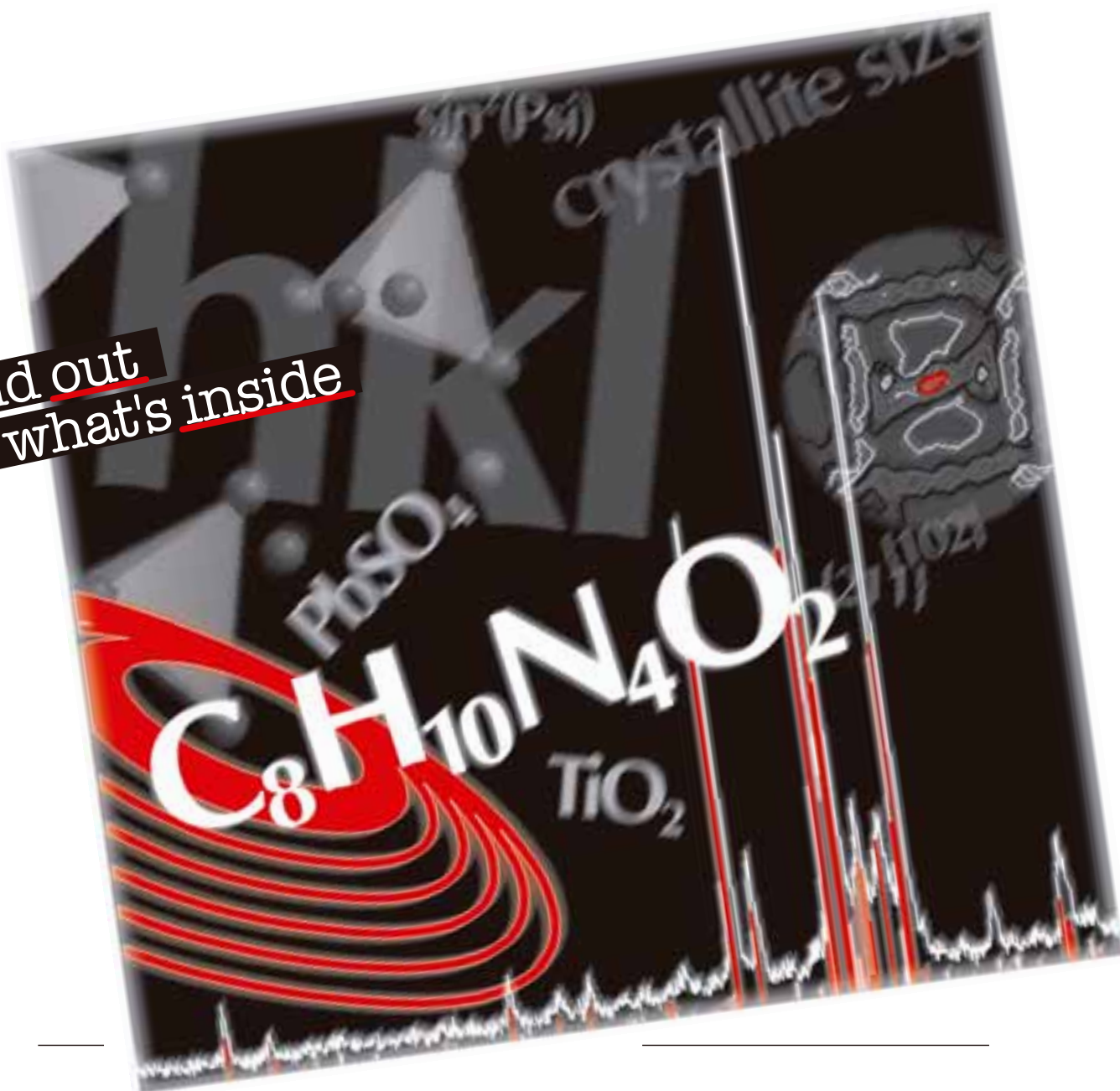


DIFFRACTION SOLUTIONS D8 ADVANCE

find out
what's inside







Aluminum

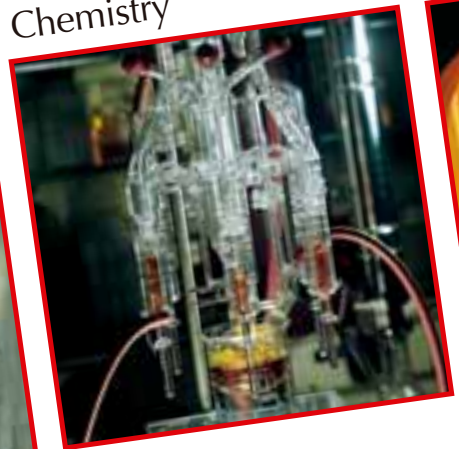
Pharmaceuticals



Polymers



Chemistry



Glass



Power supply



Archeology

Diffraction Solutions – more than just an X-ray diffraction system. At Bruker AXS, a Diffraction Solution is the concept of how to best fit your analytical needs. In addition to cutting-edge hardware and software, a Diffraction Solution consists of an application consultation to ensure the best configuration, plus post-sale customer support to keep the system running smoothly.

A Bruker AXS Diffraction Solution means:

- Unrelenting effort to understand your work and find the solution – no matter what the task is.
- Competent answers to your analytical and technical questions.
- Highly accurate, fast and innovative analysis technology that leaves no questions unanswered.
- Intuitive and clear user interface, very easy handling, individual data presentation and analysis, as well as perfect integration and communication capabilities.
- Modular product concept, that ensures you are optimally equipped for expansion, changes and future tasks.

