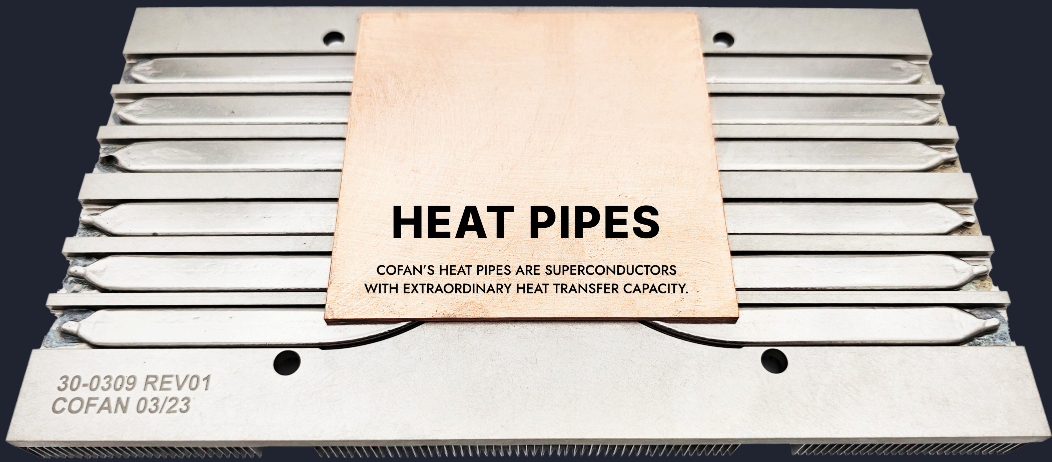
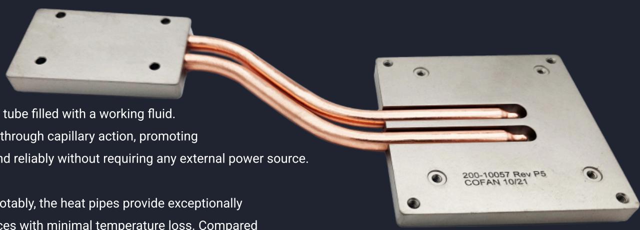
COFAN THERMAL
Trusted Thermal Management Partner Since 1994



Cofan's Heat Pipe : Efficient and Versatile Thermal Management Solutions



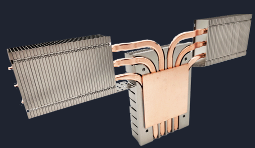
Cofan's heat pipes are engineered thermal management solutions that efficiently transfer heat from one point to another. By harnessing the principles of phase transition and thermal conductivity, each pipe contains a sealed hollow tube filled with a working fluid. A wick structure inside the pipe enables the fluid to circulate through capillary action, promoting continuous thermal flow. As a result, heat is moved rapidly and reliably without requiring any external power source.

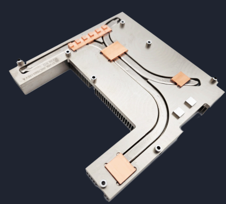
This design offers multiple performance advantages. Most notably, the heat pipes provide exceptionally high thermal conductivity, enabling heat to travel long distances with minimal temperature loss. Compared to solid metal components of similar size, they deliver far superior results. In addition, they operate entirely passively —using only natural evaporation and condensation—making them both energy-efficient and maintenance-free. Consequently, they are an excellent solution for systems that demand reliable and efficient thermal control in compact or demanding environments.

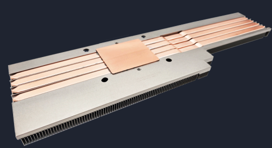
Another key benefit of Cofan's heat pipes is their structural flexibility. Thanks to their bendable form, they can be shaped to fit within limited or complex spaces, making them ideal for intricate designs. Furthermore, they provide consistent heat distribution along their full length, which is essential for safeguarding temperature-sensitive components. As such, they are widely used across various high-performance industries, including electronics, LED lighting, aerospace, and other advanced thermal applications.

