Introductions

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Agenda -

Heat Pump Technology

Heat Pumps from Mitsubishi Electric

Ai20

The Renewable Solutions Provider

Making a World of Difference

Heat Pump Technology

MITSUBISHI ELECTRIC

LIVING ENVIRONMENTAL SYSTEMS

Air Conditioning | Commercial Heating

Domestic Heating | Photovoltaics

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Renewable Heating Technology

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Heat Pump Technology

Heat Pump Types

Air Source

Utilises heat energy from outside, using a fan to draw air across a heat exchanger.

Ground Source

Utilises heat energy from the ground via “Slinkies” (weaving pipe work buried under the ground) or bore holes.

Heat Pump Technology

Heat pump basic principle

In an Air Source Heat Pump (ASHP) heat is absorbed from the ambient air in the evaporator and then rejected via a plate heat exchanger into the primary water.

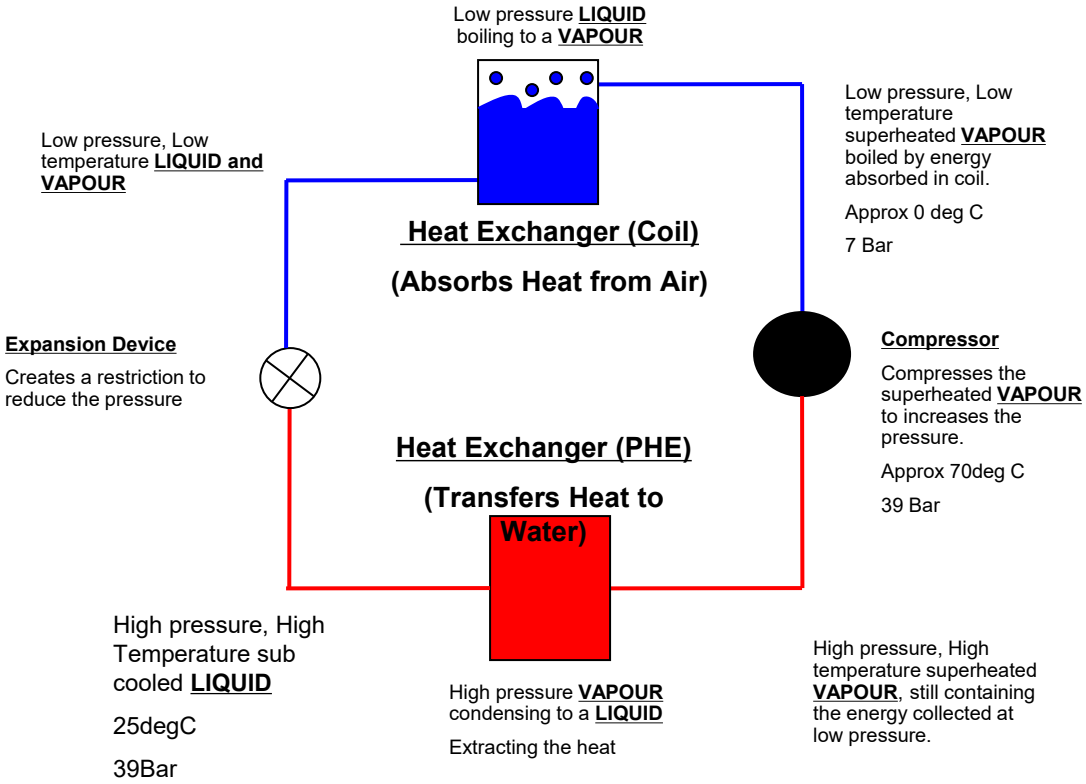
Our heat pumps operate with a refrigerant cycle known as the vapour compression cycle.

Heat Pump Technology

Glossary of Terms

- Coil or Evaporator (Absorbs Heat From Air)
- Plate Heat Exchanger or Condenser (Rejects Heat into Water)
- Compressor (Raises the Temperature and Pressure of the Refrigerant)
- Expansion Device (Pressure Reducer)
- Ambient Temperature (Outside Air Temperature)
- Refrigerant (R32)