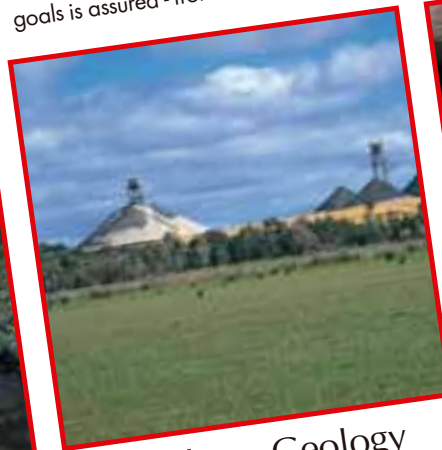
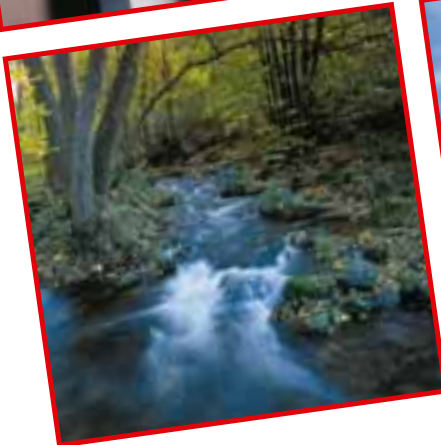
You and our Diffraction Solutions will immediately become firm partners. With our D8 ADVANCE and the DIFFRAC^{plus} software, ultimate achievement of your goals is assured - from the very beginning.

Cement



Ceramics

Environmental analysis



Mineralogy, Geology



Metals

Perfection has a name –
D8 ADVANCE

A graphic consisting of two black rectangular boxes with white text, tilted at an angle. The top box contains the text "find out" and the bottom box contains "what's inside".

find out
what's inside



Make the most of each day – with the **D8 ADVANCE**



- *Solid and maintenance-free goniometer design for long life and mechanical strength*
- *Easy, user-controlled switching between Theta/2Theta and Theta/Theta geometry*
- *Push-Plug optics for alignment-free change between Bragg-Brentano and parallel beam geometry*
- *Unique Si(Li) detector, optimized for X-ray diffraction*
- *Innovative LynxEye and VANTEC-1 linear detectors for Super Speed powder diffraction*
- *PC-based control and measuring electronics – flexibility for future adaptations*





Our users experience has shown one thing clearly – the modular, open and user-friendly D8 concept has proven itself many times over. New requirements, new applications and new methods of evaluation have opened up completely new possibilities for X-ray analysis. We have built on this success and are now proud to introduce to you the new generation of our D8 ADVANCE, the next stage of innovation. With the innovative X-ray optics, the comprehensive sample holder program, the revolutionary detectors and the new capabilities of the measuring and evaluation software, you are ready for tomorrow, using the most innovative D8 ADVANCE ever!

Existing D8 ADVANCE users can also take full advantage of available reconfiguration to obtain the latest features of our Diffraction Solutions.

D8 ADVANCE is a brand name for an optimal and very simple human-machine interface and clarity of design. And there are no compromises when it comes to safety. A redundant, fail-safe circuit meets the latest radiation and personal safety standards. Warning and operator control elements are designed to the latest specifications - ergonomically, clearly visible and well coordinated with each other. Reliable technology ensures long use of all components.

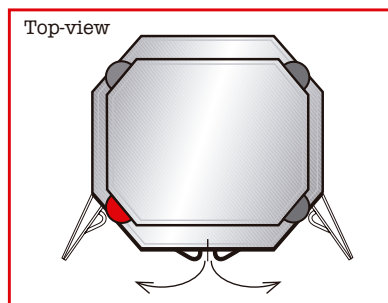
The unique goniometer concept of the D8 family provides you with many new features. The combination of stepper motors with optical encoders ensures fast and extremely precise positioning of the scans without delay time so that the total measuring time is not increased.

All hardware components can be replaced quickly, easily and reproducibly. The Push-Plug optics permits switches between Bragg-Brentano geometry and parallel beam geometry with powder Göbel Mirror. No alignment is required.

X-ray sources, required optics and detectors can be slid to optimize the measuring geometry as desired on the precision tracks of the D8 goniometer. Three predefined measuring circles simplify your work with the Bragg-Brentano geometry.

The D8 goniometer offers a unique "third" circle - a precise 360° groove on which you can mount additional components such as, detectors, adjustment devices or an optional video camera.

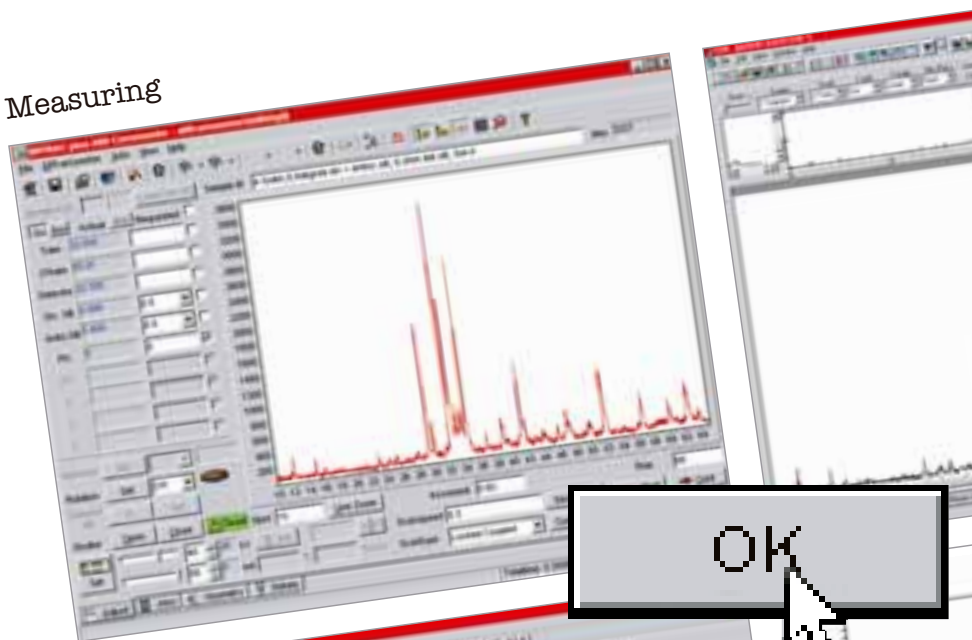
Reliable technology has been improved and innovative ideas were implemented. And it's precisely this combination of new developments (in the area of detector and X-ray source technology, for example) and the further development of proven system components that makes our D8 ADVANCE a perfect tool for the present and the future.



