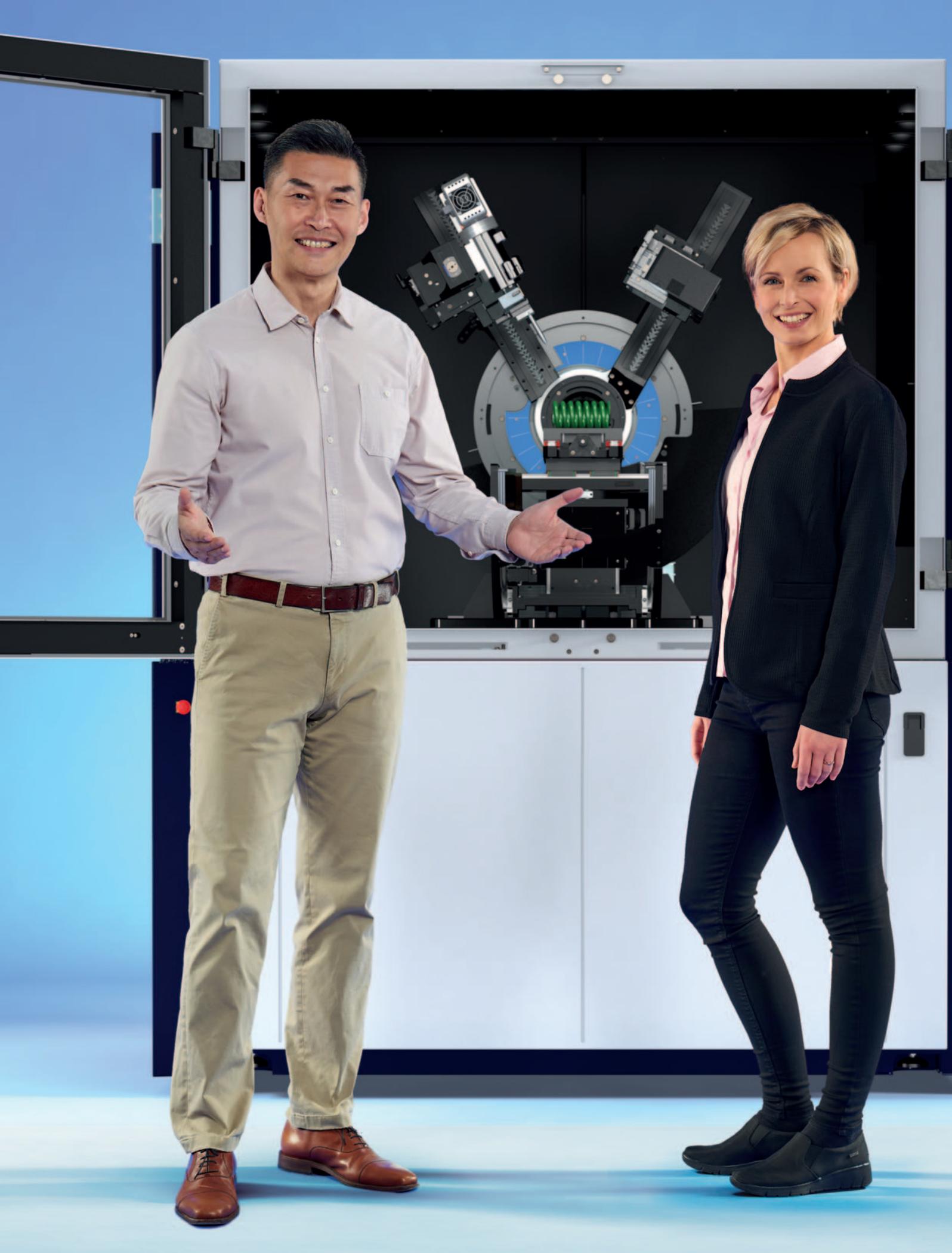


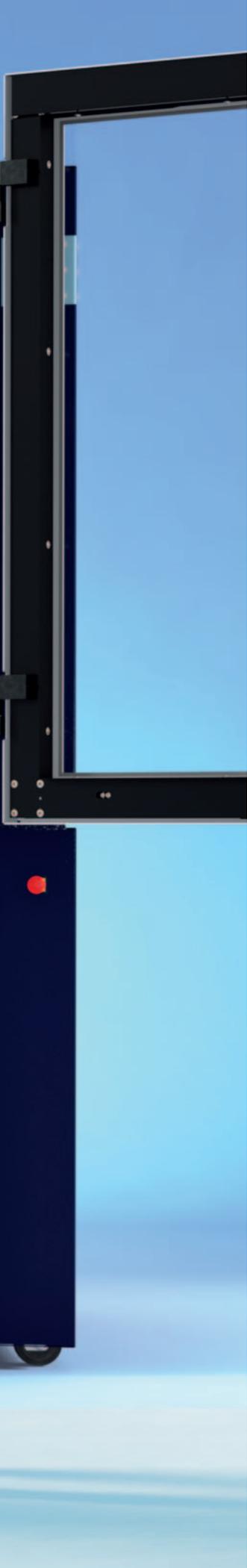


X-RAY DIFFRACTION **D8 DISCOVER**

XRD Solutions for Industry and Research

Innovation with Integrity





D8 DISCOVER

the art of X-ray analysis

D8 DISCOVER users drive innovation and science. Their work advances our fundamental understanding of materials, unlocking their full potential for applications in the world around us. They require tools to answer the unanticipated question that lies beyond their next discovery. To master this challenge, the D8 DISCOVER combines a solid foundation with over 190 high precision components for limitless analytical flexibility.

