# 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

As heat pumps require higher flow rates, the transfer of heat into the water within the cylinder requires a larger coil surface area. This has to be the true surface area of the coil and not 'fins' attached to the coil. A minimum guide of $0.25m^2$ coil surface area is recommended per kW thermal output of the heat pump.

### Flowrate

Again due to the higher flow rates required as opposed to a fossil boiler, hot water cylinders generally require a larger diameter 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 the 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 tables for the types of hot water cylinder configurations and shows a single coil tank and a twin coil tank for use with solar.

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.

Kensa has partnered with leading cylinder manufacturers to provide mains pressure cylinders featuring enhanced surface area coils which are designed specifically for heat pumps.

Selection charts of Kensa heat pumps witdesigned specifically for heat pumps. h Advance Appliance, McDonald and Joule hot water cylinders are contained within this document taking into account testing results. (However this is a guide only as the installation can also affect performance.)

Any pairing of EVO and any manufacturers cylinders may require immersion boost for legionnaires protection

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### Advance Appliances Hot Water Cylinders

Single Tank

| | Single Coil | | | | | | |
|---|---|---|---|---|---|---|---|
| | 150 | 215 | 250 | 305 | 400 | 500 | |
| Kensa Part Number | 95-060A | 95-061A | 95-069A | 95-070A | 95-071A | 95-072A | |
| | 25 | 25 | 32 | 32 | 32 | 32 | Coil size (mm) |
| Heat Pump Load Size | 2 | 3 | 3 | 3 | 3 | 3 | Meter Coil size ($m^2$) |
| 3 | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) | ✓(LR) | |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | |
| 7 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 9 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 13 | × | × | ✓ | ✓ | ✓ | ✓ | |
| 15 | × | × | ✓ | ✓ | ✓ | ✓ | |
| 17 | 17kW Evo should not be used for DHW | | | | | | |

LR—Long Reheat Time

# Hot Water Cylinder Selection Guide

## McDonald Hot Water Cylinders

Single Tank

| | ECOFlow Single Coil | | | | | | | | | STEELflow Single Coil | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 150 | 180 | 210 | 250 | 300 | 400 | 300 | 400 | | 150 | 170 | 200 | 250 | 300 | 400 | 500 |
| Kensa Part Number | 95-225A | 95-226A | 95-227A | 95-228A | 95-229A | 95-230A | 95-231A | 95-232A | | 95-233A | 95-234A | 95-235A | 95-236A | 95-237A | 95-238A | 95-196A |
| Heat Pump Load Size | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | Coil size (mm) | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| | 1.32 | 1.32 | 1.76 | 1.76 | 1.76 | 1.76 | 3 | 3 | Meter Coil size ($m^2$) | 2 | 2 | 3 | 3 | 3 | 4 | 4 |
| 3 | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓ | ✗ | ✗ | | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) | ✓(LR) |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓ | ✗ | ✗ | | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) |
| 7 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) |
| 9 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) |
| 13 | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ |
| 15 | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ |
| 17 | 17kW Evo should not be used for DHW | | | | | | | | | 17kW Evo should not be used for DHW | | | | | | |

LR—Long Reheat Time

Twin coil tanks are tested using the primary coil only

# Hot Water Cylinder Selection Guide

## Joule Hot Water Cylinders

Single Tank and twin coil operation

| | Joule Cyclone Cylinder Single Coil | | | | | | | | Joule Cylinder Twin Coil | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 150 | 180 | 210 | 250 | 300 | 400 | 500 | | 200 | 250 | 300 | 400 | 500 |
| Kensa Part Number | 95-162A | 95-163A | 95-164A | 95-165A | 95-166A | 95-168A | 95-169A | | 95-197A | 95-198A | 95-199A | 95-200A | 95-201A |
| | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | 0.1 | 0.1 | 28mm Coil Pressure drop (bar) | 0.08 | 0.09 | 0.09 | 0.1 | 0.1 |
| Heat Pump Load Size | 1.7 | 2 | 2 | 2.5 | 2.5 | 4 | 4 | Meter Coil size ($m^2$) | 2.8 | 2.8 | 3.2 | 4 | 4 |
| 3 | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) | ✓(LR) | | ✓ | ✓(LR) | ✓(LR) | ✓(LR) | ✓(LR) |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) | | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) |
| 7 | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) | | ✓ | ✓ | ✓(LR) | ✓(LR) | ✓(LR) |
| 9 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) | | ✓ | ✓ | ✓ | ✓(LR) | ✓(LR) |
| 13 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| 15 | × | × | ✓ | ✓ | ✓ | ✓ | ✓ | | × | × | ✓ | ✓ | ✓ |
| 17 | 17kW Evo should not be used for DHW | | | | | | | | 17kW Evo should not be used for DHW | | | | |

Twin coil tanks are tested using the primary coil only

LR—

Long Reheat Time

**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 | Thermino i 210 | 6.18 | 113 | 152 | HP connected to smaller coil, DHW connected to larger coil. No additional water pump. |
| 9kW Evo | Thermino i 210 | 5.74 | 110 | 141 | HP connected to larger coil. DHW connected to smaller coil No additional water pump. |
| 7kW Evo | Thermino i 150 | 4.3 | 86 | 106 | HP connected to smaller coil, DHW connected to larger coil. No additional water pump. |
| 9kW Evo | Thermino i 150 | 4.21 | 84 | 104 | HP connected to smaller coil, DHW connected to larger coil. No additional water pump. |

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.
Evo - connected to the smaller coil, DHW connected to the larger coil with the exception of the 9kW Evo & Thermio i 210 pairing which is connected to the large coil, DHW connected to the small coil

**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 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 | Thermino i 150 | 4 | n/a | 100 | |
| 3kW Shoebox | Thermino i 210 | 8 | n/a | 170 | Long Reheat time |
| 6kW Shoebox | Thermino i 150 | Not recommended unless the second compressor set point is lowered In effect changing back to a three kW. | | | |
| 6kW Shoebox | Thermino i 210 | 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 <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.