Mitsubishi Electric Sales Canada
Air Source Heat Pump Water Heater

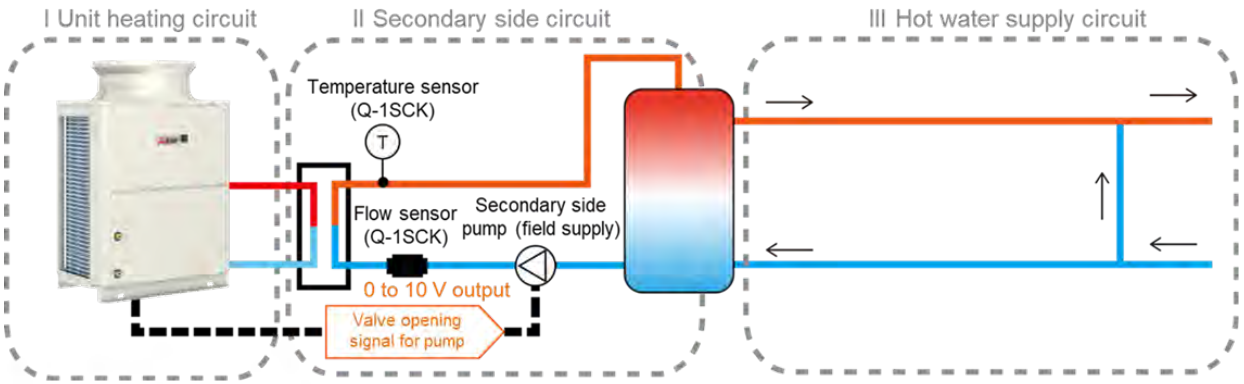
MITSUBISHI ELECTRIC
Changes for the Better

QAHV-N136TAU-HPB

CO_2 refrigerant

Capacity	136,480 Btu/h (40 kW)
Heating COP*1	4.11
Outlet water temperature range	115–176°F (46–80°C)
Heat source outdoor temperature range	-13–109°F (-25–43°C)
Refrigerant	CO_2 (R744)
External dimension (H x W x D)	70 x 48-1/16 x 29-15/16 in (1,777 x 1,220 x 760 mm)
Weight	895 lbs (406 kg)

*1 Under normal heating conditions at the outdoor temperature of 80.6°FDB/71.2°FWB (27.0°CDB/21.8°CWB), the outlet water temperature of 120°F (48.9°C), and the inlet water temperature of 70°F (21.1°C).



MITSUBISHI ELECTRIC
Changes for the Better

CITY MULTI
MULTIPLE SPLIT-TYPE VRF SYSTEMS

CO_2 – clean, green, natural refrigerant

Decarbonize your water without compromise.

- QAHV adopts CO_2 (R744) as a refrigerant, which does not destroy the ozone layer (ODP=0)
- By utilizing a natural CO_2 refrigerant that's environmentally friendly, QAHV has a GWP of 1. This helps contribute to the reduction of CO_2 emissions.

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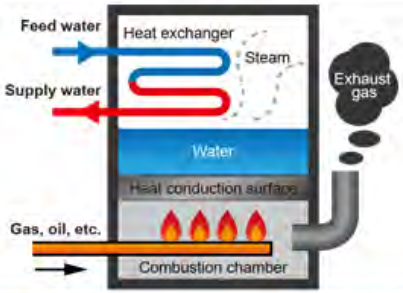
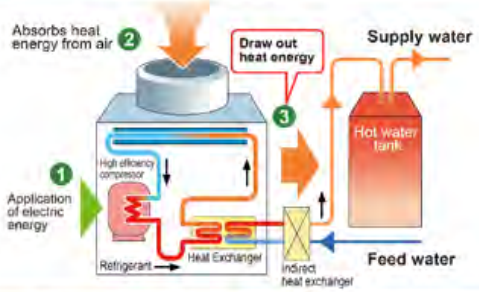
MULTIPLE SPLIT-TYPE VRF SYSTEMS

Typical Heater Type

	Boiler	Electric water heaters	Heat pump
			
Mechanism	**Makes hot water by burning gas and oil**	**Makes hot heater by directly heating the supply water in the hot water tank by energizing the heater**	**Makes hot water by using the heat absorbed from the atmosphere**
Safety	★★ Care must be taken for fire and exhaust.	★★★★★ Safe because only electricity is used and no fire is used.	★★★★★ Safe because only electricity is used and no fire is used.
Energy efficient	★★ Frequent starting and stopping of boilers due to fluctuations in the load result in an increase in fuel consumption.	★★ Uses a heater to heat, so the energy saving performance is not good.	★★★★★ Generates hot water using heat pump method, so about 3 to 4 times the input power can be obtained.
Maintenance	★★ Since combustion is involved, maintenance and inspection and assignment of managers are required.	★★★★★ Easy maintenance because the system uses electricity. The system can be monitored and operated remotely.	★★★★★ Easy maintenance because the system uses electricity. The system can be monitored and operated remotely.
Equipment cost	★★★★ Capacity of electrical equipment is small, and power receiving and transforming facility size can be reduced.	★★★★★ Easy installation and reduced initial cost.	★★ Requires a hot water storage tank and a large capacity electrical facility.
CO_2 emissions	★ CO_2 and NOx emissions are high due to the use of gases and oils.	★★ Although there is no emission of CO_2 or NOx at the installation site, it is inefficient.	★★★★★ Heat pumps enable efficient operation, reducing emissions of CO_2 and NOx.

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CITY MULTI
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QAHV-N136TAU-HPB

- **Multiple module combination (Up to 16 Units)**
- **High capacity per module**
- **Utilizes Natural refrigerant (CO_2)**
- **High efficiency (Achieved COP 4.11[*1])**
- **Supply high temperature hot water (Up to 176°F/80℃)**
- **Operable even at low outdoor temp of -13ºF/-25ºC[*2]**
- **BMS connection (Modbus)**

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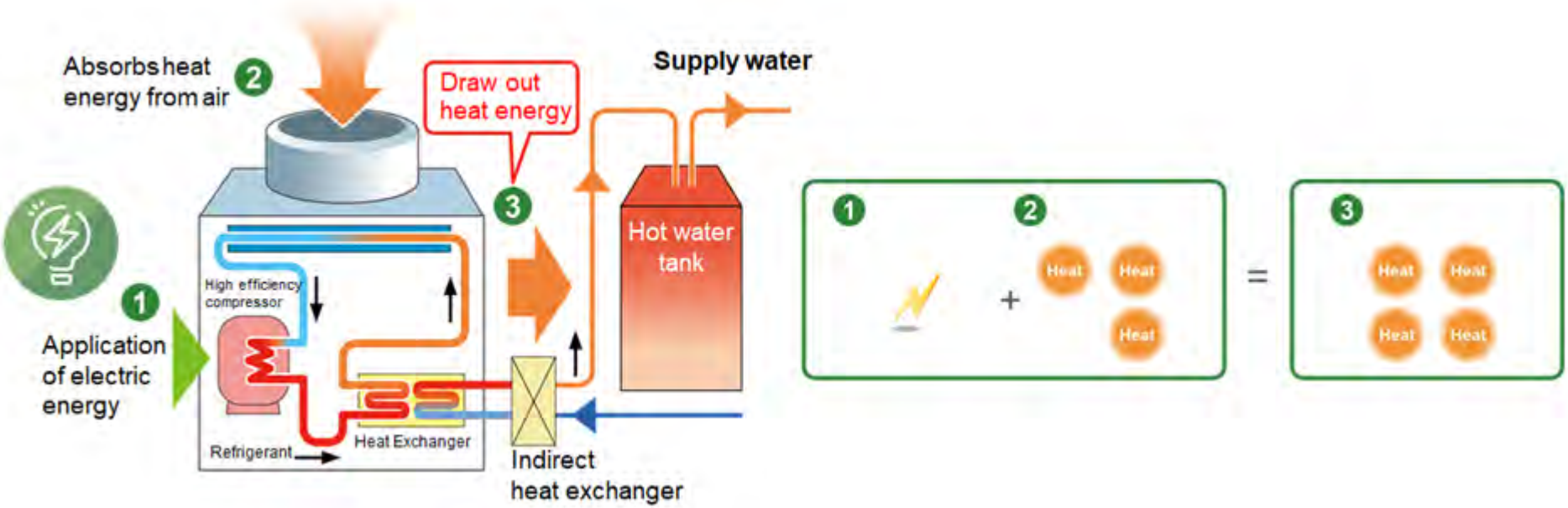
MULTIPLE SPLIT-TYPE VRF SYSTEMS

QAHV Hot Water Heat Pump



High efficiency up to 4.11 COP

Utilizes CO_2 refrigerant with a GWP of 1

Uses a unique twisted and spiral gas cooler to enhance energy efficiency

Operates down to -25˚C.

Super low noise levels for superior performance

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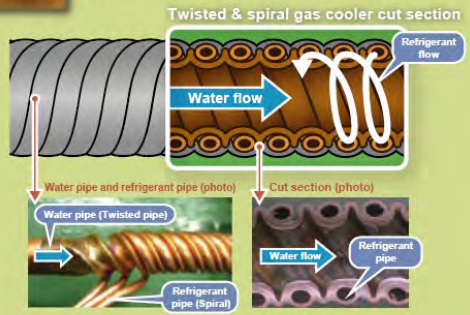
Compressor

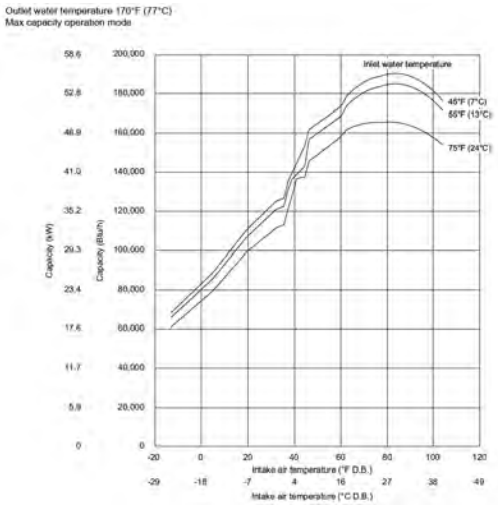
Patented technology

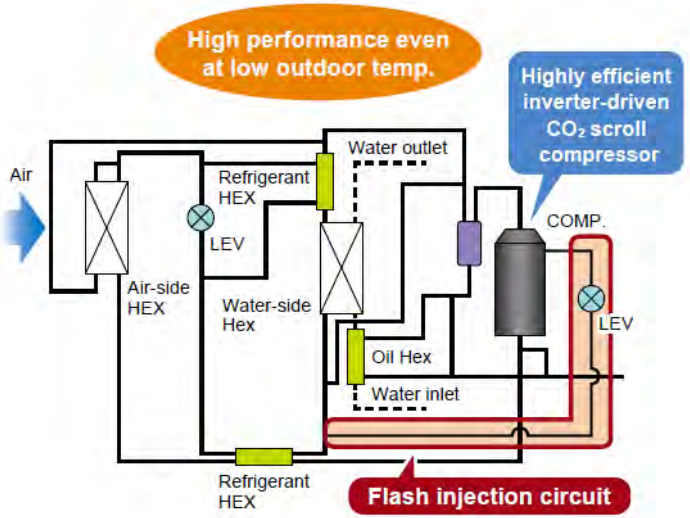
Using twist pipes as water pipes and running the refrigerant pipes along their grooves help increasing the heat-conductive area, allowing for better heat transfer.



CO_2 inverter compressor made by Mitsubishi Electric

Built-in Pump





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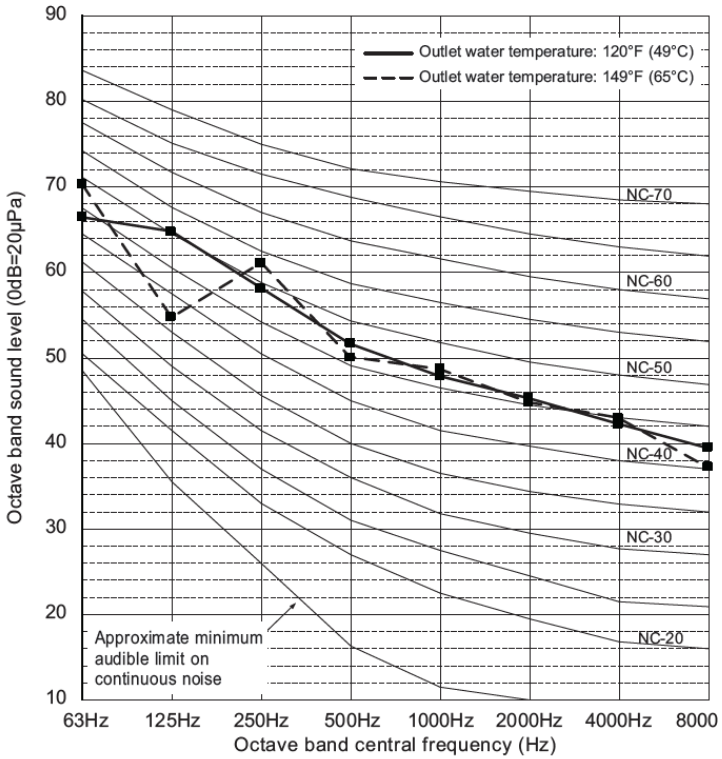
Sound Pressure Level: 56 dB

Operation mode: Energy saving operation 1 mode

Outdoor temperature: 80.6°F (27°C)



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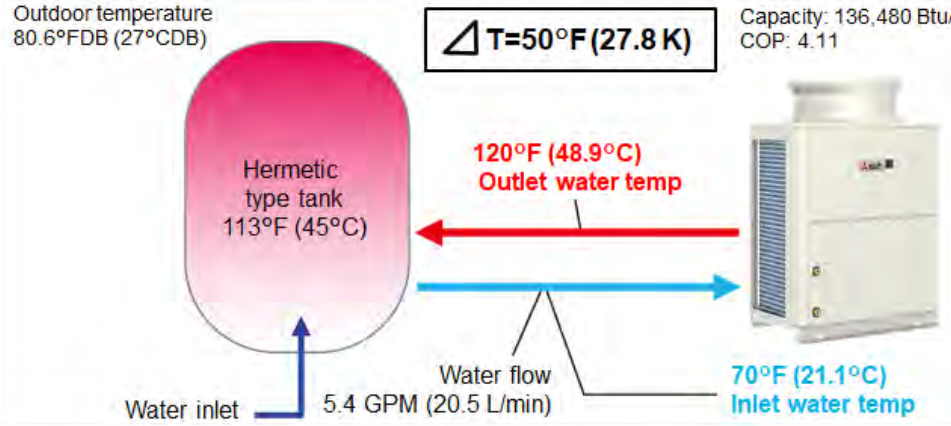
QAHV-N136TAU-HPB	Characteristics
	• **Very high COP** when QAHV has a **large temperature difference**. • Suitable for exclusive sanitary hot water supply.

* Make sure that the water entering the QAHV meets the water-quality standards. If the water-quality standards are not met, use an indirect heat exchange method.

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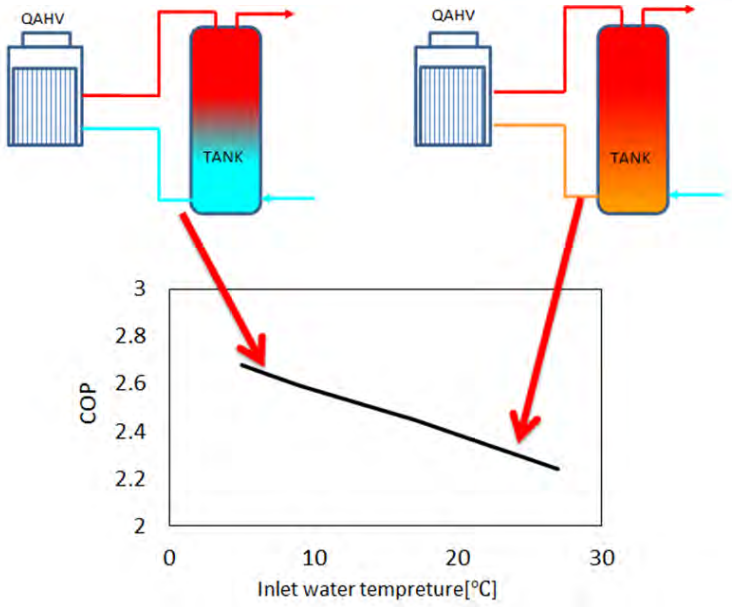
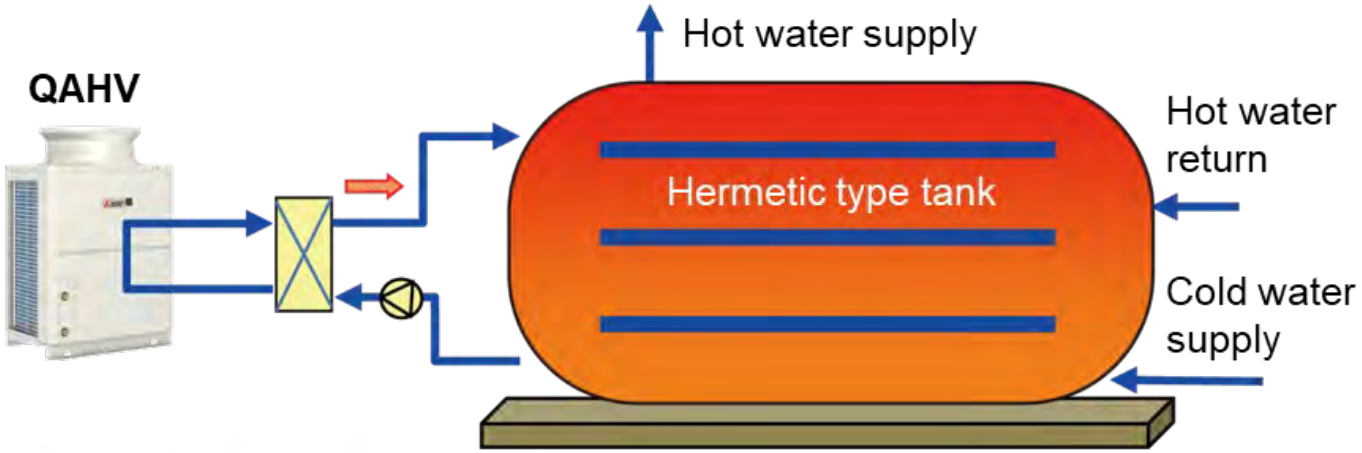
MULTIPLE SPLIT-TYPE VRF SYSTEMS

Stratification is IMPORTANT!