HEAT PIPE FEATURE

Cofan heat pipes are designed to deliver exceptional thermal performance across a wide range of industries and applications. The following features highlight what makes them both effective and versatile:



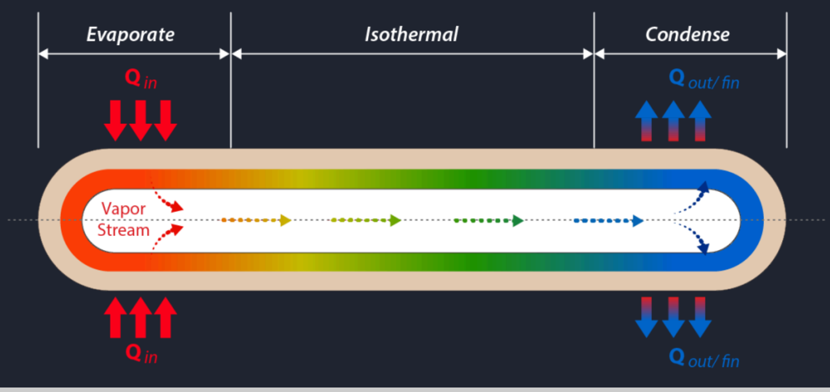




Features

- **Exceptional Thermal Conductivity**
  Conductivity ranges from 5,000 to 200,000 W/m·K, which significantly outperforms traditional solid conductors
- **Energy-Efficient Design**
  Operates passively without the need for external power, relying instead on phase change and capillary action.
- **Lightweight Construction**
  As a result of their low mass, heat pipes can be easily integrated into space- or weight-constrained systems such as mobile electronics and aerospace platforms.
- **Cost-Effective Thermal Solution**
  Despite their high performance, Cofan heat pipes remain affordable, making them ideal for large-scale manufacturing and deployment.
- **Flexible Form Factors**
  Because of their customizable design, they support a wide range of sizes and shapes, including bent or contoured configurations for complex layouts.
- **Comprehensive Quality Assurance**
  Each unit undergoes 100% inspection, both before and after bending, to ensure mechanical strength and thermal reliability.
- **Fast Thermal Response**
  Thanks to rigorous testing, these heat pipes are validated to achieve a temperature change of ΔT = 4°C in approximately 7 seconds, confirming rapid heat transfer capability.
- **Maximum Length Capacity**
  Cofan manufactures the longest heat pipes commercially available, with lengths up to 4,700 mm, allowing integration into demanding thermal applications.

HEAT PIPE TECHNOLOGY



Cofan heat pipes **utilize advanced passive cooling technology to achieve efficient and reliable thermal transfer**. Their performance is driven by a closed-loop cycle composed of evaporation, vapor transport, condensation, and fluid return. This continuous process operates without external power and depends on three internal elements working in harmony.

The first is the container, which forms the outer shell of the heat pipe. It is usually constructed from high thermal conductivity materials such as copper or aluminum. To ensure optimal performance, the container is hermetically sealed. This design maintains internal pressure and protects the working fluid from external contaminants, allowing the system to function consistently and securely.

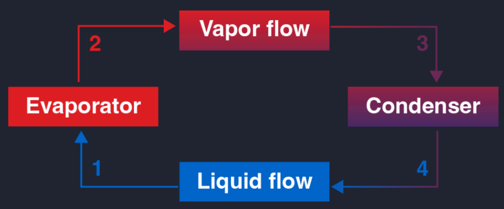
The second component is the working fluid, which is carefully selected based on thermal behavior and phase-change characteristics. Common options include water, ammonia, acetone, and various specialized refrigerants. When heat is applied to one end of the pipe, the fluid vaporizes and travels toward the cooler section. There, it condenses and releases the absorbed heat, completing one phase of the thermal cycle.

Finally, the wick structure lines the inner wall of the pipe and plays a critical role in sustaining the loop. It facilitates capillary action, drawing the condensed liquid back to the evaporator section. This allows the cycle to continue without pumps or electrical input. Depending on the application, the wick may be composed of sintered metal powder, screen mesh, or grooved surfaces. Each type supports reliable liquid movement under a variety of conditions.

Altogether, these three elements create a self-sustaining heat transfer mechanism. This design enables **Cofan heat pipes to move thermal energy effectively**—even across long distances or in orientations that work against gravity—while minimizing temperature loss.

