Cantilevers for bio samples

Note: Dimensions and mechanical properties below are typical values.

Main application		Product name	Chip		Cantilever					Tip			Material	Coating Metal
			Number	Illustration	Shape	Illustration	Stiffness (N/m)	Fres (kHz)	Thickness (μm)	Shape	Height (μm)	Radius (nm)	Tip / Lever	Tip side / Reflex
in Water	Force curve	BL-RC-150VB-C1	24	Fig. ❸	Rectangular	❶	0.03	37	0.18	V shape	7	25	SiN	Au
		BL-RC-150VB-HW	210			❷	0.006	13					SiN	Au
	AC mode	BL-AC40TS-C2	24	Fig. ❺	Rectangular	❹	0.1	110	0.2	Tetrahedral	3 (7)	10	Si	Non
													SiN	Au
	Contact mode/ AC mode*	OMCL-TR400PSA-1	34	Fig. ❽	Triangular	❻	0.08	34	0.4	Pyramidal	2.9	15	SiN	Non
		OMCL-TR400PSAHW	245			❼	0.02	11					SiN	Au
		OMCL-TR400PB-1	34	Fig. ❽	Triangular	❻	0.09	32	0.4	Pyramidal	2.9	30	SiN	Au
						❼	0.02	10					SiN	Au
		OMCL-RC800PSA-1	34	Fig. ⓭	Rectangular	❾	0.39	69	0.8	Pyramidal	2.9	15	SiN	Non
		OMCL-RC800PSA-W	490			⓫	0.76	71					SiN	Au
						❿	0.05	18						
						⓬	0.10	19						
		OMCL-RC800PB-1	34	Fig. ⓭	Rectangular	❾	0.42	64	0.8	Pyramidal	2.9	30	SiN	Au
						⓫	0.82	66					SiN	Au
						❿	0.06	17						
						⓬	0.11	17						
in Air/ in Water	AC mode	OMCL-AC160TS-C2	24	Fig. ⓰	Rectangular	⓮	42	300	4.6	Tetrahedral	14	7	Si	Non
		OMCL-AC160TS-W2	375										Si	Al
		OMCL-AC240TS-C2	24	Fig. ⓰	Rectangular	⓯	2	70	2.7	Tetrahedral	15	7	Si	Non
		OMCL-AC240TS-W2	375										Si	Al

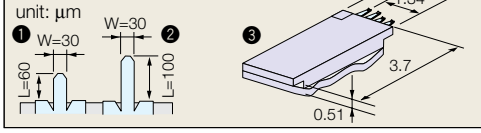
*Only applies to the 100μm lever of model OMCL-TR400PSA/PB

BL-RC series

Rectangular cantilevers with tetrahedral tips

Tip location: Just on end of cantilever

unit: μm



Chip size of silicon probe
Four cantilevers are extended from side edge of each chip

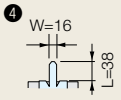
unit: mm

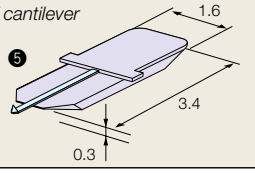
BL-AC series

Rectangular cantilevers with tetrahedral tips

Tip location: Just on end of cantilever

unit: μm





Chip size of silicon probe
One cantilever is extended from side edge of each chip

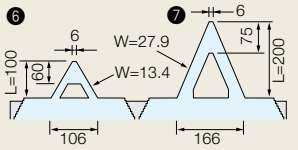
unit: mm

OMCL-TR series

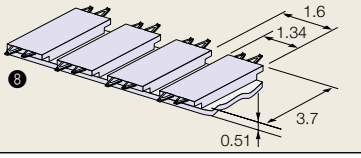
Triangular cantilevers with pyramidal tips

Tip location: 4μm below end of cantilever

unit: μm



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



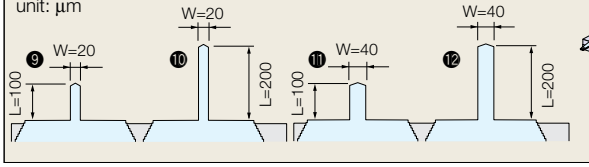
unit: mm

OMCL-RC series

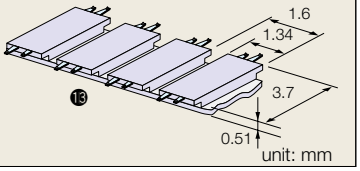
Rectangular cantilevers with pyramidal tips

