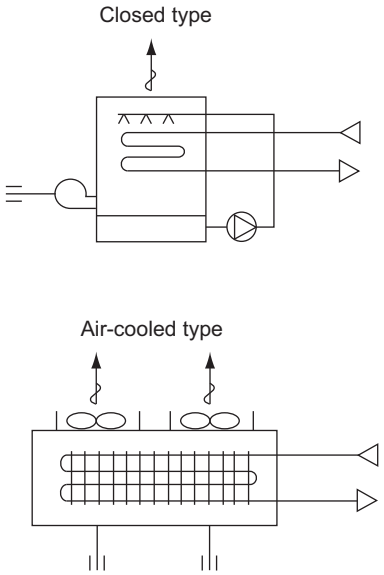
The indoor unit and refrigerant piping system are excluded in this figure.

2) Cooling tower

a) Types of cooling tower

The cooling towers presently used include the open type cooling tower, open type cooling tower + heat exchanger, closed type cooling tower, and air-cooled type cooling tower. However, as the quality control of circulation water is essential when units are installed in decentralized state inside a building, the closed type cooling tower is generally employed in such case.
Although the circulation water will not be contaminated by atmospheric air, it is recommended to periodically blow water inside the system and replenish fresh water instead.
In a district where the coil may be frozen in the winter, it is necessary to apply antifreeze solution to the circulation water, or take freeze protection measures such as to automatically discharge water inside the cooling coil at the stopping of the pump.
When the open type cooling tower is used, be sure to install a water quality control device in addition to the freeze protection measures, as the water may be deteriorated by atmospheric contaminants entered into the cooling tower and dissolved into the circulation water.

Types of cooling towers



b) Calculation method of cooling tower capacity

All units of the water heat source HYBRID CITY MULTI may possibly be in cooling operation temporarily (at pulling down) in the summer, however, it is not necessary to determine the capacity according to the total cooling capacity of all HYBRID CITY MULTI units as this system has a wide operating water temperature range.
It is determined in accordance with the value obtained by adding the maximum cooling load of an actual building, the input heat equivalent value of all HYBRID CITY MULTI units, and the cooling load of the circulating pumps. Please check for the values of the cooling water volume and circulation water volume.

$$\text{Cooling tower capacity} = \frac{Qc + 860 \times (\Sigma Qw + Pw)}{3{,}900} \text{ (Refrigeration ton)}$$

Qc : Maximum cooling load under actual state (kcal/h)
Qw : Total input of water heat source HYBRID CITY MULTI at simultaneous operation under maximum state (kW)
Pw : Shaft power of circulation pumps (kW)

$$\text{Cooling tower capacity} = \frac{Qc + 3{,}412 \times (\Sigma Qw + Pw)}{15{,}500} \text{ (Refrigeration ton)}$$

Qc : Maximum cooling load under actual state (BTU/h)
Qw : Total input of water heat source HYBRID CITY MULTI at simultaneous operation under maximum state (kW)
Pw : Shaft power of circulation pumps (kW)

* 1 Refrigerant ton of cooling tower capacity ≈ US refrigerant ton × (1 + 0.3)
= 3,900 kcal/h = 15,500 BTU/h

3) Auxiliary heat source and heat storage tank

When the heating load is larger than the cooling load, the circulation water temperature lowers in accordance with the heat balance of the system. It should be heated by the auxiliary heat source in order to keep the inlet water temperature within the operating range of the water heat source HYBRID CITY MULTI.

Further in order to operate the water heat source HYBRID CITY MULTI effectively, it is recommended to utilize the heat storage tank to cover the warming up load in the morning and the insufficient heat amount.
Effective heat utilization can be expected to cover insufficient heat at the warming up in the next morning or peak load time by storing heat by installing a heat storage tank or operating a low load auxiliary heat source at the stopping of the water heat source HYBRID CITY MULTI. As it can also be possible to reduce the running cost through the heat storage by using the discounted night-time electric power, using both auxiliary heat source and heat storage tank together is recommended. The effective temperature difference of an ordinary heat storage tank shows about 5°C [41°F] even with the storing temperature at 45°C [113°F].
However with the water heat source HYBRID CITY MULTI, it can be utilized as heating heat source up to 15°C [59°F] with an effective temperature of a high 30°C [54°F] approximately, thus the capacity of the heat storage tank can be minimized.

a) Auxiliary heat source

The following can be used as the auxiliary heat source.

- Boiler (Heavy oil, kerosine, gas, electricity)
- Electric heat (Insertion of electric heater into heat storage tank)
- Outdoor air (Air-heat source heat pump chiller)
- Warm discharge water (Exhaust water heat from machines inside building and hot water supply)
- Utilization of night-time lighting
- Solar heat

Please note that the auxiliary heat source should be selected after studying your operating environment and economical feasibility.

Determining the auxiliary heat source capacity

For the HYBRID CITY MULTI water heat source system, a heat storage tank is recommended to use. When employment of the heat storage tank is difficult, the warming up operation should be arranged to cover the starting up heating load. Since the holding water inside the piping circuit owns heat capacity and the warming up operation can be assumed for about one hour except that in a cold region, the heat storage tank capacity is required to be that at the maximum daily heating load including the warming up load at the next morning of the holiday. However the auxiliary heat source capacity should be determined by the daily heating load including warming up load on the week day.
For the load at the next morning of the holiday, heat storage is required by operating the auxiliary heat source even outside of the ordinary working hour.

When heat storage tank is not used

$$QH = HC_T \left(1 - \frac{1}{COP_h}\right) - 1000 \times Vw \times \Delta T - 860 \times Pw$$

QH	: Auxiliary heat source capacity	(kcal/h)
HC_T	: Total heating capacity of each water heat source HYBRID CITY MULTI	(kcal/h)
COP_H	: COP of water heat source HYBRID CITY MULTI at heating	
Vw	: Holding water volume inside piping	(m^3)
ΔT	: Allowable water temperature drop = T_{WH} - T_{WL}	(°C)
T_{WH}	: Heat source water temperature at high temperature side	(°C)
T_{WL}	: Heat source water temperature at low temperature side	(°C)
Pw	: Heat source water pump shaft power	(kW)

$$QH = HC_T \left(1 - \frac{1}{COP_h}\right) - 8.343 \times Vw \times \Delta T - 3412 \times Pw$$

QH	: Auxiliary heat source capacity	(BTU/h)
HC_T	: Total heating capacity of each water heat source HYBRID CITY MULTI	(BTU/h)
COP_H	: COP of water heat source HYBRID CITY MULTI at heating	
Vw	: Holding water volume inside piping	(G)
ΔT	: Allowable water temperature drop = T_{WH} - T_{WL}	(°F)
T_{WH}	: Heat source water temperature at high temperature side	(°F)
T_{WL}	: Heat source water temperature at low temperature side	(°F)
Pw	: Heat source water pump shaft power	(kW)

When heat storage tank is not used

$$QH = \frac{HQ_{1T} \cdot \left(1 - \frac{1}{COP_h}\right) - 860 \times Pw \times T_2}{T1} \times K \quad \text{(kcal)}$$

QH_{1T}	: Total of heating load on weekday including warming up	(kcal/day)
T_1	: Operating hour of auxiliary heat source	(h)
T_2	: Operating hour of heat source water pump	(h)
K	: Allowance factor (Heat storage tank, piping loss, etc.)	1.05~1.10

HQ_{1T} is calculated from the result of steady state load calculation similarly by using the equation below.

$$HQ_{1T} = 1.15 \times (\Sigma Q'a + \Sigma Q'b + \Sigma Q'c + \Sigma Q'd + \Sigma Q'f)\, T_2 - \psi\, (\Sigma Qe_1 + \Sigma Qe_2 + \Sigma Qe_3)\, (T2 - 1)$$

Q'a	: Thermal load from external wall/roof in each zone	(kcal/h)
Q'b	: Thermal load from glass window in each zone	(kcal/h)
Q'c	: Thermal load from partition/ceiling/floor in each zone	(kcal/h)
Q'd	: Thermal load by infiltration in each zone	(kcal/h)
Q'f	: Fresh outdoor air load in each zone	(kcal/h)
$Q'e_1$	: Thermal load from human body in each zone	(kcal/h)
$Q'e_2$	: Thermal load from lighting fixture in each zone	(kcal/h)
$Q'e_3$	: Thermal load from equipment in each zone	(kcal/h)
ψ	: Radiation load rate	0.6~0.8
T2	: Air conditioning hour	

$$QH = \frac{HQ_{1T} \cdot \left(1 - \frac{1}{COP_h}\right) - 3{,}412 \times Pw \times T_2}{T1} \times K \quad \text{(BTU)}$$

QH_{1T}	: Total of heating load on weekday including warming up	(BTU/day)
T_1	: Operating hour of auxiliary heat source	(h)
T_2	: Operating hour of heat source water pump	(h)
K	: Allowance factor (Heat storage tank, piping loss, etc.)	1.05~1.10

HQ_{1T} is calculated from the result of steady state load calculation similarly by using the equation below.

$$HQ_{1T} = 1.15 \times (\Sigma Q'a + \Sigma Q'b + \Sigma Q'c + \Sigma Q'd + \Sigma Q'f)\, T_2 - \psi\, (\Sigma Qe_1 + \Sigma Qe_2 + \Sigma Qe_3)\, (T2 - 1)$$

Q'a	: Thermal load from external wall/roof in each zone	(BTU/h)
Q'b	: Thermal load from glass window in each zone	(BTU/h)
Q'c	: Thermal load from partition/ceiling/floor in each zone	(BTU/h)
Q'd	: Thermal load by infiltration in each zone	(BTU/h)
Q'f	: Fresh outdoor air load in each zone	(BTU/h)
$Q'e_1$	: Thermal load from human body in each zone	(BTU/h)
$Q'e_2$	: Thermal load from lighting fixture in each zone	(BTU/h)
$Q'e_3$	: Thermal load from equipment in each zone	(BTU/h)
ψ	: Radiation load rate	0.6~0.8
T2	: Air conditioning hour	

b) Heat storage tank

Heat storage tank can be classified by types into the open type heat storage tank exposed to atmosphere, and the closed type heat storage tank with structure separated from atmosphere. Although the size of the tank and its installation place should be taken into account, the closed type tank is being usually employed by considering corrosion problems.

The capacity of heat storage tanks is determined in accordance with the daily maximum heating load that includes warming up load to be applied for the day after the holiday.

When auxiliary heat source is operated during operation and even after stopping of water heat source HYBRID CITY MULTI unit

$$V = \frac{HQ_{2T}\left(1 - \frac{1}{COP_h}\right) - 860 \times Pw \times T_2 - QH \times T_2}{\Delta T \times 1{,}000 \times \eta V} \quad \text{(ton)}$$

HQ_{2T} : Maximum heating load including load required for the day after the holiday (kcal/day)
ΔT : Temperature difference utilized by heat storage tank (°C)
ηV : Heat storage tank efficiency

HQ_{2T} : $1.3 \times (\Sigma Q'a + \Sigma Q'c + \Sigma Q'd + \Sigma Q'f)\, T_2 - \psi\, (\Sigma Qe2 + \Sigma Qe3)\, (T2 - 1)$

$$V = \frac{HQ_{2T}\left(1 - \frac{1}{COP_h}\right) - 3{,}412 \times Pw \times T_2 - QH \times T_2}{\Delta T \times \eta V} \quad \text{(lbs)}$$

HQ_{2T} : Maximum heating load including load required for the day after the holiday (BTU/day)
ΔT : Temperature difference utilized by heat storage tank (°F)
ηV : Heat storage tank efficiency

HQ_{2T} : $1.3 \times (\Sigma Q'a + \Sigma Q'c + \Sigma Q'd + \Sigma Q'f)\, T_2 - \psi\, (\Sigma Qe2 + \Sigma Qe3)\, (T2 - 1)$

When auxiliary heat source is operated after stopping of water heat source HYBRID CITY MULTI unit

$$V = \frac{HQ_{2T}\left(1 - \frac{1}{COP_h}\right) - 860 \times Pw \times T_2}{\Delta T \times 1{,}000 \times \eta V} \quad \text{(ton)}$$

HQ_{2T} : Maximum heating load including load required for the day after the holiday (kcal/day)
ΔT : Temperature difference utilized by heat storage tank (°C)
ηV : Heat storage tank efficiency

HQ_{2T} : $1.3 \times (\Sigma Q'a + \Sigma Q'c + \Sigma Q'd + \Sigma Q'f)\, T_2 - \psi\, (\Sigma Qe2 + \Sigma Qe3)\, (T2 - 1)$

$$V = \frac{HQ_{2T}\left(1 - \frac{1}{COP_h}\right) - 3{,}412 \times Pw \times T_2}{\Delta T \times \eta V} \quad \text{(lbs)}$$

HQ_{2T} : Maximum heating load including load required for the day after the holiday (BTU/day)
ΔT : Temperature difference utilized by heat storage tank (°F)
ηV : Heat storage tank efficiency

HQ_{2T} : $1.3 \times (\Sigma Q'a + \Sigma Q'c + \Sigma Q'd + \Sigma Q'f)\, T_2 - \psi\, (\Sigma Qe2 + \Sigma Qe3)\, (T2 - 1)$

4) Piping system

The following items should be kept in your mind in planning / designing water circuits.

a) All units should be constituted in a single circuit in principle.

b) When plural numbers of the water heat source HYBRID CITY MULTI unit are installed, the rated circulating water flow rate should be kept by making the piping resistance to each unit almost same value. As an example, the reverse return system as shown below may be employed.

c) Depending on the structure of a building, the water circuit may be prefabricated by making the layout uniform.

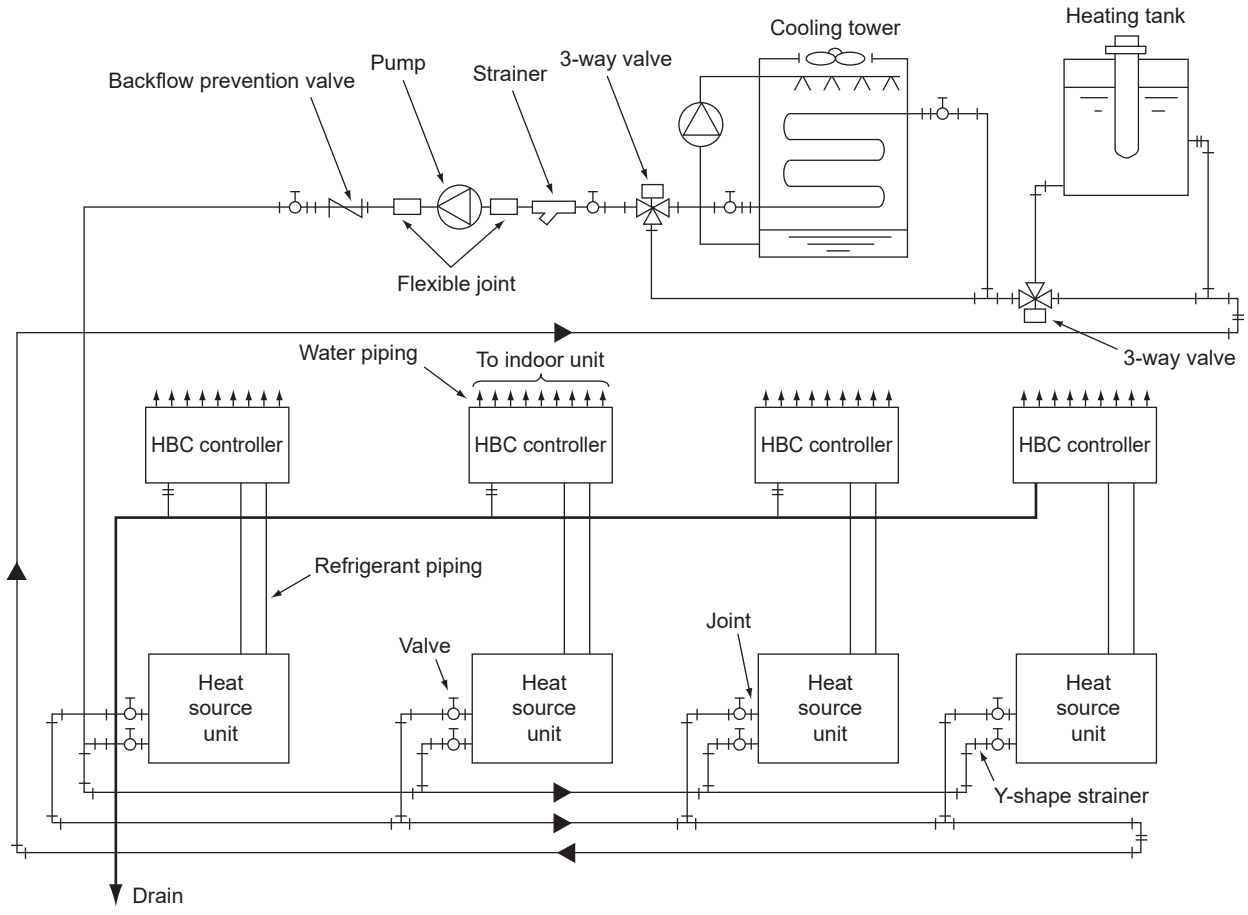
d) When a closed type piping circuit is constructed, install an expansion tank usable commonly for a make-up water tank to absorb the expansion/contraction of water caused by temperature fluctuation.

e) If the operating temperature range of circulation water stays within the temperature near the normal temperature (summer :29.4°C [85°F], winter :21.1°C [70°F]), thermal insulation or anti-sweating work is not required for the piping inside buildings.

