Peltier Effect Cooling Units

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

PELT

(No.30, 40) (No.70)

4-M Depth 4
DC Fan Fixing Screw
Ø2.4 Temperature Measurement Hole
4-M3 Depth 4.5

4-M4 Depth 4
Peltier Cable
DC Fan Cable
Ø2.4 Temperature Measurement Hole

RoHS 10
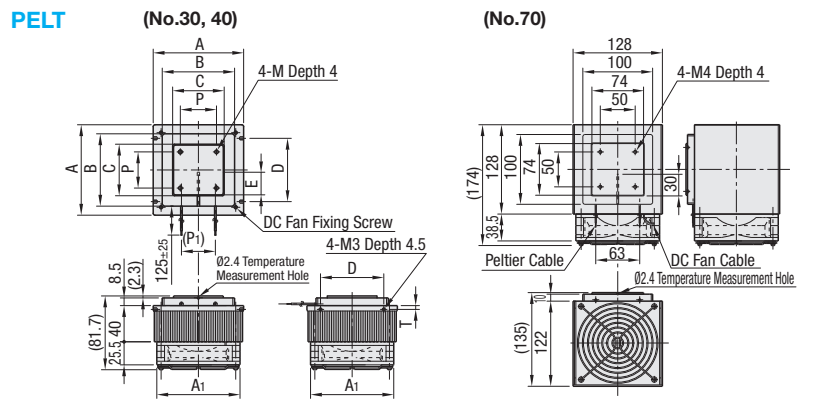
Part Number		A	A₁	B	C	D	T	P	(P₁)	E	M	Mass (g)	Unit Price 1 ~ 3 pc(s).
Type	No.												
PELT	30	80	80	60	30	50	4.2	20	24	15	M3	450	
	40	100	92	80	55	70	4.2	40	38	25	M4	700	
	70	-	-	-	-	-	-	-	-	-	-	2300	

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

Ordering Example

Part Number
PELT40

■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	

(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)
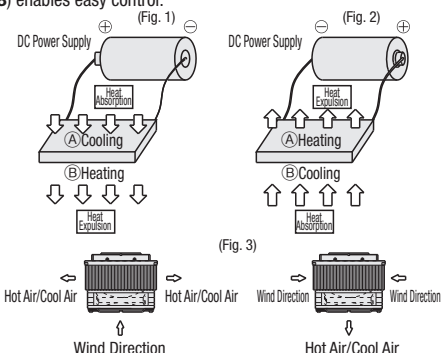
■Basic Structure
A unit product with DC fan and heat sink assembled in a Peltier device.
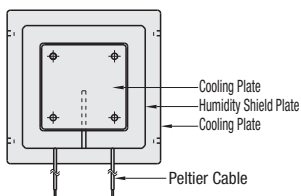
Parts	M Material
Peltier	Semiconductor device having Bismuth Telluride as chief material packaged with ceramic
Heatsinks	A6063
DC Fan	ABS, PBT Synthetic-resin
Cooling Plate	A5052

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

(Fig. 1)
DC Power Supply
Heat Absorption
A Cooling
B Heating
Heat Expulsion

(Fig. 2)
DC Power Supply
Heat Expulsion
A Heating
B Cooling
Heat Absorption

(Fig. 3)
Hot Air/Cool Air Hot Air/Cool Air
Wind Direction
Wind Direction Wind Direction
Hot Air/Cool Air

Cooling Plate
Humidity Shield Plate
Cooling Plate
Peltier Cable
Cooling Plate
Peltier Element, Humidity Shield Plate
Heat Sink
DC Fan Cable
DC Fan
Finger Guard

■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.

■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 Q_1 (W) that comes in via heat insulating material by the following formula.

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

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

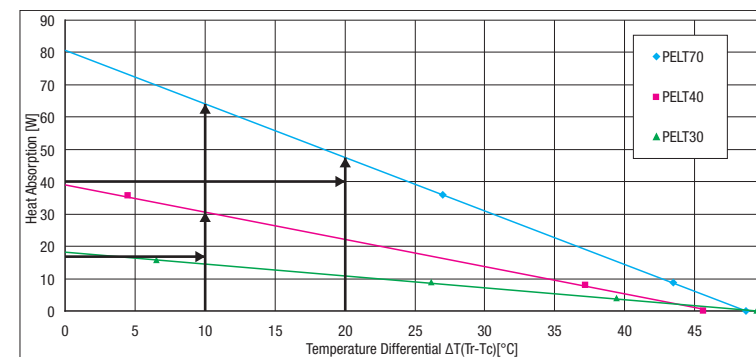$$Q_1 (W) = \frac{(25(°C)-5(°C)) \times 0.03(W/m·K) \times 0.52(m^2)}{0.03(m)} = 10.4 \approx 10 (W)$$

3) Determine the heat generated by the stirring fan and the amount of loss from heat exchange Q_2 (W).
Ex.) Q_2=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 Q_2 is reduced.)

4) Determine the heat generated by the heat source in the box Q_3 (W).
Ex.) Q_3=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, Q_3=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 Q_1 (W) that comes in via heat insulating material by the following formula.

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

3) Determine the heat generated by the stirring pump and the amount of loss from heat exchange Q_2 (W).
Ex.) Q_2=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 Q_2 is also lowered by decreasing the pump output.)

4) Determine the heat generated by the heat source in the water tank Q_3 (W).
Ex.) When the water tank is empty, Q_3=0 (W) (When heat source is in the water tank, define its calorific value as Q_3 (W).)
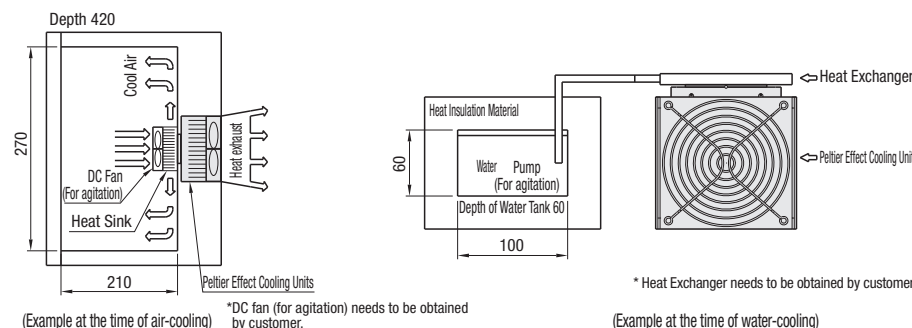
5) Calculate the total heat amount U (W). (Appropriate safety coefficient is 0.6 ~ 0.8.)
$$U (W) = \frac{(Q_1+Q_2+Q_3)}{\text{Safety Factor}} = \frac{(0.3+10+0)}{0.6} = 17.2 \approx 17 (W)$$

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.

ex Example

Depth 420
Cool Air
DC Fan (For agitation)
Heat Sink
Heat exhaust
270
210
Peltier Effect Cooling Units

*DC fan (for agitation) needs to be obtained by customer.

(Example at the time of air-cooling)

Heat Exchanger
Heat Insulation Material
Water
Pump (For agitation)
Peltier Effect Cooling Units
Depth of Water Tank 60
60
100

* Heat Exchanger needs to be obtained by customer.

(Example at the time of water-cooling)