

e-series

Air Cooled Modular Chiller and Heat Pump





The E-Series – A Modern Update to Traditional Chiller Technology

What is the E-Series Modular Chiller?

Chiller systems have been used for decades to deliver controlled cooling to commercial buildings. With increasing pressure on energy efficiency and running costs, we now need a low-carbon, cost effective option. The E-Series Chiller from Mitsubishi Electric is a modern update on a traditional chiller system.

It is Mitsubishi Electric's most efficient chiller system yet.

Unique Heat Pump Modular Approach

The E-Series Chiller is available in two versions – cooling only or the highly efficient heat pump model, which can either heat or cool your building as required. Utilising heat pump inverter compressor technology, each E-Series Chiller provides powerful and efficient heating or cooling from 90kW capacity.

Up to six individual units can be connected together to provide a system capacity from 90kW to 540kW. Using this modular approach reduces space requirements and simplifies lifting and installation.



$$90 \text{ kW} \times 6 \text{ modules} = 540 \text{ kW}$$



Features

EAHV-P900YA(-N) - Heat Pump EACV-P900YA(-N) - Cooling only



1 High Efficiency Inverter Compressor

Two advanced DC inverter-driven scroll compressors are incorporated within each 90kW module. This gives a capacity range of 8% to 100% for each module.

2 Two-stage Cooling Circuit

Both compressors serve separate plate heat exchangers located in the centre of the unit. By modulating the evaporating temperature individually, overall system efficiency can increase by an additional 3.9%, compared to single evaporating refrigeration cycles.

3 Front Service

Access for the control box and other service parts is located at the front of the unit to ease service and maintenance regimes.

4 U-shaped High Performance Compact Air Heat Exchanger

The use of U-shaped high performance compact air heat exchangers allows for a greater surface area, whilst also keeping the units much narrower than conventional chillers. Blue Fin coating on the heat exchanger is also provided as standard to help protect against corrosion.

5 Fan Inverter Control

Each of the two refrigerant circuits has three separately controlled, inverter-driven DC fans; allowing for more precise control to save energy and optimise system efficiency.

6 Fans

The fan blades have improved ventilation characteristics and a newly designed rear edge that suppresses air turbulence to increase efficiency and reduce noise levels.



Fan trailing edge

7 Digital Indicator

A dedicated digital indicator on the PCB displays high pressure, low pressure, water inlet temperature, water outlet temperature, error codes etc., thereby aiding service and maintenance.

8 Cable Entry

The power cable can be connected from below the front panel of the module.

9 Discharge Louvre

Mitsubishi Electric's unique diagonally upward air discharge louvres allow for a smaller footprint installation.

10 Hydronic Header

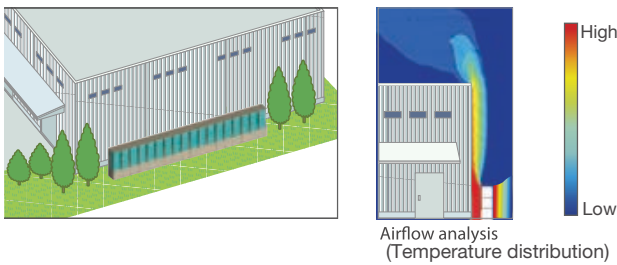
The in-built internal header pipes (-N) simplify design, installation and maintenance and makes the E-Series range modular and suitable for almost any situation.

Sophisticated Design and Small Footprint Installation

Single-row Installation

- Flexible installation, such as along an outer wall, in the corner of a factory or in a narrow space of a building.
- The compact and thin design allows for installation on each floor of a building, as is the case with industrial air conditioners (if the inside header specification is selected).
- The figure below shows the air blowing surface directed toward the wall (a diagonal blowing air guide is equipped as standard). Directing the air blowing surface toward the wall is effective in preventing short cycling.

Example of installation along the outer wall of a factory

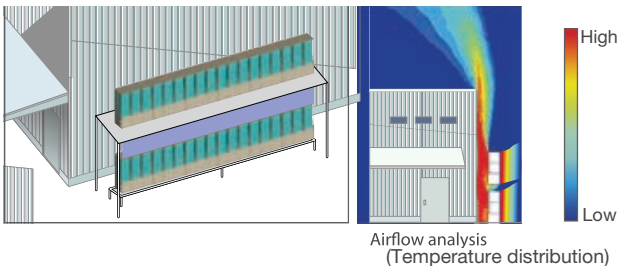


For details on installation, refer to the installation manual.

Single-row Double Stack Installation

- The side-flow feature allows for a single-row double stack installation by using a frame for the units installed in a row. Additional modules can be installed above each other.

Single-row double-stack installation example

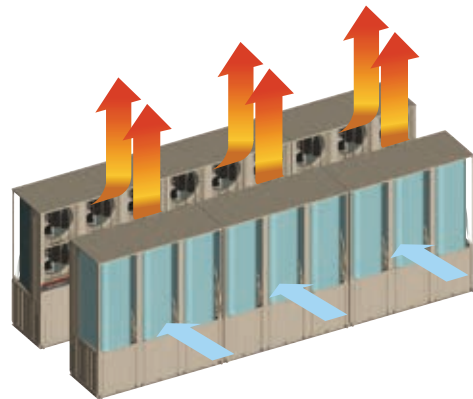


- The frame is to be supplied at the customer's site.
- The figure shows an example of using the inside header specification.

Double-row Installation

- Double-row installation in which the air blowing surfaces are directed toward each other is possible (a diagonal blowing air guide is equipped as standard).
- Rear surface-facing double-row installation in which the air suction surfaces are directed toward each other is also possible.

Front surface-facing double-row installation example

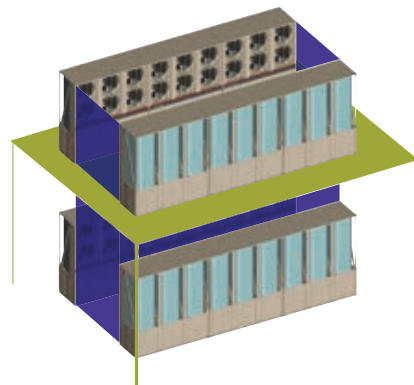


Note: The image figure shows an example of installation using the inside header specification.

For details on installation, refer to the installation manual

Double-row Double Stack Installation

- A double-row double-stack installation is possible by using a frame for the units installed in two rows.



- The frame is to be supplied at the customer's site.
- The figure shows an example of using the inside header specification.