In case of the conditions below, however, thermal insulation is required.

- When well water is used for heat source water.
- When piped to outdoor or a place where freezing may be caused.
- When vapor condensation may be generated on piping due to an increase in dry bulb temperature caused by the entry of fresh outdoor air.

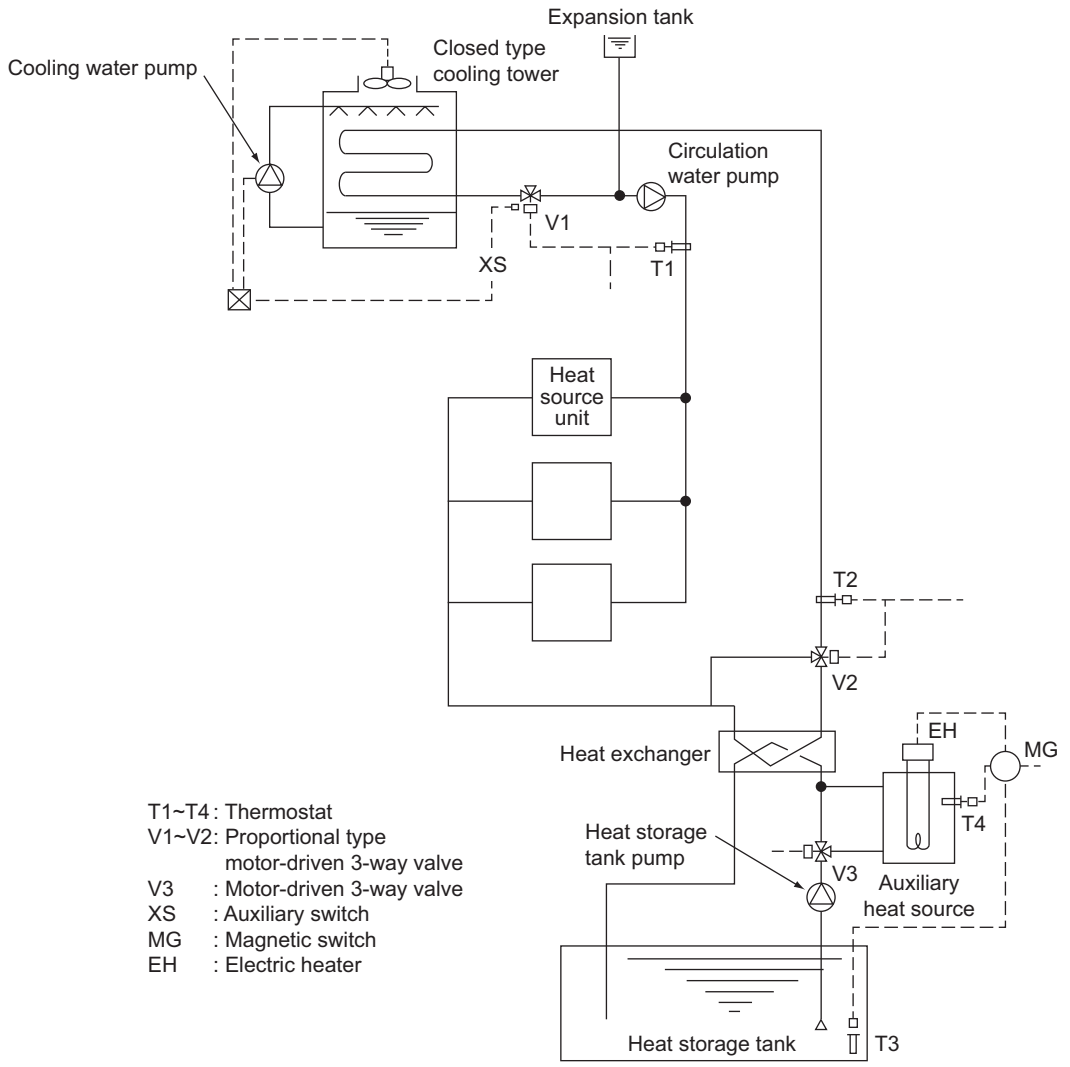
System example of water circuit



5) Practical System Examples and Circulation Water Control

Since the water heat source HYBRID CITY MULTI is of water heat source system, versatile systems can be constituted by combining it with various heat sources.
The practical system examples are given below.
Either cooling or heating operation can be performed if the circulation water temperature of the water heat source HYBRID CITY MULTI stays within a range of 15~45°C [59~113°F]. However, the circulation water temperature near 32°C [90°F] for cooling and 20°C [68°F] for heating is recommended by taking the life, power consumption and capacity of the air conditioning units into consideration. The detail of the control is also shown below.

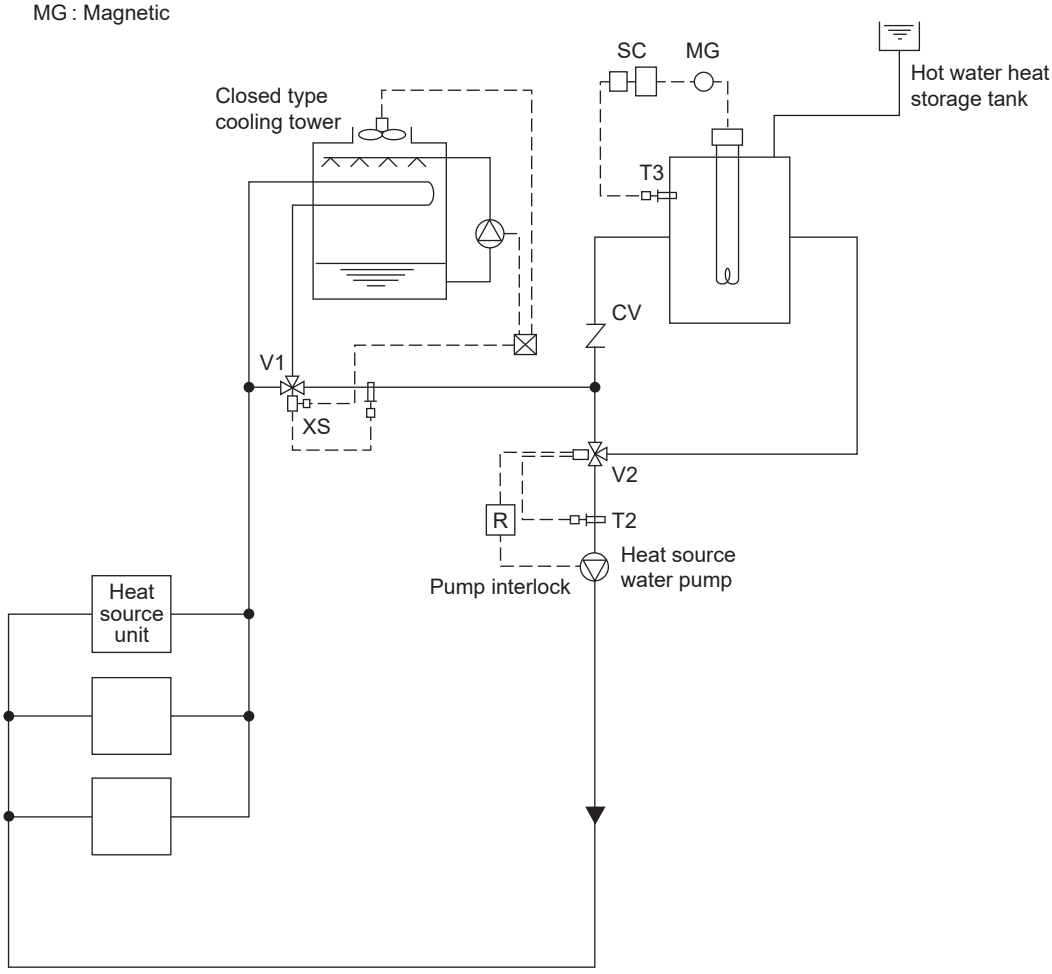
Example-1 Combination of closed type cooling tower and hot water heat storage tank (using underground hollow slab)



By detecting the circulation water temperature of the water heat source HYBRID CITY MULTI system with T1 (around 32°C [90°F]) and T2 (around 20°C [68°F]), the temperature will be controlled by opening/closing V1 in the summer and V2 in the winter.
In the summer, as the circulation water temperature rises exceeding the set temperature of T1, the bypass port of V1 will open to lower the circulation water temperature. While in the winter, as the circulation water temperature drops, V2 will open following the command of T2 to rise the circulation water temperature.
The water inside the heat storage tank will be heated by the auxiliary heat source by V3 being opened with timer operation in the night-time. The electric heater of the auxiliary heat source will be controlled by T3 and the timer.
The start/stop control of the fan and pump of the closed type cooling tower is applied with the step control of the fan and pump following the command of the auxiliary switch XS of V1, that operates only the fan at the light load while the fan and pump at the maximum load thus controlling water temperature and saving motor power.

Example-2 Combination of closed type cooling tower and hot water heat storage tank

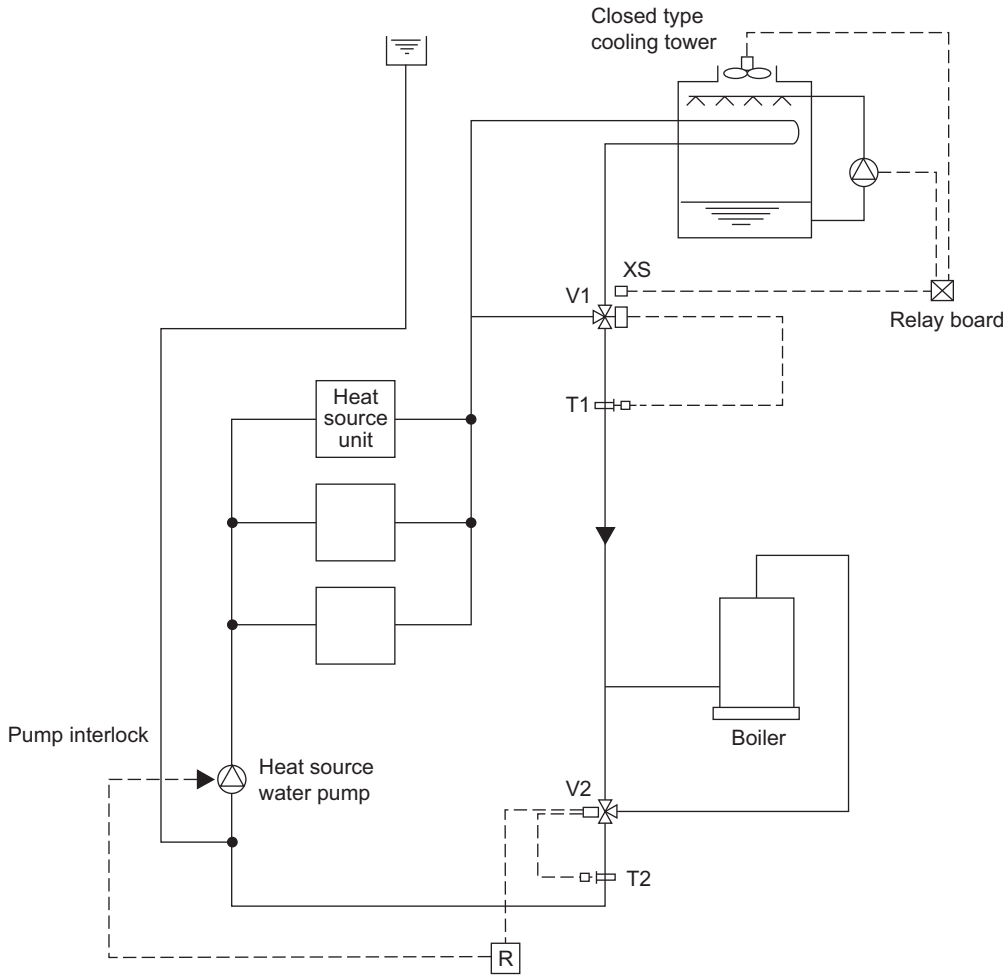
T1 : Proportional type, insertion system thermostat
T2 : Proportional type, insertion system thermostat
T3 : Proportional type, insertion system thermostat
V1 : Proportional type, motor-driven 3-way valve
V2 : Proportional type, motor-driven 3-way valve
XS : Auxiliary switch (Duplex switch type)
SC : Step controller
R : Relay
MG : Magnetic



In the summer, as the inlet water temperature rises exceeding the set temperature of T1, the bypass port of V1 will open to lower the inlet water temperature. In the winter, if the inlet water temperature stays below 25°C [77°F], V2 will open/close by the command of T2 to keep the inlet water temperature constant.
The temperature of the hot water inside the heat storage tank will be controlled through the step control of the electric heater by step controller operation following the command of T3.
During the stopping of the heat source water pump, the bypass port of V2 will be closed fully by interlocking thus preventing the high temperature water from entering into the system at the starting of the pump.
The start/stop control of the fan and pump of the closed type cooling tower is applied with the step control of the fan and pump following the command of the auxiliary switch XS of V1, that operates only the fan at the light load while the fan and pump at the maximum load thus controlling water temperature and saving motor power.

Example-3 Combination of closed type cooling tower and boiler

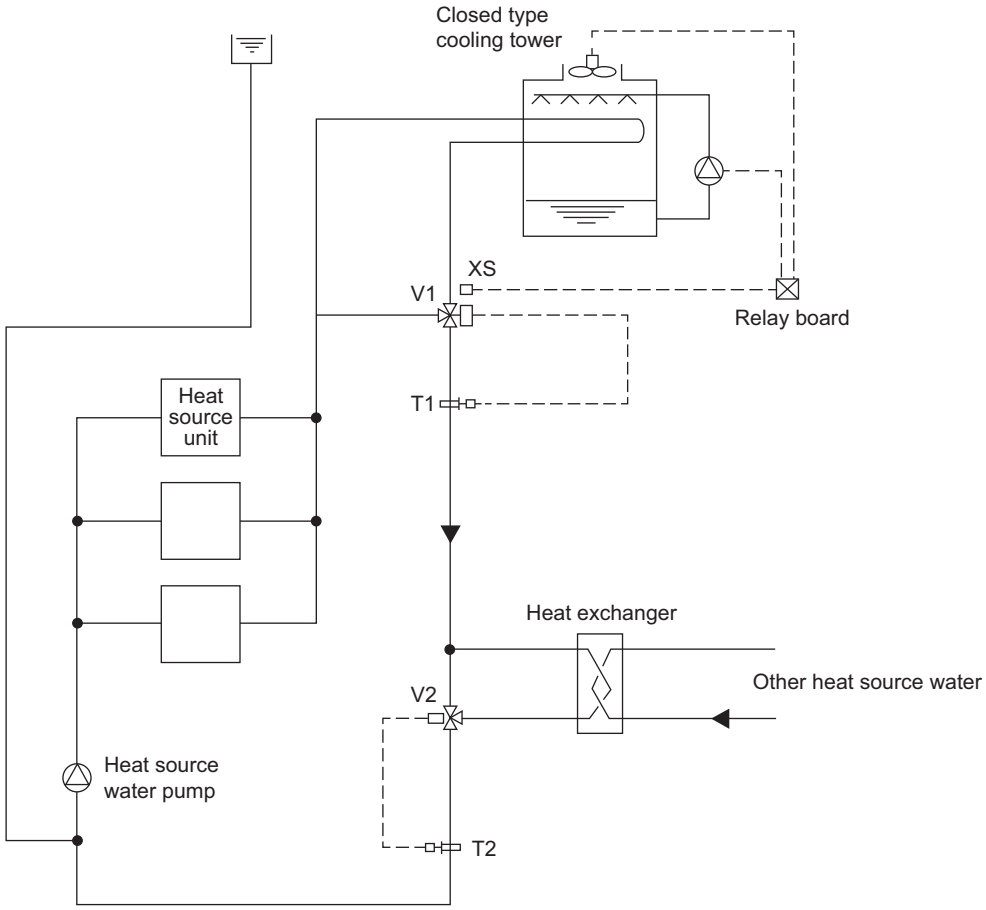
T1 : Proportional type, insertion system thermostat
T2 : Proportional type, insertion system thermostat
T3 : Proportional type, insertion system thermostat
V1 : Proportional type, motor-driven 3-way valve
S : Selector switch
R : Relay
XS : Auxiliary switch (Duplex switch type)



In the summer, as the inlet water temperature rises exceeding the set temperature of T1, the bypass port of V1 will close to lower the inlet water temperature. In the winter, if the inlet water temperature drops below 25°C [77°F], V2 will conduct water temperature control to keep the inlet water temperature constant.
During the stopping of the heat source water pump, the bypass port of V2 will be closed fully by interlocking.
The start/stop control of the fan and pump of the closed type cooling tower is applied with the step control following the command of the auxiliary switch XS of V1, thus controlling water temperature and saving motor power.

