

HOT WATER HEAT PUMP

*4th edition*

# HOT WATER HEAT PUMP

*FOR HOSPITALS*

*FOR HOTELS*

*FOR OFFICES*

*FOR FITNESS  
FACILITIES*



**Air Source Heat Pump**  
CAHV-P500YB-HPB



**Ground Source Heat Pump**  
CRHV-P600YA-HPB

# Mitsubishi Electric

## - A Leading Manufacturer of Hot Water Heat Pumps

Mitsubishi Electric has been designing and manufacturing commercial hot water heat pumps since 1970.

We were one of the first manufacturers in Japan to utilize heat pump technology to provide hot water, which can supply hot water of up to 70°C, high enough to eliminate legionella bacteria.



We quickly rose to the forefront of the hot water supply industry in Japan - a position we still enjoy today.

Our products are mainly used in commercial applications, such as hotels, hospitals, and nursing homes, where they are providing highly reliable performance.

From this position as a leading manufacturer in the hot water supply industry, we are proud to introduce our new highly efficient hot water heat pump system.



## Lineup of Hot Water Heat Pumps

Description	Air Source Heat Pump	Ground Source Heat Pump
Model	CAHV-P500YB-HPB	CRHV-P600YA-HPB
Refrigerant	R407C	R410A
		

## OPTIONAL PARTS

Description	Model	Remarks
Representative-water temperature sensor	TW-TH16-E	for CAHV-P500YB-HPB,CRHV-P600YA-HPB
Y type STRAINER 50A	YS-50A	for CRHV-P600YA-HPB
IT terminal box	AM-01A	for CAHV-P500YB-HPB

## CONTROLLER



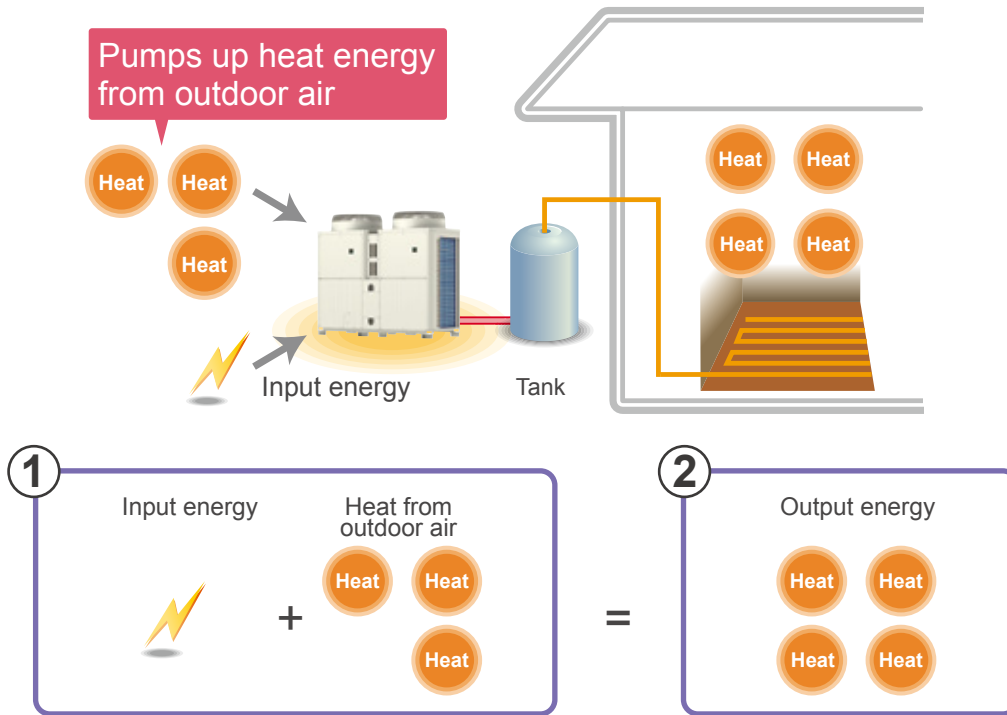
### PAR-W21MAA

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

# Air Source Heat Pump

CAHV-P500YB-HPB

## Heat Pump System



For hot water supply!



For floor heating!

