CCI HEAT PIPE

DIMENSION & PERFORMANCE SPECIFICATION

Rev: B.04

Prepared by：CCI RD01 Heat Pipe Team

Date：10. June. 2003

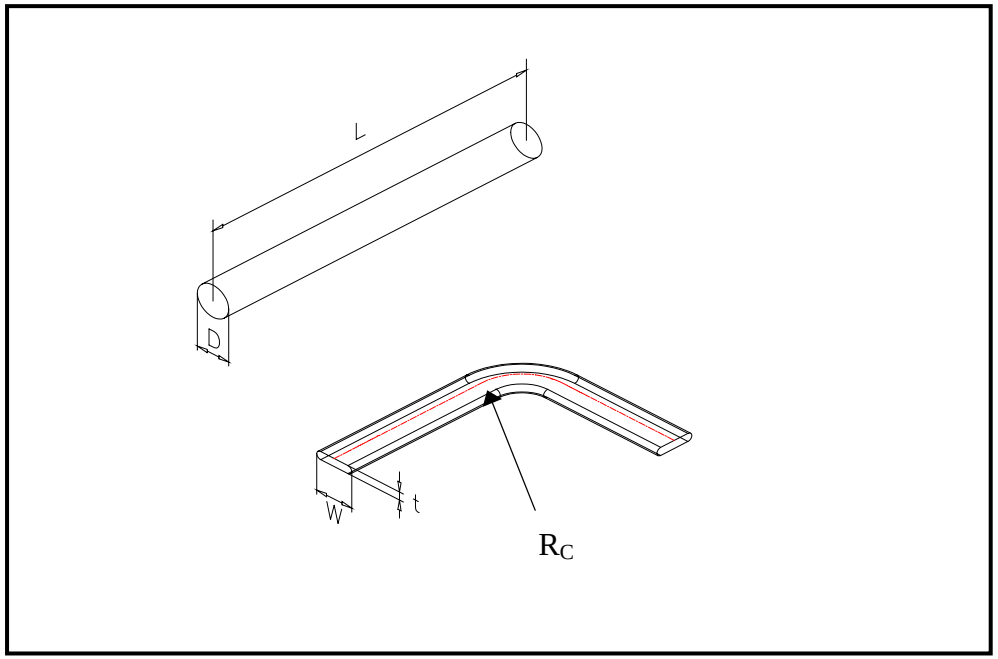
1. CCI Heat Pipe Wick Structure : Grooved, Screen Mesh

2. Mass Production Diameter : D= ϕ4, ϕ5, ϕ6, ϕ8 for Mesh Pipe

   D= ϕ5, ϕ6 for Grooved Pipe

3. Mass Production Length : L= 80 ~ 350 mm

4. Dimensions List :



*Screen Mesh type

D	t	t :Tolerance	W	W:Tolerance	Rc	Shrinking length
ψ4	3.0	±0.05	4.75	±0.1	14.0 25.0 30.0	Head end: 7.0 Tail end: 2.5
	2.5		5.02			
	2.0		5.30			
	1.8		5.40			
	1.6		5.49			
	1.5		5.55			
ψ5	3.0	±0.05	6.40	±0.1	14.0 18.0 24.0	Head end: 7.0 Tail end: 4.0
	2.5		6.67			
	2.0		6.92			
	1.8		7.02			
	1.6		7.18			
	1.5		7.22			
ψ6	3.0	±0.05	7.98	±0.1	18.0 , 20.0 24.0 , 26.0 30.0 , 33.0 43.0 , 46.0	Head end: 8.0 Tail end: 6.0
	2.5		8.23			
	2.0		8.50			
	1.8		8.63			
	1.6		8.71			
	1.5		8.76			
ψ8	3.0	±0.05	11.15	±0.1	30.0 46.0	Head end: 11.0 Tail end: 8.0
	2.5		11.42			
	2.0		11.68			
	1.8		11.85			
	1.6		11.97			
	1.5		12.02			