Ease of use – from start to finish – DIFFRAC^{plus}

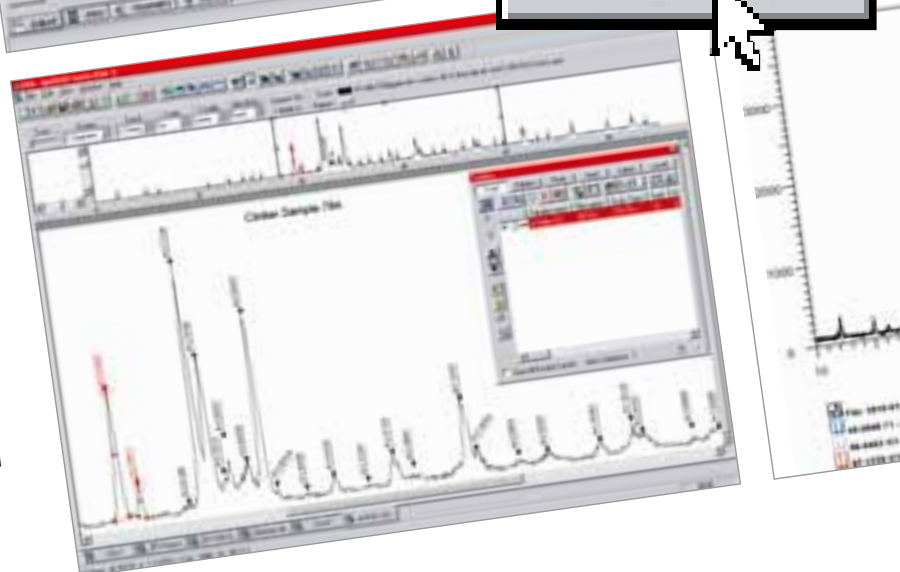
The basis of any analysis is a perfect measurement. The self-explanatory user interface of the DIFFRAC^{plus} XRD Wizard supports you during continuously recurring measuring jobs, as well as planning complex measuring strategies. You can choose between simple spreadsheet or graphical entry. Naturally, you have your D8 ADVANCE under control at all times from anywhere you happen to be. The latest, network-compatible program code lets you perform interactive measurements with the DIFFRAC^{plus} XRD Commander no matter where you are. You can also monitor the incoming measuring data and the goniometer status online. The optional video camera sends you pictures of what's going on.

Measuring



Our methods of evaluating the measured data are as versatile as X-ray diffraction itself. Intuitive user guiding makes the DIFFRAC^{plus} EVA a universal tool. In background subtraction, determination of the angular position of reflections, Fourier analysis, quantitative analysis, or the determination of peak profile parameters, the measured data can be evaluated interactively or automatically. All calculations are first shown on your monitor screen while the output data remain unchanged. Vary the parameters of the calculation with graphical input, for instance, and the changes will be seen in real-time on your screen. This unique option makes it easy to determine maximum-precision analytical results. Effectiveness and user convenience are essential features of DIFFRAC^{plus} EVA. You can design the user interface to suit your own tastes and requirements.

Evaluating



Analyzing

What does analysis with DIFFRAC^{plus} SEARCH mean? The answer is very simple. It gives you the quickest and most reliable match of crystalline phases to the measured reflections in the diffractogram. The long time leader and continuously improved search tool, DIFFRAC^{plus} SEARCH takes only seconds to compare the entire diffractogram with ten of thousands of entries in the latest ICDD data base. The reliability of our analytical method is achieved by the fact that there is neither a restriction to only the most intense reflections nor are reflection asymmetries or shoulders disregarded. This scientifically recognized method ensures that you will also be able to reliably analyze rigorous and complicate phase mixtures with complex peak overlaps.

You can also use DIFFRAC^{plus} SEARCH to select a variety of search criteria so that analysis of the measured data can be performed even faster. Click your mouse to feed the search with available preliminary information such as element composition, ICDD quality criteria or assignment to a class of materials.

To simplify routine analyses, DIFFRAC^{plus} stores all your individual settings.

No analysis without a report and no two reports are the same. DIFFRAC^{plus} EVA offers a comprehensive selection of individually configurable ways to represent, print or export to other WINDOWS[®] applications two- and three-dimensional data records.

The graphic capabilities of DIFFRAC^{plus} EVA leave no requirement unfulfilled. A print preview lets you determine the suitability of the selected colors, line thicknesses, type sizes and fonts, titles, labels, etc. After you have your selection, you can store these settings as your preferred personal presentation style. You can also convert complex multiple-phase diagrams directly into a black and white presentation: for publications, for example. Configure once and utilize the print report function for fully automatic measurements and evaluations.