# 70°C High temperature

# COP over 4\*

\*COP 4.13  
Outdoor temp.: 7°C DB/ 6°C WB  
Outlet water temp.: 35°C

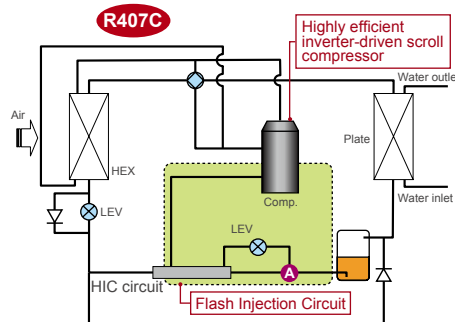
A "Flash Injection Circuit," which is designed for our ZUBADAN CITY MULTI air conditioning system for cold regions, is incorporated in our new hot water heat pump. Through utilizing this advanced "Flash Injection Circuit" and the latest high-efficiency compressor, the hot water heat pump is able to provide hot water of 70°C with the use of R407C and with better retention of capacity at low outdoor temperatures.

**Built-in inverter-driven scroll compressor**



Highly efficient

## Flash Injection Circuit



High performance even at low outdoor temp.

Two-phase refrigerant is separated into liquid refrigerant and gas refrigerant at the point of A. Liquid refrigerant, whose pressure is reduced by the linear expansion valve (LEV), exchanges heat in the HIC circuit and become gas-liquid two-phase refrigerant. This two-phase refrigerant flows into the injection port in the compressor for controlling the increase of the discharge temperature. Therefore the optimal amount of refrigerant can be provided to the system via the compressor, which makes it possible to provide hot water of 70 °C.

## Backup function

The hot water heat pump ensures an exceptionally high level of reliability through a backup function.\* If either of the compressors malfunctions, the other compressor maintains operation to avoid a complete stop of the system.

A rotation function is also available. When two or more units are in the system, the unit runs alternately, ensuring an optimum product lifecycle for both component units.

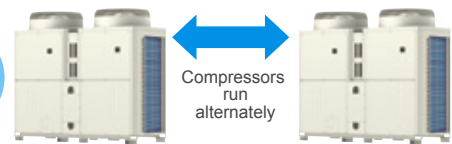
\*If the main circuit board malfunctions, the backup function and rotation function are not available.

\*Capacity drops by 50%.

Backup function



Rotation function



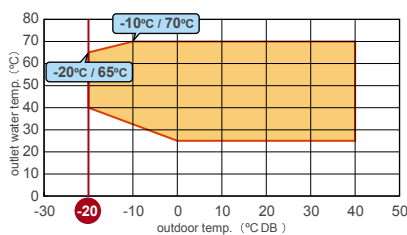
Depending on settings, the rotation function is available for units.

## Operable even at -20°C

The hot water heat pump can be operated at outdoor temp. between -20°C and 40°C.

It delivers precise comfort even on the coldest days of the year.

### Range of operation temperature and outlet water temperature



During defrosting, two compressors, which are equipped within one unit, run alternately resulting in less drop in outlet water temperature.

## 51dB(A)\* Low sound pressure level

Lower sound pressure levels have been achieved thanks to the development of a new fan.

\*Based on theoretical calculations for a distance of 10m.

## Rotation function

## Wide variety of external input/output

Various system configurations are available.

- Two external output for backup heater
- Analog input to control capacity
- Defrost signal

\* Refer to the Data Book for other functions.

## 60Pa External static pressure

Ducting can be connected to the inlet or outlet of the outdoor unit.

Either "60 Pa" or "0 Pa" can be selected. \* The factory setting is "0 Pa."

## Support for open network

With the CRHV model, now allowing connection of an IT terminal, the connection to the open network is now possible.

It will allow energy monitoring for the entire building including air conditioners and other electric appliances.

It is also possible to control the water temperature and capacity of the CRHV model.

