

# Introductions

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# Agenda -

Heat Pump Technology

Heat Pumps from Mitsubishi  
Electric



The Renewable Solutions Provider  
Making a World of Difference

# Heat Pump Technology



Air Conditioning | Commercial Heating  
Domestic Heating | Photovoltaics



## 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 basic principle

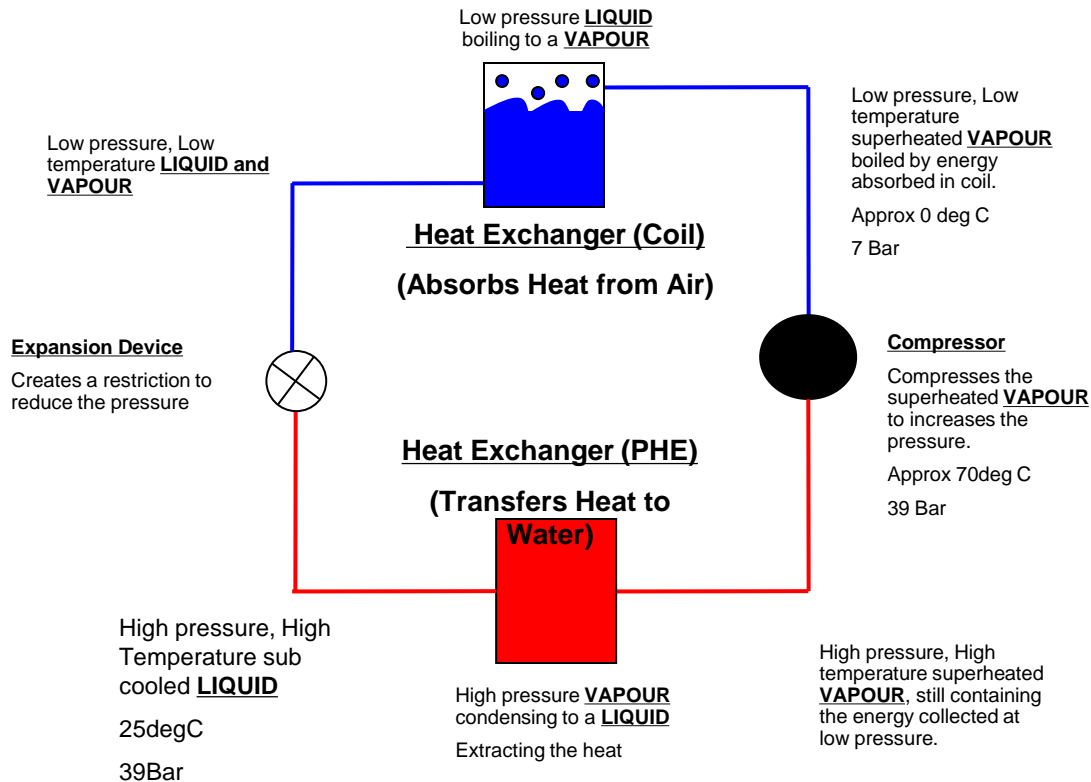
■ In an Air Source Heat Pump (ASHP) heat is absorbed from the ambient air in the evaporator and then rejected via a plate heat exchanger into the primary water.

