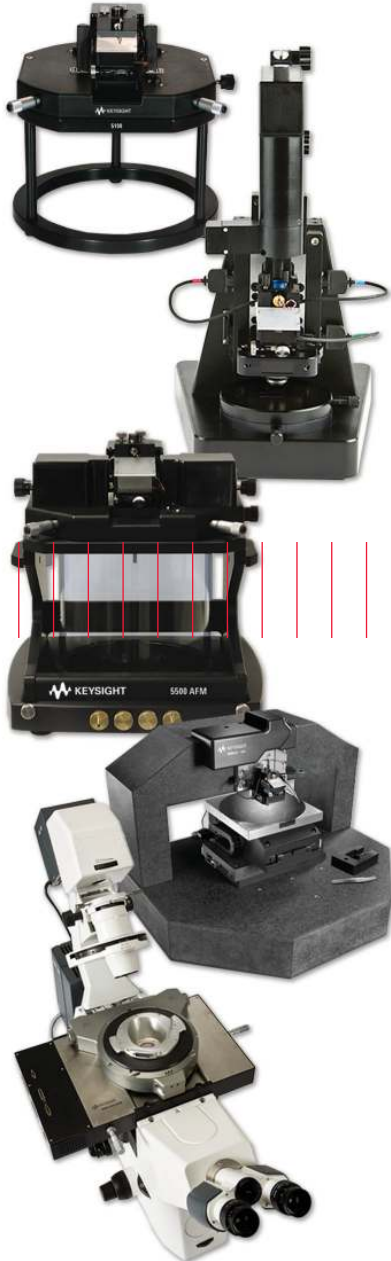








# Keysight Technologies AFM/SPM Accessories



For the following Keysight AFM/SPM Systems:

-  5100
-  5420
-  5500
-  5500 ILM
-  5600 LS
-  6000 ILM

## Keysight Technologies AFM/SPM INSTRUMENTS



### 5100 AFM/SPM (N9420S)

The Keysight Technologies, Inc. 5100 atomic force microscope is a system that delivers atomic resolution and provides excellent imaging capabilities in an easy-to-upgrade package. The 5100 offers many of the same features as Keysight's sophisticated 5500 AFM/SPM at an entry-level price. Since user requirements often grow, the 5100 is fully upgradeable to the 5500. The 5100 comes with a Keysight multipurpose scanner, giving you the ability to switch AFM/SPM imaging modes.



### 5420 AFM/SPM (N9498S)

Based on the popular Keysight 5400 AFM/SPM, the 5420 features a new ergonomic design and improved electronics. In addition to its remarkable affordable price, this scientific-grade microscope offers users electrical single-pass microscopy (ESPM) mode, which enables high-resolution KFM/EFM and PFM, as well as scanning microwave microscopy (SMM) mode, which allows highly sensitive calibrated electrical and spatial characterization.



### 5500 AFM/SPM (N9410S)

The Keysight 5500 is a powerful multiple-user research system for AFM/SPM. In addition to atomic-scale resolution, true modularity enables you to add capability-enhancing options as the need arises. The system's intelligent design permits the simple integration of numerous imaging modes and easy-to-use, application-specific sample-handling plates. Our balanced-pendulum, top-down multipurpose scanners come in a range of sizes, all offering outstanding linearity and accuracy.



### 5600 LS AFM/SPM (N9480S)

The Keysight 5600 LS allows high-resolution imaging of both large samples (in air) and small samples (in air, or in liquid under temperature control) with a 9 $\mu$ m scanner. The 5600 LS offers the largest fully addressable and programmable stage on the market, 200mm x 200mm, as well as a special stage adapter that allows the use of a sample plate to image small samples in liquid. New 300mm wafer and multi-sample 2-inch-wafer stages are available. The 5600 LS is compatible with SMM mode.