Main Components

- Container
- High strength, high thermal conductivity
- Working fluid
- Flexibility of many different size and shape options
- High latent heat, high thermal conductivity
- Wick/capillary structure
- State-of-the-art copper powder sintering for maximum performance
- Maintains effective capillary action when bent or used against gravity



Cofan heat pipes operate through a highly efficient thermal cycle that begins by absorbing heat at the source via vaporization. As heat is applied, the working fluid inside the pipe turns into vapor and travels through the central vapor channel, moving from the evaporator (heat source) to the condenser (heat sink). Once the vapor reaches the cooler end, it condenses back into a liquid. At this stage, the wick structure draws the liquid back to the heat source through capillary action. Therefore, the cycle repeats continuously, creating a passive and self-sustaining heat transfer system.

As a result of this design, Cofan heat pipes are especially effective in managing thermal loads in modern electronics, personal computers, and high-performance computing systems. In these environments, heat dissipation challenges continue to grow due to increasing power density. However, Cofan heat pipes provide a reliable, energy-efficient, and maintenance-free solution. Consequently, they ensure minimal temperature drop and promote stable performance in temperature-sensitive applications.

APPLICATIONS OF COFAN HEAT PIPES

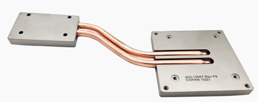
Cofan heat pipes are widely used in high-performance thermal management applications. In particular, they play a critical role in industries such as electronics, aerospace, LED lighting, HVAC, and medical equipment. Since these sectors demand precise and passive cooling, the reliability of heat pipe technology becomes essential.

- **Electronics**
  In the electronics industry, Cofan heat pipes help maintain thermal stability in laptops, desktops, servers, and other computing devices. Specifically, they dissipate heat from CPUs, GPUs, and chipsets to preserve optimal operating temperatures. As processing power continues to grow, efficient cooling becomes even more important. Therefore, heat pipes are now a key component in high-performance computing systems.
- **Aerospace**
  Likewise, Cofan heat pipes offer dependable thermal regulation in aerospace systems. They are commonly integrated into satellites, spacecraft, and avionics, where temperature extremes are a daily challenge. Because these systems often operate in remote or energy-sensitive environments, passive cooling is ideal. As a result, heat pipes are preferred for their consistent performance in mission-critical conditions.
- **LED Lighting**
  When it comes to high-power LED lighting, managing heat is crucial for long-term performance. Cofan heat pipes reduce thermal stress, which otherwise could shorten the life span of LEDs. By improving heat dissipation, they help maintain lumen output and energy efficiency. Consequently, lighting systems become more stable and reliable, even in compact or high-intensity designs.
- **HVAC Systems**
  In HVAC applications, Cofan heat pipes enhance heat exchange and balance thermal loads across the system. This means they help reduce overall energy use while supporting stable temperature control. As a result, they are highly suitable for commercial and industrial systems that require both efficiency and dependability.
- **Medical Equipment**
  Thermal stability is especially important in medical environments. Cofan heat pipes protect sensitive components in diagnostic equipment, imaging systems, and laboratory devices. Because of their passive nature, they prevent heat-related fluctuations without introducing electrical interference. Therefore, they are trusted in hospitals and clinics, where uptime and precision are non-negotiable.

COFAN'S HEAT PIPE PRODUCTS

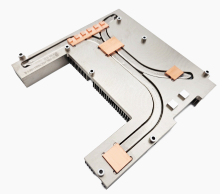
Product Information

- Process: Bending, Soldering
- Material: Aluminum, Copper
- Application: Thermal Management
- Finish: Anti-oxidant, Nickel Plating
- Part No: 91.1022.300



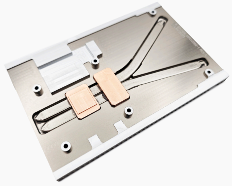
Product Information

- Process: Bending, Flatten, soldering
- Material: Aluminum, Copper
- Application: Thermal Management
- Finish: Anti-oxidant, Nickel Plating
- Part No: 91.1022.250



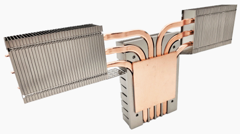
Product Information

- Process: Bending, Flatten, soldering
- Material: Aluminum, Copper
- Application: Thermal Management
- Finish: Anti-oxidant, Nickel Plating
- Part No: 91.1022.175



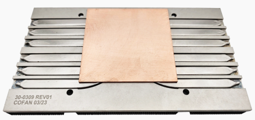
Product Information

- Process: Bending, Flatten, Soldering
- Material: Aluminum, Copper
- Application: Thermal Management
- Finish: Anti-oxidant, Nickel Plating
- Part No: 91.1024.150