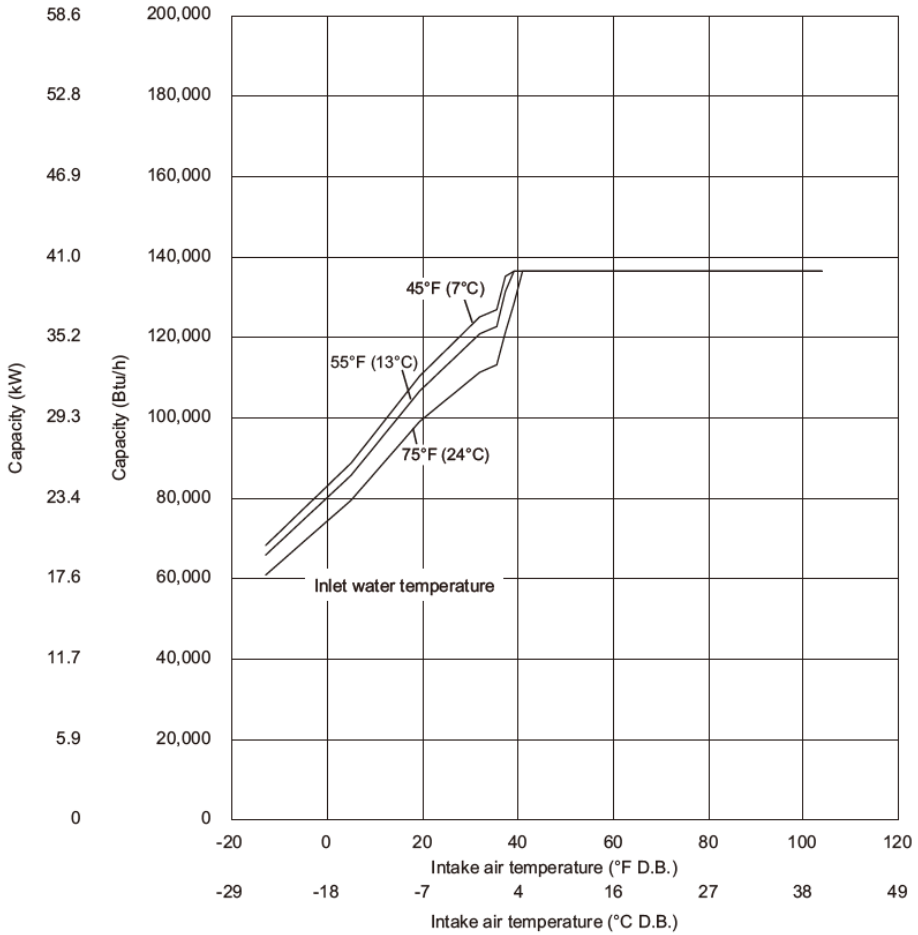


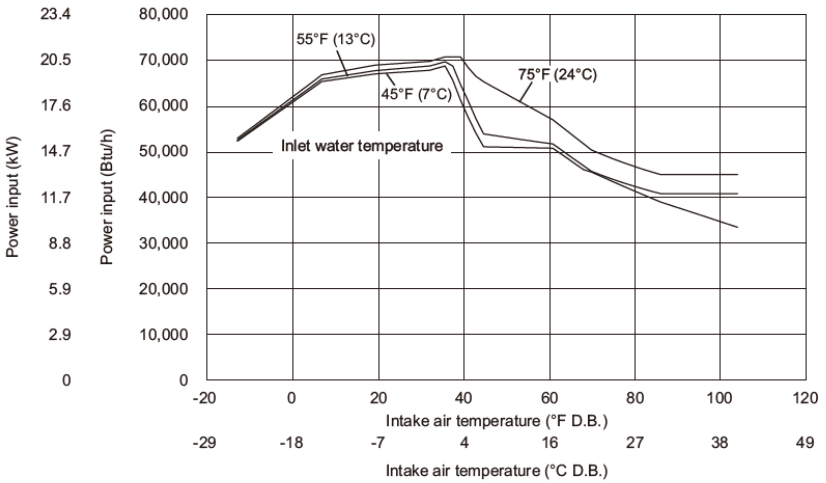


Horizontal Tank is Not Ideal

At outdoor temperature 36°F (2°C) or higher, this mode operates consistently at 136,480 Btu/h (40 kW).

Outlet water temperature 170°F (77°C)
Energy saving operation 1 mode





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MULTIPLE SPLIT-TYPE VRF SYSTEMS

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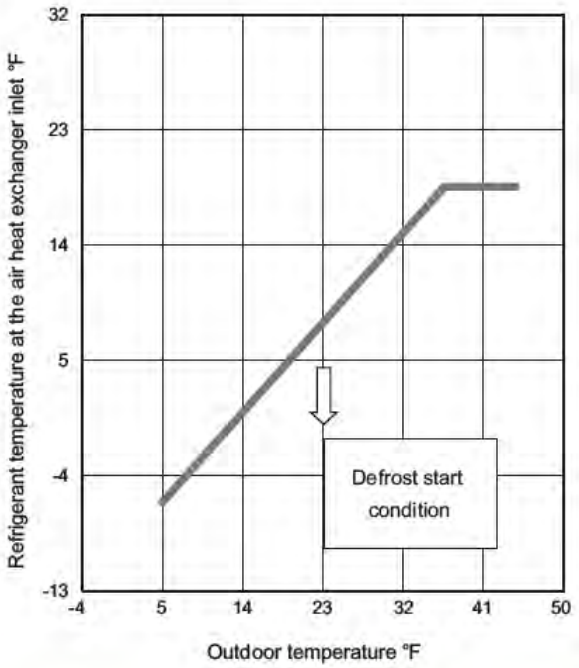
-4- Defrost start/end conditions

Defrost start conditions

Defrost begins when conditions 1) through 3) listed below are all met.

1) Refrigerant temperature at the air heat exchanger inlet is at or below the value determined in relation to the outdoor temperature(*2).
2) Cumulative compressor operation time has reached 35 minutes since the completion of the last defrost operation.
3) Cumulative compressor operation time has reached 35 minutes since the operation-ON signal was sent. Or the outdoor temperature is -15ºC (5ºF) or below and the compressor shell bottom SH temperature is at or below the specified temperature.

Defrost start conditions at temperatures below -15°C (5°F)
1.5 MPa (217 psi) ≤ Low pressure: Shell bottom SH temperature < 10 °C (18°F)
1.4 MPa (203 psi) ≤ Low pressure < 1.5 MPa (217 psi): Shell bottom SH temperature < 12°C (21.6°F)
Low pressure < 1.4 MPa (203 psi): Shell bottom SH temperature < 20°C (36°F)



Defrost end conditions

Defrost ends when any of the conditions 1) through 4) listed below is met.

1) Maximum defrost time (15 minimum) has been reached. Maximum defrost time is 20% of the cumulative compressor operation time from the last defrost or from the time operation-ON signal was sent.
2) Three minutes have elapsed since the refrigerant temperature at the air heat exchanger outlet reached 4ºC (39.2ºF) or above.
3) Low pressure has reached 8.5 MPa (1230 psi) or above.
4) High pressure has reached 12.0 MPa (2030 psi) or above at the frequency of 30 Hz.

Hospital

- QAHV (sealed hot water storage tank)
  + steam boiler (sealed hot water storage tank equipped with heat exchanger)

Total floor area: 33,702 m²

Building overview: South building 8 stories above ground, North building 7 stories above ground

Facility overview No. of medical departments: 23; No. of beds: 527

Facility updated in 2009

Hot water heat source facility

Before update: Large steam boiler

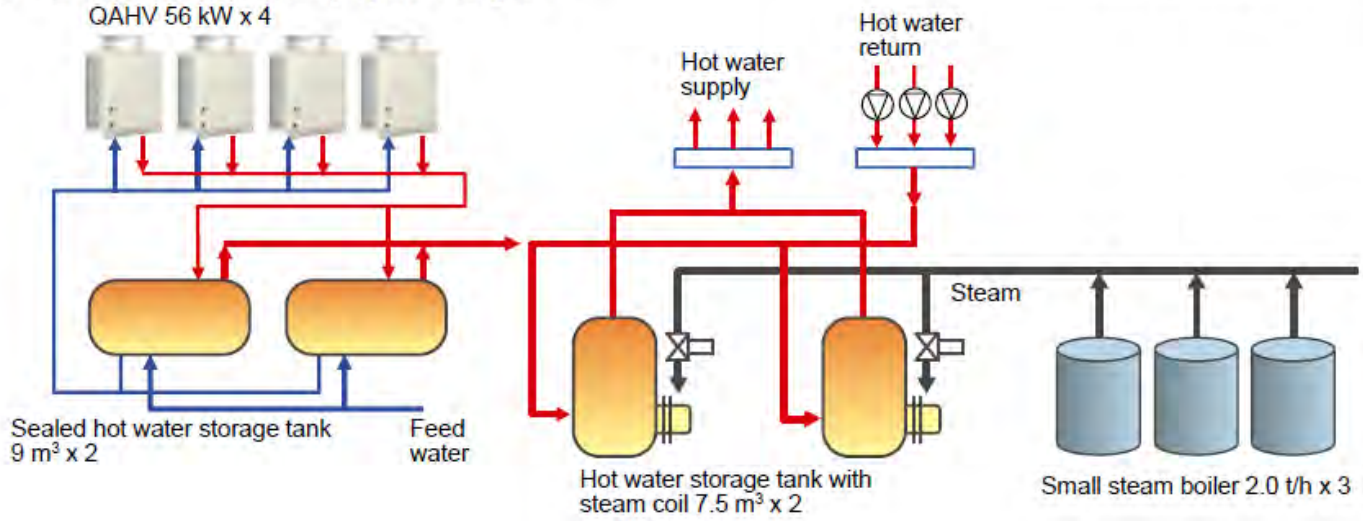
After update: QAHV 56 kW x 4

+ sealed hot water storage tank 9 m³ x 2

Small steam boiler 2.0 t/h x 3

+ sealed hot water storage tank with the steam coil 7.5 m³ x 2

Hot water heat source facility system diagram



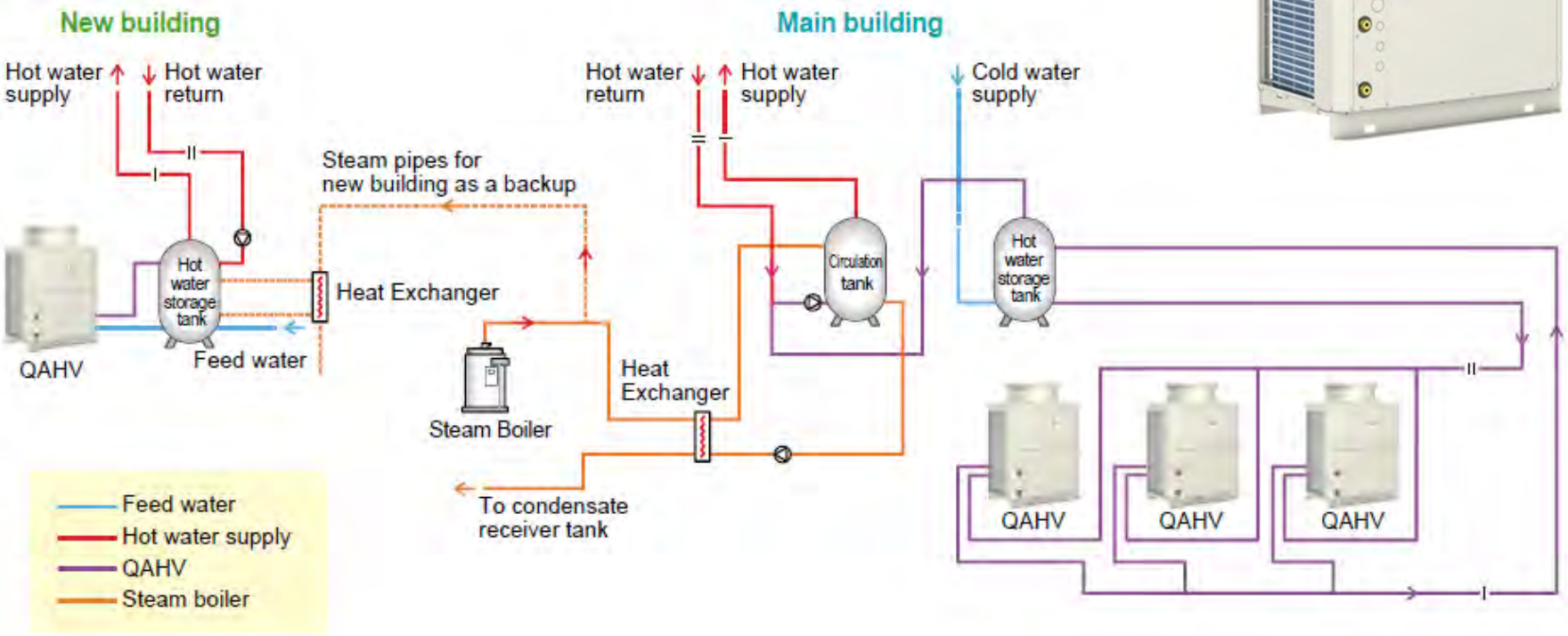
Source: Mitsubishi MEES17K020

Hotel

- QAHV + Steam boiler
  Facility updated in 2015
  Heat source equipment: QAHV 40 kW x 4
  Sealed hot water storage tank: 8.0 T x 2
  Sealed hot water storage tank: 4.0 T x 1

CO_2 refrigerant

System Diagram



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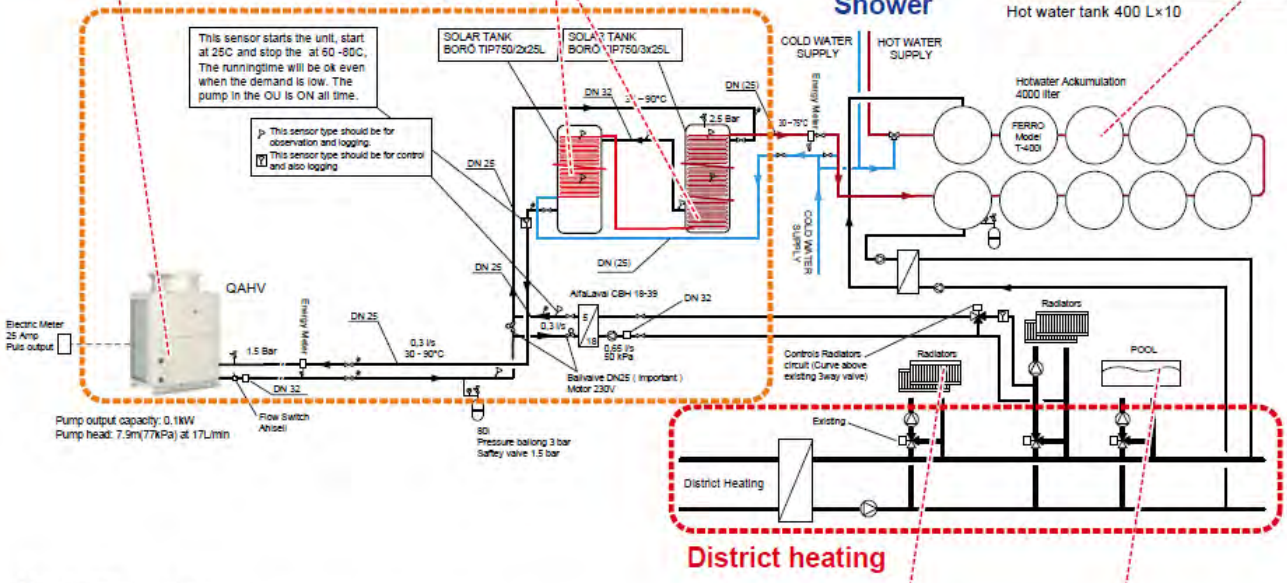
Source: Mitsubishi MEES17K020

QAHV unit
(Prototype with snow hood)

Hot water tank (2qty)

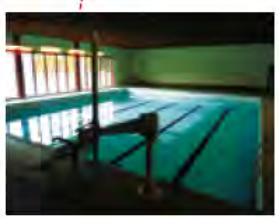
Hot water tank 400 L×10

QAHV circuit



District heating

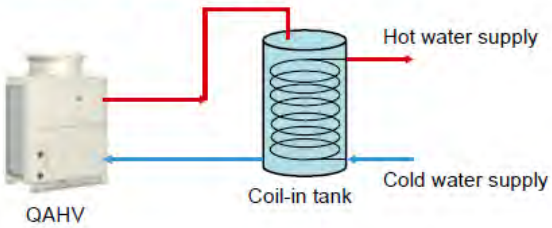
Municipal fitness center
Commissioning completed Dec 2014
QAHV used for showers and as back up for gym/pool (basically by district heating).



