Hot Water Cylinder Selection Guide

Performance

The performance of any hot water (DHW) cylinder is dependant on a number of factors which all combine to provide the final temperature produced at the cylinder. It is very important to get these factors correct or the performance of the cylinder may be compromised and end-user expectations not reached.

Two main factors which can affect the final temperature of the hot water cylinder are coil size and flowrate.

Coil Size

Due to the lower flow temperature (than a fossil boiler) available at the cylinder coil, in order to transfer the heat into the water within the cylinder a larger coil surface area is required. This has to be the true surface area of the coil and not 'fins' attached to the coil. As a rough guide $0.25m^2$ of coil surface area is recommended per kW thermal output of the heat pump and $0.2m^2$ as a minimum.

Flowrate

Again due to the lower flow temperature as opposed to a fossil boiler, hot water cylinders generally require a higher flowrate of water into the coil. If the coil in the tank is of too small diameter, this high flowrate can increase the pressure drop across the coil. If care isn't taken this pressure drop can exceed the amount of pressure available from the water pump within the heat pump and result in lower stored temperatures within the tank.

Other factors which can also affect the final stored temperature within the tank include: distance of the hot water cylinders from the heat pump; distance from the point of usage; and the plumbing configuration of any secondary returns or towel rails.

The following pages show different types of hot water cylinder configurations. Figure 1 shows a single coil tank and Figure 2 a twin coil tank for use with solar. Figures 3 and 4 deal with installations where there is more than one tank installed. Figure 3 shows where both tanks are bought up to temperature together. Figure 4 shows hot water cylinders that are brought up to temperature individually of each another, i.e. a constant and occasional configuration.

It is important in both twin tank configurations that a reverse return piping arrangement is used for the piping to and from the coils and the domestic hot water tank outlets and inlets, otherwise the tanks will not reach the correct temperatures together.

Selection charts of Kensa heat pumps with Advance Appliance hot water cylinders are contained within this document taking into account flowrate and coil size. (However this is a guide only as the installation can also affect performance.)

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R407C Range

Single Tank and non-constant twin tank operation

	Single Coil								Twin Coil					
	150	215	250		305	400	500		215	255	305		400	500
Heat Pump Load Size	25	25	25	32	32	32	32	Coil size (mm)	25	25	25	32	32	32
	2	3	3	3	3	3	3	Meter Coil size (m2)	2	2	3	3	3	3
7	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
13	✗	✗	✗	✓	✓	✓	✓		✗	✗	✗	✓	✓	✓
15	✗	✗	✗	✓	✓	✓	✓		✗	✗	✗	✓	✓	✓
17	17kW Evo should not be used for DHW								17kW Evo should not be used for DHW					

Twin Tank constant parallel operation

	Single Coil								Twin Coil					
	150	215	250		305	400	500		215	255	305		400	500
Heat Pump Load Size	25	25	25	32	32	32	32	Coil size (mm)	25	25	25	32	32	32
	2	3	3	3	3	3	3	Meter Coil size (m2)	2	2	3	3	3	3
7	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
13	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
15	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
17	17kW Evo should not be used for DHW								17kW Evo should not be used for DHW					

Hot Water Cylinder Selection Guide

High Temperature Range (R134a)

Single Tank and non-constant twin tank operation

		Single Coil									Twin Coil					
		150	215	250		305	400	500			215	255	305		400	500
HT Heat Pump Size		25	25	25	32	32	32	32	Coil size (mm)		25	25	25	32	32	32
		2	3	3	3	3	3	3	Meter Coil size (m2)		2	2	3	3	3	3
3		✓	✗	✗	✗	✗	✗	✗			✗	✗	✗	✗	✗	✗
6		✓	✓	✓	✓	✗	✗	✗			✓	✓	✓	✓	✗	✗

Twin Tank constant parallel operation

		Single Coil									Twin Coil					
		150	215	250		305	400	500			215	255	305		400	500
HT Heat Pump Size		25	25	25	32	32	32	32	Coil size (mm)		25	25	25	32	32	32
		2	3	3	3	3	3	3	Meter Coil size (m2)		2	2	3	3	3	3
3		✓	✗	✗	✗	✗	✗	✗			✗	✗	✗	✗	✗	✗
6		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓

Phase Change Material Heat Batteries and Evos.

It is possible to replace the hot water cylinder with a Phase Change Material unit from Sunamp for various sizes of Evo heat pump (see table below). PCM heat batteries offer an alternative DHW storage solution, they compete to replace hot water tanks in heating systems, particularly where space is limited. The heat battery stores and releases energy during melting and freezing of the PCM. This process occurs at a constant temperature, which means that the PCM can store a large amount of energy at a lower temperature (or lower volume) than an indirect hot water tank. The potential for lower storage temperatures makes PCM an attractive prospect for heat pumps, which are more efficient at lower flow temperatures.

Heat Pump	Sunamp Unit	Energy Stored (kWh)	Volume of Water to 40C (l)	Volume of Water at 40C (l)	Notes
7kW Evo	UniQ HW9	6.18	113	152	HP connected to smaller coil, DHW connected to larger coil. No additional water pump.
9kW Evo	UniQ HW9	5.74	110	141	HP connected to larger coil. DHW connected to smaller coil No additional water pump.
7kW Evo	UniQ HW6	4.3	86	106	HP connected to smaller coil, DHW connected to larger coil. No additional water pump.
9kW Evo	UniQ HW6	4.21	84	104	HP connected to smaller coil, DHW connected to larger coil. No additional water pump.

The volume of hot water <u>to</u> 40°C is the total volume that passed through the PCM and came out at a temperature above 40°C. The volume of hot water <u>at</u> 40°C, is the total volume that would be obtained if a mixing valve were used to maintain a 40°C output, by mixing in 5°C mains water.

Phase Change Material Heat Batteries and Shoebox Heat Pumps.

It is possible to replace the hot water cylinder with a Phase Change Material unit from Sunamp for various sizes of shoebox heat pump (see table below). However it is not recommended that the 6kW Shoebox is not combined with the Sunamp Phase Change Heat Batteries, without changes at commissioning.

Heat Pump	Sunamp Unit	Energy Stored (kWh)	Volume of Water to 40C (l)	Volume of Water at 40C (l)	Notes
3kW Shoebox	UniQ HW6	4	n/a	100	Charge time up to 2hrs
3kW Shoebox	UniQ HW9	8	n/a	170	Charge time up to 3hrs
6kW Shoebox	UniQ HW6	Not recommended unless the second compressor set point is lowered In effect changing back to a three kW.			
6kW Shoebox	UniQ HW9	Not recommended unless the second compressor set point is lowered In effect changing back to a three kW.			

For the shoeboxes charging should be via the heat battery large coil and discharge via the small coil.

The volume of hot water to 40°C is the total volume that passed through the PCM and came out at a temperature above 40°C. The volume of hot water at 40°C, is the total volume that would be obtained if a mixing valve were used to maintain a 40°C output, by mixing in 5°C mains water.