OLYMPUS®

Your Vision, Our Future

Micro Cantilever

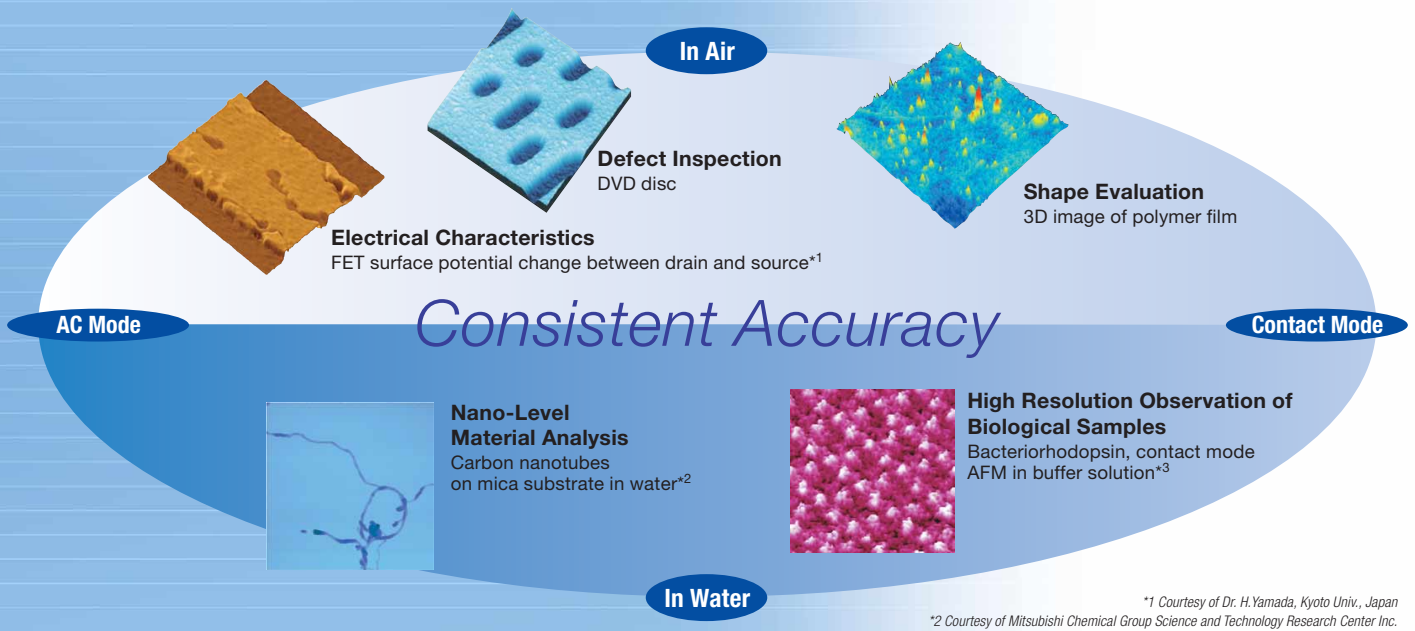
OMCL/BL Series

SINCE 1991

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

Cantilevers Leveraging Cutting Edge MEMS Technology for Outstanding Consistency and Precision

A diverse lineup to support nanotech research and other advanced applications.



*1 Courtesy of Dr. H.Yamada, Kyoto Univ., Japan
*2 Courtesy of Mitsubishi Chemical Group Science and Technology Research Center Inc.
*3 Courtesy of Drs. D.Fotiadis and A. Engel, M. E. Müller, Institute, Biozentrum, University of Basel, Switzerland

Measurement Environments

Usable in varying measurement environments—in water and air.

- Water — Water Mode
- Air — Air Mode

Measurement Modes

Soft cantilever for contact mode; high resonance frequency cantilever for AC mode.

- Contact — Contact Mode
- AC — AC Mode

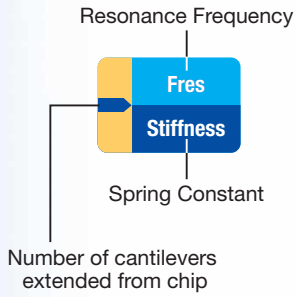
Detection Signals

Cantilevers for measuring electrical characteristics, friction, and force curve, in addition to surface irregularities.

