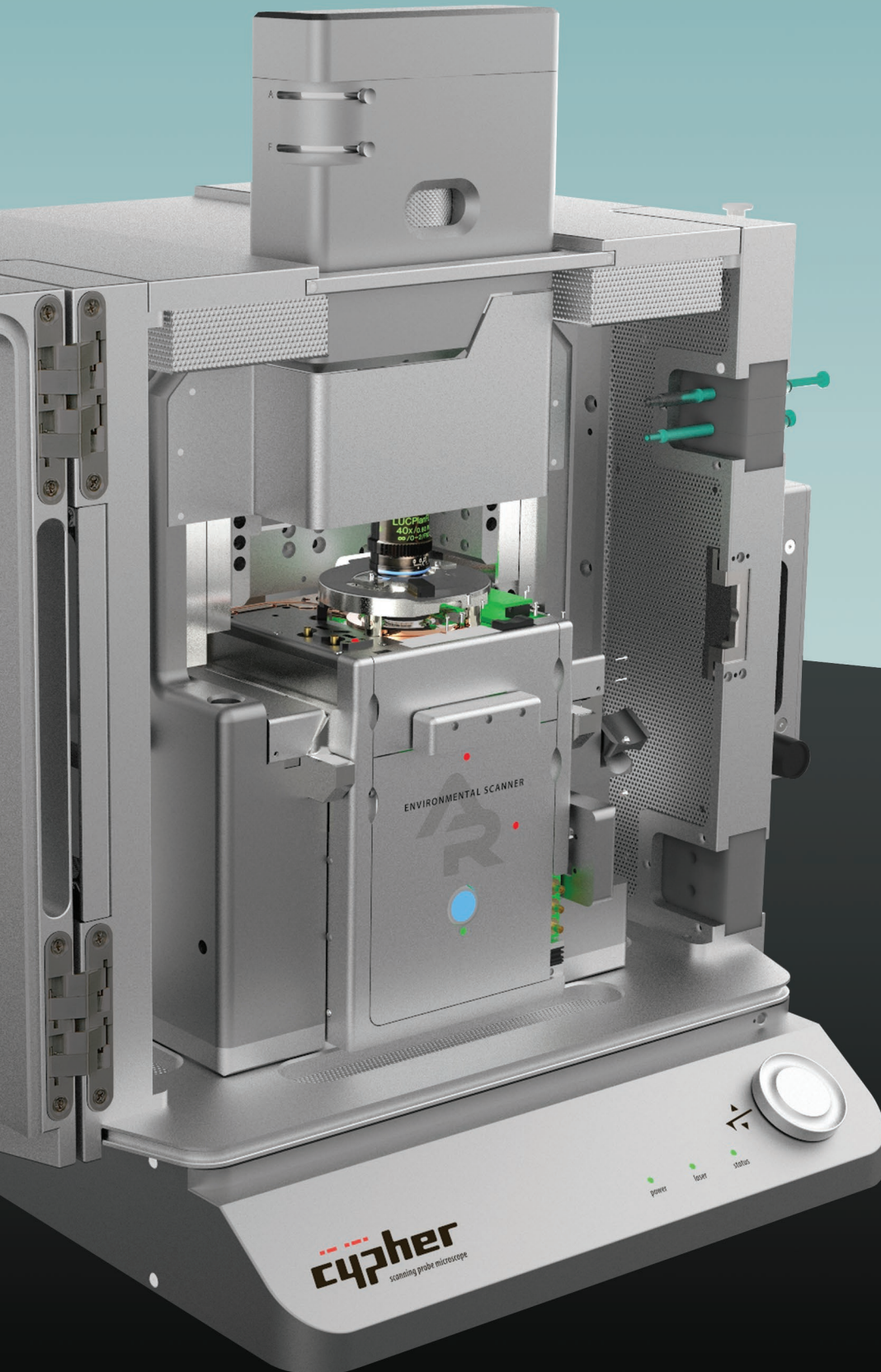


Cypher ES™ Environmental AFM

**ASYLUM
RESEARCH**
an Oxford Instruments company



Control Your Environment

- Temperature Control
- Liquid or Gas Perfusion
- Broad Chemical Compatibility

cypher

The Highest Resolution
Fast Scanning AFM

Cypher ES*

Environmental AFM

Cypher is the first commercial AFM to take advantage of the high bandwidth and low noise performance of smaller cantilevers, and is the *only* commercial AFM to routinely resolve atomic point defects and the DNA helix. Now, Asylum Research introduces the Cypher ES, which adds full environmental control to the Cypher platform - the highest resolution fast scanning AFM.

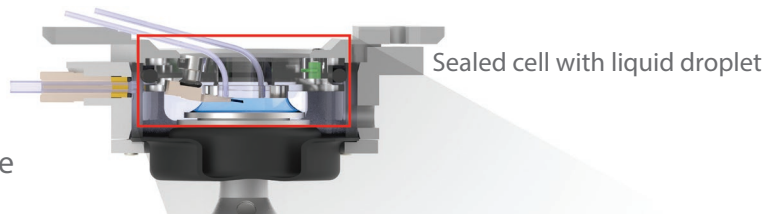
Environmental Scanner



Cypher ES – Your Sample in Any Environment

Gas/Liquid Perfusion in a Sealed Cell

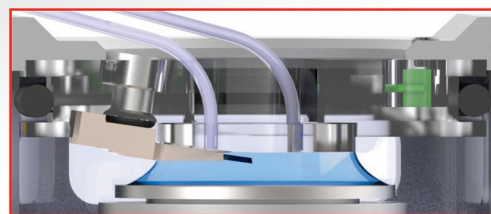
- Multiple ports for flow-through of gas and/or liquid
- Perfusion may be performed in a droplet to minimize sample volume (<100µL) and cell cleaning
- Simple gravity driven perfusion – no pumps are required