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

## 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)

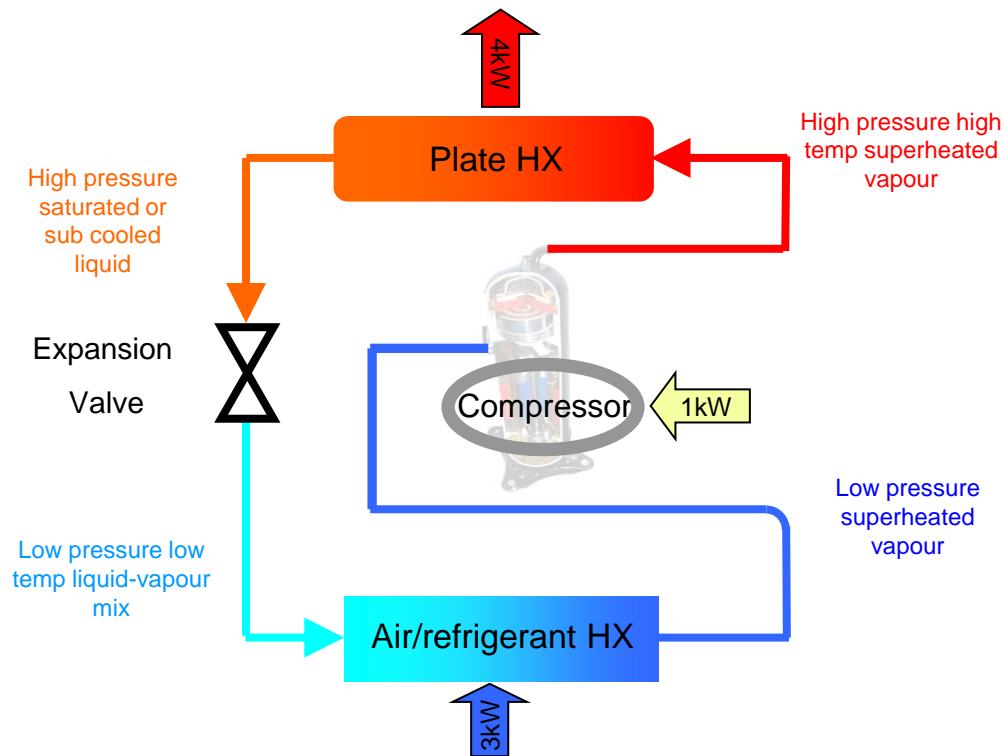
COP is only a snap shot of the system performance at a given time as the heat source temperature and flow temperature can vary.

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)



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

$$\text{Total energy rejected} = \begin{array}{l} \text{The amount of energy absorbed by the} \\ \text{evaporator (3kW) +} \\ \text{The energy to power the compressor} \\ \text{(1kW)} \end{array}$$

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

## 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.*



# PRODUCTS

# Introducing **CAHV-R**



# CAHV-R Introduction – Basic Overview



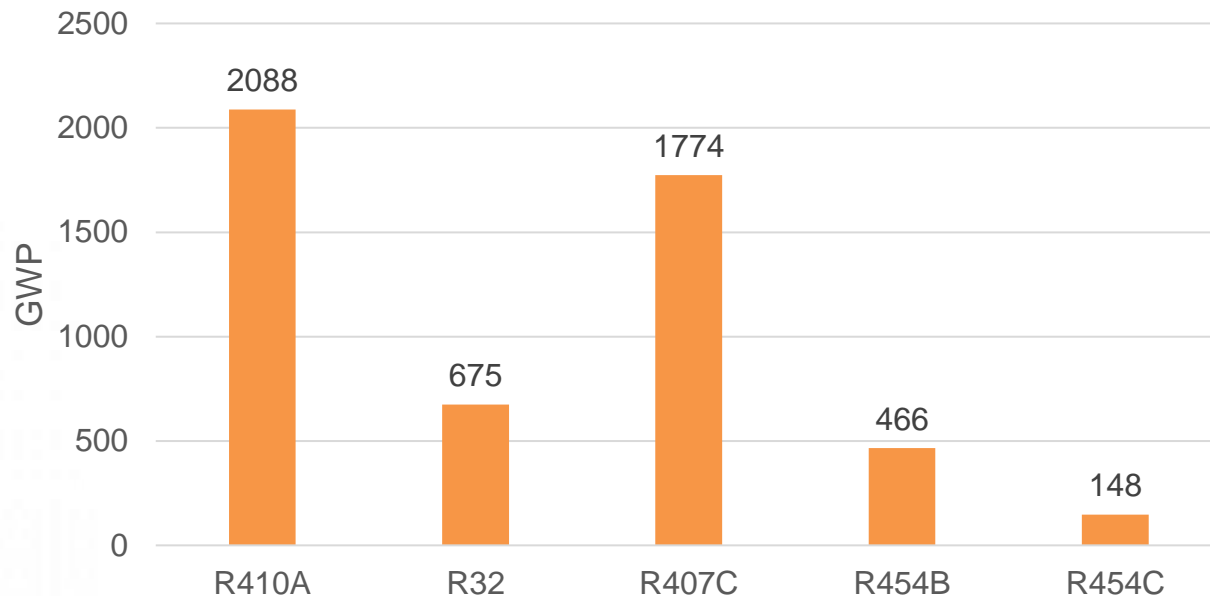
- Model Code – CAHV-R450YC-HPB
- Capacity – 40kW (A7W45)
- CPL – £19,863
- Refrigerant – R454C
- Chassis – YKB XL module
- Water outlet temps – 24 - 70°C
- SCOP – 3.57/3.24 (Low/Medium)

