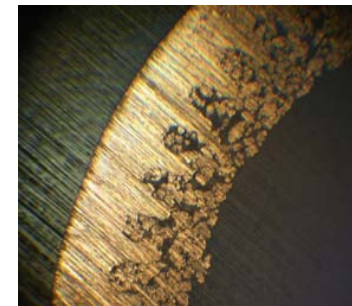
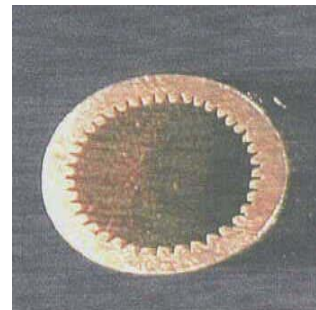
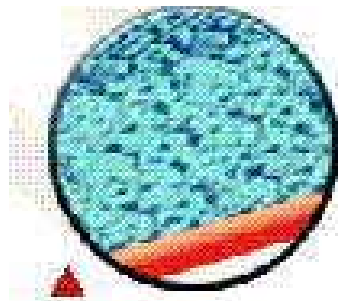
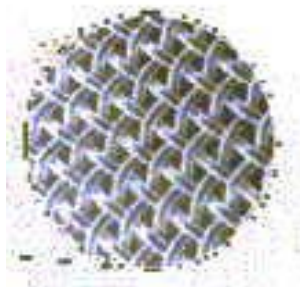


CCI HEAT PIPE DESIGN GUIDE



Rev: D01

Prepared by : CCI RD01 Heat Pipe Team

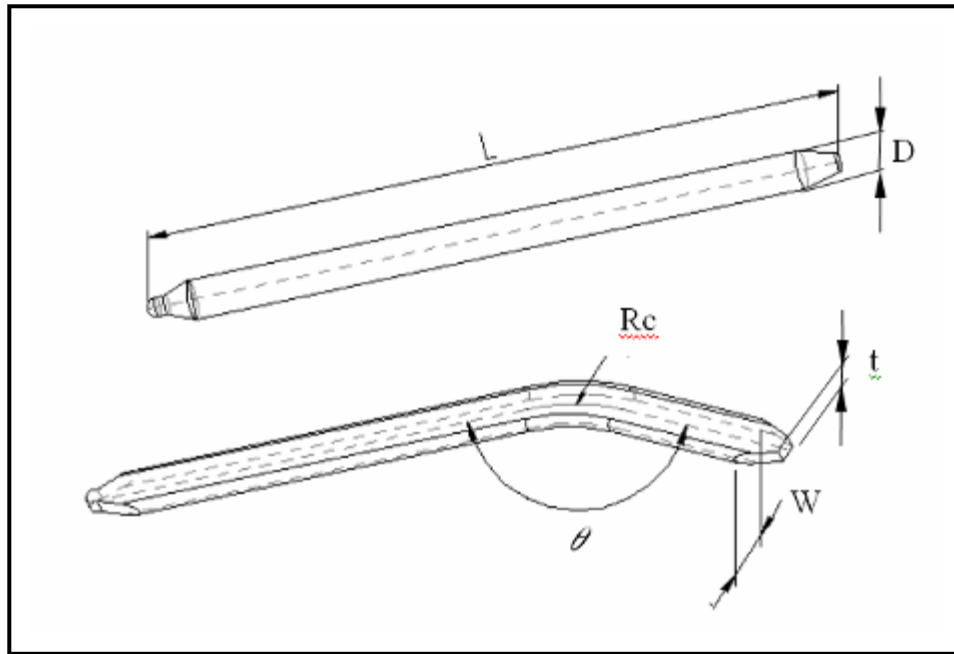
Date : 27. June. 2006

***Contents**

- **Feature descriptions & Geometry limitation**
- **Test methodology descriptions**
- **Screen Mesh**
- **Groove**
- **Sintering Powder**
- **Composite**
- **Approval sheet**