## Other features

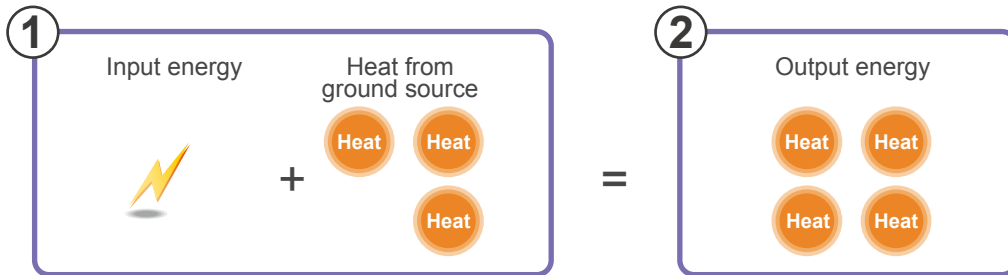
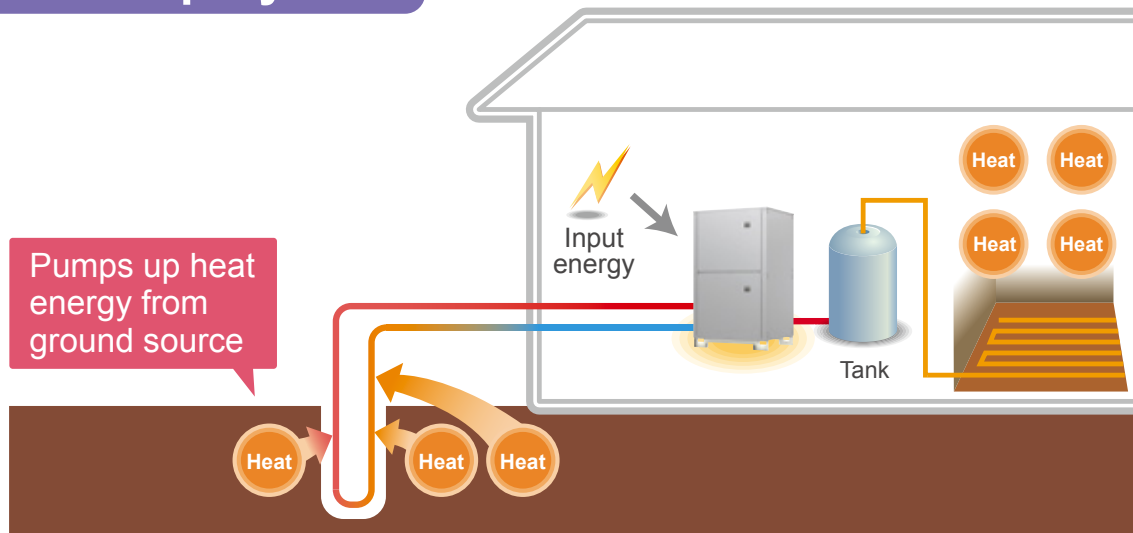
· The system is equipped with "Efficiency Priority Mode" and "Capacity Priority Mode." "Capacity Priority Mode" is more effective when used with a boiler because the boiler's fuel cost and CO<sub>2</sub> emissions can be reduced.

· The hot water heat pump has been awarded the Promotion Award of the Heat Pump and Thermal Storage Technology Center of Japan in the 2011 Electric Load Leveling Equipment and Systems.

# Ground Source Heat Pump

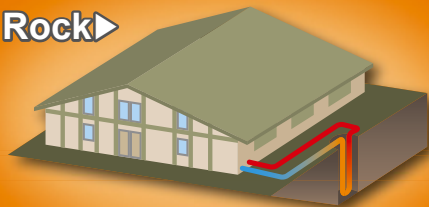
CRHV-P600YA-HPB

## Heat Pump System

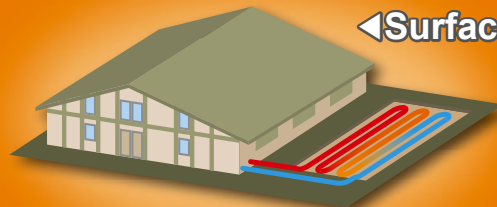


## Heat Sources

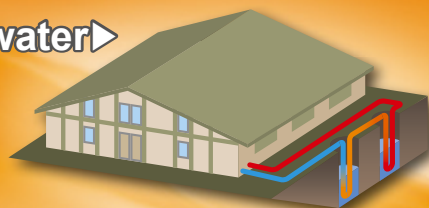
Rock



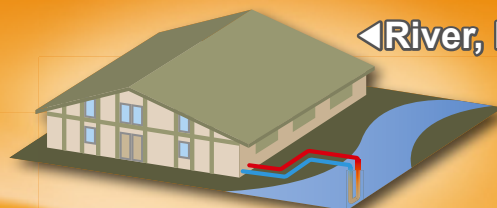
Surface soil



Ground water

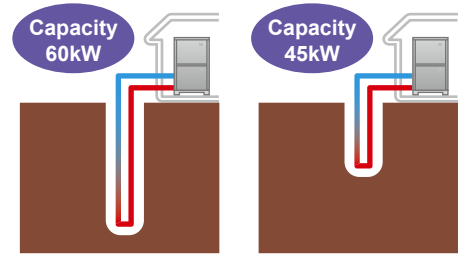


River, Lake



# Support for system renewal

Since the CRHV model is inverter-controlled, the unit-side capacity can be adjusted to suit the existing bore hole heat quantity (demand control).



