

# The Measure of Experience

## X-Ray Fluorescence Measuring Instruments for Coating Thickness Measurement and Materials Analysis

### Experience counts

Whether you are measuring coating thickness or performing materials analysis, FISCHER offers the ideal instruments for most applications.

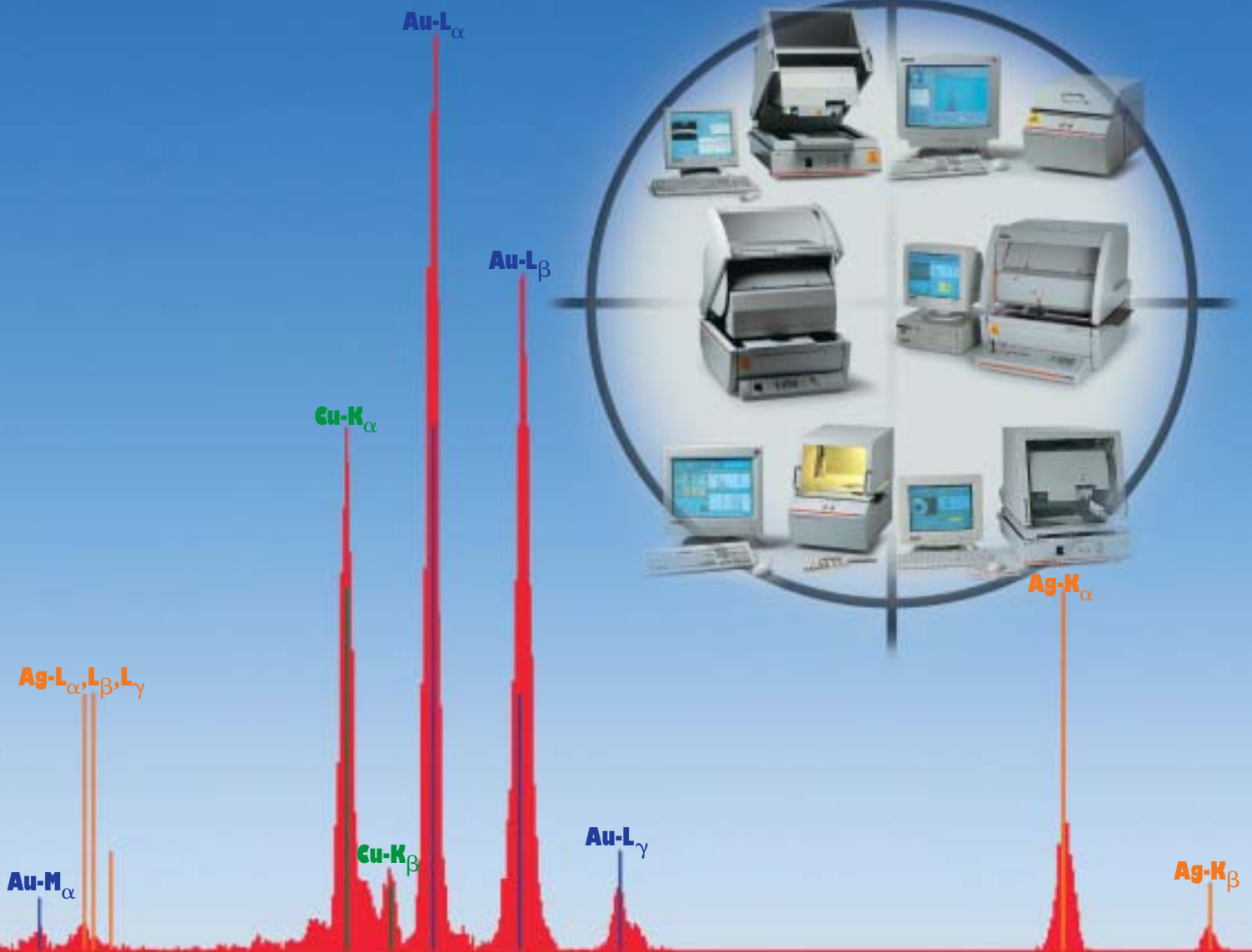
For over 20 years, pioneering work has been done for the continuous development of the FISCHERSCOPE® X-RAY product line. Numerous patents, such as the autofocus system and the transparent collimator, are a testament to this work.