The Vapour Compression Cycle: Heating



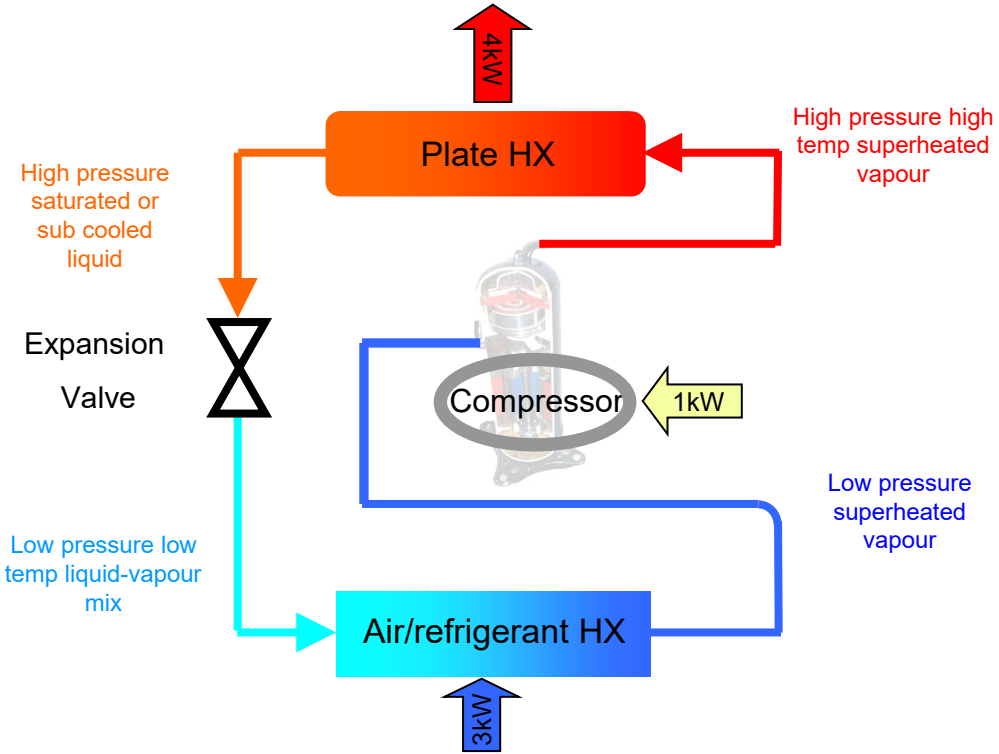
Measuring Heat Pump Performance (COP sCOP and SPF)

COP is only a snap shot of the system performance at a given time as the heat source temperature and flow temperature can vary.

For a true representation of a heat pump's efficiency SCOP is required. Also called Seasonal Performance Factor (SPF) in context of the RHI.

This takes the average COP over a 12 month period taking into account all the possible changes.

Coefficient of Performance (CoP)



Coefficient of Performance

$$COP = \frac{\text{Total energy rejected}}{\text{compressor power input}}$$

Total energy rejected = The amount of energy absorbed by the evaporator (3kW) + The energy to power the compressor (1kW)

Therefore $COP = \frac{4kW}{1kW} = 4$

Heat Pump Technology

Measuring Heat Pump Performance

The CoP of a heat pump varies dependant on different factors;

- Supply water temperature (flow temperature)
- Temperature of heat source (ground or air)
- Heat Pump Technology (Inverter driven, refrigerant etc.)

As the flow temperature from the heat pump decreases and the heat source temperature increases, the efficiency increases.

