

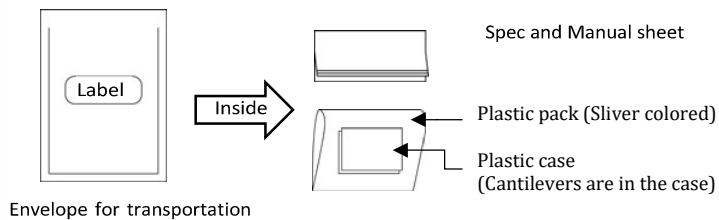
## Pyramid Micro Cantilever User's manual



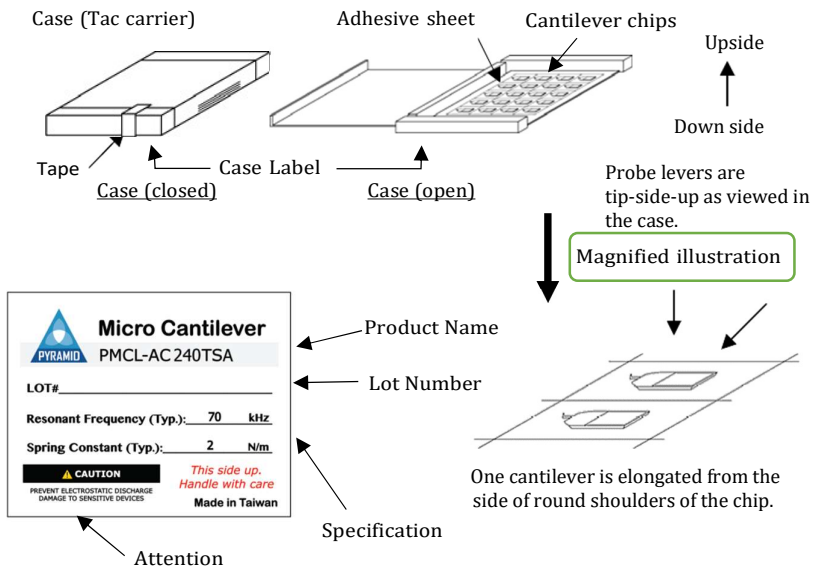
Thanks for purchasing **Pyramid PMCL-AC240TSA** Micro Cantilever. Please read this manual carefully before use.

< Explanation of the each part of the products >

Cantilever chips in a plastic case are included in the envelope with manual and spec sheet.



Cantilever chips are contained in the plastic case (Tac carrier)



Please obey the followings to Pyramid Micro Cantilever

### Warning

- ! Use protective eye glasses when handling to avoid damage to the eyes from breakage of cantilever chips.



### Attention

- ! Please handle cantilever carefully because they are fragile.

### Attention

- ! Do not drop or shake the cantilever case. Even when the Cantilever chips are contained in the cantilever case, the cantilevers may break if the case is handled roughly or jarred.

### Attention

- ! It is recommended that precautions be taken to prevent damage to the cantilever tips from electrostatic discharge.

### Attention

- ! When discarding, please obey the laws and regulations in your country and/or your company. These cantilevers are made from silicon and aluminum.

## Special feature of Pyramid Micro cantilever

(PMCL-AC240TSA)

1. AC/Tapping mode cantilever – This type of cantilever chip is for AC (dynamic) mode AFM operation. High mechanical Q factor of the cantilevers allows you high sensitivity measurement to probe your sample surface gently.
2. Pre-separated chip – Each cantilever chips is isolated in the case.  
The chips can be attached to the AFM instrument as soon as the case is open.
3. Tip view – The tip is located on the very end of the cantilever.  
This feature allows you to set the tip over a point of interest on the sample, easily and precisely, if you use an AFM combined with an optical microscope.
4. Point terminated tip – The tip radius is typically 7nm.  
A sharpened tetrahedral tip of single crystal silicon is employed for high-resolution measurements. The tetrahedral shape is ideal for achieving a point terminated tip. In addition to the geometrical dimensions of the tip, the tip is further sharpened with the delicate sharpening process.
5. Symmetric tip – The tetrahedral tip is thin with the macroscopic tip angle of 35 degrees viewing from both its front and side. Tip shows good symmetry in viewing along the probe lever axis  
Symmetric shape tip results AFM images less distortion which reduce misinterpret of the data.
6. Reflex coating cantilever – Aluminum is coated onto the back side of the probe levers for optical deflection sensing to increase the reflection signal. Good S/N signal can be expected in the optical sensor circuit
7. Compatible chip – The thickness of the chip (substrate) is 0.3mm. This type of the chip can be attached to most of AFM instruments.