*Grooved type

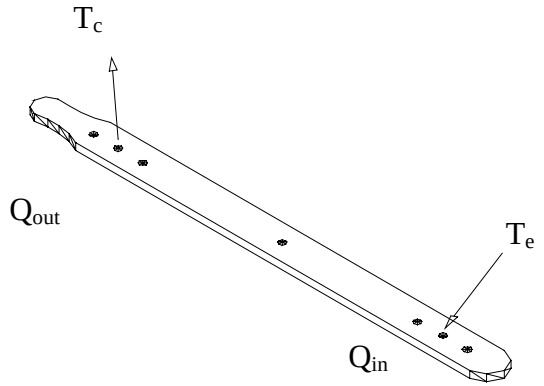
D	t	t :Tolerance	W	W:Tolerance	Rc	Shrinking length
ψ5	3.0	±0.05	6.40	±0.1	14.0 18.0 24.0	Head end: 7.0 Tail end: 3.0
	2.5		6.67			
	2.0		6.92			
ψ6	3.0	±0.05	7.98	±0.1	18.0 , 20.0 24.0 , 26.0 30.0 , 33.0 43.0 , 46.0	Head end: 8.0 Tail end: 3.0
	2.5		8.23			
	2.0		8.50			

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

5.1. Performance Reference 1: Grooved type

Conditions •Heating / Cooling: Evaporator section Le＝15 ㎜ electric resistance heater,
Condenser section Lc＝40 ㎜ with fin air cooling
•Orient : Horizontal

R_{pipe}＝（Te－Tc）/ Q_{in}



Diameter D: (mm)	Flat t: (mm)	Pipe Thermal Resistance R_{pipe} (℃/W)	Operating Max. Power Q (W)	Dry Out Power Q (W)
ϕ5 Length:100mm Straight Pipe	Round	0.02 ~ 0.04	40	50
	3.0	0.03 ~ 0.05	40	50
	2.5	0.03 ~ 0.06	30	35
	2.0	0.20 ~ 0.45	5	8

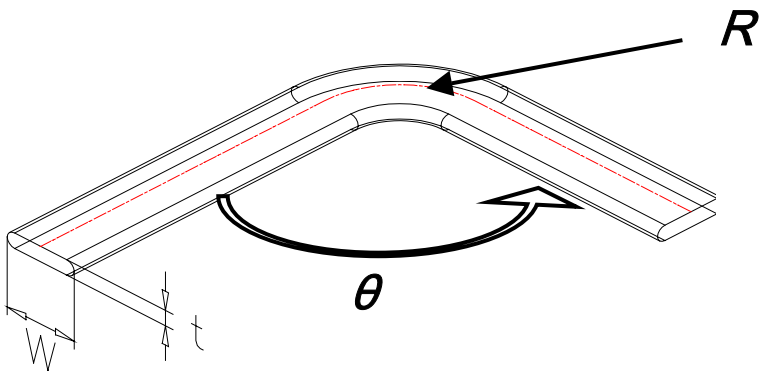
Diameter D: (mm)	Flat t: (mm)	Pipe Thermal Resistance R_{pipe} (℃/W)	Operating Max. Power Q (W)	Dry Out Power Q (W)
ϕ5 Length:150mm Straight Pipe	Round	0.03 ~ 0.05	35	45
	3.0	0.03 ~ 0.05	30	40
	2.5	0.04 ~ 0.06	25	30
	2.0	0.40 ~ 0.70	5	6

Diameter D: (mm)	Flat t: (mm)	Pipe Thermal Resistance R_{pipe} (℃/W)	Operating Max. Power Q (W)	Dry Out Power Q (W)
ϕ6 Length:100mm Straight Pipe	Round	0.02 ~ 0.03	75	100
	3.0	0.02 ~ 0.05	70	90
	2.8	0.02 ~ 0.05	60	75
	2.6	0.03 ~ 0.05	50	65
	2.5	0.03 ~ 0.05	45	55
	2.4	0.03 ~ 0.05	45	55
	2.2	0.05 ~ 0.10	25	30
	2.0	0.10 ~ 0.32	5	8