Mitsubishi Electric Corporation

PRODUCTS

Introducing
CAHV-R

MITSUBISHI ELECTRIC

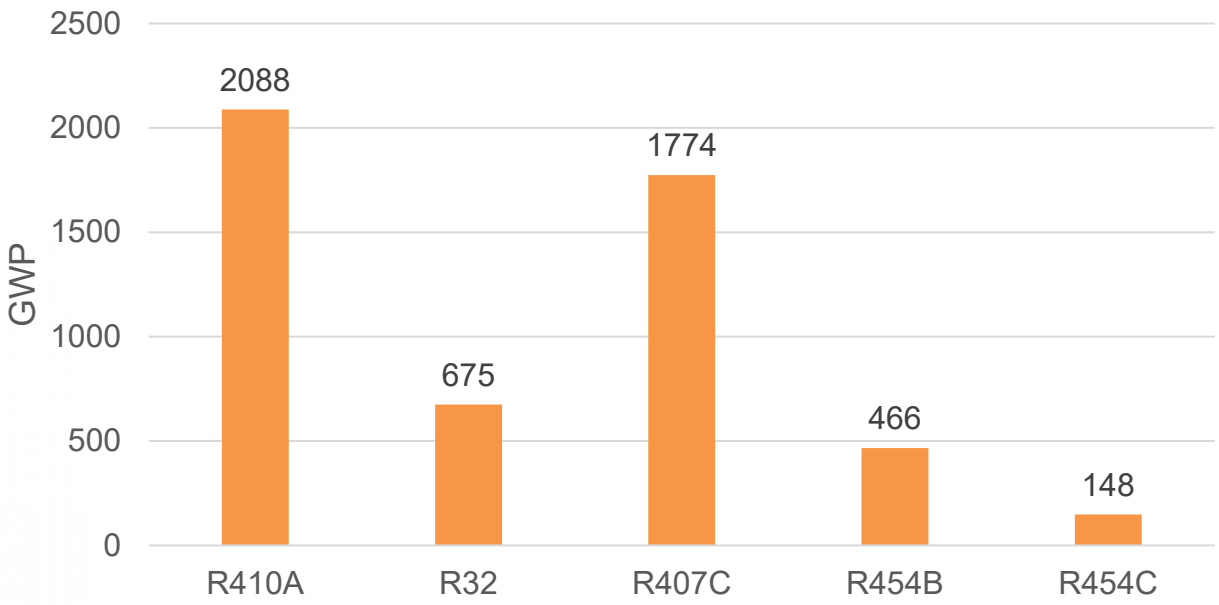
CAHV-R Introduction – Basic Overview

- Model Code – CAHV-R450YC-HPB
- Capacity – 40kW (A7W45)
- CPL – £19,863
- Refrigerant – R454C
- Chassis – YKB XL module
- Water outlet temps – 24 - 70°C
- SCOP – 3.57/3.24 (Low/Medium)

Key Features – Low GWP R454C Refrigerant

- GWP = 148
- ODP = 0
- Safety Class = A2L
- Composition = 21.5% R32 & 78.5% R1234yf

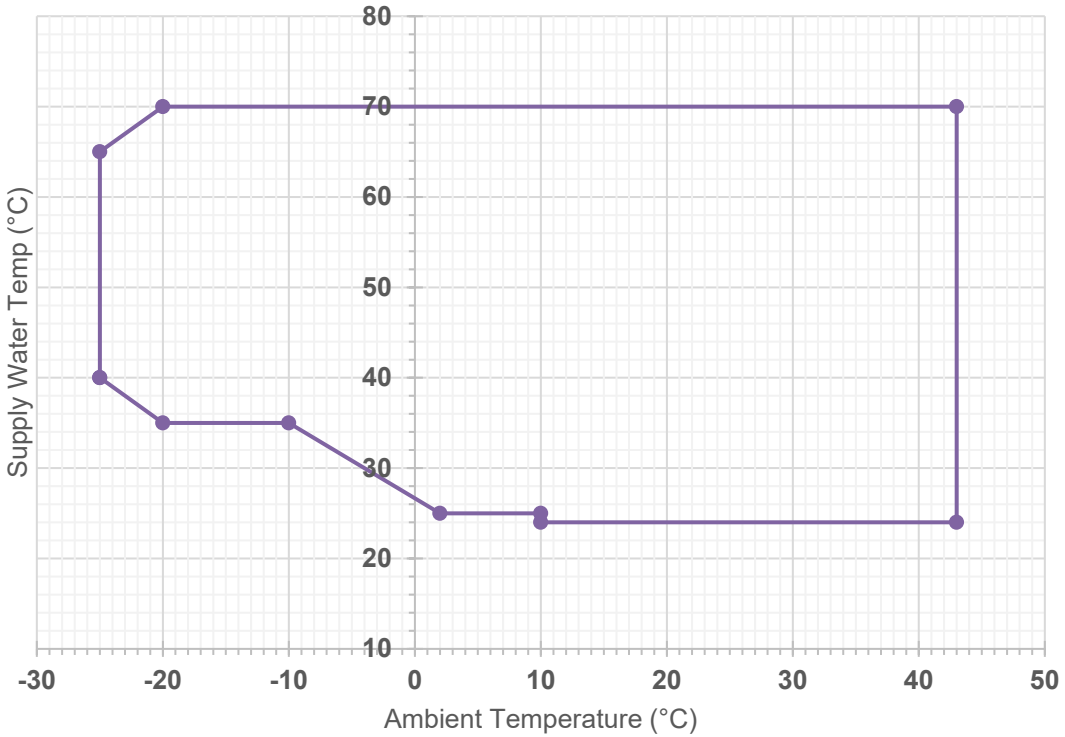
Key Features – Low GWP R454C Refrigerant



Key Features – Market Leading Embodied Carbon

- CIBSE TM65 mid-level calculation of 5,049 $kgCO_2e$
- Only 413 $kgCO_2e$ contribution from the refrigerant

