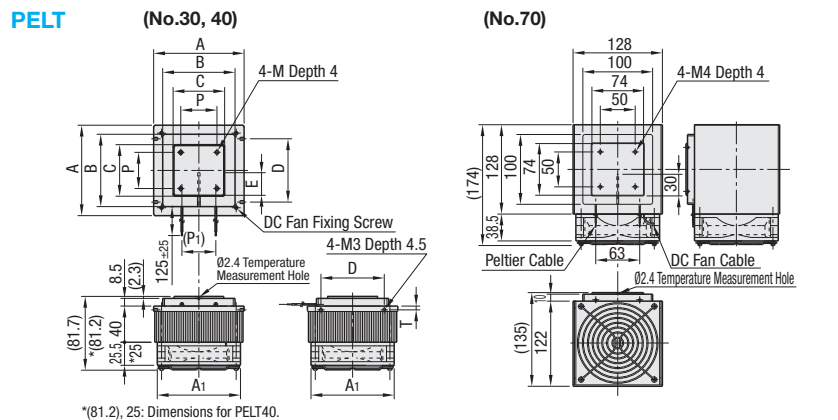


Peltier Effect Cooling Units

Instruction manual is available online:
<http://fa.misumi.jp/ht/>



Part Number	Type	No.	A	A1	B	C	D	T	P	(P1)	E	M	Mass (g)	Unit Price
PELT	30	30	80	80	60	30	50	4.2	20	24	15	M3	450	1 - 3 pcs.
	40	40	100	92	80	55	70	4.2	40	38	25	M4	700	
	70	70	-	-	-	-	-	-	-	-	-	-	2300	



Specification

No.	30	40	70
Cooling Capacity [W]	18	35	80
Max. Temperature Gaps [°C]	48	45	48
Peltier Heat Resistance Temperature [°C]	120		
DC Fan Allowable Temperature [°C]	70		
Heating Capacity [W]	36	70	140
Rated Voltage [V]	12	12	24
Starting Current [A]	4	6.3	6.5
Noise [dB]	35	37	39
Allowable Load [N]	200	300	500
Ambient Operating Temperature Range [°C]	-20 ~ +70		
Ambient Operating Humidity [%RH]	85 or Less		

*For orders larger than indicated quantity, please check with WOS.

(Terminology)

Cooling capability ... The amount of heat it can remove (cool) at full capacity. Please choose Unit No. so that the heat amount is at cooling capability or less. (Refer to Selecting Method on the next page.)

Maximum temperature difference ... It is temperature difference between room temperature and the cooled surface. It might vary depending on the room temperature. (Ex.: With No. 30 and at room temperature 25°C, the maximum controllable operation temperature is 25-48= -23°C.)

The values are representative values and not a guarantee.

Allowable Load is a value when load is applied evenly. Do not apply unbalanced load.

While the upper temperature limit for the Peltier itself is 120°C, be sure to operate at the temperature which does not exceed the allowable temperature (70°C: temperature for continuous use) for DC fan.

Features

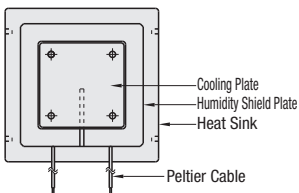
- A unit product has brought ease of use of a Peltier device which simultaneously provides cooling and heating by direct-current.
- Using in combination with a controller designed for Peltier Effect Cooling Units Controller (P.1648) enables easy control.

Principle

With a DC current, temperature difference occurs on the Peltier element, and A side will be cooled, and B side will be heated. (Fig. 1) If the electrical polarity is reversed, A side will be heated and B side will be cooled. (Fig. 2)

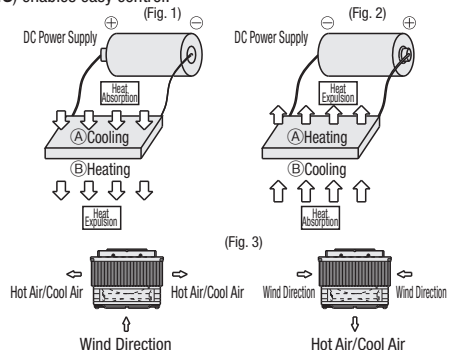
Basic Structure

A unit product with DC fan and heat sink assembled in a Peltier device.



Parts	Material
Peltier	Semiconductor device having Bismuth Telluride as chief material packaged with ceramic
Heatsinks	A6063
DC Fan	ABS, PBT Synthetic-resin
Cooling Plate	A5052

As for direction of the wind, as Figure 3 shows, it can be used from any direction. (Heat efficiency is same.)



Precautions for Use

- Please do NOT stop heat radiation fan while using Peltier Effect Cooling Units. It might cause damage because of the rise of temperature of Peltier element.
- Please ensure the power source polarity to be correct. Voltage must remain within the rated value. If the voltage is below the standard, the heat dissipation fan might stop. Combination use with MISUMI's Peltier Effect Cooling Units Controller (P.1648) is recommended for safety use.
- Be sure that impact or excess load is not applied to the Peltier device. (Please refer to allowable load of above specifications.)
- Apply insulation to cooling surface to prevent condensation. Wipe off water droplet when condensation occurs. Continuous use might cause internal corrosion because of the water intrusion into Peltier element.
- Please insert temperature sensor into Ø2.4 hole for temperature measurement and fix it with silicon adhesive bond or similar things.

*The PELT40 DC fan cable entry/exit position has changed from the right-hand side to the left-hand side.

Selecting Method: This is a calculation when most appropriate heat exchanger is used at a cooling side. Values change depending on performance of heat exchanger.

