

**MITSUBISHI  
ELECTRIC**

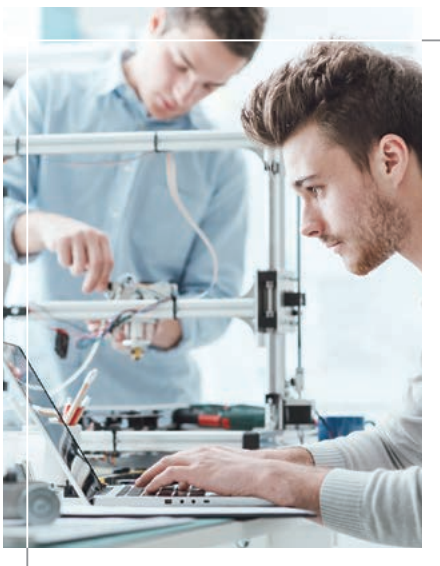
*Changes for the Better*

for a greener tomorrow



Air-cooled Chilling Units

# e-series





# e-series Air-cooled chiller

As a choice of HVAC system, chillers are widely used in versatile applications from commercial buildings to industrial use. With today's concerns on global warming and requirements to reduce energy use, building owners, as heavy energy users, are expected to choose energy efficient equipment.

Mitsubishi Electric's "e-series" chiller system is an air-cooled, inverter-driven and uniquely designed modular type of chiller with proven technology that offers comfort and energy conservation through daily operations.





# Key Features



Energy efficiency



Modular approach



Easy installation and  
space saving



Controller options

# Energy Efficiency

The e-series ensures optimum operation according to the operation load and delivers high energy saving performance throughout the year.



## Rated efficiency

The e-series achieves a market leading EER level that leads to energy savings. One of the industry's highest level of energy-saving performance is achieved through technical innovation.

\* Under normal cooling conditions at an outdoor temp of 95° FDB/75.2° FWB (35°C DB/24°CWB), outlet water temp of 44.6° F (7°C), and inlet water temp of 53.6° F (12°C). Pump input is not included in cooling capacity and power input.

EER (BTU W x h)\*

40 tons

11.35

50 tons

10.41

## Part load efficiency

In addition to rated efficiency, which indicates efficiency at full load, the e-series achieves high part load performance. This translates to high efficiency in actual usage conditions.

IPLV (Integrated Part Load Value) is calculated in accordance with AHRI 550-590 and is an indicator that evaluates overall average efficiency.

IPLV (BTU W x h)

40 tons

22.33

50 tons

21.57



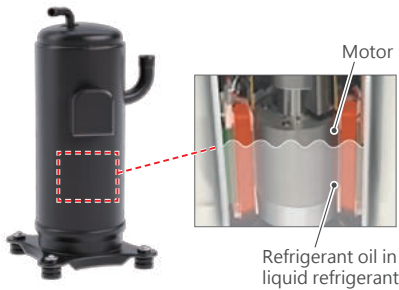
# Key technology

## Compressor

### Inverter-driven

Each unit is equipped with four high-efficiency inverter-driven compressors developed by Mitsubishi Electric. The compressors operate in pairs, varying their speed to match the required load.

When an inverter-driven system operates at partial load, the energy efficiency of the system is higher than that of a standard fixed speed, non-inverter system.



### IH warmer

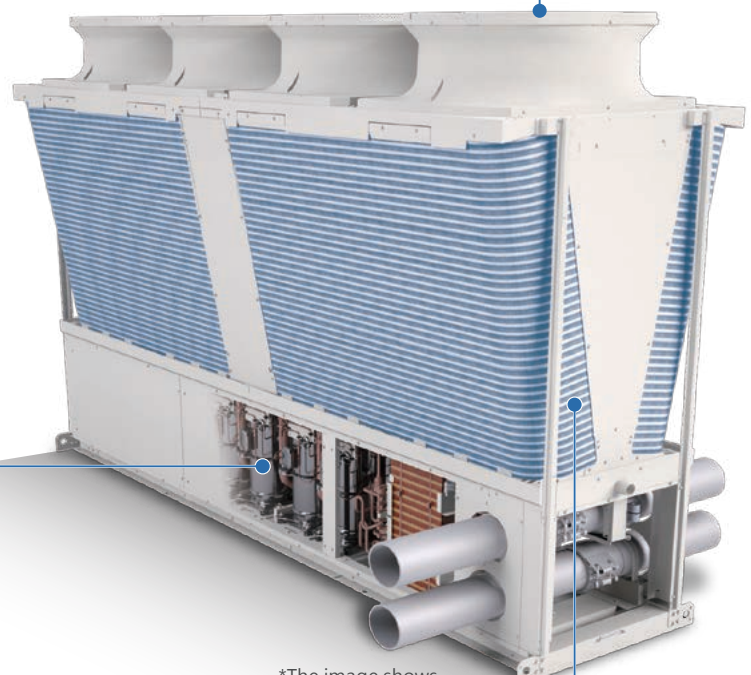
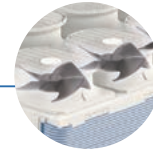
The IH (induction heating) warmer method is applied to reduce standby power consumption compared to the crankcase heater method.

The intelligent heating cycle of the iron core in the compressor is programmed to prevent refrigerant stagnation when the unit is not in operation.

## Fan

### DC inverter fan

Four DC-driven inverter fans are equipped in each e-series module for precise control to optimize the efficiency of the system. The fan casing is designed to realize high static pressure, leading to low fan power input.



\*The image shows the built-in header type.

## Heat exchanger

### Cross-steering fins

The use of cross-steering fins with slits and optimized heat exchanger path patterns allows greater heat exchange, leading to high performance while keeping the size compact.

Blue fin anti-corrosion coating is applied to the heat exchanger as a standard feature.



### Y-shaped structure

When the modules are connected, the Y-shaped structure ensures sufficient air intake to realize efficient operation and also provides sufficient service space.