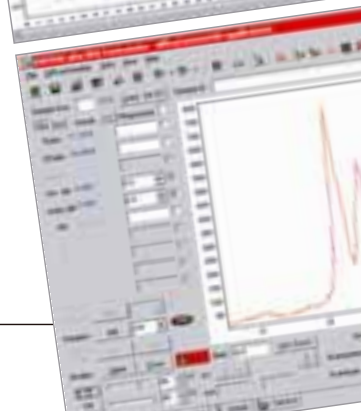
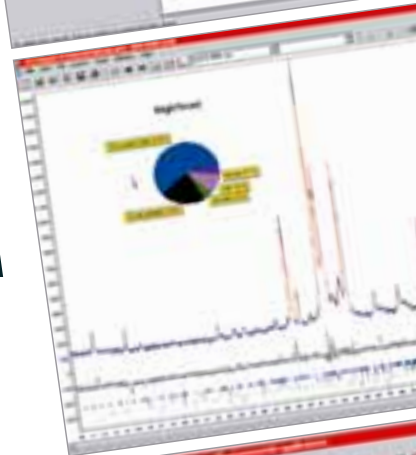
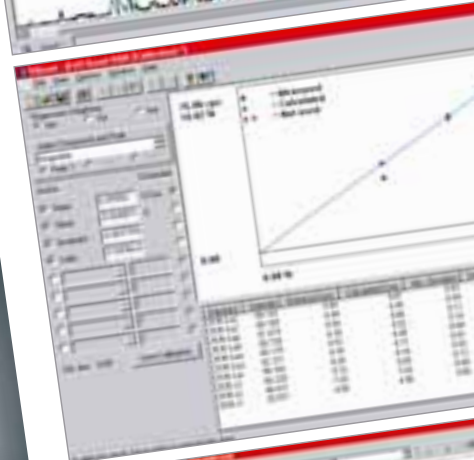
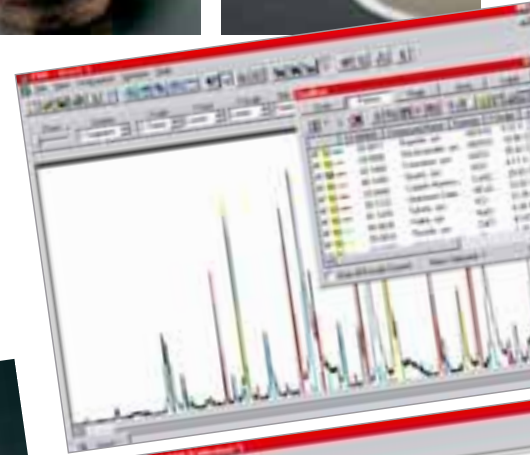
- **Simple and intuitive user interface due to visualization of complex measuring tasks**
- **Versatility due to an extensive selection of the latest evaluation methods for X-ray data**
- **Easy to use, WINDOWS[®]-like: drag and drop, undo and redo, editing several documents at a time and much more**
- **Reliable phase analysis due to the leading SEARCH algorithm, a 10-years leader, which compares the entire diffractogram with the latest ICDD data base**
- **Simple and intuitive entry of the search criteria**
- **Extensive 2-D and 3-D presentation options**
- **Direct export of the evaluations and graphics to other WINDOWS[®] applications**
- **Individually configurable user interface**
- **Optional 21 CFR Part 11 compliance**

Reporting





- Precise setting of the illuminated sample surface with motorized apertures
- Simple and exact sample mounting and positioning due to easy-to-access single and multiple sample stages
- Very good peak-to-background ratio due to use of secondary monochromators or the energy-dispersive Sol-X detector
- Super Speed powder diffraction with LynxEye™
- 90 position Auto Changer for large sample batches
- Snap-Shot recording of kinetic processes with VANTEC-1



Tailored for today, flexible for the future – Powder Diffraction with D8 ADVANCE

The components of our D8 ADVANCE are just as varied as your samples and requirements. You can be sure that every Diffraction Solution is the perfect one for your requirements for modern powder diffraction.

Depending on the nature of your samples, it may sometimes be advantageous to set up a diffractometer with Theta/Theta geometry. No problem for our D8 ADVANCE. You can easily switch between Theta/Theta and Theta/2 Theta geometries on-site.

Does the consistency of your samples not permit sufficient preparation? No problem: A large selection of sample stages and holders is available to ensure optimum measuring conditions and perfect quality of the analytical results.

Do you desire shortest measurement times and strongest signals even from smallest sample amounts? Then you will benefit from LynxEye's features: speed, sensitivity, and resolution. And even faster: the VANTEC-1 is capable of collecting up to $12^\circ 2\theta$ in 100 msec Snapshots, several hundred times faster than a conventional scanning detector.

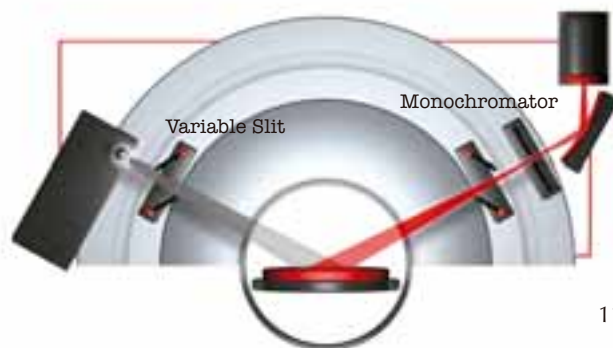
Do your samples obscure the measurement with undesirable fluorescence? You can obtain the best data with optimum measuring time by using a secondary monochromator or the energy dispersive Sol-X detector.

Our D8 ADVANCE is the specialist for the classical tasks of powder diffraction. Some examples:

- Qualitative or quantitative phase analysis
- Crystallite size determination
- Structure determination and refinement

Regardless of whether you are interested in the angular position of the reflection, the intensity, the full width at half maximum or the shape, you will benefit from the precision and proven accuracy of our D8 ADVANCE.

