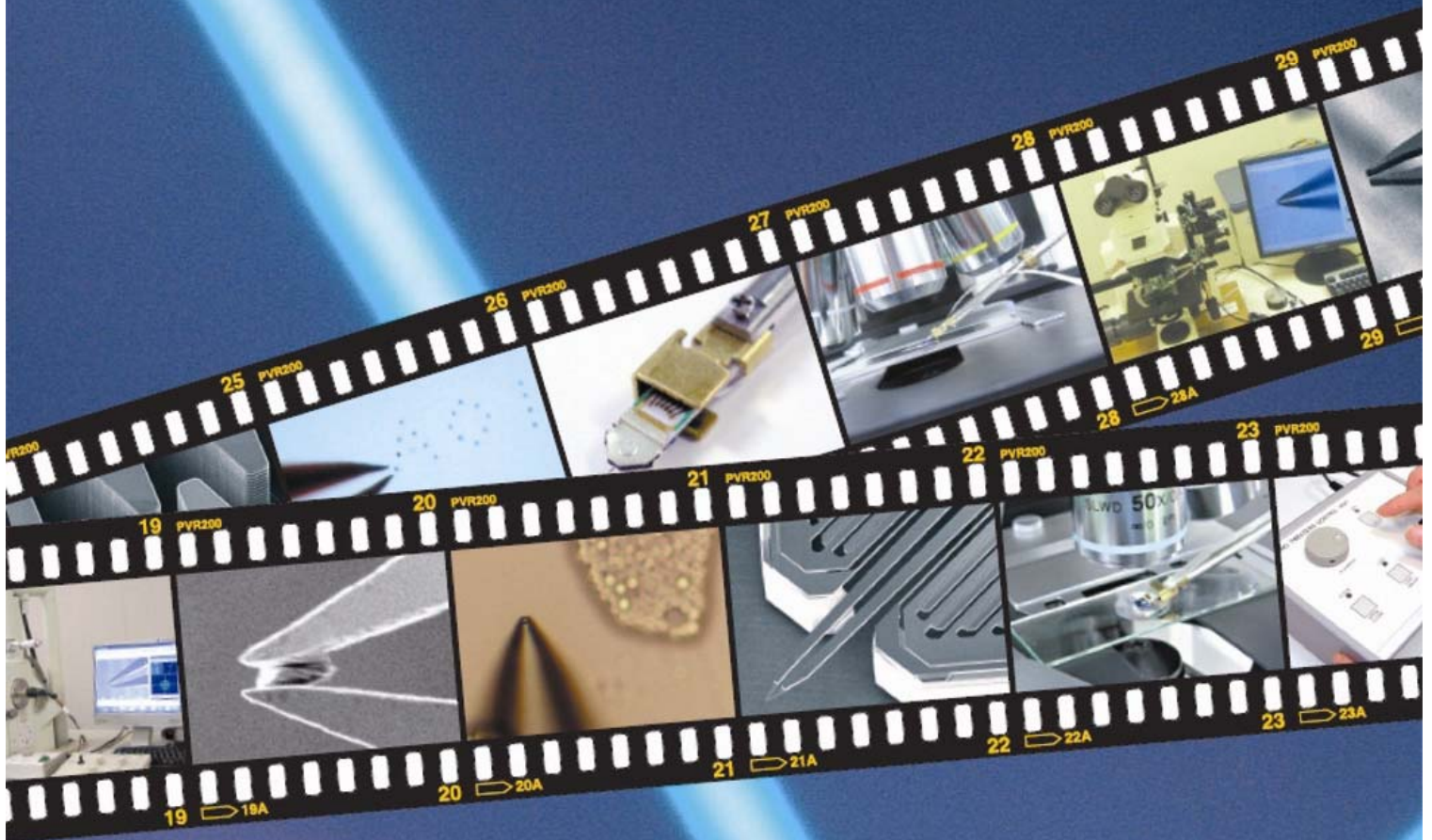


# Nano Tweezers



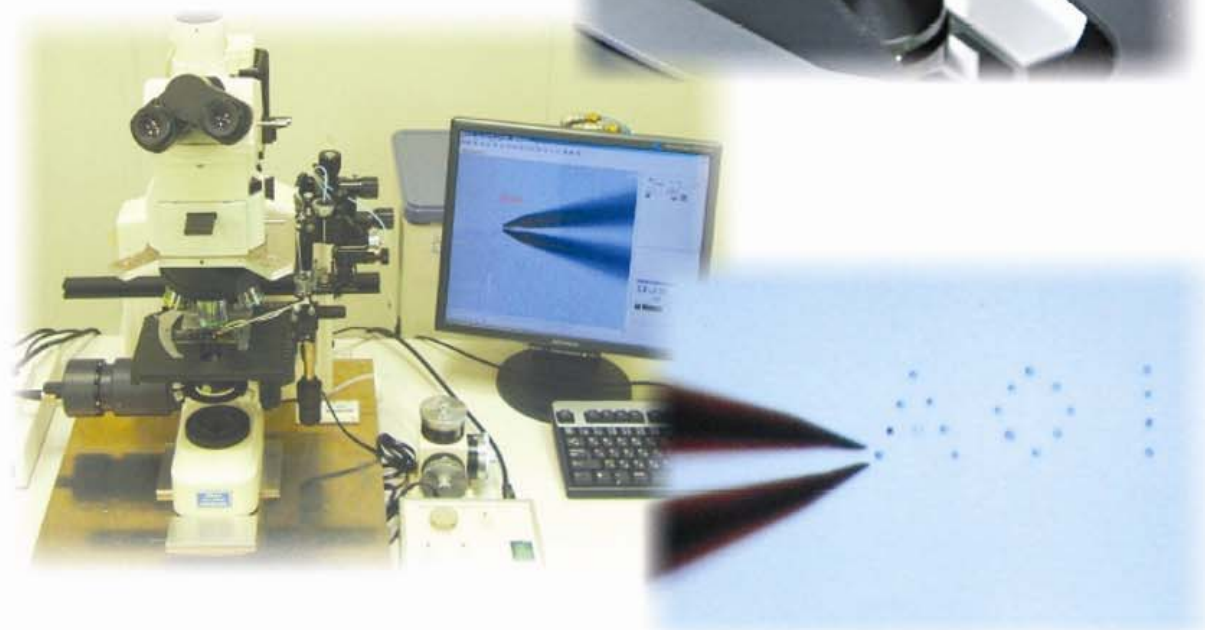
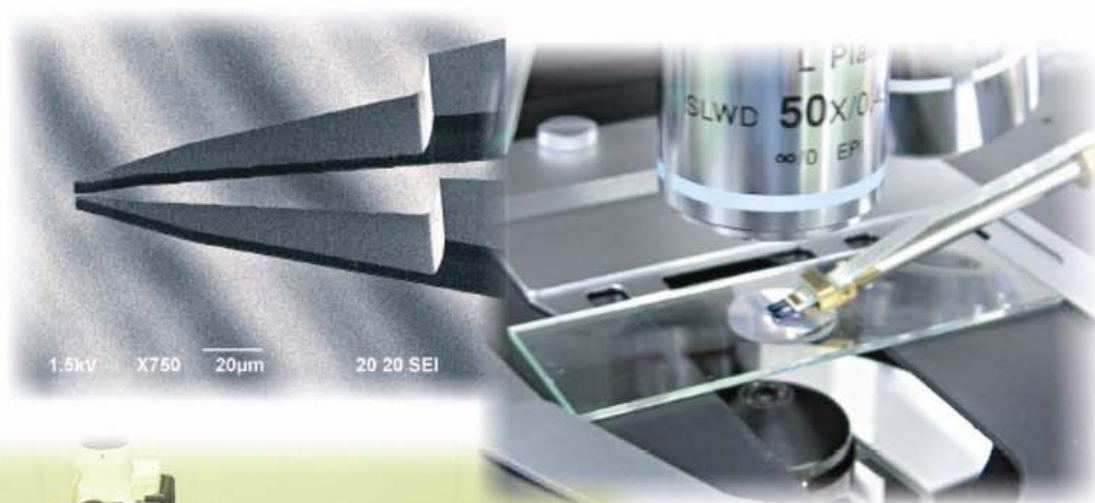
**AOI ELECTRONICS CO.,LTD.**

# Nano Tweezers

## About the Nano Tweezers

Nano Tweezers is the high-performance tweezer that can grasp the sample of micro-nano size.

