Commercial Heating | Technical Data

MITSUBISHI ELECTRIC

CAHV-R450YA-HPB

Air Source Heat Pump

Project Name	PSDS PHASE 3A
Project Reference	Primary School
Quote Reference	EXAMPLE
Prepared By	Mitsubishi Electric

Technical Selection

CAHV-R450YA-HPB

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General

i. Air Source Heat Pumps will defrost the outdoor unit heat exchanger coil in periods of low ambient temperature such that condensate will be discharged – adequate provision should be made to prevent this condensate from collecting around the unit and pipework to avoid freezing, such as a soak away or drip try , which can cause a Health & Safety risk.

ii. If the unit is continuously operated for a long time with the outside air temperature below the freezing point, install a heater at the base of the unit to prevent the water from freezing at the unit bottom

iii. All water systems should be designed, installed and commissioned in accordance with industry good practice guidelines; such as, but not limited to: BSRIA Guide BG2/2010 – Water System Commissioning, BSRIA Guide BG29/2021 – Pre-Commissioning of Pipework Systems, BSRIA Guide BG50/2021 – Water Treatment for Closed Heating & Cooling Systems, CIBSE Commissioning Code W – Water distribution systems.

iv. Air Source Heat Pumps are designed to produce low pressure hot water which may be used in a variety of applications – it is your responsibility to check that the equipment proposed is suitable for the specific design and application intent.

v. Air Source Heat Pumps perform more efficiently by utilising low water flow temperatures and also making use of weather compensation.

vi. Mitsubishi Electric takes no design responsibility or liability for the system, components, equipment selections or control strategy – it is your responsibility to check the suitability of the proposed equipment selections.

vii. It is your responsibility to check that the Equipment selections parameters, as laid out in the Technical Submission document, are as provided by yourselves.

viii. In order to comply with the Mitsubishi Electric warranty requirements all Mitsubishi Electric products must have adequate planned preventative maintenance undertaken in accordance with our recommendations.

ix. To meet Mitsubishi Electric's warranty requirements a suitable method of filtration must be provided within the system. In addition, each Air Source Heat Pump must be provided with a strainer (minimum 20 mesh), line size flushing bypass, isolating valves and flow protection device. The flow protection device can be either a flow switch or differential pressure switch, with the preferred method being a differential pressure switch.

x. The recommended water flowrates must be maintained at all times when the equipment is operating. Particular attention should be paid to any change in pressure drop due to glycol and start up temperatures. Operating the equipment with less than the recommended flowrate will invalidate the warranty.

xi. It is recommended that glycol is used for protection of the low pressure hot water heating circuit to protect against freezing – should glycol anti-freeze protection not be used, another suitable form of frost protection must be employed to adequately protect the water circuit. If the water circuit freezes and damages the equipment the warranty will become void.

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Design Conditions		
Application		Gas Boiler replacement
Outdoor Temperature Condition	°C	-10
Water Inlet Temperature	°C	65
Water Outlet Temperature	°C	70
Glycol		Ethylene
Concentration of Glycol	%	30
Freeze Protection Temperature	°C	-10
Number of Units	No.	3

Selection Results		
Total Deliverable Capacity by Units	kW	89.2
COP (at design condition & 100% load)		1.2
SCOP (Low/Medium)		3.57/3.24
Number of Controllers (PAR-W31MAA)	No.	1

Water Requirments		
Minimum Flow Rate (per Unit)	l/s	1.9
Recommended Pipe Size (to unit)*	mm	54
Header Pipe Thermistor	No.	1
Total Required Flow Rate	l/s	5.7
Main Header Recommended Pipe Size*	mm	76
Pressure Drop (through CAHV)	kPa	11.2

*pipe sizing is based on copper.