Tip location: 4μm below end of cantilever

unit: μm



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



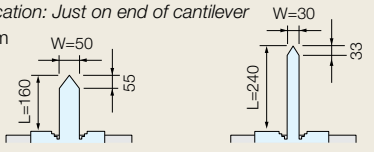
unit: mm

OMCL-AC series

Rectangular cantilevers with tetrahedral tips

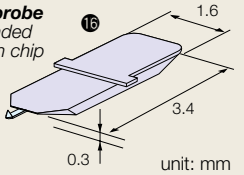
Tip location: Just on end of cantilever

unit: μm



⓮OMCL-AC160 ⓯OMCL-AC240

Chip size of silicon probe
One cantilever is extended from side edge of each chip



unit: mm

Packaging

Model \ Package	Frame type	Strip type	Pre-separated type
BL-RC-150VB-C1			●
BL-RC-150VB-HW		●	
BL-AC40TS-C2			●
OMCL-TR400PSA-1		●	
OMCL-TR400PSAHW		●	
OMCL-TR400PB-1		●	
OMCL-RC800PSA-1		●	
OMCL-RC800PSA-W		●	
OMCL-RC800PB-1		●	
OMCL-AC160TS-C2			●
OMCL-AC160TS-W2	●		
OMCL-AC240TS-C2			●
OMCL-AC240TS-W2	●		

Depending on the product, three types of packaging are available: frame type, strip type and preseparated type.

Frame type

Strip type

Pre-separated type

Specifications are subject to change without any obligation on the part of the manufacturer.

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For more technical information, please access our web site below.
http://www.olympus.co.jp/probe/

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BL/OMCL series

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BioLever

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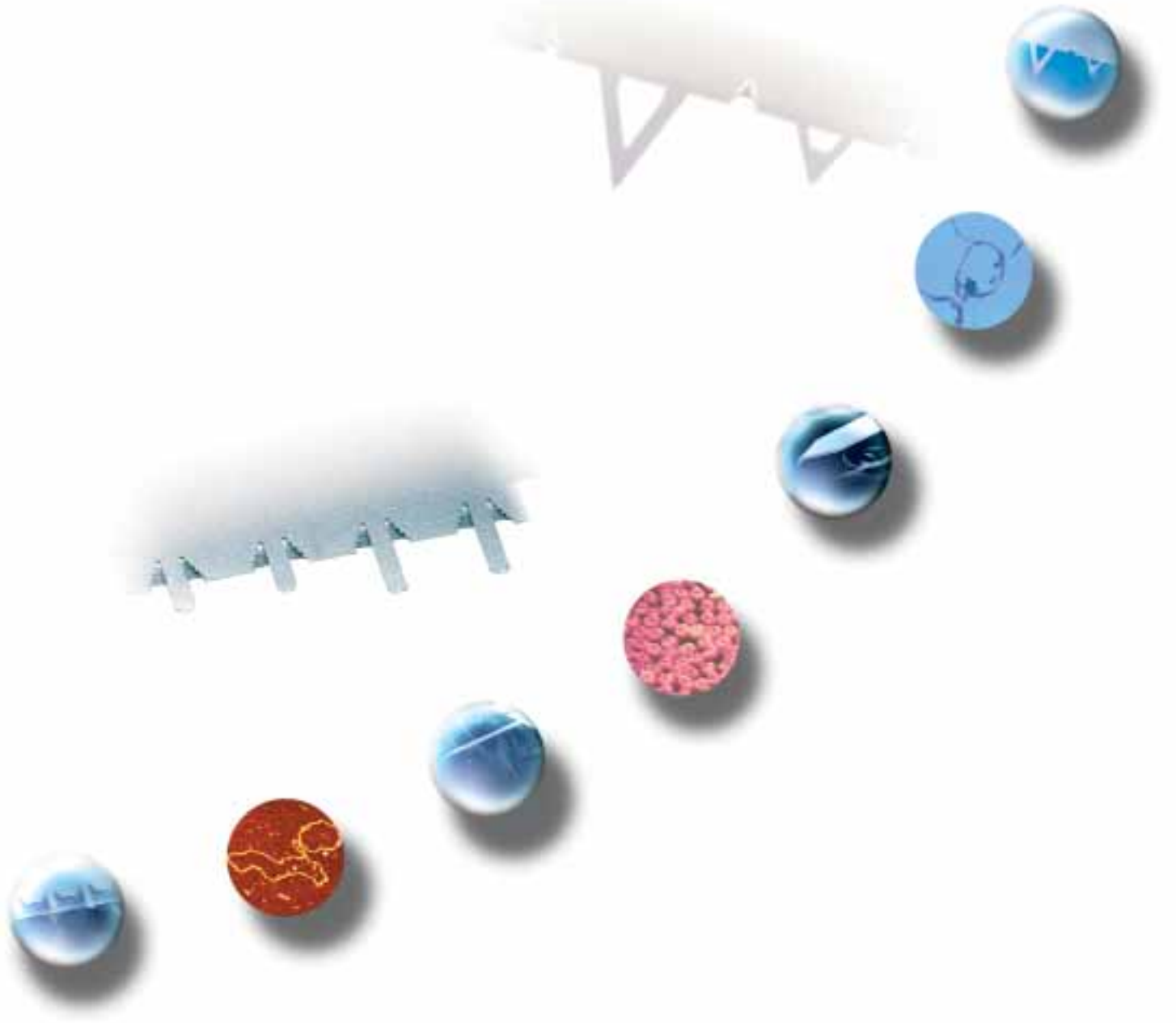
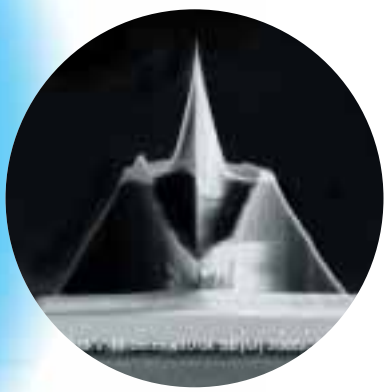