## 65°C High temperature

## SCOP Over 4\*

\*SCOP 4.33  
Brine outlet temp.: -3°C  
Outlet water temp.: 35°C

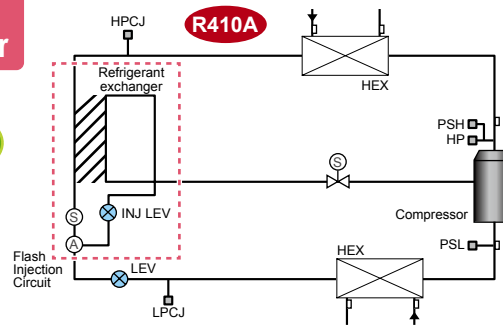
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**Built-in inverter-driven scroll compressor**



Highly efficient

### Flash Injection Circuit



High performance even at low water temp.

Two-phase refrigerant is separated into liquid refrigerant and gas refrigerant at the point of (A). Liquid refrigerant, whose pressure is reduced by the linear expansion valve (LEV), exchanges heat in the HIC circuit and become gas-liquid two-phase refrigerant. This two-phase refrigerant flows into the injection port in the compressor for controlling the increase of the discharge temperature. Therefore the optimal amount of refrigerant can be provided to the system via the compressor, which makes it possible to provide hot water of 65 °C.

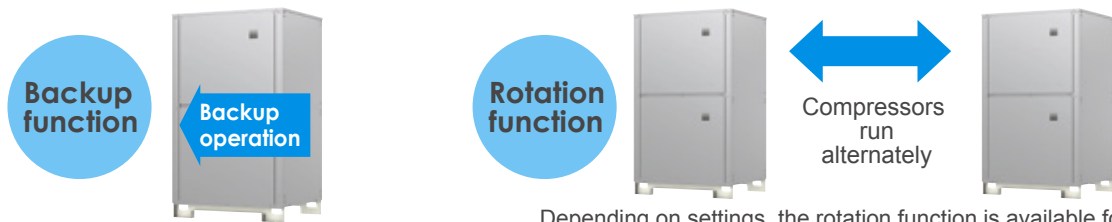
## Backup function

## Rotation function

The hot water heat pump ensures an exceptionally high level of reliability through a backup function.\* If either of the compressors malfunctions, the other compressor maintains operation to avoid a complete stop of the system.

A rotation function is also available. When two or more units are in the system, the unit runs alternately, ensuring an optimum product lifecycle for both component units.

\*If the main circuit board malfunctions, the backup function and rotation function are not available. \*Capacity drops by 50%.

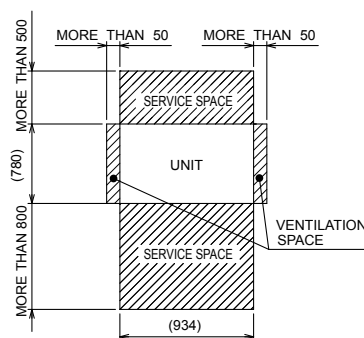


Depending on settings, the rotation function is available for units.

## Small space

A smaller footprint has been achieved through developing a new highly efficient heat exchanger with low pressure loss. Installation footprint of 0.73m<sup>2</sup>\*

\*Installation footprint for one unit without service space.



## A coated model is also available.

Selection is available from uncoated (standard) and coated specifications.



\*Color selection is available from silver (uncoated) or white (coated).  
\*Additional charge is necessary for the coated type.

