Fluid temperature control technology

Comparative data with similar products

Neo Magic+

NEO CORPORATION

Hi performance heater DiV

Company information

Our company Nissin Neo Co., Ltd. was born in 1992 as a trading company dealing with controllers for semiconductors.
Currently, headquartered in Matsudo-city, Chiba Prefecture, it has a base in South Korea, Taiwan and China (Xi'an) and it also functions as Mitsubishi ASC Center made by Hitachi Metals.
In addition to completing the head office building in 2016, R & D center was installed alongside, and product development and manufacture and sale of fluid control (flow rate, temperature, concentration) started.

Head office building

R & D Clean Room （Class 100）

Neo Magic+ Development Concept

Ver1.4

Neo Magic+ series are designed to work efficiently with the three elements (conduction, convection, radiation) required for heat transfer. And it makes superior to other heat exchangers.

In order to realize safety and long life, we examined processing methods and materials. And we designed the structure to take full advantage of the properties of the material.

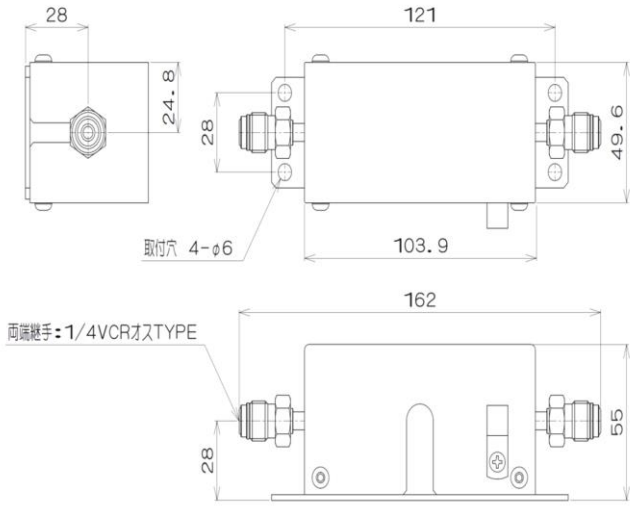
Neo Magic+ Development concept 2

Neo Magic+ requirement

1. No.1 performance for heat up rate
2. Compact design that can be placed anywhere
3. Clean design corresponding to process gas
4. Leak-free design eliminating mechanical coupling
5. Ultra high temperature heating corresponding to the next generation process
6. Long life specification eliminating disconnection / short circuit

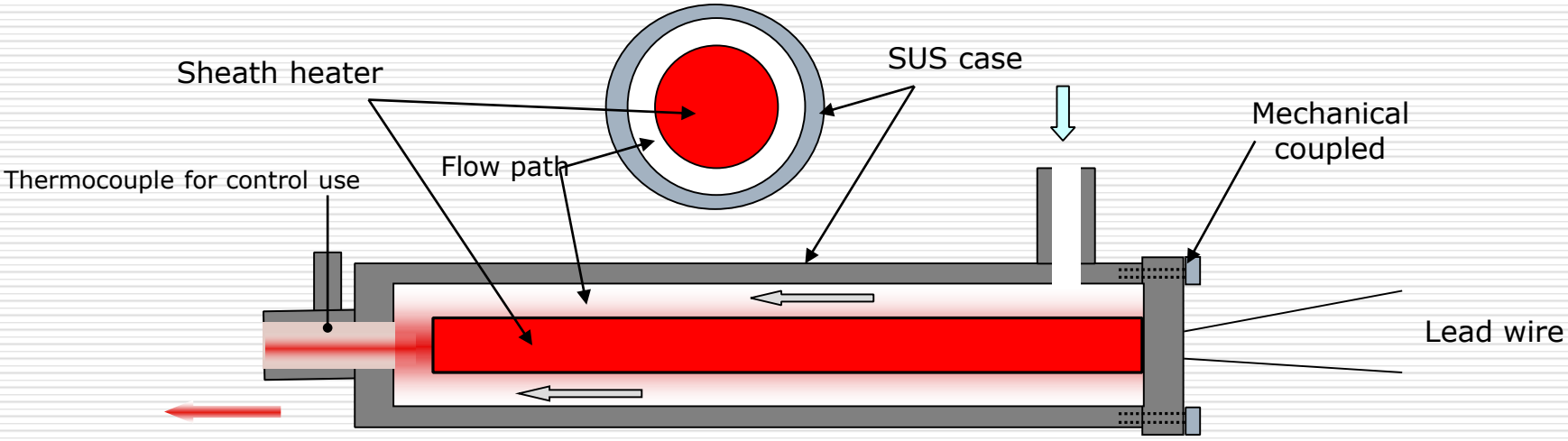
NMH-103. 105M series

Heat up rate : over 90% keeping (set/actual)
Wide flow range :50cc～30L (N2)



【Week point of similar product 1】

The figure of below is a cartridge type gas heater.
There is merit that it can be manufactured cheaply because the structure is simple, However, gas directly contacts the sheath heater, thermal decomposition may occur. The seal portion is mechanically coupled, it can not withstand thermal expansion and leakage may occur. Therefore, it can be used only for non-reactive gas.