Fitness center

- QAHV + Sealed hot water storage tank with coil
  Schedule: Dec 2014 started
  Usage QAHV to be used for gym, sanitary, hot water usage (shower)
  System: QAHV 56 kw × 1 + Hot water tank 400 L × 10
  Sealed hot water storage tank with coil × 2

Coil-in tank Heating System

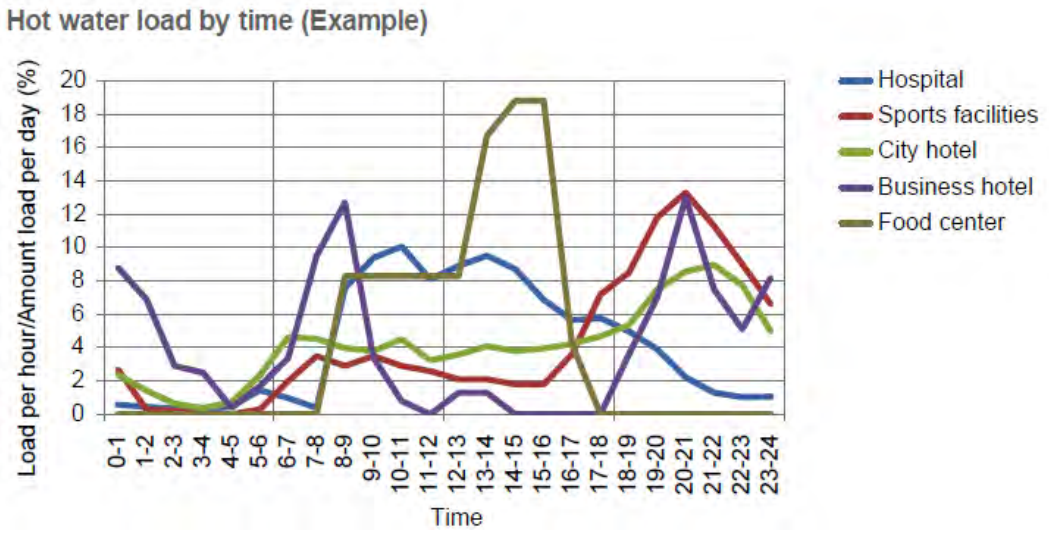


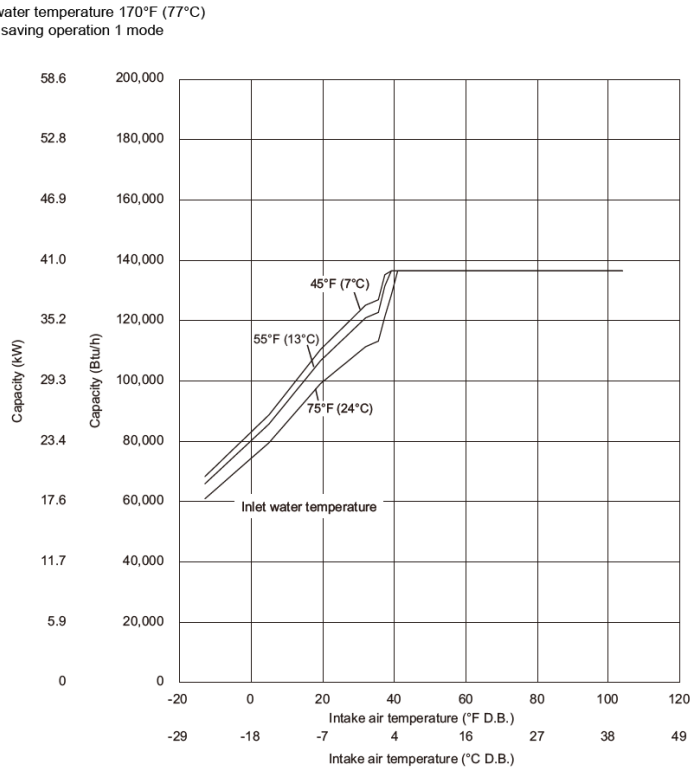
Source: Mitsubishi MEES17K020

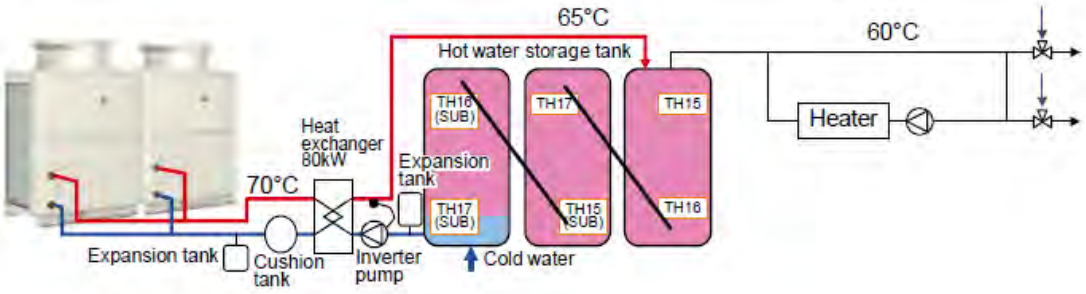
Calculate Hot Water Load

- ASHRAE Applications Service Water Heating
  - Estimate Loads based on occupancy and loads
- ASPE
  - Domestic Water Heating Design Manual
- Various Sizing Calculator
- MESCA recommend one or combination of following
  - Review existing buildings with similar size and occupancy
  - Tank size can be based on Peak Load for various hours
  - Run the QAHV for longer period of time

Air Source Heat Pump Hot Water Heater







- Operation Time
- Large Storage Tank
- Minimum Operating Temperature

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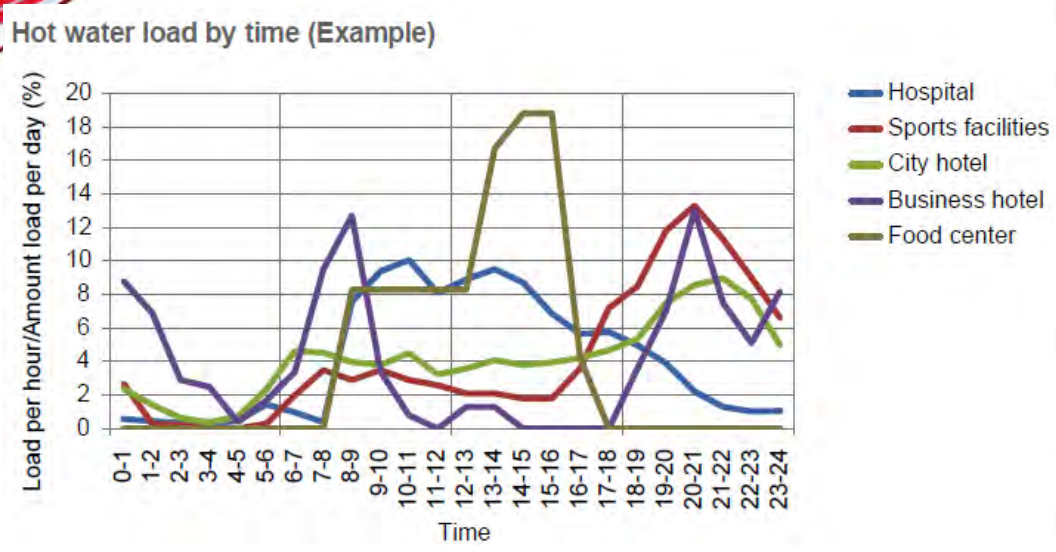
MULTIPLE SPLIT-TYPE VRF SYSTEMS

Source: Mitsubishi MEES17K020

Hot Water Load



▶ Chart Amount of hot water for design

Hot water temperature 60ºC
Feed water temperature 5ºC

Amount of hot water (HW) at 60ºC

	Amount of HW/day		Max. amount of HW/h ... (A)		Continuous time of (A)
Office	7-10	L/person	1.5-2.5	L/person	2h
Hotel	150-250	L/person	20-40	L/person	2h
Hospital	2-4	L/m²	0.4-0.8	L/m²	1h
	100-200	L/bed	20-40	L/bed	1h
Restaurant	40-80	L/m²	10-20	L/m²	2h
Restaurant/Cafe	20-30	L/m²	5-8	L/m²	2h
Apartment	150-300	L/household	50-100	L/household	2h

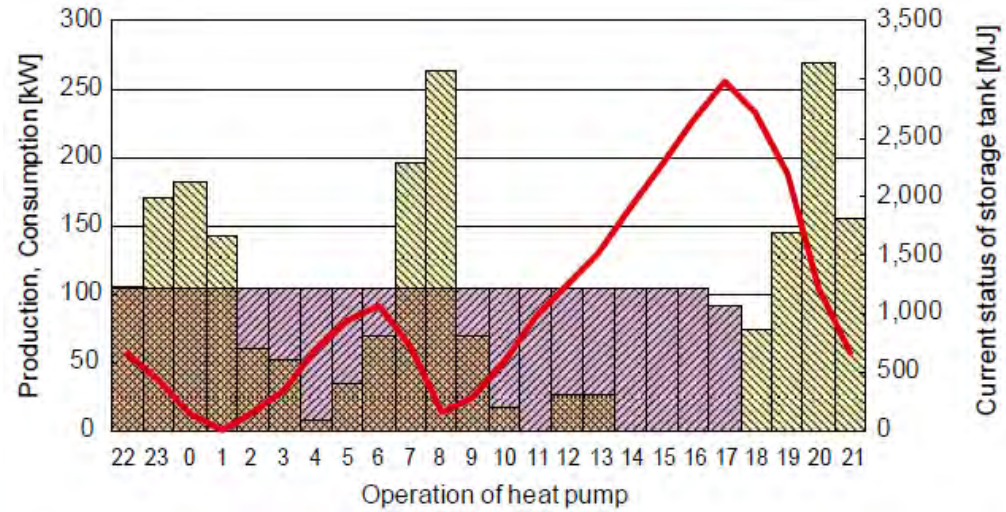
Hot water temperature 60ºC
Feed water temperature 10ºC
Mixing temperature 42ºC

Amount of hot water (HW) at 60ºC

	Amount of HW/day		Max. amount of HW/h ... (A)		Continuous time of (A)
Office	6.7-9.5	L/person	1.4-2.4	L/person	2h
Hotel	143-238	L/person	19-38	L/person	2h
Hospital	1.9-3.8	L/m²	0.4-0.8	L/m²	1h
	95-190	L/bed	19-38	L/bed	1h
Restaurant	38-76	L/m²	9.5-19.0	L/m²	2h
Restaurant/Cafe	19-29	L/m²	4.8-7.6	L/m²	2h
Apartment	143-285	L/household	48-95	L/household	2h

Note;
Amount of hot water is shown both way, in case of converted to 60°C, and in case of mixed temperature water.
So you need to confirm by which temperature the amount of (hot) water is required.

Business Hotel



▶ Hot water supply load characteristics

Maximum amount of hot water supply per hour	3,822	L/h (60ºC hot water)
Maximum heat load per hour	269	kW (It expected to heat dissipation by 10%)
Maximum load continuous time	1.0	h
Amount of hot water supply per day	29,400	L/day (60ºC hot water)
Heat Load per day	2,068	kWh/day (It expected to heat dissipation by 10%)

Feed water temperature: 5ºC
Hot water temperature: 60ºC
1 kWh = 3.6 MJ

▶ Equipment selection

			Combustion boiler	Hot water heat pump
Heat source equipment		kW	350	104 *1
Hot water tank	Heat storage	MJ	16	2,975
	Net volume	L	3,822	12,922
	Nominal volume	L	5,460	18,460

Validity capacity of hot water tank: 70 %
Heat pump unit operating time per day: 20 h/day
*1. Capacity of heat pump unit
104 kW=2,068 kWh/20 h

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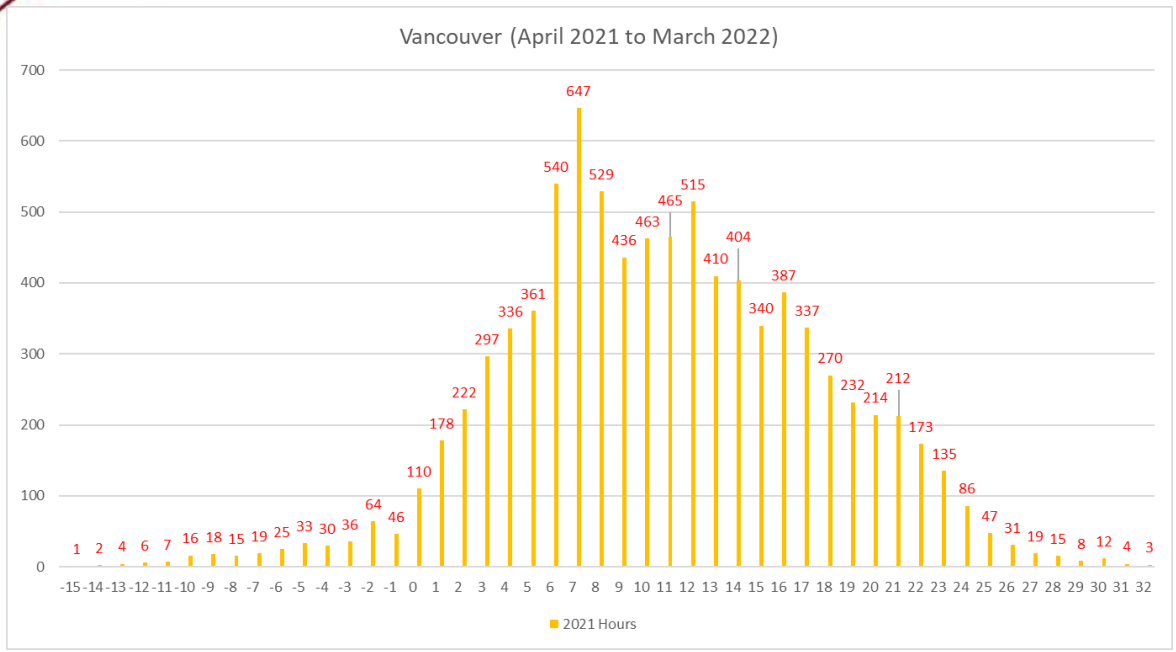
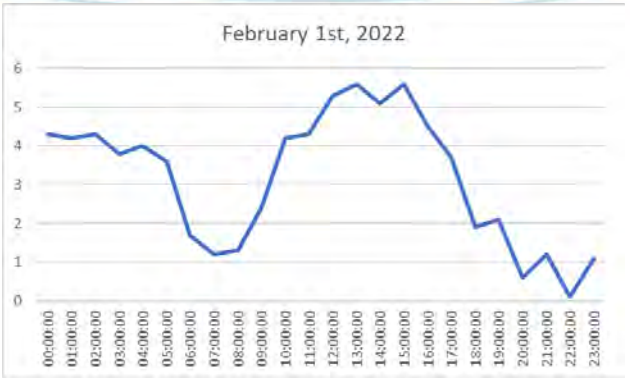
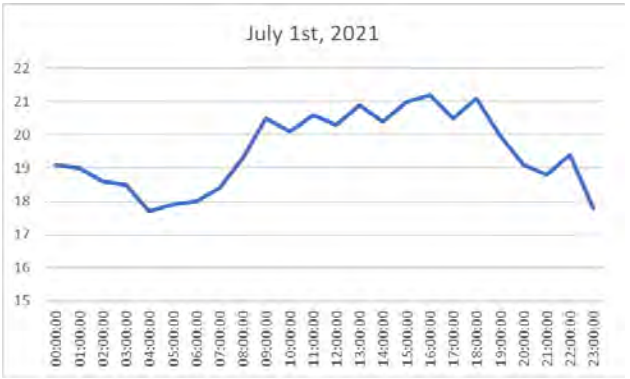
Source: Mitsubishi MEES17K020

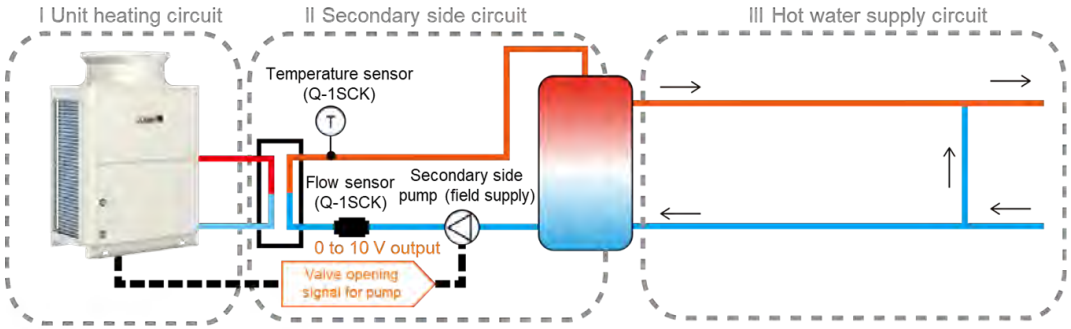
Air Source Heat Pump Hot Water Heater







Source Data: [Historical Data - Climate - Environment and Climate Change Canada (weather.gc.ca)]



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Operation modes

Maximum capacity operation

Operates at the maximum compressor frequency, regardless of the outdoor temperature. This mode is suitable when hot water needs to be generated quickly at the maximum capacity.

