Calculation formula to select the model of hot air generator

When used as hot air source

Outlet temperature Airflow volume Q″ ⇐ Heater ⇐ Inlet temperature Airflow volume Q′
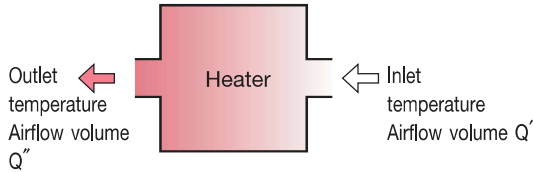
$$\text{Capacity [kW]} = \frac{Q \times (\text{Outlet temperature [℃]} - \text{Inlet temperature [℃]})}{45}$$

Q [m³/min] is the airflow volume under normal conditions (0℃ 1 atm).
Q′ [m³/min] or Q″[m³/min] varies depending on temperature [℃].

$$Q' = Q \times \frac{273 + \text{Inlet temperature [℃]}}{273} \qquad Q'' = Q \times \frac{273 + \text{Outlet temperature [℃]}}{273}$$

When used for convection

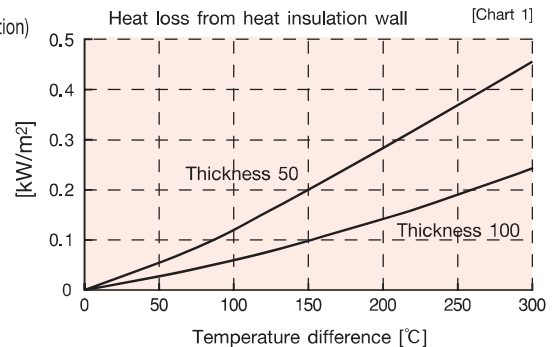● **Capacity required to raise temperature inside furnace** (100% hot air convection)

A : Surface area inside furnace [m²]   B : Time for temperature increase [h]
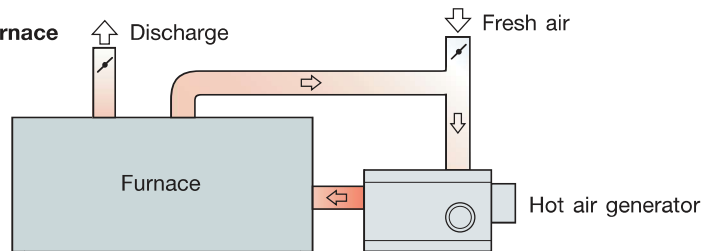H[kW/m²] Heat loss through heat insulation wall
(obtain based on Chart 1)

$$\text{Capacity [kW]} = A \times \left(\frac{0.006 \times \text{Temperature increase [℃]}}{\text{Temperature increase time [h]}} + 0.7 \times H \right)$$

※ The above result is for reference only. The capacity will vary significantly depending on the structure of the wall (thickness of inner wall, insulation performance, etc.).

Heat loss from heat insulation wall   [Chart 1]

[kW/m²] vs Temperature difference [℃]
Thickness 50
Thickness 100

● **Capacity required to operate furnace**

Discharge   Fresh air

Furnace   Hot air generator

(A) Capacity required to heat work
    Processed work volume : A [kg]
    Work specific heat : B [J/kg℃]

$$\text{Capacity [kW]} = \frac{A \times B \times \text{Temperature increase [℃]}}{3{,}600{,}000 \times \text{Temperature increase time [h]}}$$

(B) Capacity required to dry water
    Water volume to be vaporized : A [kg]

$$\text{Capacity [kW]} = \frac{A \times 0.63}{\text{Drying time [h]}}$$

(C) Volume of heat released to the furnace

Capacity [kW] = Surface area inside furnace [m²] × H [kW/m²]
    H[kW/m²] obtained based on Chart 1

(D) Loss due to partial discharge
    ※ When taking fresh air at room temperature from the exhaust.

$$\text{Capacity [kW]} = \frac{\text{Exhausted air volume [m³/min]} \times (\text{Exhaust temperature [℃]} - \text{Room temperature [℃]})}{50}$$

The capacity required during furnace operation is (A)+(B)+(C)+(D)