*Feature Descriptions

- Dimensions List



1. Mass Production Diameter : $D = \phi 4, \phi 5, \phi 6, \phi 8$ for Screen Mesh Pipe

$D = \phi 4, \phi 5, \phi 6, \phi 8$ for Grooved Pipe

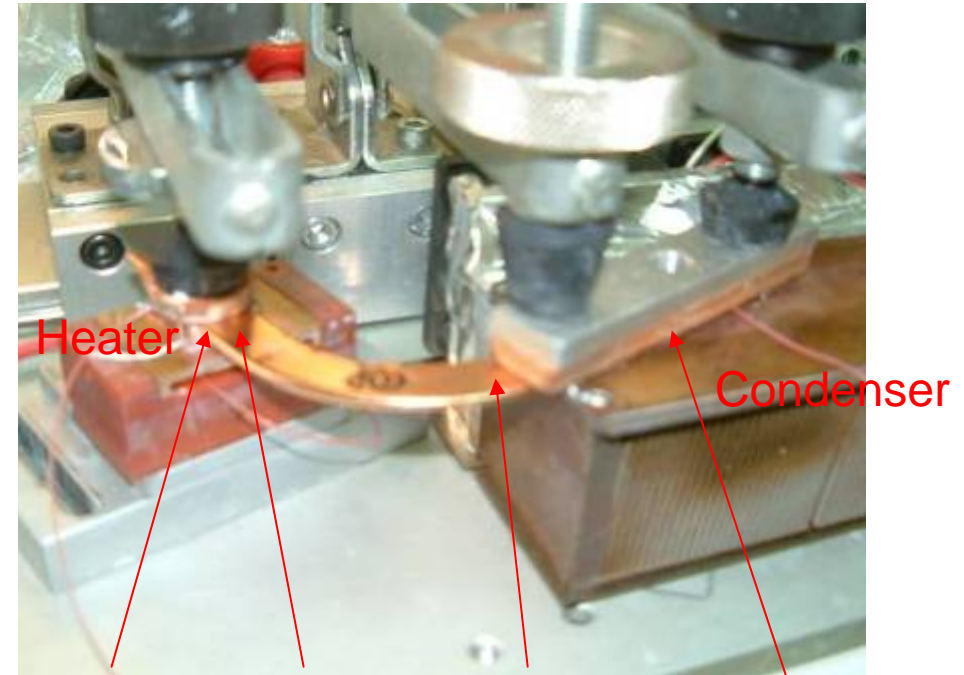
$D = \phi 6, \phi 8$ for Sintering Powder Pipe

$D = \phi 6, \phi 8$ for Composite Pipe

2. Mass Production Length : $L = 100 \sim 350$ mm

*Test Methodology

- ◆ Heater: Copper dummy heater , heat source area = 15x W mm
- ◆ Condenser: Copper fin with fan , cooling length = 60~80mm
- ◆ T_{heater} ($^{\circ}\text{C}$): Heater temperature, sensor is embedded between Heater and evaporator section of heat pipe.
- ◆ T_{hp1} ($^{\circ}\text{C}$): Evaporator temperature of heat pipe, measurement on heat pipe top side.
- ◆ T_{hp2} ($^{\circ}\text{C}$): Adiabatic temperature of heat pipe, measurement on heat pipe top side. Keep this point at 45°C by Fan speed control.
- ◆ T_{hp3} ($^{\circ}\text{C}$): Condenser temperature, sensor is embedded between HP and condenser section of heat pipe.



T_{heater}

T_{hp1}

T_{hp2}

T_{hp3}

◆ $Q(\text{watts})$: Input power

$$\begin{aligned} \text{◆ } R_{\text{heat pipe}} (\text{°C/W}) &= R_{(\text{Evaporator Local contact effect})} + R_{(\text{pipe dimension effect})} + R_{(\text{Condenser Local contact effect})} \\ &= (T_{\text{herter}} - T_{\text{hp1}})/Q + (T_{\text{hp1}} - T_{\text{hp3}})/Q + (T_{\text{hp3}} - T_{\text{sink}})/Q \\ &= (T_{\text{herter}} - T_{\text{sink}})/Q \end{aligned}$$

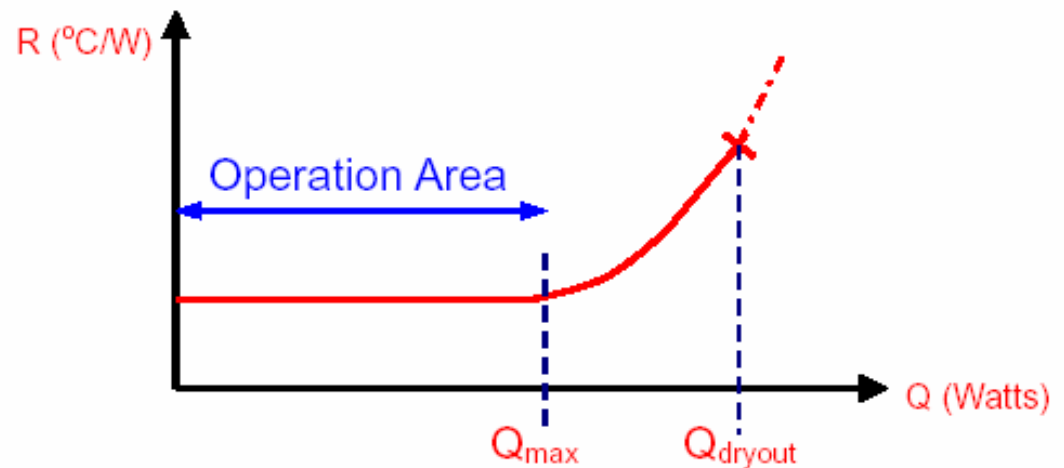
--- Term $R_{(\text{Evaporator contact effect})}$ is concerned about “Local dry out” in case of sharp heat flux loading on heat pipe.