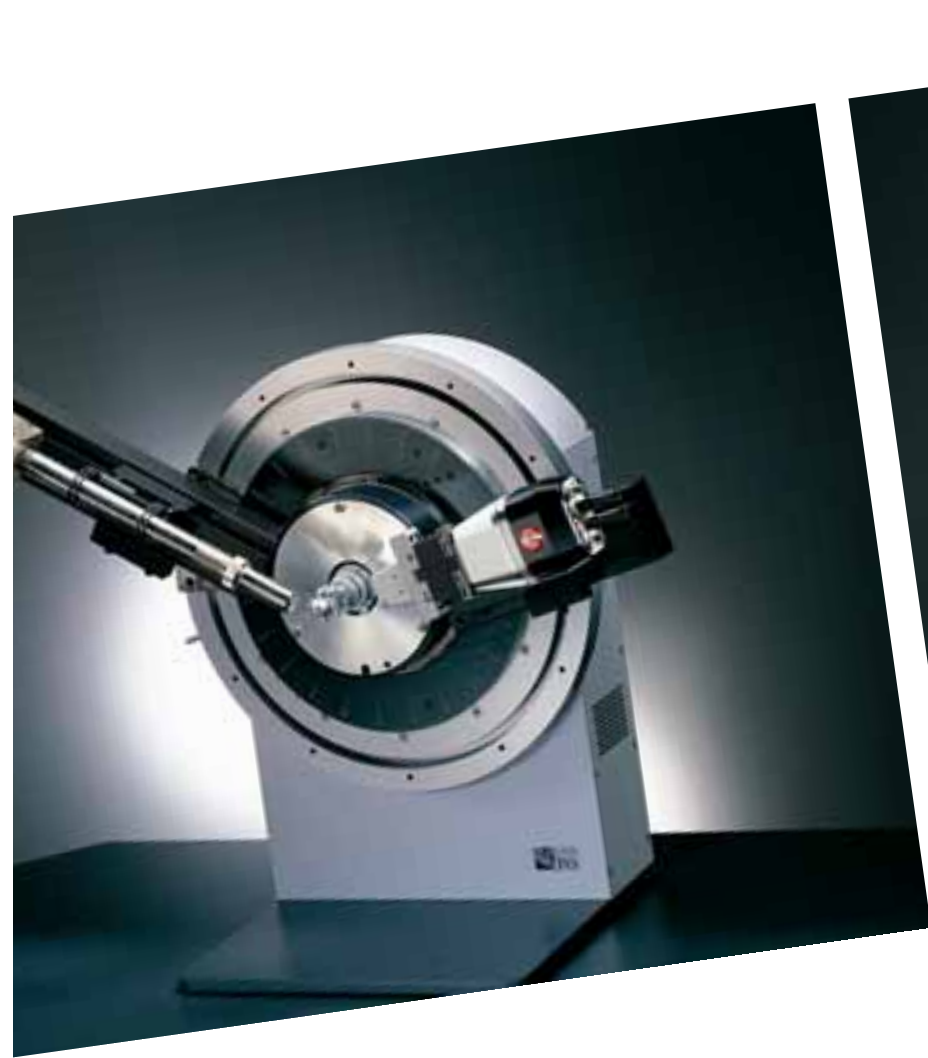
Modularity is the fundamental concept of the entire D8 product family. Moreover, our building-block principle permits us to put together a D8 ADVANCE diffractometer for you which is precisely customized to your analytical requirements. Together with you, we combine the suitable optics, optimum detector, appropriate sample stage, and the right measuring and evaluation software to create a Diffraction Solution. Perfection from the beginning.



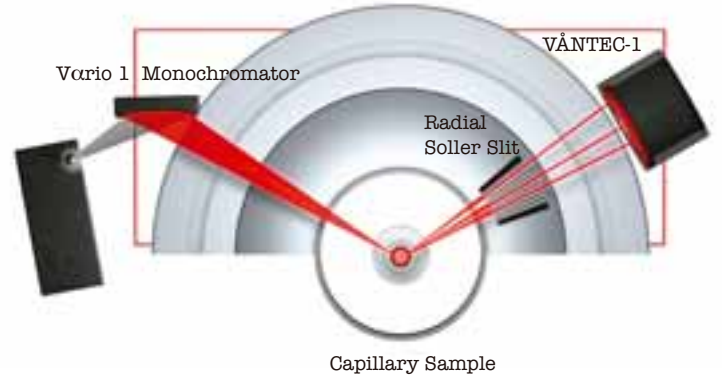
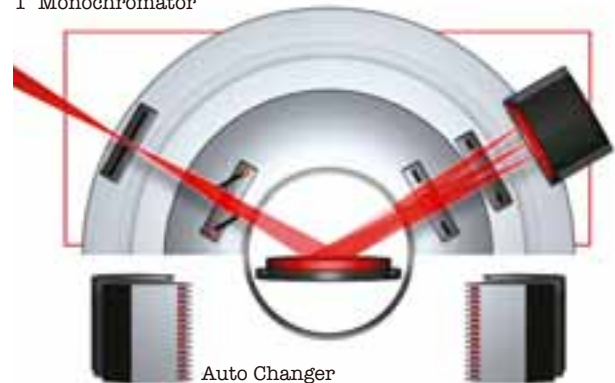
D8 ADVANCE with Vario1 – the cut above standard powder diffraction

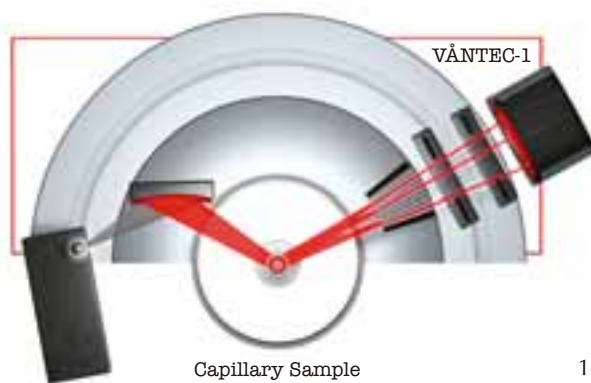
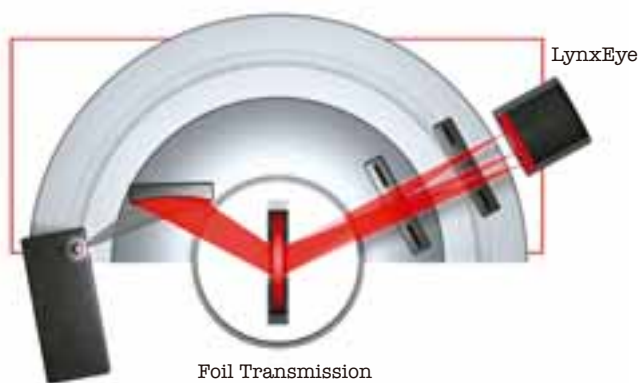
- Four focusing geometries in one system
- Change of geometry without realignment effort
- High-intensity and pure $K\alpha_1$ radiation with Bragg-Brentano geometry for short measuring times and excellent peak shapes
- High-resolution or high-flux geometries for capillary or foil transmission
- Capillary technology for low and high temperatures
- Total compatibility with all D8 ADVANCE sample stages, secondary optics and detectors
- Minimized background scattering by use of the radial Soller slit for VANTEC-1 detector
- Large sample batches with 90 position Auto Changer, transmission and reflection
- Super Speed data collection with LynxEye or VANTEC-1
- Optional Theta/Theta version for high temperature or loose powder investigations





1 Monochromator





One system, four geometries and infinite possibilities. Our D8 ADVANCE with its unique Vario1 offers all this. Designed especially for user friendliness and flexibility, the focusing Cu-K α_1 monochromator provides maximum intensity and resolution for demanding powder diffraction applications.