### 6000 ILM AFM/SPM (N9436S)

The Keysight 6000 ILM seamlessly integrates the capabilities of an AFM/SPM with those of an inverted light microscope (ILM) or an inverted confocal microscope, letting users go beyond the optical diffraction limit to achieve nanoscale resolution without any special sample preparation. The 6000 ILM allows molecular imaging, live-cell imaging, force studies, and mechanical stimulus studies to be conducted with a single-system solution, all while preserving an efficient, natural workflow.



### 5500 ILM AFM/SPM (N9435S)

Not shown. The Keysight 5500 ILM system combines the power of a high-resolution atomic force microscope with the direct optical viewing capability of an inverted light microscope. The 5500 ILM system's advanced design allows the AFM/SPM to sit on top of an inverted microscope and under the illumination pillar.

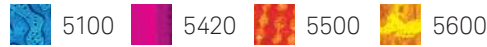
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## Scanners

Keysight Technologies offers a broad array of high-precision scanners – with scan ranges from 1 micron to 90 microns. Our utilization of top-down scanning protects electronics and piezo elements from damage caused by liquid or harsh imaging environments.

### Multipurpose Scanners



#### 90µm Scanner

N9521A/B

#### 9µm Scanner

N9520A/B

#### 90µm Closed

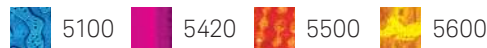
#### Loop Scanner

N9524A/B



Keysight's multipurpose scanners deliver unsurpassed performance, versatility, and ease of use for atomic force microscopy. They are ideal for imaging in fluid or air and under controlled temperature and environmental conditions. Our multipurpose scanners are available in two scan ranges: a large scanner that can scan areas up to 90µm x 90µm and a small scanner that offers atomic resolution up to 9µm x 9µm. Open-loop scanners, Z closed-loop scanners, and XYZ closed-loop scanners are available.

### STM 8µm Scanner



N9503A/B



Scanning tunneling microscopy (STM) scanners take advantage of the extreme distance sensitivity of the tunneling current between two conducting electrodes. By measuring the tunnel-current variations as a probe is scanned over a sample's surface, STM is able to deliver the highest-resolution SPM images. Keysight's STM 8µm scanner delivers excellent results on a variety of conducting materials.

### STM 1µm Scanner



N9501A



For the ultimate in high-resolution imaging performance, Keysight's STM 1µm scanner offers the precision of a single-micron scan range. It provides stable imaging at pico-ampere and sub-pico-ampere currents to resolve individual atoms and molecules.

## Scanners (continued)

### AFM/LFM Detector



N9702A



Designed specifically for use with Keysight multipurpose scanners, this detector accurately records the bending of the AFM/LFM system's cantilever so as to render images of a sample's surface properties with superb resolution and fidelity.

### AFM/LFM Detector and Standard Nose Cone



N9741A



This detector offers optimized recording capabilities and has been specially engineered for use with our multipurpose scanners. An easy-to-load nose cone that enables the performance of contact mode AFM and lateral force microscopy (LFM), as well as our patented MAC Mode imaging, is included.

### STM Pre-Amp Modules



N9551A  
N9552A  
N9554A



Three STM preamplifier modules are available from Keysight, each providing different electrical conductance (1nA/V, 10nA/V, and log scale) so as to afford system users the level of sensitivity required for their specific applications.

### Scanner Block



N9748-60001



Front: Closed Loop



Back: M/P Scanner

To enhance AFM/SPM system versatility, convenience, and ease of use, the front of this robust scanner block accommodates a Keysight closed-loop scanner while the block's back accepts a Keysight multipurpose scanner.

## Nose Cones

Keysight scanners' interchangeable, easy-to-load nose cones make switching imaging modes quick and convenient. They have low chemical reactivity and can be used in a wide range of solvents. Customized nose cones are available upon request.

### Standard AFM Nose Cone



N9533A



Keysight's standard nose cone is used to perform contact mode AFM/SPM and LFM, as well as our patented MAC Mode imaging. Designed for compatibility with Keysight multipurpose scanners, it holds the probe at 9° from horizontal. This nose cone is made from PEEK polymer.

