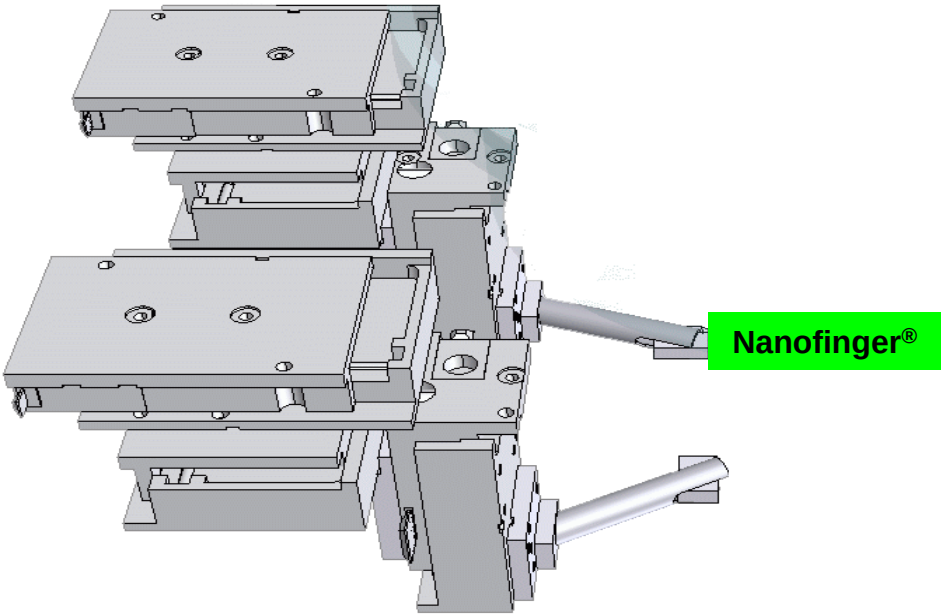
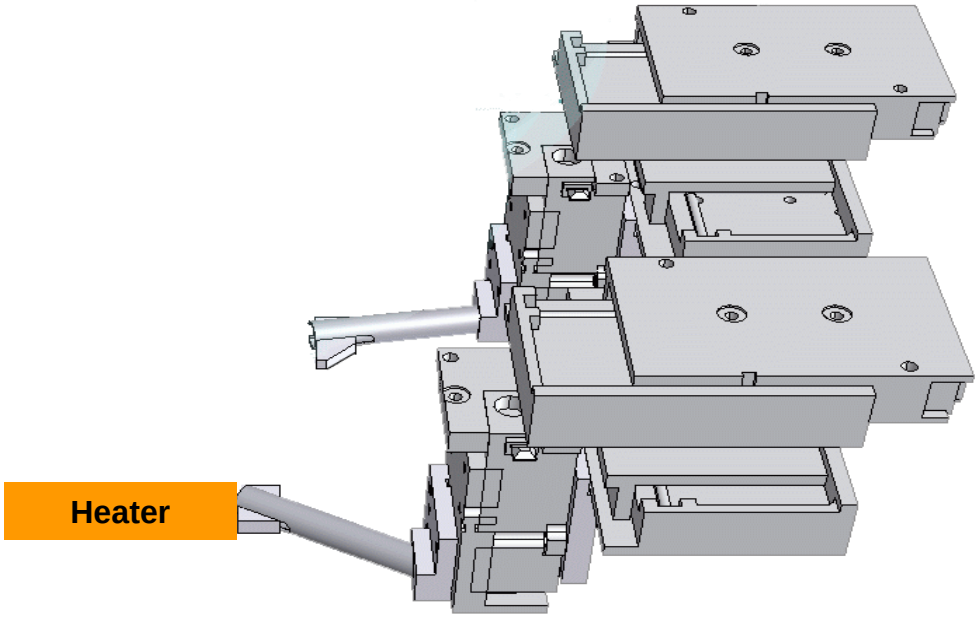
Spot-Heating:

Heat source inside SEM/FIB systems with the Nanoworkbench from Klocke Nanotechnik

Spot-Heating

Nanoworkbench Configuration:





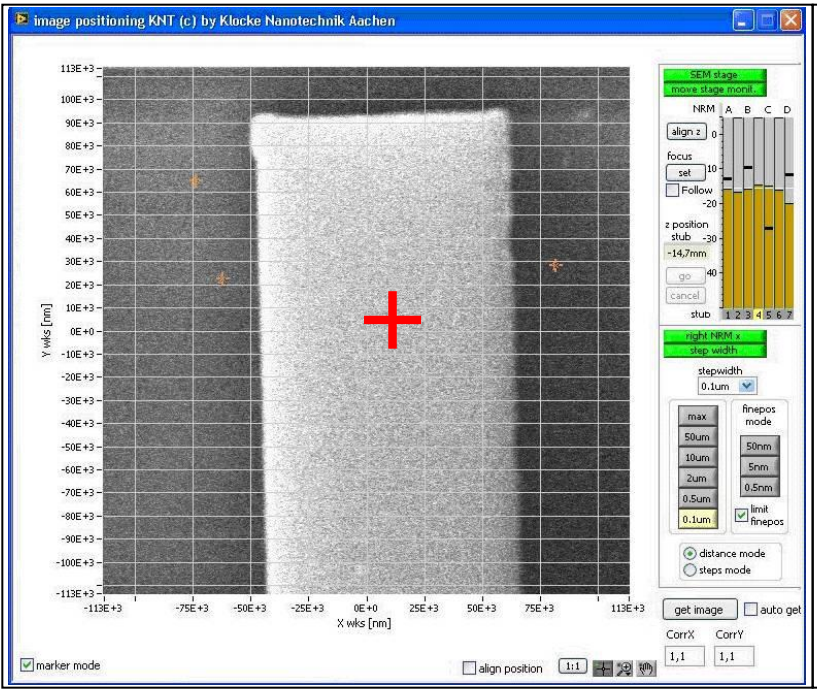
1. Nanomanipulator equipped with: 1D-Nanofinger® as Scout

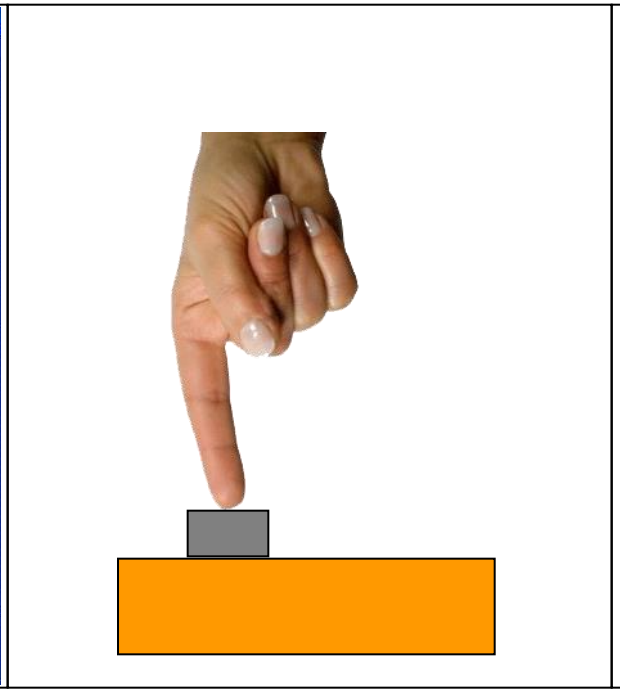
2. Nanomanipulator equipped with: Heater