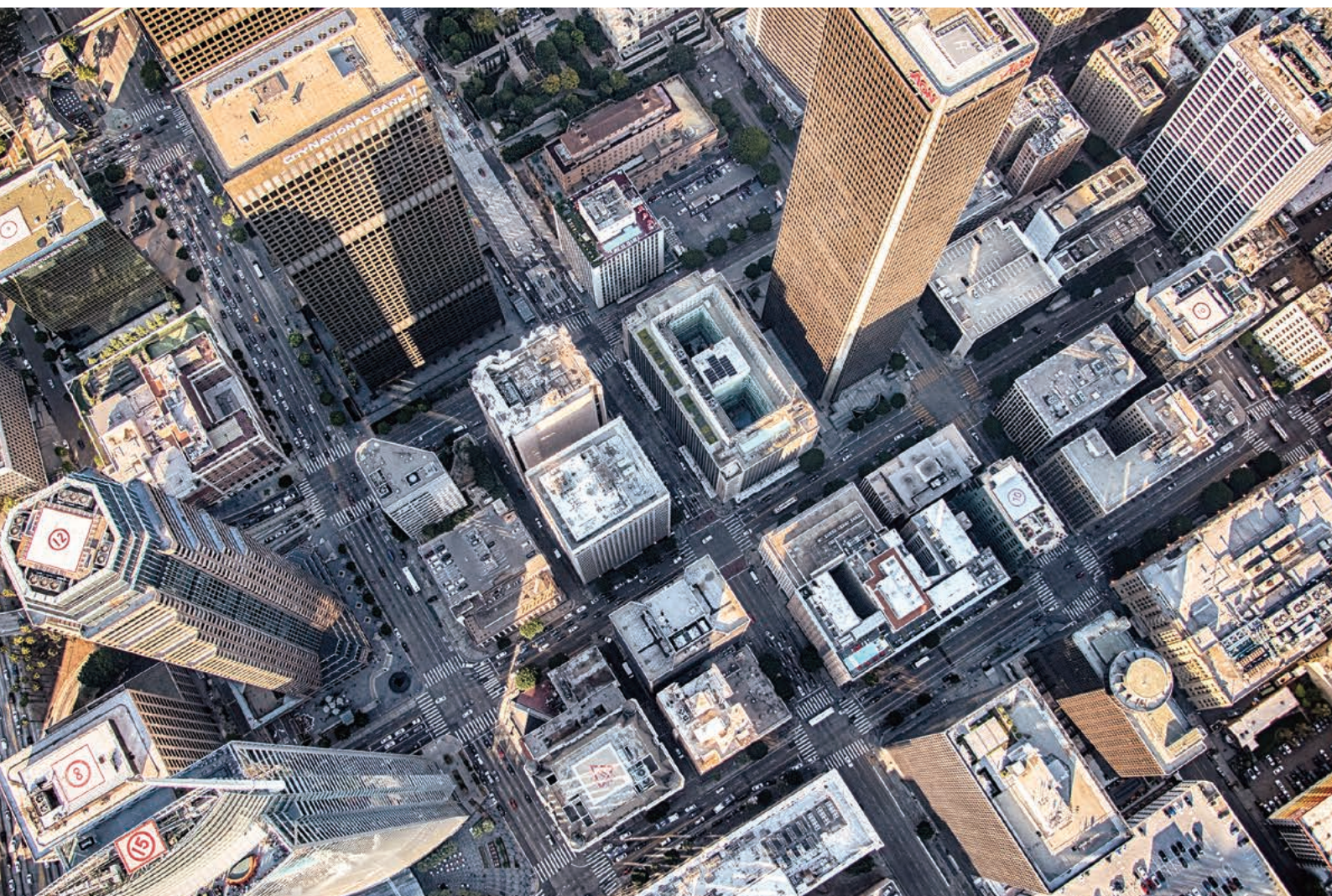


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# Modular Approach

Adds flexible and unique aspects to the e-series

The e-series adopts a modular approach, which provides flexible and unique benefits that single large-capacity chillers do not. Up to six 40-ton or 50-ton modules can be combined to offer large capacities up to 240 tons or 300 tons.



The modular approach delivers such advantages as high partial load operation, operations for avoiding risks, and scalability that are valued in both refurbishment and new-build projects.

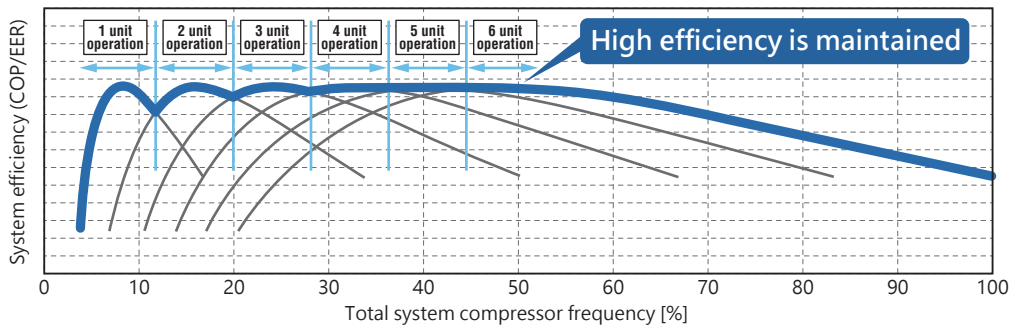


## Optimum frequency control

When multiple units are connected, the frequency of each compressor is controlled during operation to increase the efficiency of each unit and achieve high energy saving performance. This control can be implemented just by making a simple setting, without the need for any other on-site design.

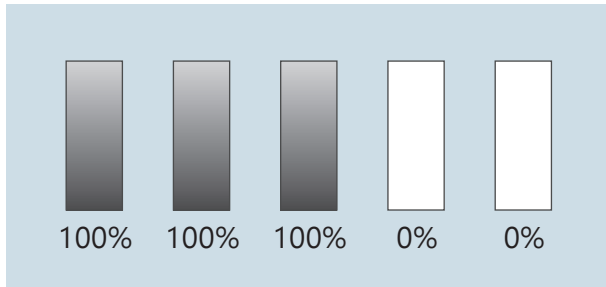
\* When using this function, dip-switch setting is required for grouping.

\* The following is an example of operation.



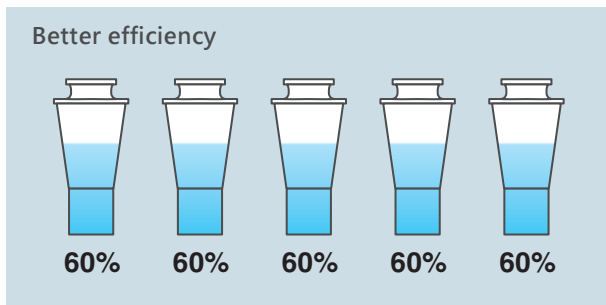
### Overall system load 60%

Without optimum frequency control



With non-inverter compressors, it is only possible to turn the unit on or off, and compressor frequency cannot be adjusted according to the required capacity.

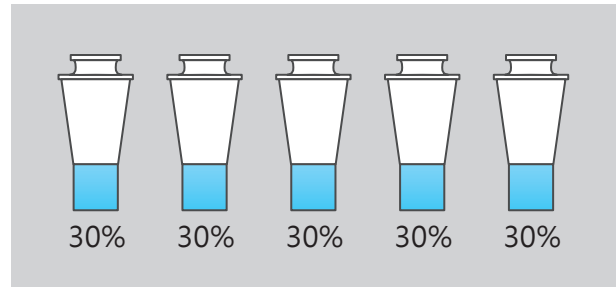
With optimum frequency control



With inverter compressors, operating frequency is controlled to achieve the highest system efficiency.

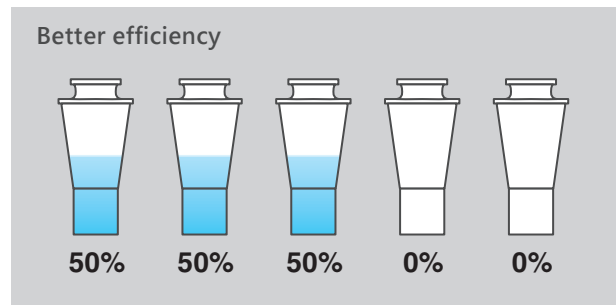
### Overall system load 30%

Without optimum frequency control



With all units and pumps operating, the system as a whole provides a standard level of efficiency.