### AAC Nose Cone (9°)



N9534A



This nose cone performs acoustic AC mode (AAC mode) AFM/SPM. Compatible with Keysight multipurpose scanners, it is a 9° nose cone made from PEEK polymer.

### AAC Nose Cone (12°)



N9534B



This 12° nose cone is used to perform AAC mode AFM/SPM. Made from PPS polymer, it is compatible with Keysight multipurpose scanners.

### CS-AFM Nose Cones



N9540A

N9541A

N9542A



Keysight's CS-AFM nose cones have been designed for use with our multipurpose scanners to enable current-sensing atomic force microscopy. For optimal application performance, three CS-AFM/SPM nose cones are offered: 0.1nA/V, 1nA/V, and 10nA/V.

## Nose Cones (continued)

### 2-Piece AAC Nose Cone

 5100  5420  5500  5600

N9543A



Our two-piece nose cone is used to perform AAC mode AFM/SPM in air. Its clever mechanical design simplifies the process of inserting a cantilever. Not appropriate for in-fluid imaging.

### Top MAC Nose Cones

 5100  5420  5500  5600

**9°**  
N9536A



These nose cones are used to perform Top MAC Mode imaging with our multipurpose scanners. A 9° nose cone is offered for Top MAC Mode measurements in air; an 8° nose cone is offered for Top MAC Mode measurements in fluid. Both nose cones are made from PEEK polymer.

**8°**  
N9537B

### STM Nose Cones

 5100  5420  5500  5600

N9530A  
N9531A  
N9532A



Keysight's STM nose cones have been designed for use with our multipurpose scanners to enable scanning tunneling microscopy. For optimal application performance, three STM nose cones are offered: 0.1nA/V, 1nA/V, and 10nA/V.

### DLFM Nose Cone

 5100  5420  5500  5600

N9535A



This 9° nose cone is used to perform dynamic lateral force modulation (DLFM) atomic force microscopy with Keysight multipurpose scanners. It is made from PEEK polymer.

### Removal Tool

 5100  5420  5500  5600

N9549A



This specialized tool enables the easy removal of interchangeable nose cone assemblies from our multipurpose scanners, facilitating quick and convenient switching between AFM imaging modes.



## Sample Plates

Keysight offers a selection of sample plates. These versatile plates help optimize imaging results, are simple and convenient to use, and can be cleaned quickly without undue effort. Their unique design affords superior stability and easy sample loading.

### Standard Sample Plate

 5100  5420  5500  5600

N9716A



The unique design of the standard sample plate delivers superior sample stability. The plates enables simple sample mounting for ease of use. Magnetic suspension provides easy loading.

### MAC Mode Sample Plate

 5100  5420  5500  5600

N9717A



The MAC sample plate provides the ability to do bottom MAC lever excitation when combined with the appropriate controller option box.

### Cover Glass Sample Plate

 5500 ILM

N9718A



The Cover Glass sample plate is useful for simple ILM operation with the 5500 combined with the ILM Quickslide adaptor for use on an inverted optical microscope. Uses standard dimension coverslips.

### Petri Dish Sample Plate

 5500 ILM

N9719A



The 35mm Petri dish sample plate is designed for ease of use with the 5500ILM.

### Temperature Sample Plates

 5100  5420  5500

#### -5 to 40°C

N9640A  
(5100 and 5500 only)

#### MAC -5 to 40°C

N9648A  
(5100 and 5500 only)

#### Ambient to 250°C

N9647A

#### MAC ambient to 110°C

N9641A


#### Ambient to -30°

N9643A (5100 and 5500 only)



The controlled temperature sample plates are available in a variety of temperature ranges created for your demanding research needs. Each is made with open sample access and is easy and convenient to use.

### Temperature Sample Plate

 5500 ILM

N9644A




The temperature controlled sample plate for the 5500ILM system allows the control of temperature from ambient to 80°C.



