

The Nanoworkbench

Standard Packet:

***A powerful SEM/FIB Workbench configuration
with Nanorobotics and Wizards from
Klocke Nanotechnik***

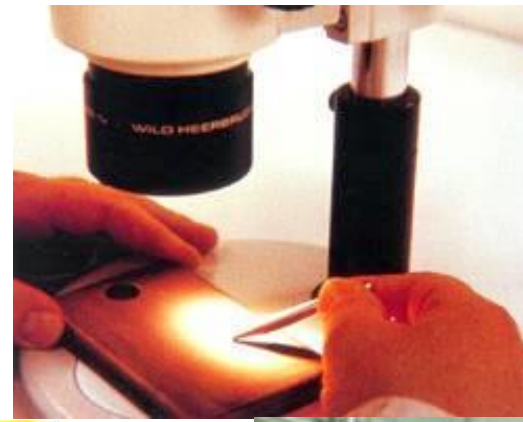


The Nanoworkbench

Motivation

At Light Microscopes...

... it is natural for everybody to use tool sets like tweezers, knives, hooks, probes and several different measurement tools.



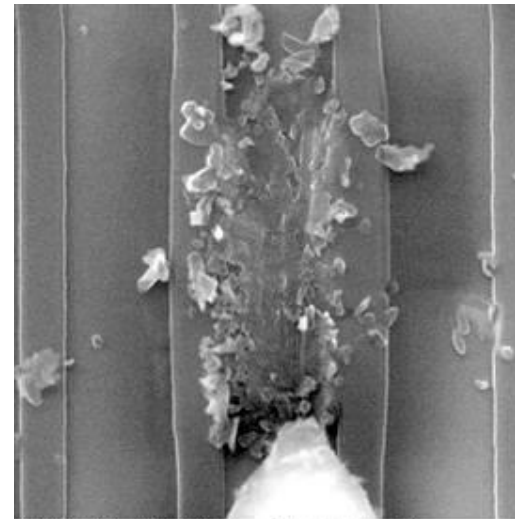
The Nanoworkbench

Motivation

But what happens at Electron Microscopes?

The operators of SEM, FIB or Dual Beam systems generally work without tool sets - and call it natural.

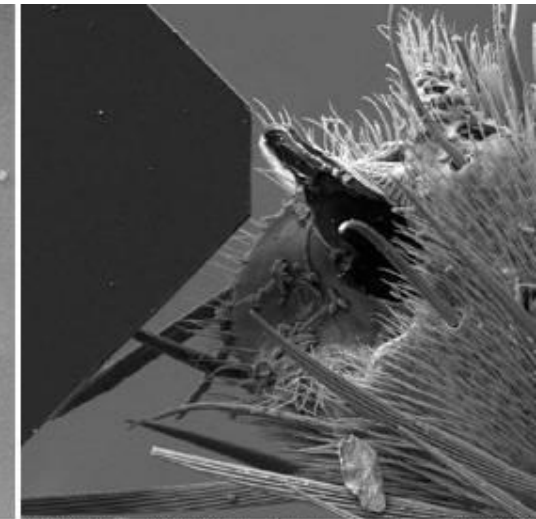
What do you want to do with your sample?



SEM HV: 20.00 kV
WD: 17.8010 mm
View field: 3.70 µm
Det: SE Detector
Date(m/d/y): 04/19/08

1 µm

MIRA TESCAN
Digital Microscopy Imaging



SEM HV: 10.00 kV
WD: 13.0270 mm
View field: 213.9 µm
Det: SE Detector
Date(m/d/y): 06/06/09

50 µm

MIRA TESCAN
Digital Microscopy Imaging

The task:

- Handling at stereo microscopes by hand and brain is intuitive and easy.
- In SEM/FIB chambers the operator looks with one eye through a few millimeter small hole in the dark, converting simple navigations into a challenge.
- Klocke Nanotechnik solved that problem

