Anton Paar

Tosca Series

Atomic force microscopes

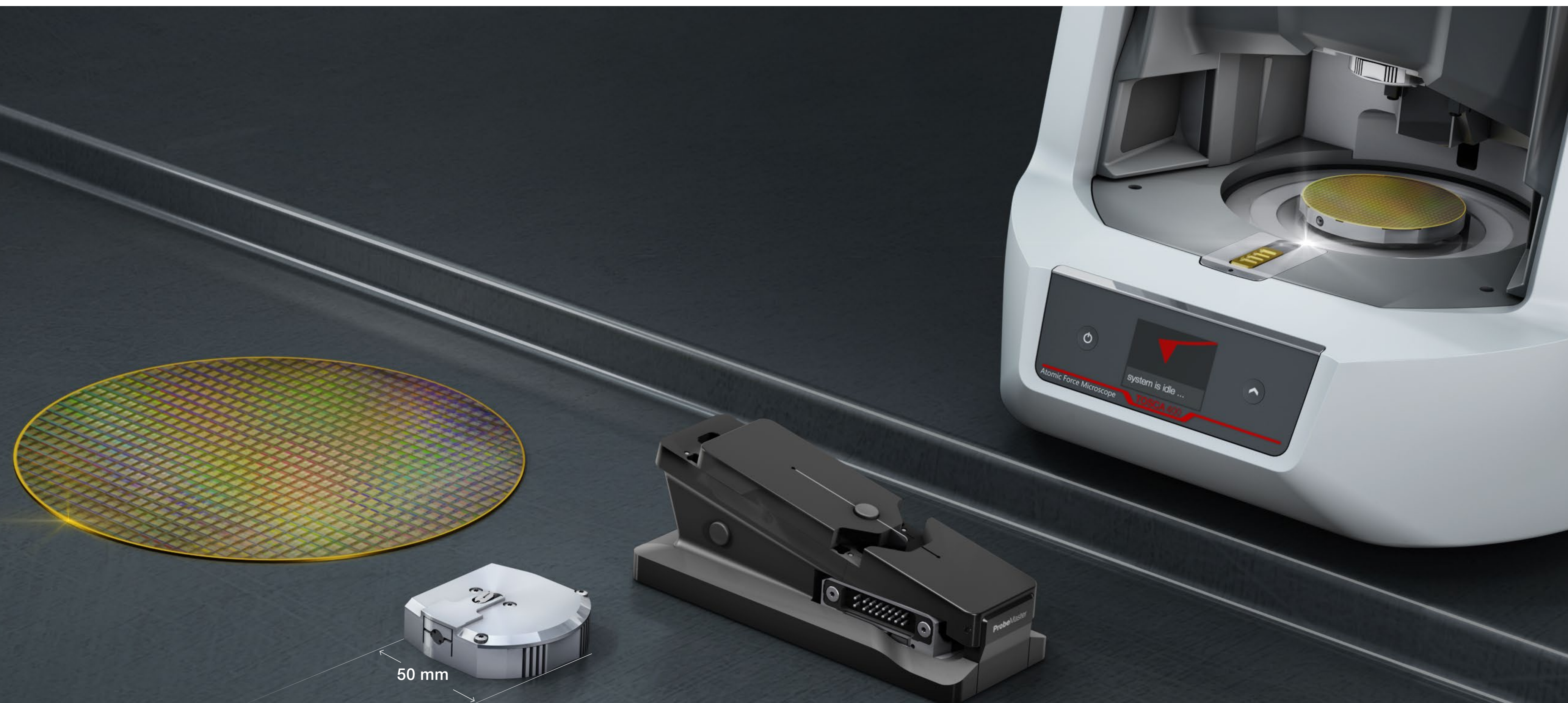
Top-level AFM for **entry-level** budgets

Are you looking for an affordable AFM that can keep up with your nano surface analysis needs? Tosca from Anton Paar is the new standard for researchers, pioneers, thinkers, and creators in nanotechnology material science who want to spend less time worrying about their AFM and more time concentrating on their research.