# 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



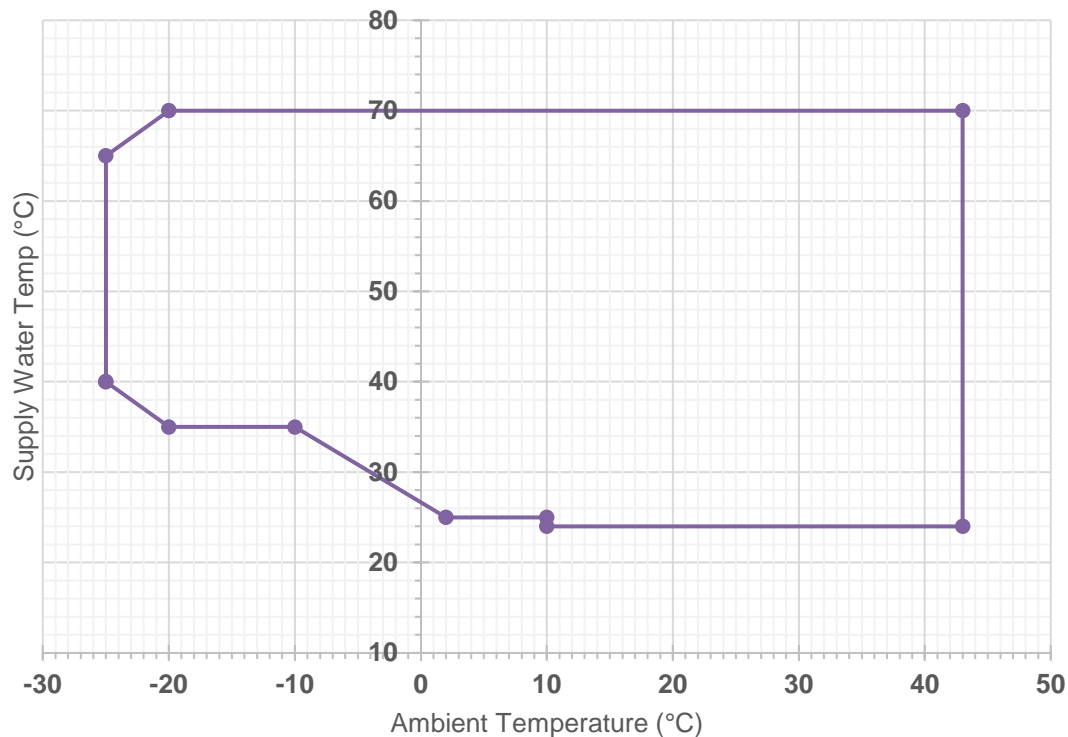


# Key Features – Market Leading Embodied Carbon



- CIBSE TM65 mid-level calculation of 5,049 kgCO<sub>2</sub>e
- Only 413 kgCO<sub>2</sub>e contribution from the refrigerant