With optimum frequency control

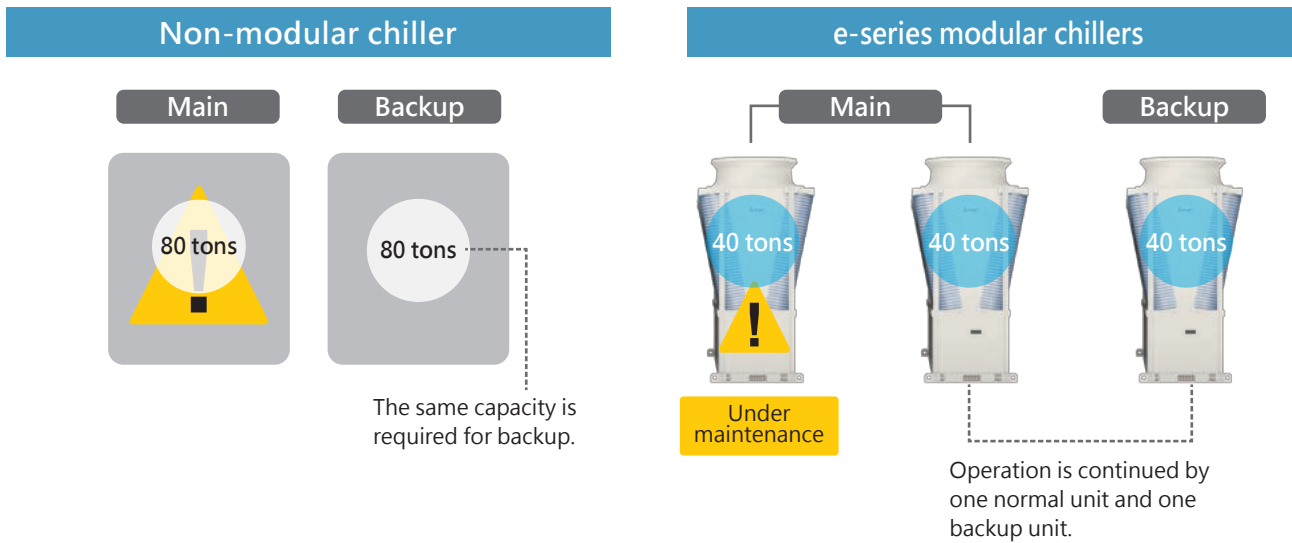


Based on the total frequency of all units, the number of operating units is decided by the system leader unit to maximize efficiency.

## Redundancy

With a non-modular chiller, risks are typically avoided by installing a backup system with the same capacity as the building load.

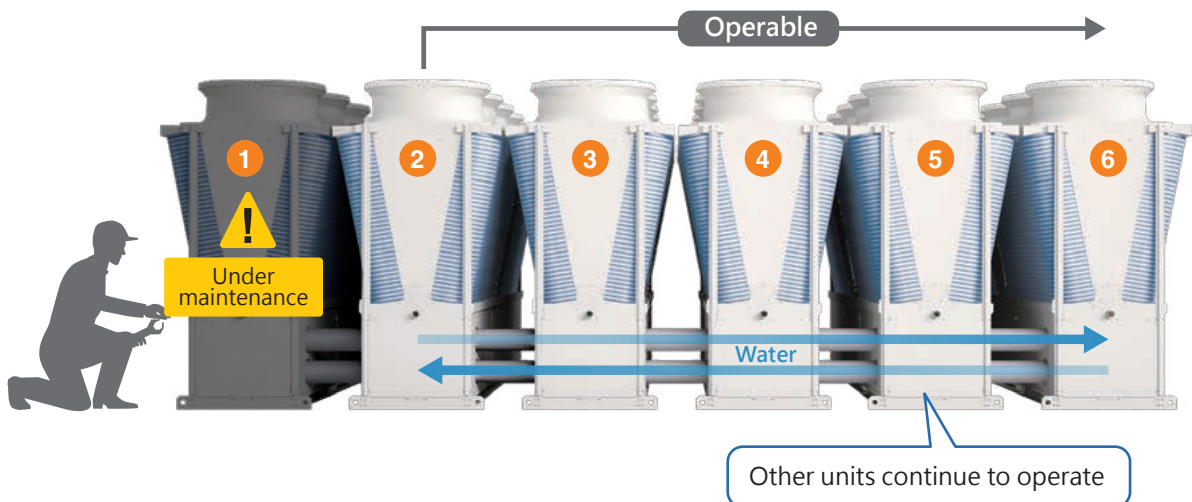
With e-series modular chillers, only an additional module is required for backup, thus minimizing the redundancy requirement and saving costs.



## Emergency operation mode

Each e-series module is equipped with four compressors developed by Mitsubishi Electric. The compressors operate in pairs, so that if one pair cannot operate in case of emergency or maintenance, the other pair can continue to operate.

When multiple units are connected, even if one unit cannot operate, the remaining units can continue operating.

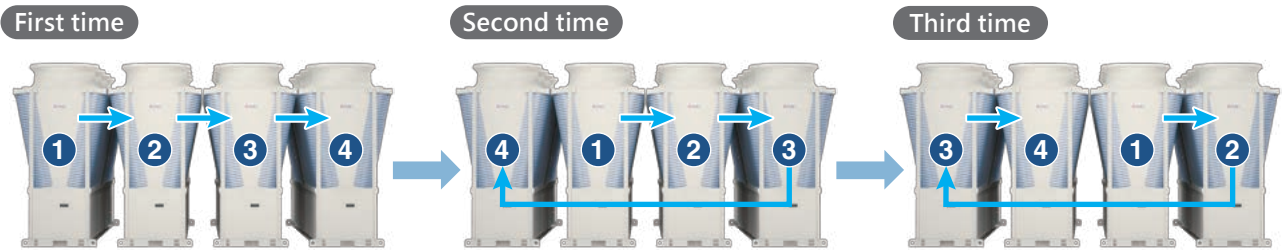






## Rotation operation

The modular chiller system has the advantage of being able to operate the units in rotation, so the operating time of each unit can be equalized.



## Scalability

Modular chillers provide the flexibility to scale up to meet new load requirements or to install units in stages in accordance with the construction schedule.

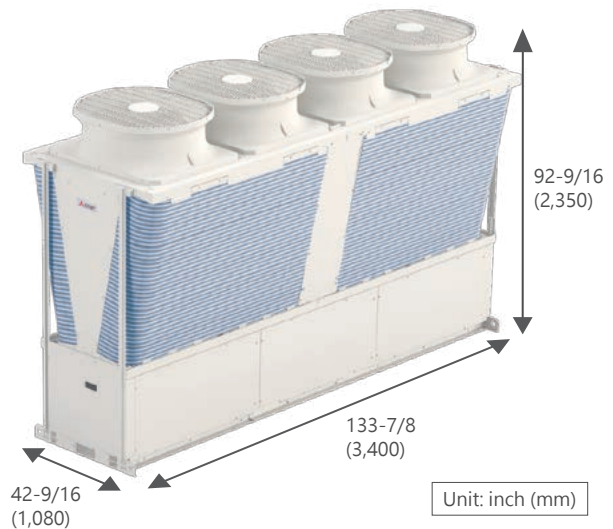


## Logistical ease

Compared to the conventional, single large-capacity chiller, which is costly to install as a large crane is required, the e-series modules are small and lightweight and ensure easy logistics.

**2,857 lbs. (1,296 kg)**

\*Built-in header type



# Easy Installation and Space Saving

The e-series offers the choice of a built-in header type in addition to the standard piping construction. The optimum type can be selected according to the design and construction requirements of the building.

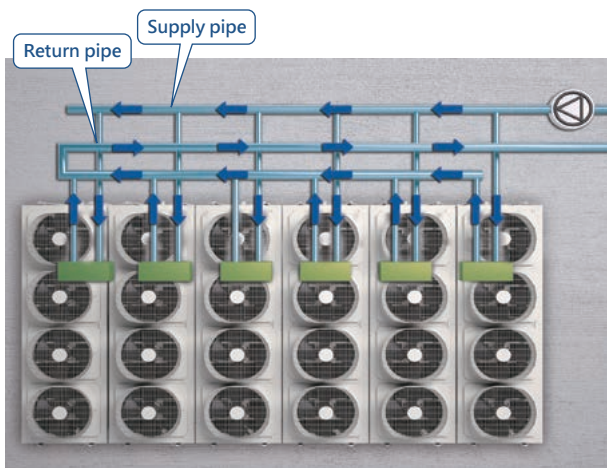
## Built-in header type

Header pipings, which are normally required for connecting the unit to local water pipes, are built into the unit.

Multiple units are easily connectable by using optional parts. This eliminates the need to procure water pipes for connecting the units, and reduces installation work.