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Efficiency Priority Mode - Part Load per Unit

Operating capacity: 100%		
Capacity of Unit	kW	29.7
Input Power per Unit	kW	24.7
COP		1.2

Operating capacity: 75%		
Capacity of Unit	kW	28.3
Input Power per Unit	kW	24.9

Operating capacity: 50%		
Capacity of Unit	kW	18.5
Input Power per Unit	kW	16.7

Operating capacity: 25%		
Capacity of Unit	kW	8.8
Input Power per Unit	kW	8.6

Operating capacity: Lower limit		
Capacity of Unit	kW	1.7
Input Power per Unit	kW	4.3

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Refrigerant		
Refrigerant Type		R454C
GWP per Unit		148
Charge per Unit	kg	9
Equivalent CO_2 Emissions per Unit	kg	1332

Compressors		
Compressor Type		Inverter Scroll Hermetic Compressor
Starting Method		Inverter
Number of Compressors per Unit	No.	1
Compressor Motor Output (per Compressor)	kW	12.1

Heat Exchanger		
Heat Exchanger Type		Stainless Steel Plate
Minimum Water Circuit Volume per Unit	Litres	525
Total Minimum Water Circuit Volume	Litres	1575

Fans		
Fan Type		Propeller Fan
Starting Method		Inverter
Number of Fans per Unit	No.	2
Total Airflow per Unit	l/s	5000
Fan Motor Output (per Fan)	kW	0.92
Available External Static Pressure	Pa	10

Electrical Data		
Power Supply per Unit	V/ph/Hz	380-415V/3-phase/50-60Hz
Max Total Current	A	120.9
Max Current per Unit	A	40.3

Weight & Dimensions		
External dimensions (H × W × D) per Unit	mm	1710 × 1750 × 740
Net Weight per Unit	kg	359

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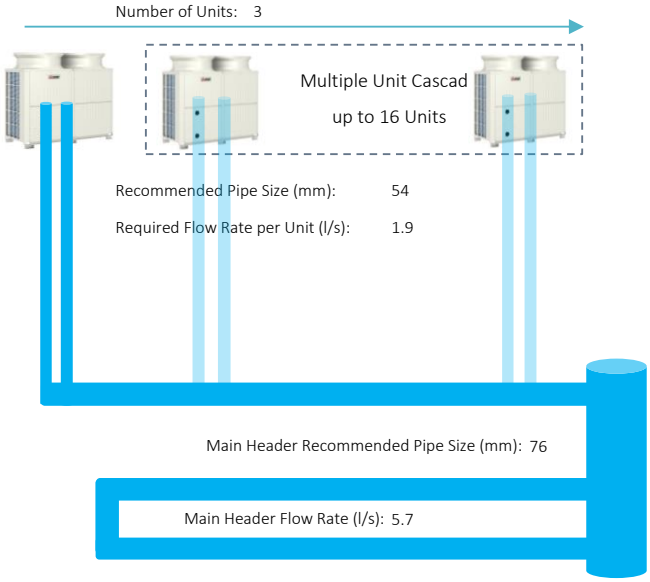
Recommended Pipe Size

Flow Rate per Unit	l/s	1.9
Number of Units		3
Total Flow Rate*	l/s	5.7
Pressure Drop**	kPa	11



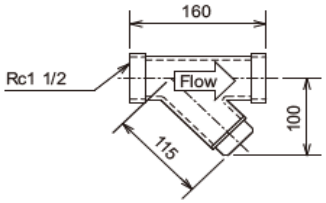
* With Main header
** Including Glycol

Pipe work sizing is the responsibility of the installing contractor and consultant. All pipe work sizes are based on CIBSE design conditions and water systems should be commissioned in accordance with the latest CIBSE Commissioning Code W for Water. All water should be cleaned and treated in accordance with BSRIA BG 29/2021 Pre-Commissioning Cleaning of Pipework Systems All pipe sizes are based on copper to BS EN 1057.