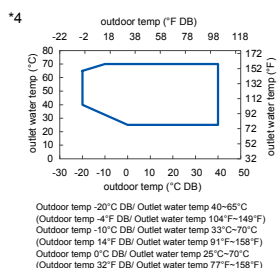
# Specifications

Model		CAHV-P500YB-HPB			
Power Source		3-phase 4-wire 380-400-415V 50/60Hz			
Capacity *1	kW	45			
		kcal/h		38,700	
		BTU/h		153,540	
	Power input	kW	12.9		
	Current input	A	21.78 - 20.69 - 19.94		
COP (kW / kW)		3.49			
Capacity *2	kW	45			
		kcal/h		38,700	
		BTU/h		153,540	
	Power input	kW	25.6		
	Current input	A	43.17 - 41.01 - 39.53		
COP (kW / kW)		1.76			
Seasonal space heating energy efficiency class for medium-temperature application		A++			
Seasonal space heating energy efficiency class for low-temperature application		A+			
Maximum current input *3		A	57.77 - 54.88 - 52.90		
Water pressure drop *1		12.9kPa (1.87psi)			
Temp range	Outlet water temp *4		25~70°C 77~158°F		
	Outdoor temp *4	D.B	-20~40°C -4~104°F		
Circulating water volume range		7.5 m³/h-15.0m³/h			
Sound Pressure level (measured in anechoic room) *1		dB (A)	59		
Sound Pressure level (measured in anechoic room) *3		dB (A)	63		
Diameter of water pipe	Inlet	mm (in.)	38.1 (Rc 1 1/2") screw		
	Outlet	mm (in.)	38.1 (Rc 1 1/2") screw		
External finish		Acrylic painted steel plate <MUNSELL 5Y 8/1 or similar>			
External dimension H × W × D		mm in.	1,710 (without legs 1,650) × 1,978 × 759 67.3 (without legs 65.0) × 77.9 × 29.9		
Net weight		kg (lbs)	511 (1127)		
Accessories		Y strainer Rc 1 1/2			
Design Pressure	R407C	MPa	3.85		
	Water	MPa	1.0		
Drawing	Wiring	KC94R746			
	External	KC94R745			
Heat exchanger	Water side	stainless steal plate and copper brazing			
	Air side	Plate fin and copper tube			
Compressor	Type	Inverter scroll hermetic compressor			
	Maker	MITSUBISHI ELECTRIC CORPORATION			
	Starting method	Inverter			
	Motor output	kW	7.5 × 2		
	Case heater	kW	0.045 × 2		
	Lubricant	MEL32			
FAN	Air flow rate	m³/min	185 × 2		
		L/s	3,083 × 2		
		cfm	6,532 × 2		
	External static press *5		0Pa, 60Pa (0mmH <sub>2</sub> O/6.1mmH <sub>2</sub> O)		
	Type × Quantity		Propeller fan × 2		
	Control, Driving mechanism		Inverter-control, Direct-driven by motor		
Motor output		kW	0.46 × 2		
HIC circuit (HIC:Heat inter-Changer)		Copper pipe			
Protection	High pressure protection		High pres.Sensor & High pres.Switch at 3.85MPa (643psi)		
	Inverter circuit		Over-heat protection, Over current protection		
	Compressor		Over-heat protection		
	Fan motor		Thermal switch		
Defrosting method		Auto-defrost mode (Reversed refrigerant circle)			
Control		LEV and HIC circuit			
Type		R407C			
GWP *6		1,774			
Original charged	Weight		11.0		
	CO <sub>2</sub> equivalent		161.3		

\*1 Under Normal heating conditions at outdoor temp, 7°C DB/6°C WB(44.6°F DB/42.8°F WB) outlet water temp 45°C(113°F), inlet water temp 40°C(104°F)

\*2 Under Heating conditions at outdoor temp, 7°C DB/6°C WB(44.6°F DB/42.8°F WB), outlet water temp 70°C (158°F)

\*3 Under Heating conditions at outdoor temp, 7°C DB/6°C WB(44.6°F DB/42.8°F WB) when this unit is set to capacity priority mode by non-voltage B contact



\*5 Dip SW on the unit control board need to be changed.

\*6 This table is based on Regulation(EU) No517/2014

- \* Due to continuing improvement, the above specifications may be subject to change without notice.
- \* Please don't use the steel material for the water piping material.
- \* Please always make water circulate or pull out the circulation water completely when not using it.
- \* Please do not use groundwater and well water.
- \* Install the unit in an environment where the wet bulb temp will not exceed 32°C (89.6°F).
- \* The water circuit must use the closed circuit.

Unit converter  
kcal/h =kW × 860  
BTU/h =kW × 3,412  
cfm =m³/min × 35.31  
lbs =kg/0.4536

<External input/output from the unit>

\*The unit can be operated and the operation status can be monitored with external input/output terminals.