--- Term $R_{(\text{Pipe structure effect})}$ is concerned about the capability of dimension and wick structure of heat pipe itself.

--- Term $R_{(\text{Condenser contact effect})}$ is concerned about “Flooding” in case of over cooling on heat pipe.

◆ $Q_{\text{max}}(\text{watts})$: Thermal resistance $R_{\text{heat pipe}}$ is significant increase when Power input is larger than a certain Power.

◆ $Q_{\text{dryout}}(\text{watts})$: Thermal resistance $R_{\text{heat pipe}}$ is ramp up and almost unsteady when Power input is larger than a certain Power.



*Screen Mesh type

| D | t | t :Tolerance | W | W:Tolerance | Rc | Shrinking length |
|----|-----|--------------|-------|-------------|---------|---------------------------------|
| φ4 | 3.0 | ±0.05 | 4.72 | ±0.1 | Rc ≥ 20 | Head end: 7.0 Tail end: 3.5 |
| | 2.5 | | 5.02 | | | |
| | 2.0 | | 5.33 | | | |
| | 1.8 | | 5.43 | | | |
| | 1.6 | | 5.54 | | | |
| | 1.5 | | 5.59 | | | |
| φ5 | 3.0 | ±0.05 | 6.40 | ±0.1 | Rc ≥ 25 | Head end: 7.5 Tail end: 4.0 |
| | 2.5 | | 6.64 | | | |
| | 2.0 | | 6.86 | | | |
| | 1.8 | | 6.95 | | | |
| | 1.6 | | 7.04 | | | |
| | 1.5 | | 7.09 | | | |
| φ6 | 4.0 | ±0.05 | 7.41 | ±0.1 | Rc ≥ 30 | Head end: 11.0 Tail end: 5.0 |
| | 3.5 | | 7.66 | | | |
| | 3.0 | | 7.95 | | | |
| | 2.5 | | 8.23 | | | |
| | 2.0 | | 8.48 | | | |
| | 1.5 | | 8.73 | | | |
| φ8 | 5.0 | ±0.05 | 10.03 | ±0.1 | Rc ≥ 40 | Head end: 14.5 Tail end: 8.0 |
| | 4.0 | | 10.59 | | | |
| | 3.5 | | 10.91 | | | |
| | 3.0 | | 11.13 | | | |
| | 2.8 | | 11.23 | | | |
| | 2.5 | | 11.38 | | | |
| | 2.0 | | 11.63 | | | |
| | 1.5 | | 11.88 | | | |

*Grooved type

| D | t | t :Tolerance | W | W:Tolerance | Rc | Shrinking length |
|----|-----|--------------|-------|-------------|--------------|---------------------------------|
| φ5 | 3.0 | ±0.05 | 6.37 | ±0.1 | $Rc \geq 20$ | Head end: 10.0 Tail end: 3.0 |
| | 2.8 | | 6.49 | | | |
| | 2.5 | | 6.64 | | | |
| | 2.0 | | 6.91 | | | |
| | 1.8 | | 7.02 | | | |
| φ6 | 4.0 | ±0.05 | 7.40 | ±0.1 | $Rc \geq 24$ | Head end: 11.5 Tail end: 3.0 |
| | 3.5 | | 7.68 | | | |
| | 3.0 | | 8.01 | | | |
| | 2.8 | | 8.08 | | | |
| | 2.5 | | 8.25 | | | |
| | 2.0 | | 8.51 | | | |
| | 1.8 | | 8.61 | | | |
| φ8 | 5.0 | ±0.05 | 10.07 | ±0.1 | $Rc \geq 32$ | Head end: 15.0 Tail end: 3.0 |
| | 4.5 | | 10.36 | | | |
| | 4.0 | | 10.65 | | | |
| | 3.5 | | 10.93 | | | |
| | 3.0 | | 11.21 | | | |
| | 2.8 | | 11.32 | | | |
| | 2.5 | | 11.49 | | | |
| | 2.0 | | 11.77 | | | |
| | 1.5 | | 12.05 | | | |

Remark: All definition of dimension and tolerance is excluded from the Dent of pipe, especially on both end and bend location of a pipe.