## Sample Plates (continued)

### Alignment Sample Plate

 5100  5420  5500  5600

N9737A



The alignment plate allows users to set scanner height before setting up their liquid cell experiment to ease the approach, and ensure that the experiment is started safely. Can also be used as a microscope slide sample plate.

### Glass Slide Sample Plate

 5500 ILM

N9706A



The slide sample plates holds industry standard 1 x 3" glass microscope slides for economical, efficient sample preparation and cleanup.

### Cover Slip Sample Plate

 5500 ILM

N9708A



The cover slip sample plate accommodates round cover slips (dia. 22– 30mm). The cover glass used by Keysight is thin (~170µm) to facilitate light microscopy, yet very stable to allow high-precision AFM imaging.

### Petri Dish Sample Plates

 5500 ILM

**35mm**

N9705A



**50mm**

N9705B

Our Petri dish sample plates, which have been designed for high-resolution live-cell imaging, facilitate simple mounting of 35mm and 50mm Petri dishes. They are convenient to use and can be cleaned quickly.

### Temperature Sample Plates

 5500 ILM

**Ambient to 80°C**

N9660A



**40°C to ambient**

N9660B

A controlled-temperature sample plate that holds a 35mm Petri dish and offers heating up to 80°C with ±0.1°C stability.

### Perfusion Cell Sample Plate

 5500 ILM

N9707A



For dynamic studies in fluid, the perfusion cell sample plate provides continuous perfusion, offers variable flow-through, and maintains liquid level. The perfusion cell sample plate is compatible with round cover slips (dia. 22– 30mm) and can be sterilized by autoclaving.

### Incubator Sample Plate

 5500 ILM



N9709A



The incubator perfusion cell sample plate has a sealed chamber, in and out ports for flow-through of liquids and gases, and the ability to heat from room temperature to 40°C with ±0.1°C stability. Cell viability can be maintained for several hours. This sample plate provides continuous perfusion, offers variable flow-through, and maintains liquid level. It is compatible with round cover slips (dia. 22mm) and can be sterilized by autoclaving.

## Environmental Options

### Environmental Isolation Chamber

 5100  5500

N9441A



Keysight's environmental isolation chamber (EIC) has been specifically designed to meet the numerous requirements of intricate, demanding AFM/SPM research. The glass EIC mounts directly to our atomic force microscopes and provides a sealed sample compartment that is completely isolated from the rest of the system. Eight inlet/outlet ports permit the flow of many different gases into or out of the sample area. Keysight scanners reside outside the EIC, so they are protected from contamination, harsh gases, solvents, caustic liquids, and other damaging experimental conditions. With the EIC, humidity levels can be controlled, oxygen levels monitored and controlled, and reactive gases easily introduced into and purged from the sample chamber.

### Noise and Vibration Isolation Chamber

 5100  5420  5500

N9445A



Keysight's table-top noise and vibration isolation chamber (Pico IC) isolates the atomic force microscope from vibration, air turbulence, and acoustic noise, all of which adversely affect imaging. This chamber provides acoustic isolation for the instrument by utilizing multiple layers of sound-damping materials. The vibration isolation system damps incoming vibrations via the use of stiff compliant bungees and a suspended heavy granite block. It also helps control temperature variability to an extent. The chamber is designed to be accessed from either the left or right side, as both the door and cable ports are reversible. It is compact, easy to use, and permits atomic-resolution imaging in noisy environments.

### Acoustic and Vibration Isolation Chamber

 5600



The acoustic chamber with 10 plus layers of sound damping materials provides up to 40dB of acoustic isolation and ensures high and low frequency isolation. The active vibration isolation continuously senses vibrations and through an inertial feedback loop signals internal actuators to react to disturbing vibrations with 5–20 sec msec response. The system has virtually no low frequency resonance so it is capable of isolating under the most extreme vibration environments. The front cover lifts easily and the front window allows viewing for quick access and adjustment.