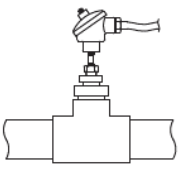
Optional parts

Strainer

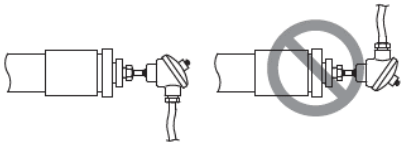
Install the strainer at the water pipe inlet



External-water temperature sensor (TW-TH16)



Vertical installation



Horizontal installation

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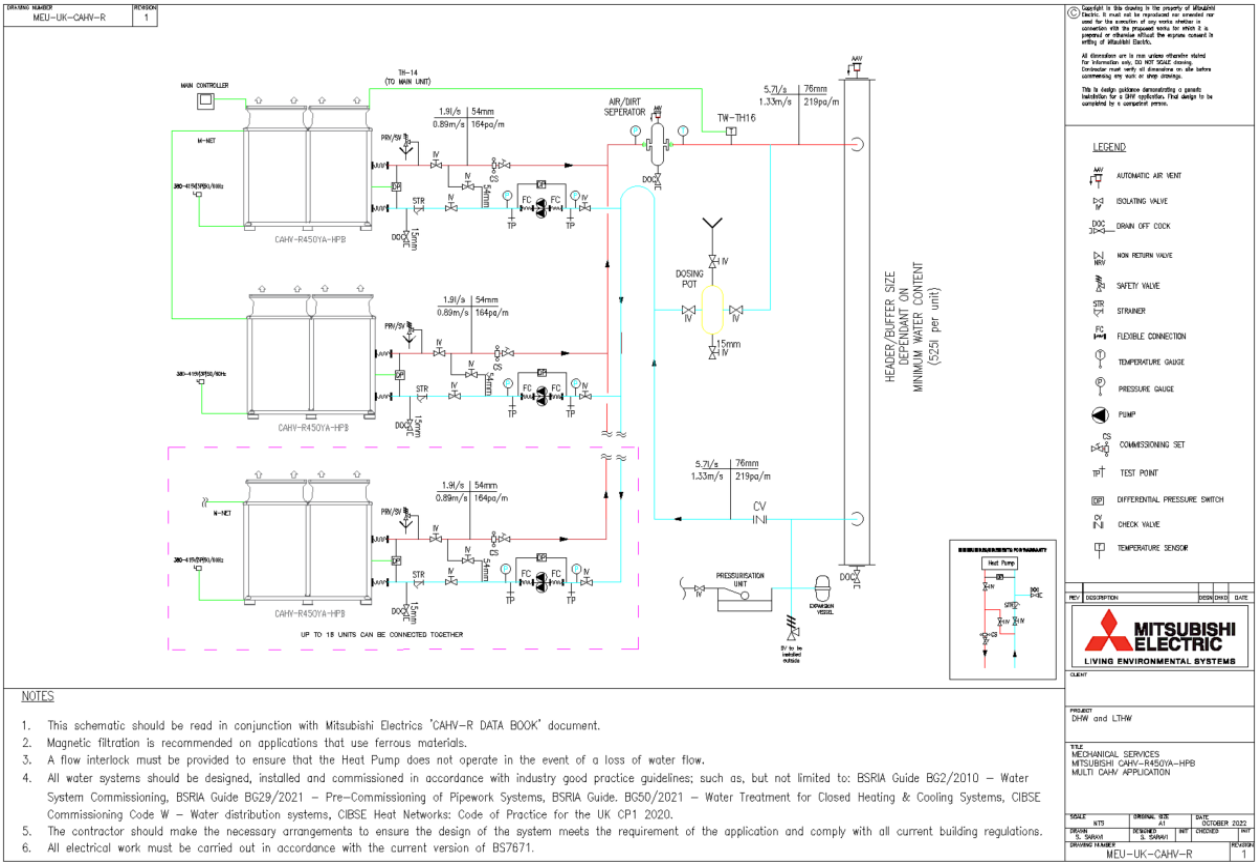
Example Schematic



NOTES

1. This schematic should be read in conjunction with Mitsubishi Electrics "CAHV-R DATA BOOK" document.
2. Magnetic filtration is recommended on applications that use ferrous materials.
3. A flow interlock must be provided to ensure that the Heat Pump does not operate in the event of a loss of water flow.
4. All water systems should be designed, installed and commissioned in accordance with industry good practice guidelines; such as, but not limited to: BSRIA Guide BG2/2010 – Water System Commissioning, BSRIA Guide BG29/2021 – Pre-Commissioning of Pipework Systems, BSRIA Guide. BG50/2021 – Water Treatment for Closed Heating & Cooling Systems, CIBSE Commissioning Code W – Water distribution systems, CIBSE Heat Networks: Code of Practice for the UK CP1 2020.
5. The contractor should make the necessary arrangements to ensure the design of the system meets the requirement of the application and comply with all current building regulations.
6. All electrical work must be carried out in accordance with the current version of BS7671.