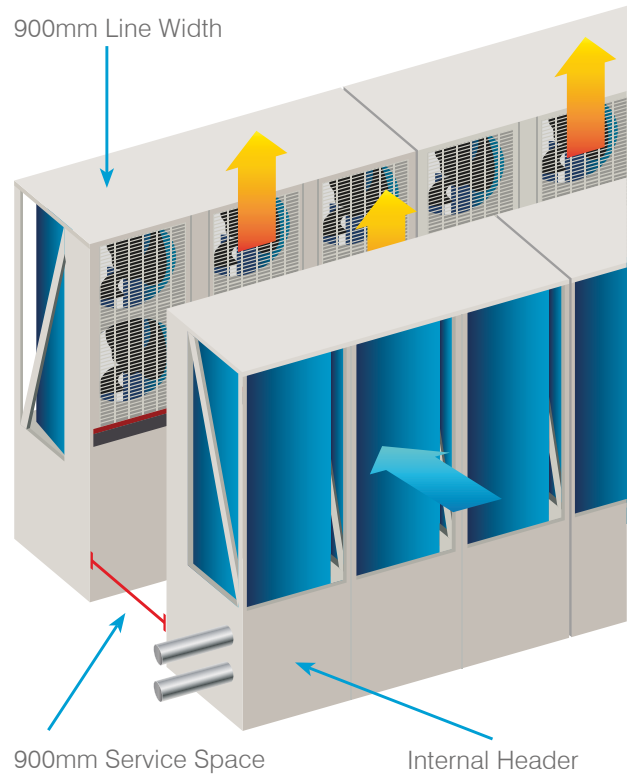
The Benefits of Mitsubishi Electric's E-Series Modular Chillers

High Efficiency

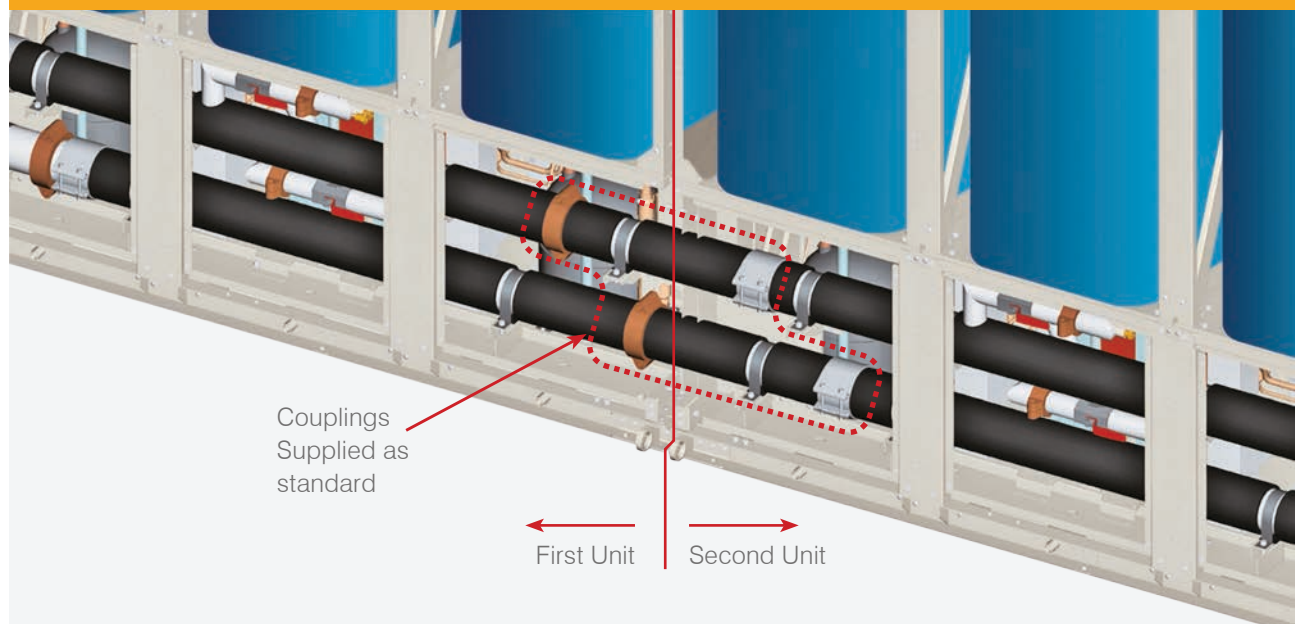
The E-Series Chiller uses highly efficient inverter scroll compressor technology to deliver exceptional efficiency and wide operating range.

Reduced Plant Space

Each 90kW module can be positioned in a row of up to six connected units using the same internal header. For larger systems it is possible to have the units facing each other with a gap of only 900mm service space.



Internal Header Pipe connecting multiple units



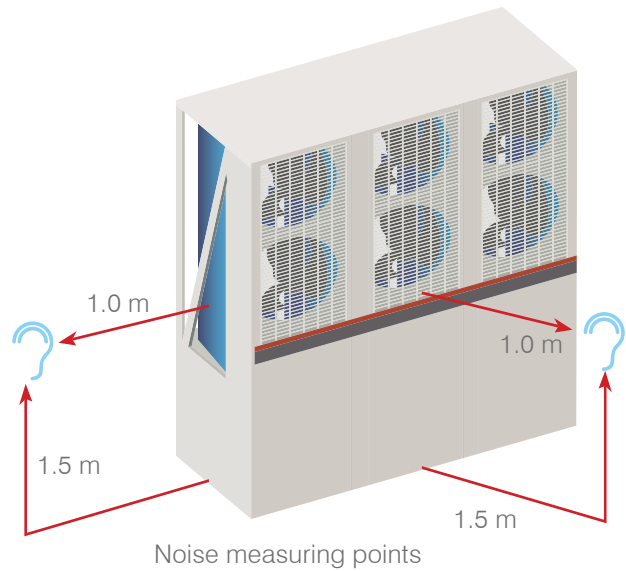
Features and Benefits

Low Noise Levels

By utilising highly efficient components within a uniquely shaped chiller, the E-Series Modular Chiller range offers market-leading low noise levels.

Low noise levels are especially important in today's city centre locations, where there is often a mixture of commercial and residential properties in the same area.

Sound Pressure Levels	
EACV/EAHV-P900YA(-N)	dB(A)
Front	64
Right	62
Back	65
Left	61