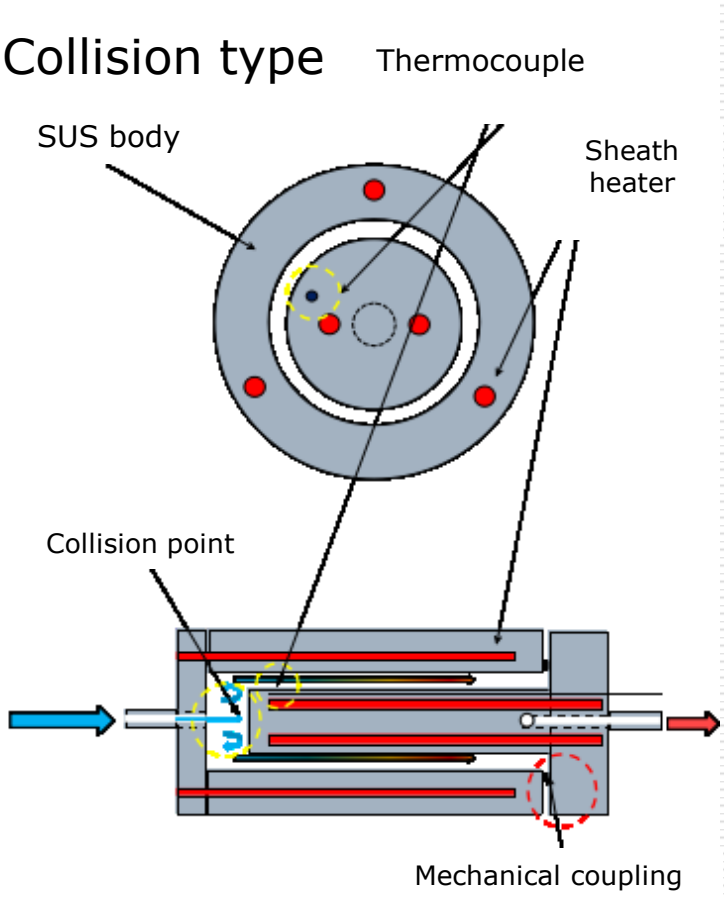


【 Week point of similar product 2】

The figure on the right shows a type of heater that transfer heat using fluid collision.

Excellent heat up rate of fluid within the range where the fluid impact stress and fluid mass can be balanced.

However, the effective range is narrow and it can be operated only at a constant pressure and flow rate.
And it can not be used for reactive gas due to mechanical coupling.



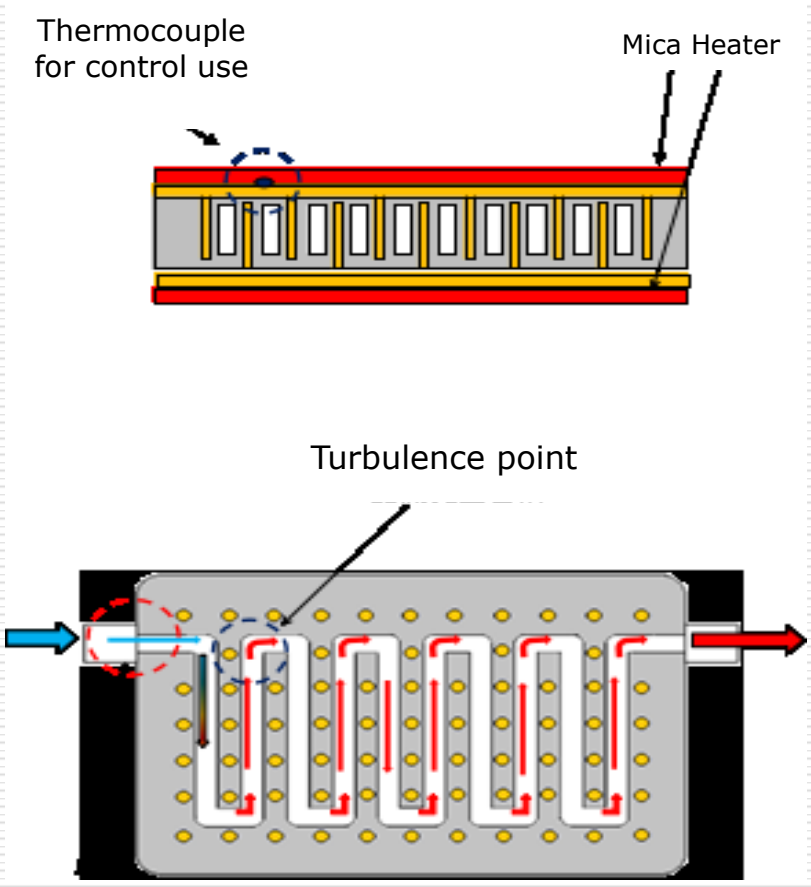
【 Week point of similar product 3】

This plate type has overcome the problems of week point 1 and 2.

And the heat conductivity is improved.

A lot of aluminum pins are inserted in the SUS body and transfer heat efficiently.

However, there are risks such as thermal expansion and melting of the heat transfer pin, disconnection of the mica heater etc, It can not operate safely for a long time.

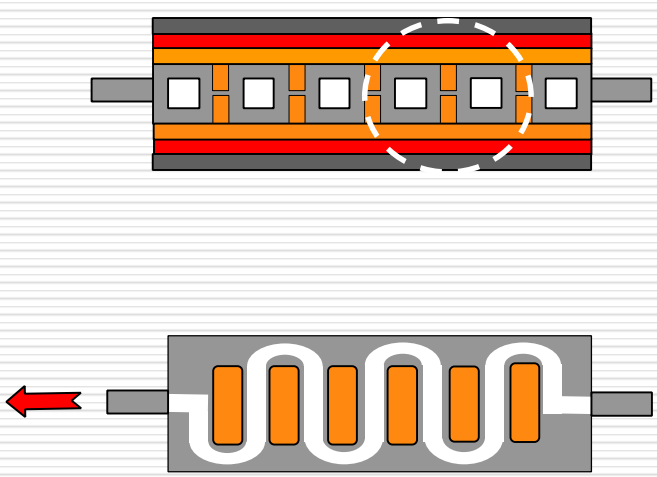


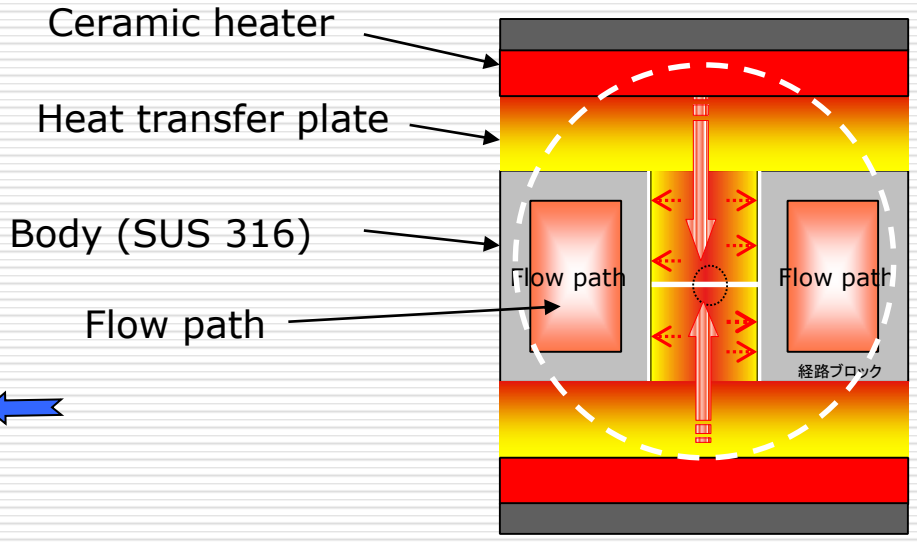
Neo Magic+ Heat transfer

Excellent heat transfer

We developed a slit type heat transfer plate to efficiently transfer the thermal energy from the heater to the fluid. (International patent pending)