Sealed cell with liquid droplet

Integrated Temperature Control

- Modular sample stages enable precise temperature control in several temperature ranges
- No external control boxes, additional electronics, or cooling pumps are required



Cantilever-sample interface in droplet with perfusion tubes

Broad Chemical Compatibility

- To ensure chemical compatibility even in the harshest environments, cells are constructed with inert materials:
 - Fused silica
 - Perfluoroelastomer (FFKM)
 - PEEK
- Suitable for solvents, acids, bases, buffers, and inert gases

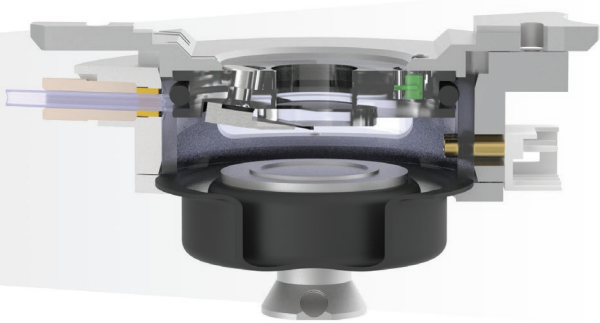


User changeable sample stage for cooling/heating

*Patent pending

Modular Design for Maximum Flexibility

The sealed cell is constructed from three components: cantilever holder, cell body, and sample stage. See the back page for specifications of the different versions of each component.



Sealed Cell

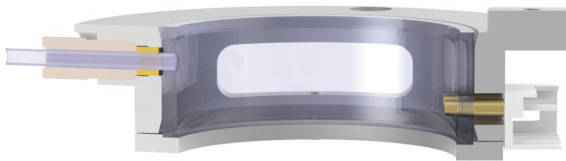
- Modular and interchangeable
- Supports positive pressure (up to 35kPa) for gas/liquid perfusion
- Liquid volumes as small as 20 μ L

Exploded View of Cell Components



Cantilever Holder

- Liquid perfusion ports
- Fused silica construction



Cell Body

- Gas perfusion ports
- Electrical feedthroughs
- Fused silica construction



Sample Stage

- Integrated cooling/heating in several temperature ranges
- Chemically inert, diaphragm for distortion-free imaging

Superior Performance, Widest Range of Capabilities

The Cypher ES adds unprecedented functionality and flexibility to the industry's highest resolution fast scanning Cypher platform. Customize the Cypher ES to meet your experimental research needs.

Expand Your Research Capabilities

The Cypher ES is compatible with all standard and advanced scan modes such as:

- Contact
- Tapping/Non-contact
- Phase
- Force Measurements
- Force Mapping
- STM
- MFM
- PFM
- C-AFM
- EFM
- SKPM
- Dual AC™
- AM-FM/Loss Tangent
- Frequency Modulation

Choose Cypher for Your Research

- Materials
- Polymers
- Energy Research
- Life Sciences
- Chemistry

Specifications

The cell is comprised of three user-selected components: cantilever holder, cell body, and sample stage. All components are compatible and interchangeable.

Cantilever Holders

Gas

- Gas environments only
- Electrical connection to cantilever
- Conductive AFM (C-AFM) compatible
- Materials: Fused Silica, FKM, Stainless Steel



Liquid

- Liquid environments only
- Two liquid ports for perfusion
- Electrical connection to cantilever
- C-AFM compatible (with Stainless Steel clip)
- Materials: Fused Silica, FFKM, and PEEK or Stainless Steel



High Voltage

- Gas environments only
- Isolated high voltage electrical connection to cantilever
- Not C-AFM compatible
- Materials: Fused Silica, FKM, Stainless Steel

STM

- Gas or liquid environments
- Two liquid ports for perfusion
- Materials: Fused Silica, FFKM, Stainless Steel, Epoxy

Cell Bodies

Gas

- Gas or droplet liquid environments
- Two gas ports for perfusion
- Three electrical connections to sample (required for C-AFM)
- Materials: Fused Silica, Nickel, Epoxy



Liquid

- Gas or liquid environments
- Two gas ports for perfusion
- No electrical connections (not compatible with C-AFM)
- Materials: Fused Silica



Sample Stages

Heater

- Gas environments only
- Ambient - 250°C
- Materials: FKM, Ceramic



Cooler-Heater

- Gas or liquid environments
- 0°C - 120°C
- Materials: FFKM, Anodized Aluminum



Ambient

- Gas or liquid environments
- Ambient temperature only
- Materials: FFKM, Stainless Steel



Side Door

- Multiple feedthroughs for easy connection of gas/liquid perfusion lines
- Multiple syringe ports
- Adjustable gravity flow stand
- Optional flowmeter for controlling gas perfusion



Scanner

Scan Range

XY range is 30µm
Z range is 5µm

XYZ Sensor Noise*

Digital LVDT sensors. XY noise is <60pm. Z noise is <50pm. Closed loop scan performance achieves lattice resolution (<10nm scans) with feedback gains equivalent to large scan (>1µm) values.

XYZ Open Loop Noise

XY: <8pm Adev in a 1Hz to 10kHz BW
Z: <4pm Adev in a 1Hz to 10kHz BW

XY Drift

<20/200nm per °C (with/without ATC).

Out-of-Plane Motion

<3nm over 30µm.

Sample Dimensions

15/6mm (diameter/thickness).

*Noise measurements are quoted as average deviation (Adev) in a 0.1Hz to 1kHz bandwidth unless otherwise noted.

Preliminary specifications. Subject to change.

Cypher is a Class 1 Laser Product

Cypher and Dual AC are trademarks of Asylum Research.

1-2014