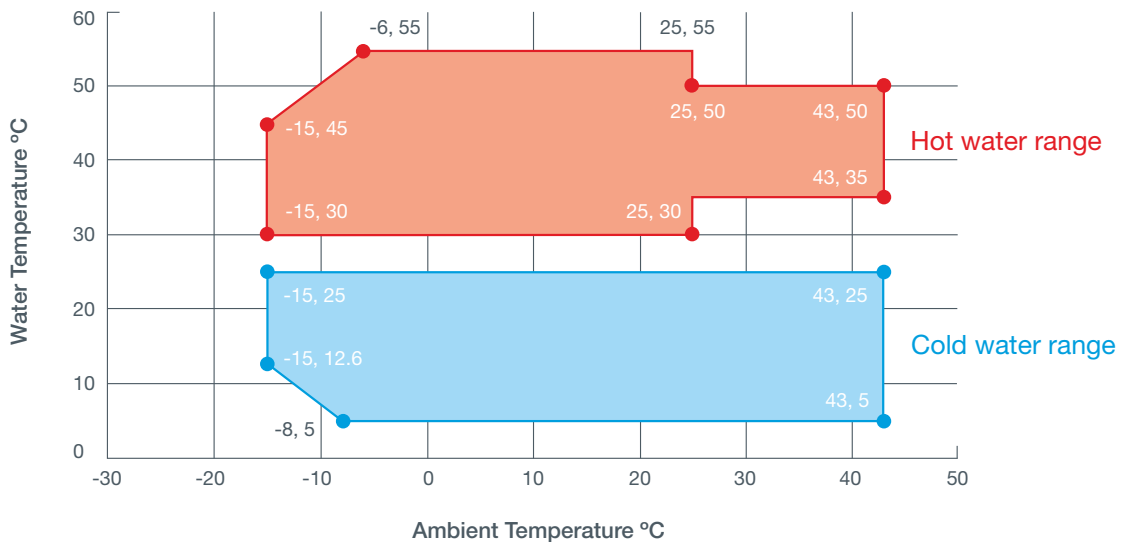


Sound Power Levels									
Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
PWL	55.8	60.8	66	67.4	70.1	74	65.2	54.1	77.1

Wide Operating Temperature Range

The E-Series Chiller can operate in ambient temperatures from -15°C to $+43^{\circ}\text{C}$ and can deliver chilled water at 5°C up to 25°C , great for standard HVAC applications as well as medium temperature data centres.

In heat pump mode the water temperature can be set from 30°C to as high as 55°C .

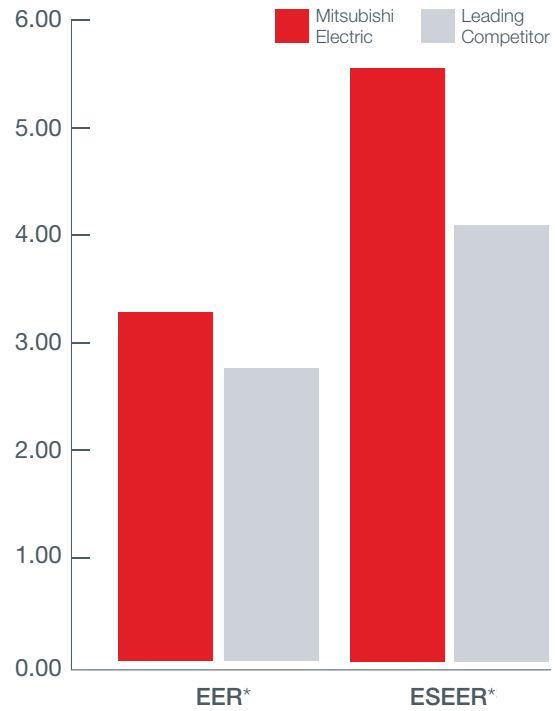


Features and Benefits

System Efficiency and Turn Down

The E-Series Modular Chiller has two inverter-driven compressors that allow the unit to operate between 8%-100% of capacity. By having a broad operating range, the chiller has exceptional part load efficiencies which is where most systems will operate.

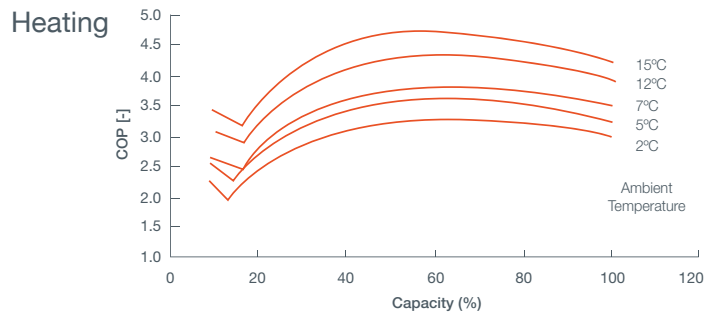
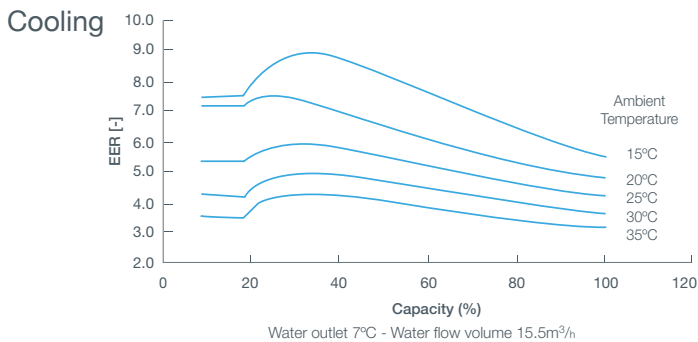
E-Series has ESEER of 5.66*.



*Pump not included; tested under nominal conditions.

High Part Load Performance

Unique to the heat pump model, the E-Series can be run in heating mode providing a whole heating and cooling solution all year round. The E-Series has high heating efficiency of 3.50* at 90kW rated conditions.



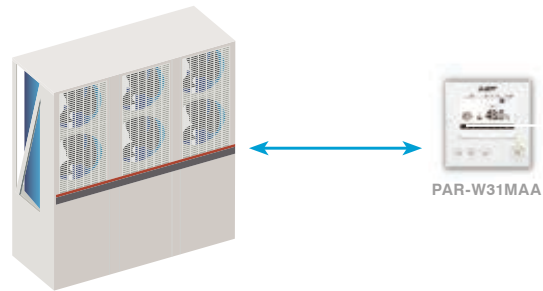
*COP value at outdoor ambient 7°C and hot water inlet / outlet temperatures of 40°C / 45°C respectively. Pump is not included.

The E-Series Control Options

Simple Control

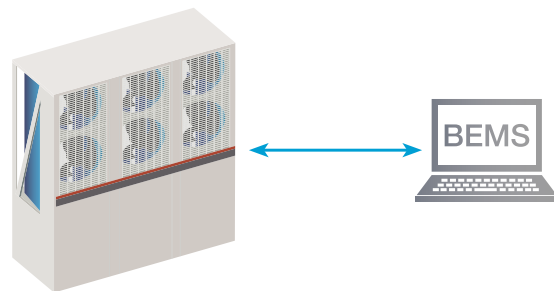
Connection to the PAR-W31MAA Local Remote Controller allows a simple user interface to control the functions of:

- Operation (on/off)
- Water setpoint
- Malfunction display
- Mode (heat/cool – model dependent)
- Timer operation schedule
- Demand control mode selection



Advanced Control

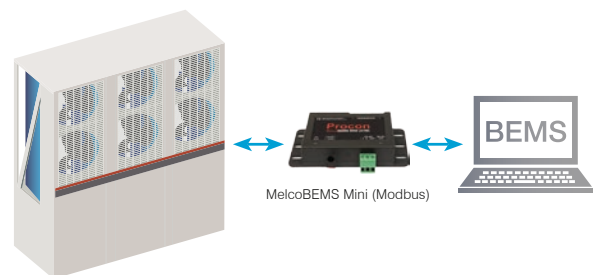
The chiller can be controlled remotely using BEMS systems for volt free input/output and monitoring via the chiller digital inputs/outputs (terminals K01–K64) of controller areas:



Digital inputs (control points)	Digital outputs (read only points)
Operation (on/off)	Operation (on/off)
Heat/Cool mode (model dependent)	Malfunction (normal/malfunction)
Water setpoint	Mode (heating/cooling)
Setpoint temperature switching (1st/2nd)	Defrost operation (normal/defrost)
Demand operation mode (on/off)	3rd party external pump operation (on/off)
Capacity change mode (COP/capacity)	Drain pan heater (on/off)
Heating ,operation mode (normal/ECO mode)	Auxillary heater - external 3rd party heater for frost protection (on/off)
Fan operation for snow (off/on)	

Modbus Control via MelcoBEMS Mini

This option provides Modbus control via MelcoBEMS Mini connected directly to CN105 port. Modbus RTU RS485 communication points using Modbus holding registers (control) and Modbus input registers (read only).



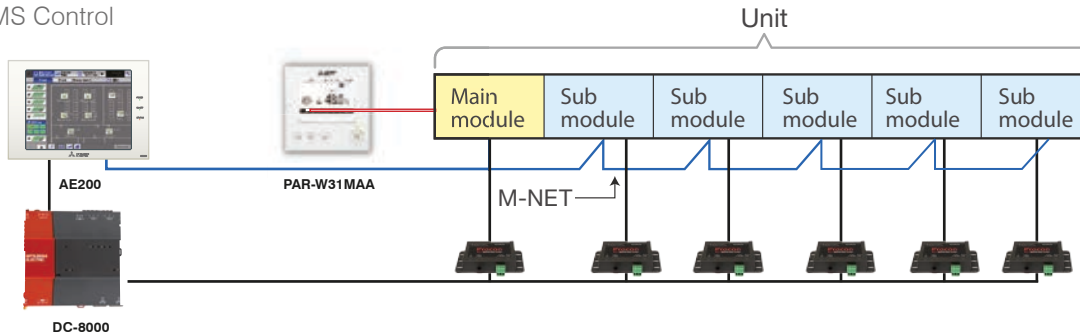
Modbus registers

Digital inputs (control points)	Input registers (read only points)
Operation (on/off)	Operation (on/off)
Heat/Cool mode (model dependent)	Malfunction (normal/malfunction)
Water setpoint	Mode (heating/cooling)
Setpoint temperature switching	Defrost operation (normal/defrost)
Demand operation mode (on/off)	3rd party external pump operation (on/off)
Capacity change mode (COP/capacity)	Drain pan heater (off/on)
Heating ,operation mode (normal/ECO mode)	Auxillary heater - external 3rd party heater for frost protection (off/on)
Fan operation for snow (off/on)	

The E-Series Control Options

Remote control

- * Up to 6 modules can be connected for each remote controller PAR-W31MAA.
- * Simultaneous control
- * AE200 Centralised control
- * BMS Control



Operation and Monitoring on LCD Touch Panel and Web Browser

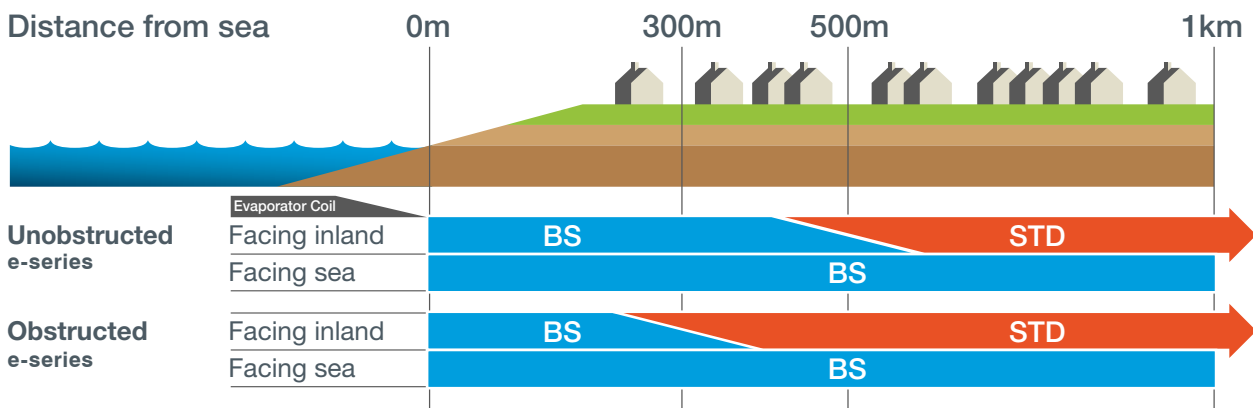
Control and Monitor Equipment with Black Diamond Controls

Remote operation and monitoring packages are available by utilising DC-8000 which uses Tridium Niagara software linked to the E-Series chiller system via the MelcoBEMS mini interface. Facilities Maintenance companies can benefit from diagnostics and interrogation of the E-Series system whilst implementing preventative maintenance.



E-Series Coastal Protection Models (-BS)

The E-Series is equipped with a premium Blue Fin coating process which offers a high grade of protection against corrosion damage of the coil. In addition, the unit has passed in-house severe salt water corrosion tests. The standard E-Series models come with excellent corrosion resistance. However, the Coastal Protection E-Series models go a step further by treating external panels with acrylic resin, and also ensuring other key elements of the unit are further protected from these aggressive environments.



= Obstruction (e.g. buildings)