The capabilities of these measuring instruments are driven by the WinFTM® control software. This easy-to-use software sets the benchmark in terms of versatility and accuracy.

You too can profit from our experience.

### FISCHERSCOPE® X-RAY instruments offer

- High-precision coating thickness measurement and materials analysis.
- Measurement method: Energy dispersive X-ray fluorescence according to ASTM B 568/ISO 3497.
- Automated measurement capability for economic operation.
- Complete model range from inexpensive standard instruments to very sophisticated high-end measuring systems.
- Top-notch service before and after the purchase.
- Application consultation based on knowledge of the underlying physics and practical experience.



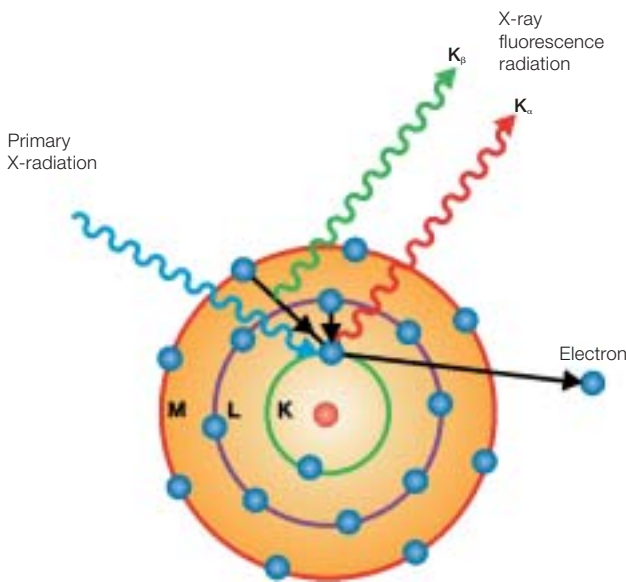
# Measuring Method, Applications, Hardware

## EDXRF – the method

Energy dispersive X-ray fluorescence (EDXRF) is a versatile technology for quick, non-destructive qualitative and quantitative multi-element analysis and coating thickness measurement. It can be used for a broad spectrum of sample types.

## Functional principle

The radiation from an X-ray tube excites the sample to emit X-ray fluorescence radiation that is characteristic for each element. The detector registers the energy spectrum.



The elements contained in the sample can be identified through the characteristic energies of the peaks of the spectrum. The concentrations of the elements are determined by the intensity of their radiation.

With coatings, the correlation between the sought-after coating thicknesses and the coating composition is often very complex, but with the WinFTM® software, all physically feasible tasks can be resolved.

Thanks to the ingenious instrument technology and the unsurpassed WinFTM® software, the user does not need specific knowledge about these complex procedures. Some advantages of this method...

- Essentially no sample preparation. In almost all cases the specimens can be placed in the measurement chamber and measured without any special treatment of the samples.
- Elements with atomic numbers from  $Z = 13$  (Al) to  $Z = 92$  (U) can be measured in a normal environment, without elaborate, expensive apparatus for generating a vacuum.
- Solids, pastes and liquids can be measured. Measurements are fast, contact-free and can be made even on the smallest test areas with irregular contours.

## Solutions for every field of application

Due to the large range of elements from aluminum to uranium that can be detected, the range of applications for X-RAY instruments reaches from industrial applications to research and science. Regardless of whether the measurement applications are of a metallurgical, geological, forensic or other analytical nature.