*Sintering Powder type

| D | t | t :Tolerance | W | W:Tolerance | Rc | Shrinking length |
|----|-----|--------------|-------|-------------|---------|---------------------------------|
| φ4 | 3.0 | ±0.05 | 4.70 | ±0.1 | Rc ≥ 12 | Head end: 7.0 Tail end: 3.0 |
| | 2.8 | | 4.83 | | | |
| | 2.5 | | 4.96 | | | |
| | 2.0 | | 5.25 | | | |
| | 1.8 | | 5.35 | | | |
| | 1.6 | | 5.44 | | | |
| φ5 | 3.0 | ±0.05 | 6.34 | ±0.1 | Rc ≥ 15 | Head end: 10.0 Tail end: 3.0 |
| | 2.8 | | 6.45 | | | |
| | 2.6 | | 6.53 | | | |
| | 2.5 | | 6.6 | | | |
| | 2.4 | | 6.66 | | | |
| | 2.0 | | 6.86 | | | |
| φ6 | 4.5 | ±0.05 | 7.09 | ±0.1 | Rc ≥ 18 | Head end: 11.5 Tail end:3.0 |
| | 4.0 | | 7.39 | | | |
| | 3.5 | | 7.66 | | | |
| | 3.2 | | 7.79 | | | |
| | 3.0 | | 7.9 | | | |
| | 2.8 | | 8.02 | | | |
| | 2.5 | | 8.15 | | | |
| φ8 | 6.0 | ±0.05 | 9.54 | ±0.1 | Rc ≥ 24 | Head end: 15 Tail end: 3.0 |
| | 5.5 | | 9.84 | | | |
| | 5.0 | | 10.11 | | | |
| | 4.5 | | 10.37 | | | |
| | 4.0 | | 10.62 | | | |
| | 3.5 | | 10.89 | | | |
| | 3.2 | | 11.02 | | | |
| | 3.0 | | 11.12 | | | |

*Composite type

| D | t | t :Tolerance | W | W:Tolerance | Rc | Shrinking length |
|----|-----|--------------|-------|-------------|--------------|---------------------------------|
| φ6 | 4.0 | ±0.05 | 7.40 | ±0.1 | $Rc \geq 27$ | Head end: 11.5 Tail end: 3.0 |
| | 3.5 | | 7.68 | | | |
| | 3.0 | | 8.01 | | | |
| | 2.8 | | 8.08 | | | |
| | 2.5 | | 8.25 | | | |
| | 2.0 | | 8.51 | | | |
| | 1.8 | | 8.61 | | | |
| φ8 | 5.0 | ±0.05 | 10.07 | ±0.1 | $Rc \geq 36$ | Head end: 15.0 Tail end: 3.0 |
| | 4.5 | | 10.36 | | | |
| | 4.0 | | 10.65 | | | |
| | 3.5 | | 10.93 | | | |
| | 3.0 | | 11.21 | | | |
| | 2.8 | | 11.32 | | | |
| | 2.5 | | 11.49 | | | |
| | 2.0 | | 11.77 | | | |
| | 1.5 | | 12.05 | | | |