Since the heat transfer slit set parallel to the flow path has a large surface area, thermal energy can be transferred quickly even for material that is disadvantageous to heat conduction like SUS Body block.

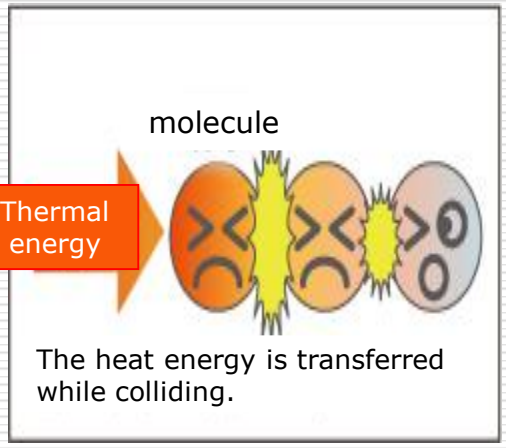


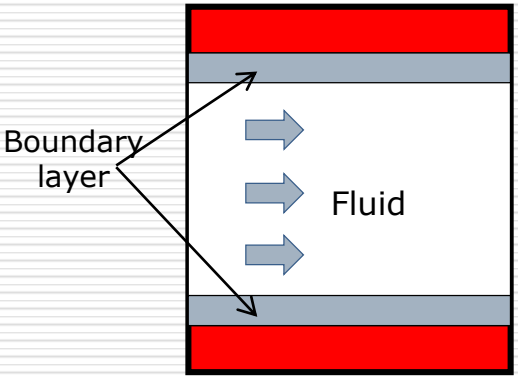


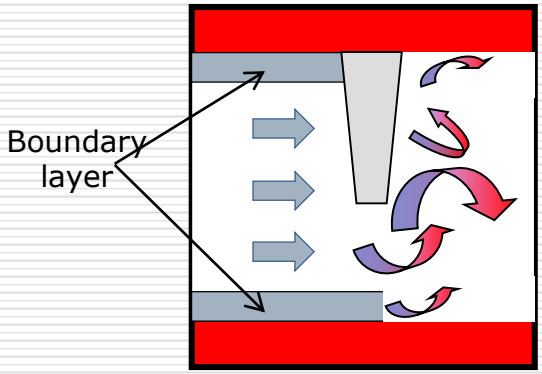
Neo Magic+ Why can it be used in wide range?

Thermal energy is transmitted by collision of molecules.
Generate the turbulence in the flow path in order to collision of molecules it increases the heat up ratio but also increases the pressure loss.

Conversely, if turbulence is not generated, the fluid will become a laminar flow and a boundary layer will be formed between fluid to the heat source and the heat up ratio will decrease.



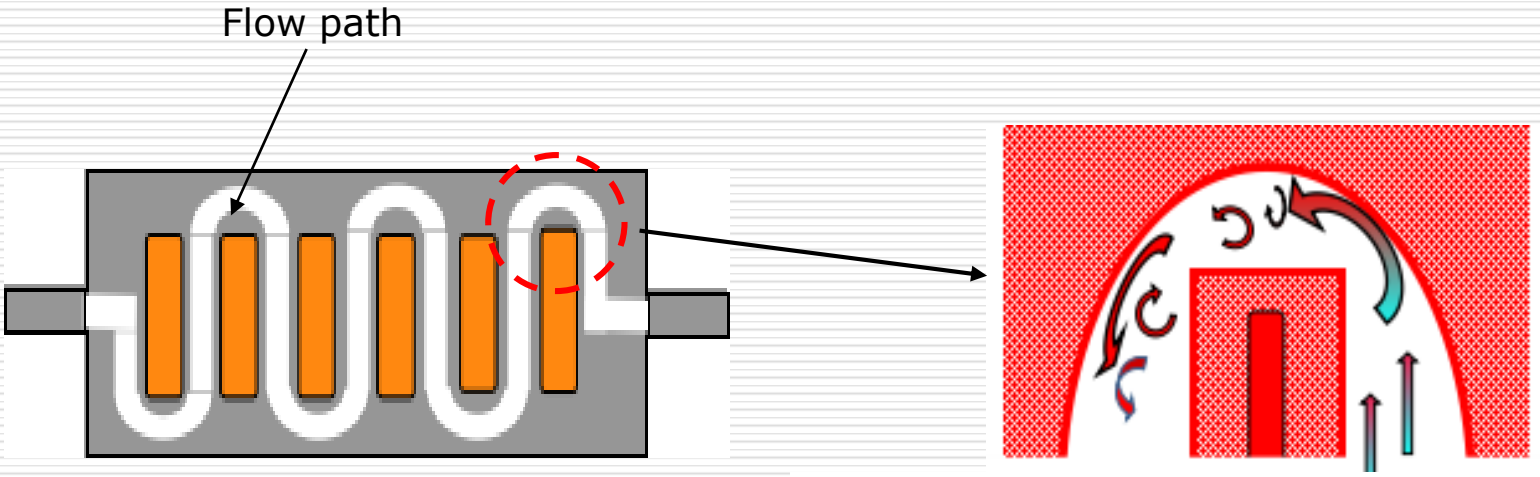




Neo Magic+ Why can it be used in wide range?-2

The heat exchange becomes more efficient as the turbulence is increased, but the pressure loss also increases.

Neo Magic+ is a unique design that solves the pressure loss problem and realizes high heat exchange rate from low flow rate to high flow rate.



