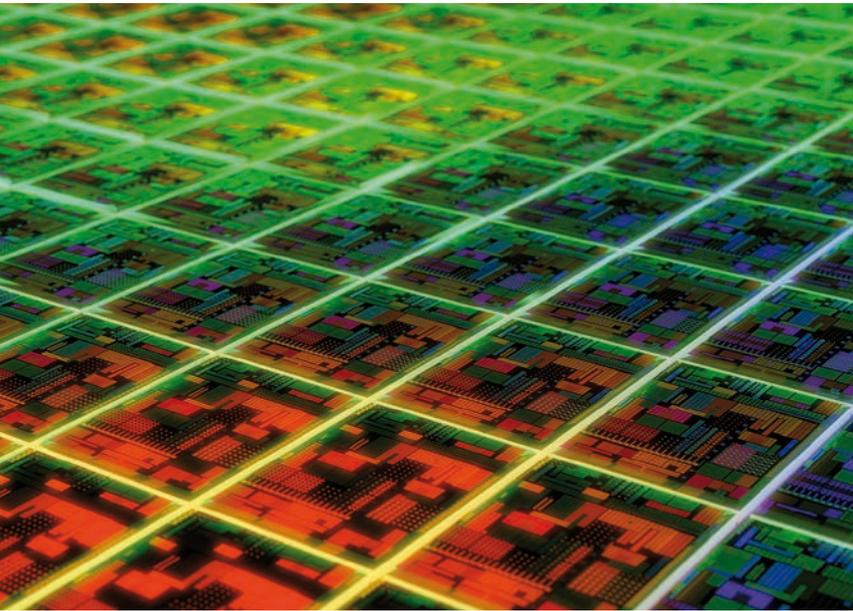


# FISCHERSCOPE® X-RAY XDV®-μ SEMI

Excellence in EDXRF microstructure metrology



**fischer**®



## A winning team

The world's leading EDXRF instrument for non-destructive microstructure wafer metrology is now integrated with a fully automated handling unit. Ensuring perfect, consistent quality control, the XDV-μ SEMI is a key element to successful advanced-packaging production.

Thanks to its highly precise and reliable measurement results, the XDV-μ SEMI's typical tasks are found in layer thickness and compositional analysis of under-bump metallization (UBM) down to the nm scale, C4 solder bumps and smaller, lead-free solder caps on copper pillars, ultra small landing pads and other advanced 2.5D/3D packaging solutions.

### Features

#### Reliable

- Hands-free operation
- Fully automated measurement process
- Well-defined constant metrology conditions

#### Precise

- Industry-leading poly-capillary optics for micro-spot measurement
- Very high detector sensitivity and resolution
- Automatic recognition of measurement structures

#### User friendly

- Easy and intuitive system software
- Service and maintenance-friendly design
- Automated and manual measurements possible with the same instrument



## 1 Safe automation

A fully enclosed design of the system as well as careful handling of wafers through specially engineered robot and alignment stations allow for worry-free operation of the fully automatic tool





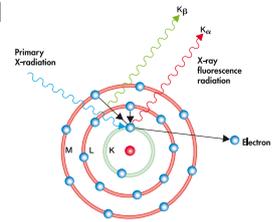
### 2 Customer-tailored versions

Up to 3 BOLTS-compatible load ports for SEMI standard transportation containers, E84 interfacing, RFID or barcode readers as well as many more optional features to choose from



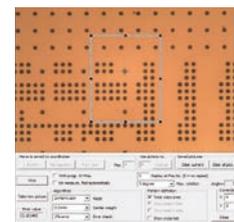
### 3 Smart details support usability and maintenance

A wide folding door, excellent visibility into the measurement chamber, and the ergonomic design of the instrument are just a few details that make work with X-RAY XDV- $\mu$  SEMI comfortable and enjoyable. Service and maintenance are made simple and fast by large service hatches and easy access to individual components



### 4 Finest test instruments, precision and high resolution

The X-RAY XDV- $\mu$  SEMI uses X-ray fluorescence radiation to measure and analyze materials precisely and non-destructively. Thanks to this powerful and flexible technology a wide variety of measurement tasks can be realized. Application specific configurations will offer tailor-made solutions around wafer metrology



### 5 Easy handling

Separate terminals for handling control and X-RAY control



### 6 Designed for clean environment

The fully encapsulated design of the metrology station ensures stable conditions. Air flow is controllable thanks to the optional filter fan units (FFU) and perforated surfaces

## Saving time, reducing cost, eliminating scrap



### Hands-free Means Safe

The automated wafer handler eliminates the biggest source of errors and dangers in semiconductor-production quality control: direct human interaction with the wafer material. The wafer handler manipulates the silicon or glass wafers with special, steady care, preventing damage to the costly almost finished products.