Model		CRHV-P600YA-HPB		
Power Source		3-phase 4-wire 380-400-415V 50Hz		
SCOP(TDesign60kW):EN14825	Heat source temp 0/-3, Hot water temp 30/35	4.33		
Average climate conditions	Heat source temp 0/-3, Hot water temp 47/55	2.86		
Capacity1 *1	kW	60.0		
		51,600		
		204,720		
	Power input *2	kW	14.2	
	Current input 380-400-415V	A	24.0 - 22.8 - 22.0	
	COP (kW / kW)		4.23	
	Hot water flow rate	m³/h	10.3	
Heat source flow rate	m³/h	14.7		
Capacity2 *1	kW	45.0		
		38,700		
		153,540		
	Power input *2	kW	10.2	
	Current input 380-400-415V	A	17.2 - 16.4 - 15.8	
	COP (kW / kW)		4.41	
	Hot water flow rate	m³/h	7.7	
Heat source flow rate	m³/h	11.2		
Seasonal space heating energy efficiency class for medium-temperature application		A++		
Seasonal space heating energy efficiency class for low-temperature application		A++		
Maximum current input		A	44	
Heat source fluid type		ethylene glycol 35WT% (freezing point -18°C (-0.4°F))		
Water pressure drop	Hot water side *3	kPa	14	
	Heat source side *3	kPa	38	
Temp range	Hot water side	°C	(inlet) less than 55, (outlet) 30~65 *6	
		°F	(inlet) less than 131, (outlet) 86~149 *6	
	Heat source side *4	°C	(inlet) less than 45, (outlet) -8~27	
		°F	(inlet) less than 113, (outlet) 17.6~80.6	
Circulating water volume range	Hot water side	m³/h	3.2 - 15.0	
	Heat source side *7	m³/h	2.0 - 16.0	
Sound pressure level (measured in anechoic room) at 1m *3		dB (A)	50	
Sound power level (measured in anechoic room) *3		dB (A)	66	
Installation location*5		Indoor use only		
Diameter of water pipe (hot water side)	Inlet	mm (in.)	50.8 (R2") screw	
	Outlet	mm (in.)	50.8 (R2") screw	
Diameter of water pipe (heat source side)	Inlet	mm (in.)	50.8 (R2") screw	
	Outlet	mm (in.)	50.8 (R2") screw	
External finish		Unpainted steel plate		
External dimension H × W × D		mm	1,561 × 934 × 780	
Net weight		kg (lbs)	413 (910)	
Design Pressure	R410A	MPa	4.15	
	Water	MPa	1.0	
Drawing	Wiring	KC94L652X01		
	External	KC94L810X01		
Heat exchanger	Hot water side	stainless steel plate and copper brazing		
	Heat source side	stainless steel plate and copper brazing		
Compressor	Type	Inverter scroll hermetic compressor		
	Maker	MITSUBISHI ELECTRIC CORPORATION		
	Starting method	Inverter		
	Case heater	kW	0.035 × 2	
	Lubricant	MEL32		
Protection	High pressure protection	High pres.Sensor & High pres.Switch at 4.15MPa (601psi)		
	Inverter circuit	Over-heat protection, Over current protection		
	Compressor	Over-heat protection		
Control		LEV and HIC circuit		
Type		R410A		
GWP *8		2,088		
Original charged	Weight	9.0		
	CO <sub>2</sub> equivalent	232		

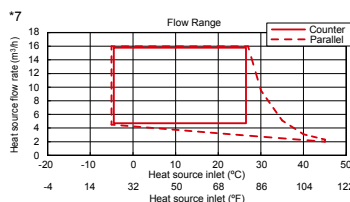
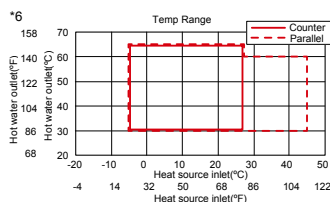
\*1 Under Normal heating conditions at outlet hot water temp 35°C(95°F) outlet heat source temp -3°C(26.6°F) inlet hot water temp 30°C(86°F) inlet heat source temp 0°C(32°F). Heating performance indicates the performance with counter flow of brine and refrigerant at the heat source HEX. (Standard pipe connection)

\*2 Includes pump input based on EN14511.