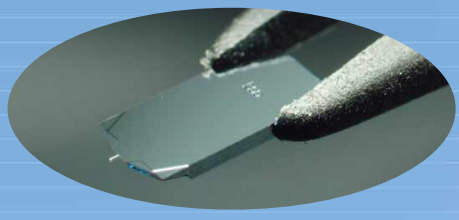
- Electric — Electrical Measurement
- Force Curve — Force Curve Measurement
- Friction — Friction Measurement

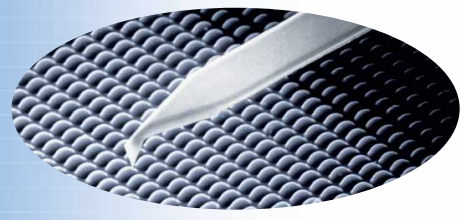
Mechanical Properties

Range of cantilevers from 0.006–85 N/m and 11–1600 kHz.



Olympus–Dedicated to Delivering Greater Precision and Ease of Use



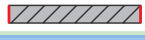


New Concept Chip

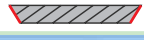
Perpendicular chip sidewalls greatly facilitate tweezer grabbing and handling.

Difference in Lateral Cross-sections of Cantilever Chips

Novel Rectangular Cross-section Chip



Conventional Trapezoidal Chip



TipView Design

Sharp probe is placed at the very end of the cantilever. TipView design facilitates exact probe positioning.

Specifications

① Co: Contact mode ② AC: AC mode ③ Ai: In air ④ Wa: In water

Product Name	Chip		Cantilever					Probe			Material	Coating Metal	Mode				Package
	Number	Illustration	Resonance Frequency (kHz)	Spring Constant (N/m)	Shape	Thickness (μm)	Illustration	Shape	Height (μm)	Radius (nm)	Probe / Lever	Probe side / Reflex side	① Co	② AC	③ Ai	④ Wa	
OMCL-AC55TS-R3	100	1	1600	85	Rectangular	2.35	①	Tetrahedral	12	7	Si / Si	Non / Au	–	✔	✔	✔	Ⓐ
OMCL-AC55TS-B3	18																Ⓑ
OMCL-AC55TN-R3	100											Non / Non	–	✔	✔	✔	Ⓐ
OMCL-AC55TN-B3	18																Ⓑ
OMCL-AC160TS-R3	100		300	26		3.7	②		14	7		Non / Al	–	✔	✔	–	Ⓐ
OMCL-AC160TS-C3	24																Ⓑ
OMCL-AC160TN-R3	100											Non / Non	–	✔	✔	✔	Ⓐ
OMCL-AC160TN-C3	24																Ⓑ
OMCL-AC200TS-R3	100		150	9		3.5	③					Non / Al	–	✔	✔	–	Ⓐ
OMCL-AC200TS-C3	24																Ⓑ
OMCL-AC200TN-R3	100											Non / Non	–	✔	✔	✔	Ⓐ
OMCL-AC200TN-C3	24																Ⓑ
OMCL-AC240TS-R3	100		70	2		2.3	④					Non / Al	–	✔	✔	–	Ⓐ
OMCL-AC240TS-C3	24																Ⓑ
OMCL-AC240TN-R3	100											Non / Non	–	✔	✔	✔	Ⓐ
OMCL-AC240TN-C3	24																Ⓑ
OMCL-AC240TM-R3	100								14	15		Pt / Al	–	✔	✔	–	Ⓐ
OMCL-AC240TM-B3	18																Ⓑ
OMCL-AC160FS-B2	18	2	300	42	Rectangular	4.6	⑤	Tetrahedral with columnar CNF probe	0.2 (14)	10	CNF / Si	Non / Al	–	✔	✔	–	Ⓑ
OMCL-AC160FS-Q2	3																
OMCL-AC240FS-B2	18		70	2		2.7	⑥		0.2 (15)	10							
OMCL-AC240FS-Q2	3																
OMCL-AC160BN-W2	375		300	42		4.6	⑤	Blade-like tetrahedral	9	8	Si / Si	Non / Non	–	✔	✔	✔	Ⓒ
OMCL-AC160BN-A2	12																Ⓑ
OMCL-AC160TS-W2	375							Tetrahedral	14	7		Non / Al	–	✔	✔	–	Ⓒ
OMCL-AC160TS-C2	24																Ⓑ
OMCL-AC240TS-W2	375		70	2		2.7	⑥		15	7							Ⓒ
OMCL-AC240TS-C2	24																Ⓑ
OMCL-AC240TM-W2	375								15	15		Pt / Al					Ⓒ
OMCL-AC240TM-B2	18																Ⓑ
OMCL-TR400PSA-HW	245	3	34	0.08	Triangular	0.4	⑦	Pyramidal	2.9	15	SiN / SiN	Non / Au	✔	✔	✔	✔	Ⓓ
OMCL-TR400PSA-1	34		11	0.02			⑧										
OMCL-TR800PSA-W (OTR8-PS-W)	490		73	0.57		0.8	⑦										
OMCL-TR800PSA-1	34		24	0.15			⑧										
OMCL-RC800PSA-W (ORC8-PS-W)	490	4	69	0.39	Rectangular	0.8	⑨										
			18	0.05			⑩										
OMCL-RC800PSA-1	34		71	0.76			⑪										
			19	0.10			⑫										
OMCL-TR400PB-1	34	3	32	0.09	Triangular	0.4	⑦		2.9	30	SiN / SiN	Au / Au					
			10	0.02			⑧										
OMCL-TR800PB-1	34		68	0.61		0.8	⑦										
			22	0.16			⑧										
OMCL-RC800PB-1	34	4	64	0.42	Rectangular	0.8	⑨										
			17	0.06			⑩										
			66	0.82			⑪										
			17	0.11			⑫										
OMCL-HA100WS-HW	245	5	160	15		2.0	⑬	Wedge Two protrusions	0.2 (12)	15	Si_3N_4 / SiN	Non / Au	✔	✔	✔	–	
OMCL-HA100WS-1	34																
BL-RC150VB-HW	210	6	37	0.03	Rectangular	0.18	⑭	V shape	7	30	SiN / SiN	Au / Au	✔	✔	–	✔	Ⓓ
BL-RC150VB-C1	24		13	0.006			⑮										
BL-AC40TS-C2	24	7	110	0.1		0.2	⑯	Tetrahedral	3.5 (7)	8	Si / SiN	Non / Au	–	✔	–	✔	Ⓑ
BL-AC10FS-A2	12		1500	0.1		0.13	⑰	Columnar CNF probe	0.1 (1.2)	7	CNF / SiN						
BL-AC10DS-A2	12							Bird beak	0.8	24	SiN / SiN						