Nano Tweezers developed by Aoi Electronics Co.,Ltd. is made of silicon wafer with MEMS (Micro Electro Mechanical System) technology. By supplying voltage with the proprietary controller, the finger tip of Nano Tweezers opens and closes smoothly and can grasp micro-nano sized objects.

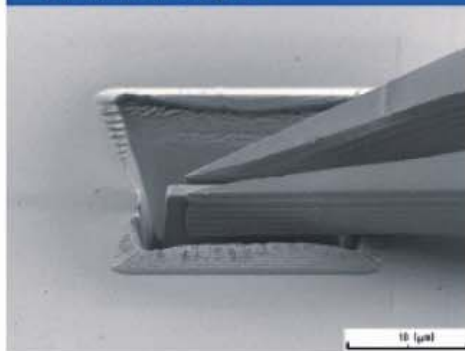


# What is possible with Nano Tweezers

We have the following experience of sample picking up by using Nano Tweezers.

- The TEM (Transmission Electron Microscope) Sample (3 to 5  $\mu\text{m}$  width)
- Bacterium, Cell ( $\phi$  1 to 20  $\mu\text{m}$ )
- Foreign substance/dust on silicon wafer or glass.

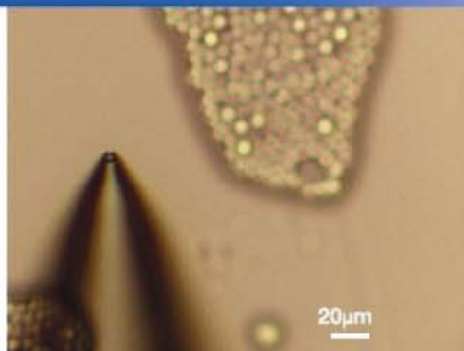
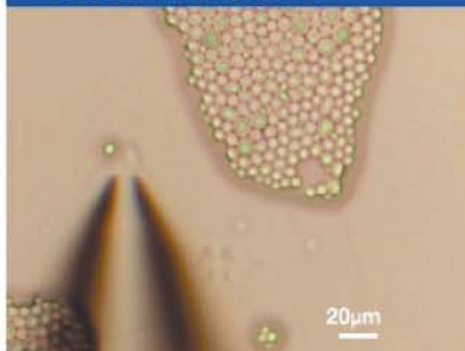
## TEM Sample



TEM Sample preparation using FIB (Focused Ion Beam) is grasped.

(Data offered by Hitachi High-Tech Science Corporation)

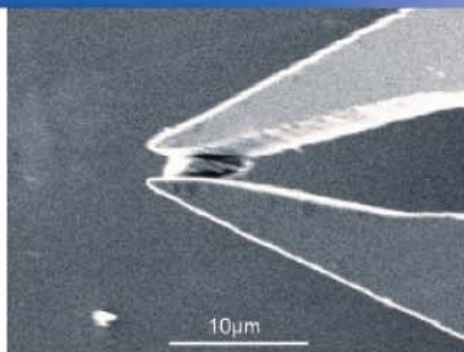
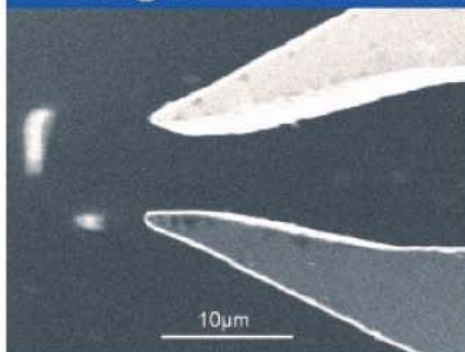
## Bacterium, Cell



A yeast fungus ( $\phi$  5  $\mu\text{m}$ ) on agar media is grasped.

(Data offered by Mr. Katsumi AMAKO by Faculty of Nutrition at Kobe Gakuin University)

## Foreign substance/dust



An amorphous particle (2  $\mu\text{m}$  width) on silicon wafer is grasped.

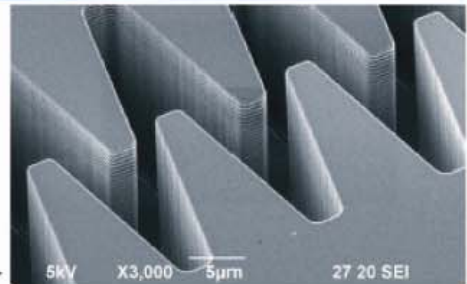
Picking up of various micro-nano samples is possible besides the above mentioned ones by using Nano Tweezers.