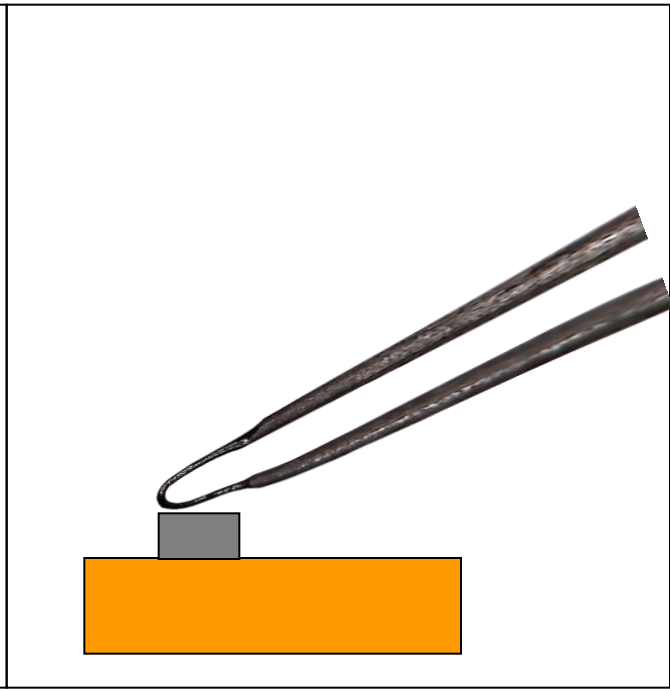
- Standard Software Package: Macro Executor, Live Image Positioning, Assistants, Sequencer

Spot-Heating

Operation Sequence







Live Image Positioning:

select target, define structures

1D-Nanofinger®:

finds target

Spot-Heater:

from 0°C to >> 1000°C

Spot-Heating

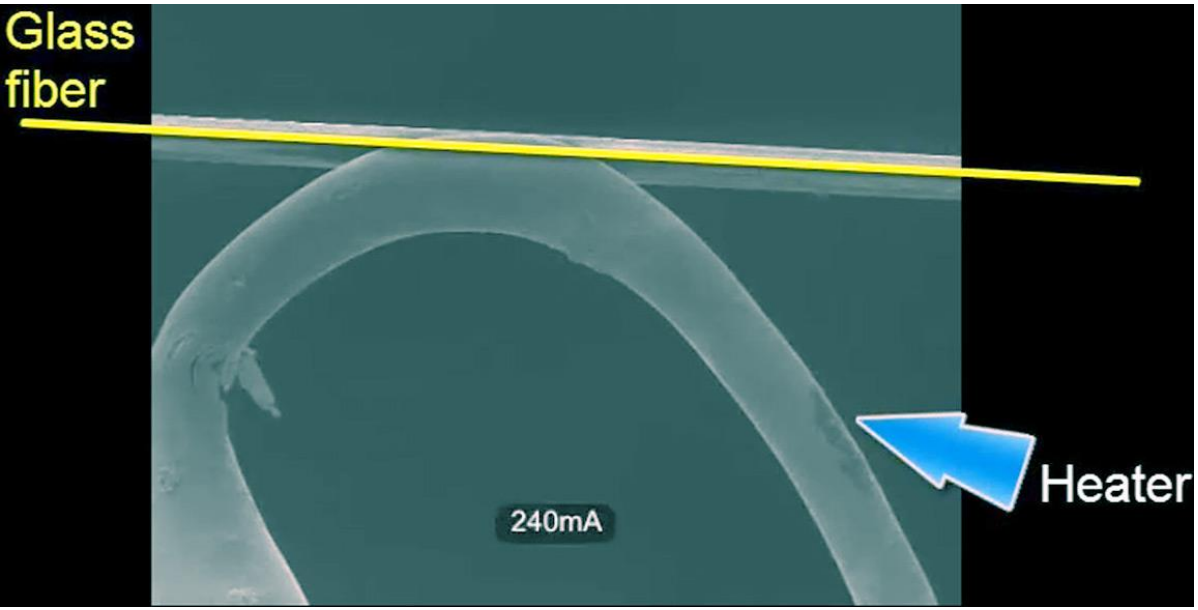
The principle

High temperatures moveable to a point:

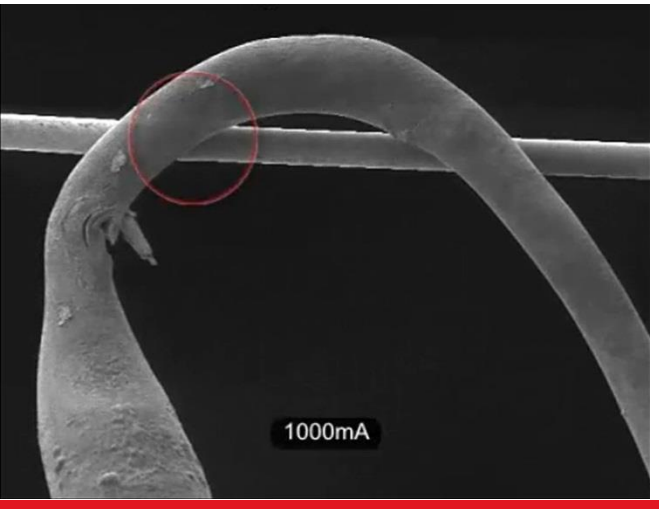
- The heat source operates like a lamp: a tungsten wire is thinned at a tiny U-shaped front area down to about 30 microns and heats up there, like the tungsten spiral of a lamp. The SEM/FIB chamber establishes the necessary vacuum.
- Depending on the given current the tungsten wire can heat up far above 1000°C.
- The heat source is fixed at one nanorobotics manipulator of the Nanoworkbench, guided to the sample by the Nanofinger® operating as Scout.
- The Sequencer allows to teach application processes for heating in closed loop with any feedback signal (temperature, current, force, …)