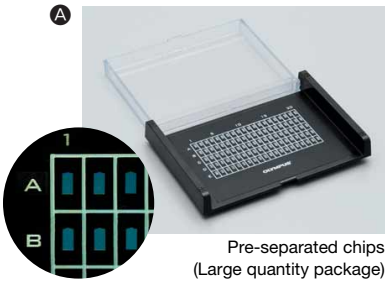
* The end notation following the last hyphen of the product name indicates the set quantity (letter) and chip type (numeral) of the cantilever. Letter (Q = 3 chips, A = 12 chips, B = 18 chips, C = 24 chips, R = 100 chips, HW = Half-wafer, W = Wafer, None = Strip) Numeral (1 = Pyrex chip, 2 = Conventional silicon chip, 3 = New concept chip).

Dimensions and mechanical properties above are typical values.

Packages

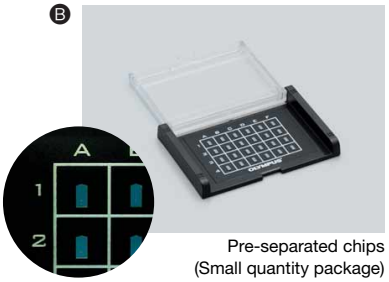
Pre-separated chips available, to use right out of the case.

Ⓐ



Pre-separated chips (Large quantity package)

Ⓑ



Pre-separated chips (Small quantity package)

Ⓒ

Wafer Type

Ⓓ

Strip Type

New Silicon Cantilever for AC Mode— Easy to Grab and Handle

Type 3

Point Terminated Probe for High-resolution Imaging

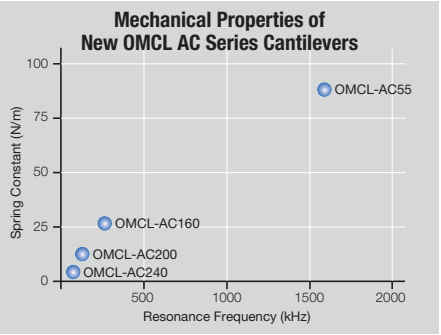
Uses a tetrahedral probe to achieve a point terminated tip with consistent sharpness. The probe tip is further sharpened over a length of more than one micron, making it perfect for observation at high-resolution.