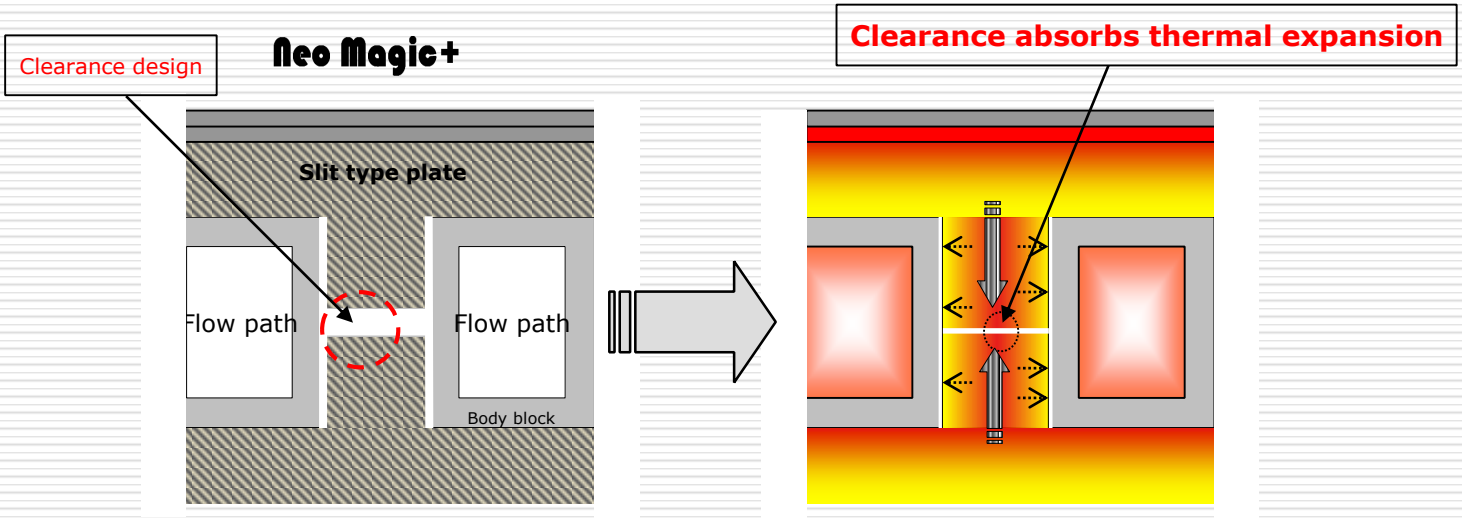
The fluid accelerates by setting the outside shape of the flow path to be a curve shape. On the other hand, when the inside of the flow path is formed into an edge shape, turbulence occurs.

Neo Magic+ Safety

(Against the crack due to thermal expansion)

Neo Magic+ series uses metal materials of different properties near the flow path to control the direction of heat conduction.
However, this means that the coefficient of thermal expansion differs, and the thermal expansion locally causes stress to concentrate and cracks are generated in the fluid path which causes corrosion or causing external leakage.

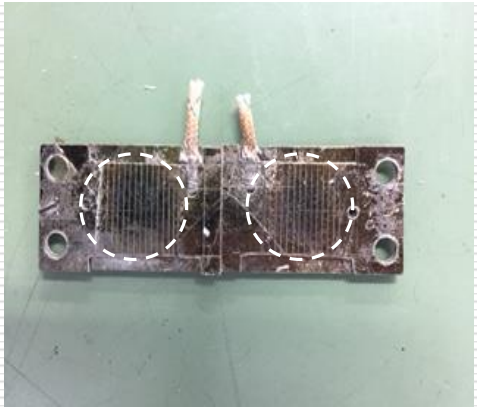
We developed Clearance design in order to avoid this risk.



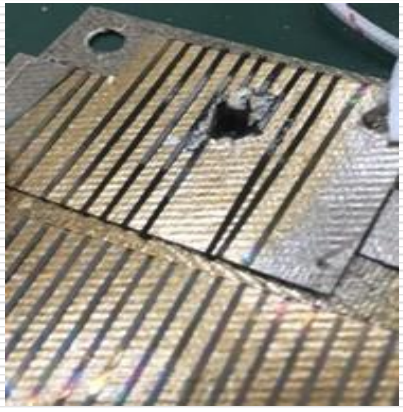
Neo Magic+ Safety-2 & Performance

By adopting an original design ceramic heater rather than a mica heater, we have improved the heating rate/rate of temperature rise/ lifetime . Especially the lifetime of the ceramic heater has tripled compared with the mica heater.

Mika heater

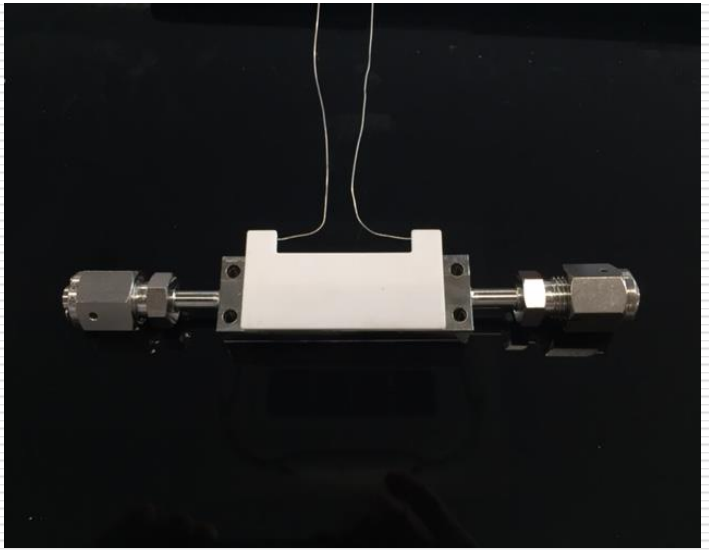


4 months use
Mika is carbonized



9 months use
Disconnection/ large damage by contact with the ground

Original design ceramic heater



Neo Magic+ Safety-3 & Welding technology

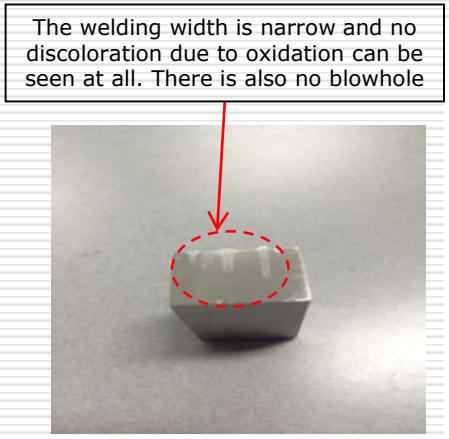
NEB (Neo Electron Beam) welding is welded using an electron beam in a vacuum chamber.