## Almost any sample dimension and condition

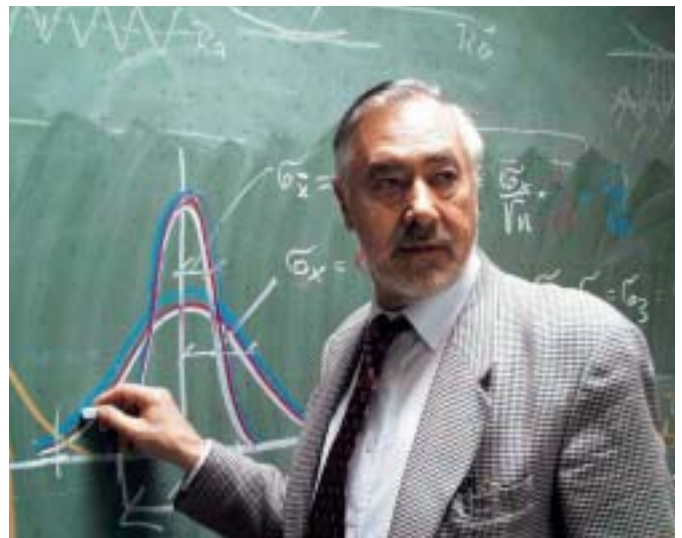
can be measured. Using the highly developed WinFTM® Software V.6, even complex coating systems with up to 24 coatings can be analyzed.



## Competency and experience

FISCHER has been developing and manufacturing superior technology for coating thickness measurement, materials analysis and general materials testing for more than 50 years.

Demanding users around the globe rank FISCHERSCOPE® X-RAY models as technologically leading; and have done so for more than 20 years.



*„The employees of the Fischer Group have collected an unmatched amount of valuable experience and have, therefore the knowledge to develop the best solutions for your company.“*

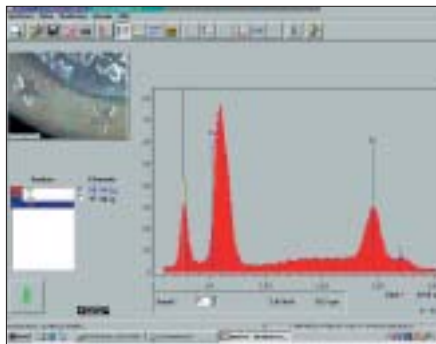
*Helmut Fischer, company founder and owner*

## WinFTM® Version 3

is the proven evaluation and control program for user-friendly operation of the FISCHERSCOPE® X-RAY instruments. It is used for coating thickness measurement and materials analysis.

WinFTM® stands for **Fischer Thickness Measurement System for Windows®**.

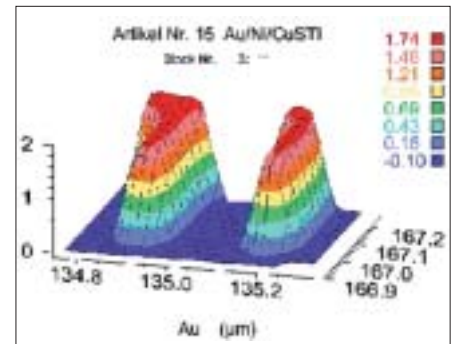
While WinFTM® V.3 is already able to optimally solve the majority of typical customer applications, WinFTM® V.6 is designed for particularly difficult measurement applications.



Spectrum with element list, analysis results and color video image.



Dialog window for setting up a Def.MA for measuring a pc-board.



Coating thickness distribution of a bond pad on a pc-board.

## WinFTM® Version 6

WinFTM® V.6 is the most recent software generation with many expanded functions. For users with special demands.

The program offers a very high degree of flexibility when defining measurement applications (Def.MA) and a free mode selection. The capability of measuring up to 24 elements in one multi-coating system is remarkable. In short:

**More coatings! More elements! Greater sensitivity!**

Function	WinFTM® V.3	WinFTM® V.6
Coating thickness measurement and materials analysis	in separate products	in one product simultaneous
Standard-free measurement and analysis	yes	yes
Max. number of individual properties of a specimen	3	24
Individual layers can consist of up to X elements	3	24
Analysis of up to X layers in one coating system	3	24
Individual element several times in different layers	no	yes
Quantitative analysis of the alloy composition	yes, up to 4 elements only solid specimens*	yes, up to 24 elements coatings systems possible
Analysis of "buried" coatings or substrate materials	no	yes
Measurement independent of the substrate material	no	yes
Direct analysis, i.e., standard-free quick analysis	yes, up to 4 elements only solid specimens*	yes, up to 24 elements coatings systems possible
Display of the mq value ("measurement quality")	yes	yes
Programmable measurement sequences ("Tasks")	yes	yes
Three modes for results display (area mass, ...)	no	yes
Standard-supported calibration	yes	yes
Material identification using spectra comparison	yes	yes
Library for pure element spectra	yes	yes
Graphical measurement point overview and XY(Z)-navigation	yes	yes
Setting up a new Def.MA (File for application parameters)	pre-specified modes	free set up
Solution analysis as a separate Def.MA-function	yes	yes, separate mode
Calculation of meas. range & random meas. uncertainty "u"	meas. range only, without u	yes, both

\*) requires the software module accessory WinFTM®-SUPER

# Superior X-RAY measuring instruments

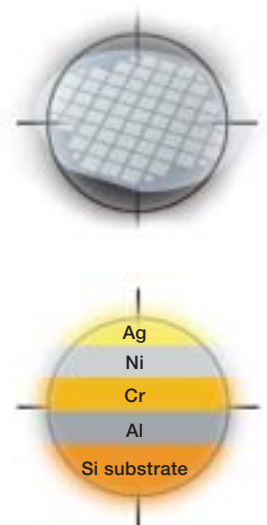


## FISCHERSCOPE® X-RAY XDAL

This spectrometer enjoys the advantages of a large, high-precision XYZ-measuring stage in combination with a semiconductor detector. Its high energy resolution allows the XDAL to provide reliable analysis results and coating thickness measurements with short measuring times.

Due to the top to bottom measurement direction, the surfaces of large specimens can be measured and scanned.

Automatic, optical focusing improves the reproducibility of the measurements.



## FISCHERSCOPE® X-RAY XAN®

A high-performance spectrometer in a remarkably low price range. Thanks to the high energy resolution of its semiconductor detector, the XAN® allows for reliable analyses and coating thickness measurements with short measuring times.

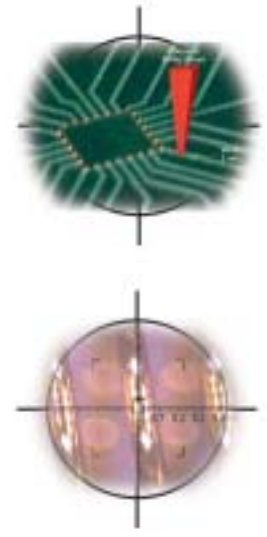
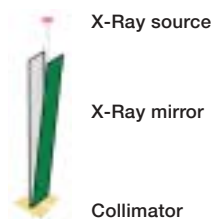
Due to the construction principle of a "bottom to top measurement direction", samples can be positioned quickly and easily.

Four motor-adjustable collimators permit work with a measurement spot that is always optimally suitable for the measurement application.



## FISCHERSCOPE® X-RAY XDVM®-μ

When the task is the measurement of the finest surface structures on miniaturized components or pc boards, the solution is the XDVM®-μ. With its novel patented mirror X-ray optics, this instrument can generate very small test spots with high radiation intensity. In this manner, measurements of structures only a few tens of micrometers are possible.





### FISCHERSCOPE® X-RAY XDVM®-W

The XDVM®-W simplifies the application of the X-ray fluorescence method and makes it very versatile. The ultra highprecision XYZ measuring stage with its large travel enables automated measurements of the finest structures.

It is ideally suited for (large volume) measurements of screws, contact strips, pc-boards, ...

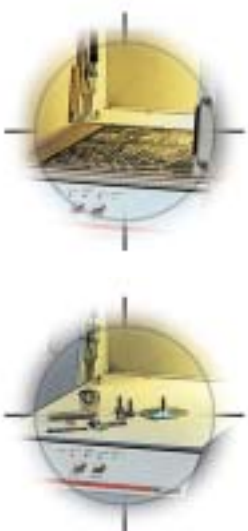


### FISCHERSCOPE® X-RAY XDL®-B / XDLM®-C4

A practical, user-friendly measuring instrument in a particularly economical design.