- **12 x** faster user training
- **10 x** faster time-to-measure
- Cantilever exchange in **10 seconds**
- **200 mm** fully addressable sample stage
- Scan size **15 µm x 100 µm x 100 µm in Z, X, Y**

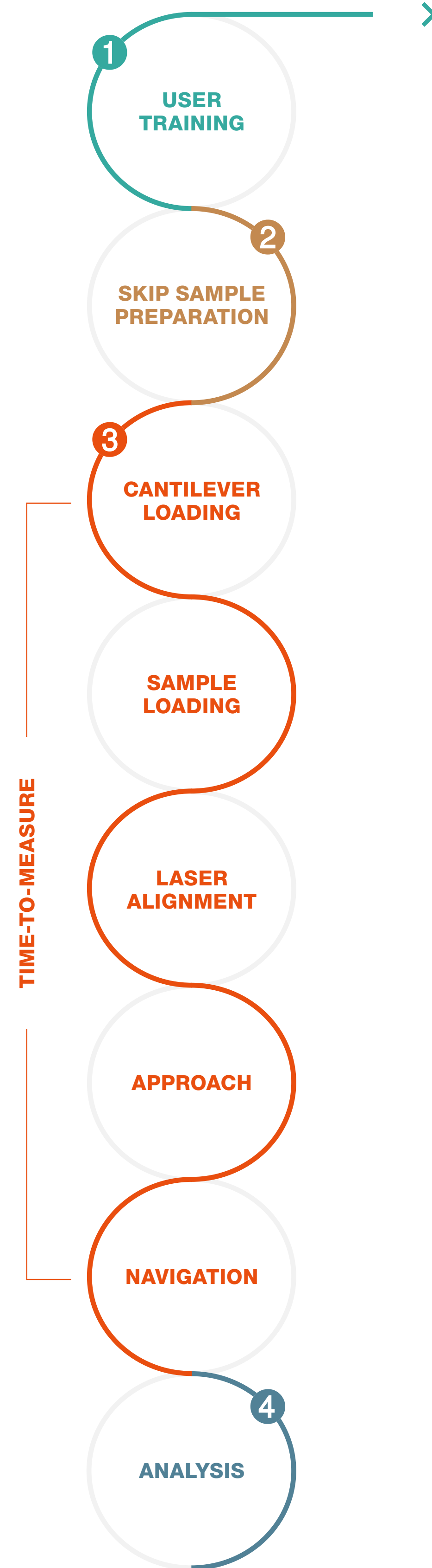
EACH COMPONENT HAS BUILT-IN BENEFITS →

The centerpiece of this cleverly engineered AFM is the patented actuator body that includes a z-piezo and z-sensor. It is small and light and fits into the palm of your hand, has no wires, thus leaving plenty of room to operate. It slots into a specially designed patented cantilever exchange tool, making cantilever exchange safer and easier than ever before. The unique design of the actuator body enables the measurement of the exact same spot on the sample surface with all available modes and a single hardware setup – without cantilever or head exchange.



The **smart** AFM your research deserves

Tosca gets you from training to results in the quickest time: Instead of spending days learning to operate the AFM, start measuring after 1 hour. Fast and safe cantilever loading in seconds, automatic laser alignment, the most intuitive sample navigation, and the safest engagement procedure on the market lead you to your goal: more time to focus on your research results.



1 USER TRAINING

CHALLENGE

I want to get started straight away. How much time do I need to learn to use Tosca?

SOLUTIONS

Tosca is so easy to operate that training for use with the standard modes only takes 1 hour.

YOUR BENEFITS & TIME SAVED

With Tosca, you can start your first measurment after 1 hour of training instead of 1.5 days on conventional AFMs.

Training takes only **1 hour**

12 x faster than conventional AFMs

2 SKIP SAMPLE PREPARATION

Cutting and slicing samples can result in damage and contamination. How can I avoid this?

Forget sample preparation and the associated risk of contamination or falsified results. With Tosca, you can directly measure large samples of up to 25 mm in height and up to 10 cm in diameter.

With Tosca, you get accurate results and can skip this tedious preparation step. Time saved: up to 15 minutes, depending on the sample.

No sample preparation required

Measure **large samples** directly

Focus on your **research**, let Tosca do the rest

3 CANTILEVER LOADING

CHALLENGES

Cantilever exchange and positioning is tricky and time-consuming. Is there a better way?

SOLUTIONS

Use the patented Probemaster for hands-free cantilever exchange in 10 seconds.

PATENT: AT520313 (B1)

YOUR BENEFITS & TIME SAVED

Probemaster quickly positions your cantilever, prevents damage, and enables proper alignment.