Key Features – Wide Operating Envelope

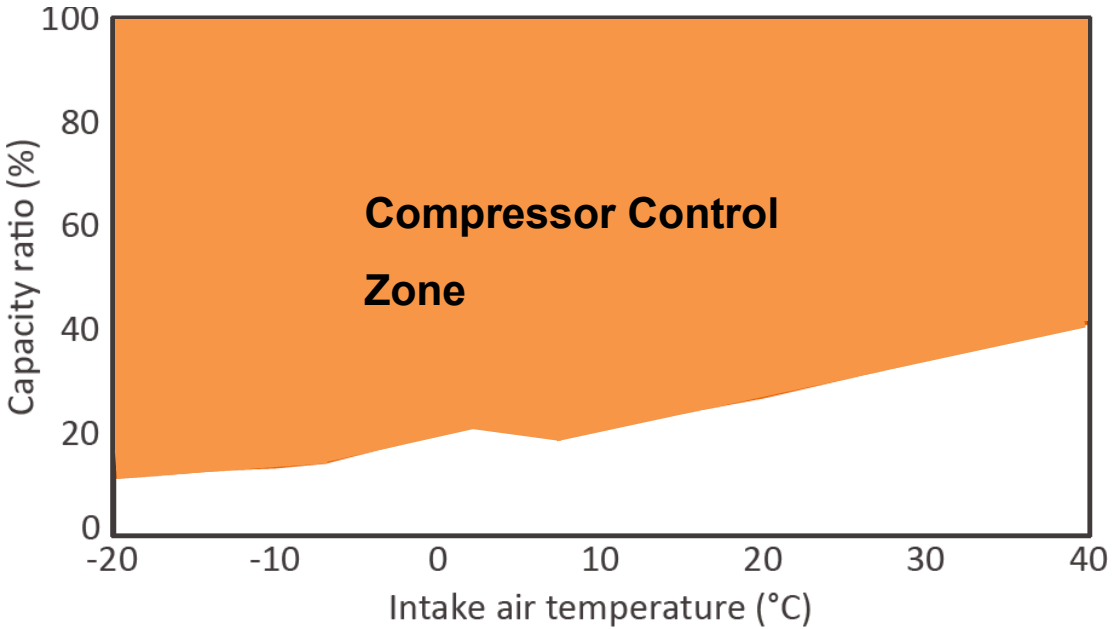


- 70℃ outlet temperature all the way to -20℃ external ambient.
- Suitable to produce DHW and LTHW.

Key Features – Rapid Defrost

- The properties of R454C and an improved air heat exchange design means that frost formation can be reduced.
- This reduces overall defrosting time.

Key Features – Low Frequency Compressor Control



- Minimum capacity output of 8.7kW at 16℃ outdoor temperature.
- Minimize thermo ON/OFF frequency during low-load operation.
- Improves energy efficiency.
- Reduces possible risks of product failures.

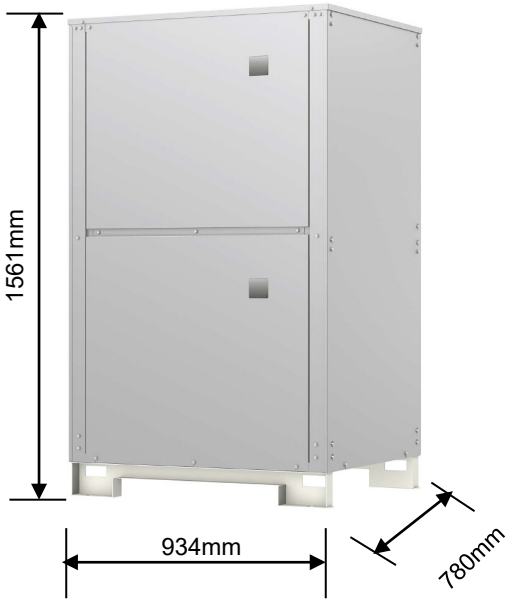
Ground Source Heat Pump

CRHV P600YA HPB

Headline features

- 60kW at B0W35 – Rated
- *45kW at B0W35 – MCS Mode – available soon*
- COP at B0W35 (60kW) - 4.23
- COP at B0W35 (45kW) – 4.41
- Cascade multiple units – up to 960kW (Heating Only)
- Heat Source Min -5˚C max 27˚C (45˚C – heat recovery applications)
- Backup and rotate
- Optimization built in
- Weather compensation
- BEMS Integration

Headline features



Weight: 395kg

Sound Power: 66dBA

Sound Pressure @ 1m: 50dBA

Footprint = 0.73m^2
Capacity per m^2 = 82.4kW/m^2

Features


Heat Source
-5˚C> Inlet <27˚C
54mm at 1.5l/s
12kPa
Heat Sink
Up to 65˚C
54mm at 1.5l/s
7kPa