Heat Loss of Air

Air at 100kPa and 300K is compressed steadily by a 20kW motor to 300kPa. The air temperature is maintained constant at 300K dues to the heat transfer to the surrounding medium at 273K. What is the rate of heat loss of the air?

Answer: 20kW

Explanation: Air is kept to the same temperature, so $dh = cp \cdot dT = 0$. From the conservation of energy, that means that $Q_{dot} = -W_{dot} = -(W_{out} - W_{in}) = +W_{in} = 20kW$.