Energy saving operation 1 (Factory setting)

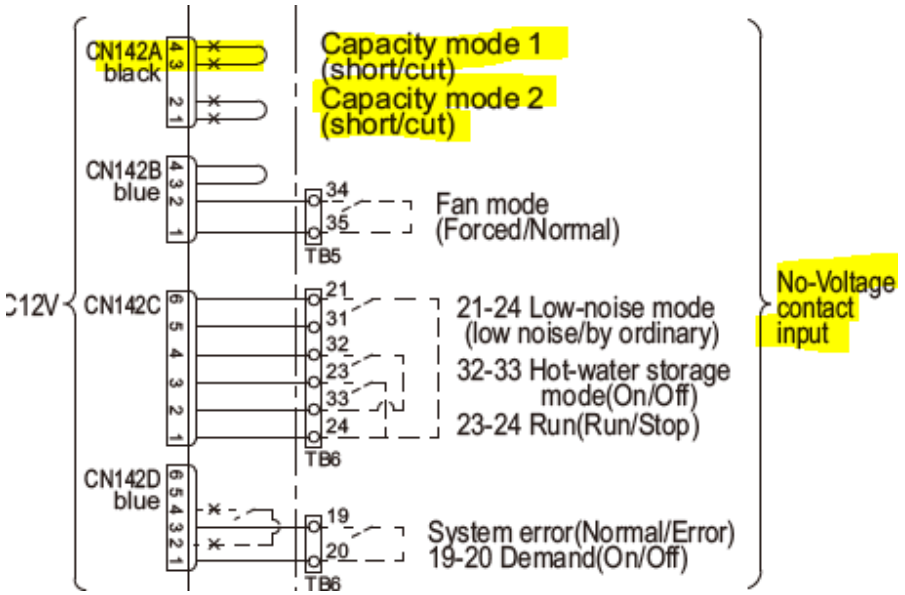
At outdoor temperature 36°F (2°C) or higher, this mode operates consistently at 136,480 Btu/h (40 kW). This mode is suitable for keeping the power consumption down.

Energy saving operation 2

This mode operates with the maximum heating capacity of 176,000 Btu/h (50 kW).
With reference to 136,480 Btu/h (40 kW) operation, when inlet water temperature lowers, the capacity is increased up to 176,000 Btu/h (50 kW) to maintain the amount of outlet hot water.

* Capacity mode table

mode	input
Max capacity operation	Capacity mode 1「cut」
Energy saving operation 1 (factory setting)	Capacity mode 1,2「short」
Energy saving operation 2	Capacity mode 1「short」 Capacity mode 2「cut」



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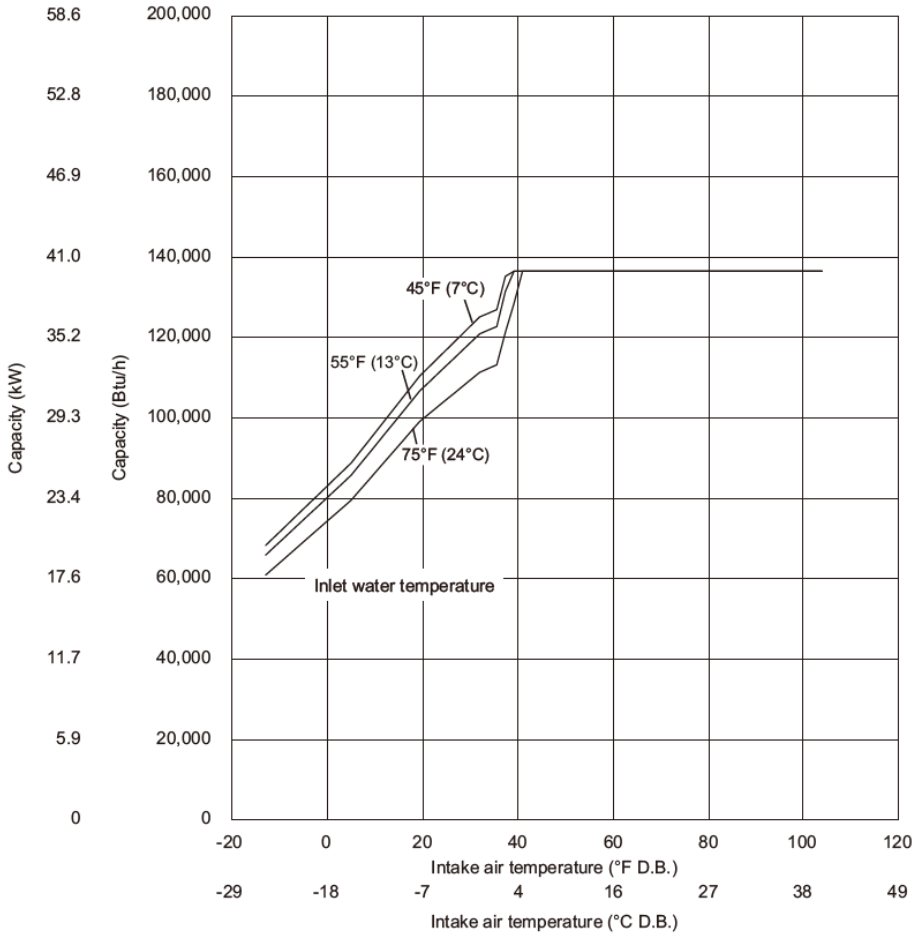
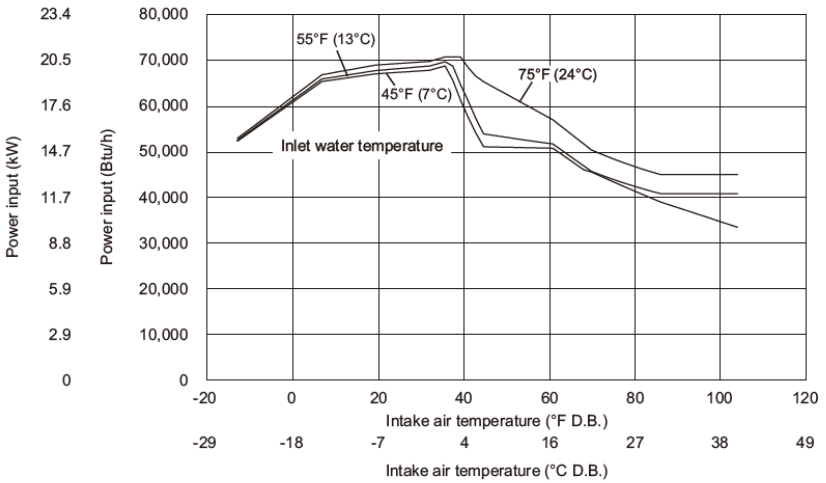
At outdoor temperature 36°F (2°C) or higher, this mode operates consistently at 136,480 Btu/h (40 kW).
This mode is suitable for keeping the power consumption down.

Outlet water temperature 170°F (77°C)
Energy saving operation 1 mode





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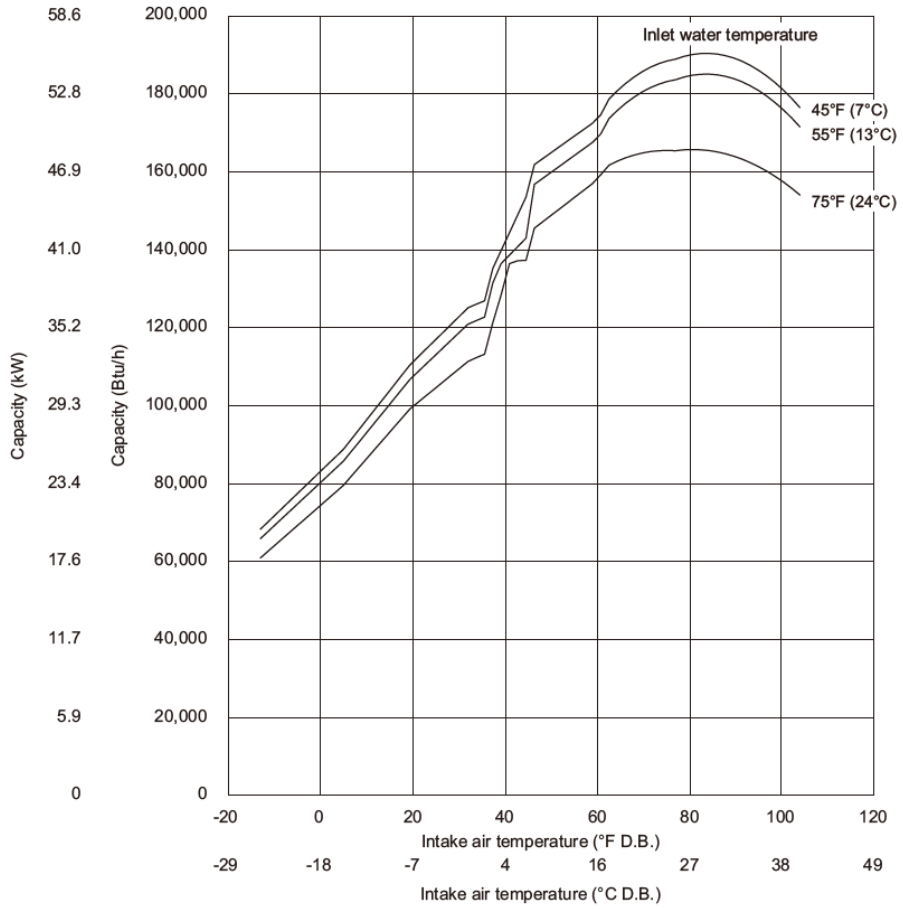
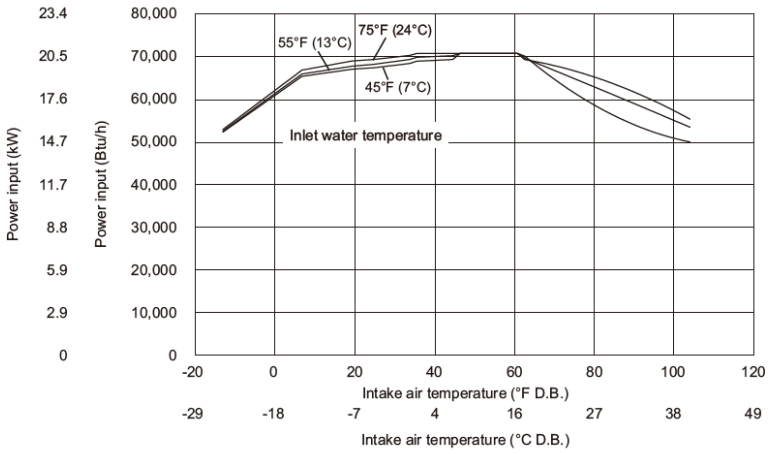
Operates at the maximum compressor frequency, regardless of the outdoor temperature. This mode is suitable when hot water needs to be generated quickly at the maximum capacity.

Outlet water temperature 170°F (77°C)
Max capacity operation mode





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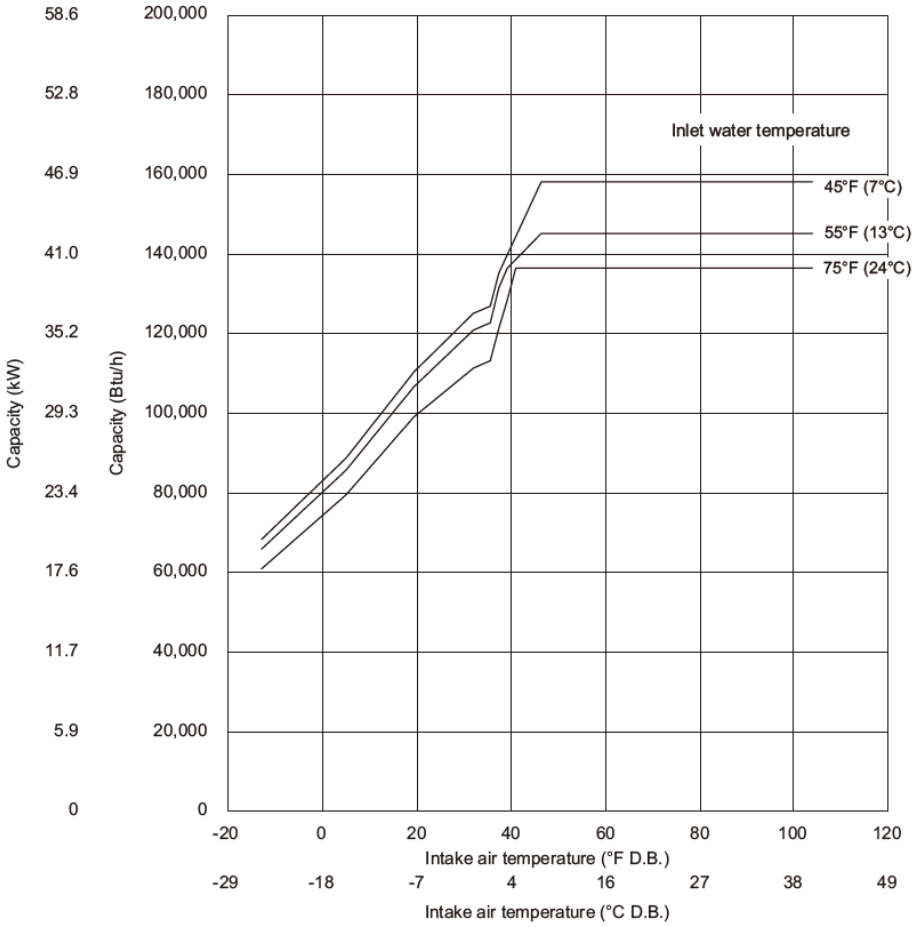
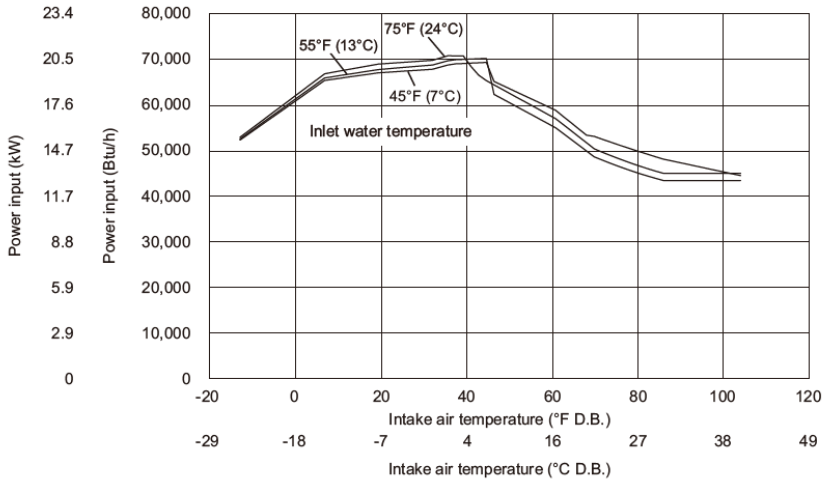
This mode operates with the maximum heating capacity of 176,000 Btu/h (50 kW).
With reference to 136,480 Btu/h (40 kW) operation, when inlet water temperature lowers, the capacity is increased up to 176,000 Btu/h (50 kW) to maintain the amount of outlet hot water.

Outlet water temperature 170°F (77°C)
Energy saving operation 2 mode





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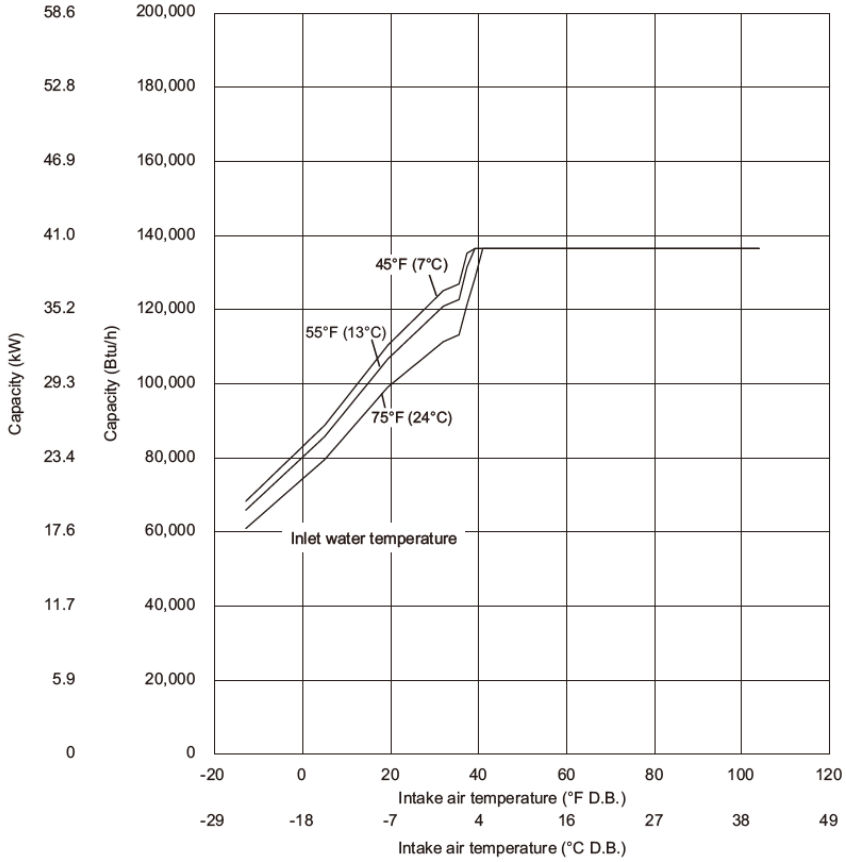
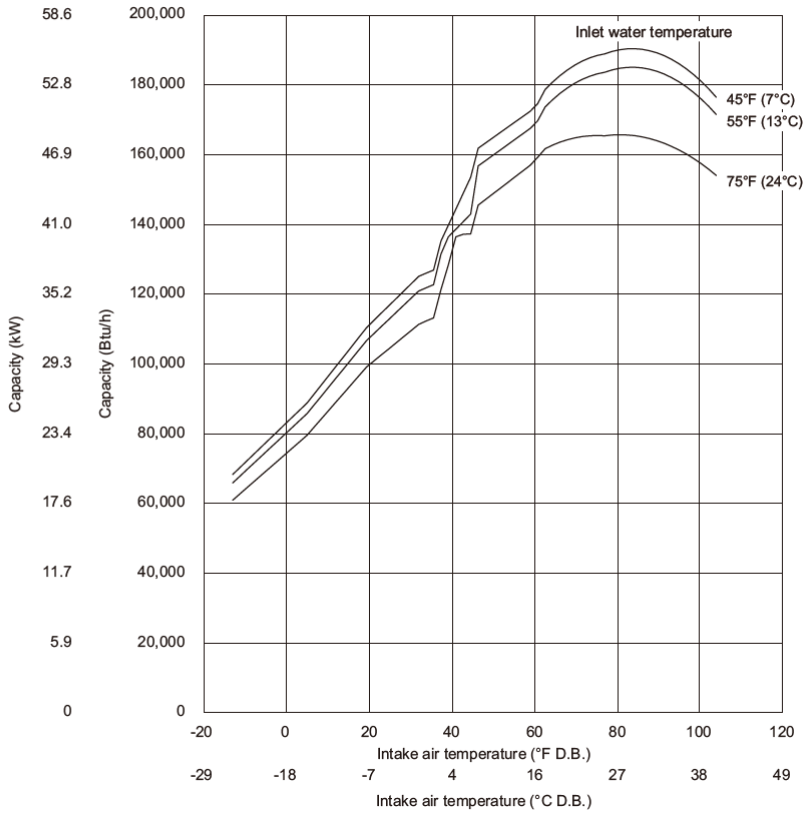
Mode Selection based on Application