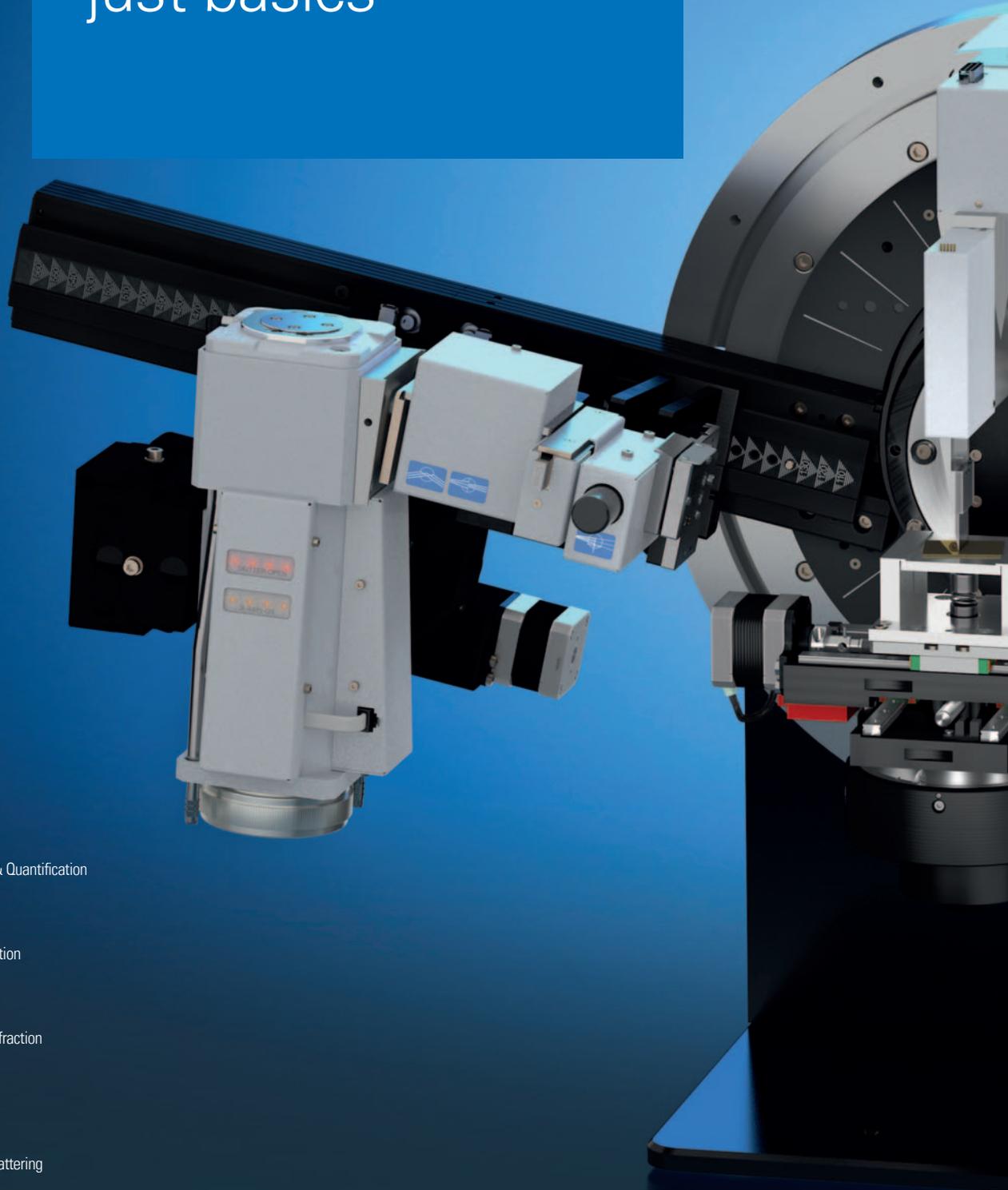
UNIVERSAL SOLUTIONS

Shared research facilities allow access to top analytical capabilities to scientists across disciplines. The D8 DISCOVER supports both novice and expert users in a wide range of applications, without compromise.

TAILORED SOLUTIONS

Whether it is a specialized analytical method or extraordinary sample handling requirement, every D8 DISCOVER can include customized hardware and software. With our extensive experience in analytical method and instrument design, we create solutions that are a perfect fit.

D8 DISCOVER more than just basics



Phase Identification & Quantification

Microstructure

Pair Distribution Function

X-ray Reflectometry

Grazing Incidence Diffraction

Stress

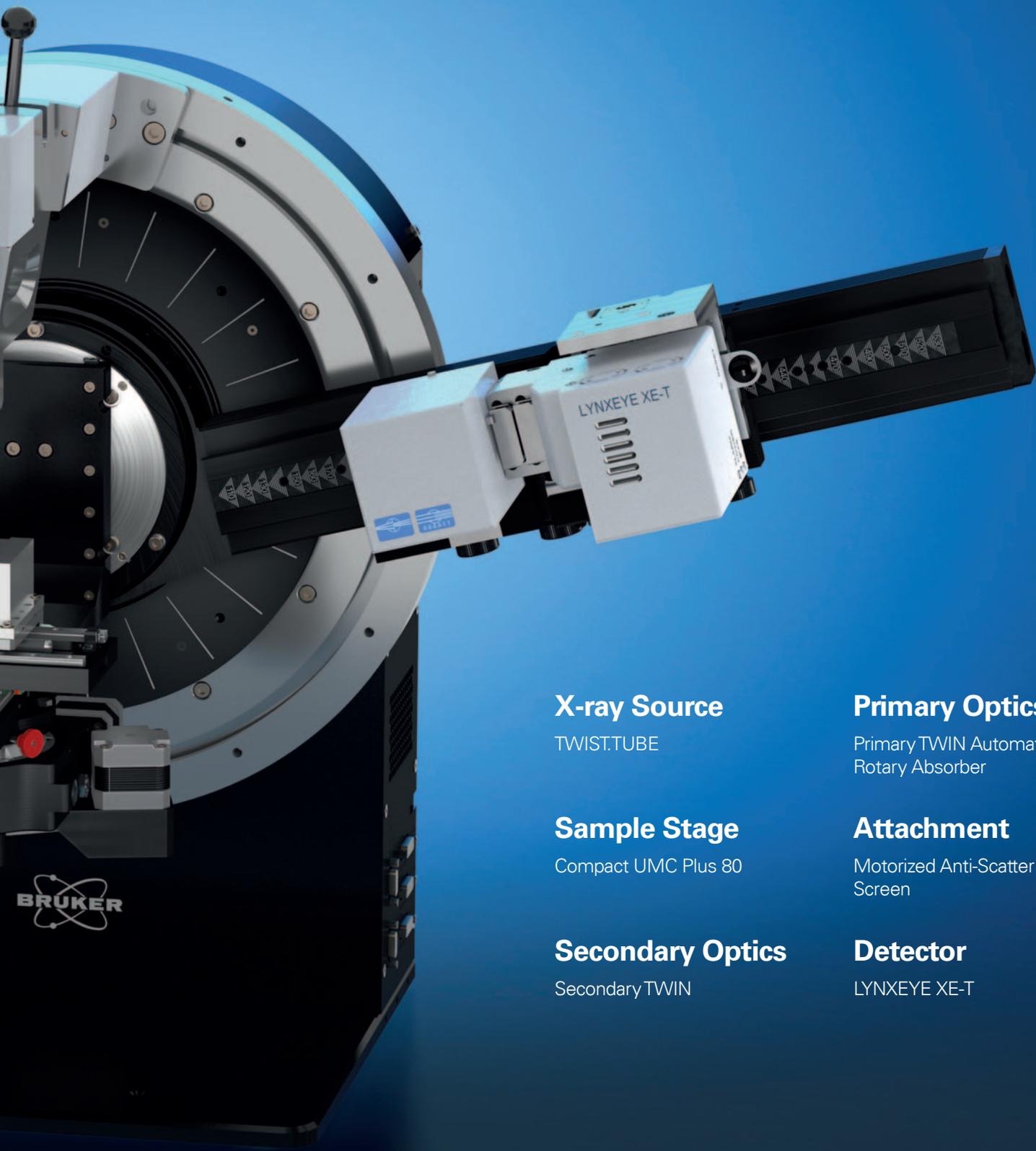
Texture

Small Angle X-ray Scattering

Wide Angle X-ray Scattering

Grazing Incidence Small Angle X-ray Scattering

Micro Diffraction



X-ray Source

TWIST.TUBE

Primary Optics

Primary TWIN Automatic
Rotary Absorber

Sample Stage

Compact UMC Plus 80

Attachment

Motorized Anti-Scatter
Screen

Secondary Optics

Secondary TWIN

Detector

LYNXEYE XE-T



D8 DISCOVER

for everyday use

A D8 DISCOVER equipped with TWIN optics provides outstanding data quality for all kinds of samples – from powders to solids, coatings and liquids.

Bulk powder samples are analyzed in parafocusing reflection geometry with the proprietary Dynamic Beam Optimization (DBO), resulting in lowest background and highest signal. A click in the software switches to parallel beam, ideal for capillary powder measurements or X-ray reflectometry (XRR) on thin films.

Switching to the equatorial Soller in the secondary TWIN optic enables grazing incidence diffraction (GID) for phase identification or residual stress determination in coatings.

For spatial mapping or analysis of small inclusions, a magnetically mounted collimator reduces the beam to a small spot, enabling microdiffraction (μ XRD).

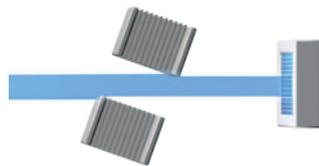
No matter what sample type comes in the lab next, the D8 DISCOVER with TWIN optics takes your experiments beyond the basics.