Example-4 Combination of closed type cooling tower and heat exchanger (of other heat source)

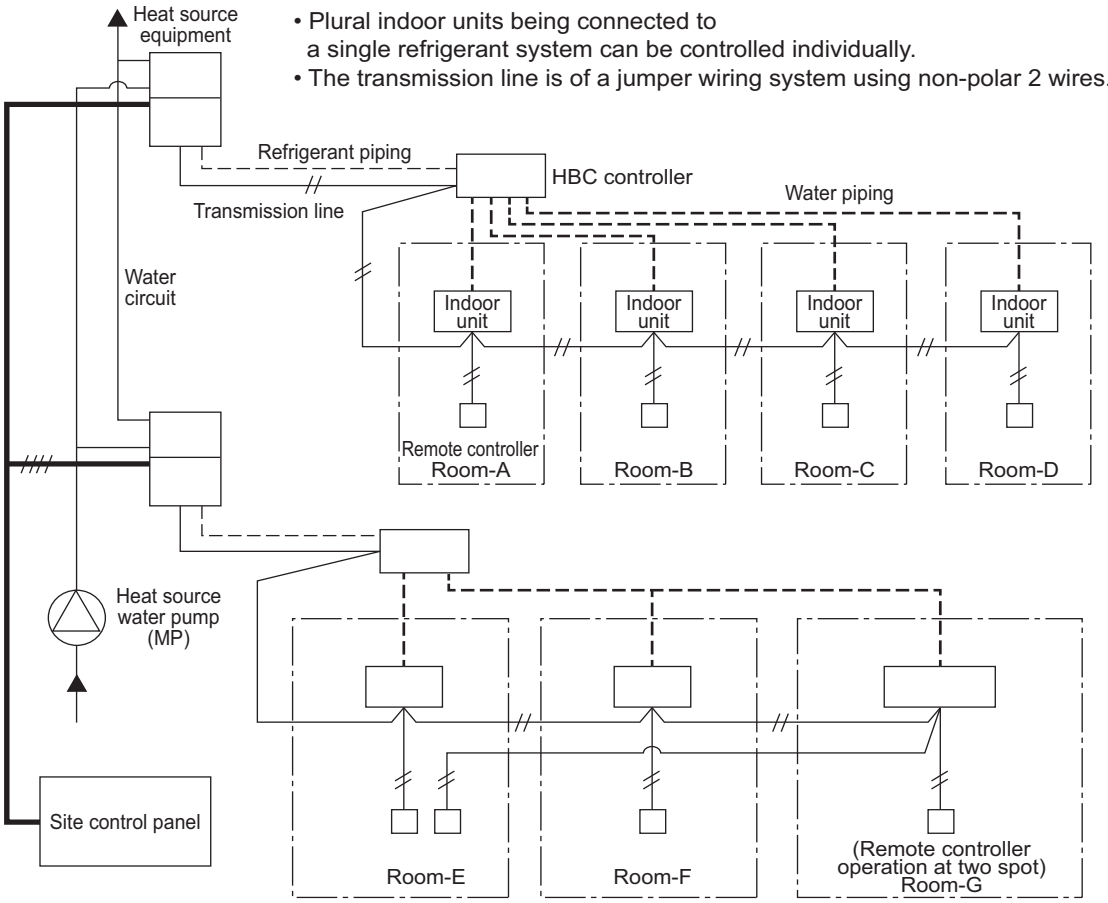
T1 : Proportional type, insertion system thermostat
T2 : Proportional type, insertion system thermostat
V1 : Proportional type, motor-driven 3-way valve
V2 : Proportional type, motor-driven 3-way valve
S : Selector switch
R : Relay
XS : Auxiliary switch (Duplex switch type)



In the summer, as the inlet water temperature rises exceeding the set temperature of T1, the bypass port of V1 will close to lower the inlet water temperature. In the winter, if the inlet water temperature drops below 26°C [79°F], V2 will conduct water temperature control to keep the inlet water temperature constant.
During the stopping of the heat source water pump, the bypass port of V2 will be closed fully by interlocking.
The start/stop control of the fan and pump of the closed type cooling tower is applied with the step control following the command of the auxiliary switch XS of V1, thus controlling water temperature and saving motor power.

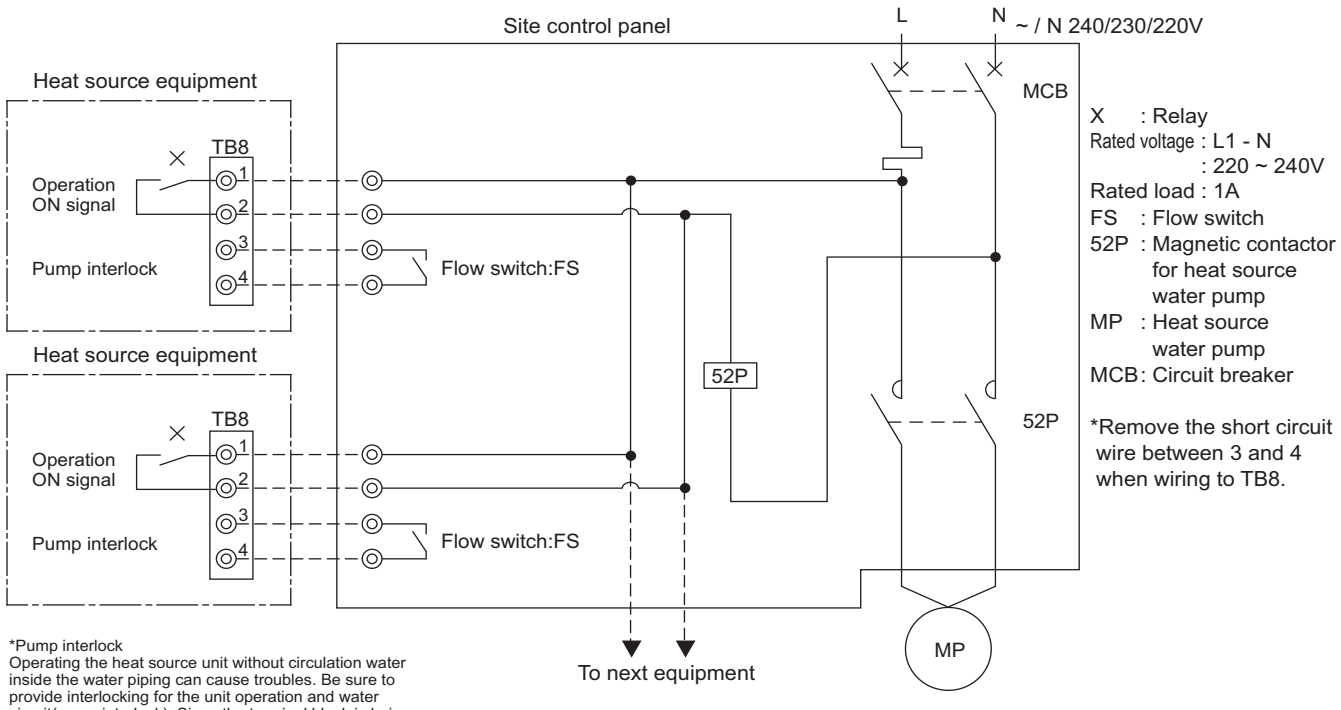
PQRY-P-YLM-A1

6) Pump interlock circuit



Wiring diagram

This circuit uses the “Terminal block for pump interlock (TB8)“ inside the electrical parts box of the heat source equipment.
This circuit is for interlocking of the heat source equipment operation and the heat source water pump.



*Pump interlock
Operating the heat source unit without circulation water inside the water piping can cause troubles. Be sure to provide interlocking for the unit operation and water circuit(pump interlock). Since the terminal block is being provided inside the unit, use it as required.

Use the flow switch (FS)

Operation ON signal

Terminal No.	TB8-1, 2
Output	Relay contacts output Rated voltage : L1 - N : 220 ~ 240V Rated load : 1A
Operation	• When setting No.917 for Dip switch 4 (Dip switch 6-10 is ON) is OFF. The relay closes during compressor operation.

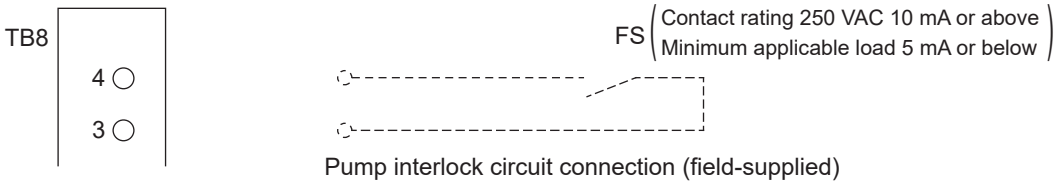
SW4 0: OFF, 1: ON									
1	2	3	4	5	6	7	8	9	10
1	0	1	0	1	0	0	1	1	1

• When setting No.917 for Dip switch 4 (Dip switch 6-10 is ON) is ON.
The relay closes during reception of cooling or the heating operation signal from the controller.
(Note : It is output even if the thermostat is OFF (when the compressor is stopped).)

Pump Interlock

Terminal No.	TB8-3, 4
Input	Level signal
Operation	If the circuit between TB8-3 and TB8-4 is open, compressor operation is prohibited.

* To prevent a false detection of error resulting from contact failure, use a flow switch with a minimum guaranteed current of 5 mA or below for FS.



Pump interlock circuit connection (field-supplied)

7) Water flow rate control

Refer to the CITY MULTI DATA BOOK for PQRY-P-YLM-A1.

4-2. Water piping work

Although the water piping for the HYBRID CITY MULTI WR2 system does not differ from that for ordinary air conditioning systems, pay special attention to the items below in conducting the piping work.

1) Items to be observed on installation work

- In order to equalize piping resistance for each unit, adapt the reverse return system.
- Mount a joint and a valve onto the water outlet/inlet of the unit to allow for maintenance, inspection and replacement work. Be sure to mount a strainer at the water inlet piping of the unit. (The strainer is required at the circulation water inlet to protect the heat source unit.)

* The installation example of the heat source unit is shown right.

- Be sure to provide an air relief opening on the water piping properly, and purge air after feeding water to the piping system.
- Condensate will generate at the low temperature part inside the heat source equipment. Connect drain piping to the drain piping connection located at the bottom of the heat source equipment to discharge it outside the equipment.
- At the center of the header of the heat exchanger water inlet inside the unit, a plug for water discharge is being provided.
  Use it for maintenance work or the like.
- Mount a backflow prevention valve and a flexible joint for vibration control onto the pump.
- Provide a sleeve to the penetrating parts of the wall to prevent the piping.
- Fasten the piping with metal fitting, arrange the piping not to expose to cutting or bending force, and pay sufficient care for possible vibration.
- Be careful not to erroneously judge the position of the inlet and outlet of water.
  (Lower position : Inlet, Upper position : Outlet)
- When connecting heat source unit water piping and water piping on site, apply liquid sealing material for water piping over the sealing tape before connection. (for Maximum water pressure above 1.0MPa)
- Wrap the sealing tape as follows.

a) Wrap the joint with sealing tape in the direction of the threads (clockwise), and do not let the tape run over the edge.

b) Overlap the sealing tape by two-thirds to three-fourths of its width on each turn. Press the tape with your fingers so that it is pressed firmly against each thread.

c) Leave the 1.5th through 2nd farthest threads away from the pipe end unwrapped.

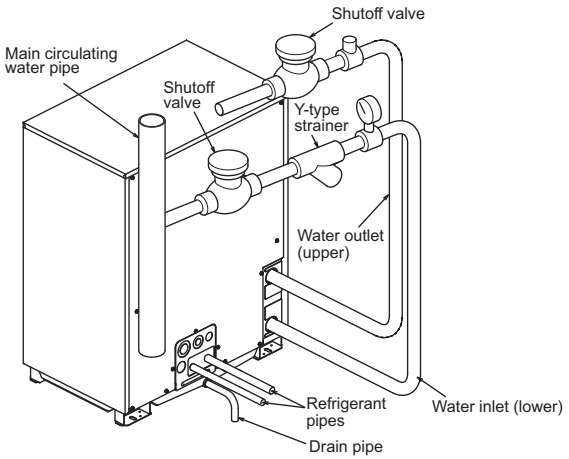
- Hold the pipe on the unit side in place with a spanner when installing the pipes or strainer. Tighten screws to a torque of 150N·m.

2) Thermal insulation work

Thermal insulation or anti sweating work is not required for the piping inside buildings in the case of the HYBRID CITY MULTI WR2 system if the operating temperature range of circulation water stays within the temperature near the normal (summer : 29.4°C[85°F], winter : 21.1°C[70°F]).
In case of the conditions below, however, thermal insulation is required.

- Use of well water for heat source water
- Outdoor piping portions
- Indoor piping portions where freezing may be caused in winter
- A place where vapor condensation may be generated on piping due to an increase in dry bulb temperature inside the ceiling caused by the entry of fresh outdoor air
- Drain piping portions

Installation example of heat source unit



3) Water treatment and water quality control

For the circulation water cooling tower of the HYBRID CITY MULTI WR2 system, employment of the closed type is recommended to keep water quality. However, in the case that an open type cooling tower is employed or the circulating water quality is inferior, scale will adhere onto the water heat exchanger leading to the decreased heat exchange capacity or the corrosion of the heat exchanger. Be sufficiently careful for water quality control and water treatment at the installation of the circulation water system

- Removal of impurities inside piping
  Be careful not to allow impurities such as welding fragment, remaining sealing material and rust from mixing into the piping during installation work.
- Water treatment
  The water quality standards have been established by the industry (Japan Refrigeration, Air Conditioning Industry Association, in case of Japan) for water treatment to be applied.

Items			Lower mid-range temperature water system		Tendency	
			Recirculating water [20<T<60°C] [68<T<140°F]	Make-up water	Corrosive	Scale-forming
Standard items	pH (25°C[77°F])		7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Electric conductivity	(mS/m) (25°C[77°F]) (μS/cm) (25°C[77°F])	30 or less [300 or less]	30 or less [300 or less]	○	○
	Chloride ion	(mg Cl⁻/ℓ)	50 or less	50 or less	○	
	Sulfate ion	(mg SO_4^{2-}/ℓ)	50 or less	50 or less	○	
	Acid consumption (pH4.8)	(mg $CaCO_3$/ℓ)	50 or less	50 or less		○
	Total hardness	(mg $CaCO_3$/ℓ)	70 or less	70 or less		○
	Calcium hardness	(mg $CaCO_3$/ℓ)	50 or less	50 or less		○
	Ionic silica	(mg SiO_2/ℓ)	30 or less	30 or less		○
Reference items	Iron	(mg Fe/ℓ)	1.0 or less	0.3 or less	○	○
	Copper	(mg Cu/ℓ)	1.0 or less	0.1 or less	○	
	Sulfide ion	(mg S^{2-}/ℓ)	not to be detected	not to be detected	○	
	Ammonium ion	(mg NH_4^+/ℓ)	0.3 or less	0.1 or less	○	
	Residual chlorine	(mg Cl/ℓ)	0.25 or less	0.3 or less	○	
	Free carbon dioxide	(mg CO_2/ℓ)	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)

In order to keep the water quality within such standards, you are kindly requested to conduct bleeding-off by overflow and periodical water quality tests, and use inhibitors to suppress condensation or corrosion. Since piping may be corroded by some kinds of inhibitor, consult an appropriate water treatment expert for proper water treatment.