The Nanoworkbench

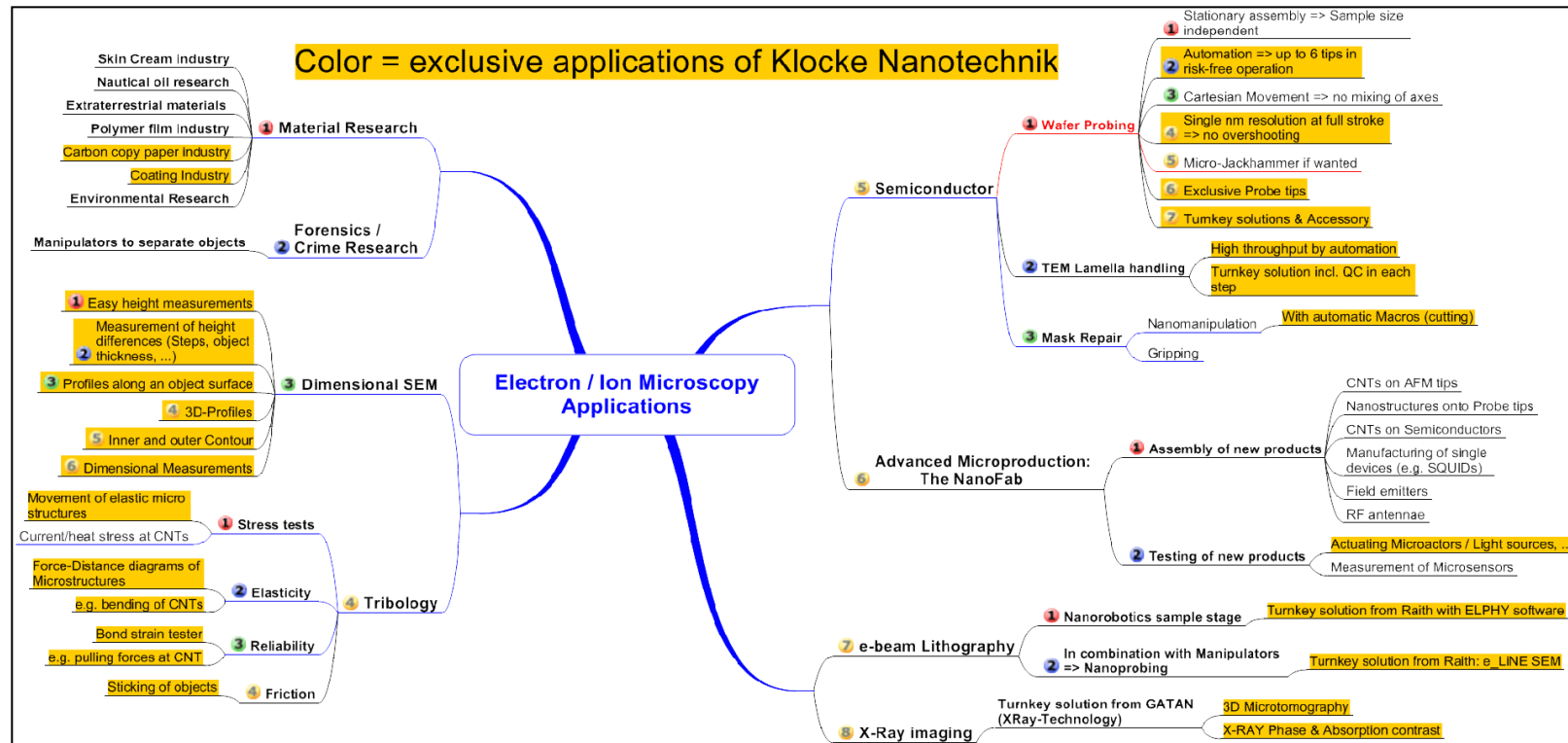
... as Standard Packet

Solution: The Nanoworkbench

... developed by Klocke Nanotechnik offers for the first time an easy to use system for in-SEM/FIB Nanomanipulation, object handling, material preparation and processing, assembly and manufacturing together with new methods for nano-characterization:

- Plenty areas
- Various configurations
- Over 300 nanorobotics components

Σ Simplification possible?

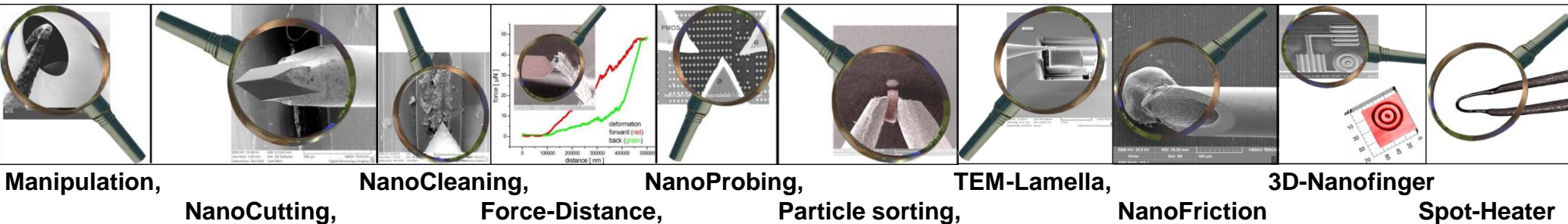


The Nanoworkbench

... as Standard Packet

The Nanoworkbench Standard Packet:

The previous sketch described briefly the complex application field. But most applications can be realized by the Nanoworkbench configured with an “**Application Package**”, that expands the SEM/FIB to a material processing system and/or a nano-analytical workbench. The following application packages are realized, further will follow:



The Nanoworkbench Standard Packet

Configuration

The “Nanoworkbench Standard Packet” includes:

- The basic application package “Nanomanipulation”
- One additional **application package** out of:
NanoCleaning or NanoProbing or TEM-Lamella or 3D-Nanofinger or NanoCutting or Force-Distance or Particle sorting or NanoFriction or Spot-Heater or further future application packages, see individual documentation of each module.