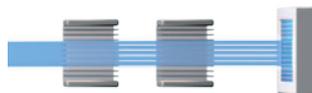
Parallel Beam



Divergent Beam



Variable Slit



Equatorial Soller

TWIN Optics, primary

- Automated divergence slit for Bragg-Brentano geometry
- Göbel mirror for parallel beam geometry
- Fully software controlled switching between beampaths

TWIN Optics, secondary

- Motorized anti-scatter slit for Bragg-Brentano and XRR
- Equatorial 0.2° Soller for GID
- Fully integrated into Bruker's unique Dynamic Beam Optimization (DBO)



All Purpose

All Users
All Samples
All Tasks
Always



TWIST.TUBE X-ray Source

- Seamless switch from line to point focus within seconds
- Standard industrial form factor
- Tube change without utility disconnection
- Available for all wavelengths from Cr to Mo
- Patented design (EP 1 923 900 B1)



UMC Sample Stage

- X/Y/Z/Phi stage with integrated fast spinner
- X,Y travel range of +/- 40 mm for large area mapping
- Z travel range of 34 mm for bulky samples
- Spinner with up to 60 rpm for good grain statistics at high scanspeed
- For samples up to 2 kg and 150 mm in diameter.



LYNXEYE XE-T Detector

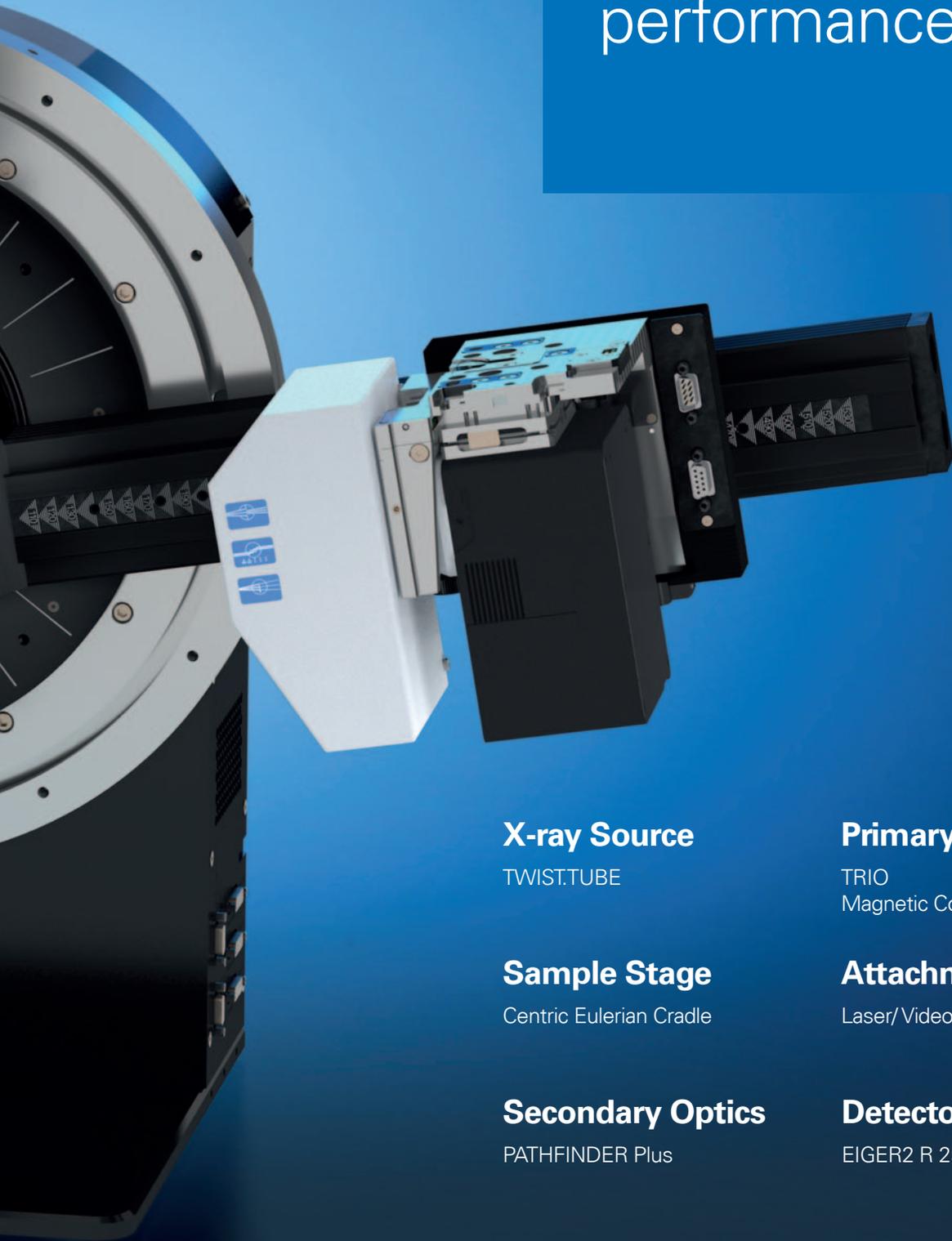
- Market-leading energy resolution of 380 eV
- 100% filtering of Fe-fluorescence when using Cu radiation
- Data collection in 0D, 1D and 2D mode
- Supports all wavelengths from Cr to Ag
- No need for K β filters and secondary monochromators



-  All Purpose
-  Phase Identification & Quantification
-  Microstructure
-  Pair Distribution Function
-  X-ray Reflectometry
-  High-Resolution X-ray Diffraction
-  Reciprocal Space Mapping
-  In-Plane Grazing Incidence Diffraction
-  Grazing Incidence Diffraction
-  Stress
-  Texture
-  Small Angle X-ray Scattering
-  Wide Angle X-ray Scattering
-  Grazing Incidence Small Angle X-ray Scattering
-  Micro Diffraction

BRUKER

D8 DISCOVER committed to performance



X-ray Source

TWIST.TUBE

Primary Optics

TRIO
Magnetic Collimator

Sample Stage

Centric Eulerian Cradle

Attachment

Laser/Video Microscope

Secondary Optics

PATHFINDER Plus

Detector

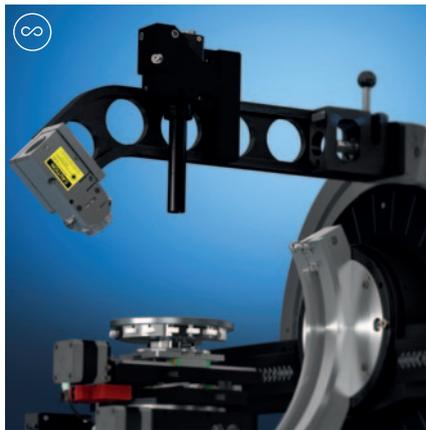
EIGER2 R 250k



All Purpose

Laser/Video Microscope

- XY sample alignment with pin-point accuracy
- Laser spot indicates measurement position
- High accuracy height alignment via patented laser/microscope optical axis intersection technology
- Fully integrated into the DIFFRAC.MEASUREMENT suite
- Toolless and reproducible mounting to the attachment ring of the goniometer



Deeper insights
Breakthrough science
Unlimited potential

Centric Eulerian Cradle

- 5-axis sample stage to cover the full application range including stress, texture and high-resolution XRD
- Psi range: -11° to 98°
- Unlimited Phi rotation
- X/Y translation: ± 40 mm
- Z range: 2 mm
- For samples up to 1 kg and 120 mm in diameter



EIGER2 R 250k Detector

- One detector for all applications
- 0D, 1D and 2D measurements in step, continuous and snapshot mode
- Large active area: 38.4×38.4 mm²
- Pixel size: 75×75 μ m²
- Supports all wavelengths from Cr to Ag



D8 DISCOVER for challenging samples

The D8 DISCOVER brings additional dimensions to the analysis of demanding samples from materials research and development: The TRIO and PATHFINDER Plus expand the analytical capabilities enabling high-resolution diffraction of thin films. The seamlessly integrated EIGER2 detector offers near limitless dynamic range and 2D measurements with exceptional resolution and field of view.