4) Pump interlock

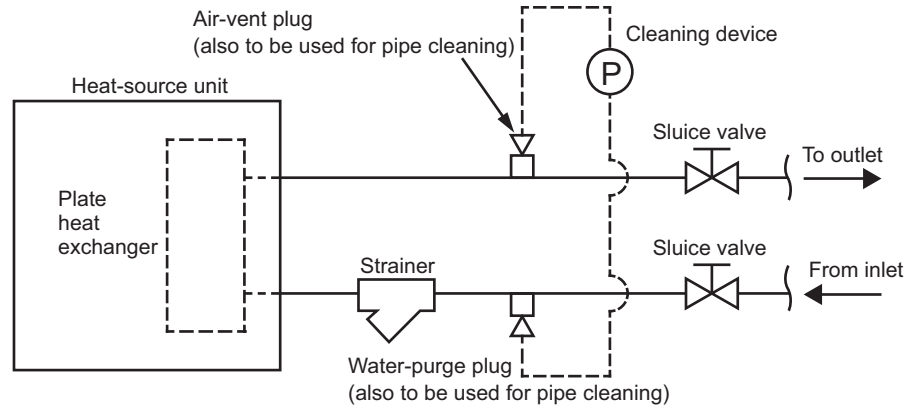
Operating the heat source unit without circulation water inside the water piping can cause a trouble. Be sure to provide interlocking for the unit operation and water circuit. Since the terminal block is being provided inside the unit, use it as required.

5) Handling plate heat exchangers for heat-source units

<Designing the piping system>

- Install a strainer (50 mesh or finer recommended) near the heat-source unit on the inlet side of the hot/cold water pipe and cooling-water pipe (hereafter referred to as water pipes) to prevent an infiltration of foreign materials of solid nature, such as dirt and sand, into the plate heat exchanger.
- Depending on the water quality, scale may form inside plate heat exchangers. Plate heat exchangers must be chemically cleaned regularly to remove scale formation. Install sluice valves on the water pipes, and provide ports for connecting a pipe between the sluice valves and the heat-source unit for chemical cleaning.
- On both the inlet and outlet sides of water pipes, provide a plug to remove trapped air and water (also to be used for cleaning heat-source units and for purging water before a period of nonuse in winter or at the end of an air conditioning season). Also, provide automatic air-vent valves where air is likely to be trapped (such as a pipe that runs vertically).
- In addition to installing the above-mentioned strainers, install a cleanable strainer near the pump pipe inlet.
- Keep the pipes properly insulated and take an appropriate measure against humidity to minimize heat loss and prevent freeze damage in severe cold climate.
- If the system is stopped during winter or at night in subfreezing temperatures, take appropriate measures to protect pipes from freezing (i.e., pipe purging and use of water-circulation pump or heater) and prevent resultant damage to the plate heat exchanger.

Example piping system configuration



<Test run>

- Before performing a test run, check that the piping system is properly installed, especially the strainers, air-vents, automatic water-supply valves, expansion tanks, and systems.
- After the pipe system is filled with water, first, operate the pump alone to check the system for trapped air and adjust the water flow rate to prevent the plate heat exchanger from freezing. Take into consideration the water pressure loss before and after each heat-source unit, and make sure the water flow rate falls within the design water flow rate range. Stop the test run and correct any problems found, if any.
- At the completion of a test run, check the strainer at the inlet pipe of the heat-source unit and clean it as necessary.

<Daily maintenance>

- Controlling the water quality
  Plate heat exchangers cannot be disassembled for cleaning and have no replaceable parts. Watch the water quality to prevent corrosion and scale formation. The quality of the water to be used for plate heat exchangers must meet the water quality guidelines JRA GL-02-1994 specified by Japan Refrigeration and Air conditioning Industry Association (JRAIA). (Refer to section 3) Water treatment and water quality control.)
- Controlling the circulation water flow rate
  Insufficient water rate will cause freeze damage to plate heat exchangers. Check for insufficient water flow caused by clogged strainer, trapped air in the system, or malfunction of the circulation water pump. Flow rate can also be checked by measuring the temperature or pressure difference between the inlet and outlet of plate heat exchangers.
  If the temperature or pressure difference goes outside of the specified range, stop the operation, remove the cause of the problem, and resume operation.
- What to do when the freeze protection trips
  If the freeze protection trips during operation, be sure to remove its cause before resuming operation. Tripped freeze protection indicates that the system is partially frozen, and resuming operation without removing the cause of the problem will result in freeze damage to plate heat exchangers and/or pipes as well as resultant refrigerant leaks and infiltration of water into the refrigerant circuit.

<Maintaining plate heat exchangers>

Plate heat exchangers must be maintained in a planned and periodical manner to prevent scale formation, which may cause performance loss or decrease water flow rate that result in freeze damage to the plate heat exchanger.

- Check the following items before the operating season.
  1. Check that the water quality meets the specified water quality.
  2. Clean the strainers.
  3. Check that the water flow rate is adequate.
  4. Check for proper operation (e.g., pressure, flow rate, inlet/outlet temperatures).

- Plate heat exchangers cannot be disassembled for cleaning. Clean them in the following way.
  1. Make sure that there is a pipe connection port on the water inlet pipe.
     Use formic acid, citric acid, oxalic acid, acetic acid, or phosphoric acid diluted to 5% to clean plate heat exchangers. Do not use highly corrosive acids, such as hydrochloric acid, sulfuric acid, or nitric acid.
  2. Make sure that valves are installed before the inlet connection port and after the outlet connection port.
  3. Connect a pipe for circulating cleaning solution to the inlet/outlet pipes of the plate heat exchanger, fill the plate heat exchanger with cleaning solution at a temperature between 50 and 60°C, and circulate the cleaning solution with a pump for 2 to 5 hours. The cleaning time will depend on the temperature of the cleaning solution and the degree of scale formation. Use the color of the cleaning solution as a guide to determine how long the system needs to be cleaned.
  4. When done, discharge the cleaning solution out of the plate heat exchanger, fill it with sodium hydrate (NaOH) or sodium bicarbonate ($NaHCO_3$) diluted with water to 1 to 2%, and let the solution be circulated for 15 to 20 minutes until the cleaning solution is neutralized.
  5. After neutralizing the cleaning solution, thoroughly rinse the plate heat exchanger with clean water.
  6. When using a commercially available cleaning solution, make sure to use a solution not corrosive to stainless steel or copper.
  7. Consult the cleaning solution manufacture for details.

- At the completion of cleaning, check the system for proper operation.

5-1. Power supply for Heat source unit

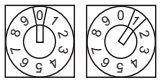
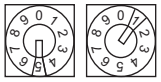
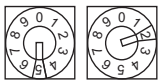
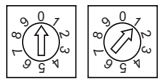
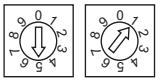
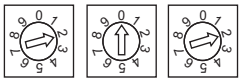
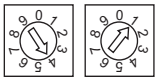
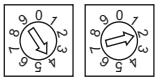
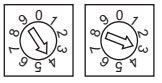
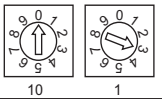
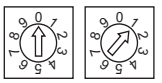
5-1-1. Electrical characteristics of Heat source unit at cooling mode

Symbols: MCA (Max Circuit Amps)
RLA (Rated Load Amps), SC (Starting Current)

PQRY-P-YLM	Unit combination	Heat source units				Compressor		RLA(A)	
		Hz	Volts	Voltage range	MCA(A)	Output (kW)	SC(A)	Cooling 380/400/415V	Heating 380/400/415V
PQRY-P200YLM	-	50/60	380 400 415	Max:456 Min:342	16.1	4.8	8	6.7/6.3/6.1	6.8/6.4/6.2
PQRY-P250YLM	-				16.1	6.2		9.1/8.7/8.4	9.1/8.6/8.3
PQRY-P300YLM	-				18.6	7.7		12.7/12.1/11.6	12.0/11.4/11.0
PQRY-P350YLM	-				23.1	9.5		16.8/16.0/15.4	14.9/14.2/13.7
PQRY-P400YLM	-				27.6	10.7		16.9/16.1/15.5	15.9/15.1/14.6
PQRY-P450YLM	-				32.9	11.6		20.3/19.3/18.6	18.7/17.8/17.1
PQRY-P500YLM	-				39.2	13.0		24.6/23.3/22.5	22.0/20.9/20.2

6-1. Address setting

6-1-1. Rule of setting address

Unit		Address setting	Example	Note
Indoor unit		01 ~ 50	 10 1	Use the most recent address within the same group of indoor units.
Heat source unit		51 ~ 99, 100 (Note1)	 10 1	The smallest address of indoor unit in same refrigerant system + 50 Assign sequential address numbers to the heat source units in one refrigerant circuit system. OC and OS are automatically detected. (Note 2) * Please reset one of them to an address between 51 and 99 when two addresses overlap. * The address automatically becomes "100" if it is set as "01~ 50"
HBC controller		52 ~ 99, 100	 10 1	The address of the smallest address of indoor unit connected to the HBC controller + 50 * Please reset one of them to an address between 51 and 99 when two addresses overlap. * The address automatically becomes "100" if it is set as "01~ 50"
Local remote controller	ME Remote controller (Main)	101 ~ 150	1 Fixed  10 1	The smallest address of indoor unit in the group + 100 * The place of "100" is fixed to "1"
	ME Remote controller (Sub)	151 ~ 199, 200	1 Fixed  10 1	The address of main remote controller + 50 * The address automatically becomes "200" if it is set as "00"
System controller	ON/OFF remote controller	201 ~ 250	 100 10 1	The smallest group No. to be managed + 200 * The smallest group No. to be managed is changeable.
	AE-C400E/EW-C50E AE-200E/AE-50E EW-50E AG-150A AT-50B	000, 201 ~ 250	0,2 0~5 0~9 100 10 1	* AT-50B cannot be set to "000".
	PAC-YG50ECA	000, 201 ~ 250	0,2 0~5 0~9 100 10 1	* Settings are made on the initial screen of AG-150A.
	BAC-HD150	000, 201 ~ 250	0,2 0~5 0~9 100 10 1	* Settings are made with setting tool of BM ADAPTER.
PI, AI, DIDO	PAC-YG60MCA	01 ~ 50	 10 1	
	PAC-YG63MCA	01 ~ 50	 10 1	
	PAC-YG66DCA	01 ~ 50	 10 1	
LOSSNAY, OA processing unit		01 ~ 50	 10 1	After setting the addresses of all the indoor units, assign an arbitrary address.
PAC-IF01AHC		201 ~ 250	2 Fixed  10 1	

Note1: To set the address to "100", set it to "50"

Note2: Heat source units OC and OS in one refrigerant circuit system are automatically detected. OC and OS are ranked in descending order of capacity. If units are the same capacity, they are ranked in ascending order of their address.

7-1. R410A Piping material

Refrigerant pipe for HYBRID CITY MULTI shall be made of phosphorus deoxidized copper, and has two types.
A. Type-O: Soft copper pipe (annealed copper pipe), can be easily bent with human's hand.
B. Type-1/2H pipe: Hard copper pipe (Straight pipe), being stronger than Type-O pipe of the same radical thickness.

The maximum operation pressure of R410A air conditioner is 4.30 MPa [623psi]. The refrigerant piping should ensure the safety under the maximum operation pressure. MITSUBISHI ELECTRIC recommends pipe size as Table 1, or You shall follow the local industrial standard. Pipes of radical thickness 0.7mm or less shall not be used.

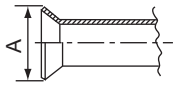
Table 1. Copper pipe size and radial thickness for R410A HYBRID CITY MULTI.

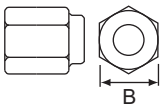
Size (mm)	Size (in.)	Radial thickness (mm)	Radial thickness (mil)	Pipe type
ø6.35	ø1/4"	0.8	[32]	Type-O
ø9.52	ø3/8"	0.8	[32]	Type-O
ø12.7	ø1/2"	0.8	[32]	Type-O
ø15.88	ø5/8"	1.0	[40]	Type-O
ø19.05	ø3/4"	1.2	[48]	Type-O
ø19.05	ø3/4"	1.0	[40]	Type-1/2H or H
ø22.2	ø7/8"	1.0	[40]	Type-1/2H or H
ø25.4	ø1"	1.0	[40]	Type-1/2H or H
ø28.58	ø1-1/8"	1.0	[40]	Type-1/2H or H
ø31.75	ø1-1/4"	1.1	[44]	Type-1/2H or H
ø34.93	ø1-3/8"	1.2	[48]	Type-1/2H or H
ø41.28	ø1-5/8"	1.4	[56]	Type-1/2H or H

* For pipe sized ø19.05 (3/4") for R410A air conditioner, choice of pipe type is up to you.
* The figures in the radial thickness column are based on the Japanese standards and provided only as a reference. Use pipes that meet the local standards.

Flare

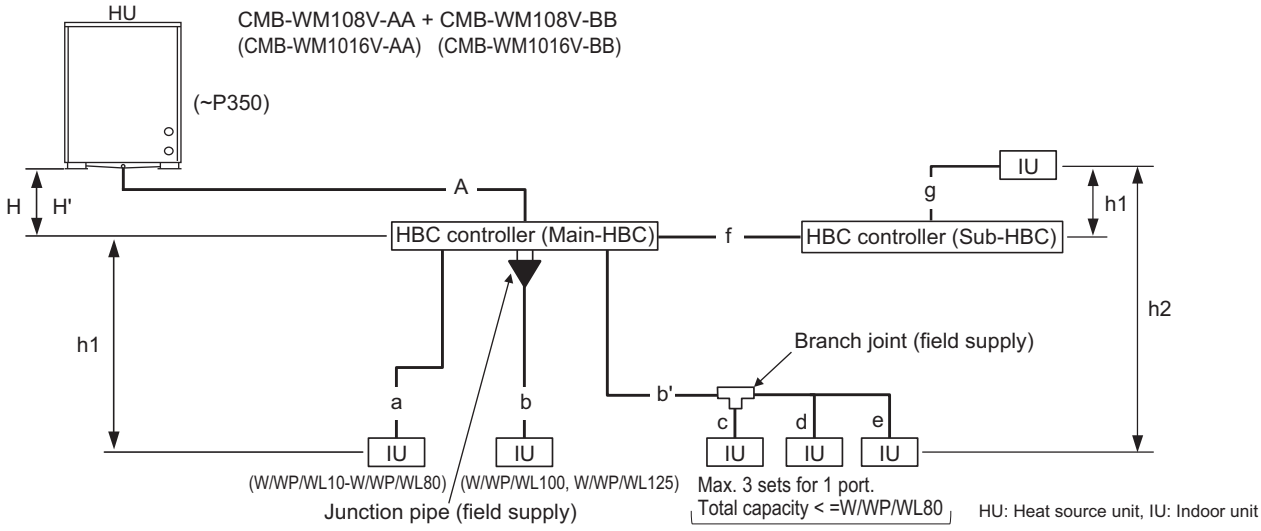
Due to the relative higher operation pressure of R410A compared to R22, the flare connection should follow dimensions mentioned below so as to achieve enough the air-tightness.