* Performance Reference 1: Screen Mesh type

- Orient : Horizontal
- Working Temperature (Adiabatic) : 70 °C

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} (°C/W)</i> | <i>Operating Max. Power Q (W)</i> |
|--|---------------------|---|---------------------------------------|
| φ4 Length:150mm Straight Pipe | <i>Round</i> | <i>0.50 ~ 0.70</i> | <i>20</i> |
| | <i>3.0</i> | <i>0.50 ~ 0.70</i> | <i>20</i> |
| | <i>2.5</i> | <i>0.55 ~ 0.80</i> | <i>18</i> |
| | <i>2.0</i> | <i>0.65 ~ 0.90</i> | <i>15</i> |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} (°C/W)</i> | <i>Operating Max. Power Q (W)</i> |
|--|---------------------|---|---------------------------------------|
| φ5 Length:150mm Straight Pipe | <i>Round</i> | <i>0.40 ~ 0.55</i> | <i>25</i> |
| | <i>3.0</i> | <i>0.45 ~ 0.60</i> | <i>25</i> |
| | <i>2.5</i> | <i>0.45 ~ 0.65</i> | <i>22</i> |
| | <i>2.0</i> | <i>0.50 ~ 0.80</i> | <i>18</i> |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} (°C/W)</i> | <i>Operating Max. Power Q (W)</i> |
|--|---------------------|---|---------------------------------------|
| φ6 Length:100mm Straight Pipe | <i>Round</i> | <i>0.20 ~0.35</i> | <i>50</i> |
| | <i>3.0</i> | <i>0.25 ~0.35</i> | <i>50</i> |
| | <i>2.5</i> | <i>0.25 ~0.40</i> | <i>45</i> |
| | <i>2.0</i> | <i>0.35 ~0.60</i> | <i>35</i> |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance $R_{pipe} (°C/W)$</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 6$ Length:150mm Straight Pipe | Round | 0.20 ~ 0.35 | 45 |
| | 3.0 | 0.25 ~ 0.35 | 45 |
| | 2.5 | 0.25 ~ 0.40 | 40 |
| | 2.0 | 0.35 ~ 0.60 | 35 |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance $R_{pipe} (°C/W)$</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 8$ Length:100mm Straight Pipe | Round | 0.15 ~0.30 | 60 |
| | 3.0 | 0.20 ~0.30 | 60 |
| | 2.5 | 0.20 ~0.35 | 55 |
| | 2.0 | 0.30 ~0.55 | 50 |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance $R_{pipe} (°C/W)$</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 8$ Length:150mm Straight Pipe | Round | 0.15 ~0.30 | 60 |
| | 3.0 | 0.20 ~0.30 | 65 |
| | 2.5 | 0.20 ~0.35 | 50 |
| | 2.0 | 0.30 ~0.55 | 45 |

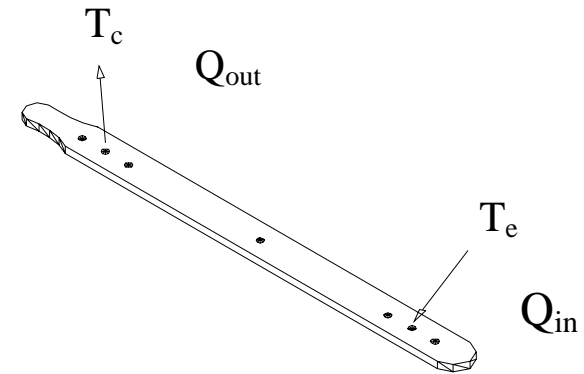
Note: Increase ~ 50mm of pipe length, Operating max. will drop \approx 12%

* Performance Reference 2: Grooved type

Conditions •Heating / Cooling: Evaporator section $L_e = 15 \text{ mm}$ electric resistance heater,
 Condenser section $L_c = 60 \text{ mm}$ with fin air cooling

- Orient : Horizontal
- Working Temperature (Adiabatic) : $70 \text{ }^\circ\text{C}$

$$R_{\text{pipe}} = (T_e - T_c) / Q_{\text{in}}$$



| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^\circ\text{C}/\text{W}$)</i> | <i>Operating Max. Power Q (W)</i> |
|--|---------------------|--|---------------------------------------|
| $\phi 5$ Length: 100mm Straight Pipe | Round | 0.02 ~ 0.04 | 40 |
| | 3.0 | 0.03 ~ 0.05 | 40 |
| | 2.5 | 0.03 ~ 0.06 | 30 |
| | 2.0 | 0.20 ~ 0.45 | 5 |

| Diameter D: (mm) | Flat t: (mm) | Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$) | Operating Max. Power Q (W) |
|---|---------------------|---|---------------------------------------|
| $\phi 5$ Length:150mm Straight Pipe | Round | 0.03 ~ 0.05 | 35 |
| | 3.0 | 0.03 ~ 0.05 | 30 |
| | 2.5 | 0.04 ~ 0.06 | 25 |
| | 2.0 | 0.40 ~ 0.70 | 5 |
| Diameter D: (mm) | Flat t: (mm) | Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$) | Operating Max. Power Q (W) |
| $\phi 6$ Length:100mm Straight Pipe | Round | 0.02 ~ 0.03 | 75 |
| | 3.0 | 0.02 ~ 0.05 | 70 |
| | 2.8 | 0.02 ~ 0.05 | 60 |
| | 2.6 | 0.03 ~ 0.05 | 50 |
| | 2.5 | 0.03 ~ 0.05 | 45 |
| | 2.4 | 0.03 ~ 0.05 | 45 |
| | 2.2 | 0.05 ~ 0.10 | 25 |
| | 2.0 | 0.10 ~ 0.32 | 5 |