Acclaimed 'TipView' structure

The probe is located at the exact end of the cantilever, making it possible to avoid obscuring the probe apex during optical observations.

n-type Doped Low Resistivity Silicon

The cantilever employs *n*-type doped silicon as the base material, with a surface resistance of 0.01-0.02 Ω•cm that is 1/200th of our other silicon base materials. The low resistive probe can also be used for surface potential measurement and a variety of other electric applications.



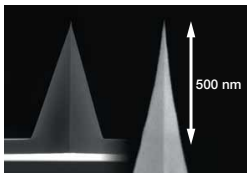
Standard Silicon Cantilever

OMCL-AC160TS-R3

TipView | New Concept Chip | Air | AC | 300 kHz | 26 N/m

High Q Factor for High-resolution Measurement

Resonance frequency of 300 kHz (Nom.) with spring constant of 26 N/m (Nom.). Stiffer middle cantilever to minimize damage to samples.



General Purpose Silicon Cantilever

OMCL-AC200TS-R3

TipView | New Concept Chip | Air | AC | 150 kHz | 9 N/m

Application for Various Sample Surfaces

Mid-range mechanical properties with 150 kHz (Nom.) resonance frequency and 9 N/m (Nom.) spring constant, for measuring surface profile and topology of samples with a wide range of hardness.

Medium-soft Silicon Cantilever

OMCL-AC240TS-R3

TipView | New Concept Chip | Air | AC | 70 kHz | 2 N/m

For the Measurements of Soft Samples

Spring constant of 2 N/m (Nom.) is smallest of silicon cantilevers for AC mode, suitable for observing surface topography and viscoelasticity of soft samples.

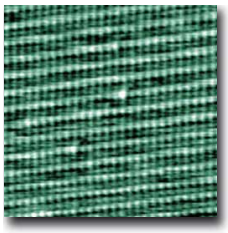
High Resonance Frequency Silicon Cantilever

OMCL-AC55TS-R3 OmegaLever

TipView | New Concept Chip | Air | Water | AC | 1600 kHz | 85 N/m

Low Thermal Noise Vibration for Unprecedented Resolution

High resonance frequency of 1.6 MHz (Nom.) and low thermal noise vibration makes high speed and high resolution measurement possible. It is also useful for trying material research, such as liquid-solid interface measurement and more.



Single crystal calcite ($CaCO_3$) showing atomic point defects, 20 nm scan. Imaged in water with Cypher AFM by Asylum Research

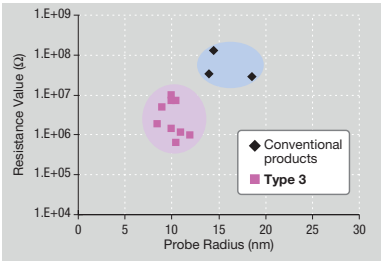
Silicon Cantilever for Electrical Measurement

OMCL-AC240TM-R3

TipView | New Concept Chip | Air | AC | Electric | 70 kHz | 2 N/m

Platinum Coating for Electrical Measurement

OMCL-AC240TM-R3 shows higher conductivity while its probe has an even sharper apex than our more conventional product. This probe reveals sample surface precisely both electrically and topographically.



*Silicon cantilever for AC mode comes standard with aluminum coating on its reflex side surface. For customers with concerns about contamination of aluminum during measurement in water, we recommend our non-coated (AC160TN, AC200TN and AC240TN) cantilevers.

High-Quality Cantilevers with Carbon Nano Fiber Probes to Minimize Image Quality Degradation under Repetitive Scanning

Carbon Nano Fiber Probe Cantilever

OMCL-AC160FS-B2

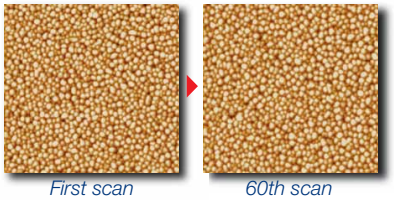
TipView | Air | AC | 300 kHz | 42 N/m

Greatly Minimizes Changes in Image Quality After Repetitive Scanning

Features a high aspect ratio carbon nano fiber (CNF) probe formed at the apex of the silicon probe support. Produces scanned images with excellent reproduction, by minimizing changes in probe diameter at the apex of the rod-shaped CNF probe even in case of wear, so that cantilevers do not need to be replaced and exchanged as often.

