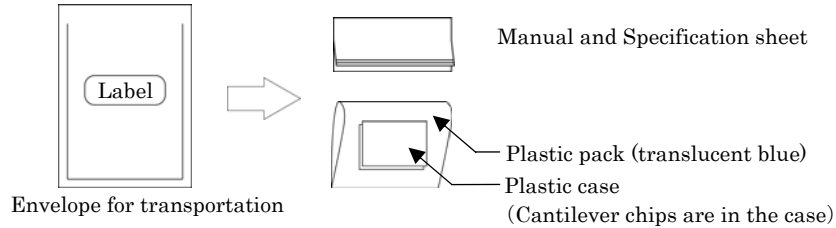


Micro cantilever user's manual

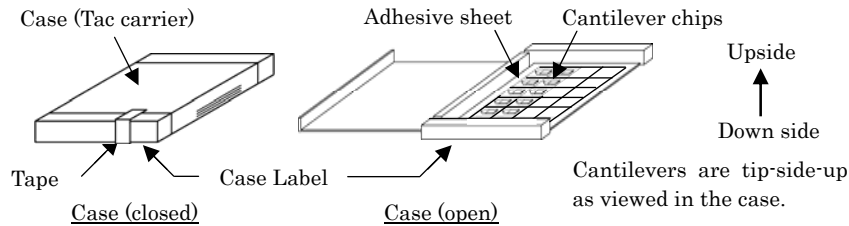
Thank you for purchasing OLYMPUS Micro cantilevers.
Please read this manual carefully before use.

<Explanation of the part of the products>

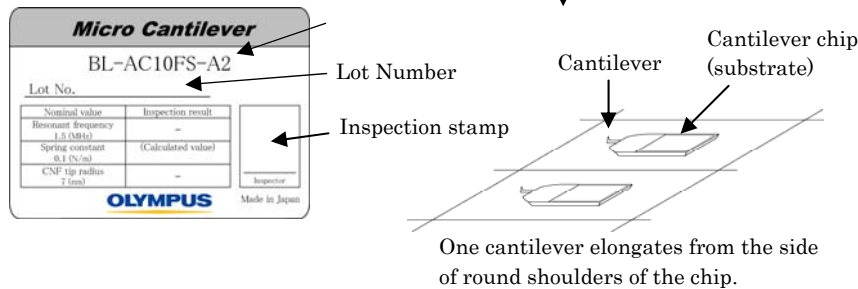
Cantilever chips in a plastic case are included in the envelope with manual and spec sheet.



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



Magnified illust.



| Nominal value | | Inspection result | |
|--------------------|-----------|--------------------|---|
| Resonant frequency | 1.5 (MHz) | - | - |
| Spring constant | 6.1 (N/m) | (Calculated value) | - |
| CNF tip radius | 7 (nm) | - | - |

Lot No.

Lot Number

Inspection stamp

Inspector

OLYMPUS

Made in Japan

OLYMPUS

Please obey the following to the OLYMPUS micro cantilevers

Warning

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



Caution

- Please handle our cantilevers carefully because they are fragile.

Caution

- 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.

Caution

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

Caution

- When discarding, please obey the laws and regulations in your country and/or your company. These cantilevers are made of silicon nitride, carbon and gold/chromium.

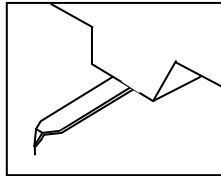
Special feature of OLYMPUS Micro cantilever (BL-AC10FS-A2)

1. Short and thin cantilever

This small silicon-nitride cantilever is suitable for high speed AFM measurement in water. It shows high resonance at around 400 kHz in water even while spring constant small, 0.1 N/m (Nominal), enough for revealing soft bio samples. It shapes in bird-beak, sized 9 μm(L) x 2 μm(W) x 0.1 μm(T). The small lever size limits the use of AFMs. The deflection sensor should have their laser spot less than 5 μm in diam, ideally less than 2 μm.

2. Micro columnar fibril – Carbon Nano Fiber probe (CNF probe)

The triangular portion near the cantilever free-end laps under at an angle of 35 degrees and it behaves as a probe support. A CNF probe made of amorphous carbon with its tip radius of less than 10 nm grows on the corner of the triangular portion. High resolution imaging can be expected due to the small fibril.



3. TipView

This cantilever is shaped like bird-beak so that the tip is located at 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. Gold reflex coating

Gold is coated on the back side of the cantilevers for optical deflection sensing.

5. Pre-separated chip

The chips can be attached to the AFM instrument as soon as the case is open.

See the specification sheet of OLYMPUS Micro cantilevers at the last page of this manual.