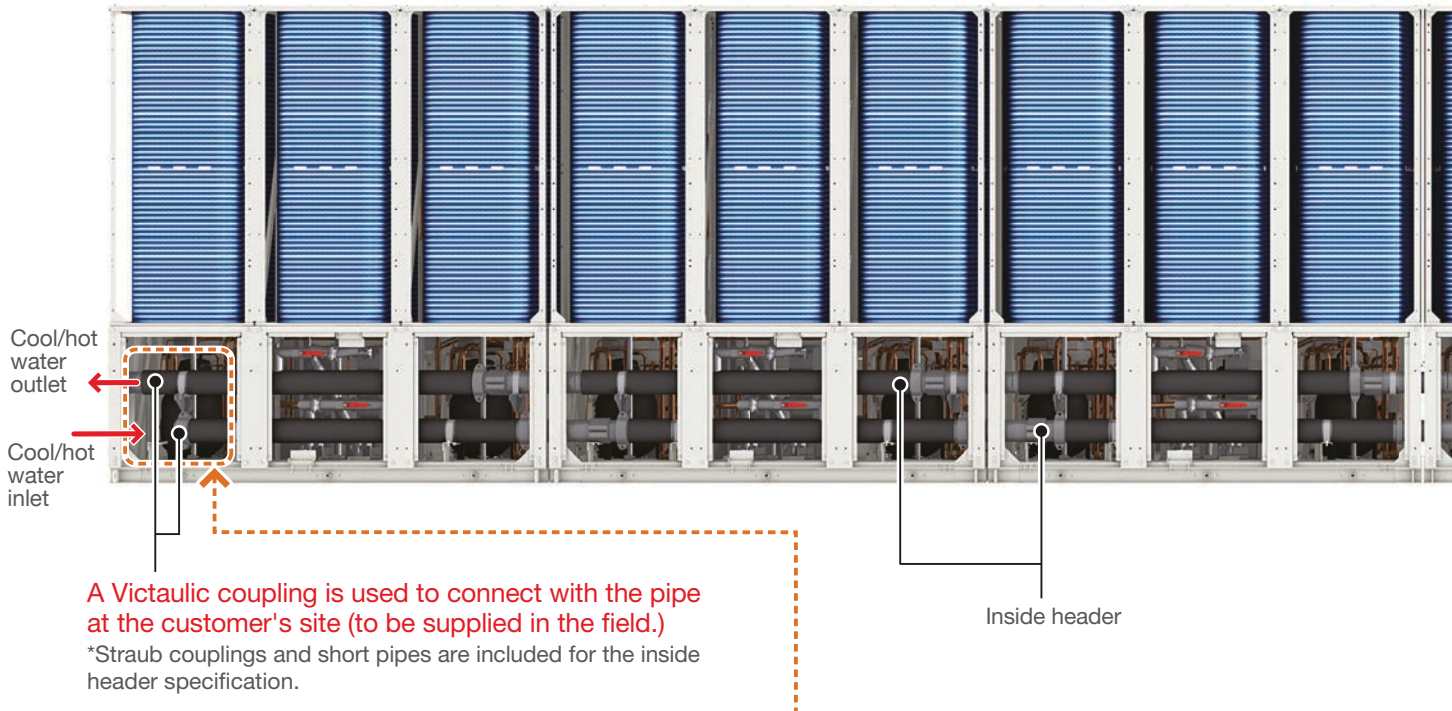
BS = corrosion protection E-Series model

STD = standard E-Series model

Internal Header Pipes and Connection Kits

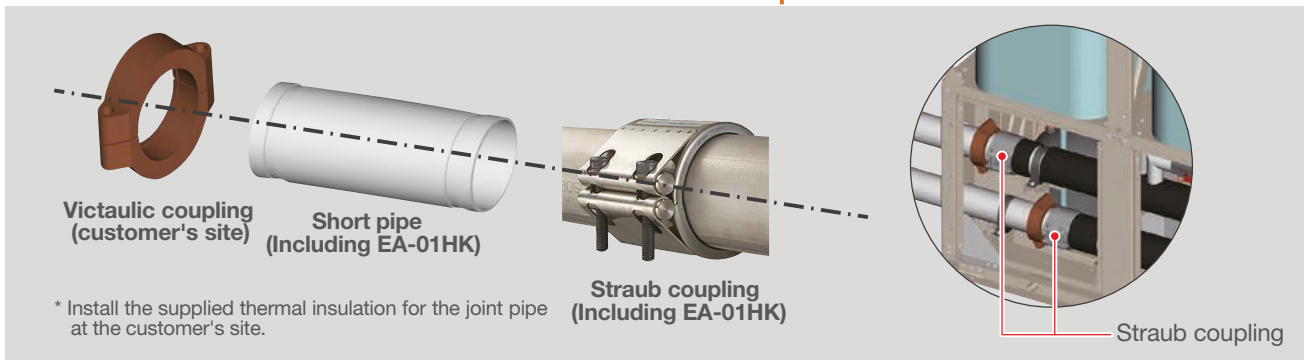
The Pipe Connection Kit

This figure shows 540 kW (EAHV-P900A-N×6) as an example.



A Victaulic coupling is used to connect with the pipe at the customer's site (to be supplied in the field.)

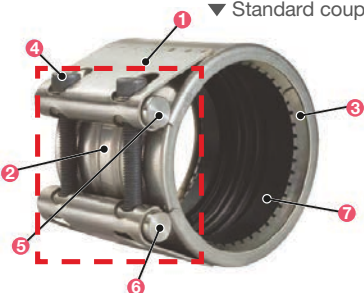
*Straub couplings and short pipes are included for the inside header specification.



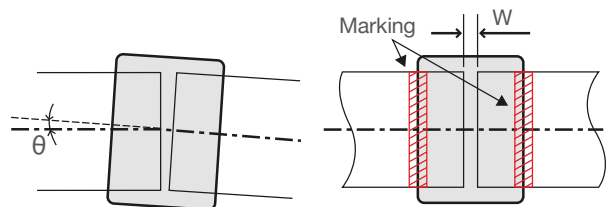
* Install the supplied thermal insulation for the joint pipe at the customer's site.

● Structure

▼ Standard coupling

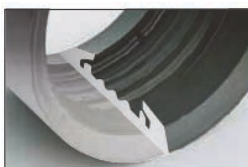


No.	Part name	Material
1	Casing	SUS 304
2	Sliding plate	SUS 301 or 304
3	Grip ring	SUS 301
4	Tightening bolt	SUS XM7
5	Rod washer	SUS 304
6	Rod nut	SUS 304
7	Rubber sleeve	EPDM

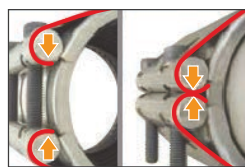


● Allowable clearance and tilt range

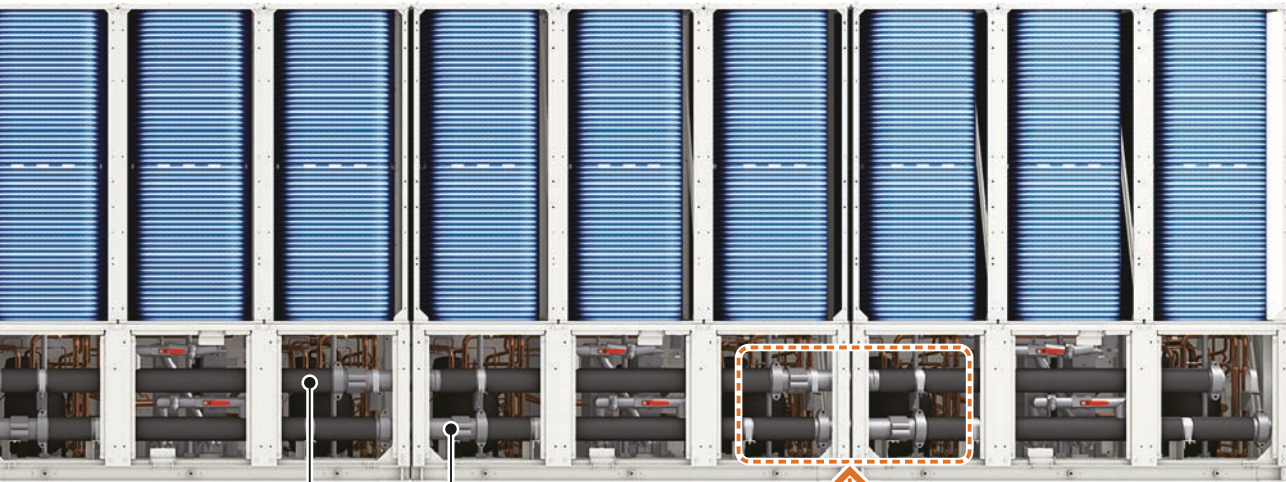
Allowable pipe clearance value [W]=0 to 25 mm
 Allowable pipe tilt angle [θ]=±2°



The sealed rubber has a lip structure to improve the water-stopping performance. Adjust the position of the Straub coupling so the marking on both sides can be seen.