See the specification sheet of Micro cantilever from Information session of this manual.

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#### 1. Preparation

1. Please prepare the followings before using Pyramid cantilevers.
2. To gain a better understanding of how cantilevers and chips are connected, cantilevers should be inspected under the microscope.
  - i. Work environment : Clean bench  
(Use of an electrical charge neutralizer or ionizer is recommended.)
  - ii. For hazard avoidance : Protective eye glasses
  - iii. For cantilever treatment : Tweezers  
(Use of anti-electrostatic discharge mat and a wrist band is recommended.)
  - iv. For inspection : Stereo microscope

#### 2. Open the case

### Attention

- ! Please handle the chips carefully because they are fragile
- ! It is recommended that precautions be taken to prevent damage to the probe tips from electrostatic discharge

1. It is recommended that the cantilever be opened in a clean environment like a clean bench in order to avoid the cantilever being contaminated. Handling under an ionizer is recommended.
2. Avoid wearing clothes like woolen sweaters, fleece etc., that give off the static electricity when handling the chip cases and chips. Use of an anti-electrostatic mat and wrist band is preferable.
3. In opening the case, put the plastic case label-side down on a desk. The cantilevers are tip-side-up as viewed in the case
4. Open the case

#### 3. Picking up the cantilever chip from the case

### Attention

- ! Avoid any contact with the cantilevers when you pull up the cantilever from the case

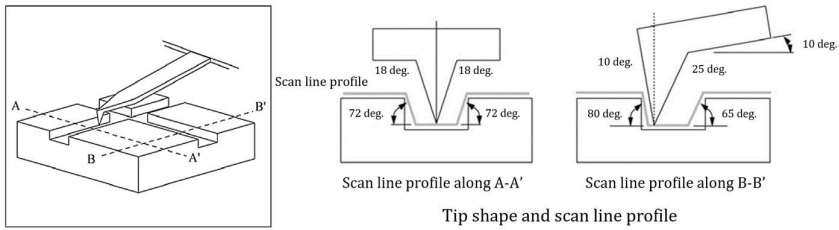
1. Pick up the chip by the long side with the tweezers and mount it in the AFM.

#### 4. Tip shape of Tetrahedral tip

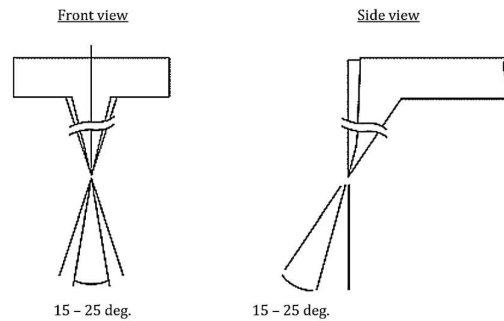
As can be seen in the bottom left illustration, a tetrahedral tip is located at the exact end of the cantilever.

The finite tip shape will determine the scan line profile as in the illustrations below. The tip profile is symmetric with a half tip angle of 18 degrees macroscopically (see the middle below).

The side tip profile is asymmetric with a tip angle of 35 degrees. Then the cantilever chip is attached to a chip holder in your AFM tool with an angle, about 10 degrees, the asymmetry is improved (see right below).



The apex of the tetrahedral tip becomes sharper due to an oxide sharpening process. The tip angle around a few hundred nano meter down from the apex, is about 15 to 25 degrees (see below).



Sharpening effect around tip apex

## 5. Information

Please contact us in the following information if you have any question on this user's manual.

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