The large measurement chamber allows the measurement of large specimens with irregular surface contours.

The DCM method (Distance Controlled Measurement; that is, optically controlled distance correction) enables automated testing of complex geometries. Large pc-boards can be easily accommodated using the slot between the measuring head cover and the measuring stage.



### FISCHERSCOPE® X-RAY XUL® / XULM®




X-ray tube and detector are arranged underneath the measuring chamber – as with the very successful predecessor model series X-RAY 1000/ 1010/1020.

The measurement direction is from bottom to top, which has great practical advantages with many measurement applications.




This significantly simplifies routine inspections of small components: Positioning is done in no time at all and measurements can be started without long focussing.



# Instrument Types at a Glance

<b>FISCHERSCOPE® X-Ray Product matrix</b>	<b>XAN®</b> 	<b>XDAL®</b> 	<b>XDVM®-μ</b> 
<b>Instrument type (XRF = X-Ray fluorescence)</b>	XRF-Spectrometer with a high energy resolution and an excellent price/performance ratio.	XRF-Spectrometer with a high energy resolution and programmable XYZ-stage.	XRF coating thickness analyzer with innovative micro-focus x-ray optics for very small measurement spots.
<b>Primary fields of application</b>	Materials analysis and coating thickness measurement in the element range Z = 13 (Al) to Z = 92 (U).  Gold assay, jewelry, lab analytics, very thin coatings, solar cells, solution analysis, powder.	Materials analysis and coating thickness measurement in the element range Z = 13 (Al) to Z = 92 (U).  Gold assay, jewelry, lab analytics, very thin coatings, solar cells, solution analysis, powder.	Coating thickness measurement and materials analysis in the element range Z = 17 (Cl) to Z = 92 (U).  Pc board testing, lead frames with extremely small structures, raster scans (area profiles) e. g., of hard disk coatings, fine wires.
<b>Product highlights</b>	Very simple and fast: manual positioning of specimen.  Always optimally high signal intensity due to multi-collimator set.	High-precision, programmable XYZ-stage with large travel range.  Very large useable interior space.	Ultra highprecision, programmable XYZ-stage with large travel range.  Revolutionary x-ray optics with very small measurement spot for high count rates.
<b>Standard software <sup>(1)</sup></b>	WinFTM® V.6; PDM standard.	WinFTM® V.6; PDM standard.	WinFTM® V.6; PDM standard.
<b>Measurement direction</b>	↑ Primary beam bottom to top.	↓ Primary beam top to bottom.	↓ Primary beam top to bottom.
<b>X-ray tube</b>	Micro-focus tungsten tube with Be window. Two primary filters (Ni and Al) can be added. Programmable energy saver function.	Micro-focus tungsten tube with Be window. Two primary filters (Ni and Al) can be added. Programmable energy saver function.	Micro-focus tungsten tube with Be window. 1 additional primary filter (Ni) can be added.
<b>Collimators</b>	Four round collimators with diameters of 0.2 mm / 0.6 mm / 1 mm / 2 mm. Software-controlled, motor-driven adjustment.	Four collimators with the dimensions: square: 0.2 x 0.2 mm and 0.3 x 0.3 mm; round: ø 0.6 mm; slot-shaped: 0.15 x 0.5 mm.	---
<b>Minimum size of measuring spot</b>	ø 0.3 mm	0.2 x 0.62 mm	0.02 mm x 0.05 mm
<b>Eff. focussing range <sup>(2)</sup></b>	2 mm	4 mm	2.5 mm
<b>Detector</b>	PIN semiconductor diode with high energy resolution.	PIN semiconductor diode with high energy resolution.	Xenon-filled proportional counter tube for high count rates.
<b>Measuring stage</b>	Fixed measurement stage. Sample support: exchangeable insert that is covered with a transparent replaceable foil for free beam transmission.	Motor-driven in X- and Y-direction with joystick, left or right mouse button; moveable and programmable sample support. Laser light spot as positioning aid.	Motor-driven in X- and Y-direction with joystick, left or right mouse button; moveable and programmable sample support. Laser light spot as positioning aid.
<b>Stage loading and sample positioning</b>	Sample placed directly on the measuring stage and positioned manually using the video image. Manual XY-stage optional.	Measuring stage automatically moves out when opening the cover (tongue function). Fine positioning using joystick or mouse (Point & Shoot).	Measuring stage automatically moves out when opening the cover (tongue function). Fine positioning using joystick or mouse (Point & Shoot).
<b>Programmable XY-travel</b>	No programmable travel.	256 mm x 230 mm v max. = 25 mm/s Precision = 0.01 mm	250 mm x 220 mm v max. = 25 mm/s Precision = 0.005 mm
<b>Z-axis</b>	No Z-axis, however, optical focussing up to a height of 2 mm.	Motorized moveable and programmable detector unit.	Motorized moveable and programmable detector unit.
<b>Interior dimensions [mm]</b>	W = 320; D = 460; H = 90	W = 460; D = 500; H = 146	W = 560; D = 530; H = 130
<b>Measuring chamber</b>	Large volume chamber with fixed, exchangeable sample support.	Slotted design for large flat specimens that would otherwise not fit in the measurement space.	Slotted design for large flat specimens that would otherwise not fit in the measurement space.
<b>Focusing on meas. spot</b>	Visual focussing using rotary knob.	Autofocus or visual focussing.	Autofocus or visual focussing.
<b>Magnification (in reference to a 19" Monitor) <sup>(3)</sup></b>	Optical: 34-46x Digitally: in steps 1, 2, 3 and 4x Total: 34-184x	Optical: 20-45x Digitally: in steps 1, 2, 3 and 4x Total: 20-180x	Optical: 30 / 92 / 277x Digitally: in steps 1, 2, 3 and 4x Total: 30-1108x