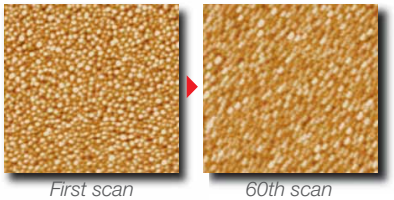
Image Retention of Polysilicon Thin Film

Micro Cantilever with Carbon Nano Fiber Probe

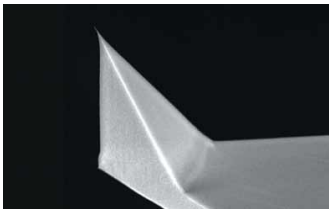


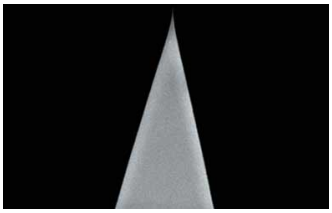
First scan *60th scan*

Conventional Silicon Probe Cantilever



First scan *60th scan*





Carbon Nano Fiber Probe Medium-soft Cantilever

OMCL-AC240FS-B2

TipView | Air | AC | 70 kHz | 2 N/m

Excellent Reproduction for Viscoelasticity Measurement

Shape of CNF probe enables viscoelasticity measurement with excellent reproduction.

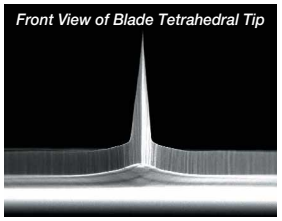
Blade Tetrahedral Probe Silicon Cantilever

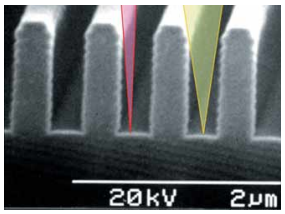
OMCL-AC160BN-A2

TipView | Air | AC | 300 kHz | 42 N/m

High Aspect Ratio Suitable for Groove Measurement

Features a sharper, blade-like tip with a 7:1 aspect ratio viewed along the cantilever axis, corresponding to a half tip angle of six degrees or less (over last 2 µm of tip). Common applications include measuring the electrode patterns of ICs and moth-eye structures for anti-reflective coating for LED, and precise imaging of grains on a thin film surface.





Comparison of Blade Tetrahedral Silicon Probe (red) and Standard Silicon Probe (yellow)

Thinner probe reaches the bottom of grooves by avoiding contact with the probe flank.

We also offer the following cantilevers from our existing product range, for data compatibility.

Standard Silicon Cantilever

OMCL-AC160TS-C2

TipView | Air | AC | 300 kHz | 42 N/m

Medium-soft Silicon Cantilever

OMCL-AC240TS-C2

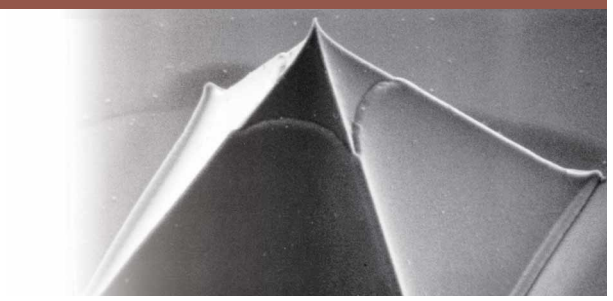
TipView | Air | AC | 70 kHz | 2 N/m

Silicon Cantilever for Electrical Measurement

OMCL-AC240TM-B2

TipView | Air | AC | Electric | 70 kHz | 2 N/m

Silicon Nitride Cantilevers with Superior Durability



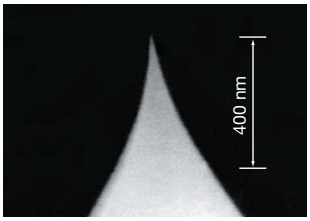
Standard Silicon Nitride Cantilevers

OMCL-TR800PSA-1

Air | Water | Contact | AC | x2 | 24/73 kHz | 0.15/0.57 N/m

Cantilevers for Contact Mode

Widely used in contact mode measurements, due to the cantilever softness and probe wear resistance. Each chip has two cantilevers of differing lengths (100 µm and 200 µm). Remains the standard for contact mode measurement, after nearly two decades since its introduction.