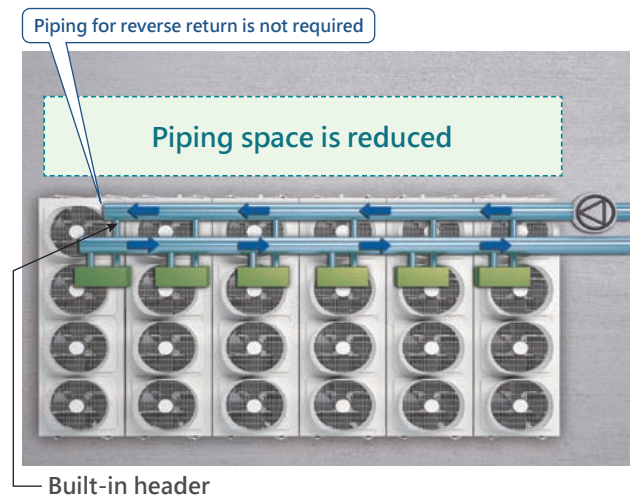
### Standard piping construction



With standard piping modules, it is possible to select the number of pumps and design the water circuit depending on the requirements of the site.

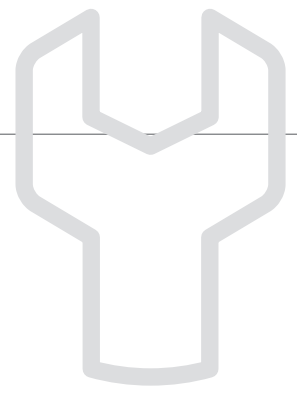
\* A maximum of 24 units (4 groups x 6 units) can be connected in the same water circuit.

### Built-in header type

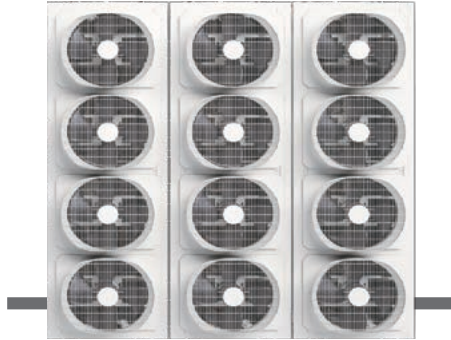


The headers between modules are built-in, realizing smaller piping space and number of connections. This allows simpler construction and saves time and cost.

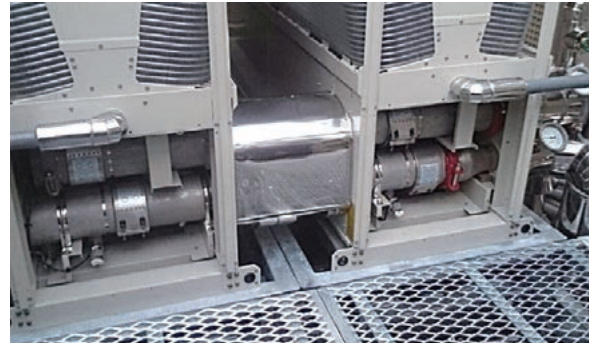
\* It is not possible to build both pump and header in unit.  
\* A maximum of 6 units can be connected.



Top view

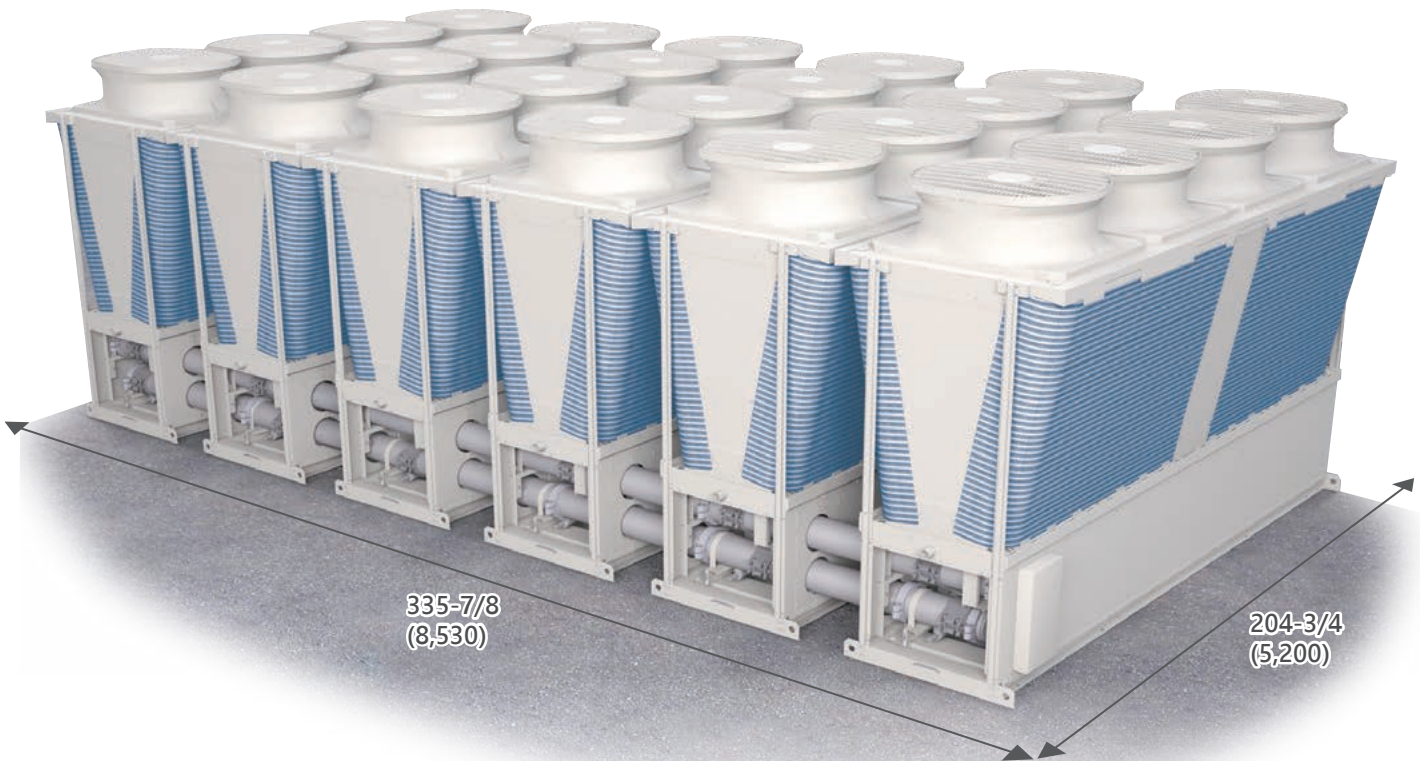
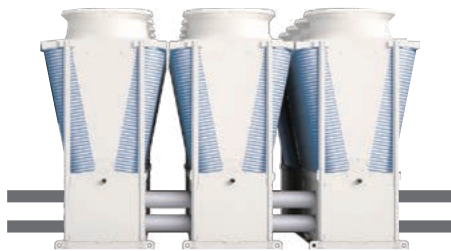


Actual installation



\*Heat insulation must be applied to the piping between units.  
(Procured locally)

Side view



335-7/8  
(8,530)

204-3/4  
(5,200)

Unit: inch (mm)

\*Service space included.

# Control Options

The need for control is paramount in order to optimize the performance and minimize its running costs.

The e-series offers a range of control options designed to meet such needs.

## Remote controller

PAR-W31MAA offers an easy-to-see full-dot and backlit LCD display. Basic operations such as ON/OFF, mode, and water temperature can be set by connecting a remote controller.