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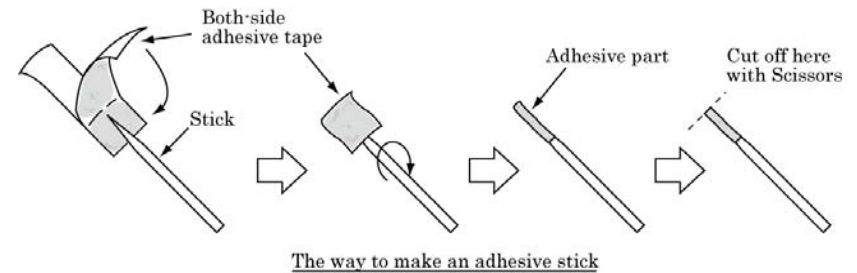
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1 | Preparation

- 1) Please prepare the followings before using OLYMPUS cantilevers.
- 2) To gain a better understanding of how cantilevers and chips are connected, cantilevers should be inspected under the microscope.

- 1) Work environment : Clean bench
(Use of an electrical charge neutralizer or ionizer is recommended.)
- 2) For hazard avoidance : Protective eye glasses
- 3) For cantilever treatment : Tweezers (sharp pointed tip)
: Thin stick like Toothpick, Both side adhesive tape
: Anti-static mat
(Use of tweezers made of insulator is recommended.)
(Use of anti-electrostatic discharge mat and a wrist band is recommended.)
- 4) For inspection : Optical microscope

- 3) Wind both-side adhesive tape around the top of the thin stick to prepare an adhesive stick for picking up the chips from the cantilever wafer



2 | Open the case

! Caution

- Please handle our cantilevers carefully because they are fragile.


! Caution

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

- 1) It is recommended that the cantilever case 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 cantilever 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



Caution

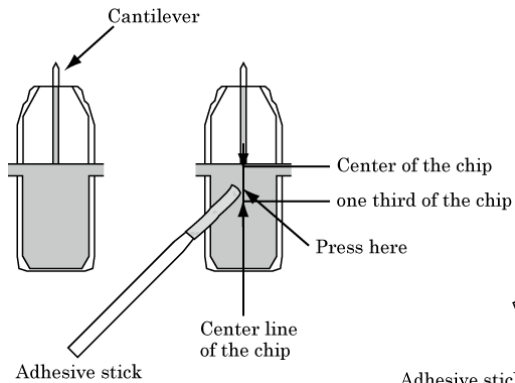
- Avoid any contact with the cantilevers when you pull up the cantilever tip from the case.



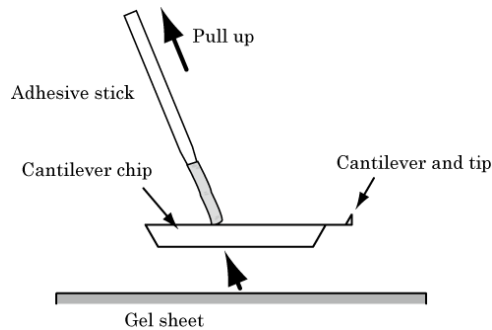
Caution

- Cantilever chips should always be placed tip-side-up.

- 1) Press down gently on the part between the center and one third of the chip along the center line with the adhesive stick (see left below).



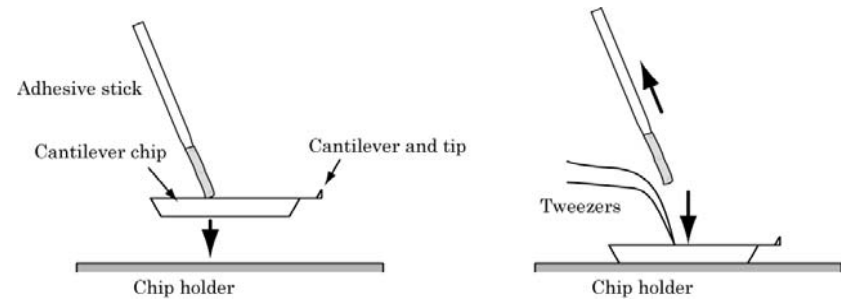
- 2) Do not press the chip too much, or the chip might be buried in the Gel sheet and the cantilever must break.
- 3) Pull up the stick carefully, then the adhered chip is picked up together (see below).



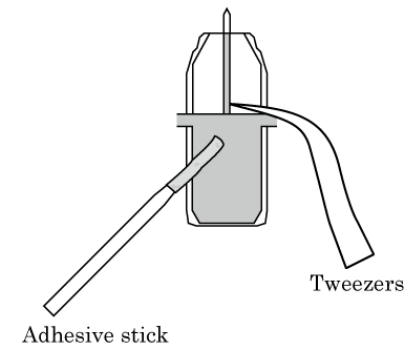
Note : Some of both-side adhesive tapes have not enough adhesive to pick up the chip from the Gel sheet. Then use the tweezers for this procedure.