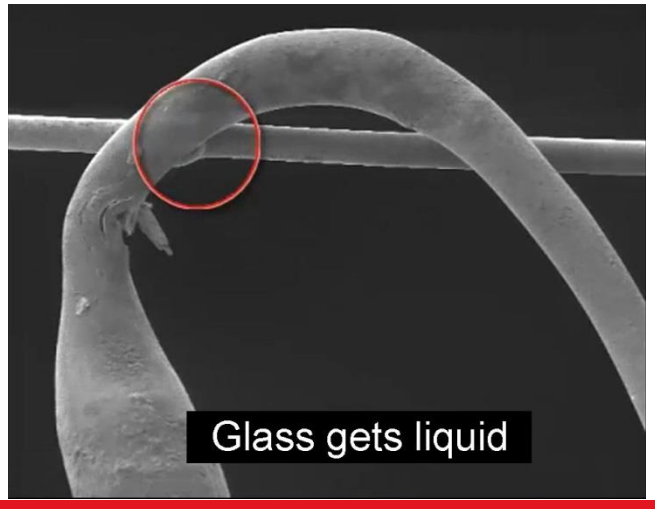
Example: Melting

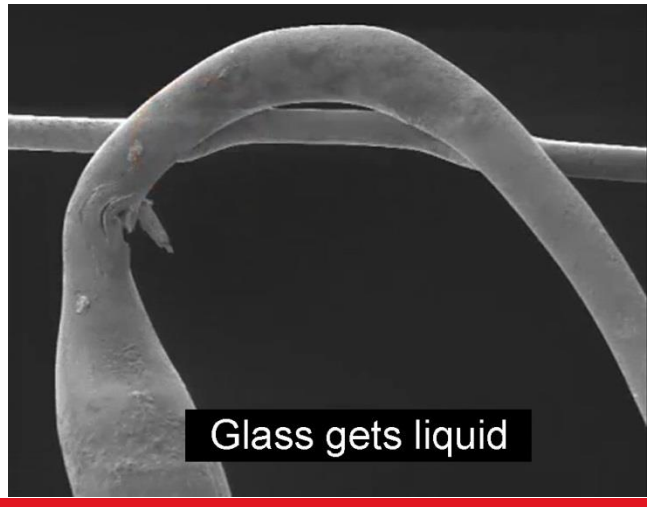
of a single Glass Fiber



- Heating of a glass fiber with the tungsten wire of the heart source

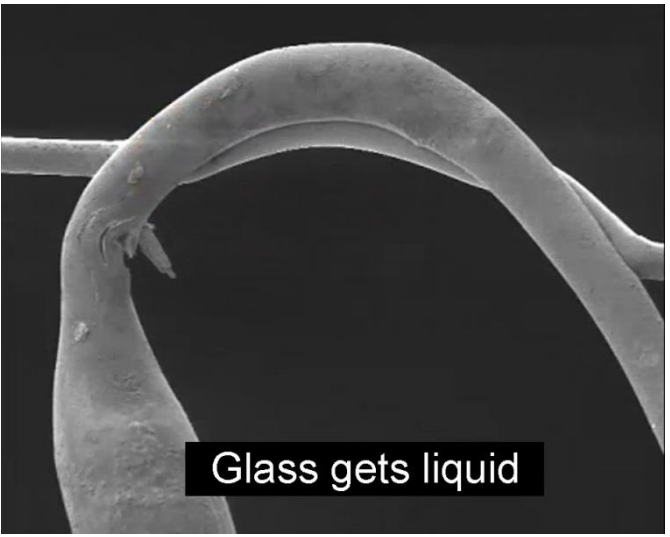


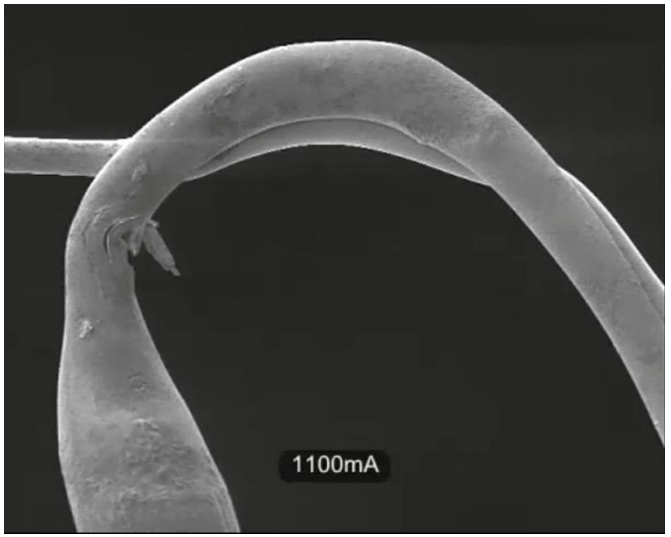




Example: Melting

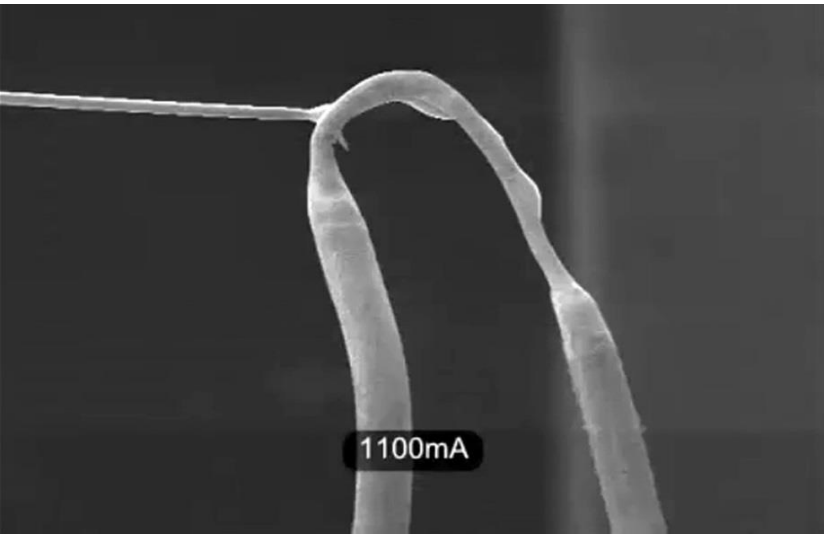
of a single Glass Fiber

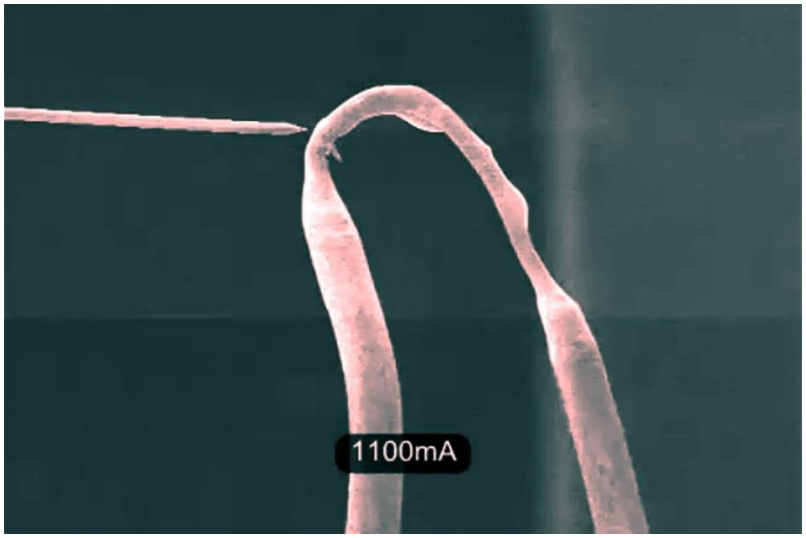




Useful for:

- Coating of a tungsten tip with hard glass
- Sharpening a glass fiber in-situ



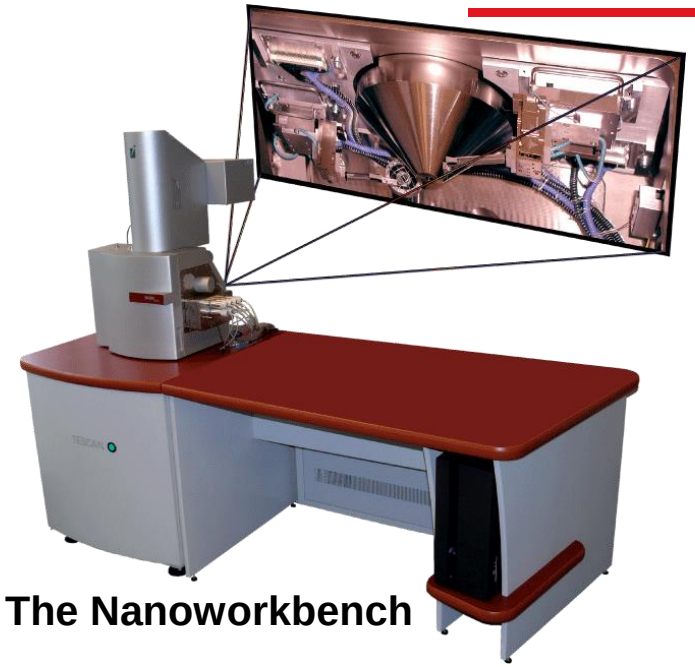


Summary

- With the Nanoworkbench from Klocke Nanotechnik spot heating of material is very fast and easy.
- Possible applications are NanoMelting, NanoWelding, NanoSoldering, material testing, etc.
- The Live Image Positioning module allows to direct the spot heater in XY to the target area just by mouse-click into the SEM image.
- The Nanofinger® operating as scout allows a fast and secure automatic approach of the spot heater to the sample, also on isolators.
- Automatic macros and absolute positioning in superior precision allow to program heating processes in closed loop with any feedback signal (temperature, current, pressure, …).

The Nanoworkbench

and its Application Packages



The Nanoworkbench

Spot-Heating …

is one out of several “Standard Application Packages”

of our Nanoworkbench.