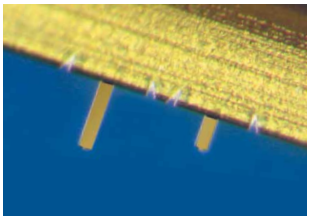
Rectangular Silicon Nitride Cantilevers

OMCL-RC800PSA-1

Air | Water | Contact | AC | Friction | 18~71 kHz | 0.05~0.76 N/m

Cantilevers for LFM

Each chip has four cantilevers with different spring constants, enabling the user to select the cantilever according to the sample. Simple rectangular cantilever shape facilitates calculation of its mechanical properties with analysis formula.



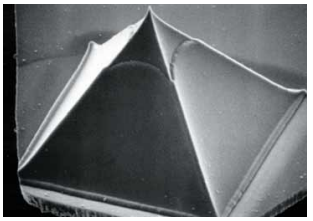
Small Spring Constant Silicon Nitride Cantilevers

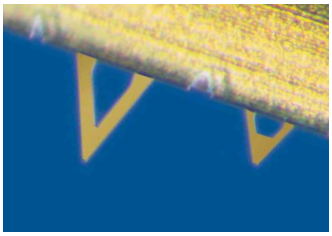
OMCL-TR400PSA-1

Air | Water | Contact | AC | x2 | 11/34 kHz | 0.02/0.08 N/m

For AC Mode Measurements in Water

Uses silicon nitride cantilevers with a small spring constant, offering half the cantilever thickness of our standard silicon nitride cantilever. Offers high sensitivity for force measurement, and contact mode measurements of very weak forces. With a 100 µm length and resonance frequency of approximately 7 kHz in water, the cantilevers are suited for AC mode measurements of specimens in water, particularly for obtaining images of live specimens that are only active in water.





Both V- and A-shaped cantilevers have a large enough triangular area near the apex to ensure laser light reflection.

* Surfaces of silicon nitride cantilevers shown on this page are coated with a reflective gold coating. We also offer TR400PB, TR800PB and RC800PB cantilevers with gold-coated surfaces on both sides, for probe surface modification and electrical measurement.

Probes Made of Hard Material, Suitable for Routine Inspections Using AFM

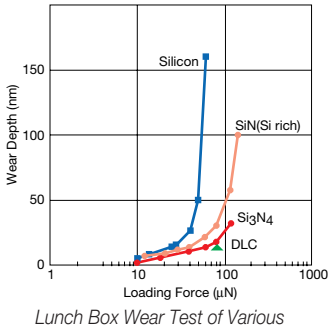
Low-Wear Silicon Nitride Cantilever

OMCL-HA100WS-1

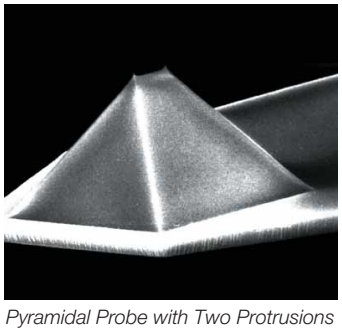
Air | Contact | AC | 160 kHz | 15 N/m

Low-wear Si_3N_4 Ratio

Recommended for measuring nano-indentations of polymer samples and for routine measurements, such as thin film inspection of semiconductors where reproducibility is required.

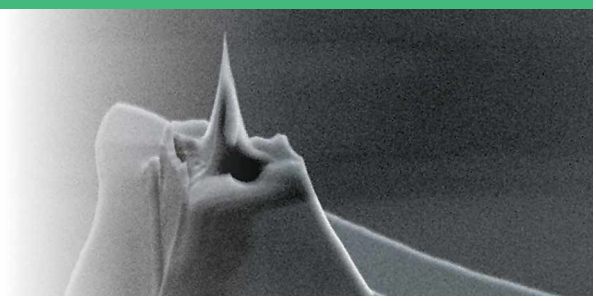


Lunch Box Wear Test of Various Probe Material



Pyramidal Probe with Two Protrusions

Silicon Nitride BioLevers to Meet the Demands of Biological Sample Measurement and Observation



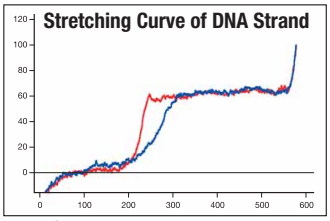
BioLever

BL-RC150VB-C1

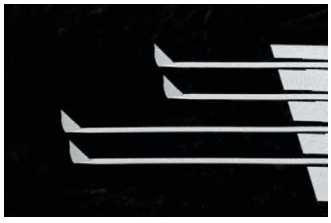
TipView | Water | Contact | AC | Force Curve | 13/37 kHz | x2 | 0.006/0.03 N/m

Force Curve Measurement of Biological Samples in Water

Extremely soft and flexible with a small spring constant, delivering a light, soft touch for contact with biological samples.