| Diameter D: (mm) | Flat t: (mm) | Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$) | Operating Max. Power Q (W) |
|---|---------------------|---|---------------------------------------|
| $\phi 6$ Length:150mm Straight Pipe | Round | 0.02 ~ 0.03 | 65 |
| | 3.0 | 0.03 ~ 0.04 | 60 |
| | 2.8 | 0.03 ~ 0.05 | 50 |
| | 2.6 | 0.03 ~ 0.05 | 45 |
| | 2.5 | 0.03 ~ 0.05 | 40 |
| | 2.4 | 0.04 ~ 0.06 | 35 |
| | 2.2 | 0.10 ~ 0.20 | 20 |
| | 2.0 | 0.40 ~ 0.60 | 5 |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 6$ Length:200mm Straight Pipe | <i>Round</i> | <i>0.02 ~ 0.03</i> | <i>45</i> |
| | <i>3.0</i> | <i>0.03 ~ 0.08</i> | <i>40</i> |
| | <i>2.5</i> | <i>0.03 ~ 0.10</i> | <i>35</i> |
| | <i>2.0</i> | <i>0.03 ~ 0.70</i> | <i>5</i> |

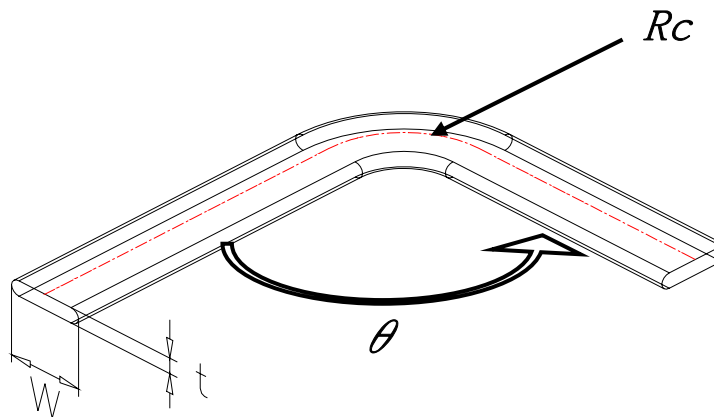
| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 8$ Length:150mm Straight Pipe | <i>Round</i> | <i>0.002 ~ 0.007</i> | <i>80</i> |
| | <i>4.5</i> | <i>0.003 ~ 0.015</i> | <i>70</i> |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 8$ Length:200mm Straight Pipe | <i>Round</i> | <i>0.002 ~ 0.007</i> | <i>75</i> |
| | <i>4.5</i> | <i>0.003 ~ 0.015</i> | <i>65</i> |

Note: $\phi 6$ heat pipe Increase ~50mm of pipe length, Operating max. power will drop $\approx 15\%$

$\phi 8$ heat pipe Increase ~50mm of pipe length, Operating max. power will drop $\approx 7\%$

| Diameter D: (mm) | θ: (°) | Pipe Thermal Resistance R_{pipe} (°C/W) | Operating Max. Power Q (W) |
|--|---------------------------------|---|---------------------------------------|
| $\phi 6$ Length:150mm Rc:18mm Flat:2.5mm | 180 | 0.03 ~ 0.05 | 40 |
| | 150 | 0.03 ~ 0.08 | 35 |
| | 120 | 0.03 ~ 0.10 | 35 |
| | 90 | 0.03 ~ 0.12 | 30 |



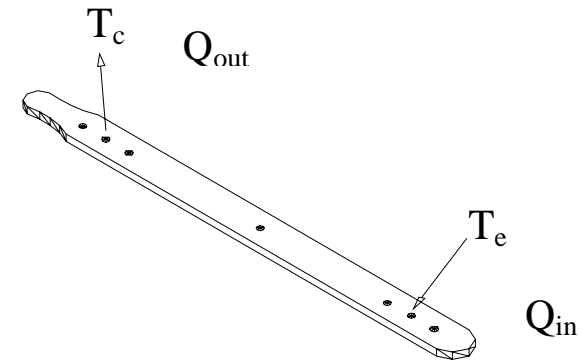
Note: Through one 90° bend, Operating max. power will drop \approx 25%.