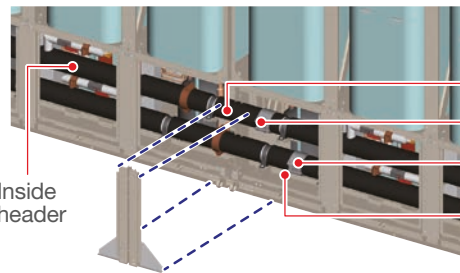


Just tighten the bolt until the casing fits against (comes into contact with) the metal.



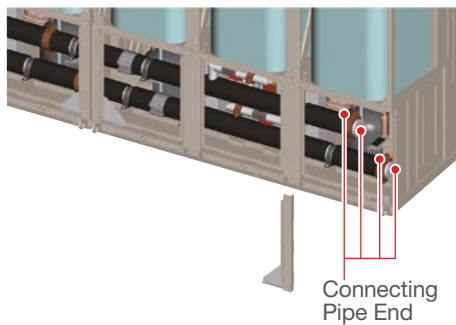
Inside header

Connecting Pipe End (Connection at Customer's Site)

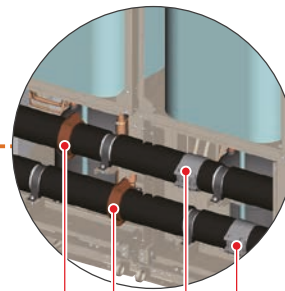


Connecting the joint coupling

Inside header



Connecting Pipe End



Victaulic coupling

Straub coupling

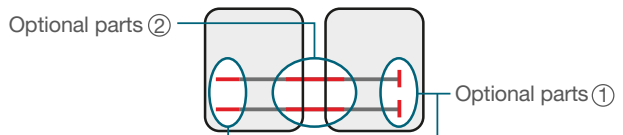
Optional parts ① (Piping Kit) EA-01HK



Optional parts ② (Connection Piping Kit) EA-02HK



Capacity	Module (Inside header)	Optional parts ① EA-01HK (model)	Optional parts ② EA-02HK (model)
30 HP	1	1	0
60 HP (30 HP x 2)	2	1	1
90 HP (30 HP x 3)	3	1	2
120 HP (30 HP x 4)	4	1	3
150 HP (30 HP x 5)	5	1	4
180 HP (30 HP x 6)	6	1	5

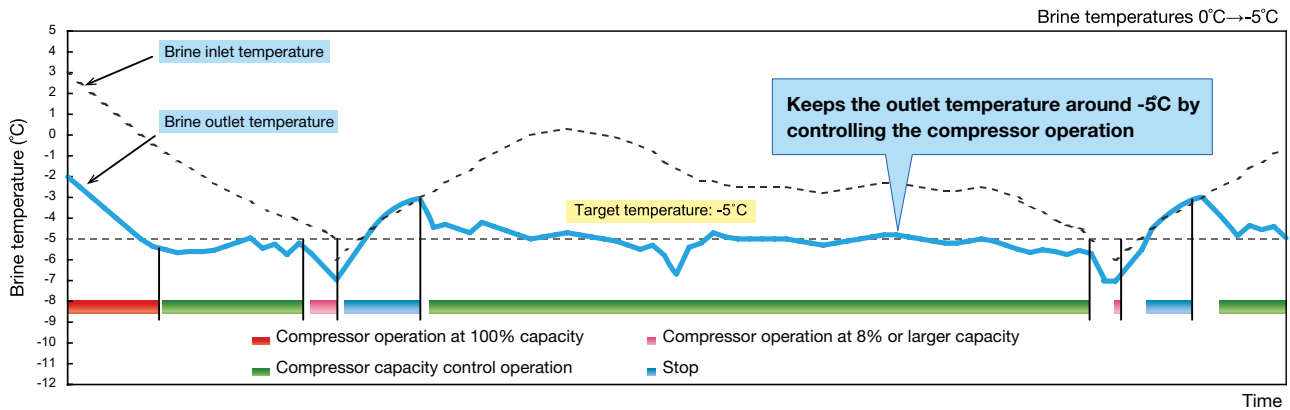


The Victaulic coupling and Straub coupling mentioned in the explanation are product names.

The EACV-P900YA (-N) Model is Suitable for Versatile Use, Including Process Cooling

- The EACV-P900YA(-N) model supports a wider outlet water temperature setting range (between 5°C and -10°C) and is suitable for use for a variety of applications. The use of inverter controlled fan and compressor enables precise control of outlet water temperature, which is essential in process cooling. This model is also suitable for use at metal and food factories and for use to cool testing equipment at hospitals.

Inverter controlled fan and compressor enables precise control of outlet temperatures on air-cooled unit.

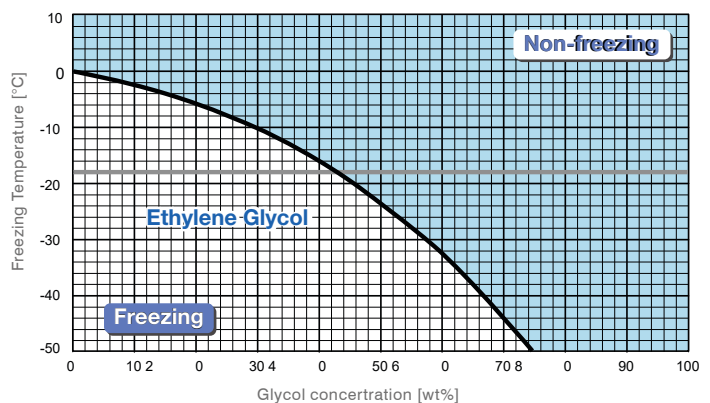


Typical Applications

- Manufacturing
- Food Industry
- Data Centres
- Medical/Health

Glycol

- Mixture of water and antifreeze solution that brings the freezing point down to prevent freezing at subzero temperatures. The freezing point depends on the percentage of antifreeze, whose main component is ethylene glycol. This model is available with the outlet water temperature setting range down to -10°C.