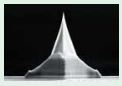
Data: Courtesy of Dr. R. Krautbauer, LMU



A-lever (60 µm length): Low noise model
The A-lever can make accurate force curve measurements in water, while its reduced overall area has the effect of reducing the Brownian motion noise in water.As a result, the slight differences which are generally overlooked, can now be captured.

B-lever (100 µm length): Small spring constant (6 pN/nm) model
The B-lever's softness with small spring constant less than 10 pN/nm, can capture even weak interaction forces so that they convert to substantial deflection changes.

Both the A and B models feature gold coating applied to the probe and reflex side of the cantilever. This improves the functionality and operability of the tip in such procedures as making tip modifications using thiol chemistry.



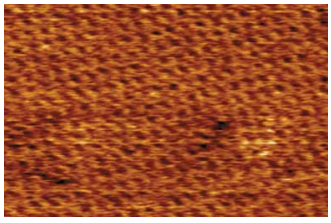
BioLever mini

BL-AC40TS-C2

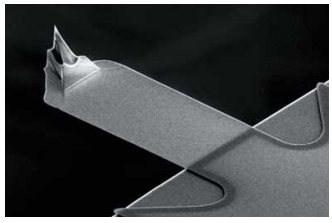
Water | AC | Force Curve | 110 kHz | 0.1 N/m

Nanometer Measurement of Biological Samples in Water

Features a high aspect ratio silicon probe formed on a mini-cantilever, to deliver ultra-precise nanometer measurement for observation of biological samples in water.



Streptavidin

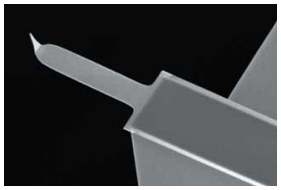


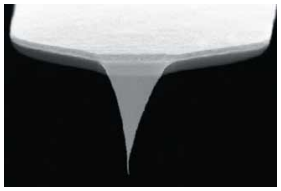
Silicon probe with 8 nm (Nom.) probe radius enables high-resolution measurements in water. Uses a small silicon nitride cantilever to keep the resonance frequency high at a range of 20–30 kHz in water, even with a small spring constant of 0.1 N/m.

BioLever fast

BL-AC10FS-A2

TipView | Water | AC | 1500 kHz | 0.1 N/m

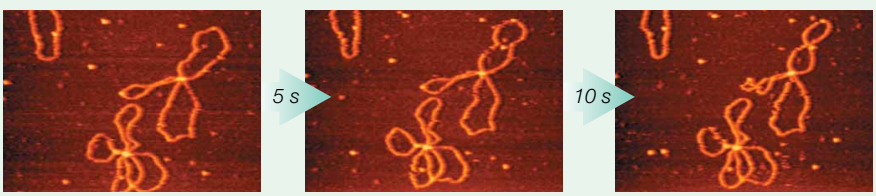




Small for Observing Dynamic Behavior of Bio Sample in Water

Features an ultra-small 9 µm cantilever with a high resonance frequency of 1.5 MHz in air and a small spring constant of 0.1 N/m. Delivers a resonance frequency of approximately 400 kHz in water, enabling high-speed aquatic imaging.
A CNF probe – a small fibril with tip radius less than 10 nm – grows at the end of the triangular portion of the bird-beak-like cantilever. The CNF probe improves AFM image quality.