* Performance Reference 3: Sintering Powder type

Conditions •Heating / Cooling: Evaporator section $L_e = 15 \text{ mm}$ electric resistance heater,
 Condenser section $L_c = 60 \text{ mm}$ wi

- Orient : Horizontal
- Working Temperature (Adiabatic) : $70 \text{ }^\circ\text{C}$

$$R_{\text{pipe}} = (T_e - T_c) / Q_{\text{in}}$$



| Diameter D : (mm) | Flat t : (mm) | Pipe Thermal Resistance R_{pipe} ($^\circ\text{C}/\text{W}$) | Operating Max. Power Q (W) |
|---|-----------------|--|---------------------------------|
| $\phi 5$ Length:100mm Straight Pipe | Round | 0.02 ~ 0.04 | 40 |
| | 3.0 | 0.03 ~ 0.05 | 40 |
| | 2.5 | 0.03 ~ 0.06 | 30 |
| | 2.0 | 0.15 ~ 0.40 | 5 |

| Diameter D : (mm) | Flat t : (mm) | Pipe Thermal Resistance R_{pipe} ($^\circ\text{C}/\text{W}$) | Operating Max. Power Q (W) |
|---|-----------------|--|---------------------------------|
| $\phi 5$ Length:150mm Straight Pipe | Round | 0.03 ~ 0.05 | 35 |
| | 3.0 | 0.03 ~ 0.05 | 30 |
| | 2.5 | 0.04 ~ 0.06 | 25 |
| | 2.0 | 0.35 ~ 0.60 | 5 |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 6$ Length:100mm Straight Pipe | <i>Round</i> | <i>0.02 ~ 0.03</i> | <i>75</i> |
| | <i>3.0</i> | <i>0.02 ~ 0.04</i> | <i>70</i> |
| | <i>2.5</i> | <i>0.03 ~ 0.05</i> | <i>45</i> |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 6$ Length:150mm Straight Pipe | <i>Round</i> | <i>0.02 ~ 0.03</i> | <i>65</i> |
| | <i>3.0</i> | <i>0.03 ~ 0.04</i> | <i>60</i> |
| | <i>2.5</i> | <i>0.03 ~ 0.05</i> | <i>40</i> |

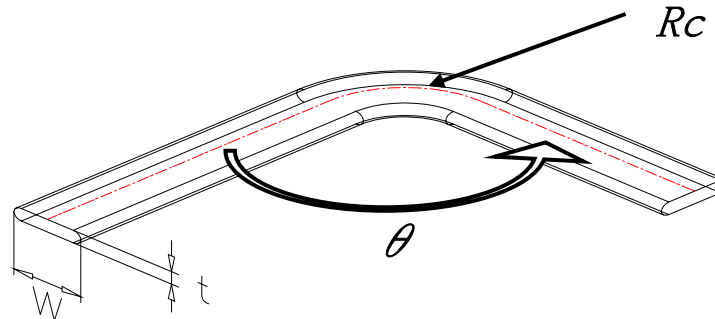
| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 6$ Length:200mm Straight Pipe | <i>Round</i> | <i>0.02 ~ 0.03</i> | <i>50</i> |
| | <i>3.0</i> | <i>0.03 ~ 0.06</i> | <i>45</i> |
| | <i>2.5</i> | <i>0.03 ~ 0.08</i> | <i>35</i> |

Note: Increase ~50mm of pipe length, Operating max. power will drop \approx 12%

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 8$ Length:150mm Straight Pipe | <i>Round</i> | <i>0.002 ~ 0.004</i> | <i>80</i> |
| | <i>4.5</i> | <i>0.003 ~ 0.011</i> | <i>70</i> |

| Diameter D: (mm) | Flat t: (mm) | Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$) | Operating Max. Power Q (W) |
|---|--------------|---|-------------------------------|
| $\phi 8$ Length:275mm Straight Pipe | Round | 0.002 ~ 0.004 | 80 |
| | 4.5 | 0.003 ~ 0.012 | 70 |

| Diameter D: (mm) | θ : ($^{\circ}$) | Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$) | Operating Max. Power Q (W) |
|---|---------------------------|---|-------------------------------|
| $\phi 6$ Length:150mm Rc:18mm Flat:2.5mm | 180 | 0.02 ~ 0.04 | 40 |
| | 150 | 0.02 ~ 0.07 | 35 |
| | 120 | 0.03 ~ 0.08 | 35 |
| | 90 | 0.03 ~ 0.10 | 30 |

