

## 1. APPLICATION

The intended use of the probe-station **SMARPROBE** is the positioning of probes to analyze or manipulate samples fixed onto its sample stage. The system can be used for atmospheric probing of large samples up to nano-probing of the latest semi-conductor technologies within an electron microscope. If the intended use is nano-probing it is recommended to choose the **SMARPROBE LX** with an active temperature control for low thermal drift (*L*) and/or with an extended scan range for vibration free fine-positioning (*X*). Typical applications of the **SMARPROBE** are:

- Electrical Characterization of Nano-Materials (i.e. *I-V*, *C-V* analysis)
- Failure Analysis via Electron Beam Induced Characterization Methods (i.e. EBAC and EBIC)
- Mechanical Manipulation of Nano-Materials
- Surface Analysis Experiments (with customized extensions)

Together with partners we can offer complete nanoprobng solutions, including SEM, necessary electronics and the **SMARPROBE** system. Please do not hesitate to contact us for further information.

### Key Properties

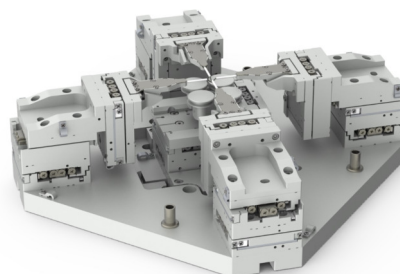
1 nm Closed Loop Positioning Resolution
25x25 mm Probing Area
>13 µm Scan Range
<1 nm/min Thermal Drift
In-situ Current Amplifier available
Auto-Touch Function available

## 2. SPECIFICATIONS

The **SMARPROBE** system is composed of the following elements, manipulators including probe holders, a sample stage, two vacuum feedthroughs, a rack for the control electronics and a graphical user interface (GUI). The **SMARPROBE** come in two different sizes, SP4 with up to four manipulators and SP8 with up to 8 manipulators. You can choose the *L* and the *X* option for low drift and extended scan range of the manipulators. Further it is possible to change between the standard and the advanced probe holder or to fully customize the system.

All manipulators and control electronics of the **SMARPROBE** are based on the SmarAct GmbH standard products which guarantees highest production standards and continuous support.

SP4LX



SP8LX



General Specifications	
Operating Environment	HV ( $10^{-7}$ mbar), Ambient Conditions
Plasma Cleaning	Compatible
Numbers of Manipulators	Up to 8
Coarse Driving Principle	Piezo Stick-Slip
Fine Driving Principle <sup>1</sup>	Piezo Scanner
Relative Drift between Probe and Sample	$> 1, < 1$ for $L$ Extension
Max. Probing Area [mm]	25x25
Max. Sample Size [mm]	25x25, larger size will reduce probing area
Min. SEM Working Distance [mm]	1 for 10x10 Samples 2 for 25x25 Samples
Base Materials	Aluminium/Titan
Dimensions Nanoprober, W x L x H [mm]	187 x 187 x 56 for 5-8 Manipulators (SP8) 156 x 156 x 56 for 2-4 Manipulators (SP4)
Dimensions Rack for Electronics, W x L x H [mm]	600 x 800 x 1400

Manipulator Properties	
Positioner Type <sup>2</sup>	CLS-3232, X Extension: DLS-3232
Movement Range [mm]	X=21, Y=13, Z=13
Scan Range [ $\mu$ m]	$> 3$ , X Extension : $> 13$
Closed-Loop Position Resolution [nm]	1
Max. Lift Force [N]	$> 1.5$

Sample Stage Properties	
Positioner Type <sup>2</sup>	CLS-3232
Movement Range [mm]	3 DOF; X=15, Y=17, Z=14
Scan Range [ $\mu$ m]	$> 3$
Closed-Loop Position Resolution [nm]	1
Sample Mounting	SEM Stub Holder (optionally up to 4)
Max. Lift Force [N]	$> 1.5$
Electrical Connection	Coaxial, Triaxial upon request
Heating/Cooling Option <sup>3</sup> [ $^{\circ}$ C]	-20 to +120

Probe Properties	
Probe Mounting	Needle Holder is fully removable
Probe Needle diameter [ $\mu\text{m}$ ]	500 or 250
Conductor Type	Coaxial, Triaxial upon request
Maximum Measurement Frequency [MHz]	100
Leakage Current at 10 V [ $\mu\text{A}$ ]	< 1
Conductor Resistance [ $\Omega$ ]	1
Maximum Voltage [V]	210
Maximum Current [mA]	105

Vacuum Connector Properties	
Connector for Motion System	1-2x Zero Force Connector
Flange Size [mm]	130 x 150
Connector for Probe Signal Conductor	1x Push-Pull Connector
Flange Size [mm]	20 x 20

User Interface Properties	
Software requirements	Windows 10
Hardware Interface	USB
Motion Control	Point+Click within SEM picture, Joystick
Joystick	Precise (10 bit) 3-axis Joystick

Accessories	
Advanced Probe Holder	Automatic Tip Landing + Current Amplifier
Heating/Cooling Stage	Water Cooled Peltier Stage
Triaxial Option	Reduced Leakage Current
Source Measurement Unit	Keithley 4200 with up to 8 SMUs

<sup>1</sup>Only applicable for the X Extension

<sup>2</sup>See CLS-3232 and DLS-3232 specification sheet, available at SmarAct GmbH, for further information.

<sup>3</sup>A water-cooled peltier stage can be inserted in place of the sub-stage

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