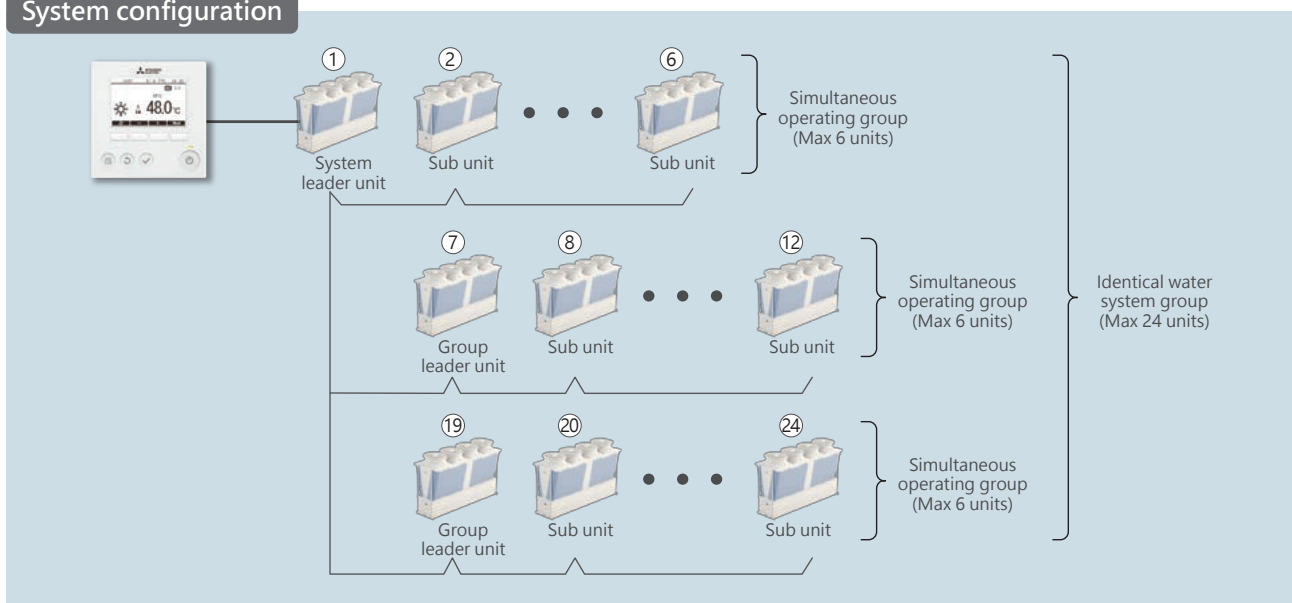


PAR-W31MAA

### Main functions

Operation/setting	ON/OFF
	Cooling
	Snow/Normal
	Demand
	Scheduled operation (daily/weekly)
Display	Target temperature
	Operation mode
	Current water temperature
Control function (function of chiller body)	Error code
	Control of number of units
	Control to prevent simultaneous defrosting

### System configuration



## External input/output

A local controller can be used to perform basic operations such as ON/OFF, input/output water temperature signals and enable operations that correspond to the signals.



### Main functions

Input	ON/OFF
	Cooling
	Snow/Normal
	Demand
	Target water temperature
Output	Operation command
	Operation mode
	Error
Control function (function of chiller)	Control of number of units
	Control to prevent simultaneous defrosting

## Centralized controller

AE-200A is a 10.4-inch LCD touch panel centralized controller. Floor layout, energy consumption, operating status and error information can be viewed for easy management of the system.

A combination of e-series and CITY MULTI systems can be connected to the same M-NET configuration.

\*AE-200A with software Ver.7.80 or later can be connected.

## BACnet® connection functions

The e-series can be easily combined into a Building Management System (BMS) with an AE-200A/EW-50A controller via BACnet®, an open transmission protocol widely used for BMS and related equipment control.

\* BACnet® is a registered trademark of ASHRAE in the United States of America.

\* BACnet® can be connected to the AE-200A with software Ver.7.90 or later.



Centralized Controller AE-200A



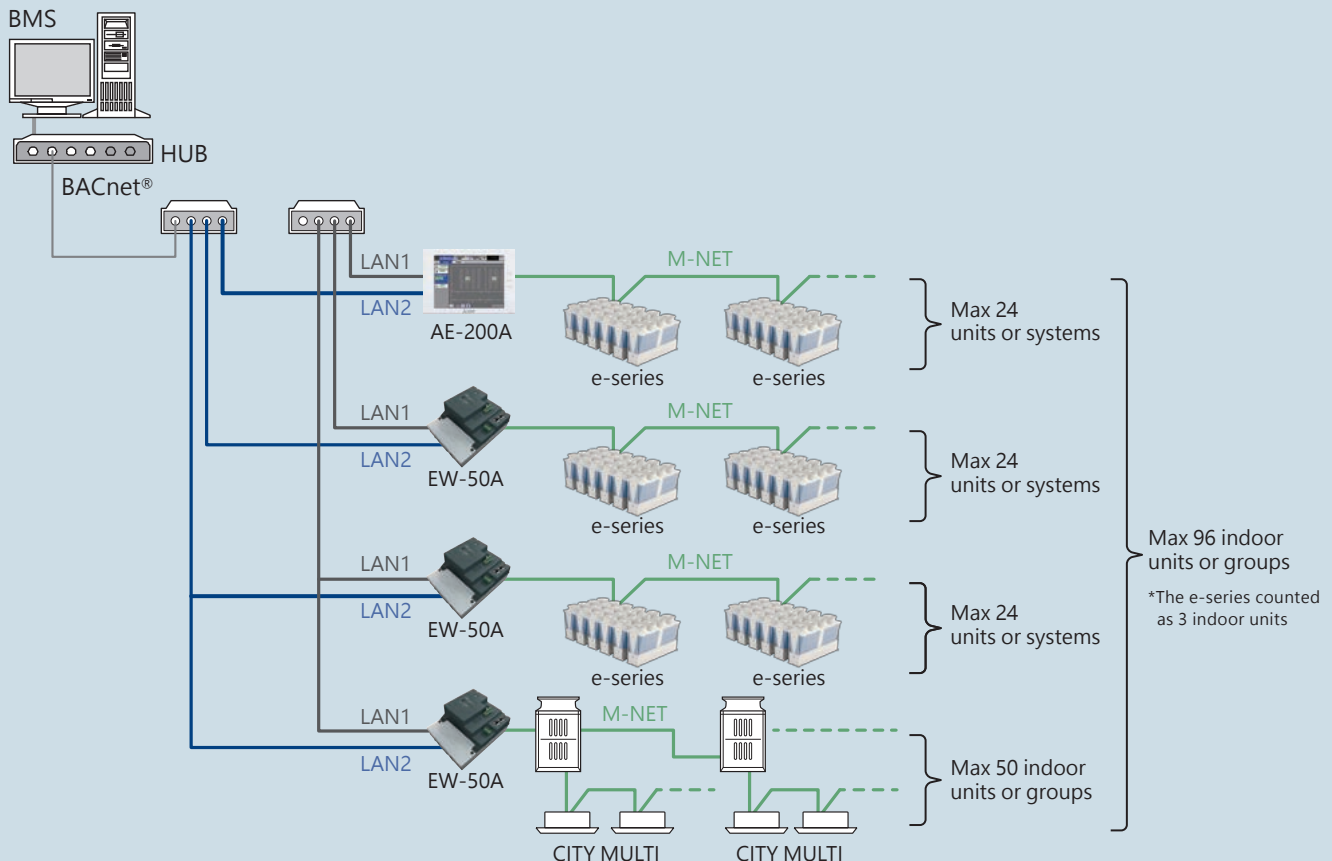
EW-50A  
\*To be used only as AE-200A's expansion controller

### Main functions

Operation/setting	ON/OFF
	Cooling
	Snow/Normal
	Scheduled operation (daily/weekly/annual)
	Target temperature
	Local control disabled (ON/OFF, operation mode, target temperature)
Display	WEB browser connected
	Operation mode
	Snow/Normal
	Current water temperature
	Error code
	Outdoor temperature
Control function (function of chiller body)	Control of number of units
	Control to prevent simultaneous defrosting

Setting	ON/OFF
	Cooling
	Snow/Normal
	Local control disabled (ON/OFF, operation mode, target temperature)
Display	Target water temperature
	ON/OFF
	Cooling
	Communication error
	Snow/Normal
	Local control disabled (ON/OFF, operation mode, target temperature)
	Individual unit error
Inlet/outlet water temperature	
Collective error	

### System configuration



# Case Study



Central air-conditioning for a hotel

## Ancora Punta Cana Private Residence Yacht

Punta Cana, Dominican Republic



The property was considering replacing its HVAC system with a system with high partial load efficiency and low sound levels. The e-series was an ideal solution for ensuring high system efficiency across different loads and minimizing the risk of downtime during replacement.

