QAHV

Monobloc Air Source Heat Pump

Frequently Asked Questions

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Q.1 What is the QAHV?

A.

The QAHV is Mitsubishi Electric's latest addition of hermetical sealed monobloc air source heat pumps.

Designed to provide sanitary hot water to the commercial sector, the QAHV utilises CO_2 as a refrigerant resulting in high efficiency and high temperature hot water. The 40kW nominal unit can provide outlet temperatures as high as 90°C and efficiencies of 3.88 at nominal conditions*.

Q.2 Why use CO_2 as a refrigerant?

A.

CO_2 is a natural, non toxic, non flammable, high heat transfer refrigerant with a GWP of just 1.

CO_2 (R744) has several unique physical properties one of which is that the critical point is low at 31.1°C @ 73.9 Bar. The CO_2 refrigerant in the QAHV operates above this critical point and therefore operates in a transcritical cycle.

Q.3 What is a transcritical cycle?

A.

A transcritical cycle is where the working fluid operates above the critical point with the critical point being defined as the point beyond which the gaseous and liquid phase is the same density and vapour will not condense or change phase.

CO_2 is cooled but does not condense at the gas cooler outlet, heat is rejected into the water by cooling or de-superheating the CO_2 vapour at supercritical pressure in a unique counter flow gas cooler. High efficiencies can be achieved when the temperature of the water entering is low, typically 7 to 15°C, and the delta T is wide, around 50-60K.

Q.4 Why heat pumps and why now?

A.

In June 2019 the UK Government set into law our commitment to end our contribution to climate change and has set targets towards a Net Zero future by the year 2050.

To achieve this commitment the we must move faster and further away from using fossil fuels in all sectors and the electrification of heat is becoming a major trend to continue this shift away from traditional gas boiler / CHP technology. Design frameworks and policy continue to direct design towards low carbon / renewables technology and heat pumps are set to become a key technology in this ambition towards 2050.

*1 Under Normal heating conditions at the outdoor temp, 16°CDB/12°CWB, the outlet water temperature 65°C, and the inlet water temperature 17°C.

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Q.5 But isn’t gas cleaner than electric?

A. **Since 2012 the UK has been very successful in decarbonising its electricity production and there is a clear trend in the grid emission factors reflecting the shift away from fossil-fuels.**

In fact, in 2012 the UK created 40% of it’s electricity from burning coal and in only 7 years that figure fell to just 2%. The latest updates seen in SAP 10.1 propose to use a figure of 136 grams of CO_2 per kilowatt hour of electric used an incredible reduction of 74% when compared to SAP 2012.

Q.6 What is the best applications for the QAHV?

A. **The QAHV can produce highly efficient and low carbon sanitary hot water. The carbon reduction is dramatically increased in applications where there is a high demand for hot water.**

Many major blue chip businesses have already published strong carbon reduction targets, in fact, the NHS produced a carbon reduction strategy in 2009 which see the NHS trying to half their carbon emissions between 2020 - 2030. Ideal applications would be in NHS / healthcare, hotel / leisure and student accommodation environments.

Q.7 Is the QAHV WRAS approved?

A. **The QAHV delivers hot water via an indirect method using either buffer stores or plate heat exchangers.**

As such, the system will not have potable water flowing through it and does not need WRAS approval. The indirect method also helps to protect the units plate heat exchanger from poor water quality and scale issues.

Q.8 What happens if the inlet water temperature to the QAHV is more than 29ºC?

A. **Once the inlet water temperature starts to increase above 29ºC the capacity and COP will start to reduce.**

This is because the heat exchange process depends on the ability to de-superheat the gaseous CO_2 in the gas cooler, the higher the inlet temperature the less de-superheating and less capacity produced.

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Q.9 Why use QAHV when we can use CAHV?

A. **QAHV is designed solely to produce sanitary hot water, by using CO_2 as a refrigerant the unit is able to produce high temperature hot water much more efficiency than the CAHV.**

With a flow temperature of 65°C the QAHV is approximately 70% more efficient than CAHV, the QAHV is also able to provide a max flow temperature 20°C higher than CAHV with a GWP of 1.

Q.10 What carbon saving can I expect compared to a gas boiler?

A. **The ability to provide highly efficient and high temperature sanitary hot water is the QAHV's key value and the carbon savings against fossil fuel technology is why the QAHV is such an important technology in the drive towards the electrification of heat.**

Typically the QAHV will provide a seasonal efficiency of 3, which means a carbon saving of 78% even when compared to gas boiler with an efficiency as high as 98%.

Q.11 Does the QAHV qualify for any BREEAM points?

A. **The impact of refrigerants is undertaken through credit POL 1 in BREEAM.**

There are 3 credits up for grabs here, 2 are available by default if the GWP of the refrigerant is under 10 and another 1 credit if the unit is hermetically sealed. The QAHV meets both of these criteria so can achieve all 3!

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Changes for the Better

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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).