4 Attaching the cantilever chips to your instrument

- 1) Please read the instruction manual of your scanning probe microscope before this operation.
This cantilever can not be used at a commercially SPM due to its smallness, $9\ \mu\text{m(L)} \times 2\ \mu\text{m(W)} \times 0.1\ \mu\text{m(T)}$.
To attach the cantilever chip to the chip holder in your SPM,
- 2) Place the chip on the adhesive stick gently against the prescribed part in your chip holder. (see left below)
- 3) Press the center of the chip with sharp pointed tweezers and pull apart the stick from the chip. (see right below)
- 4) Lock the chip into the chip holder in accordance with the manner described in the manual of your SPM. Most of the chip holders in AFMs use a leaf spring or a wire for pressing the chip to the holder. It is recommended that the chip is pressed with those at the center of the chip to achieve a good mechanical coupling between the chip and the holder.

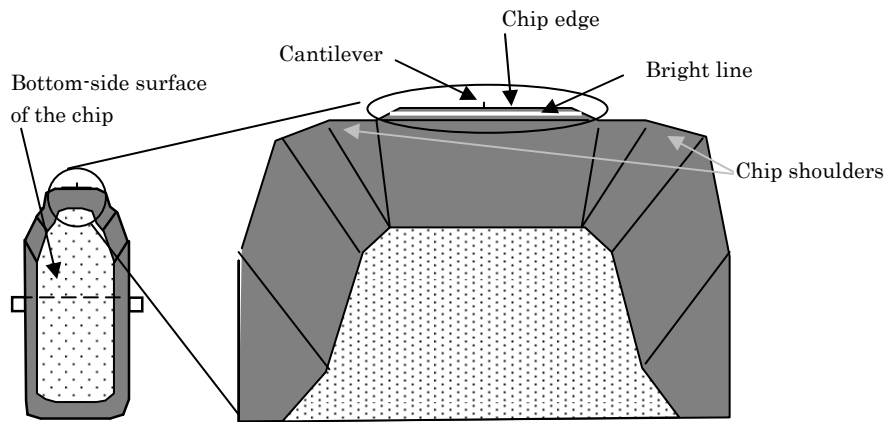


Note) To avoid contact with the cantilever, the tweezers should not access to the chip from cantilever side. Put the tweezers on the chip like following illustration.



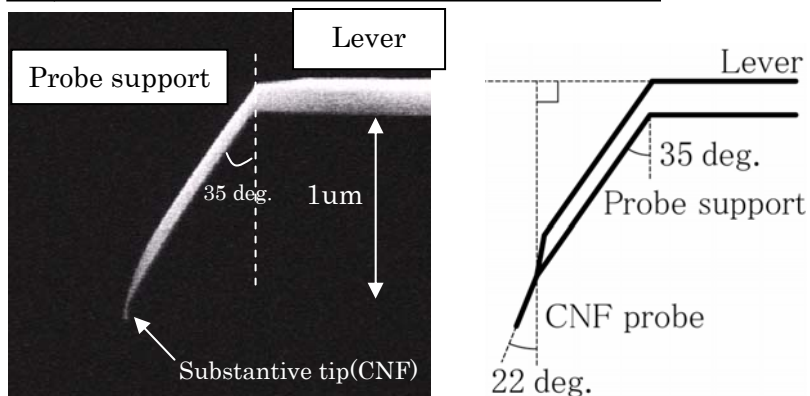
The cantilever is quite small comparing to the chip (refer to the illustration below). To avoid any contact of the chips shoulders and the sample, ridge of the chip edge and sample surface should be kept parallel to each other in the AFM system. Existence of contamination particles or shards between the chip and chip holder might tilt the chip. To prevent the tilt of the chip, it is strongly recommended that contact surfaces of the chip and chip holder be kept clean and particle-free. And this procedure is also important to obtain a better vibration spectrum of the cantilever.

As in the illustration, while observing the lever and chip with an optical microscope of your AFM system, you may find bright line or belt. It meets our specification. Rather, it works as a guide to find the small cantilever before adjusting sensor optics. The cantilever locates near the center of the bright line.



Schematic view of cantilever chip

5 Schematics of CNF probe and Plate-like probe support



The SEM image (bottom of the left page) shows the cantilever apex viewing from the side. The plate-like probe support is located at the end of the cantilever. The probe support elongates by around 1 µm with its tip-tilt-angle at 35 degrees with respect to the normal line of the cantilever. A CNF probe made of amorphous carbon with a tip radius of less than 10 nm grows on the corner edge of the probe support.

6 Information

Please contact following if you have any question on this user's manual.

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 2-3 Kuboyama-cho Hachioji-shi Tokyo 192-8512 Japan

Email : probe@olympus.co.jp

Please access to the web page of OLYMPUS micro cantilevers.

<http://www.olympus.co.jp/probe>

Ver.1.1 Sep. 19, 2012
 OLYMPUS CORPORATION