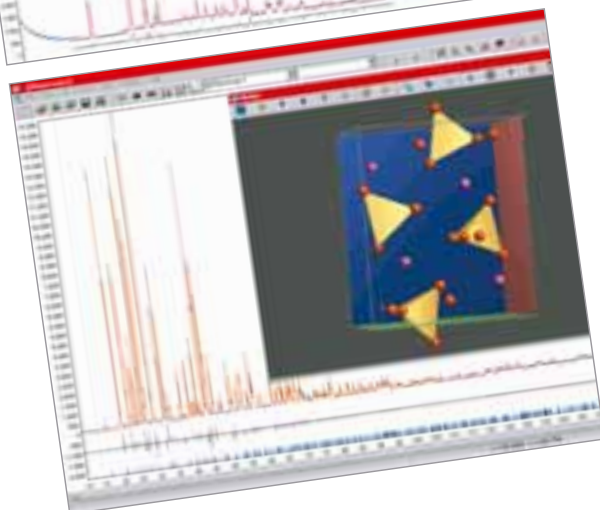
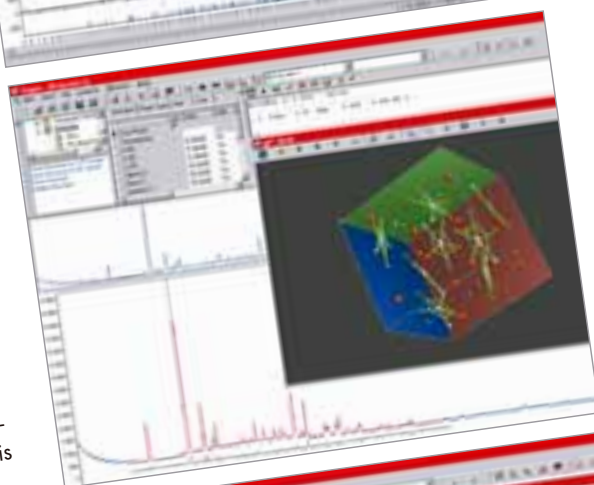
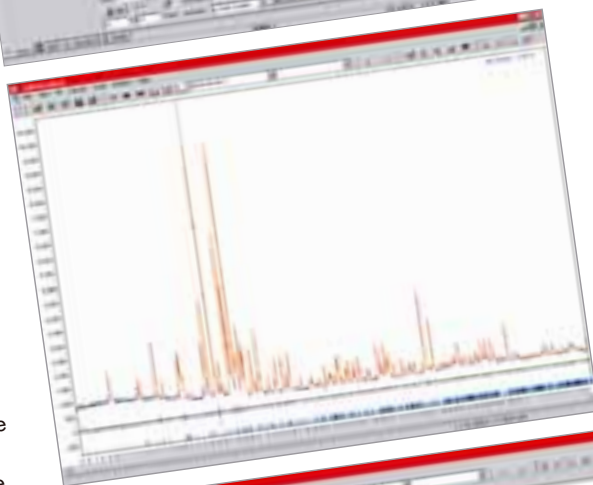
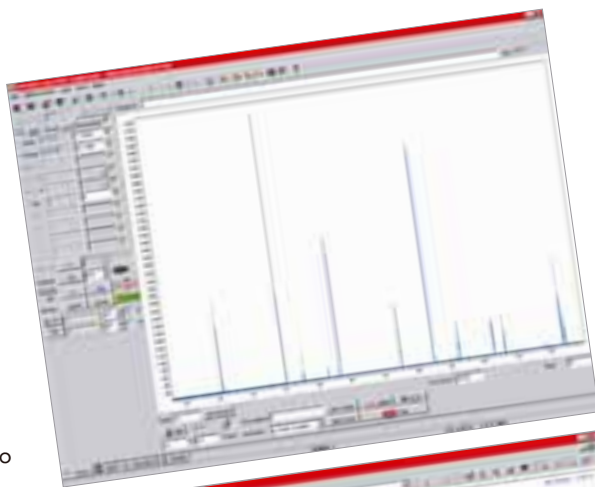
What does user friendliness mean? The compact and well-thought-out mechanical design of the Vario1 opens up analytical capabilities to you previously only available with special configurations. Totally pre-aligned, you can switch between a wide variety of geometries to fit your analytical requirements. Just slide the Vario1 monochromator along the maximum-precision tracks of the D8 goniometer. No alignment is necessary.

What does flexibility mean? In addition to the ability to change back and forth between a wide variety of geometries, a comprehensive selection of sample stages and detectors is available to you for the Vario1. The type of sample and the desired sample throughput determine the optimum combination of components. If your samples are flat and solid, reflection geometry is optimum. Analysis and sample throughput can be increased using our Flip-Stick or Auto Changer, and the linear LynxEye or VANTEC-1.

If only very small sample quantities are available, or if it is important to avoid orientation effects, utilize the advantages of the capillary technique. Sample stage and geometry are changed in seconds and you then can begin with the measurements. If you are examining polymers or sensitive materials which must be protected (wrapped in foil) during preparation, then change to foil transmission. You can also use the Flip-Stick or Auto Changer for this type of measurement. Let the D8 ADVANCE measure an entire batch of samples while you use this time for data evaluation.

The complete DIFFRAC^{plus} software package is optimized for data evaluation. In particular, the DIFFRAC^{plus} TOPAS is the recognized leader in advanced structure determination, refinement, indexing, and high-end profile analysis for standardless microstress or crystallite size determination.

DIFFRAC^{plus} TOPAS and our D8 ADVANCE with Vario1. Never before achieving pure Cu-K α_1 analysis was so simple.



