

The diagram illustrates a thermodynamic system and its surroundings. A dashed rectangular box on the left is labeled 'system' and contains the variables E and N . To the right of this box, an arrow points left towards the box, accompanied by the text 'rigid boundary can exchange mass and energy'. Below the dashed box, the word 'surroundings' is written. To the right of 'surroundings', the expressions $E_{\text{tot}} - E$ and $N_{\text{tot}} - N$ are stacked vertically. At the bottom of the diagram, a thick solid line represents the boundary of the surroundings. An arrow points upwards from below this line towards the line itself, with the text 'rigid, adiabatic boundary' to its right.

system

E N

← rigid boundary can
exchange mass
and energy

surroundings

$$\begin{aligned} E_{\text{tot}} - E \\ N_{\text{tot}} - N \end{aligned}$$

↑ rigid, adiabatic boundary