

## FISCHERSCOPE<sup>®</sup> X-RAY XDV<sup>®</sup>- $\mu$ WAFER

Specific X-Ray Fluorescence Measuring Instrument  
with a Polycapillary X-Ray Optics for Measurements  
of Very Small Structures on Wafers



## Description

The FISCHERSCOPE X-RAY XDV- $\mu$  WAFER is a specific x-ray fluorescence measuring instrument with a polycapillary x-ray optics. It has been specially developed for automated measurements and analyses of coating thicknesses and compositions on wafers.

Typical fields of application:

- Measurements of structures on wafers in the electronics and semiconductor industries, wafer diameter up to 12 in (exact  $\varnothing = 300 \text{ mm} = 11.8 \text{ in}$ )
- Analysis of very thin coatings, e.g., gold/palladium coatings of  $\leq 0.1 \mu\text{m}$  (0.004 mils)
- Automated measurements, e.g., in quality control
- Determination of complex multi-coating systems

To create ideal excitation conditions for every measurement, the instrument features electrically changeable primary filters. The modern silicon drift detector achieves high accuracy and good detection sensitivity. Due to the innovative polycapillary x-ray optics, the instrument measures using an extremely small measurement spot yet with a very high excitation intensity.

Outstanding accuracy and long-term stability are characteristics of all FISCHERSCOPE X-RAY systems. The necessity of recalibration is considerably reduced, saving time and effort.

The fundamental parameter method by FISCHER allows for the analysis of solid specimens and coating systems without calibration.

## Design

The FISCHERSCOPE X-RAY XDV- $\mu$  WAFER is designed as a user-friendly bench-top instrument. It is equipped with a high-precision, programmable XY-stage and an electrically driven Z-axis.

The XY-stage carries a vacuum wafer chuck for holding silicon wafers of diameters up to 12 inches (exact  $\varnothing = 300 \text{ mm} = 11.8 \text{ in}$ ). This allows for an optimal placement of wafers for measurements. The travel range covers every point on the wafer.

A laser pointer serves as a positioning aid and supports the quick alignment of the sample to be measured. A high-resolution colour video camera simplifies the precise determination of the measurement spot.

The optics is equipped with an auto-focus function. In order to focus difficult surfaces, the instrument can project a contrast grid onto the specimen surface.

The entire operation and evaluation of measurements as well as the clear presentation of measurement data is performed on a PC, using the powerful and user-friendly WinFTM<sup>®</sup> software.

The XDV- $\mu$  WAFER fulfills DIN ISO 3497 and ASTM B 568.

## General Specification

Intended use	Energy dispersive x-ray fluorescence measuring instrument (EDXRF) to measure thin coatings and multi-layer systems on wafers
Element range	Aluminum Al (13) to Uranium U (92) – up to 24 elements simultaneously
Application	Optimal measurement conditions for applications with Au and Pd due to the specific excitation characteristics of the polycapillary optics. For further information contact your FISCHER representative.
Design	Bench-top unit with housing with a slot on the side XY- and Z-axis electrically driven and programmable Motor-driven changeable filters
Measuring direction	Top down

## X-Ray Source/Detection

X-ray tube	Standard: Micro-focus tube with molybdenum anode and beryllium window Optional: Micro-focus tube with tungsten anode and beryllium window
High voltage	Three steps: 10 kV, 30 kV, 50 kV
Primary filter	4x changeable: Ni 10 µm (0.4 mils); free; Al 1000 µm (40 mils); Al 500 µm (20 mils)
X-ray optics	Polycapillary

## Polycapillary Options

	Standard 20 µm non halo-free*	20 µm halo-free*	10 µm halo-free*
Measurement spot, fwhm at Mo-K <sub>α</sub>	appr. Ø 20 µm (0.8 mils)	appr. Ø 20 µm (0.8 mils)	appr. Ø 10 µm (0.4 mils)
X-ray detector	Peltier-cooled silicon-drift-detector (SDD)		
Effective detector area	20 mm <sup>2</sup> (0.03 in <sup>2</sup> )	50 mm <sup>2</sup> (0.08 in <sup>2</sup> )	50 mm <sup>2</sup> (0.08 in <sup>2</sup> )
Measuring distance between specimen surface to lower edge of measuring head	fixed, approx. 4 – 5 mm (0.16 – 0.2 in)	fixed, approx. 4 – 5 mm (0.16 – 0.2 in)	fixed, approx. 1.5 – 2 mm (0.06 – 0.08 in)

\* For halo-free capillaries, the radiation intensity for all energies of the x-radiation is concentrated on the nominal measurement spot. For capillaries, indicated as non halo-free, radiation intensity with high energies (E > 20 keV) can cover a significantly larger area than the nominal measurement spot.

## Sample Stage

	Fast, programmable XY-stage with pop out function
Wafer diameter	6, 8 and 12 in (exact Ø = 150, 200 and 300 mm, 5.9, 7.9 and 11.8 in)
Maximum travel	450 x 300 mm (17.7 x 11.8 in), every point on the 6, 8 and 12 in wafers reachable
Max. travel speed XY	60 mm/s (2.4 in/s)
Repeatability precision XY	typical 1.5 µm (0.06 mils), direction-independent
Max. sample weight	5 kg (11 lb)
Max. sample height	3 mm (0.12 in)

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## Video Microscope

	High-resolution CCD colour camera for optical monitoring of the measurement location, manual focusing and auto-focus, with contrast grid, crosshairs with a calibrated scale (ruler) and spot-indicator, adjustable LED illumination, Laser pointer (class 1) to support accurate specimen placement
Zoom factor	Digital: 1x, 2x, 3x, 4x

## Electrical data

Power supply	AC 115 V or AC 230 V 50 / 60 Hz
Power consumption	Max. 120 W
Protection class	IP40

## Dimensions

External dimensions	
Width x depth x height	680 x 900 x 690 mm (26.8 x 35.4 x 27.2 in)
Weight	approx. 130 kg (287 lb)

## Environmental conditions

Operating temperature	10 °C – 40 °C / 50 °F – 104 °F
Storage/Transport temperature	0 °C – 50 °C / 32 °F – 122 °F
Relative humidity	≤ 95 %

## Evaluation unit

Computer	Windows <sup>®</sup> -PC
Software	Standard: Fischer WinFTM <sup>®</sup> BASIC incl. PDM <sup>®</sup> , Optional: Fischer WinFTM <sup>®</sup> SUPER

## Standards

CE approval, X-Ray standards	EN 61010, EN 61326, DIN ISO 3497 and ASTM B 568
Approval	Individual acceptance inspection as a fully protected instrument according to the German regulations „Deutsche Röntgenverordnung-RöV“.

## Order

### FISCHERSCOPE X-RAY XDV- $\mu$ WAFER

• Meas.spot 20 $\mu$ m non halo-free	605-046 + 605-941 *
• Meas.spot 20 $\mu$ m halo-free	605-046 + 605-404 *
• Meas.spot 10 $\mu$ m halo-free	605-046 + 605-164 *      * always order both numbers together

Special XDV- $\mu$  WAFER product modification and technical consultation on request

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