Given: $\quad\quad\quad$ kJ := 1000J

A piston cylinder device contains a liquid-vapor mixture of water at 27°C. During a constant pressure process, 750 kJ of heat is transferred to the water. As a result, part of the liquid in the cylinder vaporizes.

Required:

Determine the entropy change of the water during this process.

Solution:

The temperature of the liquid-vapor mixture of water is defined as

$$T_w := 27\,°C = 300.15\,K$$

The heat transferred to the water is defined as

$$Q_w := 750kJ$$

Since we are told that the process is a constant pressure process and that only part of the liquid in the cylinder vaporizes, we know that the water is still in the two phase region. This means that the process is not only a constant pressure process but also a constant temperature process (i.e. isothermal process). For an isothermal process, the change in entropy is given by

$$\boxed{\Delta S := \frac{Q_w}{T_w} = 2.499 \cdot \frac{kJ}{K}}$$