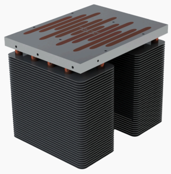
Product Information

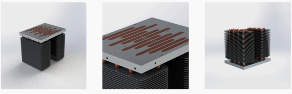
- Process: Bending, Flatten, Soldering
- Material: Aluminum, Copper
- Application: Thermal Management
- Finish: Anti-oxidant, Nickel Plating
- Part No: 91.1024.300



Product Information

- Process: Flat, Bending, Post Machining
- Material: Aluminum, Copper
- Application: Thermal Management
- Finish: Anti-Oxidant
- Part No: 91.1021.150



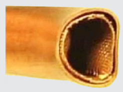
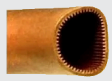


Diameter x Length [mm]	Part No.	Diameter x Length [mm]	Part No.	Diameter x Length [mm]	Part No.	Diameter x Length [mm]	Part No.
4 x 70	91-1028-70	5 x100	91-1029-100	6 x 125	91-1030-125	8x 125	91-1031-125
4 x 175	91-1028-175	5 x 125	91-1029-125	6 x 150	91-1030-150	8 x 150	91-1031-150
4 x 100	91-1028-100	5 x 150	91-1029-150	6 x 170	91-1030-170	8 x 175	91-1031-175
4 x 125	91-1028-125	5 x 175	91-1029-175	6 x 200	91-1030-200	8 x 200	91-1031-200
4 x 200	91-1028-200	5 x 200	91-1029-200	6 x 225	91-1030-225	8 x 300	91-1031-300
4 x 250	91-1028-250	5 x 225	91-1029-225	6 x 250	91-1030-250		
4 x 225	91-1028-225	5 x 225	91-1029-250	6 x 300	91-1030-300		
4 x 300	91-1028-300	5 x 300	91-1029-300				

HEAT PIPE DATA SHEET

Wick Structure			Standard Length/mm			Special Length/mm	Performance 100-350 L/mm		
	Mesh	Groove	Sintered	60-120	121-200	210-400	601-4700	Power/W	Terminal resistance °C/w
ø2	●			●	●			3-6	0.62-1.66
ø3	●		•	•	•	•		10-15	0.33-0.5
ø4	●	●	●	●	●	●		15-28	0.17-0.33
ø5	●	●	●	●	●	●	● (Groove & Mesh)	30-50	0.1-0.2
ø6	●	●	●	●	●	●	● (Groove & Mesh)	50-70	0.07-0.15
ø8	●	●	●	●	●	●	● (Mesh)	60-90	0.05-0.1
ø10	●	●	●		●	●	● (Mesh)	130-160	0.03
ø12	●				●	●	● (Mesh)	130-160	0.03
ø14	●					●	● (Mesh)	180-220	0.08

WICK STRUCTURE COMPARISON

Wick Structure	Screen Mesh	Groove	Sintering Powder
Image			
Rate Process	Easy	Easy	Hard
Capillary	Bad	Good	Better
Flat (Min.)	t = 2.0	t = 1.5	t = 2.5
Bend (Min.)	2* Heat Pipe Diameter [D]	2* Heat Pipe Diameter [D]	3* Heat Pipe Diameter [D]
Resistance (t = 3mm)	.250 ~ .350	.03 ~ .040	.030 ~ .045
Heat Flux	35	40	45
Cost	Low	Medium	High

HEAT PIPE WORKING FLUID

How to select a working fluid

- High Surface tension - generate high capillary force and resists the environment
- High Vapor pressure – reduces vapor velocity
- High latent heat – transfers more heat with less fluid
- High thermal conductivity – lower ΔT and reduces nucleate boiling at the wick/wall interface
- Low vapor viscosity – increases fluid flow capacity

Working Fluid	Relative Figure of Merit [80°C]	Useful Range [°C]	Wick Vessel Material	Life [hrs]
Ammonia	.45	- 60 ~ 100	AL SS304	36000
Ammonia	.45	- 60 ~ 100	AL SS304	36000
Freon 113	- 10 ~ 100	86	CU AL SS304	25000
Aceton	300	0 ~ 120	CU AL SS304	50000
Methanol	450	10 ~ 120	CU AL SS304	less than 50000
Ethanol	340	0 ~ 120	CU SS304	24000
Water	40000	30 ~ 250	CU	7500000

