

Coefficient of Performance for TPR 200

March 3, 2024

Fridge Specifications:

Model: TPR 200 Thermoline Vaccine Refrigerator

TGA Class I medical device

Refrigerant Type: R134a

Electrical: 2.5A/230V

Nominal Capacity: 200L

Heat Output: 300 Watts

Noise Level @ 1 metre: 53 dB

Power Consumption: 3.6 kWh/24 hours

Temperature Control Stability: +/- 1.0°C

Temperature Uniformity: +/- 2.0°C

Given the specifications:

Heat Output = 300 Watts

As no instantaneous power is quoted, we use the power rating given

Power Consumption = 3.6 kWh/24 hours

$= 3.6 \times 1000 \text{ Watts}/24 \text{ hours}$

$= 150 \text{ Watts}$

Coefficient of Performance (COP):

$$\begin{aligned}\text{COP} &= \frac{\text{Heat Output}}{\text{Power Consumption}} \\ &= \frac{300 \text{ Watts}}{150 \text{ Watts}} \\ &= 2\end{aligned}$$

Energy Efficiency Ratio (EER):

$$\begin{aligned}\text{EER} &= \text{COP} \times 3.412 \\ &= 2 \times 3.412 \\ &\approx 6.824\end{aligned}$$

To find the evaporator cooling output and electricity input, we can use the COP:

$$\begin{aligned}
 \text{Electricity Input} &= \frac{\text{Heat Output}}{\text{COP}} \\
 &= \frac{300 \text{ Watts}}{2} \\
 &= 150 \text{ Watts/hour} \\
 &= 0.15 \text{ kWh} \Rightarrow \text{Input Power} \\
 &= 0.15 \times 24 \Rightarrow 3.6 \text{ kWh/24 hours} \Rightarrow \text{Input Power}
 \end{aligned}$$

$$\begin{aligned}
 \text{Evaporator Cooling Output} &= 2 \times 150 \text{ Watts} \\
 &= 300 \text{ Watts}
 \end{aligned}$$