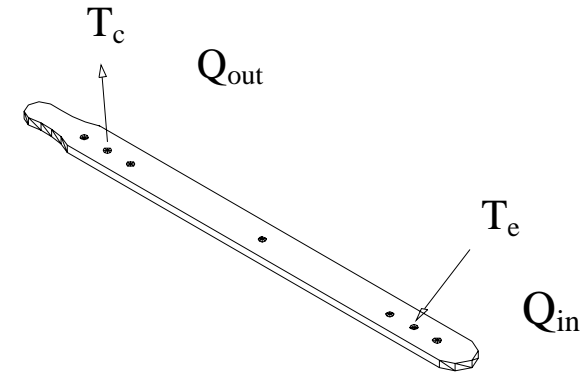


Note: Through one 90° bend, Operating max. power will drop \approx 25%.

* Performance Reference 2: Composite type (Groove Powder)

Conditions •Heating / Cooling: Evaporator section $L_e = 15 \text{ mm}$ electric resistance heater,
 Condenser section $L_c = 60 \text{ mm}$ with fin air cooling

- Orient : Horizontal
- Working Temperature (Adiabatic) : $70 \text{ }^\circ\text{C}$



$$R_{\text{pipe}} = (T_e - T_c) / Q_{\text{in}}$$

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^\circ\text{C}/\text{W}$)</i> | <i>Operating Max. Power Q (W)</i> |
|--|---------------------|--|---------------------------------------|
| $\phi 6$ Length: 150mm Straight Pipe | Round | 0.002 ~ 0.003 | 65 |
| | 3.0 | 0.003 ~ 0.004 | 60 |
| | 2.8 | 0.003 ~ 0.005 | 50 |
| | 2.6 | 0.003 ~ 0.005 | 45 |
| | 2.5 | 0.003 ~ 0.005 | 40 |
| | 2.4 | 0.004 ~ 0.006 | 35 |
| | 2.2 | 0.010 ~ 0.020 | 20 |
| | | | |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 6$ Length:200mm Straight Pipe | Round | 0.002 ~ 0.003 | 45 |
| | 3.0 | 0.003 ~ 0.008 | 40 |
| | 2.5 | 0.003 ~ 0.010 | 35 |
| | 2.0 | 0.03 ~ 0.070 | 5 |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 8$ Length:150mm Straight Pipe | Round | 0.002 ~ 0.007 | 80 |
| | 4.5 | 0.003 ~ 0.015 | 70 |

| <i>Diameter D: (mm)</i> | <i>Flat t: (mm)</i> | <i>Pipe Thermal Resistance R_{pipe} ($^{\circ}C/W$)</i> | <i>Operating Max. Power Q (W)</i> |
|---|---------------------|---|---------------------------------------|
| $\phi 8$ Length:200mm Straight Pipe | Round | 0.002 ~ 0.007 | 75 |
| | 4.5 | 0.003 ~ 0.015 | 65 |

Note: $\phi 6$ heat pipe Increase ~50mm of pipe length, Operating max. power will drop \approx 15%

$\phi 8$ heat pipe Increase ~50mm of pipe length, Operating max. power will drop \approx 7%

*Approval List:

| ITEM | | SPECIFICATION |
|----------------------------------|--------------|---|
| SHAPE | ROUND | $\phi 4 \sim \phi 8$ |
| | FLAT | T = 1.6~3.5 mm |
| BENDING / SHAPE | | Drawing |
| MATERIAL OF CONTAINER | | C1020 |
| WORKING FLUID | | DI Water |
| WICK STRUCTURE | | Grooved / Screen Mesh / Powder / Composite |
| FAIL TEMP (No cooling) | ROUND | 300 °C Leakage |
| | FLAT | 110~140 °C Inflation |
| MAX. HEAT TRANSFER RATE | | 0~80 W |
| APPLICATION INCLINATION | | Horizontal |
| GUARANTY | | 3 Years |

*Quality Control:

Heat Pipes after bending
and flatten

120°C, 48hrs Thermal Oven
Accelerated Life
(100%)

Qmxa Go/NG Test
(100%)

Burst Temp. Test
(Sampling)

1. Sintered Powder and Grooved are good in case of block high $\geq 4.0\text{mm}$
2. Mesh is good in case of all pipe need to flat to $\geq 1.6\text{ mm}$
3. Grooved is good in case of all pipe need to flat to $\geq 2.5\text{ mm}$
4. Bending $R_c \geq 4.5$ times of D is good
5. Bending $\theta \geq 90^\circ$ is good



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