Water Filtration

Strainer	Magnetic Filter	Air Dirt Separator
20 Mesh or More (Minimum)	Recommended if steel pipe	Minimum

Minimum-Without this filtration method the installations risks not receiving full warranty.
Recommended -This filtration method has recognised benefits for this type of system but its inclusion will not affect warranty.

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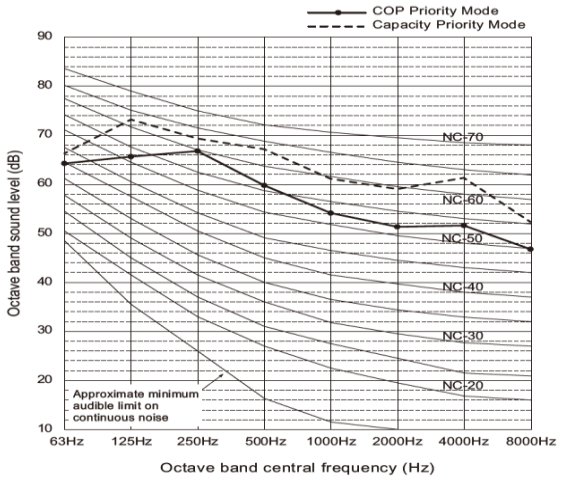
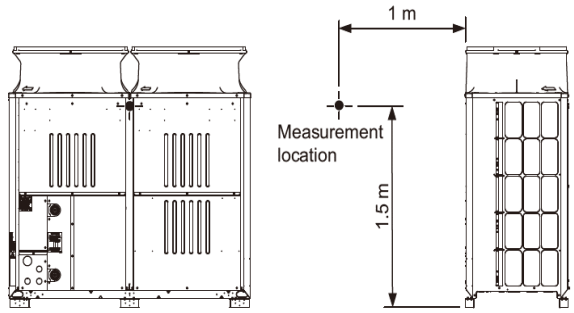
Noise Level



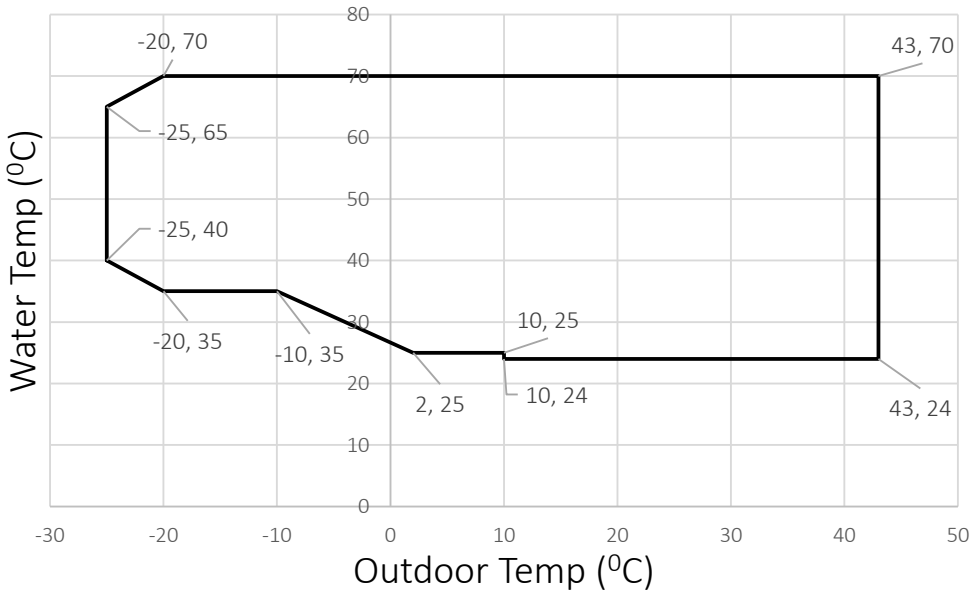


Measurment Position for Sound Pressure Level

Sound Pressure Level: 64/72 dB (COP Priority Mode/Capacity Priority Mode)