COPPER SCREEN MESH



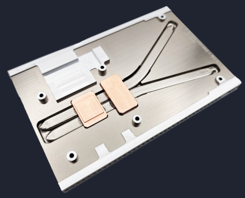
Assessment Parameter	Diameter (mm)	Diameter (mm)	Diameter (mm)	Diameter (mm)
Thickness	4	5	6	8
t = 2.0 mm	.65 ~ .09; 15	.50 ~ .80; 18	.35 ~ .60; 35	.30 ~ .55; 45
t = 2.5 mm	.55 ~ .08; 18	.45 ~ .65; 22	.25 ~ .40; 40	.20 ~ .35; 50
t = 3.0 mm	.50 ~ .70; 20	.45 ~ .60; 22	.25 ~ .35; 45	.20 ~ .30; 55

Assessment Parameter	Diameter (mm)	Diameter (mm)	Diameter (mm)	Diameter (mm)
Round	.50 ~ .70; 20	.40 ~ .35; 25	.20 ~ .35; 45	.15 ~ .30; 60
Units; R [ºC/W]; Qmax [Watt]				

COPPER GROOVE

Copper grooves inside heat pipes are precisely engineered patterns that enhance thermal efficiency in multiple ways. Each groove serves a functional purpose, contributing to capillary action and continuous heat transfer. Their benefits include:

- **Facilitating Capillary Action:** To begin with, the grooves allow the liquid working fluid to move through extremely narrow channels. This makes it easier for the fluid to distribute evenly along the pipe's inner surface, even in complex geometries.
- **Increasing Surface Area:** Additionally, the presence of grooves greatly expands the internal surface area. As a result, this enhances the processes of evaporation and condensation, improving the overall efficiency of heat transfer.
- **Enhancing Wicking Performance:** Moreover, the grooves function as an integrated wick. They help draw the condensed liquid back to the evaporator section. This continuous return flow ensures reliable, passive operation—even when the heat pipe is bent or used in orientations that work against gravity.



Assessment Parameter	Diameter (mm)	Diameter (mm)	Diameter (mm)	Diameter (mm)
Thickness	4	5	6	8
t = 2.0 mm	—	.40 ~ .70; 5	.40 ~ .60; 5	—
t = 2.5 mm	—	.04 ~ 06; 25	.03 ~ .05; 40	—
t = 3.0 mm	—	.02 ~ .05; 30	.03 ~ .04; 60	—
t = 4.5 mm	—	—	—	.003 ~ 0.15; 70
Round	—	.03 ~ .05; 35	.20 ~ .03; 65	.002 ~ .007; 80
Units; R [ºC/W]; Qmax [Watt]				

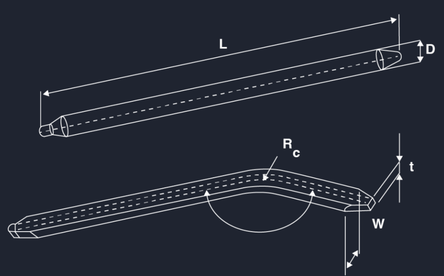
COPPER SINTERING POWDER

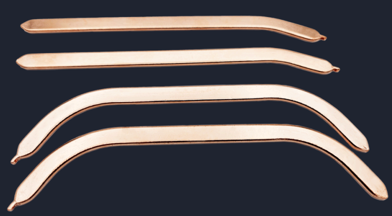
Advantages of Copper Sintering Powder

- **High Capillary Performance:** Excellent fluid movement
- **Large Surface Area:** Enhanced evaporation and condensation
- **Uniform Distribution:** Even fluid distribution
- **Improved Heat Transfer:** Efficient heat absorption and dissipation
- **Versatility:** Suitable for electronics, aerospace, medical devices, and industrial applications

Assessment Parameter	Diameter (mm)	Diameter (mm)	Diameter (mm)	Diameter (mm)
Thickness	4	5	6	8
t = 2.0 mm	—	.035 ~ .60; 5	—	—
t = 2.5 mm	—	.04 ~ 06; 25	.03 ~ .05; 40	—
t = 3.0 mm	—	.02 ~ .05; 30	.03 ~ .04; 60	—
t = 4.5 mm	—	—	—	.003 ~ 0.15; 70
Round	—	.03 ~ .05; 35	.20 ~ .03; 65	.002 ~ .007; 80
Units; R [ºC/W]; Qmax [Watt]				