NEB welding has a much higher power density than other welds and can melt in a moment before heat is transferred around the weld. By doing this, it is possible to minimize the melting width that causes thermal distortion, and high precision welding is possible.

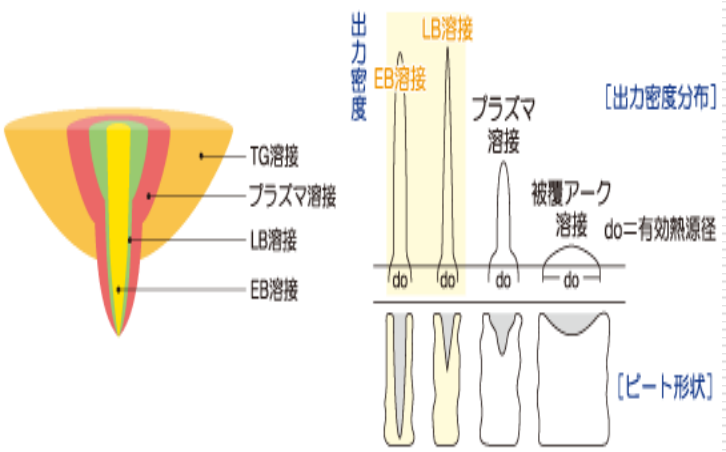
In addition, NEB welding has an average distribution of power density with respect to effective heat source diameter compared to TG welding. The peak height of output density is the same but deeper welding is possible.

By welding in a vacuum environment, oxidation of the welded part does not occur and elution of metal contamination is suppressed. Also, blowholes do not occur like TG welding, it is possible to avoid particle generation and corrosion due to remaining process gas.

TG welding



NEB welding

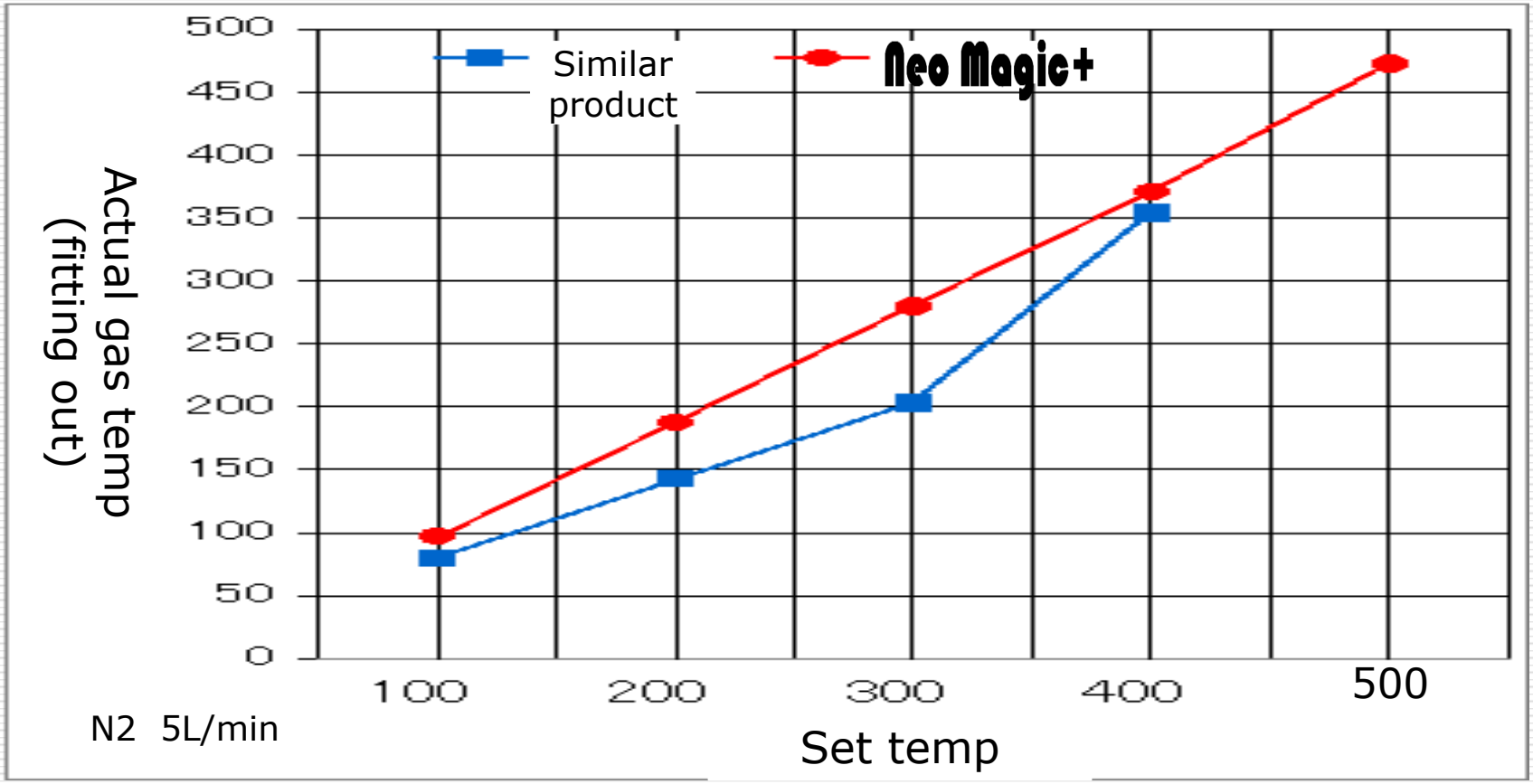


Specification comparison

	Flow Range	Temperature (Maximum)	Heater Type	Wattage	Heating Rate (Actual)	safety	perform ance	Reacti ve gas	Liquid heating
Competitors Collision type	1～50L	200℃	cartridge	875W	67%	○	×	×	×
Competitors Panel type	5～10L	300℃	Mika	600W	92%	×	○	×	×
Neo Magic NMH series Panel type	50 cc ～30 L	300℃ （～30L） 500℃ （～10L）	**Ceramic**	**300W**	96%	◎	◎	◎	◎