Flare pipe	Pipe size	A (For R410A) (mm[in.])
	ø6.35 [1/4"]	9.1
	ø9.52 [3/8"]	13.2
	ø12.70 [1/2"]	16.6
	ø15.88 [5/8"]	19.7
	ø19.05 [3/4"]	24.0

Flare nut	Pipe size	B (For R410A) (mm[in.])
	ø6.35 [1/4"]	17.0
	ø9.52 [3/8"]	22.0
	ø12.70 [1/2"]	26.0
	ø15.88 [5/8"]	29.0
	ø19.05 [3/4"]	36.0

7-2. Piping Design

7-2-1. Restrictions on pipe length



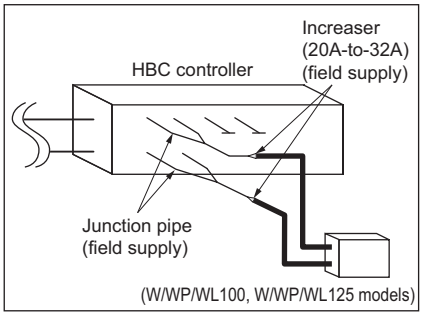
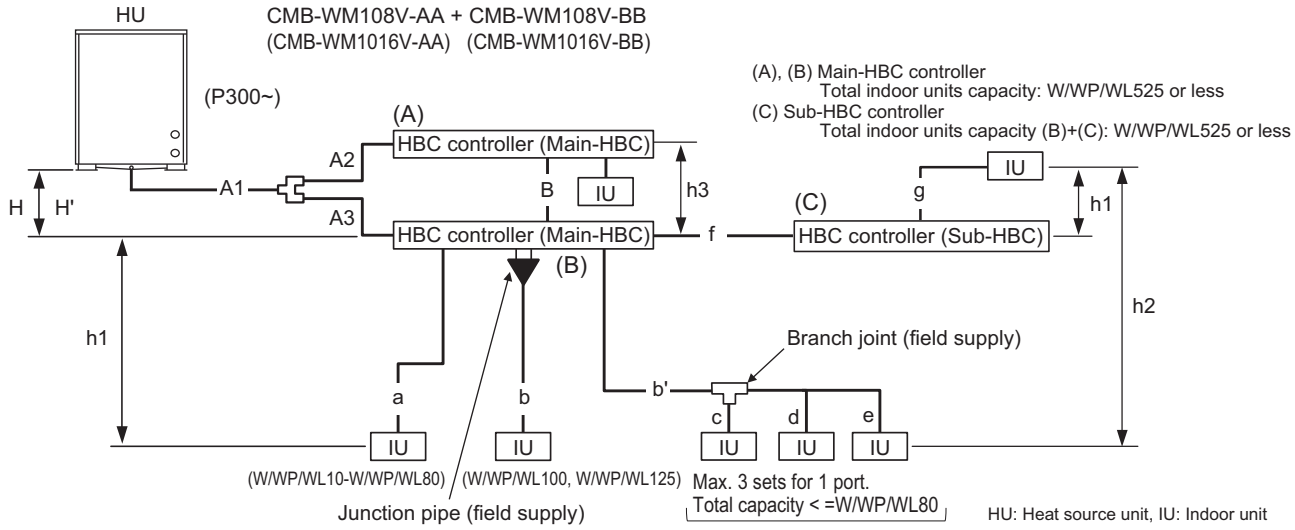


Fig. A

(Unit: m)

	Item		Piping portion	Allowable value
Pipe Lengths	Between heat source unit and HBC controller (refrigerant pipework)		A	110 or less
	Water pipework between indoor units and HBC controller		f + g	60 or less
Difference of elevation	Between HBC and heat source units	Heat source unit above HBC	H	50 or less
		Heat source unit below HBC	H'	40 or less
	Between indoor units and HBC controller		h1	15(10) or less*1
	Between indoor units		h2	15(10) or less*1

*1. Values in ( ) are applied when indoor total capacity exceeds 130% of heat source unit capacity



(Unit: m)

	Item		Piping portion	Allowable value
Pipe Lengths	Between heat source unit and HBC controller (refrigerant pipework)		A1 + A2 + A3	110 or less
	Water pipework between indoor units and HBC controller		f + g	60 or less
	Between HBC controllers		B	40 or less
Difference of elevation	Between HBC and heat source units	Heat source unit above HBC	H	50 or less
		Heat source unit below HBC	H'	40 or less
	Between indoor units and HBC controller		h1	15(10) or less*1
	Between indoor units		h2	15(10) or less*1
	Between HBC controllers		h3	15(10) or less*1

*1. Values in ( ) are applied when indoor total capacity exceeds 130% of heat source unit capacity

1. Refrigerant and water pipe size

(1) Refrigerant pipe between heat source unit and HBC controller (Part A, A1, A2, and A3)

Use of one HBC controller

		HBC controller		
Unit model		Model name	High pressure side	Low pressure side
Heat source unit side	PQRY-P200	(HBC controller) CMB-WM108V-AA CMB-WM1016V-AA *1	ø15.88 (Brazing)	ø19.05 (Brazing)
	PQRY-P250		ø19.05 (Brazing)	ø22.2 (Brazing)
	PQRY-P300		ø19.05 (Brazing)	ø22.2 (Brazing)
	PQRY-P350		ø22.2 (Brazing)	ø28.58 (Brazing)

Use of two HBC controllers

		HBC controller			
Unit model		Model name	Between heat source unit and twining pipe		Between twining pipe and HBC	
			High pressure side	Low pressure side	High pressure side	Low pressure side
Heat source unit side	PQRY-P300	(HBC controller) CMB-WM108V-AA CMB-WM1016V-AA *1	ø19.05 (Brazing)	ø22.2 (Brazing)	ø15.88 (Brazing) for each HBC	ø19.05 (Brazing) for each HBC
	PQRY-P350		ø22.2 (Brazing)	ø28.58 (Brazing)	ø15.88 (Brazing) for each HBC	ø19.05 (Brazing) for each HBC
	PQRY-P400		ø22.2 (Brazing)	ø28.58 (Brazing)	ø15.88 (Brazing) for each HBC	ø19.05 (Brazing) for each HBC
	PQRY-P450		ø22.2 (Brazing)	ø28.58 (Brazing)	ø19.05 (Brazing) for each HBC	ø22.2 (Brazing) for each HBC
	PQRY-P500		ø22.2 (Brazing)	ø28.58 (Brazing)	ø19.05 (Brazing) for each HBC	ø22.2 (Brazing) for each HBC

***1. PQRY-P400YLM model or larger requires a connection of two Main-HBC controllers in parallel.**

(2) Water pipe between HBC controller and indoor units (Sections a, b, c, d, e, and g)

Total down-stream indoor unit capacity	Connection size		Pipe size	
	Water inlet	Water outlet	Water out	Water return
W/WP/WL10–50	O.D. 22 mm	O.D. 22 mm	I.D. ≥ 20 mm	I.D. ≥ 20 mm
W/WP/WL51–125			I.D. ≥ 30 mm	I.D. ≥ 30 mm

* For other indoor units, refer to the indoor unit's DATA BOOK.
* The pipe diameter depends on the capacity of indoor units.
Refer to the indoor unit's DATA BOOK for details.

(3) Water pipe between Main-HBC and Sub-HBC controller (Section f)

Total down-stream indoor unit capacity	Pipe size between Main-HBC and Sub-HBC controller
W/WP/WL10–100	I.D. ≥ 20.0 mm
W/WP/WL101–200	I.D. ≥ 25.8 mm
W/WP/WL201–300	I.D. ≥ 30.0 mm
W/WP/WL301–400	I.D. ≥ 33.3 mm
W/WP/WL401–500	I.D. ≥ 36.2 mm
W/WP/WL501–525	I.D. ≥ 36.8 mm

* The diameter of Main-HBC ports is O.D. 22.0 mm.
* The diameter of Sub-HBC ports is O.D. 28.0 mm.

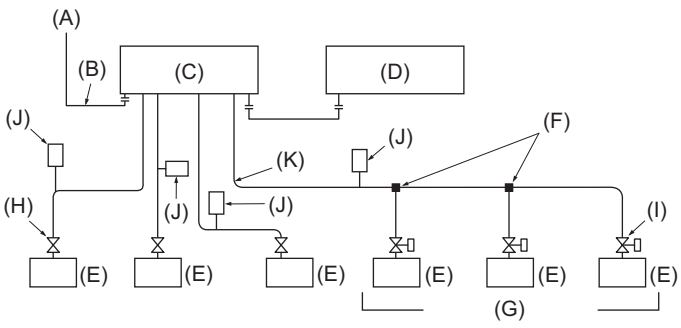
(4) Refrigerant pipe between HBC controller and HBC controller (Section B)

Unit: mm [inch]

ø15.88 [5/8"] (Brazed connection)

2. Connecting the HBC controller

(1) Size of the pipe that fits the standard HBC controller ports



(A) To heat source unit
(B) End connection (brazing)
(C) Main-HBC controller
(D) Sub-HBC controller
(E) Indoor unit
(F) Branch joint (field supply)
(G) Up to three units for 1 branch hole; total capacity: below 80 (but in same mode, cooling/heating)
(H) Shutoff valve (field supply)
(I) Pressure control valve (field supply)
(J) Auto air vent valve (Highest point on the water pipe for each branch) (field supply)
(K) Water pipework

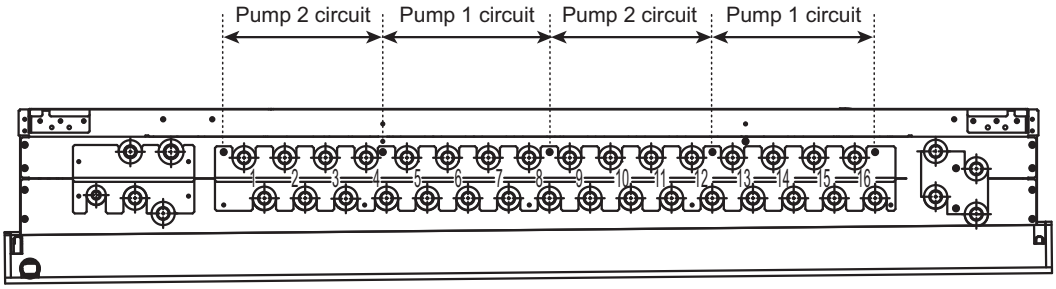


Fig. B

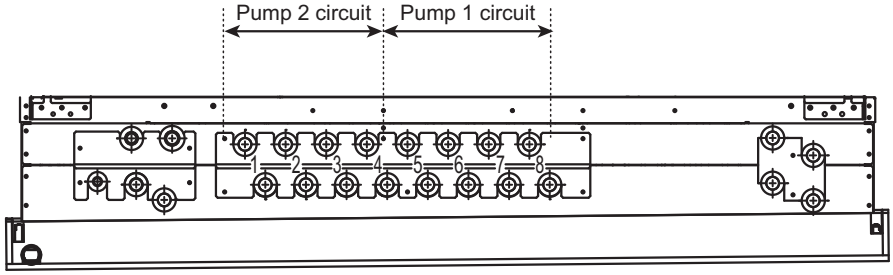


Fig. C

Note: 1

To connect multiple indoor units to a port

- Maximum total capacity of connected indoor units: W/WP/WL80
- Maximum number of connectable indoor units: 3 units
- Branch joints are field-supplied.
- All the indoor units that are connected to the same port must be in the same group and perform the Thermo-ON/OFF operation simultaneously.
- The room temperatures of all the indoor units in the group need to be monitored via the connected remote controller.
- When connecting a W/WP/WL71 through 125 model indoor unit to an HBC controller, the pipes that connect the unit to the same set of HBC controller ports cannot be branched out to connect additional units.
- Selection of water piping
  Select the size according to the total capacity of indoor units to be installed downstream.
- Do not connect multiple indoor units to the same port when operating each of them in different modes (cooling, heating, stop, and thermo-OFF). The indoor units connected to the same port must be set to operate in the same mode. Set them to the same group to make them run/stop in the same mode all together. Alternatively, enable the thermo setting on the remote controller, or set the common thermostat (optional) to run/stop the units in the same mode based on the representative temperature.
- When multiple indoor units are connected to a single port, install a pressure control valve in the pipe to equalize the pressure of all indoor units.
- Pressure control valves are required for the “WP-type” and “WL-type without the optional valve kit” indoor units only, and not for the “W-type” and “WL-type with the optional valve kit” indoor units.

Note: 2

Connecting W/WP/WL100 or 125 indoor units to an HBC controller

- When connecting W/WP/WL100 or 125 indoor units to an HBC controller, connect each unit to two sets of two ports on the HBC controller, using two junction pipes (Y-joints). (See Fig. A.)
- Connect an increaser (20A-to-32A) to the merged side of each junction pipe. (See Fig. A.)
- When the junction pipes are connected to 16 HBC ports, the branched sides of the junction pipes cannot be connected to the ports "4 and 5," "8 and 9," or "12 and 13" at the same time. (See Fig. B.)
- When the junction pipes are connected to 8 HBC ports, the branched sides of the junction pipes cannot be connected to the ports "4 and 5" at the same time. (See Fig. C.)
- When a W/WP/WL100 or a 125 model indoor unit is connected to an HBC controller, the pipes that connect the unit to the same set of HBC ports cannot be branched out to connect additional units.

Note: 3

Maximum capacity of indoor units connectable to an HBC controller for obtaining the rated performance

- An HBC controller has two pumps. Each pump can accommodate the capacity equivalent to W/WP/WL175 indoor units.
- When connecting the pipe to 16 HBC ports, make sure that the total capacity of the indoor units connected to ports "1 through 4 and 9 through 12" or "5 through 8 and 13 through 16" will not exceed W/WP/WL175 and will be equal as much as possible. (See Fig. B.)
  When connecting the pipe to 8 HBC ports, make sure that the total capacity of the indoor units connected to ports "1 through 4" or "5 through 8" will not exceed W/WP/WL175 and will be equal as much as possible. (See Fig. C.)
  If the total capacity exceeds W/WP/WL175, the performance will be degraded.

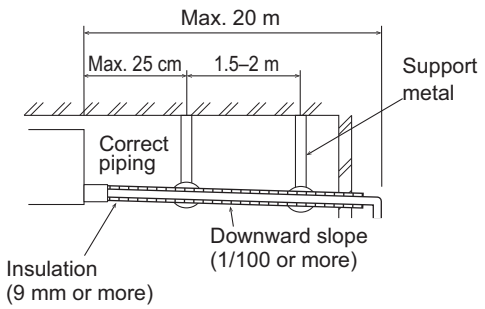
7-2-2. Drain piping work

1. Drain piping work

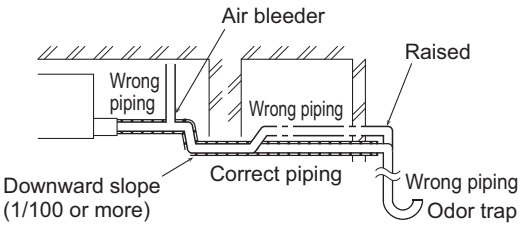
For Main-HBC and Sub-HBC controller

- Ensure that the drain piping is sloped downward (sloped gradient of more than 1/100) toward the discharge side. If it is impossible to take any downward pitch, use an optionally available drain pump to obtain a downward pitch of more than 1/100.
- Ensure that any horizontal drain piping sections that are longer than 20 m are supported with metal brackets to prevent it from bending, warping, or vibrating.
- Do not use any odor trap around the discharge port.
- As shown in (3), install a collecting pipe about 10 cm below the drain ports and give it a downward pitch of more than 1/100. This collecting pipe should be of VP-30.
- Set the end of drain piping in a place without any risk of odor generation.
- Do not put the end of the drain piping into any drain where ionic gases are generated.
- Drain piping may be installed in any direction. However, please be sure to observe the above instructions.

(1)

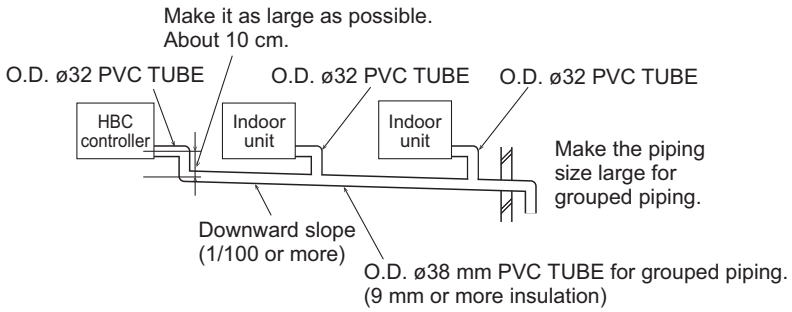


(2)



(3)

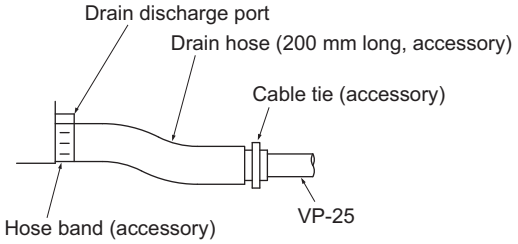
[Grouped piping]



For Main-HBC controller

- Connect the supplied drain hose to the discharge port on the unit. Use hardvinyl chloride pipes VP-25 (ø32). Tighten the supplied drain hose onto the discharge port using the supplied hose band. (For this, do not use any adhesive because the drain hose will need to be removed for servicing at a later date.)

(4)

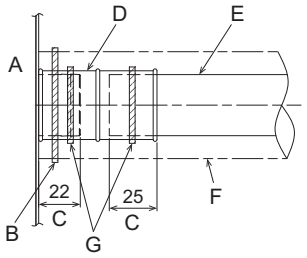


For Sub-HBC controller

♦For Sub-HBC controller, connect the drain pipe by following the steps described below.