Outlet water temperature 170°F (77°C)
Energy saving operation 1 mode



Outlet water temperature 170°F (77°C)
Max capacity operation mode



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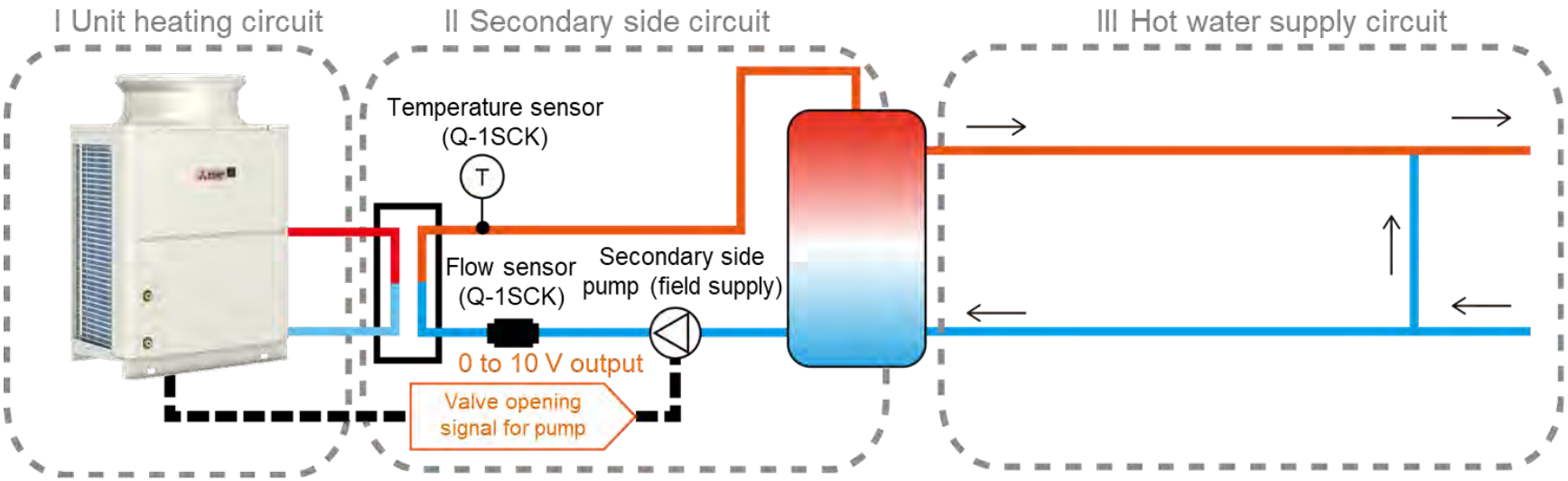
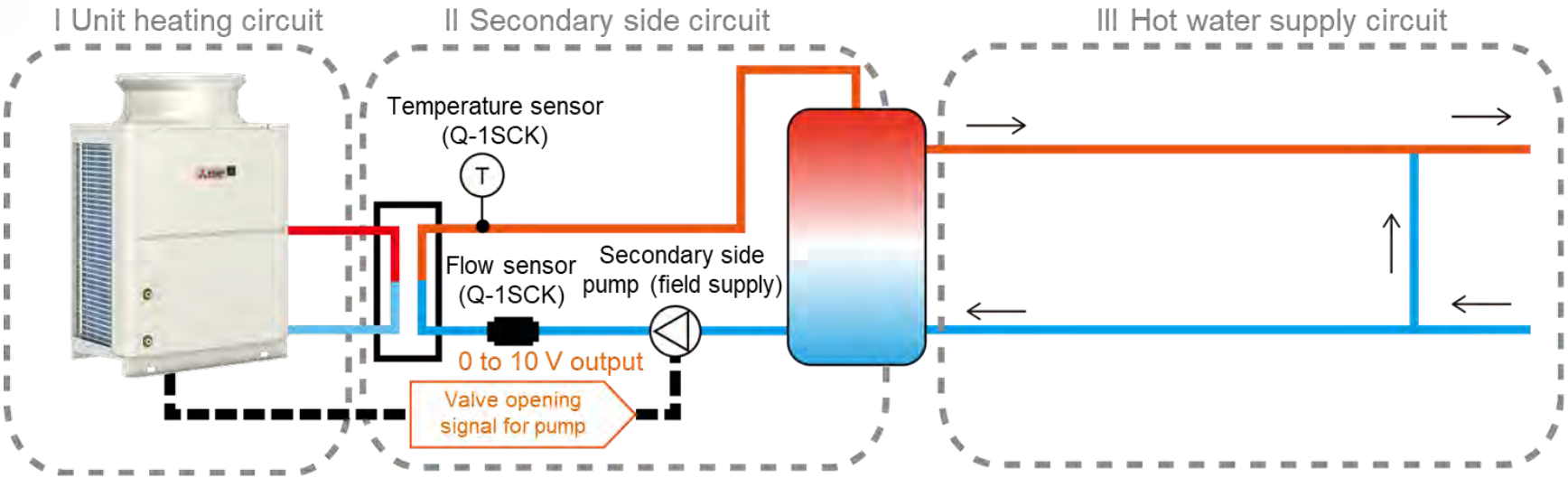
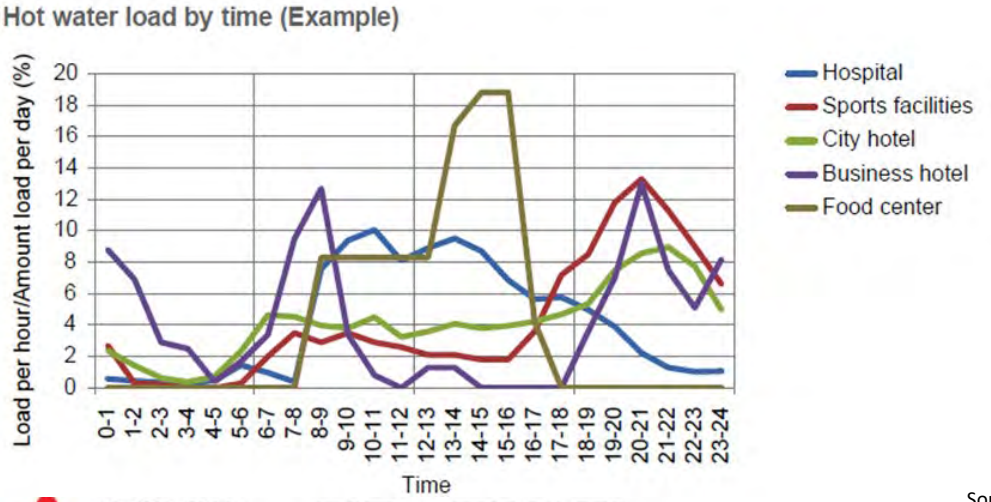
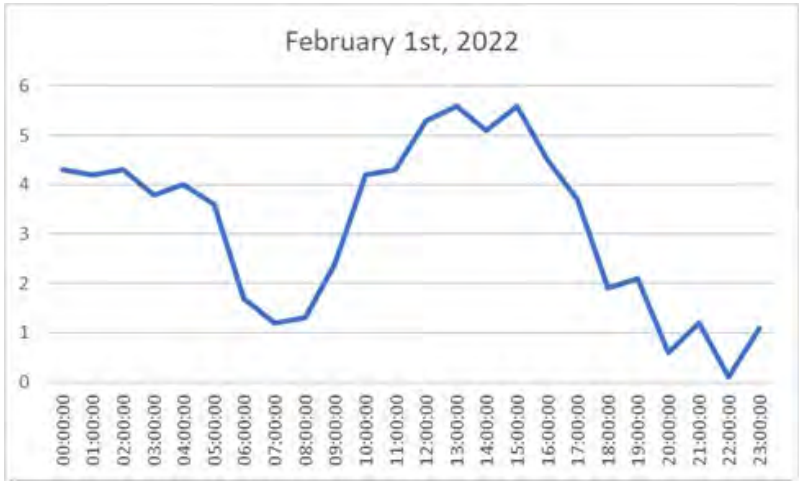
Sample Configuration



Sample Configuration







Source Data: Historical Data - Climate - Environment and Climate Change Canada (weather.gc.ca)

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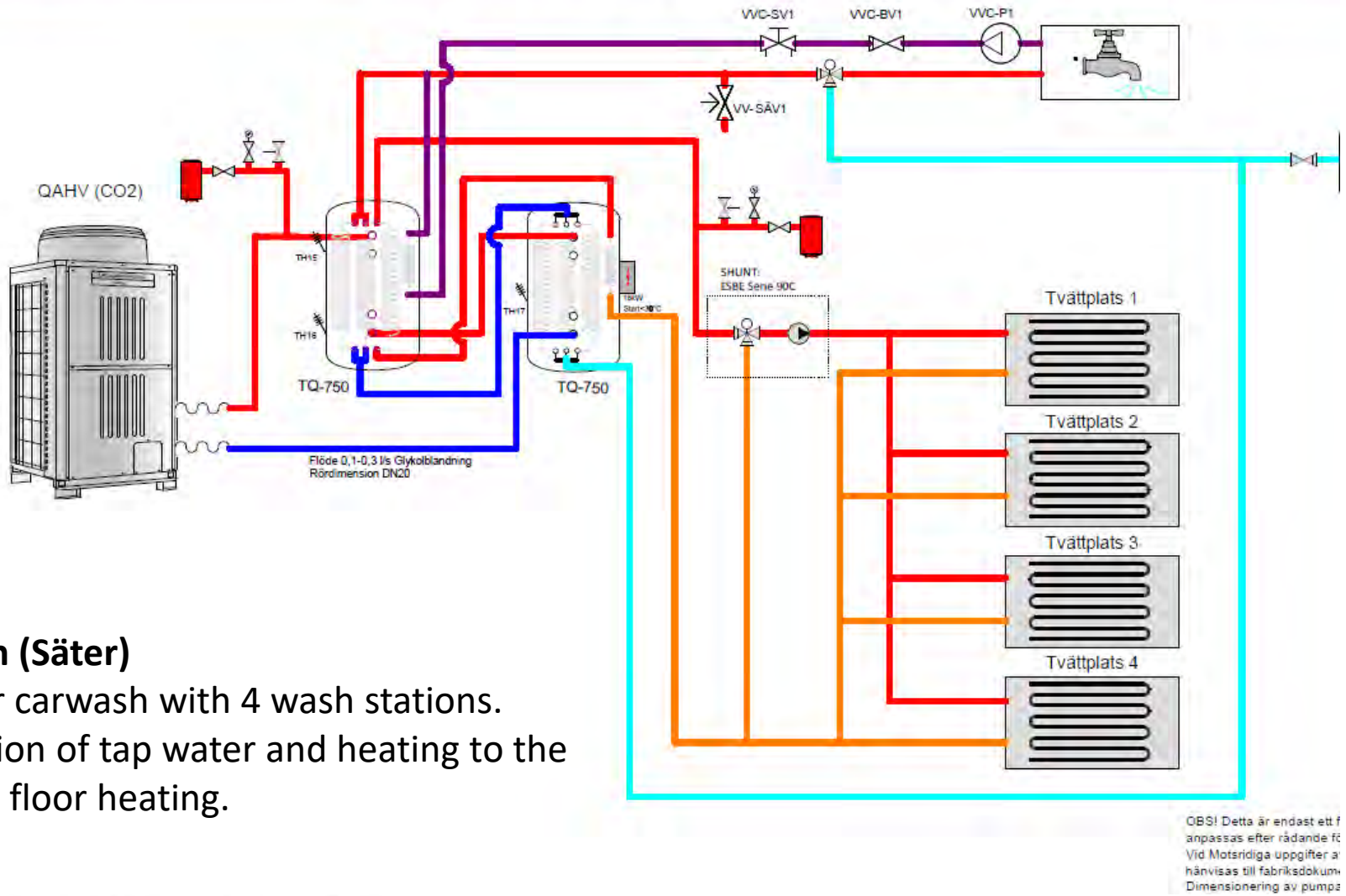
HEATING AND COOLING

Biltvätt Säter/QAHV

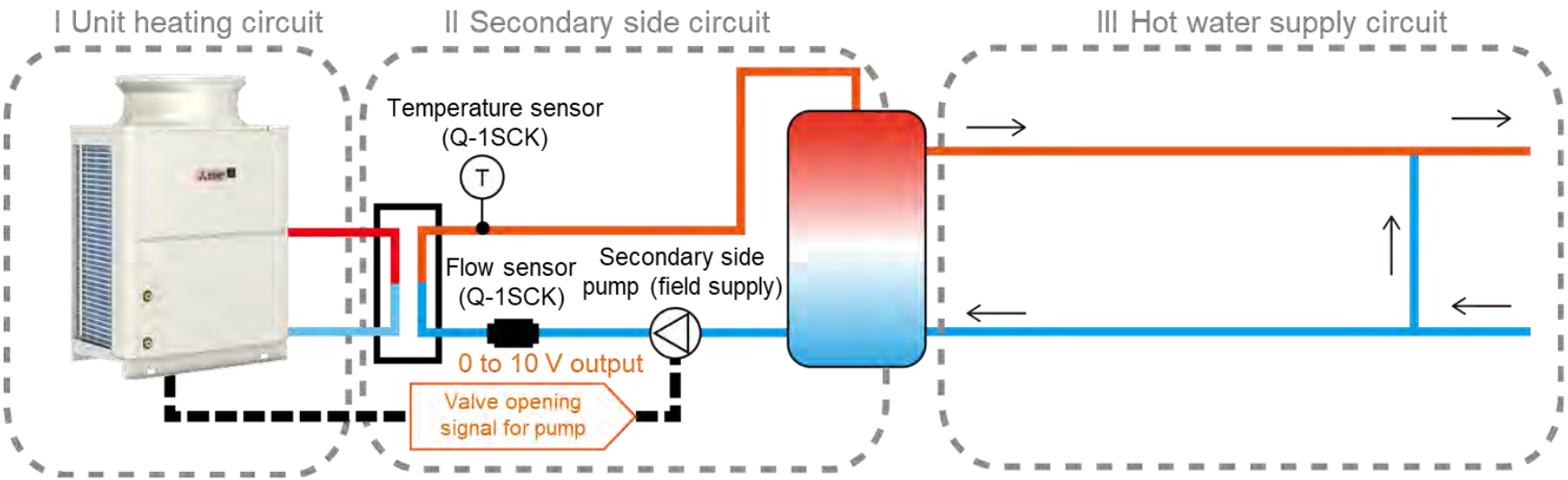


Carwash (Säter)

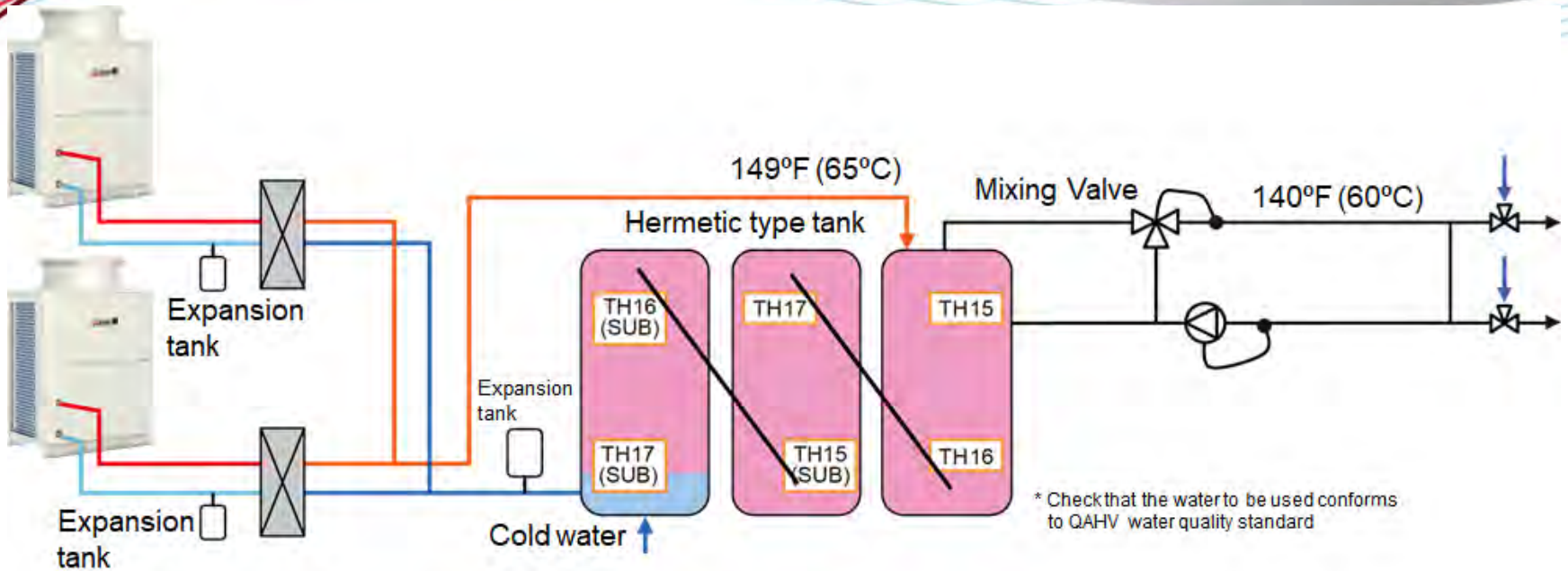
Outdoor carwash with 4 wash stations.
Production of tap water and heating to the outdoor floor heating.