### Installation

Air-source cooling only  
e-series chiller x 13

Cooling Capacity:

7,984,080 BTU/h (540kW)

\* 380V power supply model installed.

Using the power transformer,  
local 480V is converted to 380V.

Centralized controller

AE-200



### Overview of the Project

Ancora Punta Cana is a residential/hotel property located in Cap Cana Marina, considered one of the largest and most luxurious marinas in the Caribbean. Surrounded by inland marinas on the Caribbean Sea, travelers can experience a luxurious resort time with ultimate service and facilities. The resort offers a total of 300 suites of different sizes, a variety of cuisines, things to do and amenities to its guests.

### The Challenge

The property was considering replacing its HVAC system which originally consisted of water-cooled chillers. A new system was requested that would provide high system efficiency throughout the day even when the load changes between day/night and a low operating sound not to disturb the calm atmosphere. Another key consideration was to carry out the replacement without closing business.

# Club and Marina



Installed system image



System 1



System 2



Backup

Collective installation behind the building.  
Originally, the space was occupied by the cooling tower of the water-cooled chillers.

## The Solution

Initially, two of another manufacturer's 400 tons chillers were considered, but Mitsubishi Electric made a last minute attempt by proposing the e-series as an ideal solution to the property's requirements.

Having the industry leading efficiency was one of the main reasons the e-series became the final choice. Since guests are out enjoying the Caribbean Sea during the day and back at night, the cooling load differs largely between day and night. The e-series system can efficiently operate across different loads with optimum frequency control between modules. By simply connecting to M-NET, the frequency of the inverter compressor is automatically controlled to maximize the efficiency of the whole system.

Also, the aspect of modular units minimizes the risk of downtime during replacement. The project was divided into two stages. Chillers were first replaced and connected to the primary pump system to supply cool water. Then, as a second step, the system was integrated with the secondary pump for optimal operation.

The property owner also highly evaluated the simpler maintenance without a cooling tower and the low operating noise level, which was an important factor for the hotel and residential properties. Utilizing highly efficient components, the e-series achieves low operating noise.

The e-series serves all the fan coil units and air handling units in the property's facilities, which include 299 hotel rooms/residences, 7 restaurants, bars and fitness centers.

## e-series decision making factors

- High system efficiency across different loads with optimum frequency control between modules.
- No closing of business during replacement with staged installation realized by the modular concept.

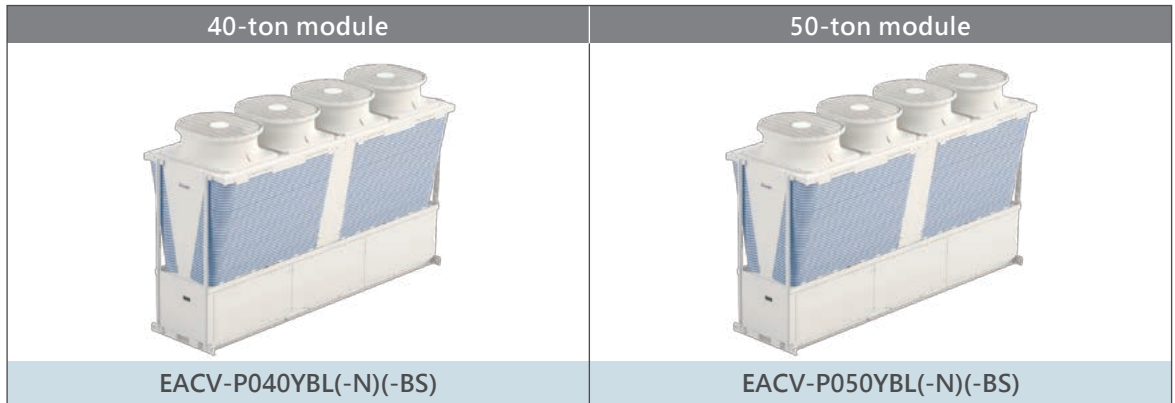


Water pipes and pumps installed in the mechanical room located below the unit.

# Product Information

## Module line-up

Cooling only



- (-N) indicates built-in header type models.
- (-BS) indicates models with external panels and heat exchangers that are treated against coastal weathering.

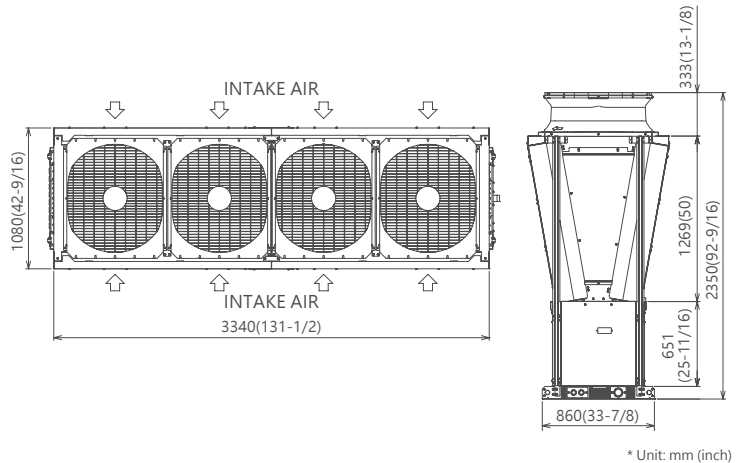
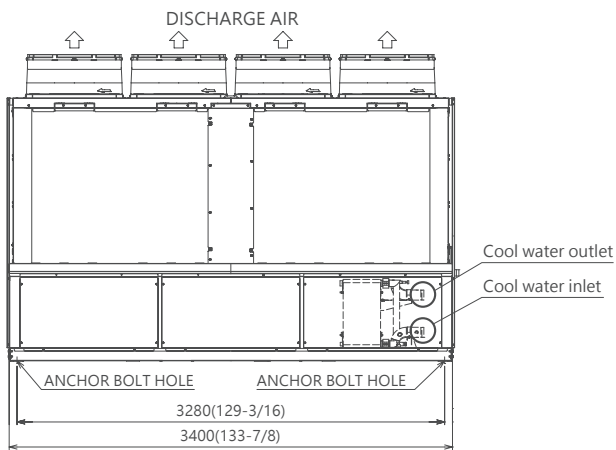
## System configuration

Up to six individual 40-ton or 50-ton modules can be combined to offer a large capacities up to 300 tons.