## Characteristics of Nano Tweezers

Nano Tweezers makes it possible of various sample picking up.

### Accurate control by electrostatic actuator

Electrostatic actuator is used for its good controllability and fast response. Fine adjustment of the grip force makes it possible to grasp such soft and fragile samples as bio samples.

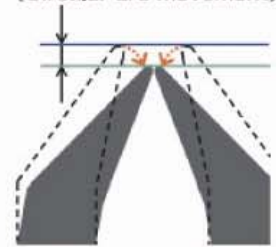


Electrostatic actuator

### Firm grip by parallel opening and closing of the finger tip of Nano Tweezers.

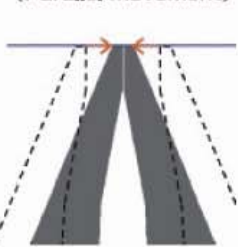
Nano Tweezers by Aoi Electronics opens and closes that the finger tip of Nano Tweezers parallel and thus the finger tip's position doesn't move back and forth, whereas the finger tip of current existing tweezers makes circular arc. Parallel movement makes it easy to approach tiny samples and also brings out excellent grip of spherical or amorphous samples.

Current existing product (Circular arc movement)



The finger tip of tweezers position moves during opening and closing action.

Nano Tweezers (Parallel movement)



The finger tip of tweezers position doesn't move during opening and closing action.

### Lock function for high power grip

With up to  $300\mu\text{N}$  high power grip, they can achieve stable grip under vibrational environment or large mass samples such as metal particles by lock function.



### Easy control by proprietary controller

The proprietary controller for Nano Tweezers has simple interface with buttons for easy operation and preset grip mode is available.



### Protection of the finger tip at attachment and removal

The proprietary protection cover is mounted on Nano Tweezers. The cover protects the finger tip of Nano Tweezers during attachment and removal for safe operation.

### Available at vacuum environment.

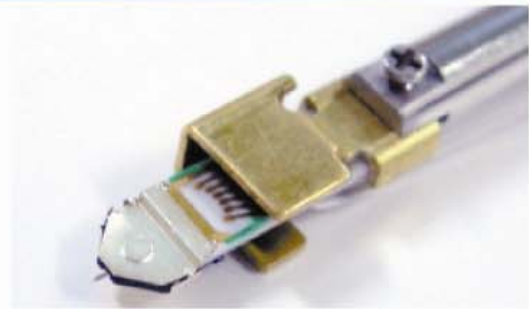
Nano Tweezers can work at vacuum environment.

Nano Tweezers can be used in electron beam microscopes such as SEM or FIB. It can grasp various samples, such as foreign substances on wafer or mask including TEM Sample by observing in the large magnification. (This function has been co-developed with Hitachi High-Tech Science Corporation)

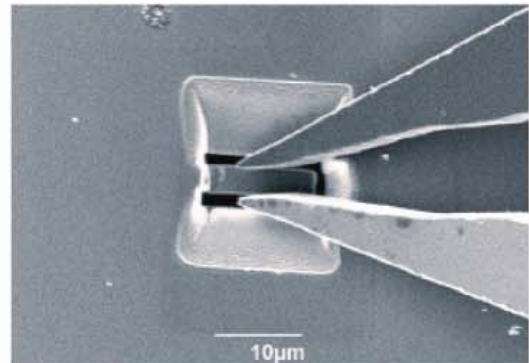


Example of attachment to SEM

※ Manipulator that is available at vacuum environment is required separately for approaching to samples in SEM.



Front edge to attachment area (ANT-PM010A)



Example of picking up TEM Sample (inside of SEM)

(Data offered by Hitachi High-Tech Science Corporation)

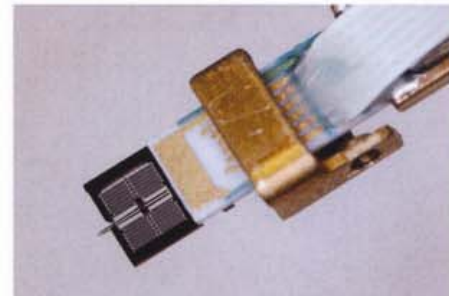
### Water-repellent coating

Nano Tweezers can grasp bio-samples by water-repellent coating.