# Key Features – Wide Operating Envelope



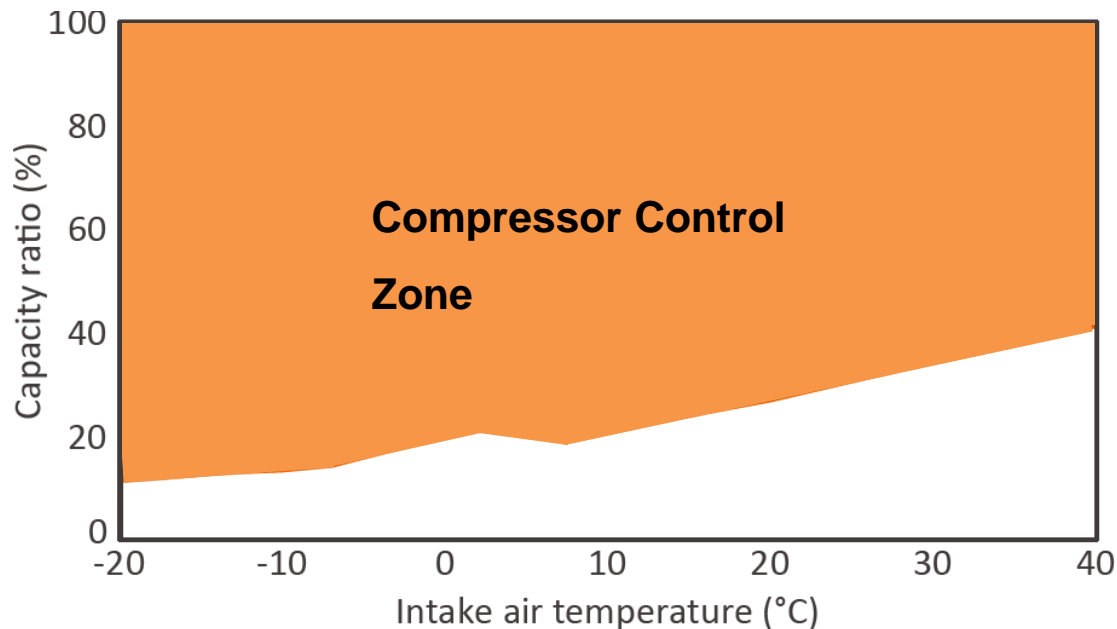
- 70°C outlet temperature all the way to -20°C external ambient.
- Suitable to produce DHW and LTHW.

# 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°C outdoor temperature.
- Minimize thermo ON/OFF frequency during low-load operation.
- Improves energy efficiency.
- Reduces possible risks of product failures.

# Ground Source Heat Pump

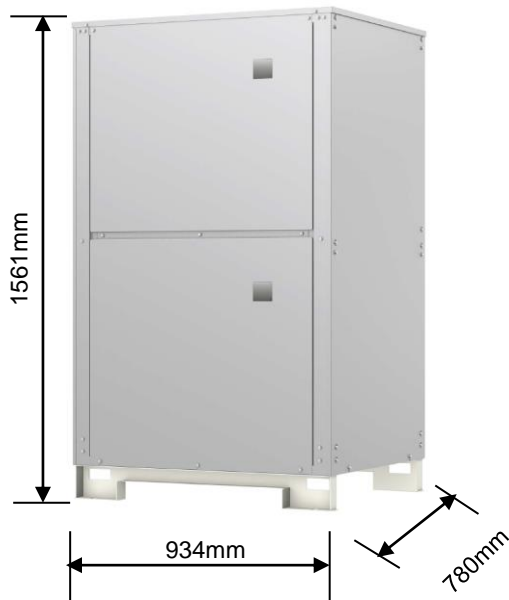
CRHV P600YA HPB



# 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 =  $0.73\text{m}^2$   
Capacity per  $\text{m}^2$  =  $82.4\text{kW}/\text{m}^2$

# Features