**May not be compatible with some commercial large-spot laser sensors due to the small size of the cantilever.*
**BL-AC10DS-A2 (BioLever fast without CNF probe) is available as before.*

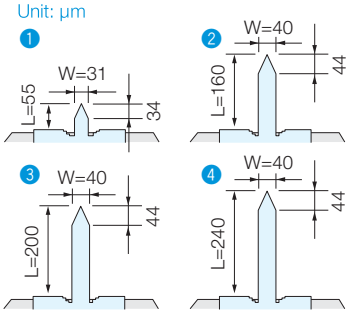


Video Clip of DNA Plasmid

Dimensions

OMCL-AC Type 3 series Rectangular cantilever with tetrahedral probe

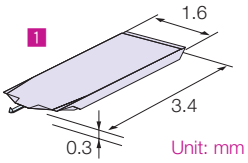
Unit: µm



Probe location: Just on end of cantilever

Chip size of silicon lever
One cantilever extends from side edge of each chip

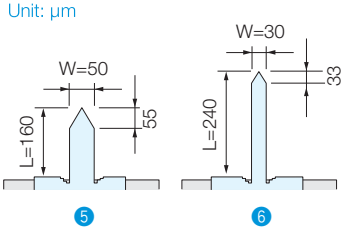
**Perpendicular chip sidewalls*



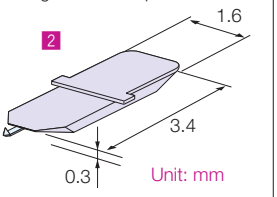
OMCL-AC series Rectangular cantilever with tetrahedral probe

Probe location: Just on end of cantilever

Unit: µm



Chip size of silicon lever
One cantilever extends from side edge of each chip

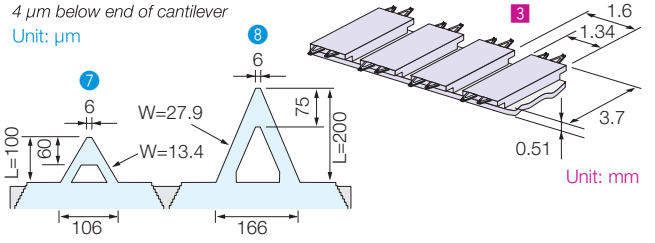


OMCL-TR series Triangular cantilevers with pyramidal probes

Chip array size of silicon nitride levers
Two cantilevers extend from each side of a glass chip

Probe location:
4 µm below end of cantilever

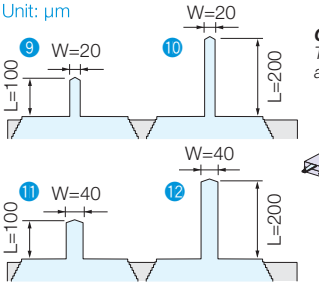
Unit: µm



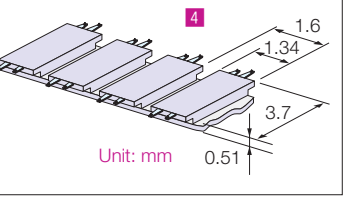
OMCL-RC series Rectangular cantilevers with pyramidal probes

Probe location: 4 µm below end of cantilever

Unit: µm



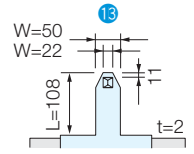
Chip array size of silicon nitride levers
Two cantilevers extend from each side of a glass chip



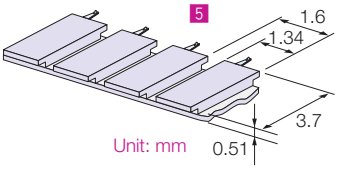
OMCL-HA100 Rectangular cantilever with wedge probe (two protrusions)

Probe location:
11 µm below end of cantilever

Unit: µm



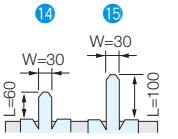
Chip array size of silicon nitride lever
One cantilever extends from side of each glass chip



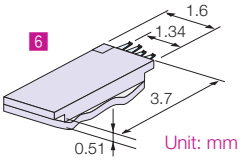
BL-RC150 Rectangular cantilevers with V shape probes

Probe location: Just on end of cantilever

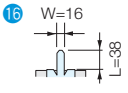
Unit: µm



Chip size of silicon nitride levers
Four cantilevers extend from side edge of each chip

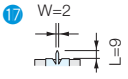


BL-AC40, -AC10 Rectangular cantilever



Probe location: 1 µm below end of cantilever

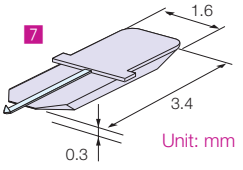
Unit: µm



Probe location: Just on end of cantilever

Unit: µm

Chip size of silicon nitride lever
One cantilever extends from side edge of each chip



• Specifications and appearances are subject to change without any notice or obligation on the part of the manufacturer.

OLYMPUS®

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

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