Opetation condition: COP Priority Mode: 7°CDB/6°CWB, Inlet water temp.: 40°C, Outlet water temp. 45°C

Operation Window



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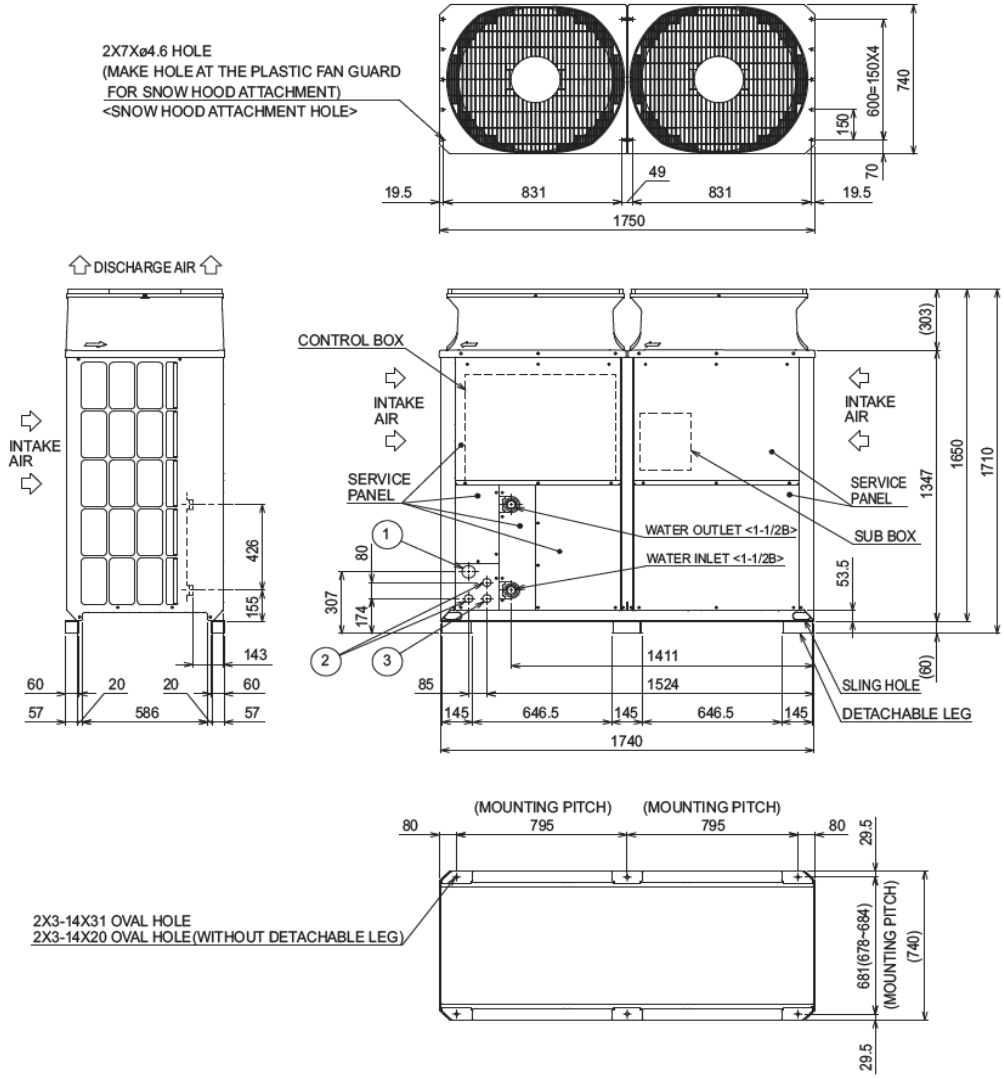
Dimensions

Unit: mm



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Specifications

The outdoor unit will be constructed from steel plate and painted with acrylic paint Munsell 5Y 8/1 and is a packaged type inverter driven air to Water heat pump capable of delivering an integrated (with defrost) capacity of 33.4kW at -5°C ambient temperature and 55°C outlet water temperature.
The single unit heat pump is made up of one scroll compressor hermetically sealed refrigerant circuits utilising R454c as a low GWP (148) refrigerant.
Water temperatures shall be between 24°C and 70°C and the unit is capable of working between ambient temperatures of -25°CDB and +43°CDB.