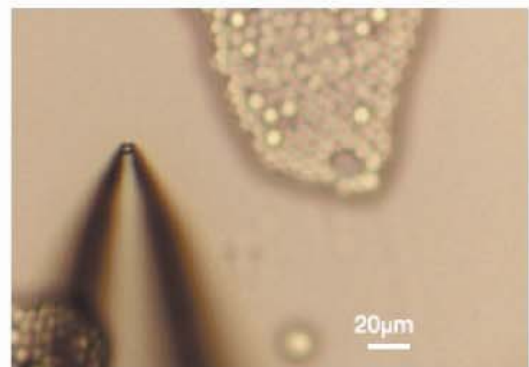
The surface of the grippers are coated by water-repellent monomolecular film which prevents grippers from adhesion of various dirt, so Nano Tweezers can grasp bio samples such as cell.



Example of approaching to bio-sample with high powered microscope.



Front edge to attachment area (ANT-PM010CW-A)



Example of picking up yeast fungus ( $\phi 5\mu\text{m}$ )

# Composition of Nano Tweezers

## Proprietary controller, Proprietary junction cable



### Composition of Nano Tweezers

- ① Proprietary controller
- ② AC adapter
- ③ Proprietary junction cable
- ④ Support arm
- ⑤ Nano Tweezers



AOI-03

### Proprietary controller for Nano Tweezers operation (AOI-03)

The proprietary controller makes it possible to operate the distance between both finger tips of Nano Tweezers with submicron resolution. Lock function is available for ANT-PM010 series and supports high powered grip up to 300 $\mu$ N.

Size: 160 × 140 × 70 (mm)  
(AC adapter attached)

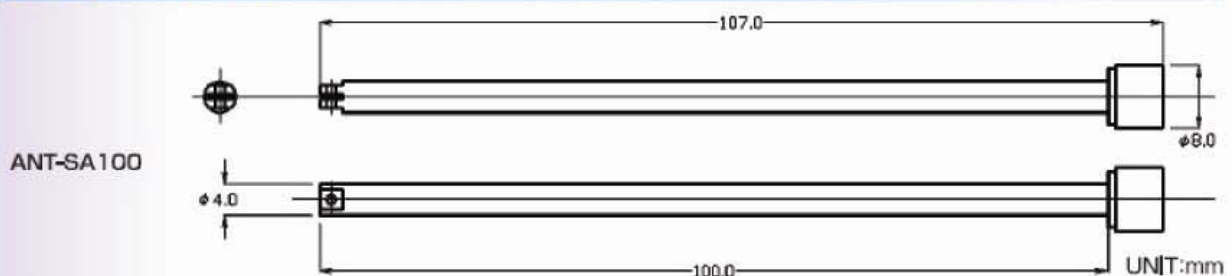


ANT-LC500A

### Proprietary junction cable (ANT-LC500A)

Proprietary junction cable to supply voltage from the proprietary controller to Nano Tweezers. (Length 1.5m)

## Support Arm



Support arm to connect ANT-PM series to manipulator. (Material:SUS304)