1. Insert the drain hose (accessory) into the drain port (insertion margin: 32 mm).
   (The drain hose must not be bent more than 45° to prevent the hose from breaking or clogging.)
   (Attach the hose with glue, and fix it with the band (small, accessory).)
2. Attach the drain pipe (O.D. ø32 PVC TUBE PV-25, field supply).
   (Attach the pipe with glue, and fix it with the band (small, accessory).)
3. Perform insulation work on the drain pipe (O.D. ø32 PVC TUBE PV-25) and on the socket (including elbow).
4. Check the drainage.
5. Attach the insulating material, and fix it with the band (large, accessory) to insulate the drain port.

(5)



A: Sub-HBC controller
B: Tie band (accessory)
C: Insertion margin
D: Drain hose (accessory)
E: Drain pipe (O.D. ø32 PVC TUBE, field supply)
F: Insulating material (field supply)
G: Tie band (accessory)

2. Discharge test

After completing drain piping work, open the HBC controller panel, and test drain discharge using a small amount of water. Also, check to see that there is no water leakage from the connections.

3. Insulating drain pipes

Provide sufficient insulation to the drain pipes just as for refrigerant pipes.

⚠CAUTION

Be sure to provide drain piping with heat insulation in order to prevent excess condensation. Without drain piping, water may leak from the unit causing damage to your property.

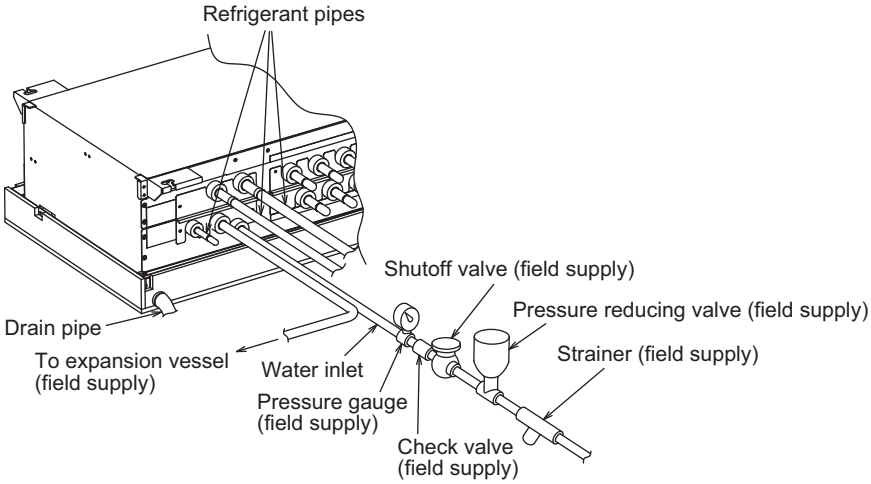
7-2-3. Connecting water pipe work

Please observe the following precautions during installation.

1. Important notes on water pipework installation

- The design pressure of the HBC controller water system is 0.6MPa.
- Use water pipe-work with a design pressure of at least 1.0MPa.
- When performing a water leak check, please do not allow the water pressure to go above 0.3MPa.
- Please connect the water pipework of each indoor unit to the correct port on the HBC controller. Failure to do so will result in incorrect running.
- Please list the indoor units on the naming plate in the HBC controller with addresses and end connection numbers.
- If the number of indoor units are less than the number of ports on the HBC controller, the unused ports must be capped. Without a cap, water will leak.
- Use the reverse-return method to insure proper pipe resistance to each unit.
- Provide some joints and valves around inlet/outlet of each unit for easy maintenance, checkup, and replacement.
- Install a suitable air vent on the water pipe. After flowing water through the pipe, vent any excess air.
- Secure the pipes with metal fittings, positioning them in locations to protect pipes against breakage and bending.
- Do not confuse the water intake and outlet piping. (Error code 5102 will appear on the remote controller if a test run is performed with the pipe-work installed incorrectly (inlet connected to outlet and vice versa).)
- This unit doesn't include a heater to prevent freezing within the pipe work. If the system is stopped for an extended period during low ambient conditions, drain the water out.
- The unused knockout holes should be closed and the refrigerant pipes, water pipes, power source and transmission wires access holes should be filled with putty.
- Install water pipe so that the water flow rate will be maintained.
- Wrap sealing tape as follows.
  1. Wrap the joint with sealing tape following the direction of the threads (clockwise), do not wrap the tape over the edge.
  2. Overlap the sealing tape by two-thirds to three-fourths of its width on each turn. Press the tape with your fingers so that it is tight against each thread.
  3. Do not wrap the 1.5th through 2nd farthest threads away from the pipe end.
- Hold the pipe on the unit side in place with a spanner when installing the pipes or strainer. Tighten screws to a torque of 40 N·m.
- If there is a risk of freezing, take precautions to prevent this happening.
- When connecting the HBC controller water piping and on site water piping, apply liquid sealing material for water piping over the sealing tape before connection.
- Please use copper or plastic pipes for the water circuit. Do not use steel or stainless steel pipework. Furthermore, when using copper pipe-work, use a non-oxidative brazing method. Oxidation of the pipe-work will reduce the pump life.
- Remove burr after cutting the piping to prevent entering the pipe connection. Prevent the particles that are generated during pipe cutting or cut edge treatment from entering the pipes. Check that there is no crack at the edge of the piping.
- Be sure to braze the water pipes after covering a wet cloth to the insulation pipes of the units in order to prevent them from burning and shrinking by heat. (There are some plastic parts in HBC controller.)
- Install the unit so that external force is not applied to the water pipes.
- After filling the pipes with water, immediately perform debris removal operation and air vent operation.

Example of heat source unit installation (using left piping)



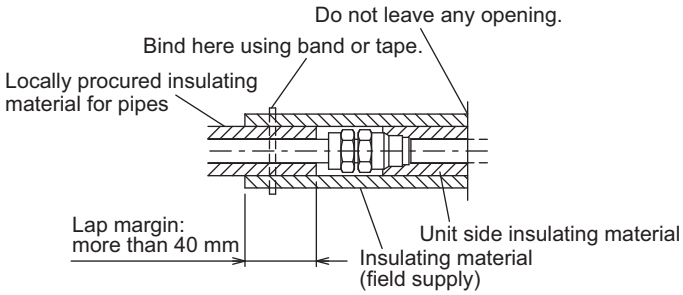
HBC controller sample installation (*1)

*1. Connect the pipes to the water pipes according to the local regulations.

- The HBC controller system must be serviced at least once a year.

2. Water pipe insulation

1. Connect the water pipes of each indoor unit to the same (correct) end connection numbers as indicated on the indoor unit connection section of each HBC controller. If connected to wrong end connection numbers, there will be no normal operation.
2. List indoor unit model names in the name plate on the HBC controller control box (for identification purposes), and HBC controller end connection numbers and address numbers in the name plate on the indoor unit side.
   Seal unused end connections using cover caps (field supply, dezincification resistant brass (DZR) or bronze only). Not replacing the rubber end caps will lead to water leakage.
3. Be sure to add insulation work to water piping by covering water pipework separately with enough thickness heat-resistant polyethylene, so that no gap is observed in the joint between indoor unit and insulating material, and insulating materials themselves. When insulation work is insufficient, there is a possibility of condensation, etc. Pay special attention to insulation work in the ceiling plenum.



- Insulation materials for the pipes to be added on site must meet the following specifications:

HBC – indoor unit	20 mm or more
Main-HBC – Sub-HBC	20 mm or more

- This specification is based on copper for water piping. When using plastic pipework, choose a thickness based on the plastic pipe performance.
- Installation of pipes in a high-temperature high-humidity environment, such as the top floor of a building, may require the use of insulation materials thicker than the ones specified in the chart above.
- When certain specifications presented by the client must be met, ensure that they also meet the specifications on the chart above.

4. Expansion vessel

- Install an expansion tank to accommodate expanded water.

Expansion vessel selection criteria:

Water containment volume of the HBC controller

- Refer to the relevant indoor unit specifications for information on the water volume.

(Unit: L)

Unit model	Water volume
CMB-WM108V-AA	10
CMB-WM1016V-AA	13
CMB-WM108V-BB	5
CMB-WM1016V-BB	9

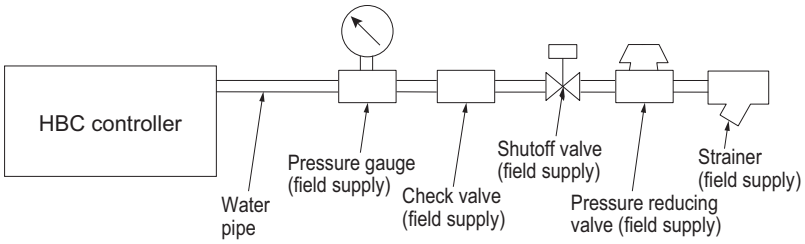
- The maximum water temperature is 60°C.
- The minimum water temperature is 5°C.
- The circuit protection valve set pressure is 370-490 kPa.
- The circulation pump head pressure is 0.24 MPa.

5. Leakproof the water pipework, valves and drain pipework. Leakproof all the way to, and include pipe ends so that condensation cannot enter the insulated pipework.
6. Apply caulking around the ends of the insulation to prevent condensation getting between the pipework and insulation.
7. Add a drain valve so that the unit and pipework can be drained.
8. Ensure there are no gaps in the pipework insulation. Insulate the pipework right up to the unit.
9. Ensure that the gradient of the drain pan pipework is such that discharge can only flow out.
10. HBC controller water pipe connection sizes and pipe sizes.

Total down-stream indoor unit capacity	Connection size		Pipe size	
	Water inlet	Water outlet	Water out	Water return
W/WP/WL10–50	O.D. 22 mm	O.D. 22 mm	I.D. ≥ 20 mm	I.D. ≥ 20 mm
W/WP/WL51–125			I.D. ≥ 30 mm	I.D. ≥ 30 mm

* For other indoor units, refer to the indoor unit's DATA BOOK.
* The pipe diameter depends on the capacity of indoor units.
Refer to the indoor unit's DATA BOOK for details.

11. Please refer to the figure below when connecting the water supply.



12. Use formula 0.1 ≤ 0.01 + 0.01 × A ≤ 0.16 for the supply pressure range to be used.
(A: Height difference (m) between the HBC controller and the highest indoor unit)
If the supply pressure is greater than 0.16 MPa, use a pressure reducing valve to keep the pressure within the range.
If the head pressure is unknown, set it to 0.16 MPa.
13. Install a shut off valve and strainer in a place that is easy to operate and makes maintenance work easy.
14. Apply insulation to the indoor unit pipework, strainer, shut off valve, and pressure reducing valve.
15. Please do not use a corrosion inhibitor in the water system.
16. When installing the HBC controller in an environment which may drop below 0°C, please add antifreeze (Propylene Glycol only) to the circulating water. For the brine selection, refer to 3-4. Correction by antifreeze solution concentration.

3. Water treatment and quality control

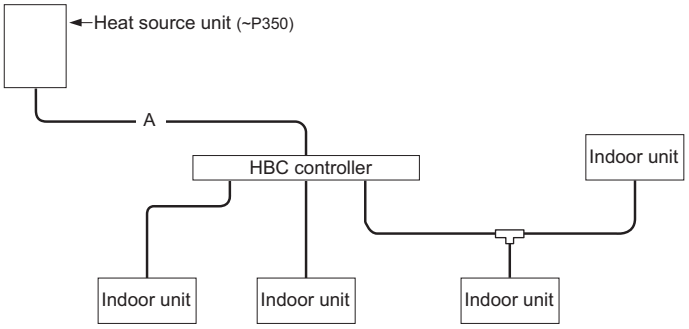
To preserve water quality, use the closed type of water circuit. When the circulating water quality is poor, the water heat exchanger can develop scale, leading to a reduction in heat-exchange power and possible corrosion. Pay careful attention to water processing and water quality control when installing the water circulation system.

♦Removing of foreign objects or impurities within the pipes.
During installation, make sure that foreign objects, such as welding fragments, sealant particles, or rust, do not enter the pipes.

♦Water Quality Processing
Depending on the quality of the cold-temperature water used in the air-conditioner, the copper piping of the heat exchanger may corrode. Regular water quality processing is recommended. If a water supply tank is installed, keep air contact to a minimum, and keep the level of dissolved oxygen in the water no higher than 1 mg/ℓ.

7-3. Refrigerant charging calculation

Example

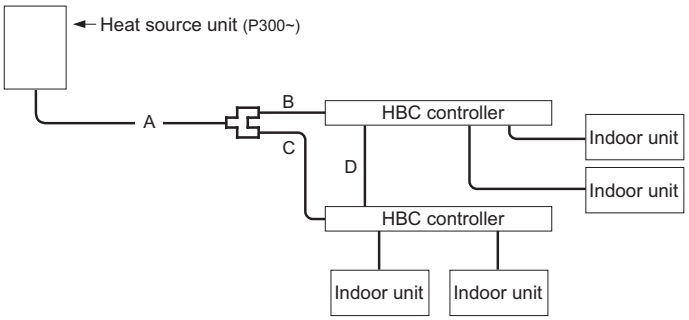


■ Sample calculation

Indoor 1: 50 A: ø19.05 42 m
2: 50
3: 50
4: 40
Heat source P250

The total length of each liquid line is as follows:
ø19.05: A = 42 m, α1 = 3.0

Therefore,
Additional refrigerant charge
= 42 × 0.14 + 3.0
= 8.88 kg
≒ 8.9 kg
* All pipe work except A is water pipe work.



Indoor 1: 50 A:ø22.20 18 m
2: 50 B:ø15.88 5 m
3: 50 C:ø15.88 10 m
4: 50 D:ø15.88 8 m
Heat source P400

The total length of each liquid line is as follows:
ø22.20: A = 18 m, ø15.88: B + C = 15 m, α1 = 3.0 × 2
Pipe between HBC controller and HBC controller: D = 8 m

Therefore,
Additional refrigerant charge
= 18 × 0.23 + (5 + 10) × 0.11 + 3.0 × 2 + 8 × 0.2
= 13.39 kg
≒ 13.4 kg
* All pipe work except A, B, C, D is water pipe work.

<Amount of refrigerant to be added>

The amount of refrigerant that is shown in the table below is factory-charged to the heat source units.
The amount necessary for extended pipe (field piping) is not included and must be added on site.

Heat source unit model	Amount of pre-charged refrigerant in the heat source unit (kg)	Heat source unit model	Amount of pre-charged refrigerant in the heat source unit (kg)
P200YLM	5.0	P400YLM	6.0
P250YLM	5.0	P450YLM	6.0
P300YLM	5.0	P500YLM	6.0
P350YLM	6.0		

■ Calculation formula

The amount of refrigerant to be added depends on the size and the length of field piping. (unit in m [ft])

1) When the distance between HBC controller and heat source unit is longer than 30.5m:
Amount of added refrigerant (kg) = $(0.21 \times L_1) + (0.14 \times L_2) + (0.1 \times L_3) + \alpha_1 (+ 0.18 \times L_4)$ *1
2) When the distance between HBC controller and heat source unit is 30.5 m or shorter:
Amount of added refrigerant (kg) = $(0.23 \times L_1) + (0.16 \times L_2) + (0.11 \times L_3) + \alpha_1 (+ 0.2 \times L_4)$ *1

L_1 : Length of ø22.20 [7/8"] high pressure pipe (m)
L_2 : Length of ø19.05 [3/4"] high pressure pipe (m)
L_3 : Length of ø15.88 [5/8"] high pressure pipe (m)
L_4 : Length of ø15.88 [5/8"] pipe between HBC controller and HBC controller (m)
α_1: Refer to the table below.
*1 Only when two main HBC controllers are used

Use of one HBC controller

Heat source unit index	Diameter of high-pressure pipe
P200	ø15.88
P250	ø19.05
P300	ø19.05
P350	ø19.05

Amount for the HBC controller
α1 (kg)
3.0

Round up the calculation result to the nearest 0.1 kg. (Example: 18.04 kg to 18.1 kg)

Use of two HBC controllers

Heat source unit index	Diameter of high-pressure pipe
P300	ø19.05
P350	ø19.05
P400	ø22.20
P450	ø22.20
P500	ø22.20

Amount for the HBC controller
α1 (kg)
3.0

× 2

Refrigerant pipe between main HBC controller and main HBC controller
ø15.88 [5/8]

* When connecting PEFY-W50/63/71/80/100/125VMA2-A units, add 0.25 kg of refrigerant for each of these units.

7-4. Water piping

7-4-1. Precautions for water piping

Consider the following when installing a water piping system.