Make It Smaller

"What we need is a cantilever designed for the measurement and observation of biological samples." It was to meet this specific request, made by many researchers, that Olympus developed the BioLever series, to complement the proven success of the OMCL series in live specimen observation. The key development concept was "Make it smaller", since a small and compact design is the principal requirement for making highly precise measurements and observations of bio samples in liquid solutions. These BioLever cantilevers, incorporating some of Olympus' most advanced technology, comprehensively fulfil the requests made by users working in bio sample research.



Clear Tip View

Olympus's "Tip View" structure places the probe at the very tip of the cantilever. This provides instant, easy access to AFM (Atomic force microscope) measurements taken between the probe position and the point of interest, while retaining usability of an optical microscope when used in combination measurement. Since the probe can be placed in position (a pre-requisite for the next zoom-up measurement) quickly and easily, there is a considerable saving in time before the measurements.

Consistent Accuracy

Recognizing that measurement results can be greatly influenced by fluctuations in probe performance, Olympus has applied unique processes to make sure that these cantilevers maintain their stable level of sharpness.
Tip shape stability helps to provide consistent, accurate data, and thus consistent reliable measurements and observations of bio samples.

i n W A T E R

i n A I R

BioLever Force curve measurement in water

Force curve measurements of biological samples in water

These cantilevers are very soft and flexible, with a small spring constant: this ensures a light, soft touch when in contact with bio samples.

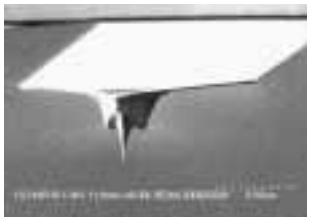
BL-RC150VB- series

BioLever mini AC (dynamic) mode AFM in water

Nanometer-level observation images of biological samples in water

This model is an ultra-small, high aspect ratio cantilever with a sharp, blade-like silicon tip to provide highly precise observation images of bio samples in water.

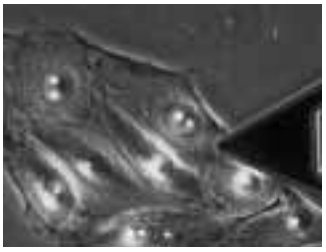
BL-AC40TS- series



OMCL-TR/RC Contact mode /AC mode AFM in water

Standard model for contact mode in water

These standard-model AFM cantilevers for contact mode in water have remained popular among customers since their introduction in 1991, due to their consistent provision of precise bio sample images.



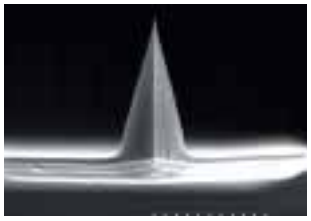
OMCL-TR400PSA-, OMCL-TR400PB-
OMCL-RC800PSA-, OMCL-RC800PB- series

OMCL-AC AC mode AFM measurement in air

Standard model for AC mode measurement in air

These silicon probe cantilevers employ the "Tip View" structure and have a sharp tetra tip. Their high Q factor enables them to make high-sensitivity measurements.

OMCL- AC160TS-, OMCL-AC240TS- series



* The use of silicon cantilevers for measuring bio samples is constantly being extended. Please try them in your own programs.

Two types of cantilevers with different lengths.