<sup>(1)</sup> Systems using WinFTM V.3 can be upgraded to V.6 inclusive PDM Software for extended product administration and result documentation.

<b>XDVM®-W</b> 	<b>XUL® XULM®</b> 	<b>XDL®-B XDLM®-C4</b> 
Universal XRF coating thickness analyzer with a programmable precision stage. The top instrument for users with the highest demands.	XRF coating thickness analyzer with simple operation and an excellent price/performance ratio.	XRF coating thickness analyzer with simple operation and various stage options.
Coating thickness measurement and materials analysis in the element range Z = 17 (Cl) to Z = 92 (U).	XUL®: High volume components with differing geometries, single readings with minimum positioning effort.	All areas. Manual and automated measurements. Most universal and most sold XRF instrument.
Connector contacts, pc-boards, for raster scans (area profiles) or coatings with very small measurement spots, fine wires.	XULM®: Particularly well suited for very fine geometries: fine conductors, wires, lead frames.	High volume components with differing geometries, also larger parts with measurement spot recessed up to 80 mm.
Ultra highprecision, programmable XYZ-stage with large travel range.	Manual measuring stage for fast and very easy sample positioning.	Measuring stage options with manual or programmable motor drive.
Very small measurement spot, greatly enlarging optics, large measurement chamber, very fast stage loading.	Compact design. Co-absorber optional.	Version XDLM®-C4 with 4x collimator (round and slot-shaped collimators). Co-absorber optional.
WinFTM® V.3; PDM optional.	WinFTM® V.3; PDM optional.	WinFTM® V.3; PDM optional.
↓ Primary beam top to bottom.	↑ Primary beam bottom to top.	↓ Primary beam top to bottom.
Micro-focus tungsten tube with Be window. 1 additional primary filter (Ni) can be added.	XULM®: Micro-focus tungsten tube; XUL®: Tungsten tube. Both with Be-window. Two primary filters (Ni and Al) can be added.	XDLM®-C4: Micro-focus tungsten tube; XDL®-B: Tungsten tube. Both with Be-window. Two primary filters (Ni and Al) can be added.
Four collimator positions, exchangeable sizes from 0.03 mm to 0.2 mm.	XUL®: single collimator $\varnothing$ 0.3 mm or optional 0.05 x 0.3 mm. XULM®: mot. 4x collimator $\varnothing$ 0.1 / 0.2 / 0.3 slot-shaped 0.05 x 0.3 mm	XDL®-B: single collimator $\varnothing$ 0.3 mm or optional 0.05 x 0.3 mm. XDLM®-C4: mot. 4x collimator $\varnothing$ 0.1 / 0.2 / 0.3 slot-shaped 0.05 x 0.3 mm
0.07 mm x 0.27 mm	XUL®: $\varnothing$ 0.51 mm XULM®: $\varnothing$ 0.15 mm	XDL®-B: $\varnothing$ 0.34 x 0.67 mm XDLM®-C4: $\varnothing$ 0.10 x 0.44 mm
5; 29; 61; 93 mm	27.5 mm	80 mm
Xenon-filled proportional counter tube for high count rates.	Xenon-filled proportional counter tube for high count rates.	Xenon-filled proportional counter tube for high count rates.
Motor-driven in X- and Y-direction with joystick, left or right mouse button; moveable and programmable sample support. Laser light spot as positioning aid.	Fixed specimen support or manual XY-stage.	Motorized moveable and programmable specimen support or manual stage. Laser light spot as positioning aid.