Note;
The graph was referred from chemical company data.
Freezing Temperature condition will be slightly different based on each company.
Please confirm detail data to the chemical company directly.
It is recommended to set the Glycol concentration to a percentage that will keep the freezing temperature at -18°C or less.

Case Study

Mitsubishi Electric Factory Automation, Nagoya, Japan.

The Nagoya Works

When Mitsubishi Electric built a new production facility for its range of factory automation products at the company's Nagoya Works, located in Aichi Prefecture,

Japan, the need for energy efficiency was paramount to match the company's ambitious carbon reduction targets.

The Production Facility

The production facility plays a key role in meeting the growing global demand for reliable, high-quality factory automation products. Like all modern buildings, it is constructed to the highest standards of air tightness and insulation.

The 26,000 square metres of floor space throughout the six storey building needs to be comfortable for staff and visitors alike, as well as incorporating the most advanced energy-efficient measures possible.

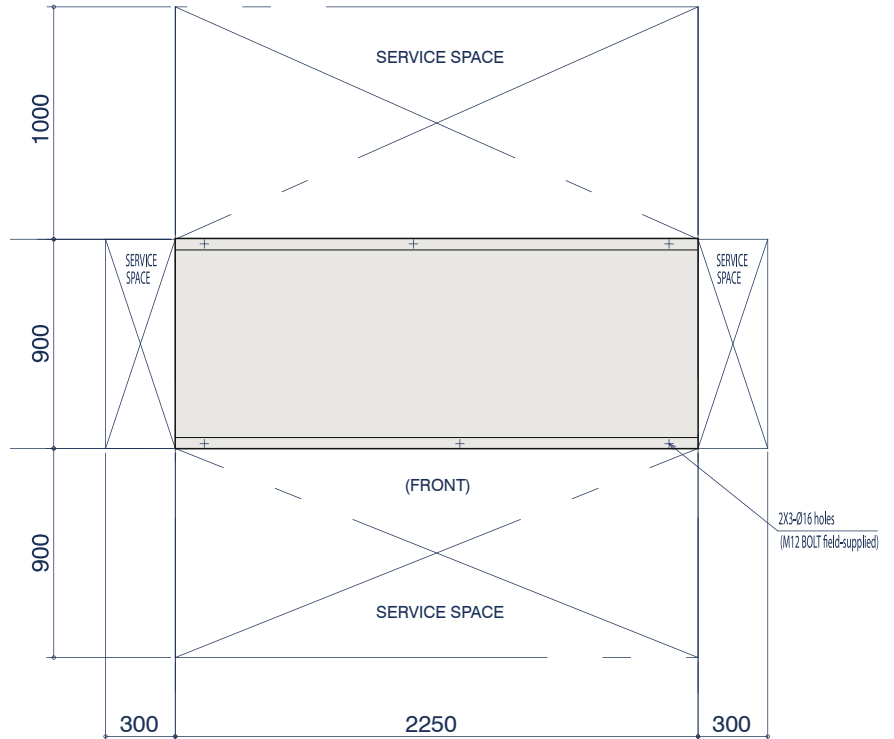
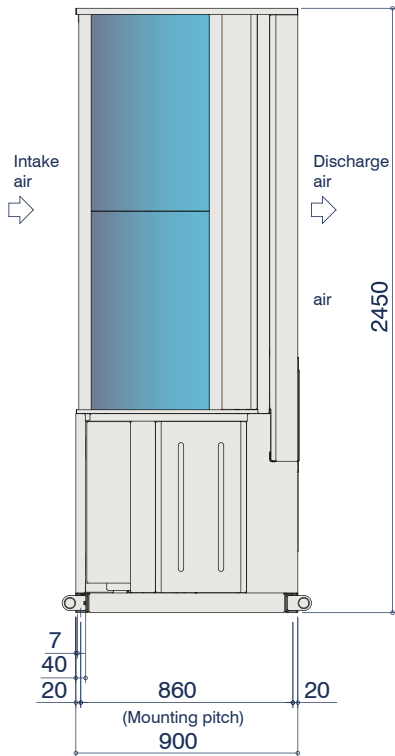
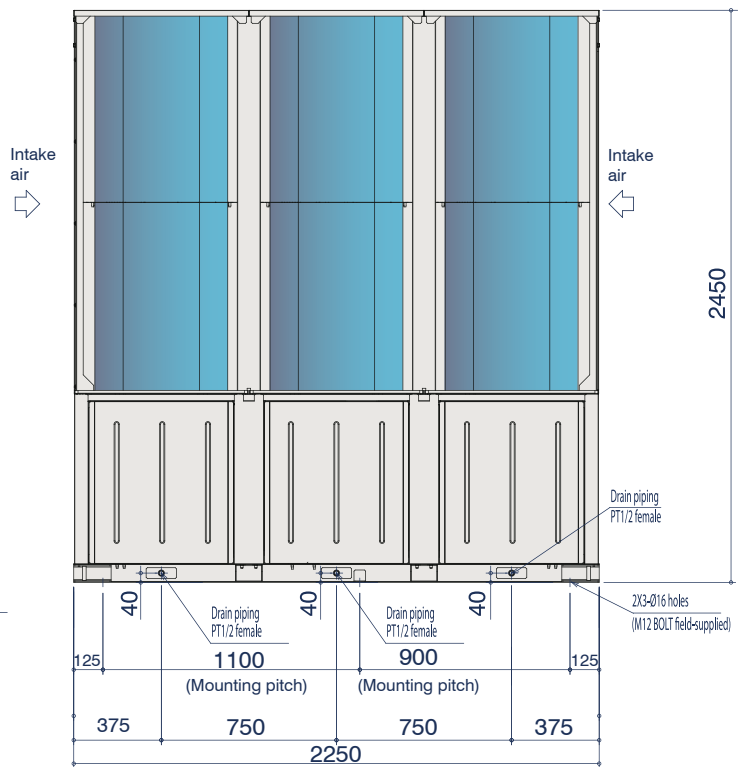
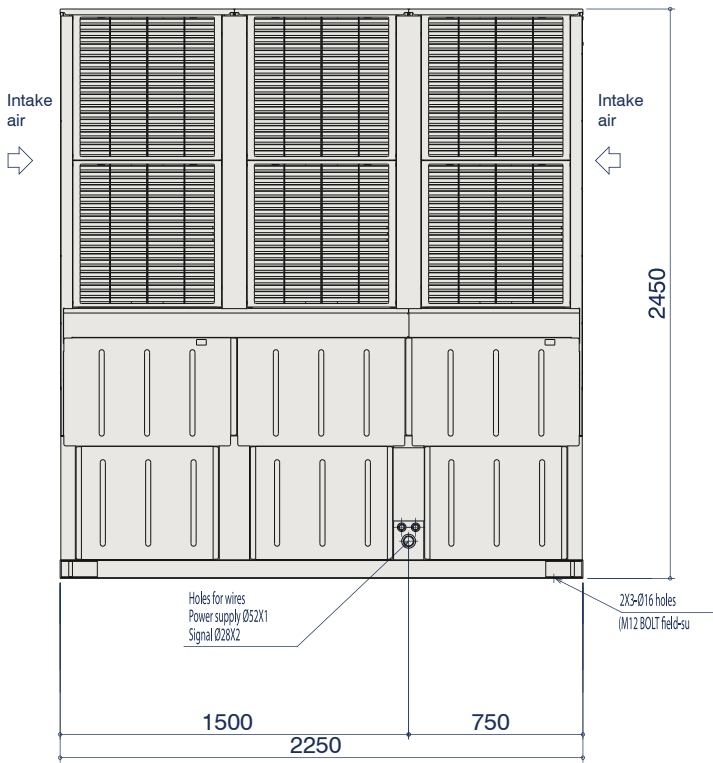
In addition to a 50kW photovoltaic system on the roof, low voltage LED lighting and comprehensive energy management systems, the factory is also benefiting from installation of 48 of the company's E-Series Chiller range – which brings a modern, low carbon update to traditional standard chiller technology.