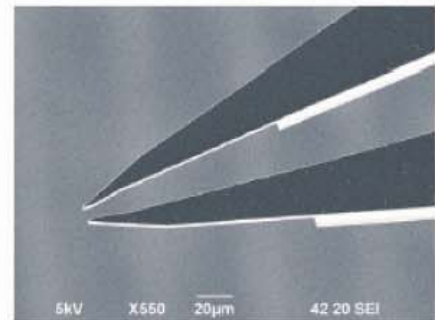
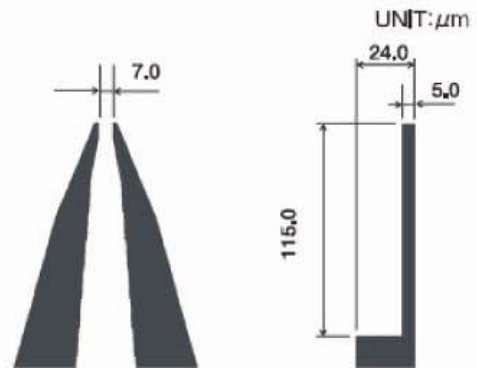
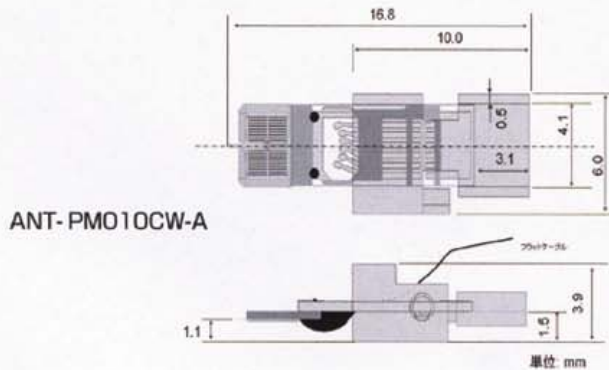
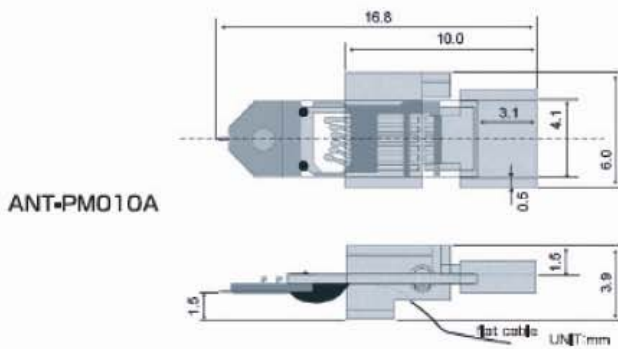
※ The shape of support arm can be adjusted for each manipulator by order.

※ Manipulator is required separately for approaching to samples.  
※ The length of flat cable soldered on Nano Tweezers is 200 mm.

# Specifications of Nano Tweezers

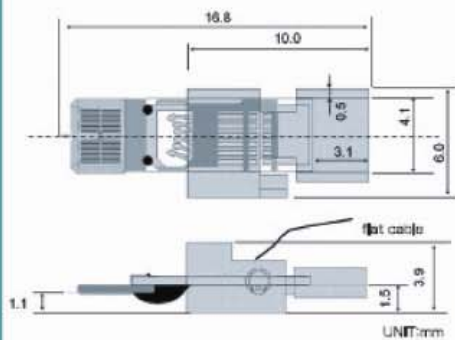
Product name	Distance between each finger tip ( $\mu\text{m}$ )	Thickness of finger tip ( $\mu\text{m}$ )	Maximum grip force ( $\mu\text{N}$ )	Material	Available at vacuum	Water-repellent coating
ANT-PM010A	7.0	5.0	300	Monocrystalline silicon (with $\text{SiO}_2$ film)	○	×
ANT-PM010CW-A	7.0	5.0	300	Monocrystalline silicon (with $\text{SiO}_2$ film)	×	○
ANT-PM026CW	26.0	24.0	150	Monocrystalline silicon (with $\text{SiO}_2$ film)	×	○

## ANT-PM010A, ANT-PM010CW

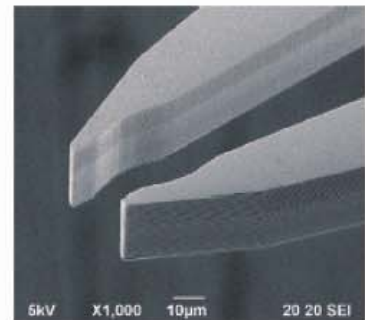
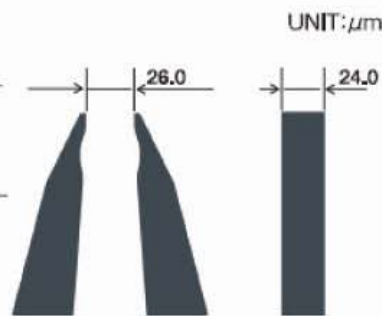


The shape of finger tip of ANT-PM010 series

## ANT-PM026CW



ANT-PM026CW



The shape of finger tip of ANT-PM026 series

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The contents of this catalog, specifications and external appearance of products are subject to change without previous notice for improvements.

(August, 2007)