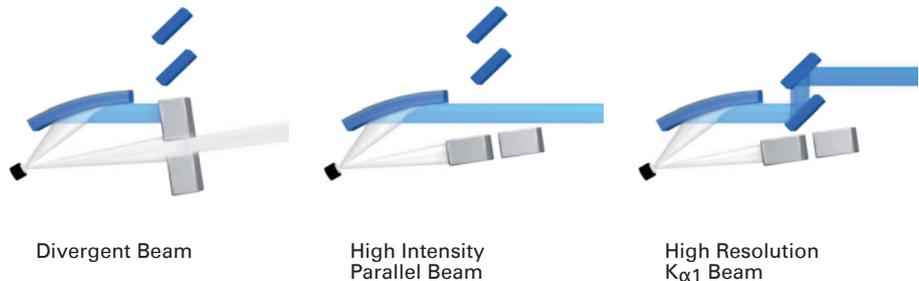
Applications include determining the texture and residual stress in castings and sheet metals, and analyzing structural details in layer stacks using triple axis diffraction. Finding the epitaxial relationships in thin film samples with large area reciprocal space mapping (RSM) is another task. Investigating the morphology of semi-crystalline polymers – either by using small angle X-ray scattering (SAXS), for the degree of crystallinity, or by applying wide angle X-ray scattering (WAXS) to find the orientation.

With μ XRD², these methods can also be applied with a spatial resolution down to microns using high precision collimators and a Laser/Video microscope sample alignment system.

By including the latest innovations in diffraction systems, this D8 DISCOVER stands out as the uncompromising performer.

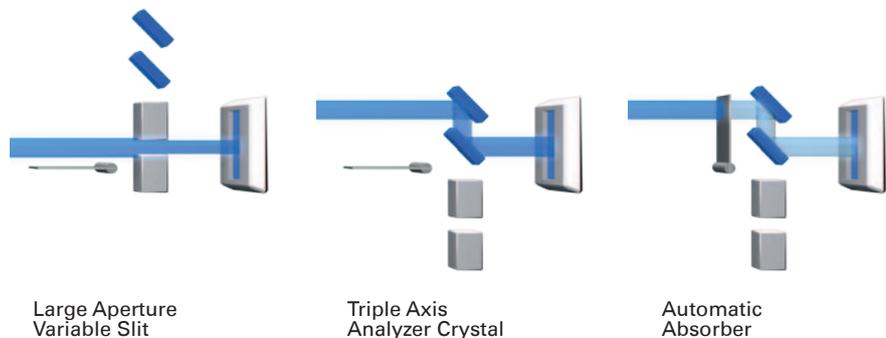
TRIO

- Fully software controlled multi beam path optics
- Motorized divergence slit for Bragg-Bentano measurements
- Göbel mirror for high intensity parallel beam applications like XRR and GID
- Ge(004) monochromator for a highly parallel $K\alpha_1$ beam

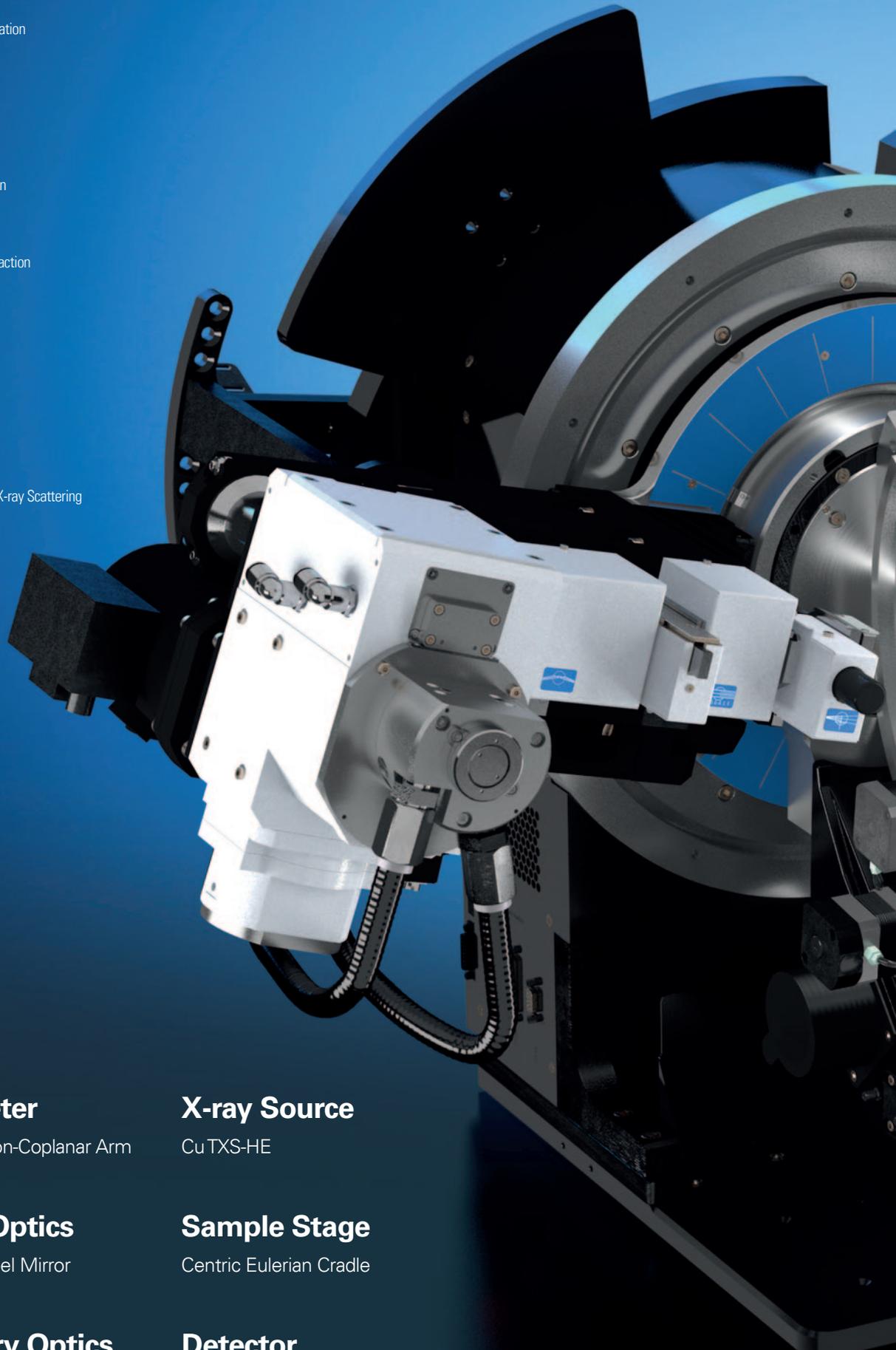


PATHFINDER Plus

- Fully controlled multi beampath optics
- High intensity beampath with motorized slits for applications like XRR or HRXRD
- High resolution beampath with Ge(220) analyzer
- Auto absorber to ensure detector linearity



-  All Purpose
-  Phase Identification & Quantification
-  Microstructure
-  Pair Distribution Function
-  X-ray Reflectometry
-  High-Resolution X-ray Diffraction
-  Reciprocal Space Mapping
-  In-Plane Grazing Incidence Diffraction
-  Grazing Incidence Diffraction
-  Stress
-  Texture
-  Small Angle X-ray Scattering
-  Wide Angle X-ray Scattering
-  Grazing Incidence Small Angle X-ray Scattering
-  Micro Diffraction