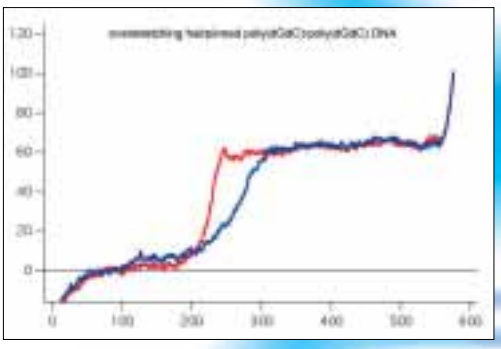
A-lever (60µm length): Low noise model

The A-lever can make accurate force curve measurements in water, while its reduced overall area has the effect of reducing the Brawnian motion noise in water.
As a result, the slight differences which are generally overlooked, can now be captured.
The A-lever also has the high resonant frequency of a 30pN/nm class cantilever, enabling it to follow even quick reactions in bio samples.

B-lever (100µm length): Small spring constant (6pN/nm) model

The B-lever's softness with low spring constant less than 10pN/nm, can capture even weak interaction forces so that they convert to substantial deflection changes.

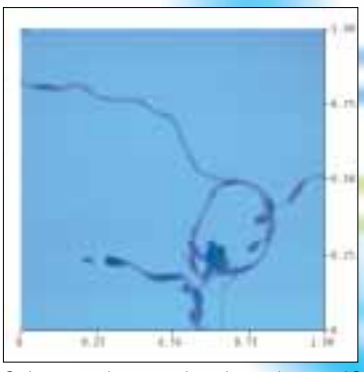
Both the A and B models feature gold coating applied to the probe and reflex side of the cantilever. This improves the functionality and operability of the tip in such procedures as making tip modifications using thiol chemistry.



DNA strand overstretching measurement in water
Data: Courtesy of Dr. R. Krautbauer, LMU

AC mode measurement in water is an observation method that minimizes damage to bio samples by applying minimal force. The “BioLever mini” is designed to obtain images of bio samples in water with nanometer-level precision. The sharp silicon probe has a high aspect ratio to help ensure that the image accurately conveys the actual sample shape. Cantilever movements are about 25% slower in water than in air.
The "BioLever mini" is smaller than the standard BioLever, which raises the frequencies of resonance peaks in water by from 20kHz – 30kHz. These high frequencies make it possible to scan faster* and shorten the observation time. Fast scanning speed means less time is required to find the targeted area among the relatively extensive regions where bio molecular samples are scattered at random.

**Speed limit of the scanning also depends on the AFM system, especially on the scanner*



Carbon nanotubes on a mica substrate in water. AC mode AFM in water
Picture: Courtesy of Mitsubishi Chemical Group Science and Technology Research Center Inc.

High-precision images through contact mode in water

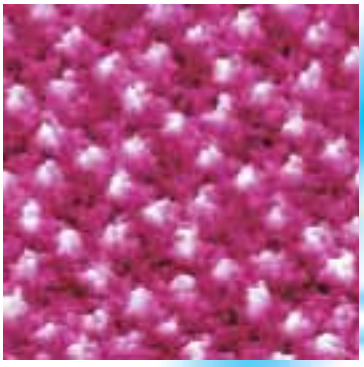
Obtaining AFM measurements of bio samples by contact mode in water, these cantilevers have impressed many researchers with their stability, precision and ease of use. Available in two lengths, 100µm and 200µm, they feature a pyramidal tip whose consistent, stable sharpness derives from Olympus' original oxide sharpening process. Relatively large in overall area, these cantilevers can be used at ease for AFM with large sensor light spot.

100µm cantilever for AC mode in water

The OMCL-TR400PSA is short (100µm in length) and has a resonant frequency of about 7kHz in water. This is the standard cantilever for AC mode measurement in water.

Rectangular cantilever OMCL-RC800PSA, RC800PB

Depending on differences in measurement and samples requirements, this model allows users to select from four types of rectangular cantilevers with different mechanical characteristics. Interest is also frequently expressed by customers who evaluate the spring constant by themselves.



BacterioRhodpsin, Contact mode AFM in buffer solution
Picture: courtesy of Drs.D.Fotiadis and A.Engel, M.E.Müller Institute,Biozentrum,University of Basel,Switzerland

Confirming the surface of biomolecule fixing substrate

In bio molecular observation, fixing the biomolecules on the substrate is very important; in particular, it is crucial to know the state of the substrate surface. The intended surface conditions can be confirmed by applying a gold coating, or by forming SAM (Self Assembled Monolayer). AC mode in air is generally employed for these applications, because it makes measurement relatively easy. This kind of substrate surface confirmation is also an important procedure in the development of biosensor devices.

Observation of DNA strand in air

For example, it is possible to observe the binding conditions of a restricted-enzyme-combined DNA strands after fixing it on a mica substrate by spraying. The conditions of dotted DNA chips are also measured in air.

FM (Frequency Modulation)-detected AFM measurement in water for biological sample

To measure bio samples in water without contacting them, trials of AFM measurement through FM detection have been started. For this purpose, stiff silicon cantilevers with a high Q factor are used.

DNA plasmid on a mica substrate
AC mode measurement in air