The Nanoworkbench enables the **hand-eye coordination**

as used at Light Microscopes now in any SEM/FIB,

together with automation of the SEM/FIB **(@ZEISS, FEI, TESCAN)**





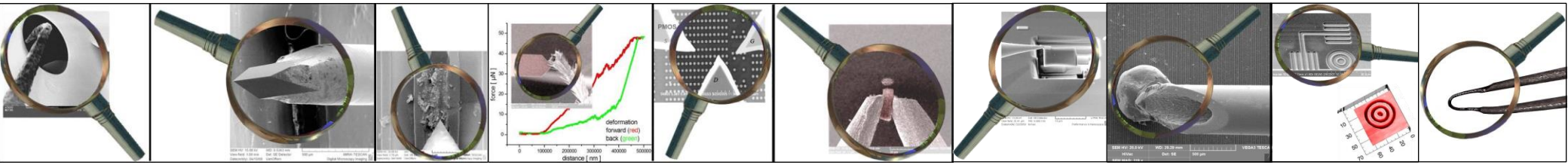
At Light Microscopes it is natural for everybody to use tool sets like tweezers, knives, hooks, probes and several different measurement tools, so it is with the Nanoworkbench.

The Nanoworkbench

One Product for all applications

The Nanoworkbench Standard Packet includes:

- The basic application package “Nanomanipulation” and
- one additional “Application Package” out of:

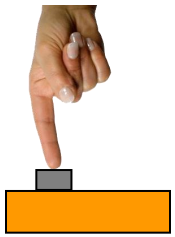


Manipulation, NanoCleaning, NanoProbing, TEM-Lamella, 3D-Nanofinger
NanoCutting, Force-Distance, Particle sorting, NanoFriction Spot-Heater

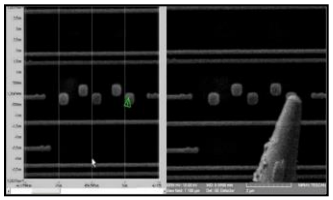
Each application package includes a standard tool, a standard sample and pre-defined processes as source-code and origin for own projects.

- **The following set of modules for easy usage an application control:**

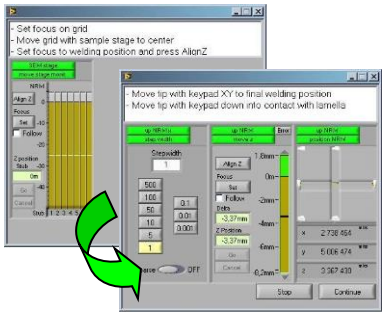
The Standard Packet



Nanofinger® as Scout, guiding the Nanoworkbench Tools,



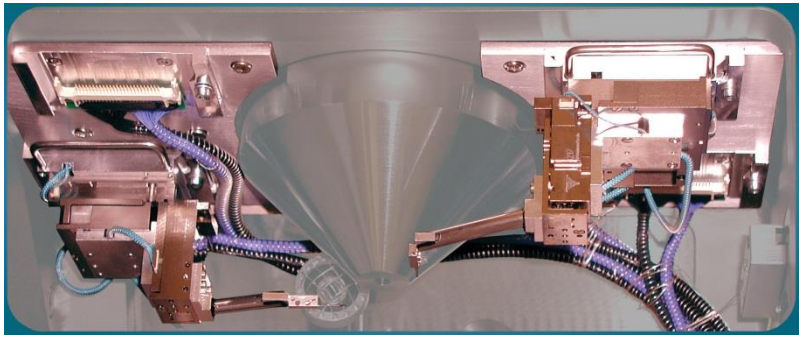
Live Image Positioning,



Assistants (Wizards),

Hand-eye coordination:

Sequencer for automation,
Macro Executor,
Remote Control,
…



2 Nanorobotics Manipulators with docking stations

More information?

Please ask for the leaflet “Nanoworkbench”

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