\*3 Under Normal heating conditions at outlet hot water temp 35°C(95°F) outlet heat source temp -3°C(26.6°F) inlet hot water temp 30°C(86°F) inlet heat source temp 0°C(32°F) capacity 60kW hot water flow rate 10.3m³/h heat source flow rate 14.7m³/h Heating performance indicates the performance with counter flow of brine and refrigerant at the heat source HEX. (Standard pipe connection)

\*4 When using in inlet heat source temp is more than 27°C, please change to parallel piping at the heat source side.  
 \*Please don't use the steel material for the water piping material.  
 \*Please always make water circulate or pull out the circulation water completely when not using it.  
 \*Please do not use groundwater and well water in direct.  
 \*The water circuit must use the closed circuit.  
 \*Due to continuing improvement, the above specifications may be subject to change without notice.

\*5 Install the unit indoors only. Do not install outdoors.



Unit converter  
 kcal/h = kW × 860  
 BTU/h = kW × 3,412  
 lbs = kg/0.4536

\*8 This table is based on Regulation(EU) No517/2014

# PAR-W21MAA Specifications

## [CAHV-P500YB-HPB]

Item	Description	Operations	Display
ON/OFF	Runs and stops the operation of a group of units	○	○
Operation mode switching	Switches between Hot Water / Heating / Heating ECO / Anti-freeze / Cooling * Available operation modes vary depending on the unit to be connected. * Switching limit setting can be made via a remote controller.	○	○
Water temperature setting	Temperature can be set within the ranges below. (in increments of 1°C or 1°F) Hot Water 25°C ~ 70°C Heating 25°C ~ 55°C Heating ECO 30°C ~ 45°C Anti-freeze 25°C * The settable range varies depending on the unit to be connected.	○	○
Water temperature display	10°C ~ 90°C (in increments of 1°C or 1°F) * The settable range varies depending on the unit to be connected.	×	○
Permit / Prohibit local operation	Individually prohibits operations of each local remote control function :ON/OFF, Operation modes, water temperature setting, Circulating water replacement warning reset. * Upper level controller may not be connected depending on the unit to be connected.	×	○
Weekly scheduler	ON / OFF / Water temperature setting can be done up to 6 times one day in the week. (in increments of a minute)	○	○
Error	When an error is currently occurring on a unit, the afflicted unit and the error code are displayed.	×	○
Self check (Error history)	Searches the latest error history by pressing the CHECK button twice.	○	○
Test run	Enables the Test run mode by pressing the TEST button twice. * Test run mode is not available depending on the unit to be connected.	○	○
LANGUAGE setting	The language on the dot matrix LCD can be changed. (Seven languages) English/German/Spanish/Russian/Italian/French/Swedish	○	○
Operation locking function	Remote controller operation can be locked or unlocked. • All-switch locking • Locking except ON/OFF switch	○	○

## [CRHV-P600YA-HPB]

Item	Description	Operations	Display
ON/OFF	Runs and stops the operation of a group of units	○	○
Operation mode switching	Switches between Hot Water / Heating / Heating ECO / Anti-freeze * Available operation modes vary depending on the unit to be connected. * Switching limit setting can be made via a remote controller.	○	○
Water temperature setting	Temperature can be set within the ranges below. (in increments of 1°C or 1°F) Hot Water 30°C ~ 65°C Heating 30°C ~ 45°C Heating ECO 30°C ~ 45°C Anti-freeze 30°C * The settable range varies depending on the unit to be connected.	○	○
Water temperature display	10°C ~ 90°C (in increments of 1°C or 1°F) * The settable range varies depending on the unit to be connected.	×	○
Permit / Prohibit local operation	Individually prohibits operations of each local remote control function :ON/OFF, Operation modes, water temperature setting, Circulating water replacement warning reset. * Upper level controller may not be connected depending on the unit to be connected.	×	○
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# Marstrands Havshotel

## Marstrand, Sweden

### Installation Summary

- **Application Type** : SPA
- **Product** : 2 × CAHV heat pump boilers
- **Capacity** : 68kW at -20°C ambient
- **Heat Delivery Method** : Radiators and hot water
- **Outlet water temp.** : 65°C

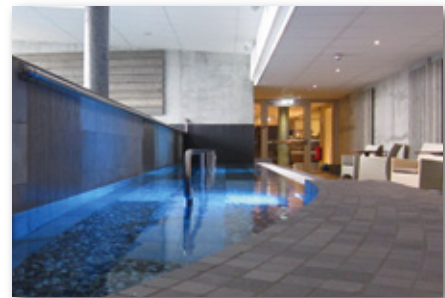


### The Challenge

Marstrands Havshotel has 124 rooms, a large restaurant, and a spa area with sauna and swimming pools.