Unrestricted capabilities, on-line switch of transmission/reflection – D8 ADVANCE with Göbel Mirror

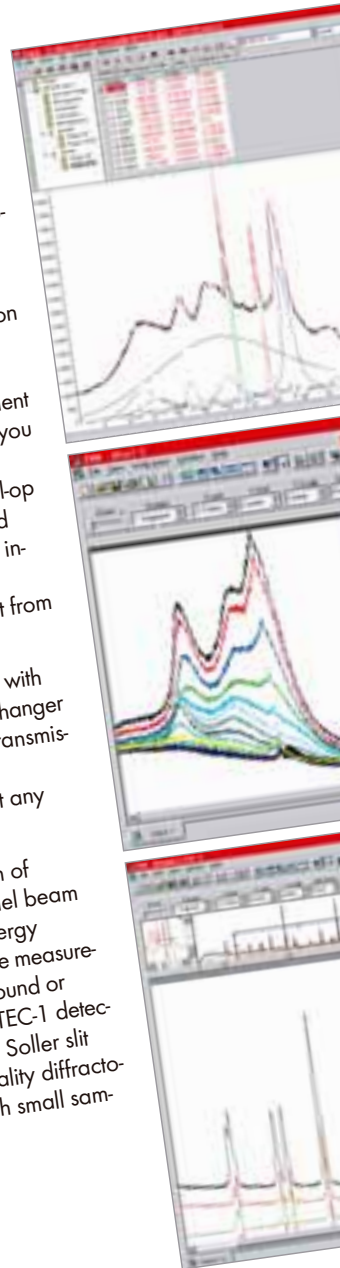
- **Göbel Mirrors for Cu, Co or Cr radiation**
- **Unique Flip-Stick or 90 position Auto Changer for software controlled switch between reflection and transmission**

The D8 ADVANCE with Göbel mirror offers incomparable flexibility when it comes to sample consistency, shape, handling and preparation. In addition to conventional, pressed samples, you can also examine loose powders, fibres, and irregularly shaped substances, even liquid or viscous substances.

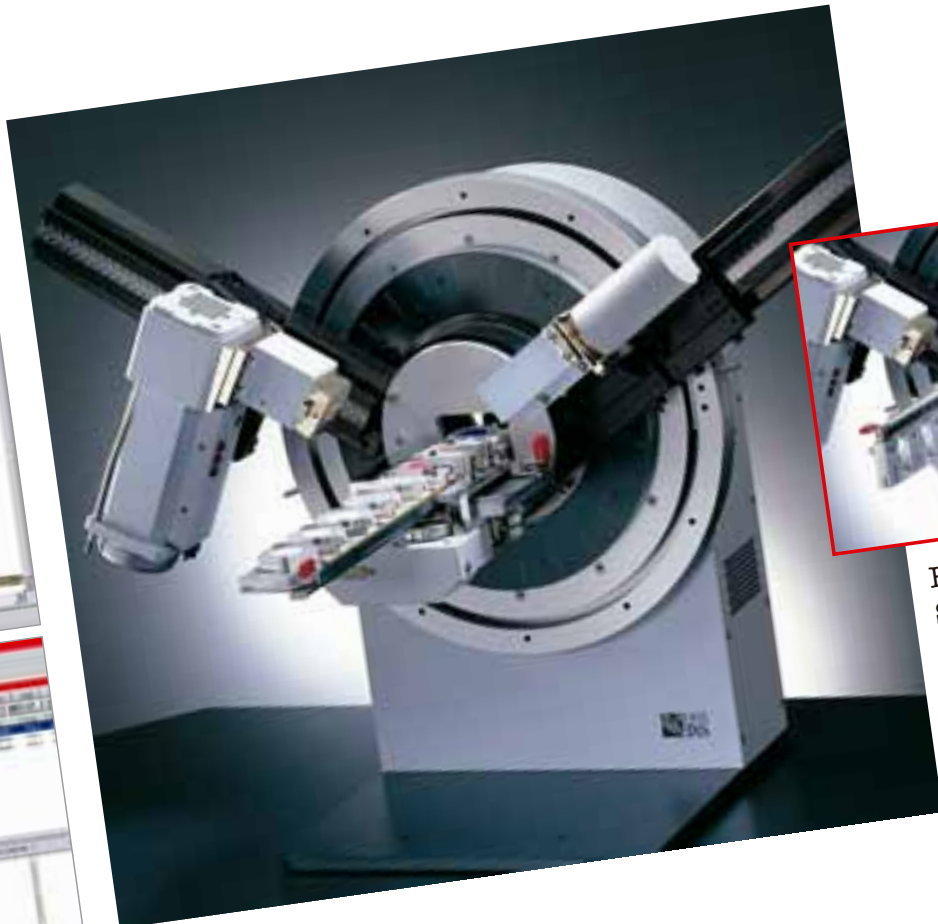
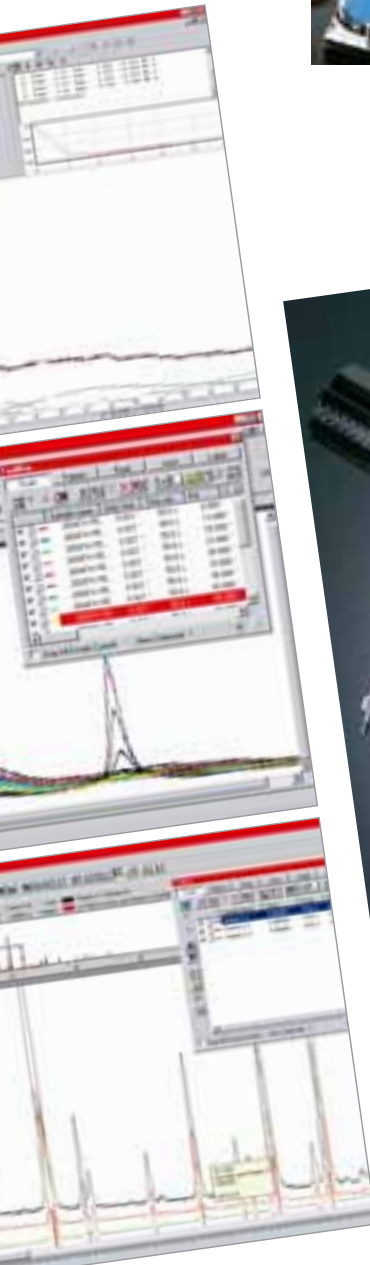
Surface quality, precise sample position and absorption behavior of the sample are not important. The parallel beam geometry ensures that you obtain excellent diffractograms with high resolution. If you have only a very small amount of the sample or your sample tends to develop preferred orientation, we recommend preparation in a glass capillary. Just install the capillary stage in your D8 ADVANCE and you can benefit from this method of examination.

