Closed feedwater heater

Mass Flow 1 enters (1) a closed feedwater heater as a saturated vapor at a pressure of 600 kPa. It leaves (2) as a saturated liquid. Mass Flow 2 is heated. This stream has a pressure of 5 MPa and enters (3) with an enthalpy of 341 kJ/kg. It leaves (4) with the maximum achievable temperature. What is the ratio between mass flow 1 and 2? Mass flow 2 / Mass flow 1 = ? You may find the following image helpful. 1, 2, 3 and 4 in the text are displayed in this image.

Answer: 6.34.

Explanation: First, we calculate the energy balance over the heat exchanger:

$$\dot{Q}_{net} = \dot{m}_1 \cdot (h_1 - h_2) = \dot{m}_2 \cdot (h_4 - h_3)$$

We then rewrite to: $\dot{m}_2 = \dfrac{h_1 - h_2}{h_4 - h_3} \cdot \dot{m}_1$ Looking up the corresponding enthalpy values:

$h_1 = 2756 kJ/kg$
$h_2 = 670 kJ/kg$
$h_3 = 341 kJ/kg$
$h_4 = 670 kJ/kg$

And finally, simply filling in the formula gives:

$$\dot{m}_2 = \frac{2756 - 670}{670 - 341} \cdot \dot{m}_1 = 6.34 \dot{m}_1$$