Goniometer

ATLAS with Non-Coplanar Arm

X-ray Source

Cu TXS-HE

Primary Optics

Focusing Goebel Mirror
Axial Soller

Sample Stage

Centric Eulerian Cradle

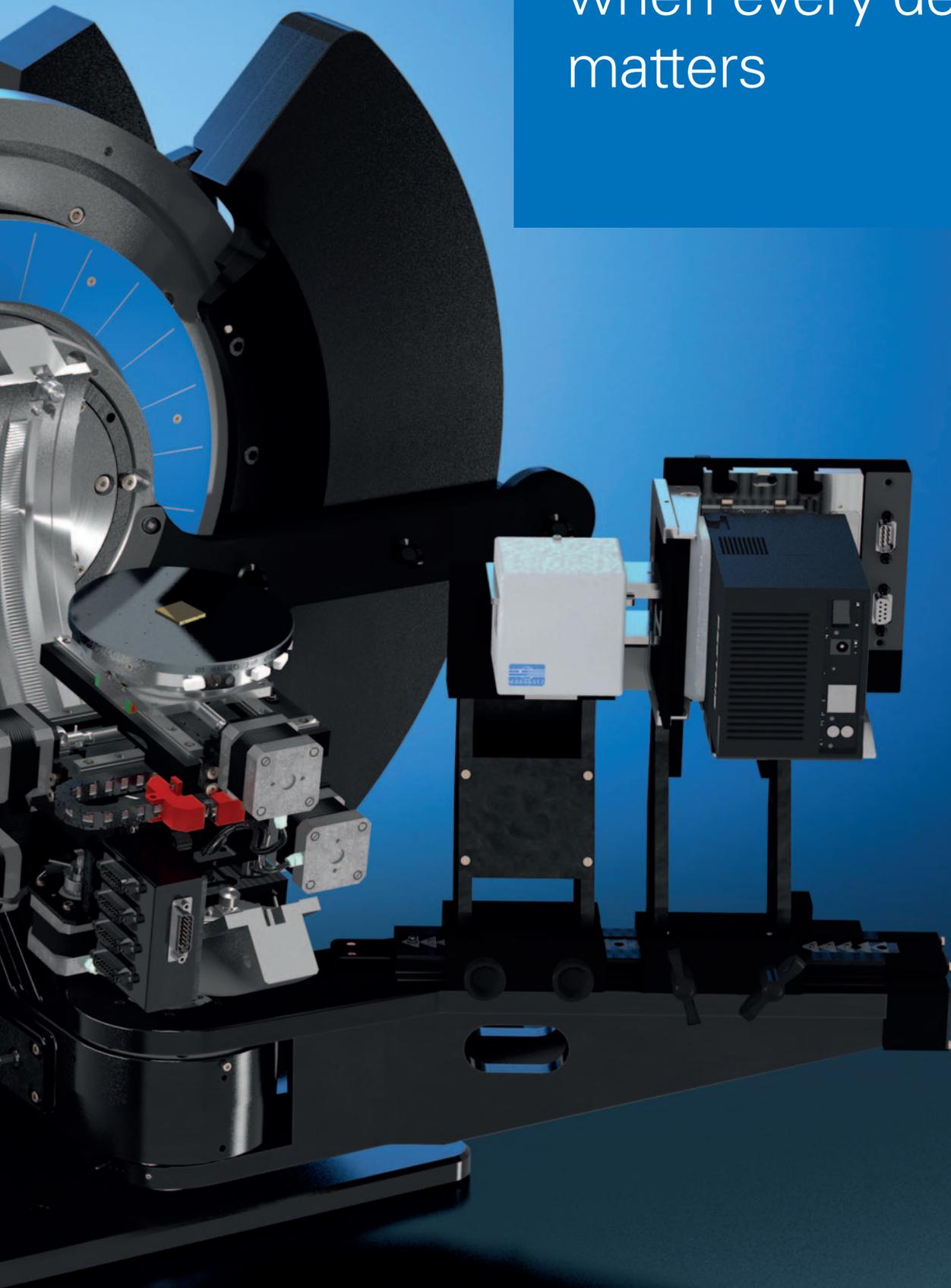
Secondary Optics

Large FoV Axial Soller

Detector

EIGER2 R 500k

D8 DISCOVER Plus when every detail matters



D8 DISCOVER Plus for the most demanding applications

The D8 DISCOVER Plus is the industry leading XRD solution with advanced non-coplanar measurement capabilities.

Building on the foundation of the rock solid ATLAS™ goniometer, with highest guaranteed angular accuracy, the D8 DISCOVER Plus includes leading technology components perfectly suited for the ultimate thin film analysis.

Innovative X-ray source technology including the 1 μ S micro-focus source and TXS-HE rotating anode feed an ingenious optic portfolio to ensure high brilliance in X-ray generation and beam conditioning. The non-coplanar detector arm allows high accuracy in-plane grazing incidence diffraction (IPGID) for the surface sensitive study of sample properties like lateral crystallite size, mosaicity or epitaxial relations in thin films.

Whether the experiment requires the fastest acquisition times, highest signal or smallest beam, the EIGER2 detector with its exceptional field of view, ideal pixel dimensions and ultra high dynamic range, is the perfect match for every analytical task.

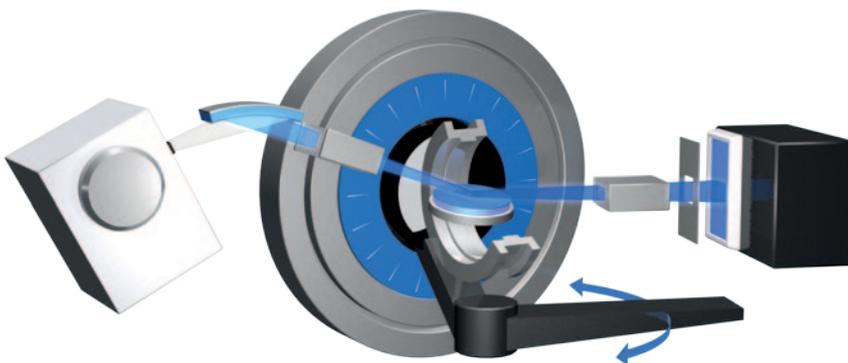
The D8 DISCOVER Plus sets the bar for experiments where every detail matters.

ATLAS Goniometer

- The foundation for accurate results with highest beam position stability
- Industry leading angular accuracy of $\pm 0.007^\circ$ over the entire 2θ range – guaranteed
- Robust and maintenance free
- Available for Ceramic Sealed Tube, 1 μ S and TXS-HE

Focusing Göbel Mirror

- High precision multilayer optics focusing the beam down to $< 200 \mu\text{m}$
- 2 to 3 times more flux on the sample (compared to parallel beam mirrors)
- Benefits GID and in-plane diffraction
- Highest flux for small samples reduces measurement times





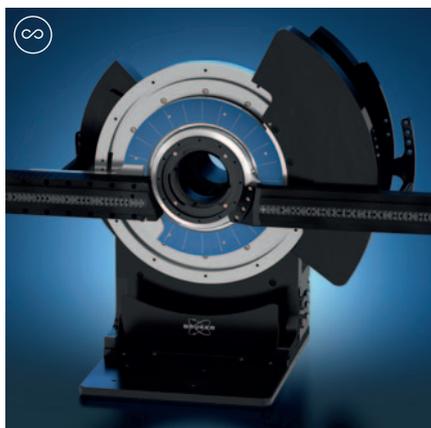
All Purpose

More:
Accuracy
Intensity
Speed
Field of view



High-Efficiency Turbo X-ray Source (TXS-HE)

- 5.4 kW rotating anode X-ray source
- Filament size 0.3 x 3 mm² with up to 6 kW/mm² focal brightness
- Perfectly suited for line and point focus applications
- Available wavelengths: Cr, Co, Cu, Mo



Non-Coplanar Arm

- Maximum 2Theta 155° for unrivalled analytical accuracy
- Guaranteed alignment accuracy of +/- 0.015°, depending on the configuration
- Minimum step size 0.001°
- Dovetail track for flexible optics positioning
- Integrated Detector-Distance detection system for EIGER2 detectors



EIGER2 R 500k Detector

- One detector for all applications
- Largest active area: 38.4 x 77.1 mm² with 75 µm pixel size
- Seamless switch between 2Theta and Gamma optimized mode
- 0D, 1D and 2D measurements in step, continuous and snapshot mode
- Supports all wavelengths from Cr to Ag

TAILORED solutions
welcome to the
universe of choices





Important Notice:
Due to ongoing innovations and limited space,
we cannot show all TAILORED solutions!