Each application package includes a standard tool, a standard sample and a pre-defined process.

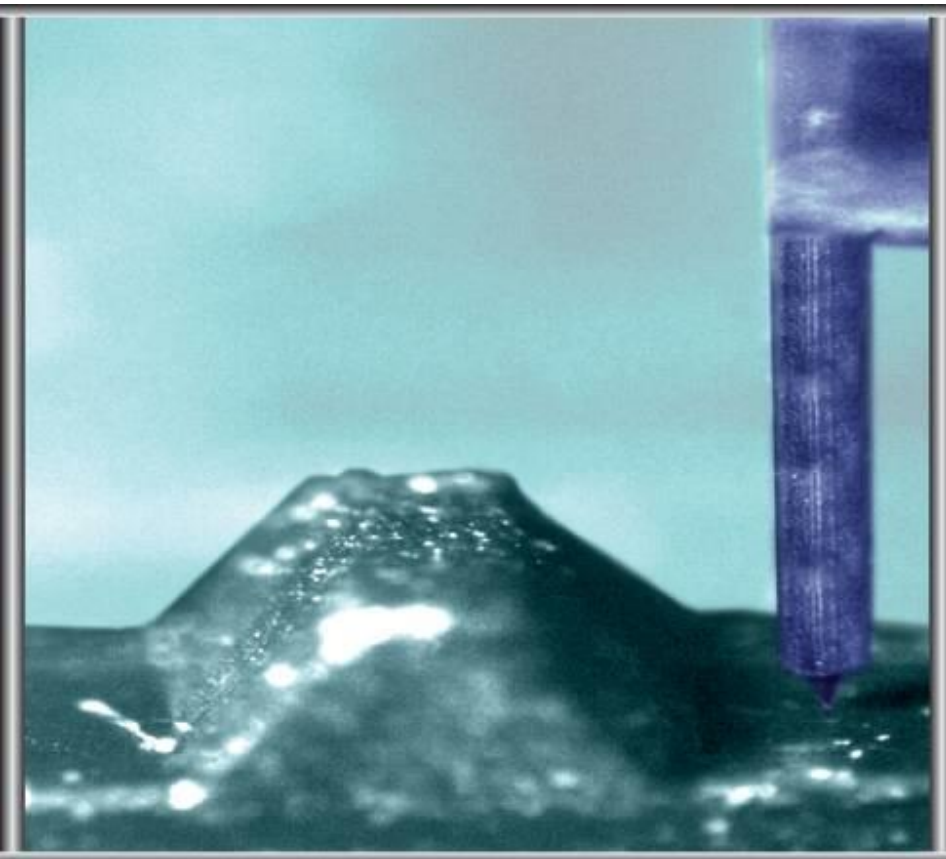
- **The following set of modules for easy usage an application control:**

The Standard Packet

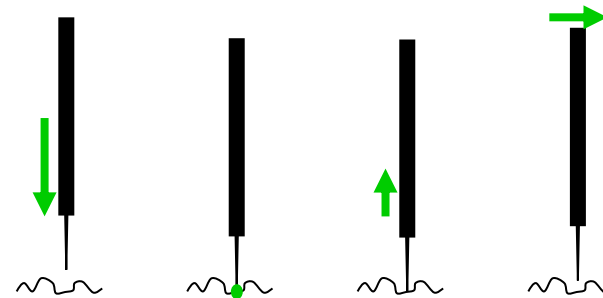
The patented 1D-Nanofinger[®]

The 1D-Nanofinger[®] as scout:

for finding sample and tool positions, also on isolators:



- Move towards a sample and stop 5 nm above, store sample position in world coordinates
- Operate as „Self Finding Tool“ => find e.g. a maximum or minimum