Diameter D: (mm)	Flat t: (mm)	Pipe Thermal Resistance R_{pipe} (℃/W)	Operating Max. Power Q (W)	Dry Out Power Q (W)
ϕ6 Length:150mm Straight Pipe	Round	0.02 ~ 0.03	65	85
	3.0	0.03 ~ 0.04	60	75
	2.8	0.03 ~ 0.05	50	65
	2.6	0.03 ~ 0.05	45	55
	2.5	0.03 ~ 0.05	40	45
	2.4	0.04 ~ 0.06	35	40
	2.2	0.10 ~ 0.20	20	25
	2.0	0.40 ~ 0.60	5	6

Diameter D: (mm)	Flat t: (mm)	Pipe Thermal Resistance R_{pipe} (℃/W)	Operating Max. Power Q (W)	Dry Out Power Q (W)
ϕ6 Length:200mm Straight Pipe	Round	0.02 ~ 0.03	45	65
	3.0	0.03 ~ 0.08	40	55
	2.5	0.03 ~ 0.10	35	45
	2.0	0.03 ~ 0.70	5	6

Diameter D: (mm)	θ : (°)	Pipe Thermal Resistance R_{pipe} (℃/W)	Operating Max. Power Q (W)	Dry Out Power Q (W)
ϕ6 Length:150mm Rc:18mm Flat:2.5mm	180	0.03 ~ 0.05	40	45
	150	0.03 ~ 0.08	35	40
	120	0.03 ~ 0.10	35	40
	90	0.03 ~ 0.12	30	35



5.2. Performance Reference 2: Screen Mesh type

Conditions •Heating / Cooling: Evaporator section Le＝15 ㎜
Condenser section Lc＝40 ㎜
•Orient : Horizontal

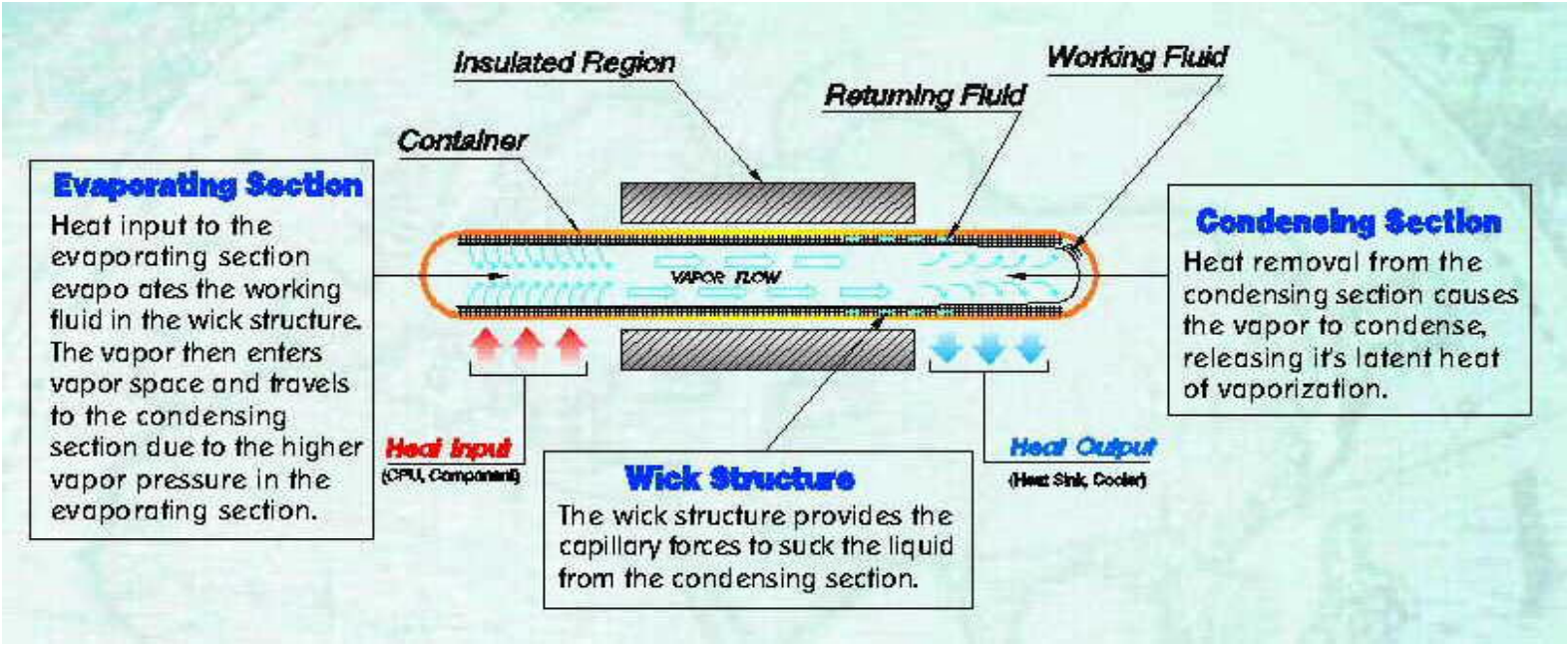
Diameter D: (mm)	Flat t: (mm)	Pipe Thermal Resistance R_{pipe} (℃/W)	Operating Max. Power Q (W)	Dry Out Power Q (W)
ϕ6 Length:100mm Straight Pipe	Round	0.20 ~0.35	50	55
	3.0	0.25 ~0.35	50	55
	2.5	0.25 ~0.40	45	50
	2.0	0.35 ~0.60	35	45