Ex.) To lower current temperature (Tr)=25°C to achieving temperature inside the cooling box (Tc)=5°C

1) Obtain the surface area S (m²) of the box to cool.
 Ex.) For a box with internal dimensions of 270x210x420 (mm)
 $S(m^2) = (0.27 \times 0.21 + 0.42 \times 0.21 + 0.42 \times 0.27) \times 2 = 0.52(m^2)$

2) Calculate the heat Q₁ (W) that comes in via heat insulating material by the following formula.

$$Q_1(W) = \frac{(\text{Current Temperature } Tr(°C) - \text{Achieving Temperature } Tc(°C)) \times \text{Heat Conductivity } K(W/m \cdot K) \times \text{Surface Area } S(m^2)}{\text{Thickness of Insulating Plate } T(m)}$$

Ex.) Urethane foam used as insulator. When thermal conductivity (K) = 0.03 (W/m · K), and thickness (T) = 30 (mm) = 0.03 (m)

$$Q_1(W) = \frac{(25(°C) - 5(°C)) \times 0.03(W/m \cdot K) \times 0.52(m^2)}{0.03(m)} = 10.4 \approx 10(W)$$

3) Determine the heat generated by the stirring fan and the amount of loss from heat exchange Q₂ (W).

Ex.) Q₂ = 10 (W)
 (Though it is difficult to obtain precise figures as these differ depending on fan type or insulating property, general value range is 5 ~ 15 (W). When fan speed is decreased, value of Q₂ is reduced.)

4) Determine the heat generated by the heat source in the box Q₃ (W).
 Ex.) Q₃ = 5 (W) when a motor generating 5 watts of heat in the box. (Applicable only when there is a heat source such as a motor or IC board. When the box is empty, Q₃ = 0 (W).)

5) Calculate the total heat amount U (W). (Appropriate safety coefficient is 0.6 ~ 0.8.)

$$U(W) = \frac{(Q_1 + Q_2 + Q_3)}{\text{Safety Factor}} = \frac{(10 + 10 + 5)}{0.7} = 35.7 \approx 36(W)$$

6) Choose the best unit from the heat absorption property of the unit in the graph.
 Ex.) Choose No.70 whose heat absorption capacity beyond 40W on the ΔT (Tr-Tc)=20°C line.

Ex.) To lower current temperature (Tr)=25°C to achieving temperature inside the water tank (Tc)=15°C

1) Obtain the surface area S (m²) of the water tank to cool.
 Ex.) For internal dimensions of water tank 60x60x100 (mm):
 $S(m^2) = (0.06 \times 0.06 + 0.06 \times 0.1 + 0.06 \times 0.1) \times 2 = 0.031(m^2)$

2) Calculate the heat Q₁ (W) that comes in via heat insulating material by the following formula.

$$Q_1(W) = \frac{(25(°C) - 15(°C)) \times 0.03(W/m \cdot K) \times 0.031(m^2)}{0.03(m)} = 0.31(W) \approx 0.3(W)$$

3) Determine the heat generated by the stirring pump and the amount of loss from heat exchange Q₂ (W).

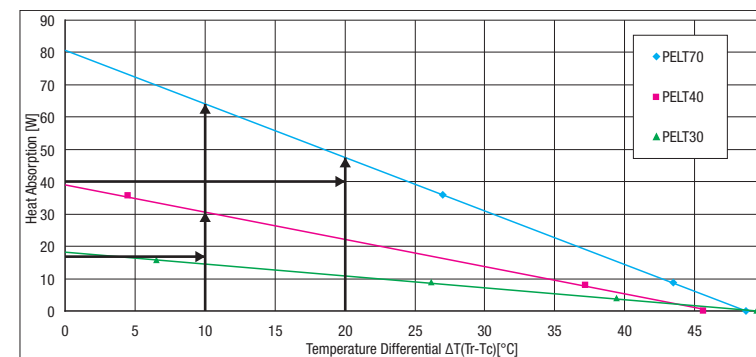
Ex.) Q₂ = 10 (W) (Though it is difficult to obtain precise figures as these differ depending on fan type or insulating property, general value range is 5 ~ 15 (W). The values of Q₂ is also lowered by decreasing the pump output.)

4) Determine the heat generated by the heat source in the water tank Q₃ (W).
 Ex.) When the water tank is empty, Q₃ = 0 (W) (When heat source is in the water tank, define its calorific value as Q₃ (W).)

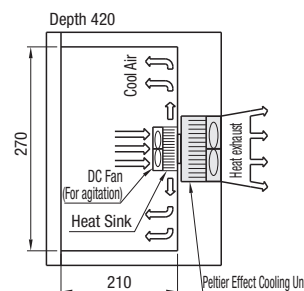
5) Calculate the total heat amount U (W). (Appropriate safety coefficient is 0.6 ~ 0.8.)

$$U(W) = \frac{(Q_1 + Q_2 + Q_3)}{\text{Safety Factor}} = \frac{(0.3 + 10 + 0)}{0.6} = 17.2 \approx 17(W)$$

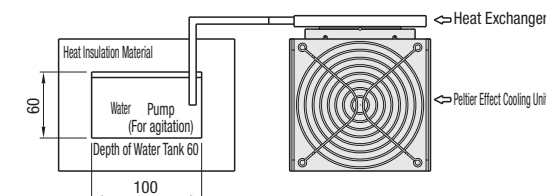
6) Choose the best unit from the heat absorption property of the unit in the graph.
 Ex.) Choose No.40 or No.70 whose heat absorption capacity beyond 15W on the ΔT (Tr-Tc)=10°C line.



Example



(Example at the time of air-cooling) *DC fan (for agitation) needs to be obtained by customer.



*Heat Exchanger needs to be obtained by customer.

(Example at the time of water-cooling)