40 tons	Qty	x 1 units	x 2 units	x 3 units	x 4 units	x 5 units	x 6 units
	Tons	40 tons	80 tons	120 tons	160 tons	200 tons	240 tons
50 tons	Qty	x 1 units	x 2 units	x 3 units	x 4 units	x 5 units	x 6 units
	Tons	50 tons	100 tons	150 tons	200 tons	250 tons	300 tons

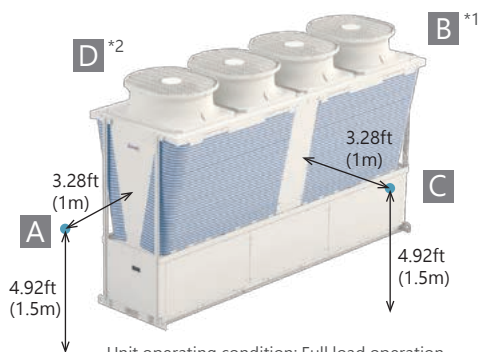
\* Only same-type modules may be combined.

## Dimensions



\* Unit: mm (inch)

## Sound level



Unit operating condition: Full load operation (There must be space all around the unit)

- \*1 Measuring point same as A
- \*2 Measuring point same as C

	Sound pressure level dB(A)	
	EACV-P040YBL(-N)(-BS)	EACV-P050YBL(-N)(-BS)
A Service surface	66	68
B Counter service surface	66	67
C Right surface	68	71
D Left surface	70	70
	Sound power level dB(A)	
	EACV-P040YBL(-N)(-BS)	EACV-P050YBL(-N)(-BS)
	84	86

\* The above values are measured in an anechoic room. Sound levels may be higher depending on the operating conditions or if they are affected by an echo. (They could be roughly 4 dB to 6 dB higher, although it depends on the installation conditions.)

When installing a unit, consider the echo effect and implement soundproofing as necessary.



# Specifications (Cooling only)

Standard	40 tons	EACV-P040YBL	50 tons	EACV-P050YBL
Anti-corrosion	40 tons	EACV-P040YBL-BS	50 tons	EACV-P050YBL-BS
Built-in header	40 tons	EACV-P040YBL-N	50 tons	EACV-P050YBL-N
Anti-corrosion / Built-in header	40 tons	EACV-P040YBL-N-BS	50 tons	EACV-P050YBL-N-BS

Model		EACV-P040YBL(-N)(-BS)	EACV-P050YBL(-N)(-BS)	
Power source		3-phase 3-wire 460V 50/60Hz		
Cooling capacity *1	BTU/h	511,800	614,160	
	kW	150.00	180.00	
	Power input	kW	45.10	59.01
	EER	BTU/(W×h)	11.35	10.41
	IPLV *3	BTU/(W×h)	22.33	21.57
Water flow rate	GPM (m³/h)	113.6 (25.8)	136.5 (31.0)	
Current input	Cooling current 460V *1	A	63	83
	Maximum current	A	111	
Water pressure drop *1	ftAq	38.2	54.9	
	psi	16.5	23.8	
	kPa	114	164	
Temp range	Cooling	° F (°C) Outlet water 41 ~ 86 (Outlet water 5 ~ 30) *4		
	Outdoor	° F (°C) 5 ~ 109.4 (-15 ~ 43) *4		
Circulating water volume range		GPM (m³/h) 56.8 ~ 149.7 (12.9 ~ 34.0)		
Sound pressure level (measured in anechoic room) at 3.28ft (1m) *1		dB (A) 66		
Sound power level (measured in anechoic room) *1		dB (A) 84		
Diameter of water pipe (Standard piping)	Inlet	in. (mm) 2 1/2B (65A) housing type joint		
	Outlet	in. (mm) 2 1/2B (65A) housing type joint		
Diameter of water pipe (Built-in header piping)	Inlet	in. (mm) 6B (150A) housing type joint		
	Outlet	in. (mm) 6B (150A) housing type joint		
External finish		Polyester powder coating steel plate		
External dimensions H x W x D		in. (mm) 92-9/16 x 133-7/8 x 42-9/16 (2350 x 3400 x 1080)		
Net weight	Standard piping	lbs (kg) 2822 (1280)		
	Built-in header piping	lbs (kg) 2857 (1296)		
Design pressure	R410A	psi (MPa) 601 (4.15)		
	Water	psi (MPa) 145 (1.0)		
Heat exchanger	Water side	Stainless steel plate and copper brazing		
	Air side	Plate fin and copper tube		
Compressor	Type	Inverter scroll hermetic compressor		
	Starting method	Inverter		
	Quantity	4		
	Motor output	kW 11.7 x 4		
	Lubricant	MEL32		
Fan	Air flow rate	cfm	9357 x 4	
		m³/min	265 x 4	
		L/s	4417 x 4	
	Type, Quantity	Propeller fan x 4		
	Starting method	Inverter		
Motor output	kW 0.92 x 4			
Protection	High pressure protection	High pres. sensor & High pres. switch at 601psi (4.15MPa)		
	Inverter circuit	Over-heat protection, Over-current protection		
	Compressor	Over-heat protection		
Refrigerant	Type x charge	R410A x 33 (lbs) x 4 *2 (R410A x 15 (kg) x 4)		
	Control	LEV		

Notes:

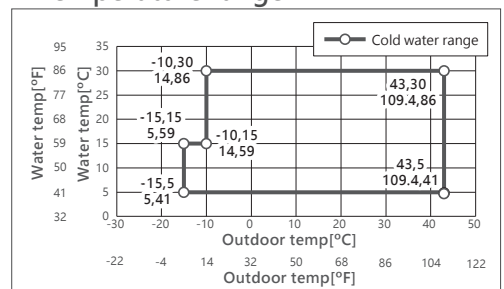
\*1 Under normal cooling conditions at an outdoor temp of 95° FDB/75.2° FWB (35°CDB/24°CWB), outlet water temp of 44.6° F (7°C) and inlet water temp of 53.6° F (12°C). Pump input is not included in cooling capacity and power input.

\*2 Amount of factory-charged refrigerant is 6.6lbs(3kg) x 4. Please add the refrigerant onsite.

\*3 IPLV is calculated in accordance with AHRI 550-590.

- Please do not use steel material for the water piping.
- Please always make water circulate or pull the circulation water out completely when not in use.
- Please do not use groundwater or well water directly.
- The water circuit must be a closed circuit.
- Due to continuous improvement, the above specifications are subject to change without notice.
- This model is not equipped with a pump.

### \*4 Temperature range



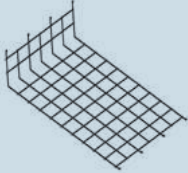
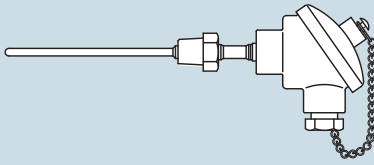
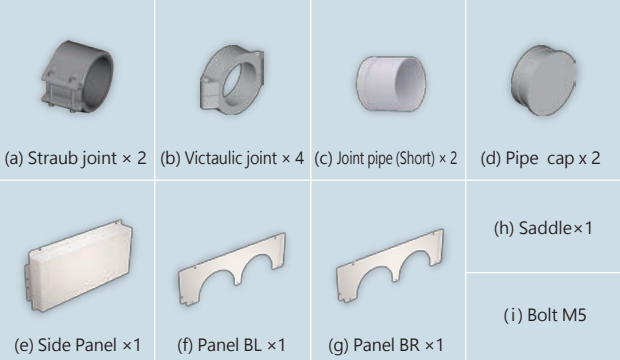
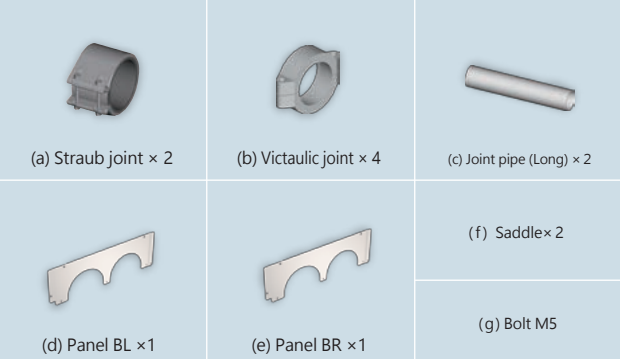
Unit converter	kcal/h = kW x 860	lbs = kg/0.4536
	BTU/h = kW x 3,412	cfm = m³/min x 35.31

# Controller

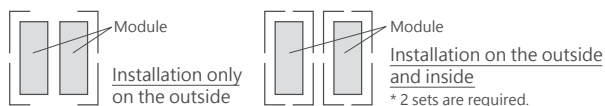
Individual Remote Controller	Centralized Remote Controller *	
		
PAR-W31MAA	AE-200A	EW-50A

\* AE-200A with software ver. 7.80 or later can be connected.  
 \* EW-50A can only be used as AE-200A's expansion controller.