Position your cantilever in **10 seconds**

No **cantilever** breakage

SAMPLE LOADING

Is it possible to load more than one sample to streamline the process?

Load multiple samples and measure them in one run. Tosca's patented magnetic lock ensures stable positioning of the samples.

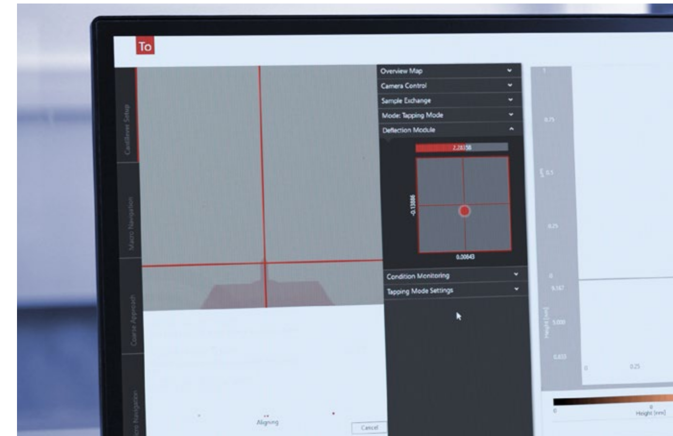
PATENT: AT515951 (B1)

Fix the samples on the large carrier at the location of your choice and rely on stable positioning. Measure multiple samples in one step. Time saved: depending on the user, up to 20 minutes per sample.

Load **multiple samples** and measure them all in one run

Save up to **20 minutes** on repeated sample replacement

LASER ALIGNMENT



CHALLENGES

Manual alignment of the laser is a tedious procedure that also requires expertise. Is there an alternative?

SOLUTIONS

Tosca provides fully automatic laser alignment in 5 seconds.

PATENT: AT520419 (B1)

YOUR BENEFITS & TIME SAVED

The Tosca automatic laser alignment feature makes you an alignment expert. It only takes you two clicks in the software. Time saved: up to 5 minutes per alignment.

Fully automatic laser alignment in **5 seconds**

Just takes **two mouse-clicks** in the software

APPROACH

Getting the approach right is difficult. How can I avoid head crash and cope with complex geometries, transparent samples, and samples embedded in glass?

Tosca's patented side-view camera allows for the safest and easiest engagement procedure on the market.

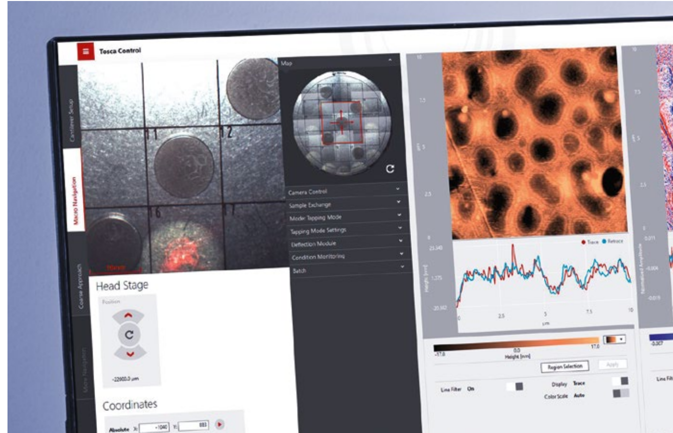
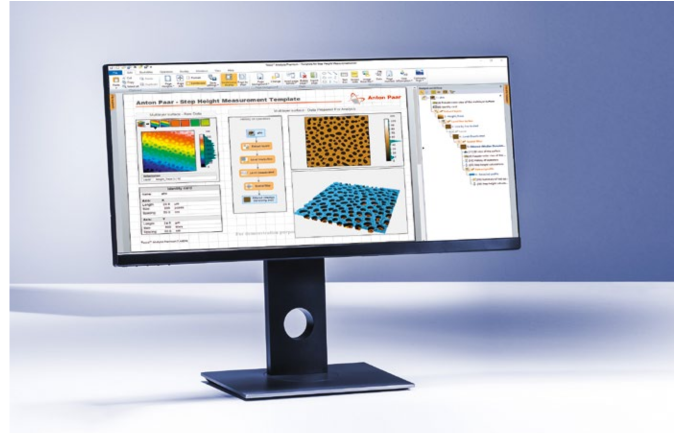
PATENT: EP3324194B1

Using the horizontal view of the cantilever over the sample surface lets you visually monitor the approach. Time saved: depending on the sample and user, 5 to 10 minutes with significantly lower risk of failure.

