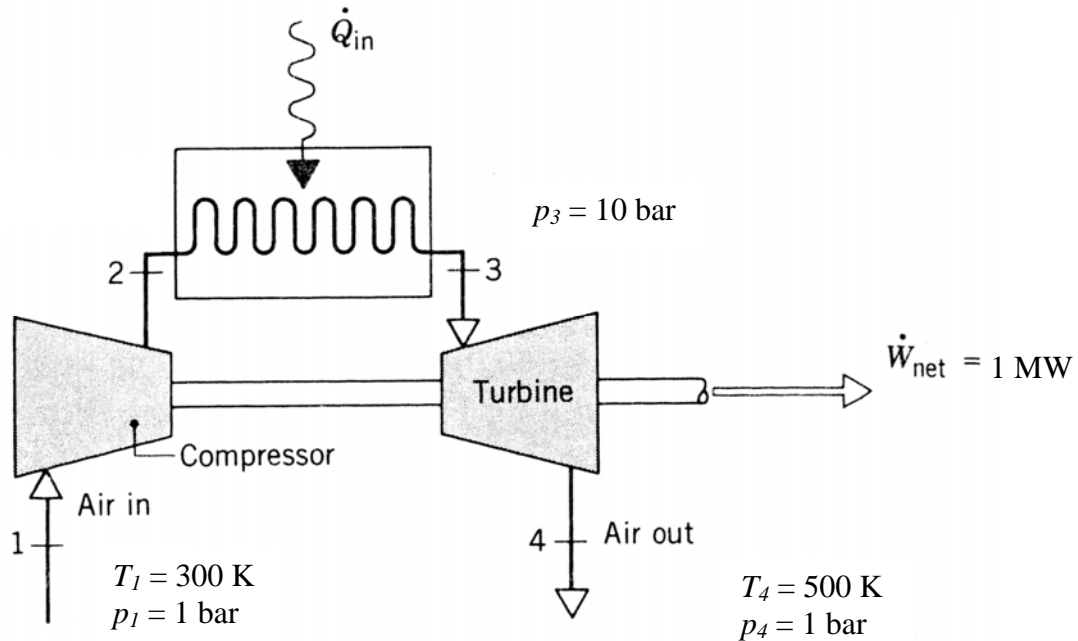


Consider the gas turbine power-plant shown below, operating at steady-state conditions. The power-plant consists of an air compressor mounted on the same shaft as the turbine. Relevant data are given in the figure. Both compressor and turbine are ideal (reversible) and kinetic and potential energy effects can be neglected. Heat is added at constant pressure (there is no pressure drop in the heater between stations 2 and 3) and air can be assumed an ideal gas with $\gamma = 1.4$ and $R = 287 \text{ J/kg-K}$. The compressor and turbine are operating at adiabatic conditions.



- What are the thermodynamic processes in the above gas turbine power-plant?
- Draw a p - v diagram and sketch the processes $1 \rightarrow 2$, $2 \rightarrow 3$ and $3 \rightarrow 4$. Label all states and known quantities.
- Find the turbine inlet temperature T_3 .
- What is the compressor exit pressure p_2 ? Find the compressor exit temperature T_2 .
- What is the air mass flow through the gas turbine power-plant?
- What is the specific shaft work supplied to the compressor?
- What is the heat transfer rate \dot{Q}_{in} in the heater?

(Extra page for solutions)