Heating rate comparative chart

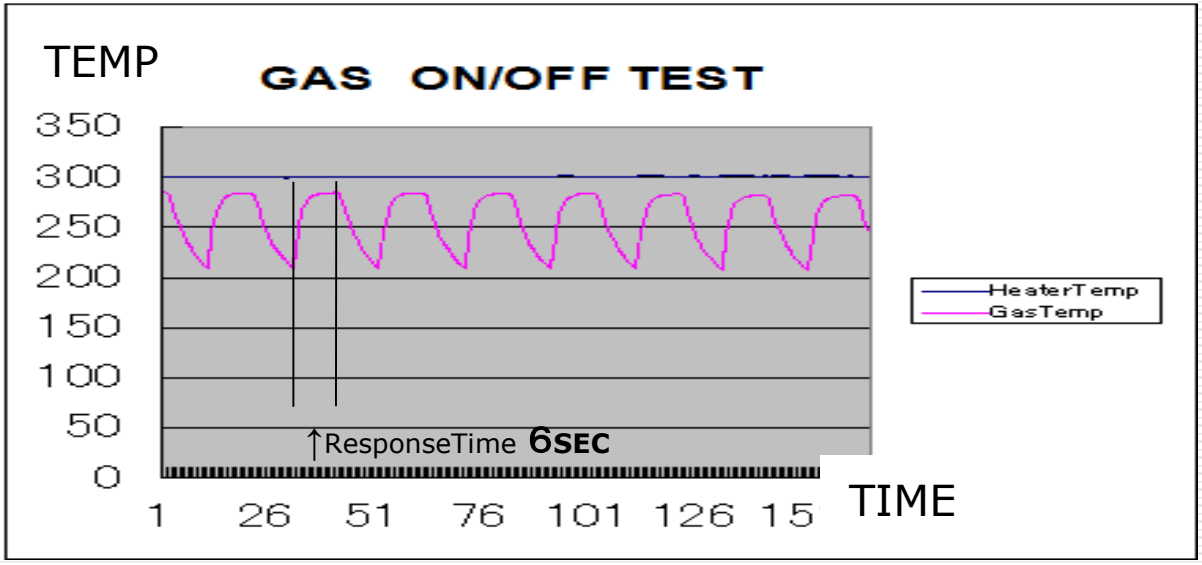
Neo Magic+ vs. similar product



Neo Magic+ Response data (NMH103M)

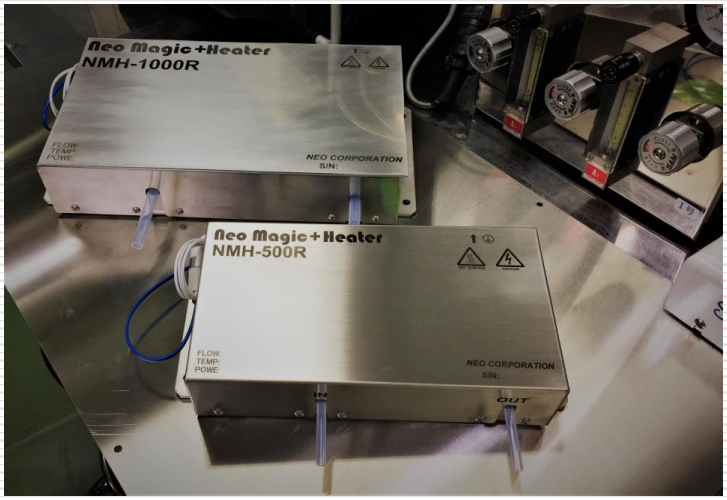
Neo Magic+

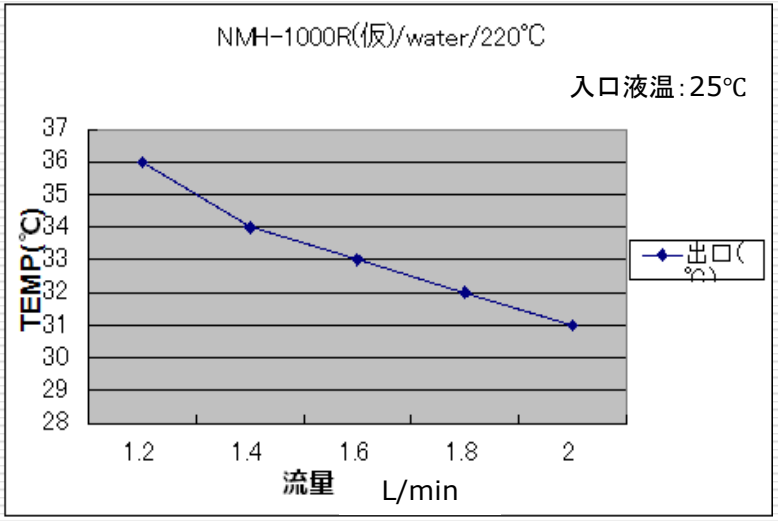
Gas /flow : N2 / 10Lm
Set temp : 300 ℃
Off -On cycle:
We verified the ability of repeatability and response for NMH103M.
It took only 6 sec to reach the set temperature after starting gas flow.
This is an excellent response performance.
We believe that this performance can be applied to semiconductor manufacturing recipes.