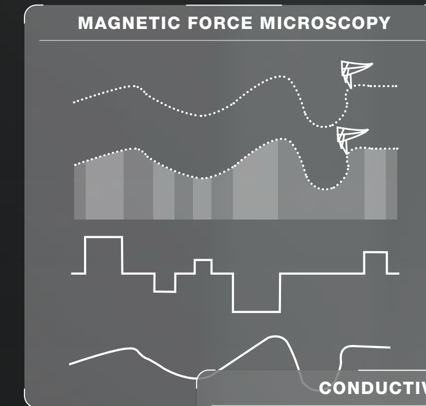
Safe and **quick** approach

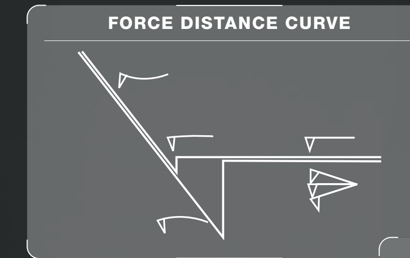
No risk of head crash

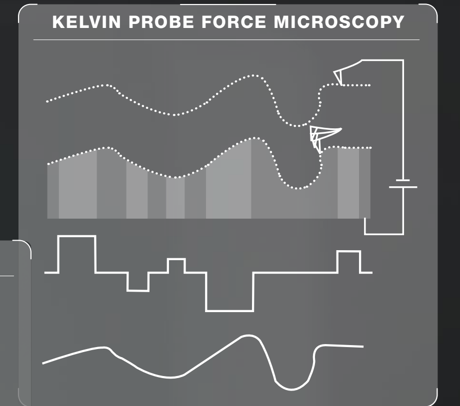
Get the **most** out of your **data**

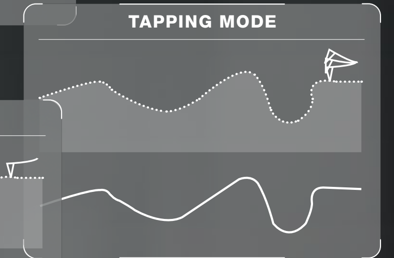
NAVIGATION	4 ANALYSIS
	
CHALLENGE	
Finding the area of interest on the sample requires time and patience. How can I optimize this procedure?	I need an analysis software with a range of analysis possibilities and templates. I also need the option of tracing all analysis steps.
SOLUTIONS	
Tosca implements an intuitive click-and-move navigation: just click on the region of interest for immediate automatic navigation instead of time-consuming manual positioning.	Use the Tosca Analysis templates to obtain complete reports within seconds. Each individual analysis operation is recorded, so you can trace the raw data handling at all times.
YOUR BENEFITS & TIME SAVED	
Navigation only requires a single mouse-click, possible on a large scale from cm, µm, down to nm with three integrated cameras. Time saved: 5 to 10 minutes per measurement with the additional benefit of convenience.	You only need to load the raw data, also multiple data from batch measurements, and the report is completed within 5 seconds. Time saved: up to 20 minutes per analysis report.
Click-and-**move** navigation	Always keep raw data and **trace** all analysis steps
Save 5 to **10 minutes** per measurement	Reports complete in **5 seconds**