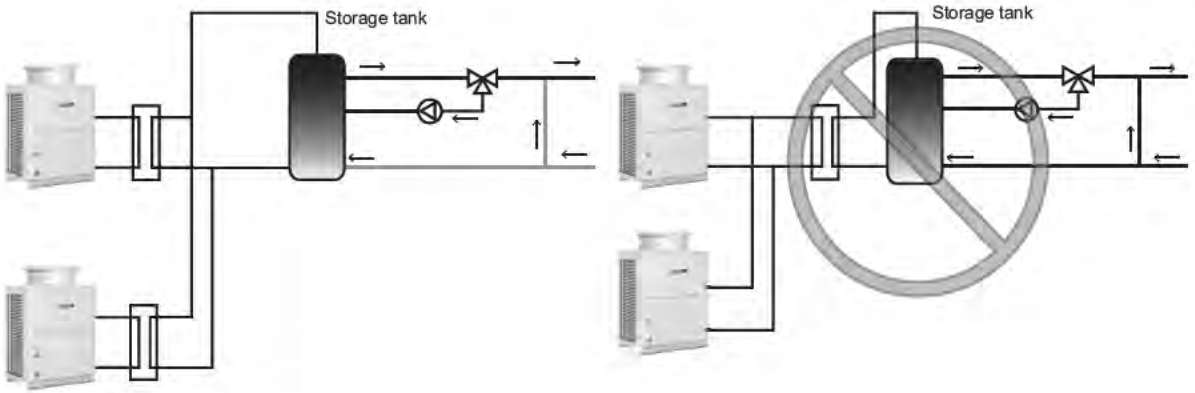
OBS! Detta är endast ett f
anpassas efter rådande fö
Vid Motsridiga uppgifter a
hänvisas till fabriksdokum
Dimensionering av pumpa

Single Unit



- Minimum total amount of retained water on the QAHV side is 10.6 gal (40 L).





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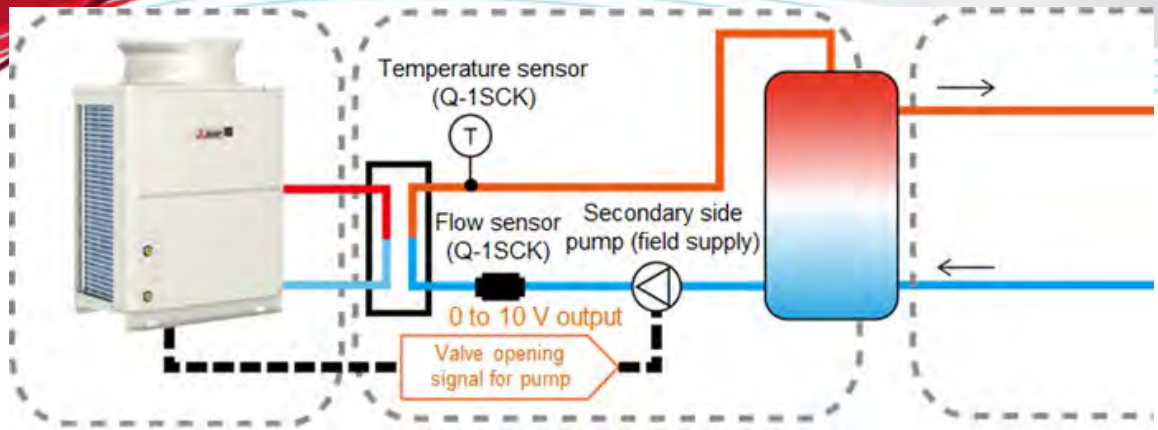


- Minimum total amount of retained water on the QAHV side is 10.6 gal (40 L).

4-2-3. Selection criteria for heat exchanger

Step 1 Determination of prerequisites for selection

1. Heat exchanger capacity 40000 W (136000 BTU/h)
2. Estimation of outlet hot water and inlet water temperatures
   As a guide, select a heat exchanger of which the temperature difference between the high temperature section and the low temperature section will be 5°C (9°F) or below.

2-1. Outlet hot water temperature (when secondary side outlet hot water temperature is set to 65°C (149°F) (setting at the time of shipment))

- Secondary side circuit outlet hot water temperature: 65°C (149°F)
- Unit outlet hot water temperature: 70°C (158°F)

2-2. Inlet water temperature

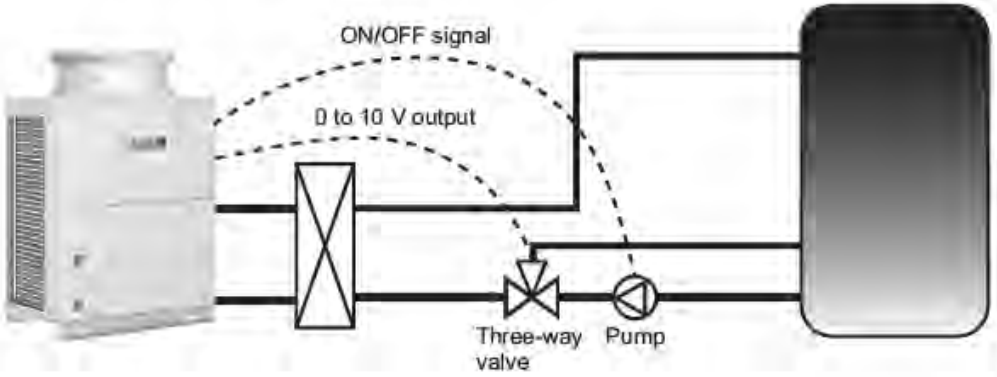
- Secondary side inlet water temperature: 10°C (50°F)
- Unit inlet water temperature: 15°C (59°F)

3. Used flow rate
   (40000 W/(70-15)°C/4200 J/kg•K) × 60 s = 10.4 kg/min ≈ 10.4 ℓ/min ≈ 2.74 GPM

Step 2 Determination of model

Notes on selection

- Select a heat exchanger that allows water to pass through both of the flow channels.
- Select a heat exchanger so that the pressure applied to the heat exchanger in the on-site system will not exceed the maximum operating pressure of the heat exchanger.
- Select a heat exchanger that allows flowing at a flow rate of maximum 30 ℓ/min (7.9 GPM).
- Select a heat exchanger with a capacity of at least 40000 W (136000 BTU/h).
- Ensure that the shearing stress at the flow rate to be used will be 16 Pa (0.01 ftAq) or more. (Refer to step 4.)



Overview of system

This system has a pump provided at the outlet of the tank and a three-way valve provided downstream of the pump, and adjusts the flow rate by controlling the opening and closing of the three-way valve.

	Flow rate output device	Flow rate adjustment device
	Pump	Three-way valve
Wiring connection places	1-3 of CN512 of control board (ON/OFF output)	Sub box terminal block No. 10, 11, 12

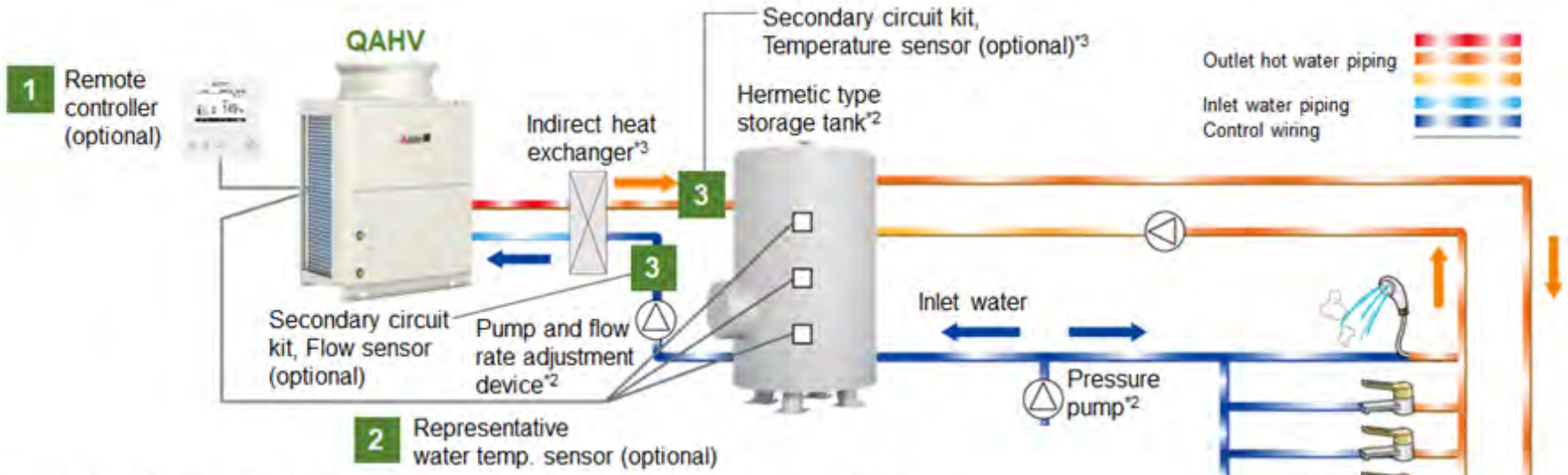
Notes on selection method and system configuration

Notes on pump selection and connection

- Calculate the total pump head according to the system at the site and then select a pump capable of outputting the minimum flow rate of about 3 ℓ/min (0.8 GPM) and maximum flow rate of about 30 ℓ/min (7.9 GPM) with the necessary pump head for the piping at the site.
- When selecting the pump, please note that output at a high flow rate will not occur if the flow rate with the pump head of the system at the site is low, and output at a low flow rate will not occur if the flow rate is too high.
- Be sure to check that the flow rate becomes 20 to 30 ℓ/min (5.3 to 7.9 GPM) at the maximum output during a flow rate adjustment test run.

* If the flow rate is not within the range of 20 to 30 ℓ/min (5.3 to 7.9 GPM), select a different pump or adjust the maximum frequency using an inverter, etc. so that the maximum flow rate of 20 to 30 ℓ/min (5.3 to 7.9 GPM) is achieved.
* To select a proper pump, first select a pump that supports slightly high flow rate, and then adjust the frequency with an inverter so that the flow rate becomes 20 to 30 ℓ/min (5.3 to 7.9 GPM) at the maximum output. (In that case, an inverter is necessary to be prepared separately.)

QAHV System Schematic



*1 If the system does not meet the water quality standard, malfunctions such as scale formation or corrosion may occur. Such water cannot be used in a system in which water is directly supplied to the unit.
*2 Required to procure locally (not supplied).
*3 If the water entering the QAHV does not meet the water-quality standards, use an indirect heat exchange method. Prepare the secondary circuit kit (option parts) and an indirect heat exchanger (locally procured).

Field Supply Equipment

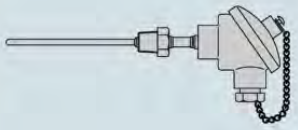
- **Hermetic type storage tank**
- **Heat exchanger**
- **Pump**
- **Expansion Tank**
- **Others**

1 Remote controller

PAR-W31MAA-J

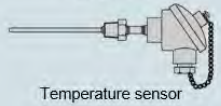
2 Representative water temperature sensor

TW-TH16-E



3 Secondary circuit kit
(Temperature sensor, Flow sensor)

Q-1SCK



Temperature sensor

Flow sensor

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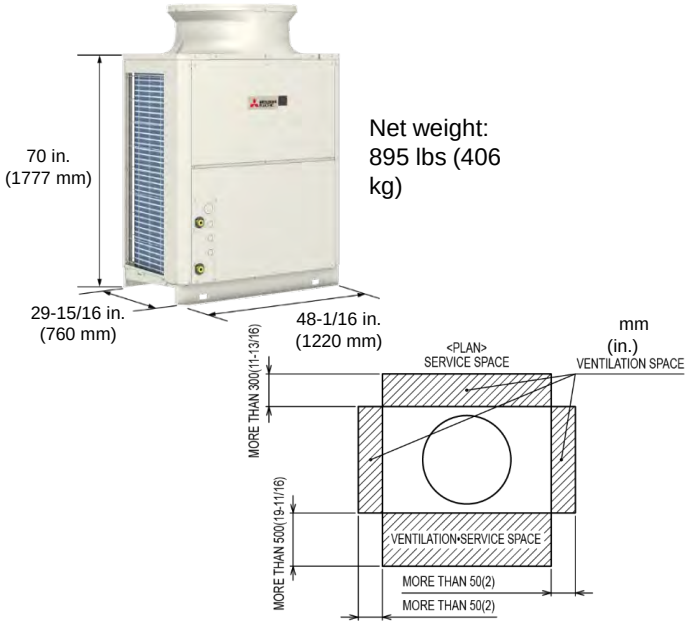
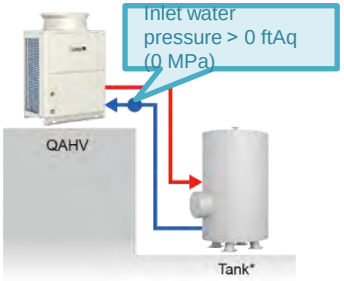
Installation Space requirement



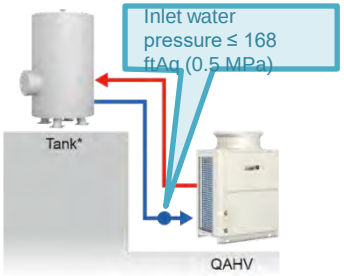
Notes on Water pipe installation

The maximum piping length is 196 ft (60 m).



- In case of installed the unit above the storage tank

  Decide the height so that the unit inlet water pressure will not be negative for the tank pressure.



- In case of installed the unit below the storage tank

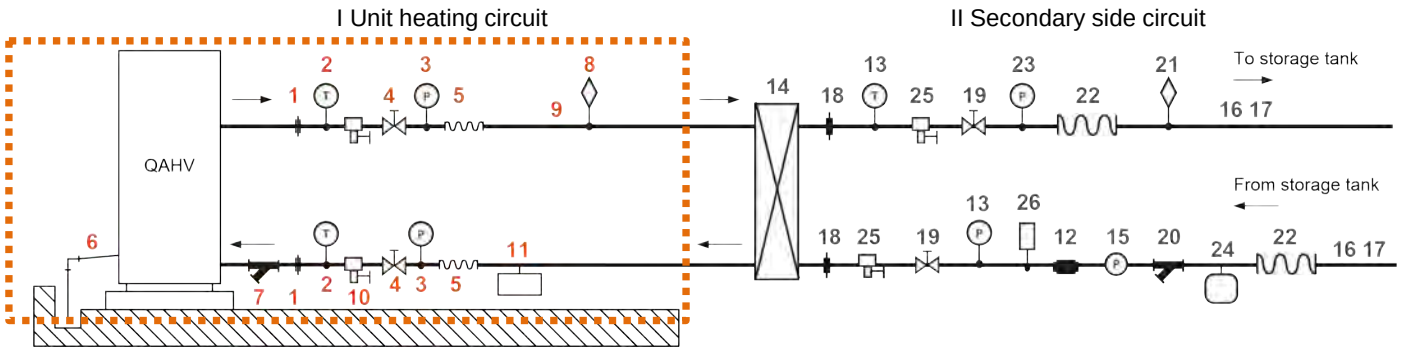
  Decide the height so that the unit inlet water pressure will be 168 ftAq (0.5 MPa) or below for the tank pressure.

* When the heat exchanger is installed in the secondary side, the restrictions related to the inlet water pressure still apply.