TAILORED for a perfect fit

For more than 60 years, Bruker is committed to delivering the best analytical instruments, software and methods. Your requirements include handling large specimens or high sample throughput, high brilliance sources or specialized X-ray optics? We provide TAILORED D8 DISCOVER solutions using our extensive component portfolio to create the perfect fit for your application.

Bruker TAILORED solutions can be found in locations ranging from industrial mines and metal foundries to semiconductor and pharmaceutical manufacturing sites.

Examples of TAILORED solutions:

D8 DISCOVER for High Throughput Screening

Equipped with leading technology components, the D8 DISCOVER HTS enables researchers in the pharmaceutical industry to significantly accelerate API and drug development. Combining the μS microfocus source, multiple wellplate sample stages, and top performance detectors like the EIGER2, the D8 DISCOVER HTS runs fast screening in reflection and transmission geometry.

D8 DISCOVER for μm beam XRD

The unrivaled HB-TXS X-ray source coupled with dedicated high performance MONTEL optics provides the brightness required to carry out diffraction experiments with beam sizes down to $10\ \mu\text{m}$ – crucial to the innovation of microdevices.

Engineering specials for the perfect fit

Whenever your requirements cannot be met with our existing configurations, the demand drives our motivation and we apply our extensive experience in sample handling and throughput, workflow design and ease-of-use to realize dedicated hard- and software solutions. Our aspiration is not just to meet, but to exceed your expectations.

D8 DISCOVER

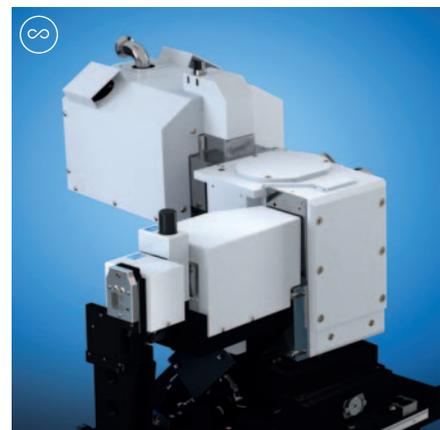
tunable to perform

Although every D8 DISCOVER builds on the same proven platform, each one is configured individually to exactly meet your performance needs, centred around your applications and workflows.

We achieve this using the largest selection of components available for any X-ray diffraction solution, with new innovations added on a routine basis. With our DIFFRAC.SNAPLOCK optics for toolless exchange, and DIFFRAC.MODE component recognition, different setups are ready to measure within minutes.

-  All Purpose
-  Phase Identification & Quantification
-  Microstructure
-  Pair Distribution Function
-  X-ray Reflectometry
-  High-Resolution X-ray Diffraction
-  Reciprocal Space Mapping
-  In-Plane Grazing Incidence Diffraction
-  Grazing Incidence Diffraction
-  Stress
-  Texture
-  Small Angle X-ray Scattering
-  Wide Angle X-ray Scattering
-  Grazing Incidence Small Angle X-ray Scattering
-  Micro Diffraction

197 components
with **1** goal:
the best results



High-Brilliance Turbo X-ray Source (HB-TXS)

- 2.5 kW X-ray generator combined with 0.1 x 1 mm² filaments allows for very highest intensity on smallest spots
- Combine with parallel, focusing or hybrid Montel optics
- Designed to minimize the cost of ownership and to maximize uptime
- Available wavelengths: Cu or Mo

µS X-ray Source

- Microfocus source with 50 W X-ray generator, Cu radiation
- Perfect for small spot application and the investigation of small samples
- Combine with parallel, focusing or hybrid MONTEL optics
- Air-cooled
- 3 years of warranty



µMask Plus

- Crossed slits for defining the size of the X-ray beam in width and height seamlessly
- High accuracy slits design with <math>< 1 \mu\text{m}</math> resolution
- Slit opening 0 to 16 mm for maximum flexibility



POLYCAP

- Polycapillary optics for point focus applications like stress and texture
- For all wavelengths from Cr to Mo
- Max. beam size of 4 mm
- Beam divergence of 0.25°



MONTEL Plus Optics

- For µS X-ray sources
- 100 mm MONTEL optics with parallel-parallel mirrors
- Beam divergence $< 0.04^\circ$ in axial and equatorial direction
- Beam size $\sim 1.8 \times 1.8 \text{ mm}^2$
- Perfect for mm sized samples and small spot application
- Unrivalled axial resolution for in-plane diffraction

Inverted Göbel Mirror

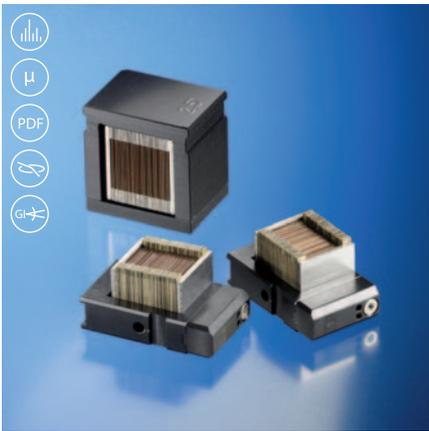
- Focuses an incoming parallel X-ray beam into the center of the goniometer down to $\sim 200 \mu\text{m}$
- Increases the flux density in the center of the goniometer
- Boost the signal in grating incidence geometry
- Mirror-to-sample distance 240 mm

Channel Cut Monochromators

- Highly parallel and monochromatic $K\alpha_1$ beam for high-resolution applications like HRXRD or RSM
- Ge(220) and Ge(004) variants in symmetric and asymmetric geometry for balancing intensity and resolution perfectly

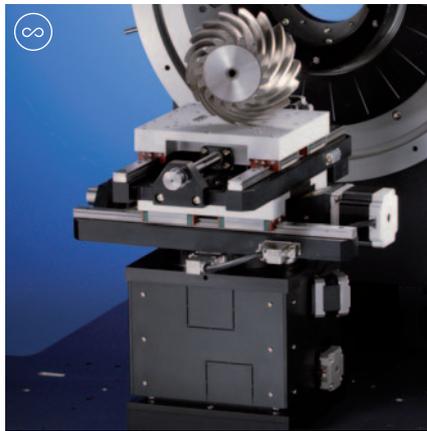
Axial Soller Slits

- Reduce the axial divergence
- For more symmetric peak shapes at small angles
- Available resolutions: 1.6°, 2.5°, 4.1° and 5°
- Perfect balance between intensity and resolution
- Mount on the primary or secondary side



UMC 151 Stage

- Sample stage with large travel range and Phi rotation
- XY-travel range 100 mm
- 360° Phi rotation with maximal 3 rpm
- Z-range: 50 mm with max. sample height of 133 mm
- Maximum sample weight: 5 kg



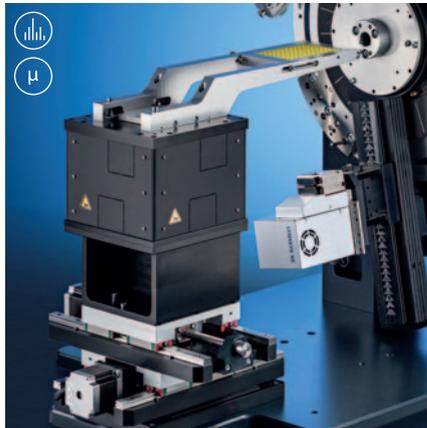
Compact UMC Plus 150 Stage

- Mapping of 6" to 8" wafers
- Reflection mode for 96 well plate
- Vacuum and electric feedthroughs for wafer chuck and tilt stages
- 150 mm XY and 35 mm Z travel range
- Infinite Phi rotation
- Up to 2 kg load



UBC Collimators

- Toolless mounting of short and long collimators with μm precision
- Improve data-quality through reduced air scattering
- Available pinhole sizes: 20 μm to 2.0 mm for point beam applications
- 22 x 1.8 mm² anti-scatter guards for line beam applications in different lengths



