PFE500-48 Heat Dissipation Design Example

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An easy calculation for Heat-sink size is explained on this subject.
Please perform actual evaluation and confirmation to determine final heat-sink construction.

1. Calculation of Power Loss from o/p power & Efficiency

Example : Output —— Vo=48V, Io=10A (Po=480W) Input —— Vin=200VAC

Efficiency is η=85%*according to "PFE500-Series Evaluation Data" at the condition above.

So, power loss at PF500 unit is calculated : $Pd = Po \times (\frac{1}{\eta} - 1) = 480W \times (1/0.85 - 1) = \underline{85W}$

This means that Base-plate Tempearature increases ΔTp=85 °C when attaching a heat-sink with 1°C/W thermal resistance. $(\Delta Tp = \theta_{hs-a} \times Pd = 1°C/W \times 85W)$

* with 1% margin

2. Definition of Base-plate Temperature Increase (ΔTp) from Ambient Temperature (Ta)

In this case, when Ambient Ta=50°C max., Tp=90°C max. for customer equipment, then ΔTp = 90-50 = <u>40°C</u> max., is allowed.

3. Calculation of Thermal Resistance (θ_{hs-a}) for Heat-sink

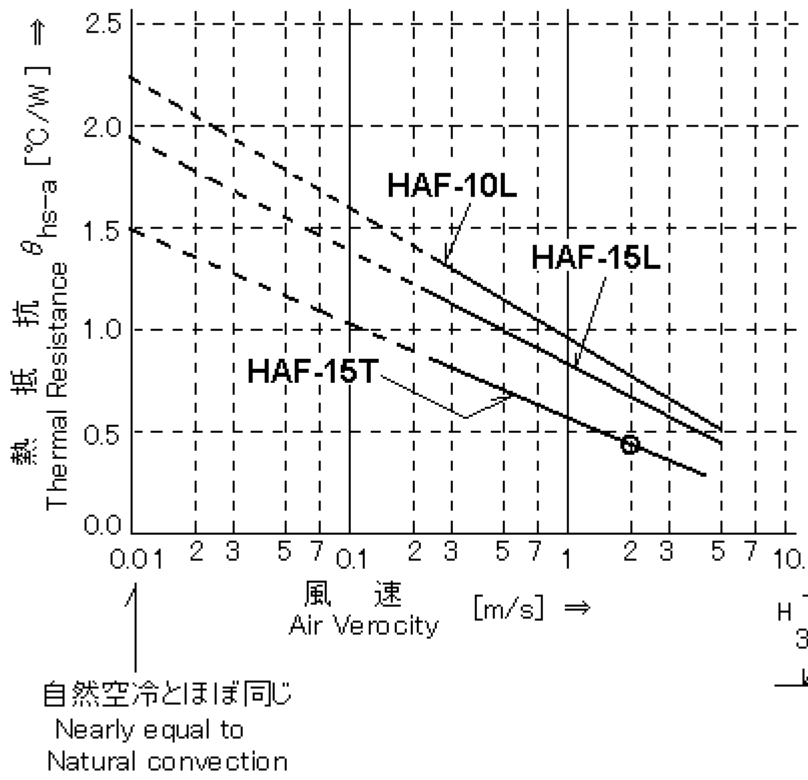
$$\Delta Tp = 40°C,\ Pd = 85W \longrightarrow \theta_{hs-a} = \frac{\Delta Tp}{Pd} = \underline{0.47\ °C/W}$$

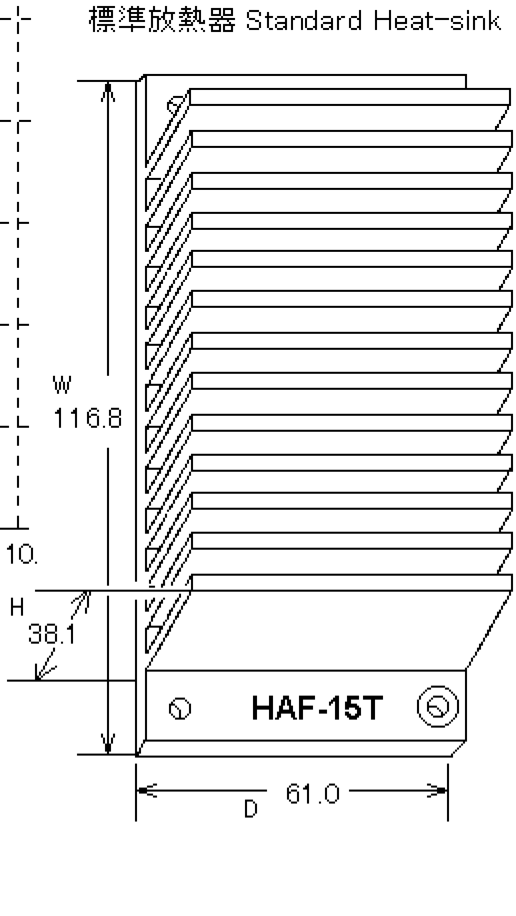
4. Study of Actual Heat-sink

First, when considering standard heat-sink of DENSEI-LAMBDA "HAF-15T", more than 2 m/s airflow velocity is required by the graph below. But 15T height is too high for recent "low profile" requirements.

═══ How to realize low height heat-sink ═══

Generally, heat-sink with same enveloping volume has same thermal resistance.
So, for example, by changing its size as 2 times of "D" and a half of "H" below, same thermal resistance can be achieved.





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