## Optional parts

Description	Image	Model name	Remarks
Fin guard		DT-150FG *1	EACV-P YBL(-N)(-BS)
Representative-water temperature sensor		TW-TH16-E	EACV-P YBL(-N)(-BS)
Piping kit		DT-01HK *2	EACV-P YBL-N(-BS) (Required for Built-in Header type / single and multiple unit installation)
Connection piping kit		DT-02HK *2	EACV-P YBL-N(-BS) (Required for Built-in Header type / multiple unit installation)

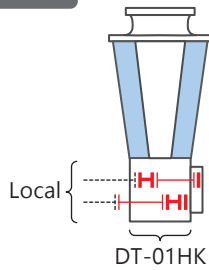
\*1 One set contains 4 fin guards.  
 Please refer to the following installation examples.



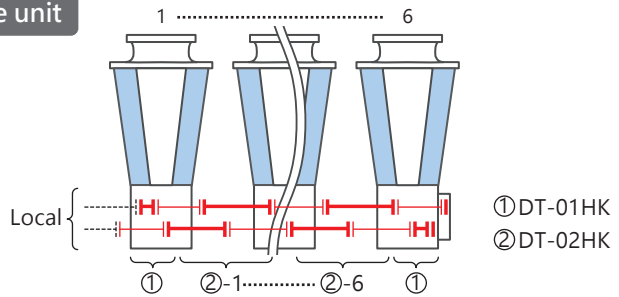
\*2 For details, please refer to the installation manual and "Details of Piping kit and Connection piping kit" section on the next page.

# Details of Piping kit and Connection piping kit

## 1. Single unit

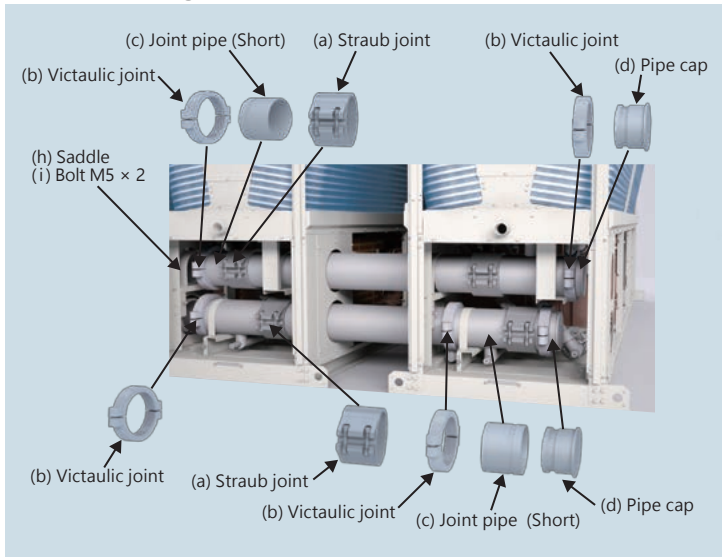


## 2. Multiple unit

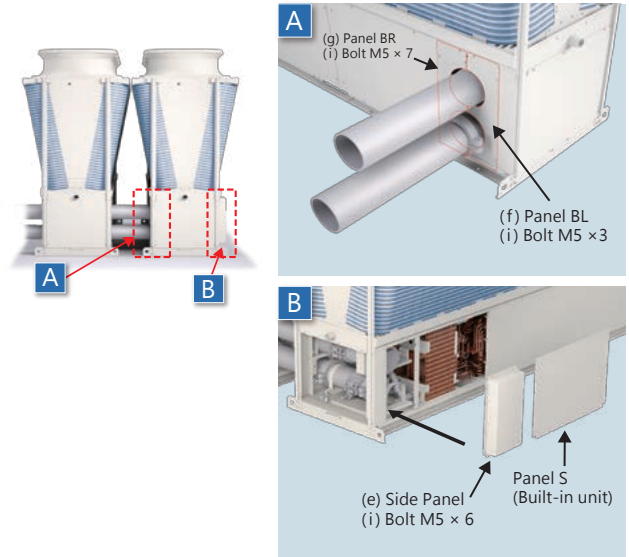


### ① Piping kit (DT-01HK)

#### • Header piping

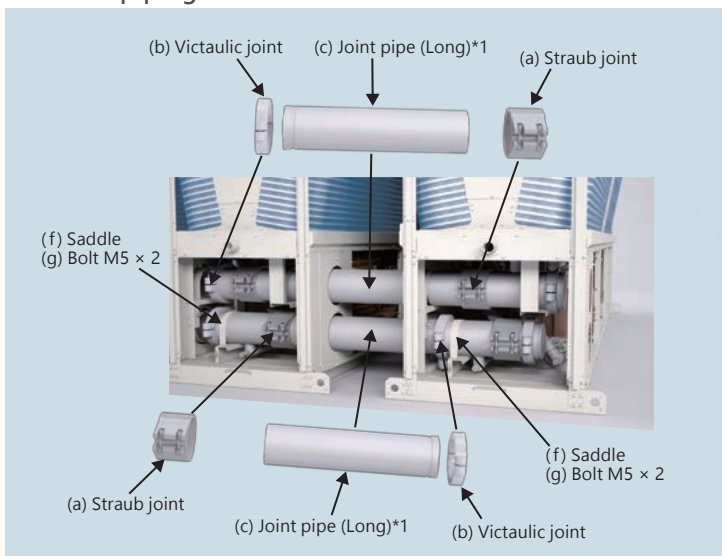


#### • Panel

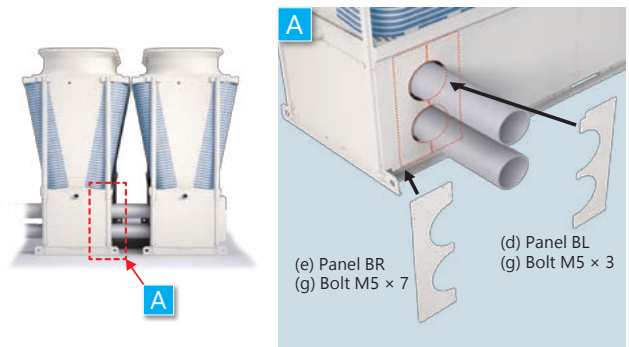


### ② Connection piping kit (DT-02HK)

#### • Header piping



#### • Panel



\*1 It is possible to increase the service space with a connection piping procured locally. Please refer to the DATABOOK for details.



**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.

**⚠ 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-cooled Chilling Units contain a fluorinated greenhouse gas, R410A (GWP:2088). This GWP value is based on Regulation (EU) No. 517/2014 from IPCC 4th edition. In case of Regulation (EU) No. 626/2011 from IPCC 3rd edition, this is as follows. R410A (GWP:1975)

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