Multiple units can be connected together by a shielded 2 core cable and controlled using the inbuilt supplied control logic. Up to 16 units can be piped together delivering up to 534.4kW at -5°C. The inbuilt logic will cascade the units on and off based on the load and also deliver an optimised cascade based on compressor frequency and COP. Backup and rotate will allow for even wear of the system whilst also providing backup within a single unit and within a multiple unit installation. The SCOP (Low/Medium) is 3.57/3.24 at outdoor temperature of 7°CDB, the outlet water temperature of 45°C.
A minimum circuit size of 525litres per unit is required and all pipe work should be installed in accordance with related BS regulations and the Mitsubishi Electric design guide. The refrigeration process of the CAHV unit will be maintained by pressure and temperature sensors controlling check joints and four-way valves.
The CAHV unit has a max running current of 40.3 Amps and requires a 380V-415V AC 3 phase and neutral 50A mains supply. Control will be via a 30V DC signal generated by the outdoor unit. This signal will be sent to other outdoor units in its group via a 2-core non polar screened cable.
Control of the system is via volt free inputs and outputs into the BEMS/BMS. An error signal will alert the BMS and through interrogation of the PAR W31MAA. Flow or return temperatures can also be monitored via the PAR W31MAA.

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Import to Read

IMPORTANT: Please read and observe our “Safety precaution” warnings and cautions and any warnings included within the Technical guidance set out in the relevant equipment data book before you carry out any function on the product. This output is based upon the best available information but is given as indicative guidance only and should not be considered as final system design. We recommend that the information in this Technical Proposal Form is read in conjunction with the latest equipment data book and installation manual at all times. All water systems should be designed, installed and commissioned in accordance with good practice guidelines; such as, but not limited to: BSRIA Guide BG2/2010 – Water System Commissioning, BSRIA Guide BG29/2021 – Pre-Commissioning cleaning of Pipework Systems, BSRIA Guide BG50/2021 – Water Treatment for Closed Heating & Cooling Systems, CIBSE Commissioning Code W – Water distribution systems.
Mitsubishi Electric takes no design responsibility or liability for the system, components, equipment selections or control strategy – it is your responsibility to check the suitability of the proposed equipment selections. In order to comply with the Mitsubishi Electric warranty requirements all Mitsubishi Electric products must have adequate planned preventative maintenance undertaken in accordance with our recommendations. To meet Mitsubishi Electric’s warranty requirements a suitable method of filtration must be provided within the system – please refer to installation manual available from the document library. The recommended water flow rates must be maintained at all times when the equipment is operating. Particular attention should be paid to any change in pressure drop due to glycol and start up temperatures. Operating the equipment with less than the minimum flow rate will invalidate the warranty.
The temperatures, capacity de-rates and pressure drop based on glycol concentration will vary between manufacturers. We also remind you of our quotation texts:
This quotation is given by Mitsubishi Electric in good faith based upon information provided by you or your company. We have not undertaken a site survey to support this quotation. Whilst we endeavour to factor into our quotation any special site conditions or user requirements which you may have expressly identified to us previously in writing, this quotation is not a project system design and is not a confirmation of project volumetric or yield analysis. We recommend that you assess final product selection and make the final system design based upon your own volumetric or yield analysis and project knowledge, including any project requirements which might impact on that selection. Please check carefully any requirement for a Mitsubishi Electric product to integrate with any third party equipment. We are not responsible for integration capability of our products with any third party equipment unless we have expressly confirmed that this integration is approved in the current Mitsubishi Electric product specification or in a current technical bulletin.