

SCL's Add-on kit for Keysight AFM (cantilever holder "nose", pre-amplifier and signal splitter box (see below))

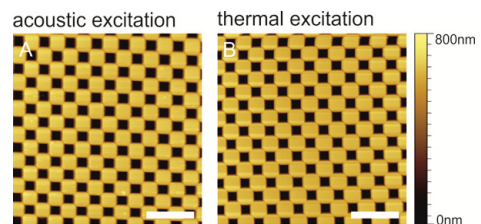
Description

The self-sensing add-on kit enables a user to work with self-sensing cantilevers on a Keysight 5x00 AFM series. This combines the benefits of a conventional bio AFM with the advantages of a laser free deflection detection using SCL's self-sensing cantilevers. The add-on can be used without changes to the original AFM hardware for imaging in intermittent contact mode. The self-sensing cantilever add-on kit consists of a cantilever holder plug-in module for self-sensing cantilevers (nose), a pre-amplifier, a signal splitter box, cables and 10 self-sensing cantilevers. The nose contains an adjustable low noise instrumentation amplifier and a fixed reference voltage for the Wheatstone bridge of 2.048V for high sensitivity measurements or 0.5 V for measurements in de-ionized water. For driving the cantilever a nose implemented piezo or a heater of a SCL PRSA cantilever can be used (mechanical or thermal excitation). The deflection signal is amplified (adjustable from 1x to 100x) and filtered before it is wired to the lock-in amplifier of the Keysight AFM MAC-box. The hardware is powered via the Keysight break-out box or an external power supply unit and is connected via the signal splitter box. The whole system is plug-and-play able and only the cantilever holder has to be changed for electrical or optical readout.

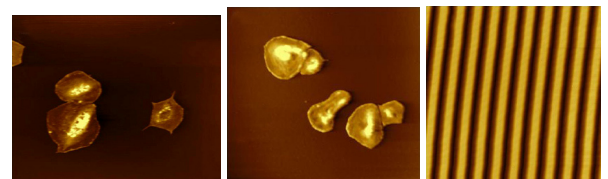
Specifications

Dimensions (l x w x h)	
nose (cylindrical)	D = 1 cm, l = 2 cm
signal splitter box	110 x 90 x 70 mm
post-amplifier	40 x 40 x 25 mm
Electrical Pre-Amplifier Specifications	
Operation voltage Vs	+/-15 V (from Keysight breakout box)
Gain, voltage amplification	10...10.000x
Bandwidth	$f_{3dB} = 2,5 \text{ MHz @ } 2\text{mV}_{pp}$ sine input signal
external offset voltage range	(Vs-) +0.5 V to (Vs+) -0.5 V
Output impedance	50 Ohm
Input impedance	3 G Ω 6 pF
Wheatstone bridge supply voltage	0.51 V or 2.048 V (voltage reference)
Slewrate output stage	27 V/ μ s
Connectors and cables	
Input connector (cantilever side)	FFC 8 Pin
Output connector	Header Connector 8 Pin
Input FFC cable	FFC, 8 pol, length: 152 mm
Output cable	shielded flexible cable, l = 1 m, open ends

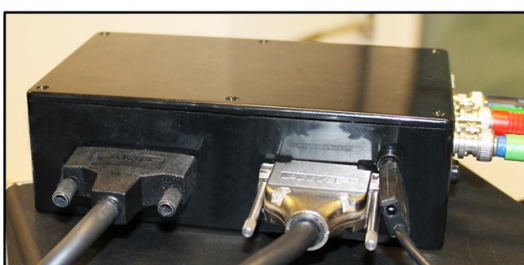
Example images



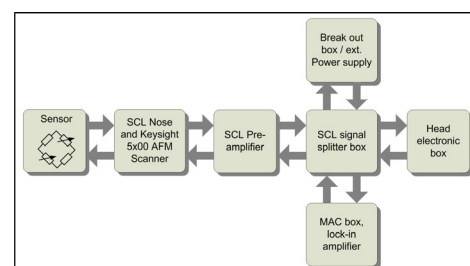
Images of a calibration grating recorded with the add-on kit using different excitation modes. The z-noise for a single point image is about 0.21 nm.



Platelets in dry state, physiological buffer and calibration grating in milk



Signal-Splitter Box



Block diagram of the self-sensing add-on kit