

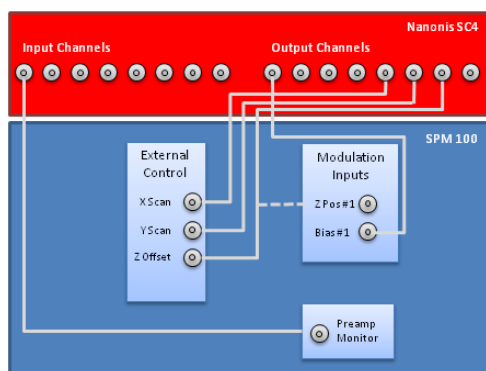
Upgrade Kit for RHK-SPM100

BRING YOUR SPM100 TO THE NEXT LEVEL

The SPM100 is probably the most widely used SPM controller in the research community. Especially in low-temperature and UHV experiments the SPM100 has been in use since the 80's and lead to many important discoveries.



Now, with the Upgrade Kit for the RHK-SPM100 you can benefit from the newest developments in software technology used in a Nanonis system without having to obsolete your old SPM100 controller. The kit simply takes over the control of the SPM100 hardware and replaces scan generator, feedback loop and data acquisition.



Connection diagram for a typical setup: The scan and feedback signals are directly connected to the External Control connectors. Alternatively, ZPos#1 can be used for the feedback signal.

The tunnelling current can be read either through the monitor of the preamp or directly from the preamplifier.

The coarse approach is triggered either with a TTL signal to an external module, direct communication to an external approach module if the protocol is known, or a kinetic waveform can be generated by the Nanonis hardware and sent through the SPM100 for amplification.

Once connected, you immediately benefit from the power of a **fully digital control system**. The frontend is user-friendly and absolutely stable, and the experimental capabilities are almost limitless given the powerful programming interface.

Feedback Loop

A fully digital feedback loop with all of its benefits replaces the SPM100 analog feedback.

- **TipLift™:** when stopping the feedback the tip holds its position without “droop”, you can even define a set height above the control position to which the tip is moved when the loop is opened.
- **SafeTip™:** monitor a second signal apart from the feedback signal and immediately withdraw the tip within <100us when a certain threshold is passed.
- **Setpoint-independent feedback:** In a digital system the feedback is completely independent of the setpoint, with no need to adjust parameters.
- **Improved control:** Enjoy the full dynamic range of operating conditions to find the “sweet spot” for your particular head, but also enjoy fine bandwidth control once the head is stabilized.

Data Acquisition

- **8 Analog Input Channels:** Eight independent, simultaneously acquired input channels with adaptive oversampling to reach a resolution of up to **24 bit** (at 100S/s, 20 bit at 10kS/s), independent of the number of channels acquired. The resolution is always automatically optimized for your current acquisition rate.
- **2 TTL Pulse Counters:** two independent pulse counters for frequencies up to 40MHz.

Output Channels

- **8 Analog Output Channels:** Due to the patented hrDAC™ all eight output channels of the Nanonis system have a resolution of **22 bit**. The resolution is independent of speed or number of channels.

Scan Generation

- A 22-bit scan generator completely replaces the RHK equivalent, making obsolete any offset and gain setup required in the old system. You can achieve atomic resolution over the full scan range without having to resort to confusing offset and gain settings.

Coarse Approach

- PMC100 – triggered with TTL signals directly from the Nanonis system
- Besocke type – function generator to generate wave from analog output of Nanonis system
- Other: Support of various stepper motors and DC motors for approach

Support and Updates

The upgrade kit makes the users eligible for full support and future updates which are published on the Nanonis website.

Optional Modules

The optional modules which become available with the new systems include:

Integrated Digital Lock-In Amplifier: Modulate and demodulate any signal up to 2kHz, ideal for dI/dV measurements, record transfer functions, fully integrated into software. No expensive external lock-In or additional cabling required!

Generic PI Controller: One additional feedback loop can be configured to control on any signal, also includes an extra lock-in to control on a demodulated signal.

LabVIEW Programming Interface: Programmatically control all software modules, automate routines, operate external equipment via GPIB, RS232, etc. Create your own experimental routines in software.

Atom Tracking: Dynamically track local maxima and minima, record drift and automatically determine sample tilt.

Digitally Integrated Phase Locked Loop

As an additional module – also available at a later stage – the Nanonis Oscillation Controller OC4 is a digitally integrated PLL with highest frequency stability and accuracy, ideal for non-contact AFM measurements, MRFM and other dynamic measurement modes.

Single OC4: digitally integrated PLL with frequency up to 5MHz

Dual-OC4: second PLL, phase coherent with first, second frequency either on same or different output.

Kelvin Probe: Module to perform AM and FM Kelvin Probe

Supported Systems

The Upgrade Kit supports all SPM100 systems with serial numbers below 1200.

| | |
|--------------------|---|
| SPM100 Rev. 5 | √ |
| SPM100 Rev. 6 & 6B | √ |
| SPM100 Rev. 7 | √ |
| SPM100 Rev. 8 | √ |

Supported Microscopes

The Upgrade kit can run all STMs of the 500 and 700 series. For the AFMs in the 550 and 750 series, an additional OC4 is required for the dynamic modes

| | |
|-------------|------------------------------------|
| UHV STM 500 | √ |
| UHV STM 700 | √ |
| UHV AFM 550 | √ - requires OC4 for dynamic modes |
| UHV AFM 750 | √ - requires OC4 for dynamic modes |

