

Usable thermal energy stored in pressurized stratified heating buffer tanks as a function of temperature difference ( $\Delta T$ )

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Typical Heating regime (T <sub>supply</sub> / T <sub>return</sub> )	$\Delta T$ (T <sub>supply</sub> - T <sub>return</sub> ), K	Net water volume of the heating buffer tank, V <sub>net</sub>										
		10 m <sup>3</sup>	20 m <sup>3</sup>	30 m <sup>3</sup>	50 m <sup>3</sup>	80 m <sup>3</sup>	100 m <sup>3</sup>	150 m <sup>3</sup>	200 m <sup>3</sup>	300 m <sup>3</sup>	400 m <sup>3</sup>	500 m <sup>3</sup>
45 / 35 °C (low-temp buffer for heat pump) 50 / 40 °C (low-temp buffer for heat pump) 55 / 45 °C (low-temp buffer for heat pump) 60 / 50 °C (low-temp buffer for heat pump)	10	104.5	209	313.5	522.5	836	1045	1567.5	2090	3135	4180	5225
50 / 35 °C (low-temp buffer for heat pump) 55 / 40 °C (low-temp buffer for heat pump) 60 / 45 °C (low-temp buffer for heat pump) 65 / 50 °C (low-temp buffer for heat pump)	15	156.8	313.5	470.2	783.8	1254	1567.5	2351.2	3135	4702.5	6270	7837.5
50 / 30 °C (low-temp buffer for heat pump) 55 / 35 °C (low-temp buffer for heat pump) 60 / 40 °C (low-temp buffer for heat pump) 65 / 45 °C (low-temp buffer for heat pump) 70 / 50 °C (boiler based heating system) 75 / 55 °C (boiler based heating system) 80 / 60 °C (boiler based heating system) 85 / 65 °C (boiler based heating system) 90 / 70 °C (boiler based heating system) 95 / 75 °C (boiler based heating system)	20	209	418	627	1045	1672	2090	3135	4180	6270	8360	10450
55 / 30 °C (low-temp buffer for heat pump) 60 / 40 °C (low-temp buffer for heat pump) 65 / 40 °C (low-temp buffer for heat pump) 70 / 45 °C (boiler based heating system) 75 / 50 °C (boiler based heating system) 80 / 55 °C (boiler based heating system) 85 / 60 °C (boiler based heating system) 90 / 65 °C (boiler based heating system) 95 / 70 °C (boiler based heating system)	25	261.2	522.5	783.7	1306.2	2090	2612.5	3918.8	5225	7837.5	10450	13062.5
60 / 30 °C (low-temp buffer for heat pump) 65 / 35 °C (low-temp buffer for heat pump) 70 / 40 °C (boiler based heating system) 75 / 45 °C (boiler based heating system) 80 / 50 °C (boiler based heating system) 85 / 55 °C (boiler based heating system) 90 / 60 °C (boiler based heating system) 95 / 65 °C (boiler based heating system)	30	313.5	627	940.5	1567.5	2508	3135	4702.5	6270	9405	12540	15675
65 / 30 °C (low-temp buffer for heat pump) 75 / 40 °C (boiler based heating system) 80 / 45 °C (boiler based heating system) 85 / 50 °C (boiler based heating system) 90 / 55 °C (boiler based heating system) 95 / 60 °C (boiler based heating system)	35	365.8	731.5	1097.2	1828.8	2926	3657.5	5486.2	7315	10972.5	14630	18287.5
75 / 35 °C (boiler based heating system) 80 / 40 °C (boiler based heating system) 85 / 45 °C (boiler based heating system) 90 / 50 °C (boiler based heating system) 95 / 55 °C (boiler based heating system)	40	418	836	1254	2090	3344	4180	6270	8360	12540	16720	20900
<b>Stored / Usable thermal energy (kWh)</b>												

Assumptions:

1. Water as heat carrier, density  $\rho = 1000 \text{ kg/m}^3$ , specific heat capacity  $c = 4.18 \text{ kJ/kg}\cdot\text{K}$ , closed pressurized system.
2. Stratification efficiency factor  $\eta_s = 0.9$  is assumed for well-designed stratified buffer tanks with low internal mixing.
3. Usable thermal energy calculated as: **Q<sub>usable</sub> =  $\rho \cdot V_{net} \cdot c \cdot \Delta T \cdot \eta_s$**
4. For a given buffer tank volume, usable thermal energy depends on temperature difference  $\Delta T$  only; different supply/return regimes with the same  $\Delta T$  result in the same stored energy.
5. Listed regimes represent typical design examples.