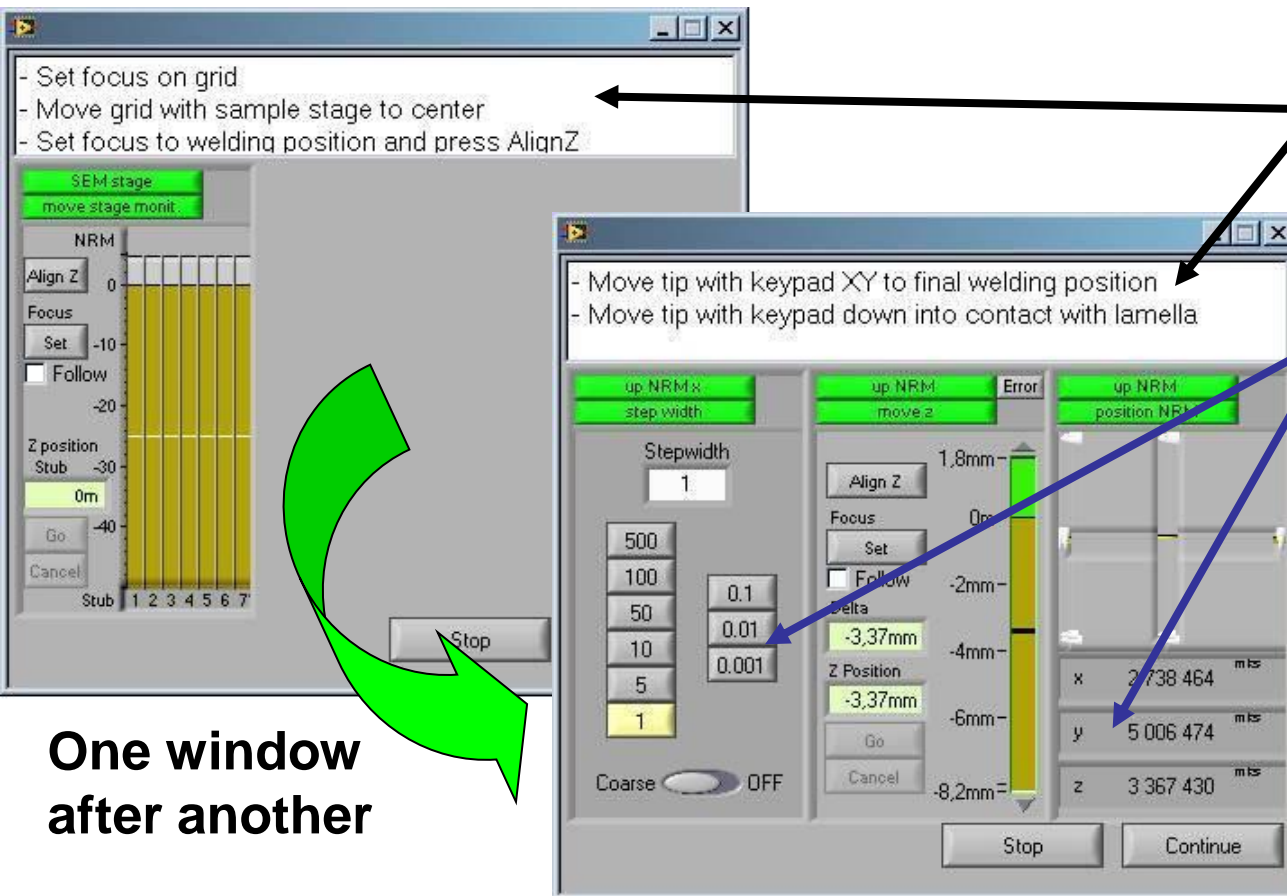


- Wizard guided movement of tools to those positions are enabled.

The Standard Packet

Assistants/Wizards for easy usage

“A suitable wizard for all applications is mandatory”



Guided process provides step by step instructions

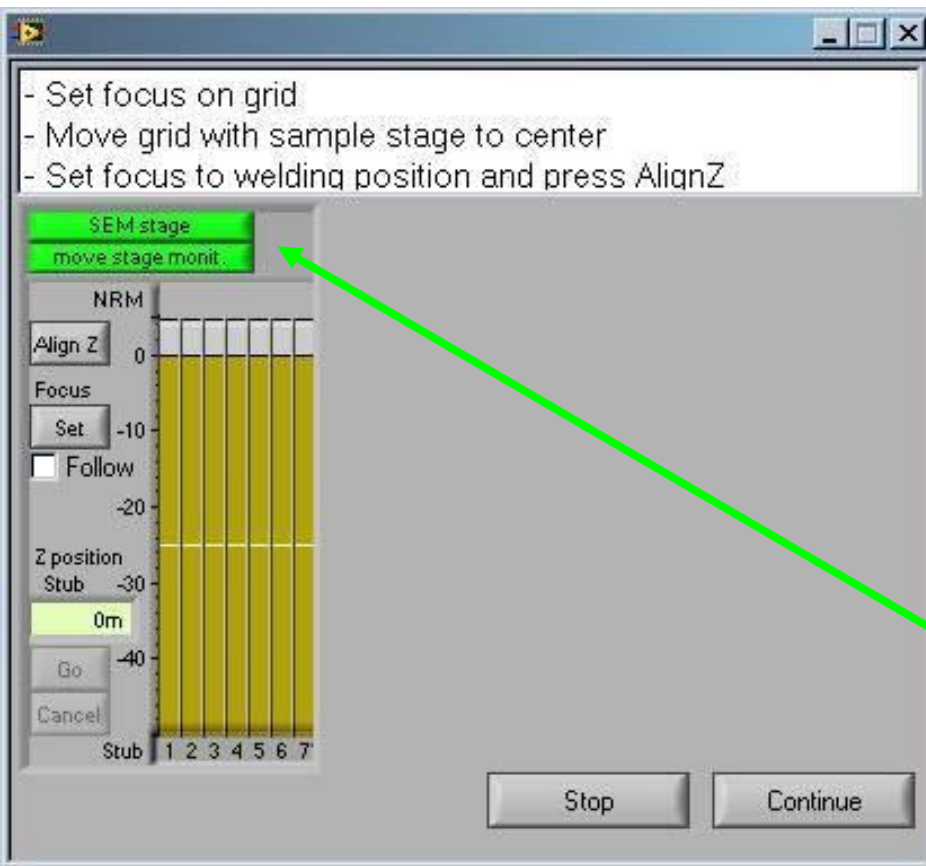
All data of user interest is clearly displayed