### Increased Productivity

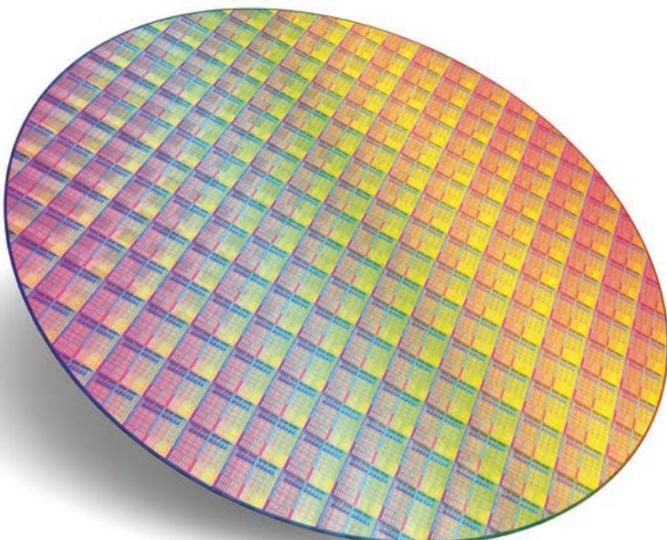
Available with one or more load ports to dock FOUPs and other SEMI standardized transportation pods, the wafer handling solution provides a long unsupervised operation time. Once the FOUP is placed on the load port, feeding, handling and metrology of the wafers are performed fully automatically. Your valuable employees are free to work on other tasks.



### Lowest TCO in Microstructure Metrology

Smartly combining leading-edge technologies, both, in wafer handling and microstructure metrology, the new FISCHER metrology solution XRAY XDV- $\mu$  SEMI for advanced packaging and other semiconductor-manufacturing applications enables an entirely new dimension in cost-effective quality control on the factory floor. The combination of reliable, long-life components and intelligent design yields the lowest total cost-of-ownership (TCO) for fully-automated metrology tools in this field.

- Safe handling of wafers prevents damage and loss
- Repeatable test conditions
- Hands-free, independent measurements; no supervision needed
- Lowest total cost of ownership for finished wafer metrology





## Automatic Docking and Loading

By default, the wafer handling system is equipped with state-of-the-art load ports. Multiple wafer sizes can be handled through adapters. If manual docking is no longer an option in a highly optimized production environments, you may switch to SEMI E84-compliant pod transfer. In any case, pods are simply placed on the docking table. The load port automatically performs all steps to safely dock the pod and open the front opening door.

## A Clean System

All moving parts are installed below or far behind the wafer surface, thus ensuring a high-level particle-free environment. In order to further reduce any remaining particles, both, the handling work cell as well as the measurement enclosure may be equipped with Fan Filter Units (FFUs).

## Proven Design

Both, the handling as well as the metrology part of the XDV- $\mu$  SEMI solution are well-proven designs that are smartly linked together and hence deliver trouble-free operation over a long period of time.

## Perfect alignment

The wafers are handled by an advanced 4-axis servo-driven robot. No matter in which position the wafers are stored in the pod or cassette, the alignment station detects the wafer orientation and pre-arranges the wafers to measurement position. The pre-alignment is done while a second wafer is in the X-RAY XDV- $\mu$  Wafer measurement unit, thus saving time by operating with two wafers simultaneously.

## Pattern recognition

The X-RAY XDV- $\mu$  SEMI automatically locates the exact measurement position. The system software stores a wafer pattern during setup and searches for it during the measurement cycle. You can be sure that the wafers are reliably and precisely tested, always at the right positions.

## Power and Sensitivity

Advanced X-ray poly-capillary optics combined with a large-area silicon drift detector set the basis for highly precise and repeatable measurement results. The proprietary, industry-leading poly-capillary optics concentrate the X-rays on an extremely small and well-defined measurement spot. Microstructures such as solder bumps can be measured precisely without interfering signals from the surrounding elements. The large silicon drift detector provides a high-resolution spectrum of the measurement signal.

- Automatic, safe and clean operation of Wafer pods
- No contamination of wafers
- Robust and proven design
- Parallel work stations save time through simultaneous alignment and measurement
- Automatic pattern recognition ensures reliable measurement positions
- Smallest measurement spots provide perfect microstructure metrology
- High-resolution test results by large and sensitive detectors

# Overview

FISCHERSCOPE X-RAY XDV- $\mu$ SEMI		
Handling	Wafer feeding	Up to 3 BOLTS-compatible load ports, suitable for various SEMI-standard 200/300mm wafer pods. Adapters for smaller containers and cassettes are available on request
	Robot	Reliable 4-axis, servo-driven precision robot
	End effector	Standard vacuum end-effector; option: edge-grip end-effectors; end-effectors for warped and thin wafers
	Alignment	Alignment station with rotary and linear axis, holding wafers with vacuum
X-Ray Instrument	Model	FISCHERSCOPE X-RAY XDV- $\mu$ Wafer instrument
	General features	Outstanding accuracy, repeatability and long-term stability ensures reliable operation. Recalibration intervals can be considerably reduced. Fundamental parameter analysis, based on real physical models, allow precise measurements without calibration samples or prior knowledge of the sample composition
	X-Ray optics	Proprietary, industry-leading poly-capillary system
	Measurement spot size (fwhm @ Mo-K $\alpha$ )	$\varnothing = 20\mu\text{m}$ , $20\mu\text{m}$ halo-free or $10\mu\text{m}$
	Detector System	Peltier cooled, large-area silicon drift detector (SDD)
	Sample Positioning	Automated wafer chuck with vacuum lift pins; holds wafers up to 12"/300mm diameter
	Sample alignment	High-precision XY stage with absolute accuracy in the $\mu\text{m}$ range. Laser pointer for manual pre-alignment of measurement spot
Video microscope	High-resolution CCD camera, 3x optical zoom, 4x electronic zoom for precise positioning and pattern matching	
System Software	Handling unit	WaferWare <sup>®</sup> master software
	X-Ray instrument	WinFTM <sup>®</sup> operating software, integrated communication with WaferWare
	Interface	SECS/GEM interface to MES (Manufacturing Execution System)
Others	Status	Operating status of handling unit and measurement unit independently displayed by status lights
	Options	Wide range of initial and retrofitting optional features available