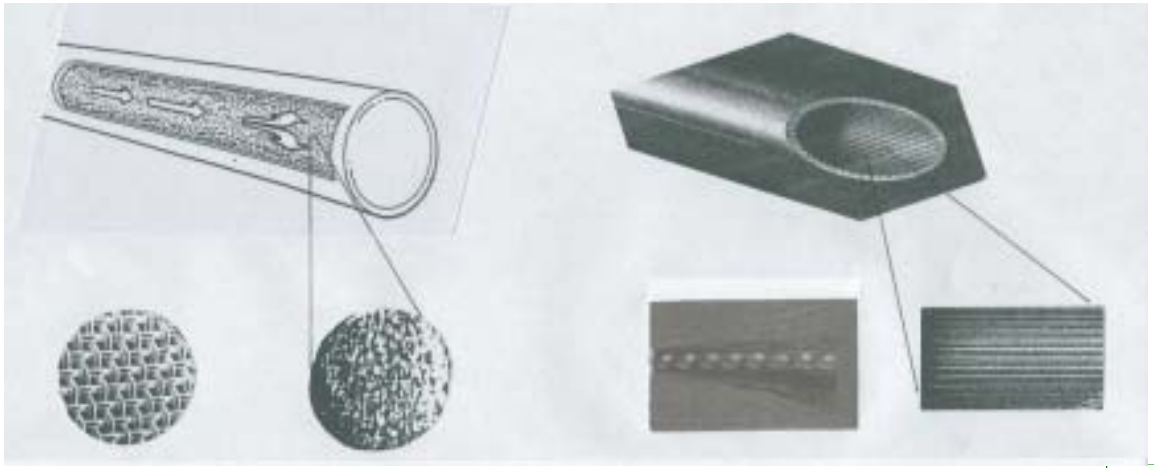
Diameter D: (mm)	Flat t: (mm)	Pipe Thermal Resistance R_{pipe} (℃/W)	Operating Max. Power Q (W)	Dry Out Power Q (W)
ϕ6 Length:150mm Straight Pipe	Round	0.20 ~ 0.35	45	50
	3.0	0.25 ~ 0.35	45	50
	2.5	0.25 ~ 0.40	40	45
	2.0	0.35 ~ 0.60	35	40