## Environmental Options (continued)

### Glove Box



 5100  5500

N9446A



Our miniature glove box can be attached directly to the atomic force microscope body, offering greater environmental control. This clear acrylic box has a stainless steel adapter ring and eight threaded ports for gas inlet/outlet. Air- or moisture-sensitive samples can be precisely loaded on the microscope without ever exposing them to the external atmosphere; the antechamber allows the introduction of samples into the inert environment. Since the sample, piezo, and electronic parts are totally isolated from the imaging environment, it is possible to perform experiments under very reactive conditions without damaging the system or the sample.

### Temperature Controllers

 5100  5420  5500  5600  6000

0.1K accuracy

N9654A








0.025K accuracy

N9655A



Keysight's temperature controller uses a patented thermal insulation and compensation design to deliver precise temperature control from -30°C to 250°C, along with the lowest thermal drift available for high-resolution SPM. It is fully compatible with all imaging modes in air, liquid, and controlled environments and allows imaging during temperature changes. The temperature controller's design isolates the sample plate from the rest of the SPM system; an insulated ceramic fixture protects the surrounding apparatus from the effects of heating or cooling, thus providing the most precise, stable temperature control available for SPM.

### Current Booster

 5100  5420  5500  5600  6000

N9656A



This current booster is required for cooling select Keysight sample plates down to temperatures as low as -30°C.

### Temperature Sample Plate Connection Kit

 5100  5420  5500  5600

N9657A



Connection kit for temperature samples plates includes a set of cables that connect to temperature controller, booster and stage.

## Electronics

### AC Mode Controllers for AAC Mode only

 5420  5500  5600  6000

**For the 5420,  
5500, 5600**

N9424A-055








**For the 6000ILM**

N9424A-060

AC Mode controller operates in either intermittent contact (net repulsive) regime or non-contact (net attractive) regime. During intermittent contact, the tip is brought close to the sample so that it lightly contacts the surface at the bottom of its travel, causing the oscillation amplitude to drop. The tip is usually driven by a sinusoidal force, with the drive frequency typically at or near one of the cantilever's resonance frequencies and most often at the fundamental frequency. The topography, amplitude and phase can be collected simultaneously. The phase and amplitude images may highlight physical properties that are not readily discernible in the topographic map.

### MAC Mode Controllers

 5100  5420  5500  5600  6000

**Bottom MAC  
(Standard)**

N9621A-001



**Top MAC**

N9621A-002

**For the 6000ILM**

N9621B-003

Keysight's patented magnetic AC mode (MAC Mode) is a gentle, nondestructive AFM/SPM imaging technique for use in air and liquid that offers precise control over oscillation amplitude and, thus, excellent force regulation. Since only the tip is driven when using MAC Mode, the signal-to-noise ratio is greatly increased and there is tremendous improvement in fluid imaging. MAC Mode has allowed researchers to resolve submolecular structures that could not be resolved with any other SPM technique.

### AC Mode Controllers for AAC III

 5420  5500  5600  6000

N9624A

**For the 5420,  
5500, 5600**

N9624B-055



**For the 6000ILM**

N9624B-060

The Acoustic AC (AAC) Mode controller is designed so that the movement of cantilever holder is at or near its resonant frequency, typically 100 to 400kHz. Interaction between the probe and the sample reduces the oscillation amplitude. Built in Q-control and three user-configurable lock-in amplifiers afford accuracy and faster time to results. Two expansion slots are also provided. A wider operating frequency range (up to 6MHz) enables higher harmonic imaging, yielding images with contrast beyond that seen using fundamental amplitude and phase signals. It allows single-pass KFM/EFM simultaneously imaging topography, amplitude, and surface potential.