neo magic+Heater

Metal-free type(PTFE) heat exchanger NMH-R series





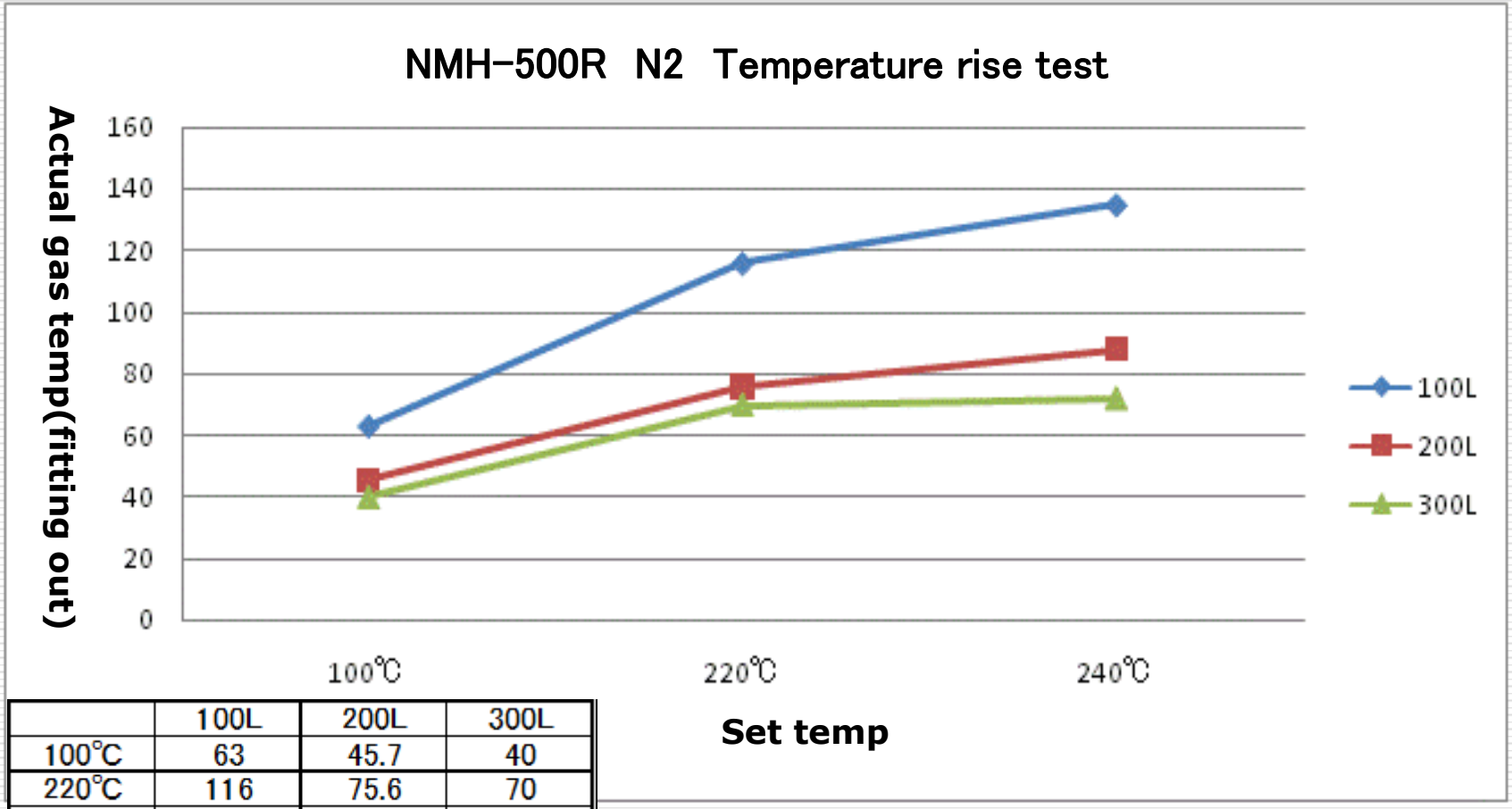
・Max: 500ｇ/min ＆1000ｇ/min. MAX2２0℃
・PTFE is adopted to fluid contacting areas、and can be used to clean process.

Standard specification

		NMH-R series	
Type name		NMH-500R	NMN-1000R
Flow rate （H2O)	(cc/min)	100～500	500～1000
Maximum service temperature	（℃）	220	220
Required power supply		AC200～240V 1800W	AC200～240V 3600W

Neo magic+Metal-free type(PTFE)