Tongue function – additional fast Y-axis for stage delivery; ideal for frequent sample loading. Fine positioning using joystick or mouse (Point & Shoot).	Sample placed directly on the measuring stage and positioned manually using the video image. Manual XY-stage optional.	Motorized versions: stage automatically moves out when opening the cover (tongue function). Fine positioning using joystick or mouse (Point & Shoot).
250 mm x 250 mm; v max. = 25 mm/s Additional axis for 4x stage travel velocity (rapid loading!). Precision = 0.005 mm	No programmable travel.	256 mm x 230 mm v max. = 25 mm/s Precision = 0.01 mm
Motorized moveable and programmable detector unit.	No Z-axis, however, optical focussing up to a height of 27.5 mm.	Versions with fixed, motorized or programmable Z-axis available.
W = 560; D = 530; H = 145	W = 360; D = 380; H = 240	W = 460; D = 500; H = 300
Slotted design for large flat specimens that would otherwise not fit in the measurement space.	Large volume chamber with fixed, exchangeable sample support.	Slotted design for large flat specimens that would otherwise not fit in the measurement space.
Autofocus or visual focussing.	Visual focussing using rotary knob.	Autofocus or visual focussing.
Optical: 40-142x Digitally: in steps 1, 2, 3 and 4x Total: 40-568x	Optical: 38-46x Digitally: in steps 1, 2, 3 and 4x Total: 38-184x	Optical: 20-45x Digitally: in steps 1, 2, 3 and 4x Total: 20-180x



The Institute for Electronics and Measurement Technology HELMUT FISCHER in Sindelfingen/Germany is an innovative leader in the field of coating thickness measurement, material analysis, microhardness testing, electrical conductivity- and ferrite content measurement as well as for density and porosity testing. The company is able to recommend the best solution for any appli-

cation. A comprehensive range of products is offered using X-ray fluorescence; Beta-backscatter; Magnetic; Magnetic induction; Electric resistance; Eddy current and Coulometric techniques. HELMUT FISCHER has 12 subsidiary companies and 32 marketing agencies strategically located around the globe.



DUALSCOPE® MP40 with ED10 probe to measure coating thickness on ferromagnetic, as well as non-ferromagnetic materials with automatic recognition and selection of the measurement method.



FISCHERSCOPE® MMS® PC. Universal measurement system for magnetic, magnetic inductive, Eddy current and Beta backscatter method coating thickness measurement and general test procedures of materials.



Micro hardness measurement unit FISCHERSCOPE® H100C to determine the Martens hardness of thin coatings and foils.

The high quality standard of FISCHER instruments is the result of our efforts to provide the very best instrumentation to our customers.

FISCHER is a reliable and competent partner, offering expert advice, extensive service, and training seminars.

Today, FISCHER instruments are used successfully in all technological fields of industry and research.

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Subject to changes

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