1. Design pressure of the water piping
   Use a water pipe that is strong enough to withstand the design pressure (1.0 MPa).
2. Water pipe type
   Use of plastic pipe is recommended.
   When using copper pipes, be sure to braze the pipes under a nitrogen purge. (Oxidation during may shorten the life of the pump.)
3. Expansion vessel
   Install an expansion vessel to accommodate expanded water.
4. Drain piping
   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.
5. Insulation
   Cover the water pipe with insulating materials with the specified thickness or more to prevent thermal loss or condensation from collecting.
6. Air vent valve
   Install air vent valves to the highest places where air can accumulate.
7. Maintenance valve
   It is recommended to install valves on the inlet/outlet for each HBC controller branch for maintenance.
8. Water pressure gauge
   Install a water pressure gauge to check the charged pressure.

7-4-2. Notes on corrosion

1. Water quality
   It is important to check the water quality beforehand. See table below (Circulating water/Makeup Water Quality Standards).

Items		Lower mid-range temperature water system		Tendency	
		Recirculating water [20<T<60°C] [68<T<140°F]	Make-up water	Corrosive	Scale-forming
Standard items	pH (25°C[77°F])	7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Electric conductivity (mS/m) (25°C[77°F]) (μS/cm) (25°C[77°F])	30 or less [300 or less]	30 or less [300 or less]	○	○
	Chloride ion (mg Cl^-/ ℓ)	50 or less	50 or less	○	
	Sulfate ion (mg SO_4^{2-}/ ℓ)	50 or less	50 or less	○	
	Acid consumption (pH4.8) (mg $CaCO_3$/ ℓ)	50 or less	50 or less		○
	Total hardness (mg $CaCO_3$/ ℓ)	70 or less	70 or less		○
	Calcium hardness (mg $CaCO_3$/ ℓ)	50 or less	50 or less		○
	Ionic silica (mg SiO_2/ ℓ)	30 or less	30 or less		○
Reference items	Iron (mg Fe/ ℓ)	1.0 or less	0.3 or less	○	○
	Copper (mg Cu/ ℓ)	1.0 or less	0.1 or less	○	
	Sulfide ion (mg S^{2-}/ ℓ)	not to be detected	not to be detected	○	
	Ammonium ion (mg NH_4^+/ ℓ)	0.3 or less	0.1 or less	○	
	Residual chlorine (mg Cl/ ℓ)	0.25 or less	0.3 or less	○	
	Free carbon dioxide (mg CO_2/ ℓ)	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)

2. Debris in the water
   Sand, pebbles, suspended solids, and corrosion products in water can damage the metal pipe and heat exchanger on the HBC controller and may cause corrosion. When installing, prevent debris from entering the water. If there is debris in the water, perform debris removal operation after test run by cleaning the strainers inside the HBC controller.
3. Connecting pipes made of different materials
   Connecting pipes used for HBC controller and indoor unit are copper alloy pipes. If steel pipes are connected to the pipes, the contact surface will corrode. Do not use steel pipes to avoid corrosion.
4. Residual air
   Residual air in the pipe results in water pump malfunction, noise, or water pipe corrosion in the water circuit. Ensure air is purged before use.

7-5. Compatibility

<Horizontal type Main HBC connection>

Outdoor/Heat source unit	Main 1	Sub 1	Main 2	Sub 2	Compatibility
PURY(E)P-YNW PQRY-P-YLM	WM-V-AA type	–	–	–	Compatible
	WP type	–	–	–	Compatible
	WM-V-AA type	WM-V-BB type	–	–	Compatible
	WM-V-AA type	WM-V-AB type	–	–	Compatible
	WM-V-AA type	WP type	–	–	Compatible
	WP type	WM-V-BB type	–	–	Compatible
	WP type	WM-V-AB type	–	–	Compatible
	WP type	WP type	–	–	Compatible
	WM-V-AA type	–	WM-V-AA type	–	Compatible
	WM-V-AA type	–	WP type	–	Compatible
	WP type	–	WM-V-AA type	–	Compatible
	WP type	–	WP type	–	Compatible
	WM-V-AA type	WM-V-BB type	WM-V-AA type	–	Compatible
	WM-V-AA type	WM-V-BB type	WP type		Compatible
	WM-V-AA type	WM-V-AB type	WM-V-AA type		Compatible
	WM-V-AA type	WM-V-AB type	WP type		Compatible
	WM-V-AA type	WP type	WM-V-AA type		Compatible
	WM-V-AA type	WP type	WP type		Compatible
	WP type	WM-V-BB type	WM-V-AA type		Compatible
	WP type	WM-V-BB type	WP type		Compatible
	WP type	WM-V-AB type	WM-V-AA type		Compatible
	WP type	WM-V-AB type	WP type		Compatible
	WP type	WP type	WM-V-AA type		Compatible
	WP type	WP type	WP type		Compatible
	WM-V-AA type	–	WM-V-AA type	WM-V-BB type	Compatible
	WM-V-AA type	–	WM-V-AA type	WM-V-AB type	Compatible
	WM-V-AA type	–	WM-V-AA type	WP type	Compatible
	WM-V-AA type	–	WP type	WM-V-BB type	Compatible
	WM-V-AA type	–	WP type	WM-V-AB type	Compatible
	WM-V-AA type	–	WP type	WP type	Compatible
	WP type	–	WM-V-AA type	WM-V-BB type	Compatible
	WP type	–	WM-V-AA type	WM-V-AB type	Compatible
	WP type	–	WM-V-AA type	WP type	Compatible
	WP type	–	WP type	WM-V-BB type	Compatible
	WP type	–	WP type	WM-V-AB type	Compatible
	WP type	–	WP type	WP type	Compatible
	WM-V-AA type	WM-V-BB type	WM-V-AA type	WM-V-BB type	Compatible
	WM-V-AA type	WM-V-BB type	WM-V-AA type	WM-V-AB type	Compatible
	WM-V-AA type	WM-V-BB type	WM-V-AA type	WP type	Compatible
	WM-V-AA type	WM-V-BB type	WP type	WM-V-BB type	Compatible
	WM-V-AA type	WM-V-BB type	WP type	WM-V-AB type	Compatible
	WM-V-AA type	WM-V-BB type	WP type	WP type	Compatible
	WM-V-AA type	WM-V-AB type	WM-V-AA type	WM-V-BB type	Compatible
	WM-V-AA type	WM-V-AB type	WM-V-AA type	WM-V-AB type	Compatible
	WM-V-AA type	WM-V-AB type	WM-V-AA type	WP type	Compatible
	WM-V-AA type	WM-V-AB type	WP type	WM-V-BB type	Compatible
	WM-V-AA type	WM-V-AB type	WP type	WM-V-AB type	Compatible
	WM-V-AA type	WM-V-AB type	WP type	WP type	Compatible
	WM-V-AA type	WP type	WM-V-AA type	WM-V-BB type	Compatible
	WM-V-AA type	WP type	WM-V-AA type	WM-V-AB type	Compatible
	WM-V-AA type	WP type	WM-V-AA type	WP type	Compatible
	WM-V-AA type	WP type	WP type	WM-V-BB type	Compatible
	WM-V-AA type	WP type	WP type	WM-V-AB type	Compatible
	WM-V-AA type	WP type	WP type	WP type	Compatible
	WP type	WM-V-BB type	WM-V-AA type	WM-V-BB type	Compatible
	WP type	WM-V-BB type	WM-V-AA type	WM-V-AB type	Compatible
	WP type	WM-V-BB type	WM-V-AA type	WP type	Compatible
	WP type	WM-V-BB type	WP type	WM-V-BB type	Compatible
	WP type	WM-V-BB type	WP type	WM-V-AB type	Compatible
	WP type	WM-V-BB type	WP type	WP type	Compatible
	WP type	WM-V-AB type	WM-V-AA type	WM-V-BB type	Compatible
	WP type	WM-V-AB type	WM-V-AA type	WM-V-AB type	Compatible
	WP type	WM-V-AB type	WM-V-AA type	WP type	Compatible
	WP type	WM-V-AB type	WP type	WM-V-BB type	Compatible
	WP type	WM-V-AB type	WP type	WM-V-AB type	Compatible
	WP type	WM-V-AB type	WP type	WP type	Compatible
	WP type	WP type	WM-V-AA type	WM-V-BB type	Compatible
	WP type	WP type	WM-V-AA type	WM-V-AB type	Compatible
	WP type	WP type	WM-V-AA type	WP type	Compatible
	WP type	WP type	WP type	WM-V-BB type	Compatible
	WP type	WP type	WP type	WM-V-AB type	Compatible
	WP type	WP type	WP type	WP type	Compatible

<Vertical type Main HBC connection>

Outdoor/Heat source unit	Main 1	Sub 1	Sub 2	Sub 3	Compatibility
PURY(E)P-YNW PQRY-P-YLM	WM-F-AA type	–	–	–	Not compatible
	WM-F-AA type	WM-V-BB type	–	–	Not compatible
	WM-F-AA type	WM-V-AB type	–	–	Not compatible
	WM-F-AA type	WP type	–	–	Not compatible
	WM-F-AA type	WM-V-BB type	WM-V-BB type	–	Not compatible
	WM-F-AA type	WM-V-BB type	WM-V-AB type	–	Not compatible
	WM-F-AA type	WM-V-BB type	WP type	–	Not compatible
	WM-F-AA type	WM-V-AB type	WM-V-BB type	–	Not compatible
	WM-F-AA type	WM-V-AB type	WM-V-AB type	–	Not compatible
	WM-F-AA type	WM-V-AB type	WP type	–	Not compatible
	WM-F-AA type	WP type	WM-V-BB type	–	Not compatible
	WM-F-AA type	WP type	WM-V-AB type	–	Not compatible
	WM-F-AA type	WP type	WP type	–	Not compatible
	WM-F-AA type	WM-V-BB type	WM-V-BB type	WM-V-BB type	Not compatible
	WM-F-AA type	WM-V-BB type	WM-V-BB type	WM-V-AB type	Not compatible
	WM-F-AA type	WM-V-BB type	WM-V-BB type	WP type	Not compatible
	WM-F-AA type	WM-V-BB type	WM-V-AB type	WM-V-BB type	Not compatible
	WM-F-AA type	WM-V-BB type	WM-V-AB type	WM-V-AB type	Not compatible
	WM-F-AA type	WM-V-BB type	WM-V-AB type	WP type	Not compatible
	WM-F-AA type	WM-V-BB type	WP type	WM-V-BB type	Not compatible
	WM-F-AA type	WM-V-BB type	WP type	WM-V-AB type	Not compatible
	WM-F-AA type	WM-V-BB type	WP type	WP type	Not compatible
	WM-F-AA type	WM-V-AB type	WM-V-BB type	WM-V-BB type	Not compatible
	WM-F-AA type	WM-V-AB type	WM-V-BB type	WM-V-AB type	Not compatible
	WM-F-AA type	WM-V-AB type	WM-V-BB type	WP type	Not compatible
	WM-F-AA type	WM-V-AB type	WM-V-AB type	WM-V-BB type	Not compatible
	WM-F-AA type	WM-V-AB type	WM-V-AB type	WM-V-AB type	Not compatible
	WM-F-AA type	WM-V-AB type	WM-V-AB type	WP type	Not compatible
	WM-F-AA type	WM-V-AB type	WP type	WM-V-BB type	Not compatible
	WM-F-AA type	WM-V-AB type	WP type	WM-V-AB type	Not compatible
	WM-F-AA type	WM-V-AB type	WP type	WP type	Not compatible
	WM-F-AA type	WP type	WM-V-BB type	WM-V-BB type	Not compatible
	WM-F-AA type	WP type	WM-V-BB type	WM-V-AB type	Not compatible
	WM-F-AA type	WP type	WM-V-BB type	WP type	Not compatible
	WM-F-AA type	WP type	WM-V-AB type	WM-V-BB type	Not compatible
	WM-F-AA type	WP type	WM-V-AB type	WM-V-AB type	Not compatible
	WM-F-AA type	WP type	WM-V-AB type	WP type	Not compatible
	WM-F-AA type	WP type	WP type	WM-V-BB type	Not compatible
	WM-F-AA type	WP type	WP type	WM-V-AB type	Not compatible
	WM-F-AA type	WP type	WP type	WP type	Not compatible

CONTENTS

Installation information

* Refer to the enclosed Installation Manual for details on installation. Arrange to have an expert install the system correctly.

1-1. General precautions

1-1-1. Usage

- The air-conditioning system described in this DATA BOOK is designed for human comfort.
- This product is not designed to assist in the preservation of food, provide conditions to maintain plants or animals, or stabilize environments for the preservation of precision equipment or art objects. To prevent loss of quality, do not use the product for purposes other than those it is designed for.
- To reduce the risk of water leakage and electric shock, do not use the product for air-conditioning vehicles or vessels.

1-1-2. Installation environment

- Do not install any unit other than the dedicated unit in an area where the voltage changes significantly, large amounts of mineral oil (e.g., cutting oil) are present, cooking oil may splash, or a large quantity of steam can be generated, such as a kitchen.
- Do not install the unit in acidic or alkaline environments.
- Installation should not be performed in locations exposed to chlorine or other corrosive gases. Avoid installation near sewers.
- To reduce the risk of fire, do not install the unit in an area where flammable gas may leak or flammable material is present.
- This air-conditioning unit has a built-in microcomputer. The effects of noise should be taken into consideration when deciding on the installation position. It is recommended that the air-conditioning unit be installed in a position away from antennas or electronic devices.
- Install the unit on a solid foundation in accordance with local safety measures against typhoons, wind gusts, and earthquakes to prevent the unit from being damaged, toppling over, or falling.

1-1-3. Backup system

- In regions in which the malfunctioning of the air conditioner may have a critical effect, it is recommended to have two or more systems made up of single outdoor/heat source units and multiple indoor units.

1-1-4. Unit characteristics

- The heat pump efficiency of the outdoor unit depends on the outdoor temperature. In heating mode, performance drops as the outside air temperature drops. In cold climates, performance can be poor. Warm air will continue to be trapped near the ceiling and the floor level will remain cold. In such cases, heat pumps require a supplemental heating system or air circulator. Before purchasing, consult your local distributor for assistance in selecting the unit and system.
- When the outdoor temperature is low and the humidity is high, the heat exchanger on the outdoor/heat source unit side tends to collect frost, which reduces its heating performance. The Auto-defrost function will be activated in order to remove the frost, and the heating mode will temporarily stop for 3-10 minutes. Heating mode will automatically resume upon completion of the defrost process.
- An air conditioner with a heat pump requires time to warm up the whole room after the heating operation begins, because the system circulates warm air in order to warm up the whole room.
- Sound levels were obtained in an anechoic room. Sound levels during actual operation are usually higher than the simulated values due to ambient noise and echoes. Refer to the section on "SOUND LEVELS" in the DATA BOOK for the measurement location.
- Depending on the operating conditions, the unit generates noise caused by valve actuation, refrigerant flow, and pressure changes even when operating normally. Try to avoid positioning the air conditioner in locations where quietness is required. With regard to the BC/HBC controller, it is recommended that the unit be installed in areas such as corridor ceilings, restrooms and plant rooms.
- The total capacity of the connected indoor units can be greater than the capacity of the outdoor/heat source unit. However, when the connected indoor units operate simultaneously, each unit's capacity may become smaller than the rated capacity.
- When the unit is started up for the first time within 12 hours after the power comes on, i.e. after a power failure, it performs initial startup operation (capacity control operation) to prevent damage to the compressor. The initial startup operation requires a maximum of 90 minutes to complete, depending on the operating load.

1-1-5. Related equipment

- Use an earth leakage breaker (ELB) with medium sensitivity, and an activation speed of 0.1 second or less.
- Consult your local distributor or a qualified technician when installing an earth leakage breaker.
- If the unit is an inverter type, select an earth leakage breaker able to respond to high harmonic waves and surges.
- Leakage current is generated not only through the air-conditioning unit but also through the power wires. The leakage current of the main power supply is therefore greater than the total leakage current of each unit. Take the capacity of the earth leakage breaker or leakage alarm into consideration when installing one at the main power supply. To measure the leakage current simply on site, use a measurement tool equipped with a filter, and clamp all the four power wires together. The leakage current measured on the ground wire may not be accurate because the leakage current from other systems may be included in the measurement value.
- Do not install a phase-advancing capacitor on a unit connected to the same power system as an inverter-type unit and its related equipment.
- If a large current flows due to the malfunctioning of the product or faulty wiring, both the earth leakage breaker on the product side and the upstream overcurrent breaker may trip almost at the same time. Separate the power system or coordinate all the breakers depending on the system's priority level.