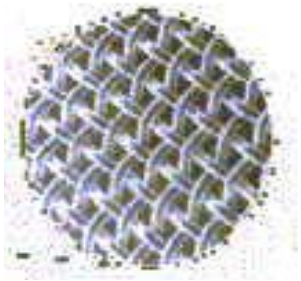
6. Approval List:

ITEM		SPECIFICATION
SHAPE	ROUND	ψ3　ψ8
	FLAT	T = 1.5~3.5 mm
BENDING / SHAPE		Drawing
TOTAL LENGTH		L=80~350 ± 1.0mm
MATERIAL OF CONTAINER		OFHC
WORKING FLUID		Pure H_2O
WICK STRUCTURE		Grooved / Screen Mesh
FAIL TEMP （No cooling）	ROUND	320 ℃ Leakage
	FLAT	140 ℃ Inflation
MAX. HEAT TRANSFER RATE		0　80 W
APPLICATION INCLINATION		Horizontal
GUARANTY		5 Years

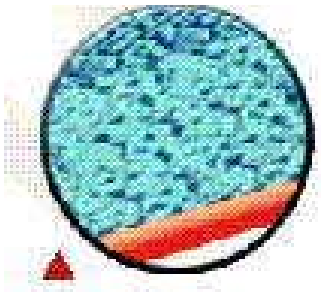
7. Reference for Design in:







Mesh



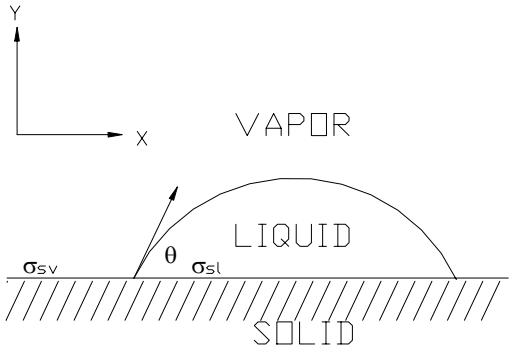
Sintered

Fiber

Grooved

	Mesh (CCI)	Sintered	Fiber	Grooved (CCI)
Capillary Force	****	*****	****	***
Permeability	***	****	***	*****
Thin Flat Design (t <2.0 mm)	*****	***	****	***
Bend Design (More 1 or 2 Bend)	*****	***	*****	***
Small Radius Design (R_c<3D)	***	***	*****	****
Inclined Design (Heating up)	****	*****	****	***
Different Level	****	*****	****	***

$$\Delta Pc = \frac{2\sigma}{\gamma}(\cos\theta)\left(\frac{\rho_{v,sat}}{\rho_l}\right)$$



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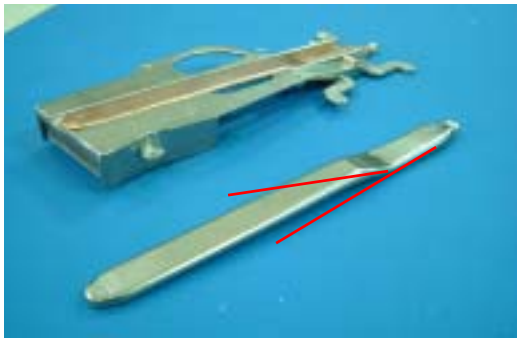
1. Sintered Powder and Grooved are good in case of block high >= 4.0mm
2. Mesh is good in case of all pipe need to flat to >= 1.5 mm
3. Grooved is good in case of all pipe need to flat to >= 2.5 mm
4. Bending R_c>= 3 times of D is good
5. Bending θ >= 90^o is good