## Electronics (continued)

### MAC Mode III Controllers

 5420  5500  5600  6000

#### Bottom MAC (Standard)

N9621B-001



#### Top MAC

N9621B-002

Built on proven, patented MAC Mode technology, Keysight's MAC Mode III is very useful in areas requiring high resolution and force sensitivity. Built in Q-control and three user-configurable lock-in amplifiers afford accuracy and faster time to results. Two expansion slots are also provided. A wider operating frequency range (up to 6MHz) enables higher harmonic imaging, yielding images with contrast beyond that seen using fundamental amplitude and phase signals. MAC Mode III allows single-pass KFM/EFM imaging; its simultaneous topography, amplitude, and surface potential measurements are facilitated by a servo-on-height cantilever approach unsusceptible to scanner drift.

### Break Out Box

 5420  5500  5600  6000

N9447A



The break-out box is a signal access module that provides access to essential input and output channels of our atomic force microscopes. Through the convenient BNC connectors on the box, users can not only monitor each channel or diagnose any malfunction, but also feed in a channel with a specified signal or design their own customized operations.

### Break Out Box for 5100






 5100

N9453A



The break-out box is a signal access module that provides access to essential input and output channels of the 5100 AFM/SPM. Through the convenient BNC connectors on the box, users can not only monitor each channel or diagnose any malfunction, but also feed in a channel with a specified signal or design their own customized operations.

### PicoTREC

 5100  5420  5500  5600  6000

N9630A



Keysight's exclusive PicoTREC molecular recognition toolkit is designed for use with our MAC Mode and atomic force microscopes. This option, which includes specialized hardware, electronics, consumables, and accessories, allows researchers to quickly identify molecules that are engaged in binding events and generate a recognition map along with an AFM/SPM topography image of the sample.

### Aux Signal Access Box

 5100  5420  5500  5600  6000

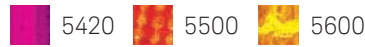
N9454A



Signal access box that enables single pass KFM and EFM measurements.

## SMM Options

### Capacitance Standard

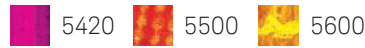


N9856A-010



Keysight recently issued the first commercially available capacitance calibration standard for an atomic force microscope. These calibration specifications for capacitance measurements allow quantitative assessment of material and device properties via SMM.

### SMM Nose Cone

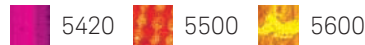


N9546A



Second generation SMM nose cone is compatible with the 5000 series AFM/SPM (except 5100). This enables the unique benefits of environment experiments on the 5500. The set-up of the scanner and nose cone has been simplified and the probe exchange has been greatly improved.

### Controller Module



N9632A



Dopant Profile Measurement Module (DPMM) is used for SMM dopant profiling in dC/dV mode. It optimizes dC/dV imaging of the calibration standard.

### N-Type and P-Type Dopant Calibration Standard



#### N-Type

N9856A-020



#### P-Type

N9856A-021



Calibration standards for N-Type and P-Type for SMM imaging.

## Electrochemistry Options

### Potentiostat/Galvanizer

 5100

N9699A



Our low-noise potentiostat/galvanostat delivers 10nA sensitivity for in situ EC-SPM studies, both EC-STM and EC-AFM. The instrument's current range is 10 $\mu$ A to 10mA.

### 3-Pin Electrode Cable

 5100  5420  5500  5600

N9760A



This cable connects the sample plate to the Keysight microscope for STM, EC, and CS-AFM/SPM applications.

### EC Electrodes

 5100  5420  5500  5600

N9680A



These EC electrodes include a Pt counter, Ag reference, and pogo contact.

### Test/Dummy Cells for EC

 5100  5420  5500  5600

N9681A




Resistive dummy cells for testing electrochemistry can be ordered from Keysight in sets of five (5).



## Electrochemistry Options (continued)

### Electrical Feed-Through Wiring

 5500

N9712A



Electrical feed-through with wiring to enable custom applications with the 5500 environmental chamber.

### Micro Electrode Reference and Salt Bridge

 5100  5420  5500  5600

N9682A



Kit includes micro-reference electrode (Ag/Ag/Cl in 3M KCl) plus a salt bridge.