UMC 150 HTS Stage

- Sample stage for High-Throughput Screening for up to 3 well plates
- Reflection and transmission geometry
- Different types of well-plates can be mounted via adapters
- XYZ-ranges: 100 mm / 150 mm / 50mm
- Maximum sample weight: 1 kg



UMC 1516 Stage

- Sample stage with large travel range and Phi/Psi rotation
- XY-travel range 100 mm
- Psi range: -5° to +55°
- 360° Phi rotation with maximum 3 rpm
- Z-range: 50 mm
- Maximum sample weight: 5 kg

Find the latest TAILORED solution online



Tilt Stage

- Zeta/Xi-tilt stage for sample alignment
- For the alignment of reflexions or sample surface parallel to an underlying Phi axis
- Angular range: +/- 7.5°
- Smallest step size: 0.0001°



Large Field of View Soller Sits

- Long optics with 20 x 20 mm² opening for highest intensity
- Axial or equatorial orientation
- For thin-film and surface analysis (with parallel beam geometry)
- Available resolutions: 0.1°, 0.2°, 0.4°, 0.5°, 1.0° for best balance between resolution and flux



Wafer Chuck

- Wafer chuck for mapping of 2" to 6" wafers
- Stress-free mounting of even and plane samples
- Samples held by vacuum
- Easy loading of wafers with vacuum tweezers
- Unlimited Phi rotation



Non Ambient Chambers

- Modular chambers for powders, solids and thin films
- Temperature range from 80 K to 2300° C
- One controller for all chambers
- Fully software integrated
- MTC platform for various applications and temperature ranges

- All Purpose
- Phase Identification & Quantification
- Microstructure
- Pair Distribution Function
- X-ray Reflectometry
- High-Resolution X-ray Diffraction
- Reciprocal Space Mapping
- In-Plane Grazing Incidence Diffraction
- Grazing Incidence Diffraction
- Stress
- Texture
- Small Angle X-ray Scattering
- Wide Angle X-ray Scattering
- Grazing Incidence Small Angle X-ray Scattering
- Micro Diffraction

DIFFRAC.SOFTWARE instructive guide

DIFFRAC.WIZARD

As a novice, you may wish clear guidance, but as an expert you want ultimate control. DIFFRAC.WIZARD strikes the perfect balance by providing a guided user experience, without constraining you to a pre-defined workflow. Specialized measurements such as residual stress, texture, non-ambient and high resolution diffraction use a common interface with dedicated graphical elements.

DIFFRAC.COMMANDER

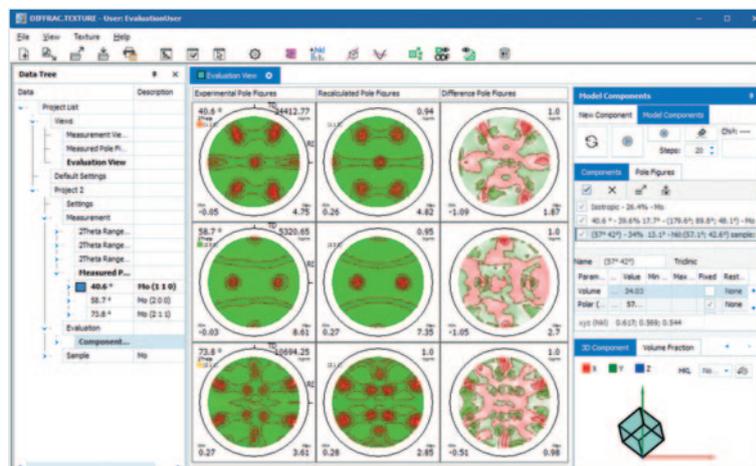
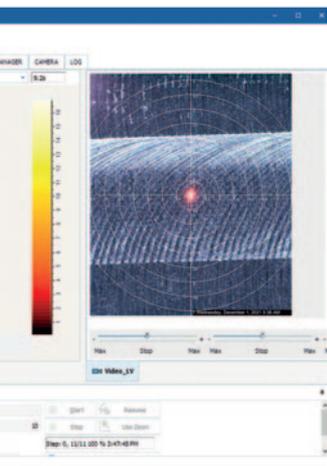
Whether launching a prepared method or directly performing a measurement, DIFFRAC.COMMANDER gives you a quick view of the instrument status and complete control. The interface automatically updates in real time as components are changed and gives access to related component controls.

DIFFRAC.SUITE

From phase identification and structure solution to strain analysis in epitaxial systems, DIFFRAC.SUITE software uses familiar interfaces, workflows and outputs to ensure ease-of-use to maximize your efficiency.

For most accurate analysis results, the individual plug-ins of DIFFRAC.SUITE provide exceptional analytical depth based on leading algorithms.

Analyze

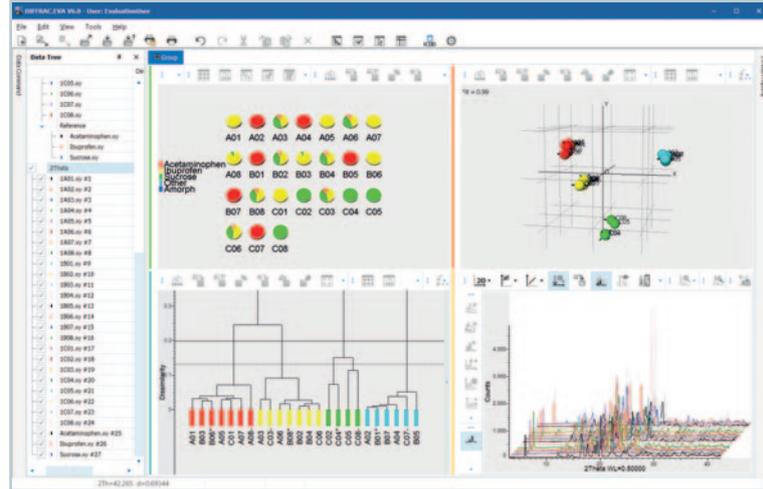


DIFFRAC.SUITE

trusted reliability

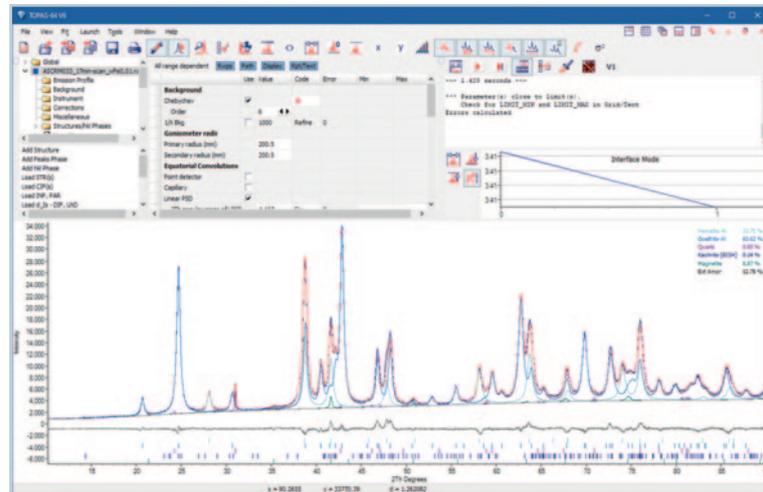
DIFFRAC.EVA

- Data reduction, basic scan evaluation and presentation
- Phase identification and quantification
- Crystallinity and crystallite size determination
- Cluster analysis for sorting and analysing large datasets



