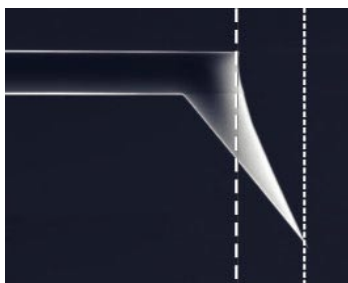




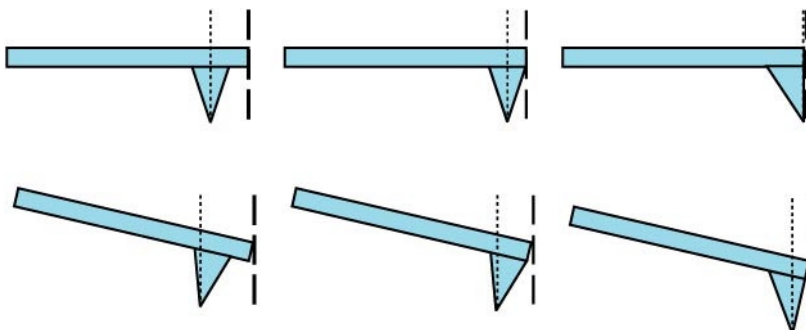
## AdvancedTEC Silicon-SPM-Probes Advanced Tip at the End of the Cantilever®

### Precise Positioning through Real Tip Visibility

NANOSENSORS™ AdvancedTEC™ probes are designed for high resolution imaging. They feature a tetrahedral tip that protrudes over the very end of the cantilever. This unique feature allows precise positioning and makes the AdvancedTEC™ the only AFM scanning probe in the world that offers **REAL TIP VISIBILITY FROM TOP**, even if the probe is tilted as a result of its mounting onto the AFM head. This feature makes them the premium choice for all applications where the tip has to be placed exactly on the point of interest and/or has to be visible (eg. nano manipulation)



Other commercially available tip shapes:



— — — End of Cantilever

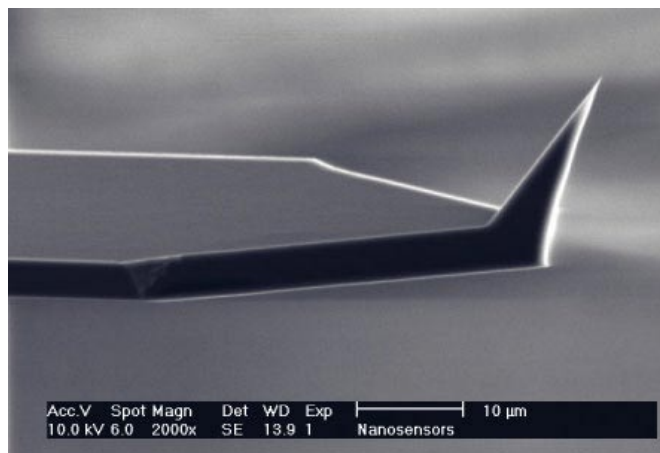
..... Tip Position

⊛ 13° Tilted Probe due to its mounting onto the AFM Head

### Tip Shape

The AdvancedTEC™ tip has a tetrahedral shape and protrudes over the very end of the cantilever. The tip height is 15 - 20  $\mu\text{m}$ . The half cone angles are  $< 12^\circ$  when viewed along the cantilever axis and  $< 8^\circ$  seen from the side. For the last micron the vertex angle of the tip tapers from its macroscopic value to a half cone angle  $< 5^\circ$ . The tip radius of curvature is better than 10 nm. The aspect ratio of the last 0.5  $\mu\text{m}$  is  $> 4:1$  when seen from front and side. Additionally the AdvancedTEC™ tip shape is defined by real crystal planes that result in highly reproducible geometries and extremely smooth surfaces.

Thanks to their very small half cone angles the tip of the AdvancedTEC™ series shows great performance on samples that have a small pattern size combined with steep sample features.

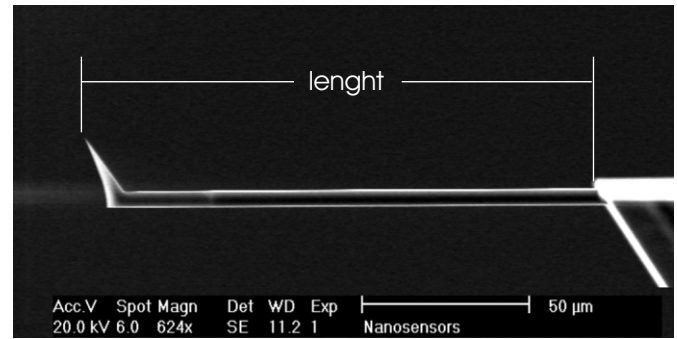


SEM image of an AdvancedTEC™, 3D view.



### Tip Features at a Glance

- Real tip visibility from top
- Tip height 15 - 20 μm
- Tip radius of curvature smaller than 10 nm
- Aspect ratio of the last 0.5 μm of the tip > 4:1 (seen from front and side!)
- Half cone angles
  - < 12° along the cantilever axis
  - < 8° seen from the side
- Tip shape is defined by real crystal planes
- Monolithic silicon



SEM image of an AdvancedTEC™. Side view of tip and cantilever.

### Cantilever and Support Chip

The AdvancedTEC™ has a rectangular cantilever that ends in a triangular shape. The cross section of the cantilever is trapezoidal. Depending on the application the cantilever geometry ranges from 160 to 450 μm in length, 20 to 50 μm in width and 1 to 6 μm in thickness.

The cantilever is fixed to a silicon support chip. The support chip as an integral part of the probe is designed for manipulating the probe and fixing it to the SPM. The geometric dimensions of the support chip are very reproducible enabling the replacement of the probes without major readjustment of the laser. Please note that the AdvancedTEC™ product series is not compatible with the alignment chip for the PointProbe® Plus series.

### Material Features and Coatings

NANOSENSORS™ Silicon-SPM-Probes are manufactured from highly doped, single crystal silicon which leads to unique features: Silicon is a well-known and established material for semiconductor technology. The high conductivity of the doped silicon avoids electrostatic charging. The resistivity is as low as 0.01 - 0.025 Ωcm. The fabrication out of bulk material results in a monolithic design of support chip, cantilever and tip. This avoids any intrinsic stress and leads to absolutely straight cantilevers. Even if the ambient temperature changes no bending of the cantilever will occur. The chemically inert silicon allows the application in fluids or electrochemical cells.

Beside the standard version the AdvancedTEC™ is optionally available either with a double sided gold or double sided platinum-iridium5 alloy coating.

### Product List

	Type	Application	Force Constant [N/m] (nominal)	Res. Frequency [kHz] (nominal)	Coatings (optional, tip- and backside)
Contact	ATEC-CONT	Contact Mode	0.2	15	PtIr5, Au
Non-Contact	ATEC-NC	Non-Contact / Tapping Mode	45	335	PtIr5, Au
Special	ATEC-FM	Force Modulation Mode	2.8	85	PtIr5, Au

For more details please refer to the product datasheet on our website  
www.nanosensors.com  
info@nanosensors.com