Processes are executed automatically, when no user input is required

The Standard Packet

Assistants/Wizards for easy usage

One common control for SEM/FIB and manipulator:

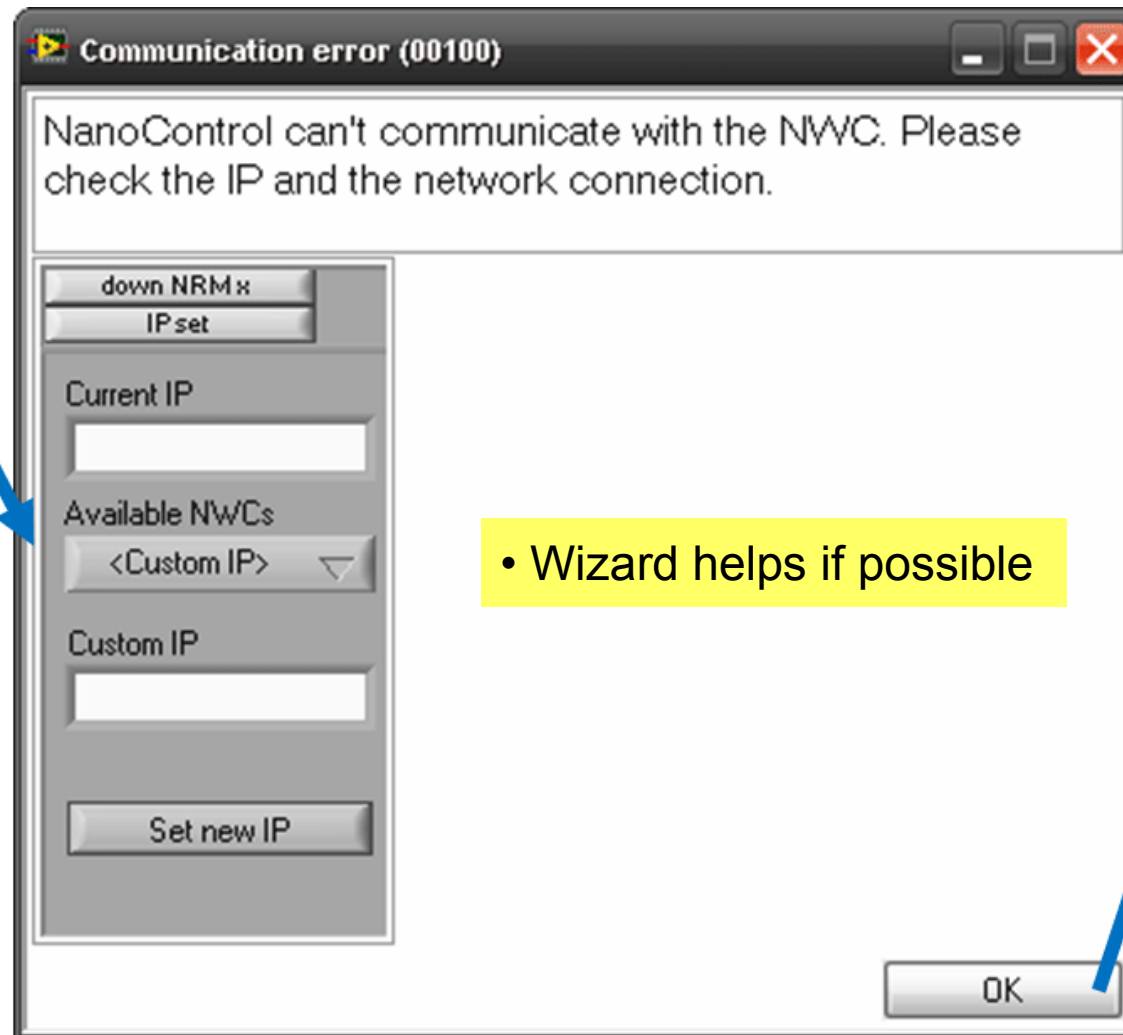


- SEM/FIB and Nanomanipulator positions are controlled in a global coordinate system
- The Wizard controls SEM/FIB stages & manipulators, reads and sets SEM/FIB focus and zoom, automates these features and guides even through complex processes
- „Traffic lights“ (green, yellow and red) show clearly the system status