1-1-6. Unit installation

- Your local distributor or a qualified technician must read the Installation Manual that is provided with each unit carefully before performing installation work.
- Consult your local distributor or a qualified technician when installing the unit. Improper installation by an unqualified person may result in water leakage, electric shock, or fire.
- Ensure that there is enough space around each unit.

1-1-7. Optional accessories

- Only use accessories recommended by Mitsubishi Electric. Consult your local distributor or a qualified technician when installing them. Improper installation by an unqualified person may result in water leakage, power leakage, system breakdown, or fire.
- Some optional accessories may not be compatible for use with the air-conditioning unit or may not be suitable for the installation conditions. Check the compatibility when considering any accessories.
- Note that some optional accessories may affect the air conditioner's external form, appearance, weight, operating sound, and other characteristics.

1-1-8. Operation/Maintenance

- Read the Instruction Book that is provided with each unit carefully prior to use.
- Maintenance or cleaning of each unit may be risky and require expertise. Read the Instruction Book to ensure safety. Consult your local distributor or a qualified technician when special expertise is required, such as when the indoor unit needs to be cleaned.

1-2. Precautions for Indoor unit, Hydro unit, and HBC controller

1-2-1. Operating environment

- If the refrigerant leaks, the oxygen level may drop to harmful levels. If the air conditioner is installed in a small room, measures must be taken to prevent the refrigerant concentration from exceeding the safety limit even if the refrigerant leaks.
- If the units operate in cooling mode at a humidity above 80%, condensation may collect and drip from the indoor units.
- Regular checking and cleaning of the drain drainage paths, such as the drain pan or the drain pump, is recommended to prevent clogging. The neglect of a clogged drain pump may trigger the water-leakage protection function which stops operation of the entire system.

1-2-2. Unit characteristics

- The return air temperature display on the remote controller may differ from the displays on the other thermometers.
- The clock on the remote controller may be displayed with a time lag of approximately one minute every month.
- The temperature measured by the built-in temperature sensor on the remote controller may differ from the actual room temperature due to the effect of the wall temperature.
- Use the built-in thermostat on the remote controller or a separately-sold thermostat when indoor units installed on or in the ceiling operate the automatic cooling/heating switchover.
- The room temperature may rise drastically due to Thermo OFF in areas where the air-conditioning load is large, such as computer rooms.
- Be sure to use a regular filter. If an irregular filter is installed, the unit may not operate properly, and operating noise may increase.
- The room temperature may increase above the preset temperature in environments in which the heating or airconditioning load is small.

1-2-3. Unit installation

- The insulation for the gas pipe between the hydro unit and the outdoor unit or the insulation for the low-pressure pipe between the HBC controller and the outdoor/heat source unit must be at least 20 mm thick. If the unit is installed on the top floor or in a high-temperature, high-humidity environment, thicker insulation may be necessary.
- Do not have any branching points on the downstream of the refrigerant pipe header.
- When a field-supplied external thermistor is installed or when a device for demand control is used, the unit may stop abnormally or damage may occur to the electromagnetic contactor. Consult your local distributor for details.
- Do not install the unit above the cooking or food processing area.

1-2-4. Noise level (Sound pressure level)

- The sound pressure level is a value measured in an anechoic room in accordance with the conventional method in JIS standard. The sound pressure level actually measured at the installation site is usually higher than the value indicated in this DATA BOOK due to the influence of ambient noise and echoes.

1-3. Precautions for outdoor unit/heat source unit

1-3-1. Installation environment

- The outdoor unit with the salt-resistant specification is recommended for use in an area in which it will be exposed to salt air.
- Even when the unit with the salt-resistant specification is used, it is not completely protected against corrosion. Be sure to follow the directions or precautions described in the Instruction Book and Installation Manual for installation and maintenance. The salt-resistant specification is referred to in the guidelines published by JRAIA (JRA9002).
- Install the unit in an area where the flow of discharge air is not obstructed. If the flow of discharge air is obstructed, short-cycling of discharge air may occur.
- Provide proper drainage around the base of the units; condensation may collect and drip from outdoor units. Provide water-proofing protection to the floor when installing the unit on the rooftop.
- In regions where snowfall can be expected, install the unit so that the outlet faces away from the direction of the wind, and install a snow guard to protect the unit from snow. Install the unit on a base approximately 50 cm higher than the expected snowfall. Close the openings for pipes and wiring, because the ingress of water and small animals may cause equipment damage. If a SUS snow guard is used, refer to the Installation Manual that comes with the snow guard and be careful with the installation to avoid the risk of corrosion.
- When the unit is expected to operate continuously for a long period of time at outside air temperatures of below 0ºC, take appropriate measures, such as the use of a unit base heater, to prevent ice forming on the unit base.
- Install the snow guard so that the outlet/inlet faces away from the direction of the wind.
- When approximately 50 cm or more of snow accumulates on the snow guard, remove the snow from the guard. Install a roof that is strong enough to withstand loads caused by snow in areas where snow accumulates.
- Provide proper protection around the outdoor units in places such as schools to avoid the risk of injury.
- A cooling tower and heat source water circuit should be a closed circuit so that water is not exposed to the atmosphere. When a tank is installed to ensure that the circuit has enough water, minimize the contact with outside air to ensure that the oxygen dissolved in the water is 1 mg/L or less.
- Install a strainer (50 mesh or more recommended) on the water pipe inlet on the heat source unit.
- Interlock the heat source unit and water circuit pump.
- Note the following to prevent the freezing and bursting of pipes when the heat source unit is installed in an area where the ambient temperature can be 0ºC or below.
  - Keep the water circulating to prevent it from freezing when the ambient temperature is 0ºC or below.
  - Before a long period of non-use, be sure to purge the water from the unit.
- The salt-resistant unit is resistant to salt corrosion, but not salt-proof.

Please note the following when installing and maintaining outdoor units in a marine environment.

1. Install the salt-resistant unit in an area in which it is not directly exposed to sea breezes, and minimize exposure to salt water mist.
2. Avoid installing a sun shade over the outdoor unit, so that rain will wash away salt deposits off the unit.
3. Install the unit horizontally to ensure proper water drainage from the base of the unit. Accumulation of water in the base of the outdoor unit will significantly accelerate corrosion.
4. Periodically wash salt deposits off the unit, especially when the unit is installed in a coastal area.
5. Repair all noticeable scratches after installation and during maintenance.
6. Periodically check the unit, and apply an anti-rust agent and replace corroded parts as necessary.

1-3-2. Circulating water

- Regularly check the quality of the water in the heat source unit, following the guidelines published by JRAIA (JRA-GL02-1994).
- A cooling tower and heat source water circuit should be a closed circuit so that water is not exposed to the atmosphere. When a tank is installed to ensure that the circuit has enough water, minimize the contact with outside air to ensure that the oxygen dissolved in the water is 1 mg/L or less.

1-3-3. Unit characteristics

- When the Thermo ON and OFF is frequently repeated on the indoor unit, the operating status of outdoor/heat source units may become unstable.

1-3-4. Related equipment

- Provide grounding in accordance with the local regulations.

1-3-5. Noise level (Sound pressure level)

- The sound pressure level is a value measured in an anechoic room in accordance with the conventional method in JIS standard. The sound pressure level actually measured at the installation site is usually higher than the value indicated in this DATA BOOK due to the influence of ambient noise and echoes.
  Valve operation noise and refrigerant flow noise may occur from inside the outdoor unit/heat-source unit.

1-4. Precautions for control-related items

1-4-1. Product specification

- To introduce the MELANS system, a consultation with us is required in advance. Especially to introduce the electricity charge-apportioning function or energy save function, further detailed consultation is required. Consult your local distributor for details.
- Billing calculation for AE-200E/AE-50E/EW-50E, or the billing calculation unit is unique and based on our original method. (Backup operation is included.) It is not based on the metering method, and do not use it for official business purposes. It is not the method that the amount of electric power consumption (input) by air conditioner is calculated. Note that the electric power consumption by air conditioner is apportioned by using the ratio corresponding to the operation status (output) for each air conditioner (indoor unit) in this method.
- In the apportioned billing function for AE-200E/AE-50E and EW-50E, separate watt-hour meters should be used for A-control units, K-control units, and CITY MULTI packaged air conditioners. It is recommended that an individual watt-hour meter should be used for large-capacity indoor units (with two or more addresses).
- When using the peak cut function on the AE-200E/AE-50E or EW-50E, note that the control is performed once every minute and it takes time to obtain the effect of the control. Take appropriate measures such as lowering the criterion value. Power consumption may exceed the limits if the AE-200E/AE-50E or EW-50E malfunctions or stops. Provide a back-up remedy as necessary.
- The controllers cannot operate while the indoor unit is OFF. (No error)
  Turn ON the power to the indoor unit when operating the controllers.
- When using the interlocked control function on the AE-200E/AE-50E/EW-50E/PAC-YG66DCA or PAC-YG63MCA, do not use the control for fire prevention or security. (This function should never be used in a way that would put people's lives at risk.) Employ any methods or circuits that allow ON/OFF operation using an external switch in case of failure.

1-4-2. Installation environment

- Surge protection may be required for the transmission line in areas where lightning strikes occur frequently.
- The receiver for a wireless remote controller may not work properly due to the effect of general lighting. Leave a space of at least 1 m between the general lighting and the receiver.
- When the auto-elevating panel is used and the system is operated using a wired remote controller, install the wired remote controller in a place where all the air conditioners being controlled (at least the bottom part of them) can be seen from the wired remote controller. If not, the descending panel may cause damage or injury; be sure to use a wireless remote controller designed for use with the elevating panel (sold separately).
- Install the wired remote controller (switch box) in a place where the following conditions are met.
  - Where the installation surface is flat
  - Where the remote controller can detect an accurate room temperature
    The temperature sensors that detect the room temperature are installed both in the remote controller and in the indoor unit.
    When the room temperature is detected using the sensor in the remote controller, the main remote controller is used to detect the room temperature. In this case, follow the instructions below.
    - Install the controller in a place where it is not affected by a heat source.
      (If the remote controller faces direct sunlight or the direction of the supply air flow, the remote controller cannot detect the accurate room temperature.)
    - Install the controller in a place where the average room temperature can be detected.
    - Install the controller in a place where no other wires are present around the temperature sensor.
      (If other wires are present, the remote controller cannot detect an accurate room temperature.)
- To prevent unauthorized access, always use a security device such as a VPN router when connecting the AE-200E/AE-50E or EW-50E to the Internet.

Caution for refrigerant leakage for R410A

The installer and/or air conditioning system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
The following standard may be applicable if no local regulation or standard is available.

1-1. Refrigerant property

R410A refrigerant is harmless and incombustible. The R410A is heavier than the indoor air in density. Leakage of the refrigerant in a room has possibility to lead to a hypoxia situation. Therefore, the critical concentration specified below shall not be exceeded even if the leakage happens.

• Critical concentration

Critical concentration hereby is the refrigerant concentration in which no human body would be hurt if immediate measures can be taken when refrigerant leakage happens.

Critical concentration of R410A: 0.44kg/m^3
(The weight of refrigeration gas per 1 m^3 air conditioning space.);
* The Critical concentration is subject to ISO5149, EN378-1.

For the CITY MULTI system, the concentration of refrigerant leaked should not have a chance to exceed the critical concentration in any situation.

1-2. Confirm the Critical concentration and take countermeasure

The maximum refrigerant leakage concentration (Rmax) is defined as the result of the possible maximum refrigerant weight (Wmax) leaked into a room divided by its room capacity (V). It is referable to Fig.1-1. The refrigerant of Outdoor/Heat source unit here includes its original charge and additional charge at the site.
The additional charge is calculated according to the refrigerant charging calculation of each kind of Outdoor/Heat source unit, and shall not be over charged at the site. Procedure 1-2-1~3 tells how to confirm maximum refrigerant leakage concentration (Rmax) and how to take countermeasures against a possible leakage.

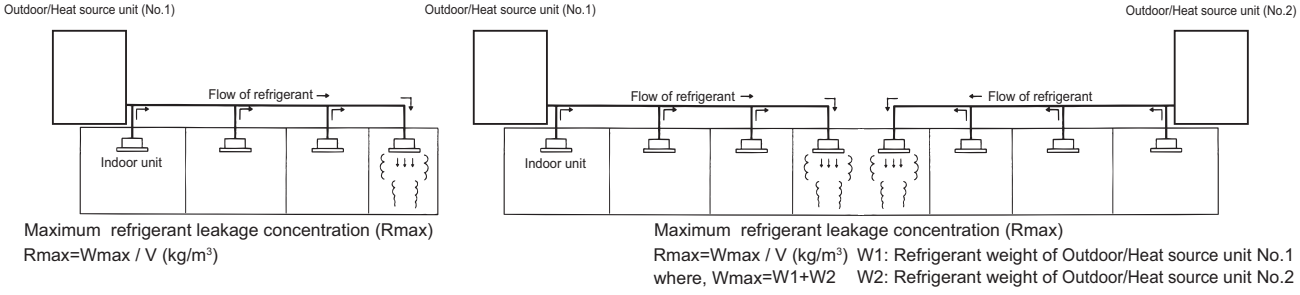


Fig. 1-1 The maximum refrigerant leakage concentration

1-2-1.Find the room capacity (V),
If a room having total opening area more than 0.15% of the floor area at a low position with another room/space, the two rooms/space are considered as one.The total space shall be added up.
1-2-2.Find the possible maximum leakage (Wmax) in the room.If a room has Indoor unit(s) from more than 1 Outdoor/Heat source unit, add up the refrigerant of the Outdoor/Heat source units.
1-2-3.Divide (Wmax) by (V) to get the maximum refrigerant leakage concentration (Rmax).
1-2-4.Find if there is any room in which the maximum refrigerant leakage concentration (Rmax) is over 0.44kg/m^3.
If no, then the CITY MULTI is safe against refrigerant leakage.
If yes, following countermeasure is recommended to do at site.
Countermeasure 1: Let-out (making V bigger)
Design an opening of more than 0.15% of the floor area at a low position of the wall to let out the refrigerant whenever leaked.
e.g.make the upper and lower seams of door big enough.
Countermeasure 2: Smaller total charge (making Wmax smaller)
e.g.Avoid connecting more than 1 Outdoor/Heat source unit to one room.
e.g.Using smaller model size but more Outdoor/Heat source units.
e.g.Shorten the refrigerant piping as much as possible.
Countermeasure 3: Fresh air in from the ceiling (Ventilation)
As the density of the refrigerant is bigger than that of the air. Fresh air supply from the ceiling is better than air exhausting from the ceiling.
Fresh air supply solution refers to Fig.1-2~4.

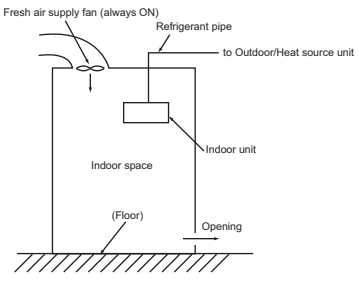


Fig.1-2.Fresh air supply always ON

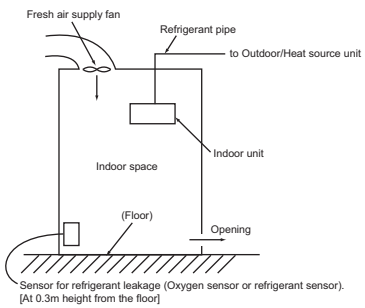


Fig.1-3.Fresh air supply upon sensor action

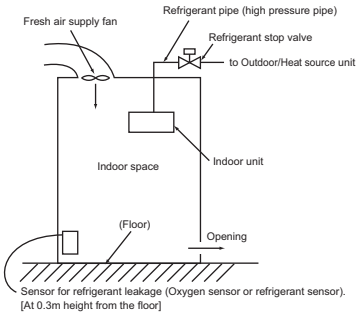


Fig.1-4.Fresh air supply and refrigerant shut-off upon sensor action

Note 1. Countermeasure 3 should be done in a proper way in which the fresh air supply shall be on whenever the leakage happens.
Note 2. In principle, MITSUBISHI ELECTRIC requires proper piping design, installation and air-tight testing after installation to avoid leakage happening.
In the area should earthquake happen, anti-vibration measures should be fully considered.
The piping should consider the extension due to the temperature variation.

⚠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, R410A.

MITSUBISHI ELECTRIC CORPORATION

www.MitsubishiElectric.com

MEES24K044

New publication effective July 2024
Specifications subject to change without notice