## Tailor made to your needs

Features					
Wafer size	12"		8"		6" (optional)
Number of Wafer Pods	1		2		3
Wafer Pods and Special Adapters	300mm FOUN	200mm SMIF	200mm Cassette	200mm Open Cassette Adapter (with cover)	
Pod Loading	Automatic SEMI E84-compliant loading interface			Manual loading of pods	
Pod Identification	Barcode reader			RFID reader	
End effector	Regular vacuum end effector			Edge-grip end effector	
Wafer flipping	Wafer-flipping station			No wafer flipping	
CCTV Supervision	CCTV supervision for handling compartment			CCTV supervision for measurement enclosure	
ESD Control	ESD control for handling compartment			ESD control for measurement enclosure	
Clean room extension	FFU for handling compartment			FFU for measurement enclosure	



### **FISCHER worldwide**

Knowing what their customers need and want is a must for anyone trying to succeed in today's globalized markets. Because we at FISCHER think of ourselves as partners to our customers, we attach great importance to providing them excellent advice and working in close cooperation with them. This is why the Helmut Fischer Group maintains its worldwide presence through local subsidiaries and qualified distribution partners; there is always one near you.

### **Application Laboratories**

Especially in a strongly demanding industry like the semiconductor industry, a highly qualified application support is required. FISCHER addresses this need through its strategically located Application Laboratories around the world (Germany, Switzerland, China, USA, India, Japan and Singapore). Our competent and experienced staff help you to select the appropriate instrument configuration for your individual application.

### **Service**

Good service and efficient customer support are just as important to FISCHER as technically advanced and innovative products. For this reason, FISCHER has established a dense and tightly-linked global network of service partners staffed with highly qualified personnel. Offering extensive services such as setup, maintenance, training, calibration and so forth, FISCHER supports you in every aspect of your instruments and their use. This is how FISCHER guarantees the reliability and precision of its products. Worldwide.



**Helmut Fischer GmbH**  
**Institut für Elektronik und Messtechnik**  
 71069 Sindelfingen, **Germany**



**Helmut Fischer AG and**  
**Helmut Fischer Technologie AG**  
 CH-6331 Hünenberg, **Switzerland**



**IfG-Institute for Scientific Instruments GmbH**  
 12489 Berlin, **Germany**

**Fischer Instrumentation (GB) Ltd**  
 Lymington, Hampshire SO41 8JD, **England**



**Fischer Instrumentation Electronique**  
 78180 Montigny le Bretonneux, **France**

**Helmut Fischer S.R.L.**  
 20099 Sesto San Giovanni (Milano), **Italy**

**Fischer Technology, Inc.**  
 Windsor, CT 06095, **USA**



**Fischer Instruments, S.A.**  
 08018 Barcelona, **Spain**

**Helmut Fischer S. de R.L. de C.V.**  
 76230 Querétaro, QRO, **Mexico**

**Helmut Fischer Meettechnik B.V.**  
 5627 GB Eindhoven, **The Netherlands**

**Fischer do Brasil**  
 04711-030 São Paulo, **Brasil**

**Fischer Instrumentation (Taiwan) Co., LTD.**  
 Taipei City 11493, **Taiwan**

**Fischer Instruments K.K.**  
 Saitama-ken 340-0012, **Japan**

**Nantong Fischer Instrumentation Ltd**  
 Shanghai 200333, **P.R. China**



**Fischer Instrumentation (Far East) Ltd**  
 Kwai Chung, N.T., **Hong Kong**

**Fischer Measurement Technologies (India) Pvt. Ltd**  
 Pune 411057, **India**

**Fischer Instrumentation (S) Pte Ltd**  
 Singapore 658065, **Singapore**

**Helmut Fischer Korea Co., Ltd**  
 Seoul City, **Republic of Korea**

**Fischer Technology (M) SDN Bhd**  
 47301 Petaling Jaya, **Malaysia**

**Helmut Fischer Thailand Co., Ltd**  
 Bangkok 10250, **Thailand**

**Fischer Instruments Middle East FZE**  
 P.O.Box Dubai 371 100, **United Arab Emirates**



[www.helmut-fischer.com](http://www.helmut-fischer.com)