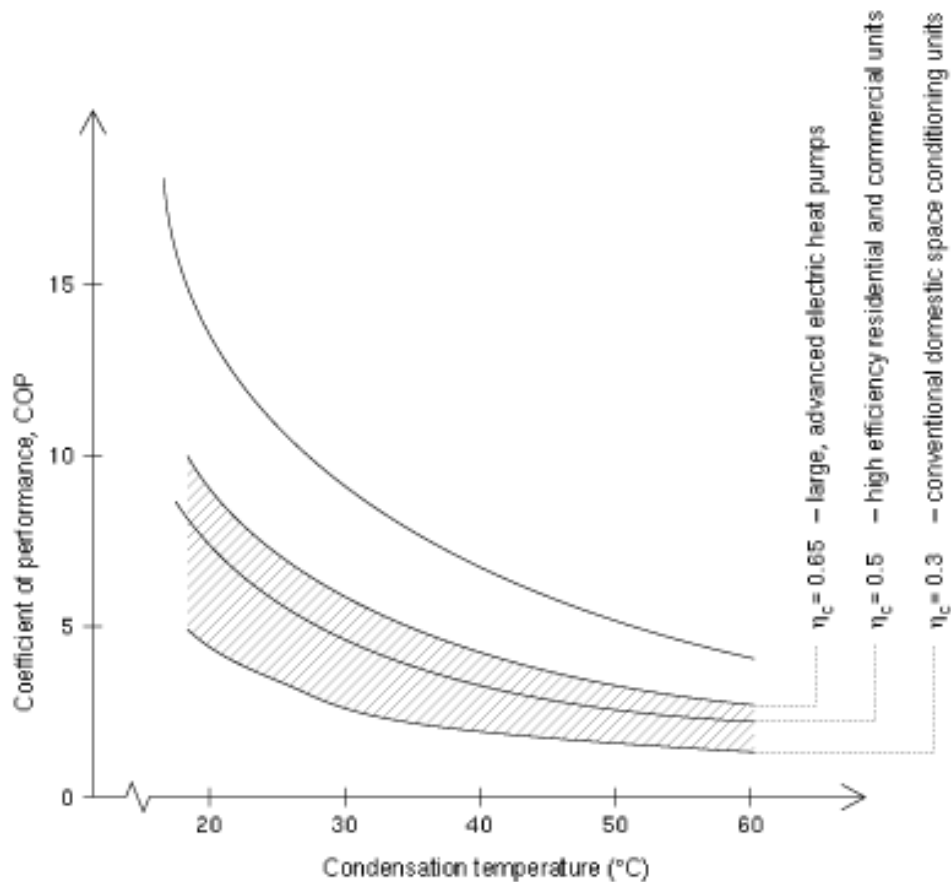


See next page for COP versus temperature relationship.

For engine and thermally driven heat pumps the performance is indicated by the primary energy ratio (PER). The energy supplied is then the higher heating value (HHV) of the fuel supplied. For electrically driven heat pumps a PER can also be defined, by multiplying the COP with the power generation efficiency.

The COP or PER of a heat pump is closely related to the temperature lift, i.e. the difference between the temperature of the heat source and the output temperature of the heat pump. The COP of an ideal heat pump is determined solely by the condensation temperature and the temperature lift (condensation - evaporation temperature).

Figure 1 shows the COP for an ideal heat pump as a function of temperature lift, where the temperature of the heat source is 0°C. Also shown is the range of actual COPs for various types and sizes of real heat pumps at different temperature lifts.



The ratio of the actual COP of a heat pump and the ideal COP is defined as the Carnot-efficiency. The Carnot-efficiency varies from 0.30 to 0.5 for small electric heat pumps and 0.5 to 0.7 for large, very efficient electric heat pump systems.