### Micro Electrode Reference

 5100  5420  5500  5600

N9683A



Kit includes micro-reference electrode (Ag/Ag/Cl in 3M KCl).

### Salt Bridge

 5100  5420  5500  5600

N9684A



Durable salt bridge for electrochemistry.

## Accessories

### Optics for 5100 and 5500

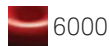


N9451A



The open-top design of Keysight multipurpose scanners allows high-resolution video microscopy straight down the optical axis of our 5100 and 5500 atomic force microscopes. Together with co-axial illumination and a micrometer-driven translation stage, this optical microscope makes it easy to precisely position a tip over a specific scanning area of interest quickly and easily. Variable zoom provides a wide range of field-of-view. Multiple video options are available for high-quality image resolution.

### Video Optics for 6000ILM



N9451C



Specially designed for the Keysight 6000ILM, this top-view video optics package includes a high-resolution color camera and enables researchers to see opaque samples during scanning. Furthermore, the ability to view AFM/SPM tip placement from above helps make positioning and focusing easier than ever.

### Flow-Through System



N9444A



Keysight's flow-through system allows researchers to monitor real-time changes in surface chemistry or biological processes while exchanging solutions.

## Accessories (continued)

### 5500ILM Quick Slide

 5500

N9462A



Precision adaptor stage for Zeiss, Olympus and Nikon Inverted Light Microscopes that hold the 5500 AFM/SPM scanning head for studies on light microscopes.

### Flip Stand

 5100  5500

N9440A



Sturdy mounting stand for the 5100 and 5500 microscopes that provides a rigid platform for imaging, and the convenience of tilting the AFM/SPM up for sample mounting and removal.

### Sample Stage Stand

 5100  5420  5500  5600  6000

N9729A



Convenient sample plate holder that provides a convenient, safe station for sample preparation prior to mounting on the AFM/SPM.

### Adaptor Stage

 5420  5600

N9720A



Adaptor that allows the use of the standard 5500 sample plates on the 5420 and the 5600LS large stage AFM/SPM to perform temperature, electrochemistry, or bottom MAC imaging.

### Flame Annealing Kit

 5100  5420  5500  5600

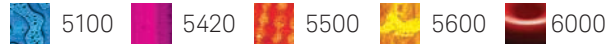
N9757A



This flame annealing kit includes a quartz plate, a quartz chip, and a quartz tube nozzle to allow users to remove contamination from their substrates.

## Accessories (continued)

### Gold Substrates



**1.0cm x 1.1cm coverage**

N9805A/B



1.4cm x 1.1cm, Annealed gold-coated substrates with 1500 angstroms of Au (111) covering 1.0cm x 1.1cm. Quantity 2 or 5.

**2.0cm x 1.6cm coverage**

N9806A/B

2.4 cm x 1.60 cm, Annealed gold-coated substrates with 1500 angstroms of Au (111) covering 2.0 cm x 1.6 cm. Quantity 2 or 5.

**2.0cm x 2.1cm coverage**

N9807A/B

2.4 cm x 2.1 cm, Annealed gold-coated substrates with 1500 angstroms of Au (111) covering 2.0 cm x 2.1 cm. Quantity 2 or 5.

### STM Fluid Cell and Clamping Plate



**Clamping Plate**

N9726A



**Fluid Cell**

N9727A



Small fluid cell and clamping plate. Sample connection is made through the side wall. Minimum sample size 9.5mm (0.375 inch).

### Fluid Cell Kit



N9721A



AFM/SPM liquid cell made from Kel-F with sealing o-rings.

### Flow-Through Cell



N9738A



AFM/SPM flow-through fluid cell, Kel-F 15.6mm cell, clamping plate, sealing o-rings, and tubing.

### Bungee Cord Set



N9750A



Bungee cord set with 4 cords for the Pico IC noise vibration isolation chamber.



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