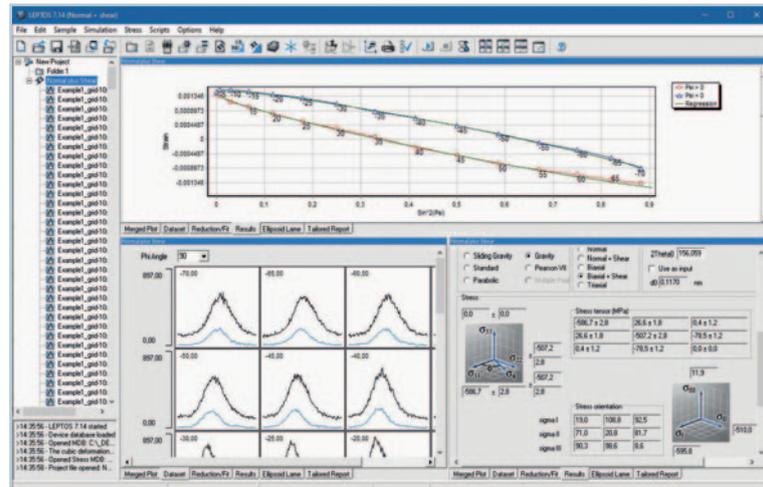
DIFFRAC.TOPAS

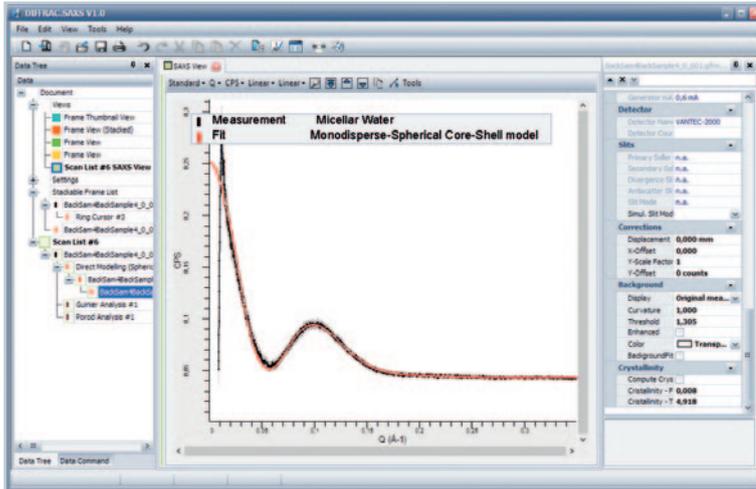
- Most popular Rietveld refinement software in industry and academia
- Quantitative phase analysis
- Structure determination and refinement
- Pair Distribution Function (PDF) data analysis
- Flexible macro language



DIFFRAC.LEPTOS S

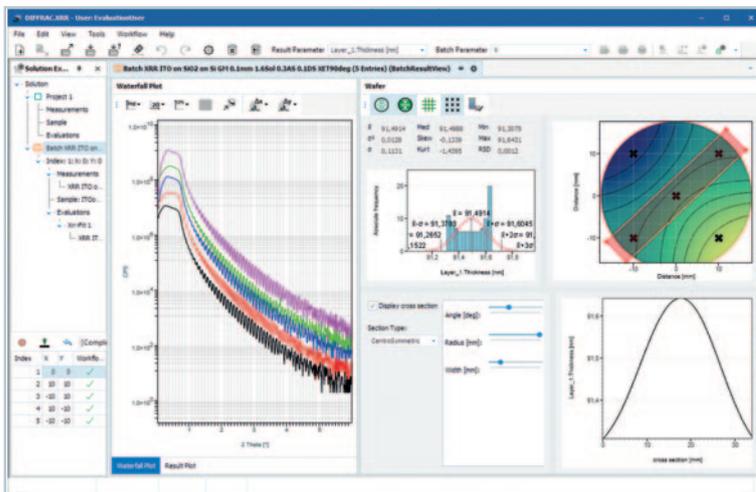
- Residual stress analysis from 0D, 1D or 2D data
- Classic $\sin^2\Psi$ and extended XRD² methods
- Evaluate stress gradients from multiple {hkl} in polycrystalline coatings
- Model-based fitting, including sample effects like absorption, refraction and coating thickness





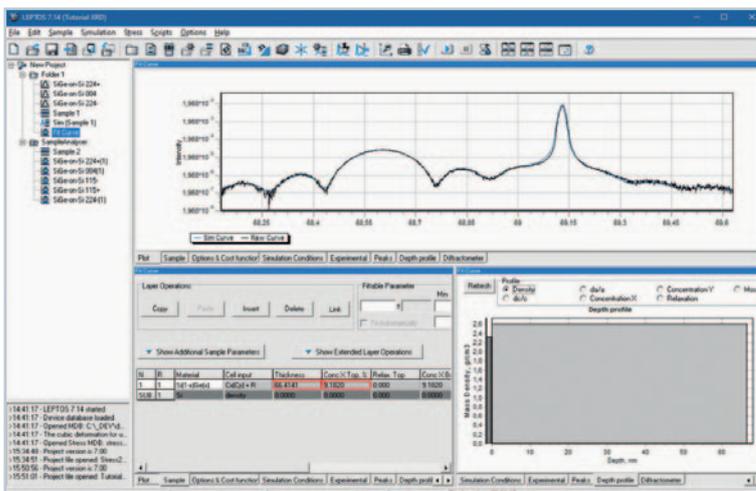
DIFFRAC.SAXS

- Easy, fast and accurate interpretation of 1D and 2D SAXS data
- SAXS specific plots and evaluations (Guinier, Porod, Kratky)
- Model-based fitting of nano-structures in solution
- Nanography maps
- Pair distance distribution function (PDDF)



DIFFRAC.XRR

- Flexible modeling of samples
- Comprehensive and extendable databases for materials and samples
- Advanced automation and workflow capabilities
- Automated analysis and display of series of reflectivity measurements
- Evaluation of wafer mapping data including customizable contour plots and statistical analysis



DIFFRAC.LEPTOS H

- Powerful analysis software for high-resolution X-ray diffraction data
- Crystallographic material database
- Advanced X-ray scattering theories and numerical methods for estimation, simulation and fitting of data
- Sample analyzer for simultaneous fitting of multiple measurements
- Area mapping tool for evaluation of data obtained from sample areas like wafers

Technical Data

	D8 DISCOVER	D8 DISCOVER Plus	
Goniometer	Horizontal and Vertical	ATLAS™ (vertical)	ATLAS™ with NCA
Measurement geometry	Coplanar Mode	Coplanar Mode	Non-Coplanar Mode
Smallest addressable stepsize	0.0001°	0.0001°	0.001°
2Theta range	-10° to 168°	-10° to 168°	-5° to 155°
Guaranteed 2Theta accuracy	< +/- 0.02° ¹⁾	< +/- 0.007° ¹⁾	< +/- 0.015° ¹⁾
Sources	Ceramic sealed tube I μ S microfocus source HB-TXS high brilliance rotating anode	Ceramic sealed tube I μ S microfocus source TXS-HE high-efficiency rotating anode	
Detectors	LYNXEYE family : SDD-160-2, LYNXEYE-2, LYNXEYE XE-T DECTRIS EIGER2 family: EIGER2 R 250K, EIGER2 R 500K, fully integrated		
Miscellaneous			
Dimensions (width x height x depth)	168 x 202 x 129 cm 66.0 x 79.5 x 50.6 inch		
Weight (without optional accessories)	945 kg 2,083 lbs	1050 kg 2,314 lbs	
Max. Power consumption	From 6.5 kVA (I μ S and Sealed tube) to 9 kVA (TXS), depending on the configuration, without controllers for additional equipment		
Power supply	Single phase: 208 to 240 V Three phases: 120 V, 230 V, 240 V 47 to 63 Hz		
Cooling water supply	Air-cooled (I μ S), 4 l/min to 18l/min, depending on the configuration		
Patents	Primary TWIN: US 6665372, DE 10141958; secondary TWIN: US 7983389 B2; TRIO: US 10429326; Encapsulated X-ray mirror: EP 1 503 386 B1; LYNXEYE Family turned 90°: EP 1 647 840 A2 and EP 1 510 811 B1; 2D data correction algorithm: US 9897559		

1) Depending on the configuration

Bruker AXS
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