- Piping length restrictions

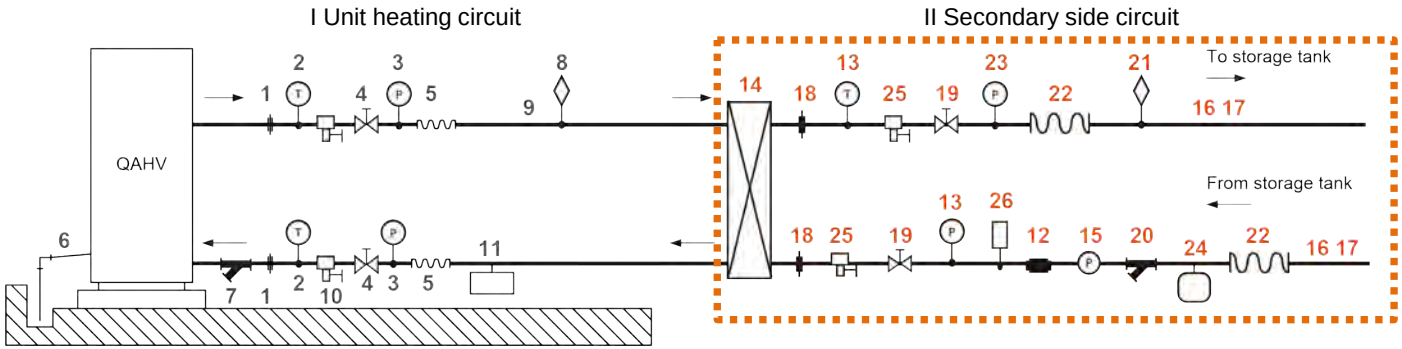
The maximum piping length is 60 m (196 ft).
Select appropriate diameter pipes to prevent negative pressure from the pumping head and the pressure loss in the pipes.
Pumping head (when maximum flow rate is 20.5 ℓ/mm (5.4GPM): 68 kPa (22.8 ftAq)

* When no secondary-side control is used, items 12 through 24 are not required.



No.	Component	Application
1	Union joints/flange joints	Required to allow for a replacement of equipment.
2	Thermometer	Required to check the performance and monitor the operation of the units.
3	Water pressure gauge	Recommended for checking the operation status.
4	Valve	Required to allow for a replacement or cleaning of the flow adjuster.
5	Flexible joint	Recommended to prevent the noise and vibration from the pump from being transmitted.
6	Drain pipe	Install the drain pipe with a downward inclination of between 1/100 and 1/200. To prevent drain water from freezing in winter, install the drain pipe as steep an angle as practically possible and minimize the straight line. For cold climate installation, take an appropriate measure (e.g., drain heater) to prevent the drain water from freezing.
7	Strainer	Install a strainer near the unit to keep foreign materials from entering the water-side head exchanger.
8	Air vent valve	Install air venting valves to the places where air can accumulate. Automatic air vent valves are effective.
9	Water pipe	Use pipes that allow for easy air purging, and provide adequate insulation.
10	Drain valve	Install drain valves so that water can be drained for servicing.
11	Expansion tank	Select an expansion tank that is suitable for the system.

* When no secondary-side control is used, items 12 through 24 are not required.

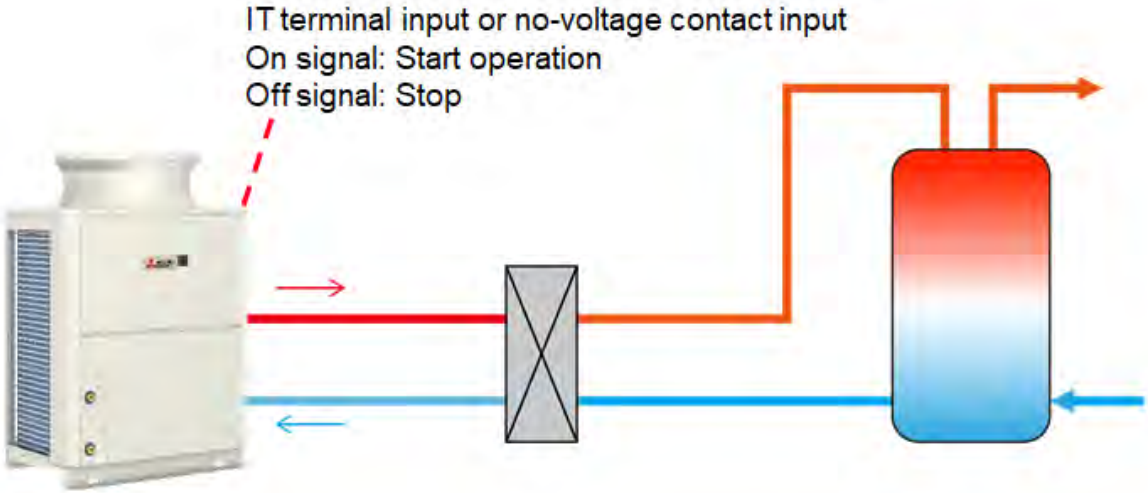


No.	Component	Application
12	Flow sensor (Optional parts)	Measures and controls the secondary side flow rate
13	Temperature sensor (Optional parts)	Measures and controls the secondary side outlet hot water temperature
14	Plate heat exchanger	Exchanges heat between hot water output from the unit and water input from the tank
15	Pump + Flow rate adjustment device	Outputs hot water from the secondary side and adjusts the flow rate
16	Water piping	Water flow channel
17	Anti-freeze heater	Prevents pipe damage due to freezing of the water circuit
18	Union joint	Improves the workability of replacing equipment
19	Valve	Improves the workability of cleaning the heat exchanger and replacing parts
20	Strainer	Prevents foreign materials from entering into the heat exchanger
21	Air vent valve	Bleeds air from the pipe
22	Flexible joint	Prevents the propagation of vibration
23	Water pressure gauge	Used to check the operation status
24	Expansion tank	Absorbs excessive water pressure due to expansion caused by a rise in temperature
25	Drain valve	Improves workability of replacing equipment
26	Safety valve	Prevents rupturing of the water circuit

Control Method

Local control

Controlling QAHV's outlet hot water temperature by analog signal input or dip switches (Control board on the unit).



Advantages

Using the QAHV input and output contacts, hot water supply system can be freely configured on-site.
This system is suitable if you want to configure a system freely by yourself.

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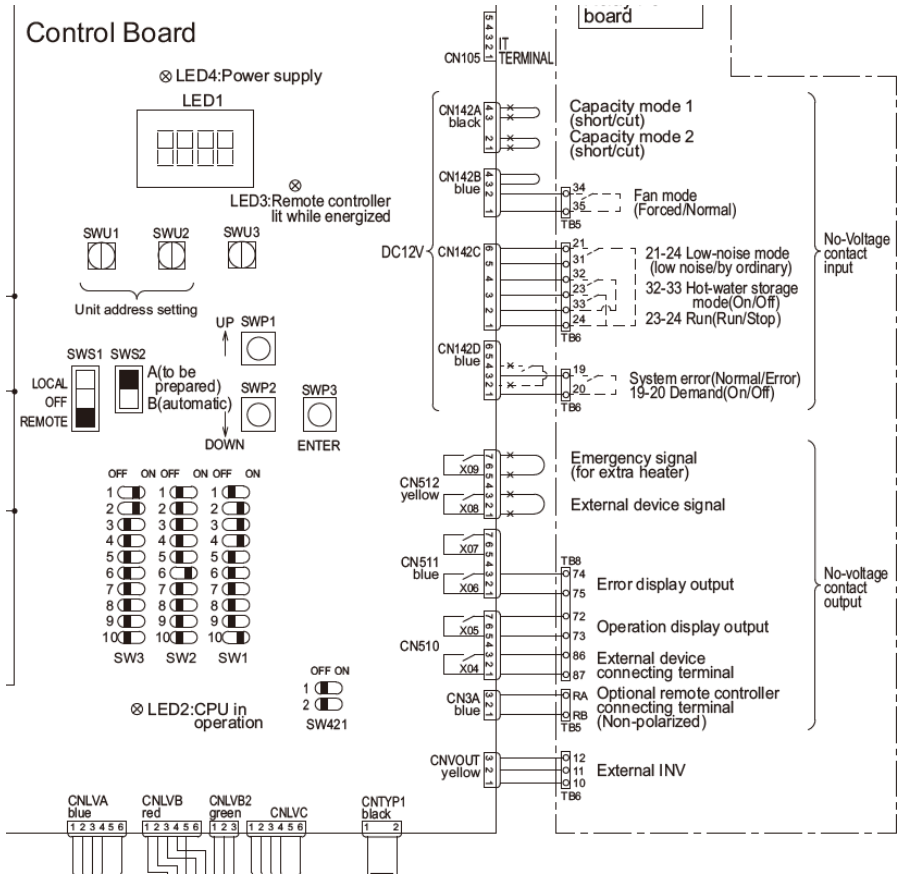
When using a local controller, refer to the table below for the types of input/output signals that are available and the operations that correspond to the signals.

External Input/Output

Input type	Dry contact		ON (Close)	OFF (Open)	Terminal block/ connector	Three-sensor method Six-sensor method			Local control method	
						main sensor	sub sensor *2	sub unit	main unit	sub unit
	(a) UNIT OPERATION	Run/ Stop	The unit will go into operation when the water temperature drops below the preset temperature.	The unit will stop except when the unit is in the Anti-Freeze mode.	TB6 23-24	△ *3	-	-	○	-
	(b) FAN MODE	Forced/ Normal	The fan will remain in operation after the compressor has stopped (including when the OPERATION status is "STOP").	The fan will stop when the compressor stops.	TB5 34-35	△	-	-	△	-
	(c) PEAK-DEMAND CONTROL	On/Off	The unit will operate at or below the maximum capacity level that was set for the Peak-demand control setting.	-	TB6 19-20	△	△	△	△	△
	(d) Hot water storage mode	On/Off	Heating operation with the set outlet hot water temperature	Stop	TB6 32-33	△ *3	-	-	○	-
	(e) Low-noise mode	On/Off	Operation using the set capacity as an upper limit	Normal operation	TB6 21-24	△	△	△	△	△
	Analog				Terminal block/ connector	main sensor	sub sensor *2	sub unit	main unit	sub unit
	(f) WATER TEMP SETTING CONTROL		Water temperature control can be set by using the external analog input to the CN421 on the circuit board. One analog input type can be selected from the following types: 4-20 mA, 1-5 V, 0-10 V, or 2-10 V.		CN421 2(+)-3(-)	△	-	-	△	-
	(g) EXTERNAL WATER SENSOR 1 (optional)		-		TB5 25-26	○	○	-	-	-
	(h) EXTERNAL WATER SENSOR 2 (optional)		-		TB5 27-28	○	○	-	-	-
	(i) EXTERNAL WATER SENSOR 3		-		TB5 27-30	○	○	-	-	-
	(j) EXTERNAL WATER SENSOR (secondary circuit)		-		TB5 T1-T2	○ *4	○ *4	○ *4	○ *4	○ *4
	(k) EXTERNAL PUMP (secondary circuit)		-		CN512 1-3	○ *4	○ *4	○ *4	○ *4	○ *4
	(l) FLOW SENSOR (secondary circuit)		-		TB4 13-14	○ *4	○ *4	○ *4	○ *4	○ *4
	(m) FLOW ADJUSTMENT DEVICE (secondary circuit)		-		TB6 10-12	○ *4	○ *4	○ *4	○ *4	○ *4
Output type	Contact type		Conditions in which the contact closes (turns on)	Conditions in which the contact opens (turns off)	Terminal block/ connector	main sensor	sub sensor *2	sub unit	main unit	sub unit
	(n)ERROR INDICATOR	Close/ Open	The unit has made an abnormal stop.	During normal operation	TB8 74-75	△	△	△	△	△
	(o) OPERATION INDICATOR	Close/ Open	The "Unit Operation" contact (item (a) above) or the ON/OFF button on the remote controller is ON.	The "Unit Operation" contact (item (a) above) or the ON/OFF button on the remote controller is OFF.	TB8 72-73	△	△	△	△	△
	(p) Emergency signal (for extra heater)	Close/ Open	Outside temperature is at or below 1ºC (34ºF)	Outside temperature is at or above 3ºC (37ºF)	CN512 5-7	△	△	△	△	△
	(q) EXTERNAL DEVICE	Close/ Open	During freeze-up protection operation During pump residue operation	Other than the items at left	TB8 86-87	△	△	△	△	△
RC/ SC/ M-NET	REMOTE CONTROLLER		PAR-W31MAA		TB5 RA-RB	△	-	-	-	-
	SYSTEM CONTROLLER		AE-200		TB7 MA-MB*1	△	-	-	-	-
	M-NET		-		TB3 MA-MB	○ *5	○	○	○ *5	○

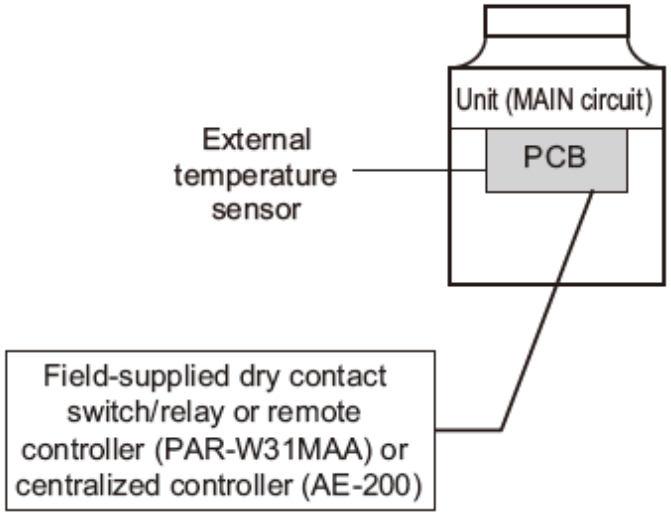
○: Setting required △: Settings are required as needed -: No settings required

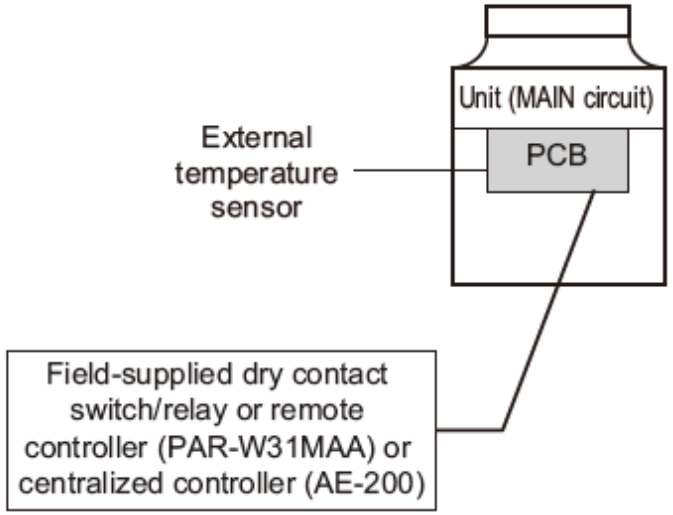
*1 When AE-200 is connected, leave the power jumper on the outdoor unit as it is (Connected to CN41 at factory shipment). If the power jumper is connected to CN40, power will excessively be supplied and AE-200 will not properly function.
*2 Only Six-sensor method.
*3 Required if not connected to PAR-W31MAA and AE-200.
*4 Required only when secondary control is enabled.
*5 Required only when multiple units are connected.



External Control or Single Sensor Control

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





PAR-W31MAA

Up to 16 units can be controlled with one remote controller.

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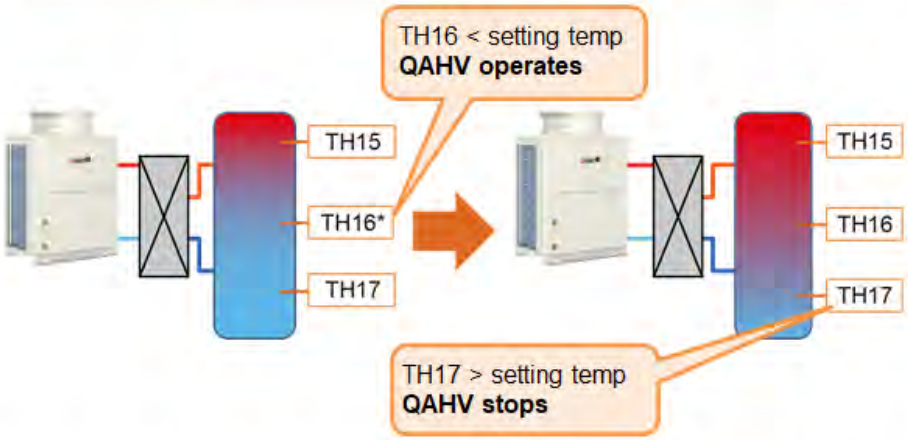
PAR-W31 or AE-200 is required

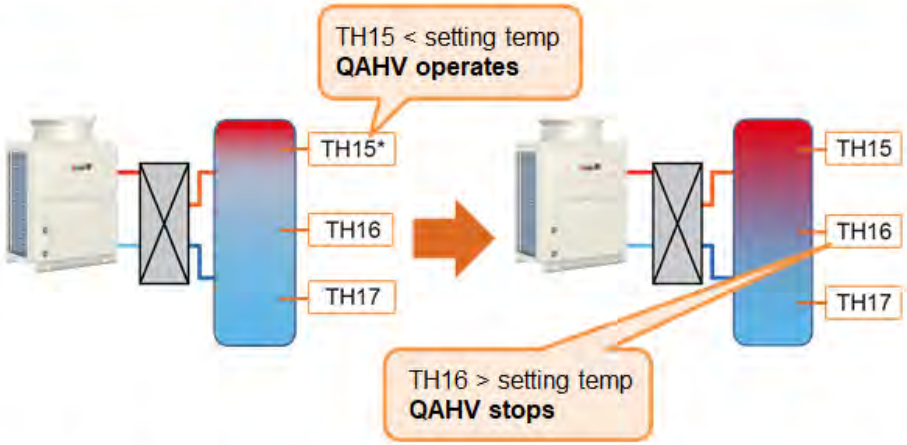
Domestic hot water storage volume is large



Hot water storage operation is performed so that the TH17 reading is higher than the set temperature of QAHV.
Operation of the unit is controlled based on the sensor reading.