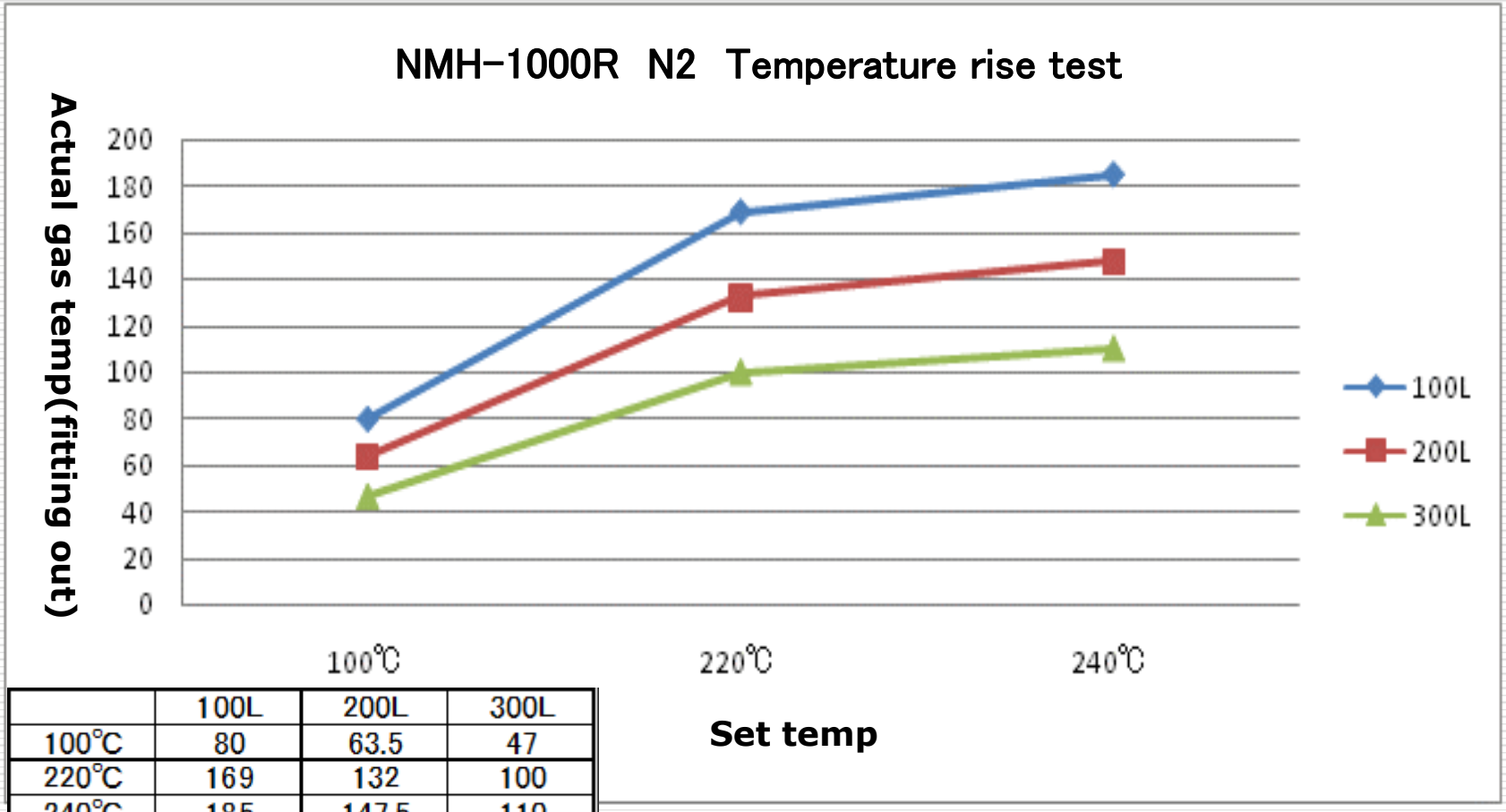
Temperature increase comparison



	100L	200L	300L
100℃	63	45.7	40
220℃	116	75.6	70
240℃	135	87.7	72

Neo magic+Metal-free type(PTFE)

Temperature increase comparison

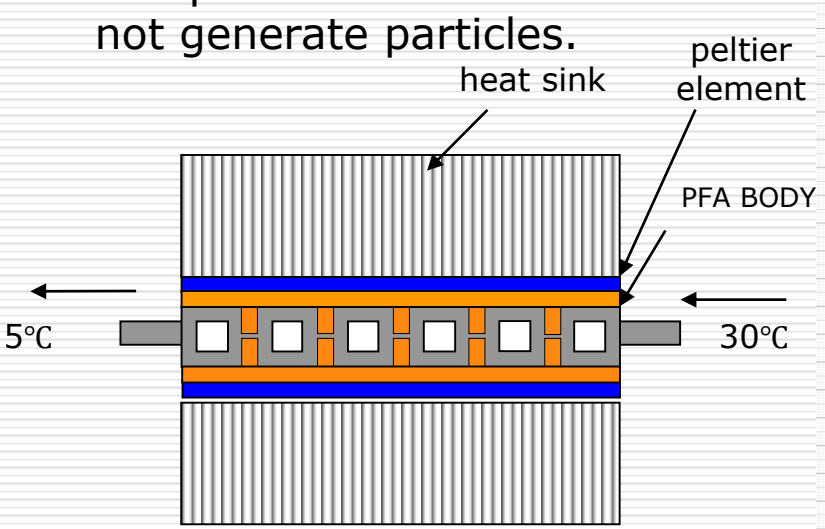


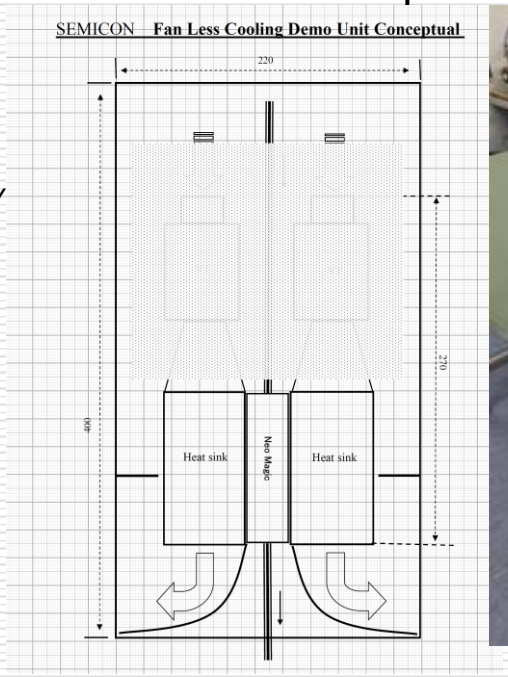
	100L	200L	300L
100℃	80	63.5	47
220℃	169	132	100
240℃	185	147.5	110

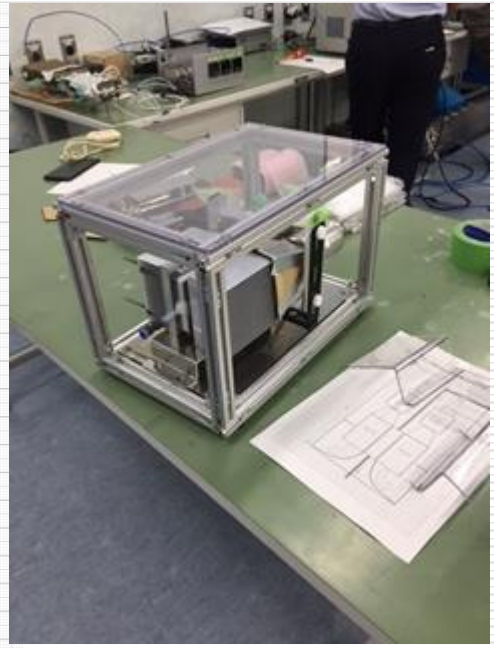
次期開発製品

neo magic+Cool　　*Fan Less!!*

The fluid path part is a highly efficient cooling unit using Peltier element using our proprietary slit structure (PAT.P) block.
Moreover, we eliminated the fan from the heat sink required for heat dissipation of the Peltier element and realized a unique structure that does not generate particles.







Last but certainly not least

Nissin Neo has developed Neo Magic+ as a product that will build the future.
We will continue to promote new product development with Only One pride.

Thank you for your attention.