The Standard Packet

Traffic Lights for easy usage

• Red => press Info



• Wizard helps if possible

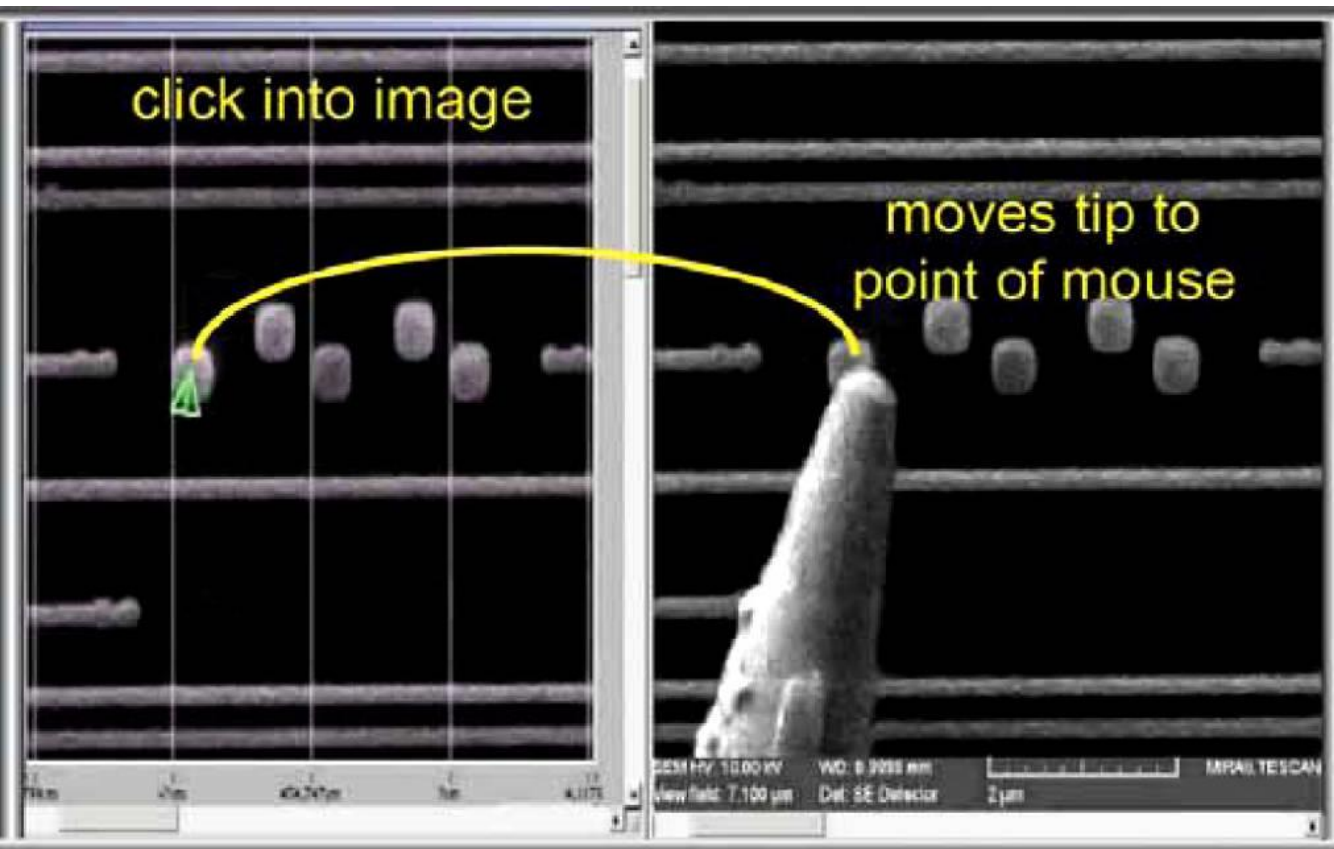
• Green = „go“



The Standard Packet

Live image positioning

Live Image Positioning, movements in World Coordinates:



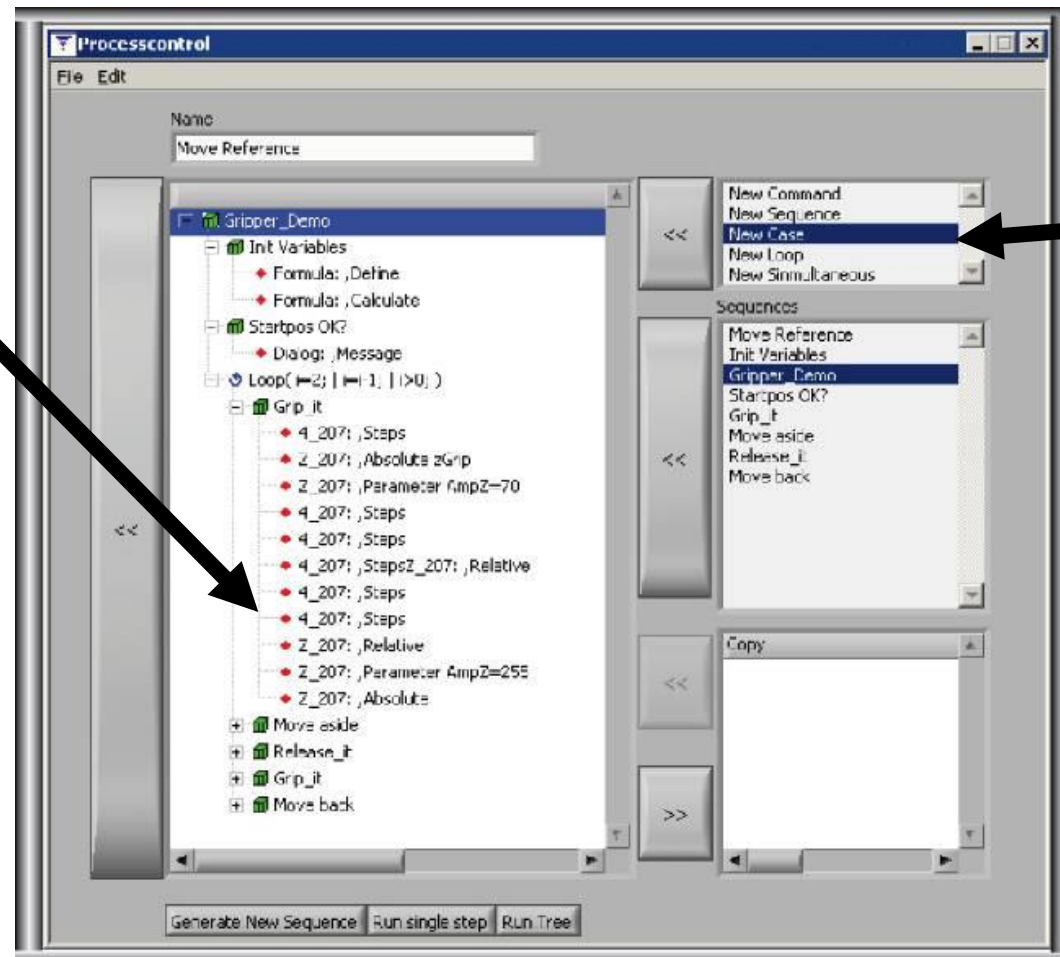
- One mouse click in the SEM image moves any tool to this position in XY direction
- Sample stage movements can be included
- Flag positions
- Automatic tool approach by Nanofinger® in Z-direction

The Standard Packet

Sequencer for Automation

- Sequencer with intuitive tree structure:

with icons for
command levels



Commands,
Sequences,
Loops
Cases
Simultaneous

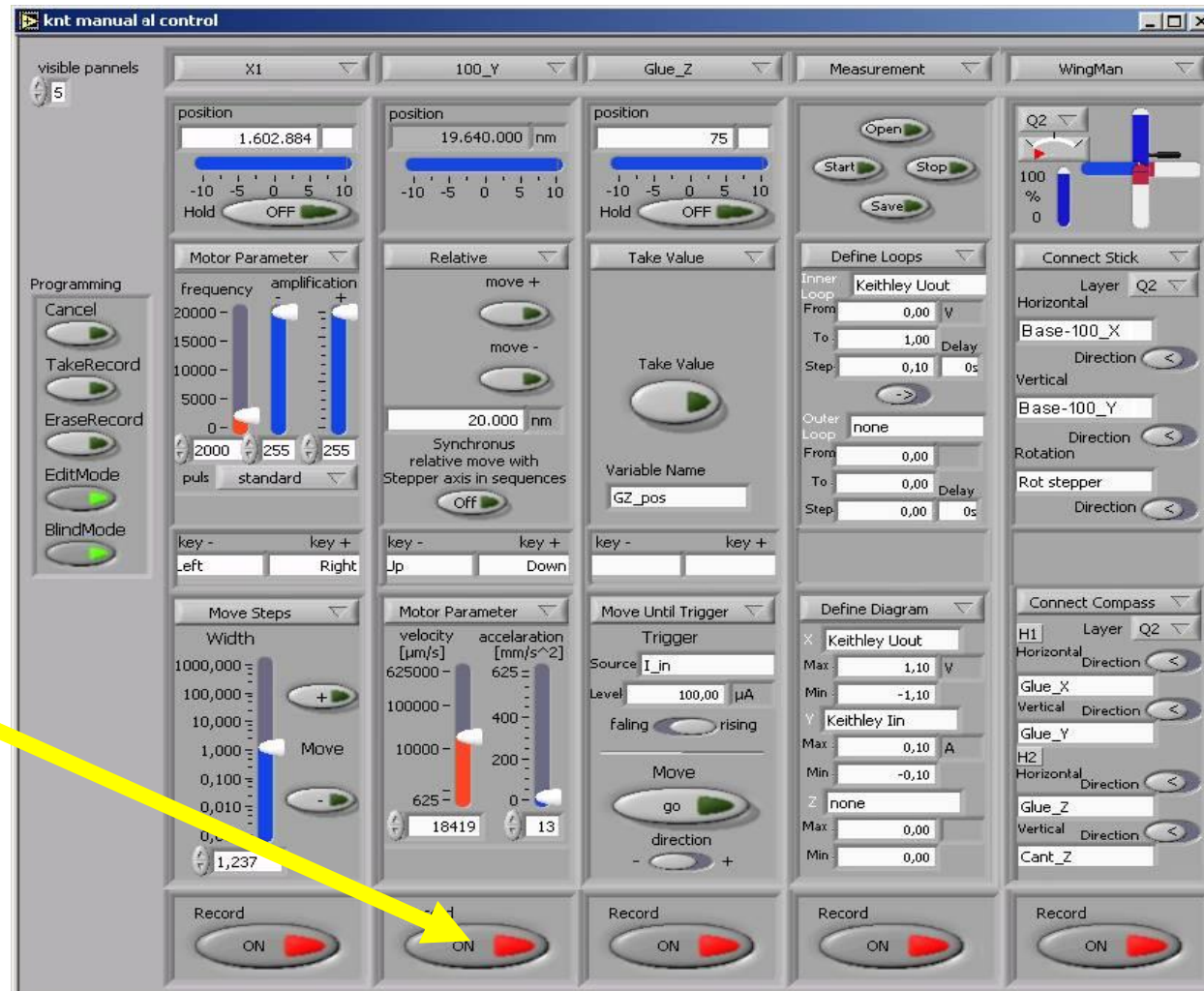
... and:
Wizards!

The Standard Packet

Sequencer for Automation

Programming of the
Sequencer for automation ...?

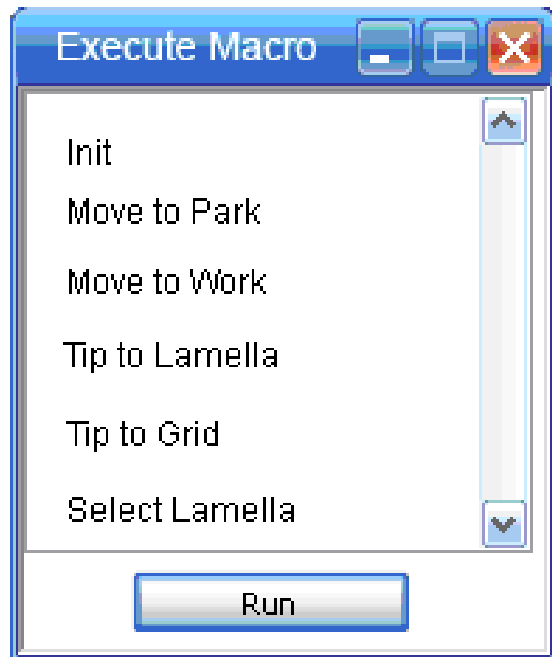
... simply with record buttons!



The Standard Packet

Macro Executor

The Macro Executor controls everything:



- Calls all macros and processed defined in the system
- Is executed by Remote Control interface

The Standard Packet

User Login for secure usage

- **System selection:**

pre-configured arrangement of Nanorobotics
fitting to a particular system,

NanoControl 13
version 13_0028

System
Develop (DB)

Account
User IB
Password

☐ Automatically logon next time

Start Close

- **Login for:**

+ Standard Users
+ Administrators

- Only Administrators
have access to the
Sequencer

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Summary

The Standard Packet includes:

- The basic application package “Nanomanipulation”;
- One additional application package out of:
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- A standard tool, a standard sample and a pre-defined process for each application;
- The following set of modules for easy usage an application control:
Self Finding Tool, Live Image Positioning, Assistants (Wizards), Sequencer for automation, Macro Executor, User Logins, Remote Control;
- Hardware:
2 Nanorobotics Manipulators including docking stations.
2 Controllers
System integration

® Nanofinger is a registered Trademark of Klocke Nanotechnik GmbH