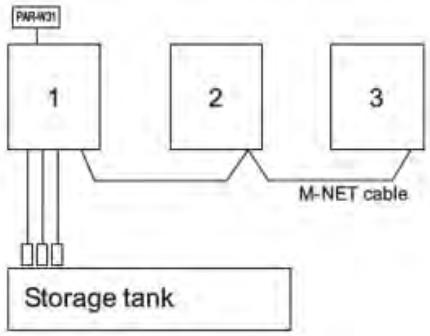
* TH16 temperature < (Set water temperature - Mode 2 Thermo differential value [Code: 1509]).
Unit operation start.

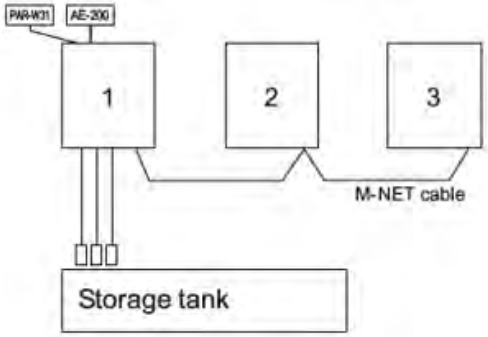
Domestic hot water storage volume is small



Hot water storage operation is performed so that the TH16 reading is higher than the set temperature of QAHV.
Compared to when DHW storage volume is large, the hot water storage operation time can be reduced, enabling efficient operation.

To be set on the circuit board for each operation mode/Default value is differential 50°F (10°C).
* TH15 temperature < (Set water temperature - Mode 1 Thermo differential value [Code: 1508]).
Unit operation start.





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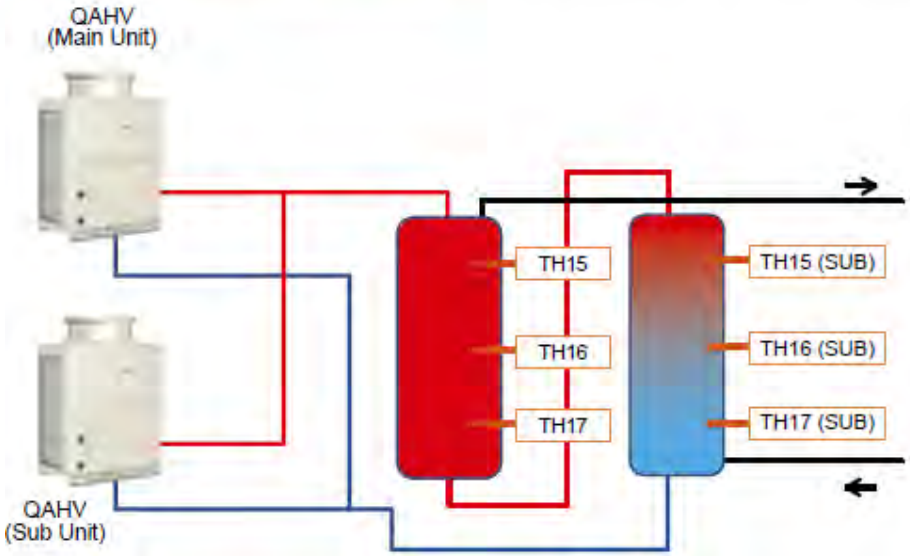
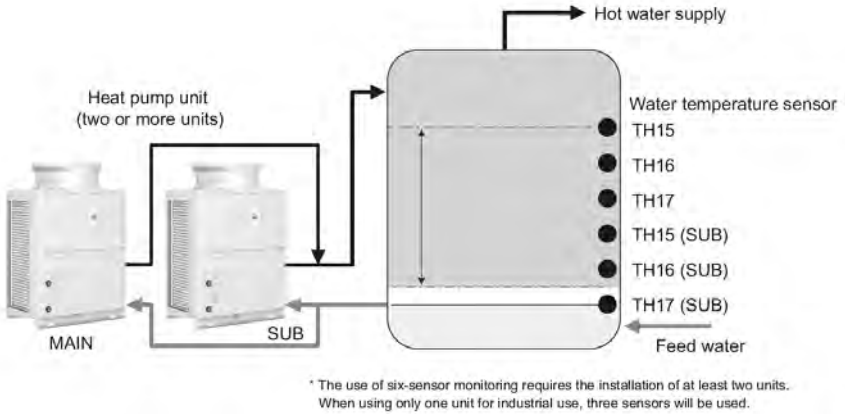
6 Sensor Control Method

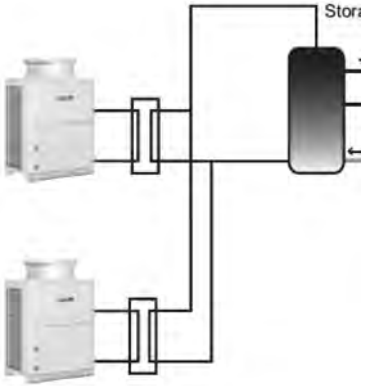
Controlling the water temp in the storage tank by using six water temp sensors (TW-TH16E)

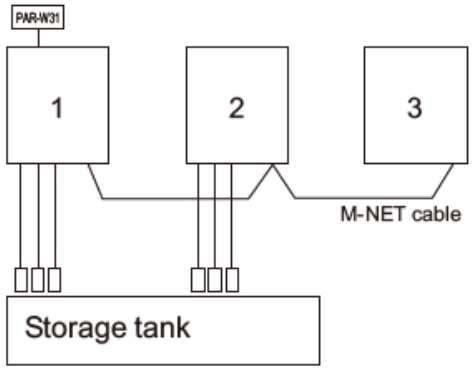
* Requires 2 or more QAHVs to use the 6 sensors

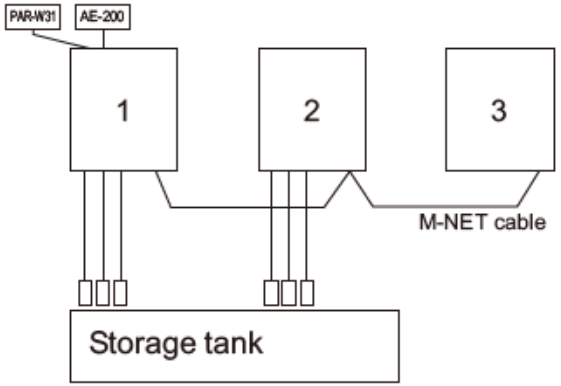




*Each QAHV will require a dedicated heat exchanger







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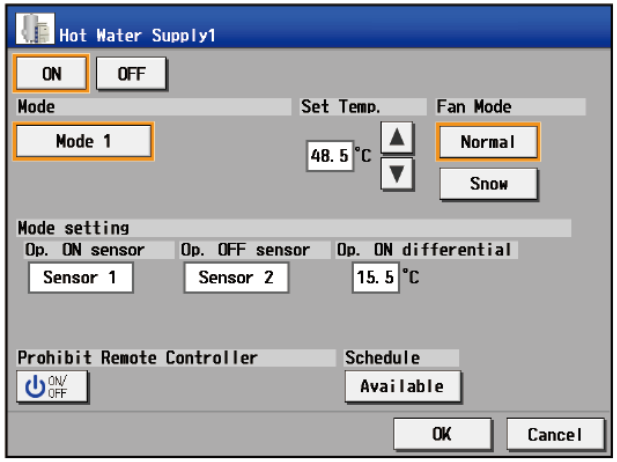
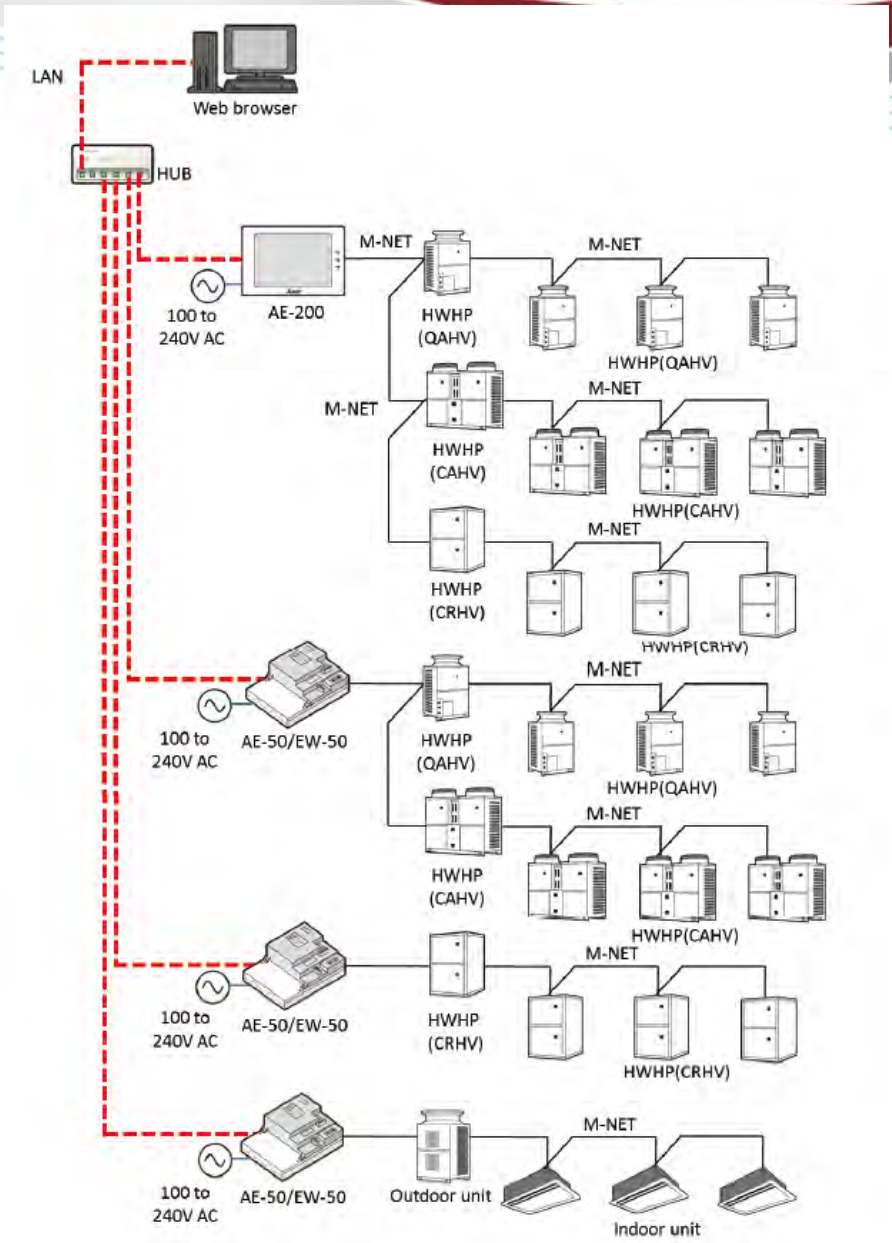
AE-200

HWHP operation screen (QAHV)



Apportion function NOT available.



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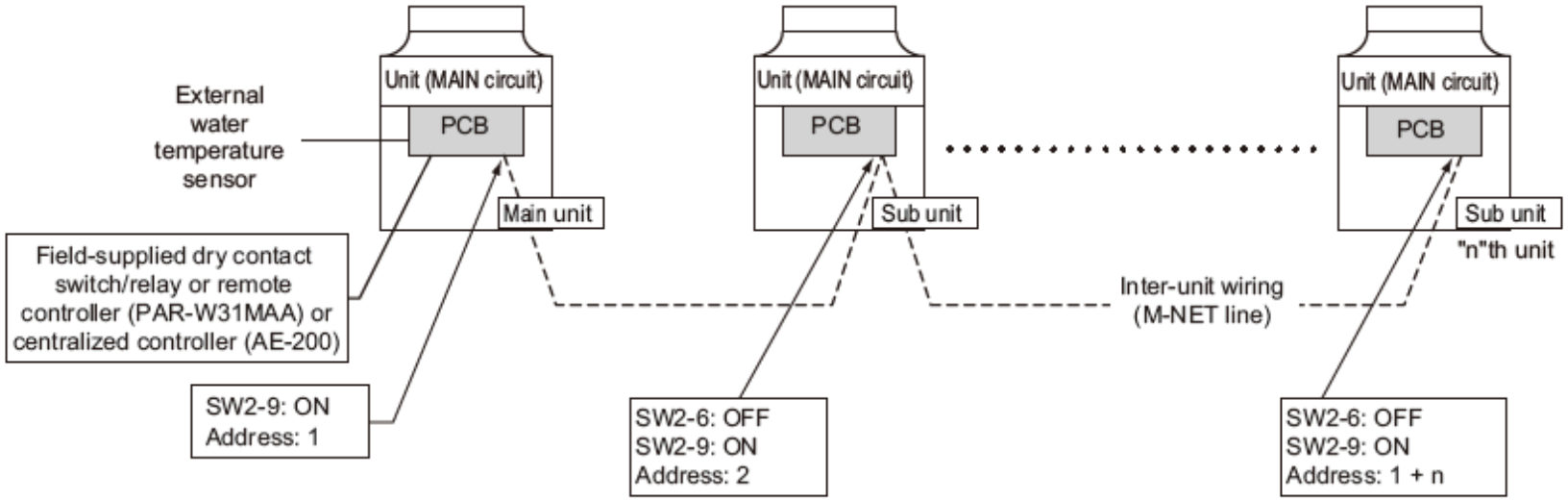
Up to 16 Units/ 2176 MBH Total



* The main unit is the unit to which an external water temperature sensor is connected.

(*) Main/Sub units and switch settings

	SW2-9 (Multiple system)
Main unit (Unit to which the external water temperature sensor is connected.)	ON

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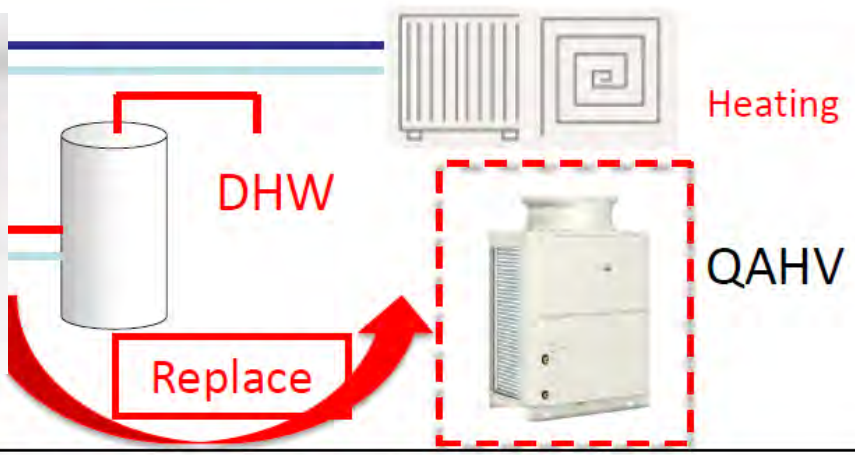
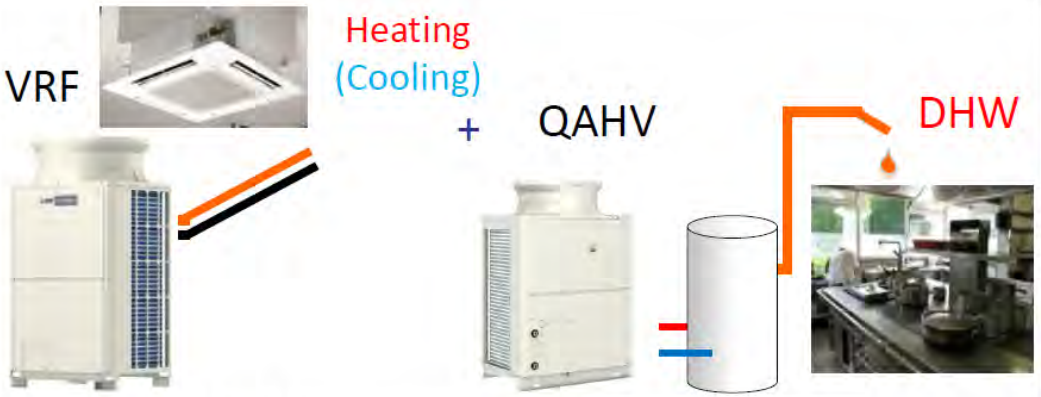
CITY MULTI MULTIPLE SPLIT-TYPE VRF SYSTEMS

System ima	 
opportunity	Replacing exsiting (aging) oil boilers by QAHV
Key notes	-High efficiency: Very good -Lower CO2 emissions:Very good -Safety, Cleaness: Very good -Maintenace: Good We can expect good business opportunities to replace existing and aging boilers by QAHV and to create the ideal solution for commerial application with high hot water demand.

Adding QAHV to existing Atmospheric Boiler Plant

Opportunity

System image	
opportunity	Promoting QAHV for commercial applications where City multi is also installed.
Key notes	-Envirnmnnetal benefits: Very good (compared to boilers) -Running cost saving: Very good -Control/monitoring: Good (with AE-200E) We can supply our customers with the **complete solution** for Cooling, Heating and Hot water by proposing City Multi plus QAHV/CAHV (plus AE-200E).

QAHV-N136TAU-HPB

- Multiple module combination
- High capacity per module
- Utilizes Natural refrigerant (CO_2)
- High efficiency (Achieved COP 4.11*1)
- Supply high temperature hot water (Up to 176°F/80°C)
- Operable even at low outdoor temp of -13ºF/-25ºC*2
- External Control available

*1 Under normal heating conditions at the outdoor temperature of 80.6ºFDB/71.2ºFWB (27.0ºCDB/21.8ºCWB), the outlet water temperature of 120ºF (48.9ºC), and the inlet water temperature of 70ºF (21.1ºC).
*2 Maximum outlet hot water temp on secondary side is 158ºF/70ºC.

*Specifications are subject to change without notice

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Discussion