The controls for the high-efficiency chiller units at Nagoya Works have been easily integrated into the Building Energy Management Systems (BEMS), so that they can operate smoothly alongside the Air Handling Units and VRF air conditioning, to maximise efficiency.

In addition to delivering 4.3MW of cooling and heating to the building, the modular approach of the E-Series range reduced both space and weight on the rooftop, and the in-built header pipes simplified the design and installation. The ability to position units as close as 900mm apart has also ensured easy access for maintenance.



Dimensions



Specifications

Model			EAHV-P900YA (-N) (-BS)	EACV-P900YA (-N) (-BS)	
Power source			3-phase 4-wire 380-400-415V 50/60Hz		
Cooling capacity *1		kW	90.0		
		kcal/h	77,400		
		BTU/h	307,080		
	Power input *3	kW	27.27		
	Current input	A	46.0 - 43.7 - 42.2		
	EER (Pump input is not included)		3.30		
	ESEER (Pump input is not included)		5.66		
	EER *4 (Eurovent certified)		2.94	3.08	
	ESEER *4 *5 (Eurovent certified)		4.71		
	ESEER (With pump input based on EN14511) *4 *6		5.46		
IPLV *7	kW/ kW	6.34			
Water flow rate	m³/h	15.5			
Heating capacity *2		kW	90.0	N/A	
		kcal/h	77,400	N/A	
		BTU/h	307,080	N/A	
	Power input *3	kW	25.71	N/A	
	Current input	A	43.4 - 41.2 - 39.7	N/A	
	COP (Pump input is not included)		3.50	N/A	
	COP (Includes pump input based on EN14511) *4		3.25	N/A	
	Water flow rate	m³/h	15.5	N/A	
Water pressure drop *1	Water	kPa	135		
	Cooling Water	°C	Outlet water 5 ~ 25		
	Heating	°C	Outlet water 30 ~ 55	N/A	
Temp range	Outdoor	°C	-15 ~ 43		
	Circulating water volume		m³/h	7.7-25.8	
Sound pressure level (measured in anechoic room) at 1m *1		dB(A)	65		
Sound power level (measured in anechoic room) *1		dB(A)	77		
Diameter of water pipe (Standard piping)	Inlet	mm (in)	50A (2B) housing type joint		
	Outlet	mm (in)	50A (2B) housing type joint		
Diameter of water pipe (Inside header piping -N)	Inlet	mm (in)	100A (4B) housing type joint		
	Outlet	mm (in)	100A (4B) housing type joint		
External finish			Polyester powder coating steel plate		
External dimensions		HxWxD	2450 x 2250 x 900		
Net weight	Standard piping	kg (lbs)	987 (2176)	957 (2110)	
	Inside header piping model (-N)	kg (lbs)	1022 (2253)	992 (2187)	
Design pressure	R410A	MPa	4.15		
	Water	MPa	1.0		
Heat exchanger	Water side	Stainless steel plate & copper brazing			
	Air side	Plate fin and copper tube			
Compressor	Type	Inverter scroll hermetic compressor			
	Maker	MITSUBISHI ELECTRIC CORPORATION			
	Starting method	Inverter			
	Quantity	2			
	Motor output	kW	11.7 x 2		
	Case heater	kW	0.045 x 2		
	Lubricant	MEL32			
	Starting current	A	8.5		
Max Running Current	A	61			
Fan	Air flow rate	m³/min	77 x 6		
		L/s	1283 x 6		
		cfm	2719 x 6		
	Type - Quantity	Propeller fan x 6			
	Starting method	Inverter			
Motor output	kW	0.19 x 6			
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			
Refrigerant	Type/GWP *8	R410A x 19(kg) x 2			
	Total charge	Weight	kg	38	
		CO ₂ equivalent *9	t	79.37	

*1 Under normal cooling conditions at outdoor temp 35°CDB/24°CWB (95°FDB/75.2°FWB) outlet water temp 7°C (44.6°F) inlet water temp 12°C (53.6°F).

*2 Under normal heating conditions at outdoor temp 7°CDB/6°CWB (44.6°FDB/42.8°FWB) outlet water temp 45°C (113°F) inlet water temp 40°C (104°F).

*3 Pump input is not included.

*4 Pump is not included in E-series.

*5 EN14511 standard (2013) formula is applied to figure out this value in case of fixed flow rate operation (flow rate is fixed at any heat load)

Pump input is included in cooling capacity for EER calculation. Condition of water inlet and outlet is fixed at inlet 12°C and outlet 7°C.

*6 EN14511 standard (2013) formula is applied to figure out this value in case of variable flow rate operation (flow rate varies per heat load)

Pump input is included in cooling capacity for EER calculation.

Condition of water temperature : inlet water temperature varies due to fixed water flow rate and outlet is fixed at outlet 7°C.

*7 Calculations according to standard performances (in accordance with AHRI 550-590).

*8 Amount of factory-charged refrigerant is 6 (kg)x2. Please add the refrigerant at the field.

*9 These values are based on Regulation (EU) No. 517/2014.

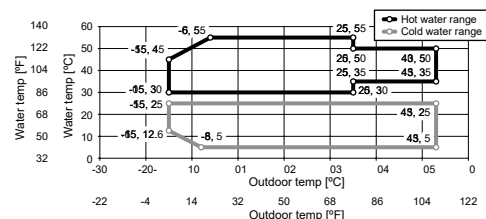
* Please don't use the steel material for the water piping.

* Please always make water circulate, or pull the circulation water out completely when not in use.

* Please do not use groundwater or well water in direct.

* The water circuit must be closed circuit.

* Due to continuous improvement, the above specifications may be subject to change without notice.



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



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 realisation of a sustainable society.

For more information, please visit www.mitsubishi-electric.co.nz or call our Customer Service Team on **0800 784 382**



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