1. Sintered Powder and Grooved are good in case of block high >= 4.0mm
2. The angle of different high ψ<= 15^o is good

1. Mesh and Fiber are good
2. Bending R_c>= 3 times of D is good
3. Both Bending θ >= 90^o is good

8. Quality Control:

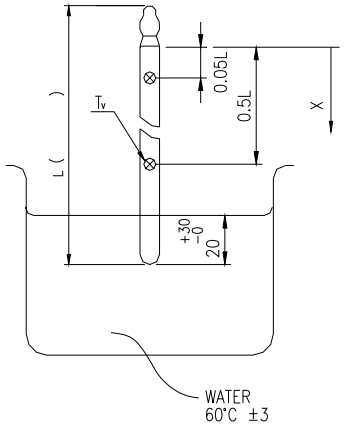
Heat Pipes after bending and flatten

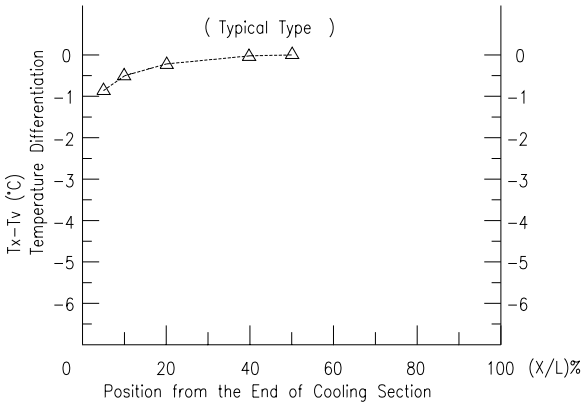
160℃,48hrs Thermal Oven Accelerated Life
(100％)

60℃ Thermal Bath △T Test
(100％)

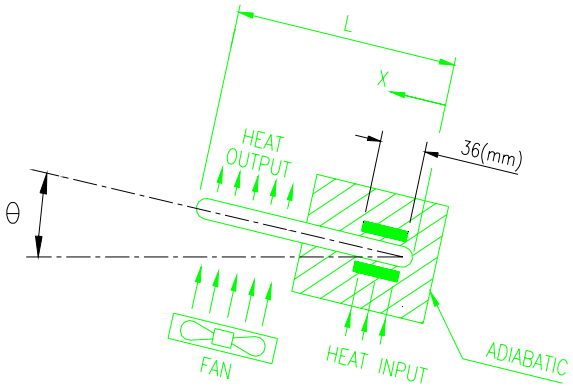
Performance Test
(Sampling)

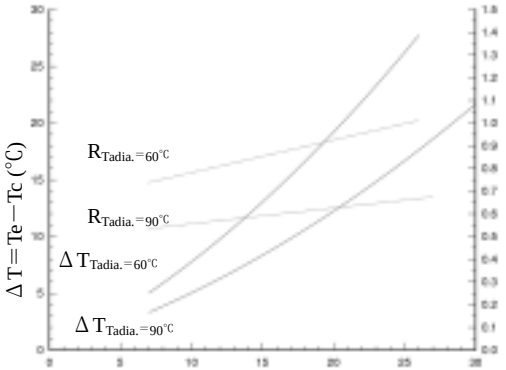
Fail Temp. Test
(Sampling)



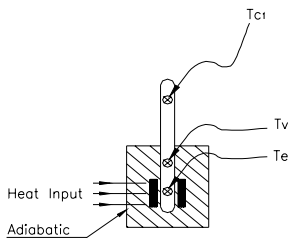


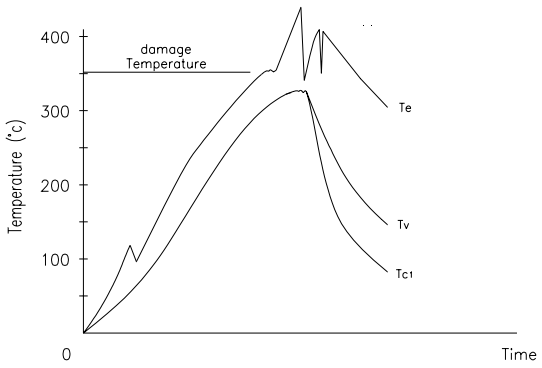
Condition	Criteria
L＜200 mm	ΔT＜2.0℃





D6　0.02 ~ 0.2（℃/W）depend on apply





T_{fail}　320℃

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