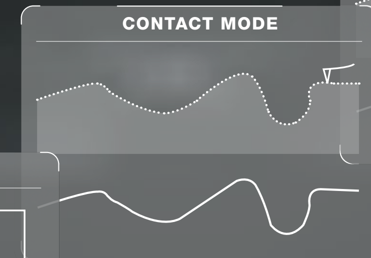
One location, **all** modes

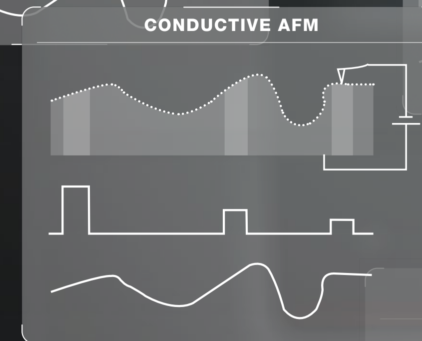


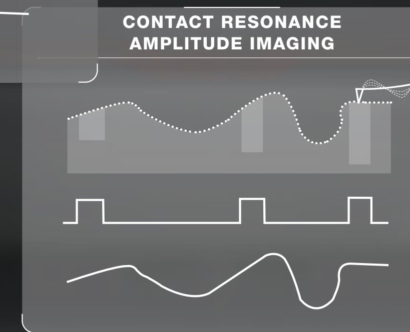


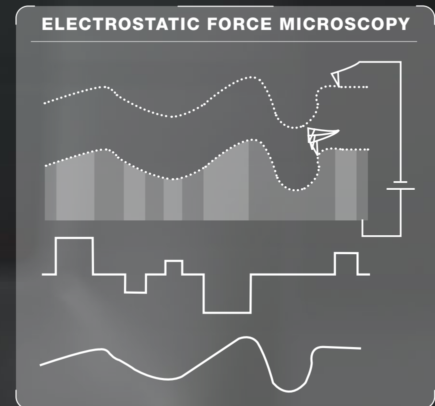












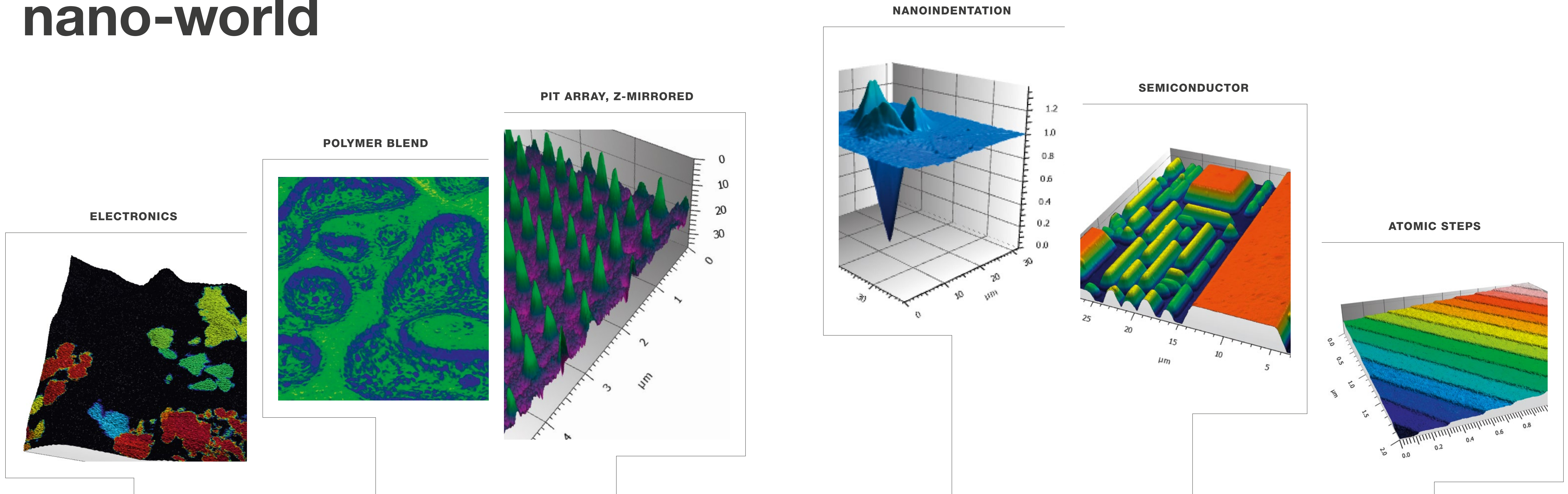
ALL MODES ON ONE LOCATION →

Due to its unique engineering, Tosca AFM gives you the possibility to investigate mechanical, electrical, and magnetic sample properties on the same location with a single hardware setup.

Load the cantilever and measure all applicable modes on the exact same location without head or cantilever exchange. Superimpose various sample properties measured on the same spot to get great insights for your material analysis.