The existing heating system of Marstrands Havshotel was oil boiler heating system, which was high-priced, and the operation costs were also high. Consultancy and hotel distributor explained early on that they wanted a hotel with high climatic comfort and low operating costs.

The hotel owner desired a sustainable and energy-efficient hotel that never compromises guest comfort.



### The Solution



Both the hotel owner and the consultants chose indoor units (PEFY-P-VMR-E) to heat and cool the hotel rooms. The system includes Air To Water Booster units (PWFY-P-VM-E-BU) to reuse wasted heat from cooling operation for hot water supply.

It was also possible to regenerate energy from water left over in the SPA, along with ground sources. The choice fell on WR2 systems with Air To Water Booster units (PWFY-P-VM-E-BU).

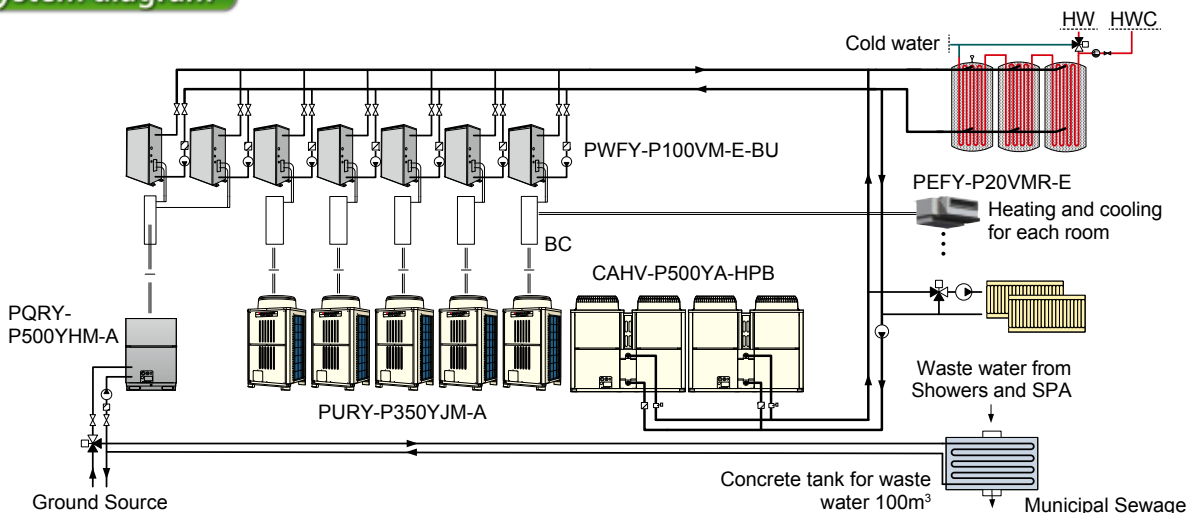
To support heating (using radiators) and hot water supply at the extreme low temperature, the consultants chose CAHV heat pump boilers for their effectiveness.

The two new CAHV heat pump boilers are capable of providing the capacity of 68kW at -20 °C.

### User Testimonial

*"I believe that no heat pumps are better than the ones from Mitsubishi Electric. We can supply our customer with the complete solution for Cooling, Heating, and Hot water. In Sweden, standard hotels consume totally about 350 kW/h/m<sup>2</sup> (this includes everything) on average, whereas Marstrands Hotel consumes 160 kW/h/m<sup>2</sup>. The savings on energy bills between the conventional system and the new system are huge."*

### System diagram





for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.



FM33568 / ISO 9001;2008

The Air Conditioning & Refrigeration Systems Works acquired ISO 9001 certification under Series 9000 of the International Standard Organization (ISO) based on a review of Quality management for the production of refrigeration and air conditioning equipment.

**ISO Authorization System**

The ISO 9000 series is a plant authorization system relating to quality management as stipulated by the ISO. ISO 9001 certifies quality management based on the "design, development, production, installation and auxiliary services" for products built at an authorized plant.



The Air Conditioning & Refrigeration Systems Works acquired environmental management system standard ISO 14001 certification.

The ISO 14000 series is a set of standards applying to environmental protection set by the International Standard Organization (ISO). Registered on March 10, 1998.

**⚠ 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, during 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 equipments and heat pumps contain a fluorinated greenhouse gas, R407C or R410A depending on the products.

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