CUSTOMIZED BENDING & FLATTENING





Diameter, D [mm]	3	4	5	6	8	9	9.6	10	12	12.7	16
Minimum Bending Radious [2*D]	6	8	10	12	16	18	19	20	24	25	32
Standard Bending Radious [3*D]	9	12	15	18	24	27	29	30	36	38	48
Recommended Bending Radious [4*D]	12	16	20	24	32	36	38	40	48	51	64
Minimum Bending Angle [ø]	90º										
Recommended Bending Angle [ø]	120º										

COPPER HEAT PIPE SPEC.

Diameter	Thickness	Thickness Tolerance	Width	Width Tolerance	Bend Radius	Invalid end Length	Q'max	(Sintered) Length	(Groove) Length	(Mesh) Length
φ2	1.50	± 0.05mm	2.40	± 0.15mm	Rc7 ↑	Head end: 5.0 Tail end: 1.0	6W ↑	—	—	60-200mm
φ3	2.50	± 0.05mm	3.42	± 0.15mm	Rc9 ↑	Head end:5.0 Tail end: 1.0	12W ↑	70-200mm	—	50-350mm
	2.00		3.67							
	1.80		3.82							
	1.20		4.09							
φ4	2.50	± 0.05mm	5.03	± 0.15mm	Rc12 ↑	Head end:7.0 Tail end: 3.0	20W ↑	80-1000mm	60-2350mm	60-1000mm
	2.00		5.29							
	1.50		5.56							
	1.20		5.71							
φ5	3.00	± 0.05mm	6.30	± 0.15mm	Rc15 ↑	Head end:7.0 Tail end: 5.0	30W ↑	80-1000mm	60-2350mm	60-1500mm
	2.50		6.62							
	2.00		6.90							
	1.50		7.15							
φ6	4.00	± 0.05mm	7.32	± 0.15mm	Rc18 ↑	Head end:9.0 Tail end:6.0	35W ↑	80-1000mm	60-2350mm	60-2350mm
	3.50		7.65							
	3.00		7.96							
	2.00		8.45							
φ8	5.00	± 0.05mm	9.98	± 0.15mm	Rc24 ↑	Head end:11.0 Tail end:8.0	50W ↑	90-1000mm	80-2350mm	80-2350mm
	4.00		10.60							
	3.00		11.06							
	2.00		11.85							
φ10	9.00	± 0.05mm	10.80	± 0.15mm	Rc30 ↑	Head end:15.0 Tail end:12.0	80W ↑	100-1000mm	90-2350mm	90-4700mm
	7.00		12.08							
	5.00		13.20							
	3.00		14.20							
φ12	8.00	± 0.05mm	14.90	± 0.15mm	Rc36 ↑	Head end:15.0 Tail end: 15.0	120W ↑	—	—	100-2350mm
	6.00		15.90							
φ14	10.00	± 0.05mm	17.00	± 0.15mm	Rc45 ↑	Head end: 20.0 Tail end: 20.0	160W ↑	—	—	100-2350mm
	8.00		18.00							

Diameter (mm)	Thickness, t +0.05/-0.10 [mm]	DiamWidth, W ± 0.15 [mm]
3	1.2	3.94
	1.5	4.10
	2.0	3.65
	2.5	3.32
	3.0	N/A
4	1.5	5.49
	2.0	5.23
	2.5	4.96
	3.0	4.65
	4.0	N/A
5	1.4	7.14
	1.5	6.77
	2.0	6.60
	2.3	6.50
	2.5	6.26
	3.0	5.95
	4.0	5.63
	5.0	N/A
6	1.5	8.69
	2.0	8.41
	2.3	8.25
	2.4	8.20
	2.5	8.16
	2.7	8.00
	3.0	7.84
	3.5	7.57
	4.0	7.30

Diameter (mm)	Thickness, t +0.05/-0.10 [mm]	DiamWidth, W ± 0.15 [mm]
	4.8	6.86
	5.0	6.63
	5.3	6.60
	6.0	N/A
8	2.0	Undone
	2.5	11.26
	3.0	10.97
	3.5	10.71
	4.0	10.45
	4.5	10.20
	5.0	9.96
	6.0	9.36
	8.0	N/A