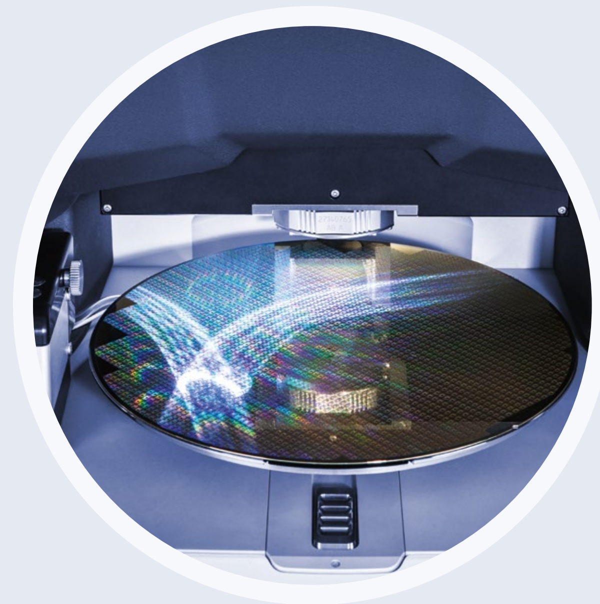
Read more

Discover your samples in the **nano-world**



	ELECTRONICS	POLYMER BLEND	PIT ARRAY, Z-MIRRORED	NANOINDENTATION	SEMICONDUCTOR	ATOMIC STEPS
DETAILS	Cracked thick-film resistor (500 kΩ); current and height overlay image, image size 700 nm x 700 nm, resolution 400 x 400 px	PMMA/SBS polymer blend, phase and height overlay image, image size 10 µm x 10 µm, resolution 500 x 500 px	PDMS membrane, height image (z-mirrored), image size 5 µm x 5 µm, resolution 500 x 500 px	Nanoindentation on copper using a Berkovich nanoindenter, image size 38 µm x 32 µm, resolution 500 x 500 px	Wafer, image size 30 µm x 30 µm, resolution 500 x 500 px	Silicon carbide, step size 0.76 ±0.03 nm (nominal step size 0.75 nm), image size 2 µm x 2 µm, resolution 500 x 500 px
MODE	Conductive atomic force microscopy	Contact resonance amplitude imaging	Tapping mode	Tapping mode	Tapping mode	Contact mode
ANALYSIS	Tosca perfectly shows the different conductive domains in this standard SMD resistor by the precise current measurement of the C-AFM mode.	Tosca provides excellent insight into the surface distribution of the polymer components due to the difference in their mechanical properties.	Tosca measures multiple dimensions, such as the lattice constant of the array and the surface diameter and height of the individual pits.	Tosca provides a high-resolution 3D visualization of the indent at the nanoscale. The surface area, height, and volume of indent, and the pile-ups are precisely calculated. This is important for determining the materials' mechanical properties, such as hardness and Young's modulus.	The deposited structures on the wafer are clearly imaged in 3D and the size of the individual components can be measured.	Tosca precisely measures the single atomic step. This is a high-quality imaging tool for investigating 2D materials, such as graphene or molybdenum disulfide (MoS_2) with a sub-nanometer film thickness.

Your tools for high-end **AFM**



← WAFER STAGE

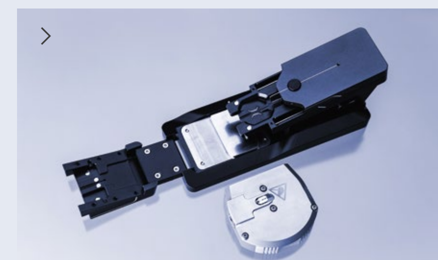
The fully addressable Wafer Stage can handle wafers of up to 200 mm in size and is designed for wafer handling with vacuum tweezers. This stage, combined with the batch measurement of the Tosca Control software, enables you to measure multiple pre-defined spots on the wafer in a fully automated way, also remotely. You can perform roughness analysis on a full wafer to optimize and develop new processing steps and perform failure analysis. For measuring multiple wafer fragments, you can easily switch to the standard stage.

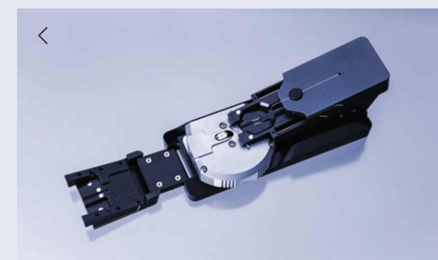
← ACTIVE VIBRATION ISOLATION AND ACOUSTIC ENCLOSURE

The active vibration isolation is necessary for measurements at extremely high resolutions, especially on the sub-nanometer scale. It compensates for vibrations caused by, for example, vehicles passing by the laboratory building. With this accessory, distortions or measurement errors are eliminated. The acoustic enclosure for the Tosca series is an additional and optional accessory which eliminates noises such as air conditioning, closing doors, and voices. The enclosure has a robust steel frame which can be moved easily on the integrated wheels.

PROBEMASTER ↓

There are many different cantilevers and brands on the market – Tosca allows you to use your favorite one. Just put the actuator body and the cantilever into the Probemaster, the patented cantilever exchange tool from Anton Paar, slide it back and you now have the cantilever of your choice in an optimal position for your next measurement. There is no need to use tweezers anymore. Probemaster provides extensive space for placing a cantilever, so it can easily be handled by inexperienced users.





“

We are confident in the high quality of our instruments. That’s why we provide **full warranty for three years**.

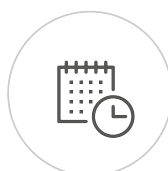
”

All new instruments* include repair for 3 years.
You avoid unforeseen costs and can always rely on your instrument.
Alongside the warranty, we offer a wide range of additional services and maintenance options.

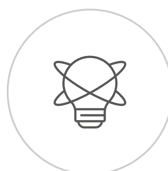
*Due to the technology they use, some instruments require maintenance according to a maintenance schedule. Complying with the maintenance schedule is a prerequisite for the 3-year warranty.

Service and support directly from the manufacturer
Our comprehensive service provides you with the best individual coverage for your investment. You benefit from:

MAXIMUM UPTIME: Regardless of how intensively you use your instrument, we help you keep your device in good shape and safeguard your investment – including a 3-year warranty.



THE SHORTEST RESPONSE TIME: We provide a response to your inquiry within 24 hours – from real people, not from bots.



CERTIFIED SERVICE ENGINEERS: The seamless and thorough training of our technical experts as well as their certification are carried out at our own facilities.

A GLOBAL SERVICE NETWORK: It spans 86 locations with a total of 350 certified service engineers. Wherever you are located, there is always an Anton Paar service engineer nearby.

	Tosca 400	Tosca 200
SCANNER		
X-Y scan range	100 µm x 100 µm	50 µm x 50 µm[1]
Z scan range	15 µm	10 µm[2]
Z-sensor noise	50 pm[3]	
Max. scan speed	10 lines/s	5 lines/s
SAMPLE		
Max. sample diameter	100 mm (200 mm[4])	50 mm
Max. sample height	25 mm (2 mm[4])	25 mm
Max. sample weight	<600 g	
Position repeatability (uni-directional)	<1 µm	
VIDEO MICROSCOPE		
Camera	Color, 5 megapixel, CMOS sensor	
Field of view	1.73 mm x 3 mm	
Spatial resolution	5 µm	
Focus	Motorized focus	
OVERVIEW CAMERA		
Camera	Color, 5 megapixel, CMOS sensor	
Field of view	40 mm x 40 mm	
Spatial resolution	50 µm	
SIDE-VIEW CAMERA		
Side-view camera	Black and white, range of view 30 mm	
MODES		
Standard modes	Contact mode, tapping mode (including phase image), lateral force microscopy, force distance curve	
Optional modes	Contact resonance amplitude imaging, magnetic force microscopy, Kelvin probe force microscopy, electrostatic force microscopy, conductive atomic force microscopy, current control conductive atomic force microscopy	
DIMENSIONS AND WEIGHT		
Size (D x W x H), AFM unit	490 mm x 410 mm x 505 mm	
Size (D x W x H), controller	340 mm x 305 mm x 280 mm	
Weight, AFM unit	51.1 kg	
Weight, controller	7.8 kg	

[1] optional upgrade to 90 µm x 90 µm
[2] optional upgrade to 12 µm or 15 µm
[3] average value of actuator bodies produced; maximum value 80 pm
[4] when using the Wafer Stage (optional)

Tosca is a registered trademark (013412143) of Anton Paar.

© 2021 Anton Paar GmbH | All rights reserved.
Specifications subject to change without notice.
D53IP002EN-I

www.anton-paar.com