Parallel beam geometry with the with the Flip-Stick or 90 position Auto Changer sample stages for reflection and transmission lets you measure all kinds of samples in one batch - without any readjustment or realignment.

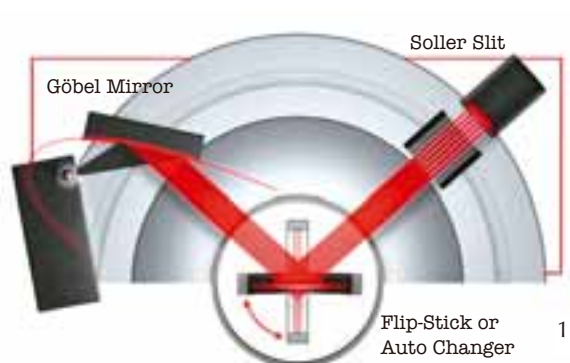
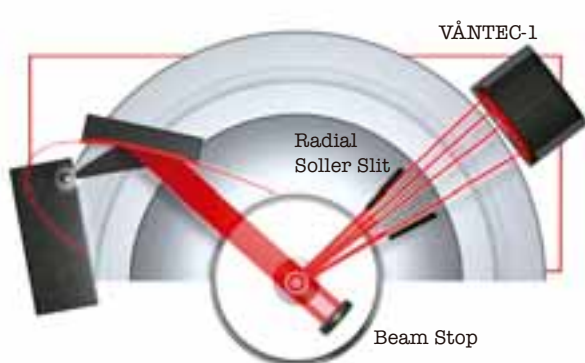
Naturally, the entire selection of detectors is available for parallel beam geometry. If necessary, the energy dispersive Sol-X detector rids the measurements from disturbing background or fluorescence. Our linear VÅNTEC-1 detector with its exceptional radial Soller slit lets you obtain maximum-quality diffractograms very quickly even with small sample quantities.



- **Radial Soller slit for VÅNTEC-1 for lowest background**
- **Dynamic scintillation counter, energy-dispersive Sol-X, or Super Speed LynxEye or VÅNTEC-1**



Flip-Stick Sample Stage



Natural or Non-ambient – D8 ADVANCE for **controlled sample environment**

- *Temperatures from 8 to 3000 K*
- *High-vacuum, inert or reactive atmospheres*
- *Humidity up to 90% RH, temperatures up to 90 °C*
- *Pressure up to 20 bar*
- *Snap-Shot recording of kinetic processes with VANTEC-1*

Your samples are not going to reveal their hidden secrets unless they are subjected to their natural state or extreme environmental conditions. The crystalline properties may change under the influence of temperature, pressure, gas atmosphere or humidity. When your D8 ADVANCE is equipped with one of the various sample chambers, you can study these effects in detail.

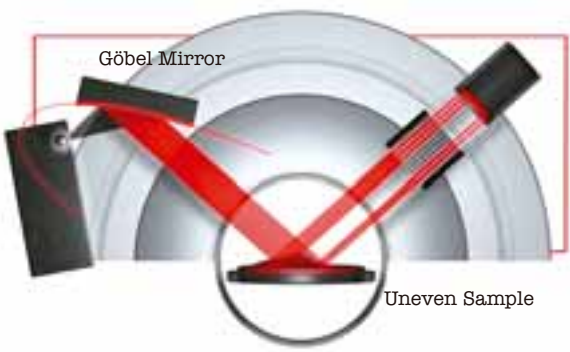
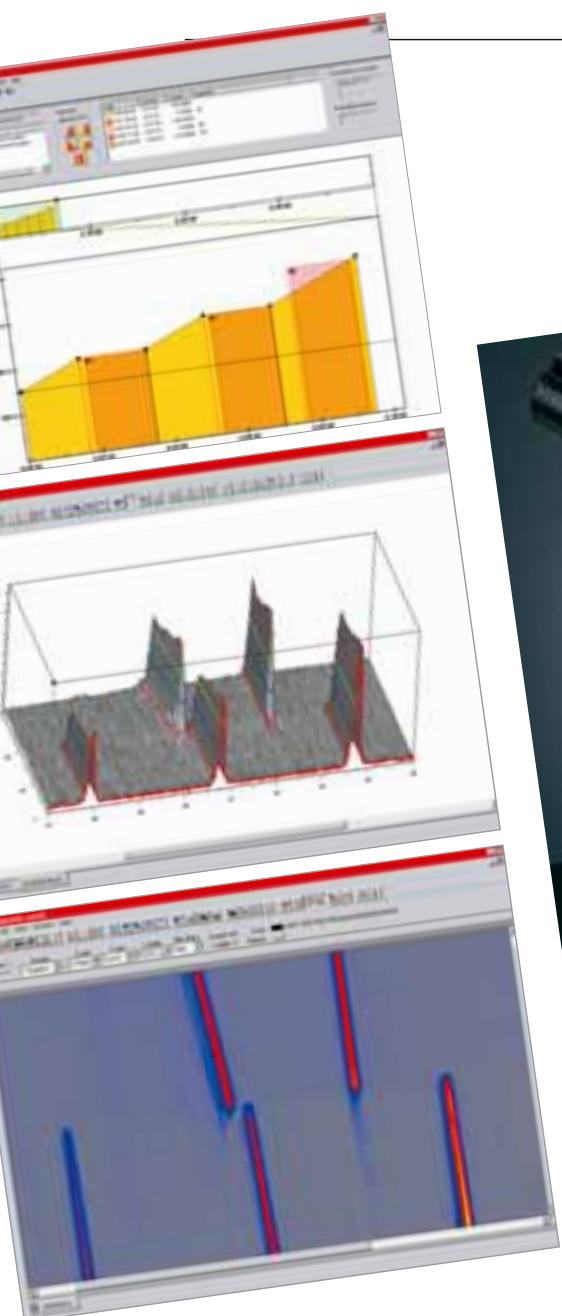
For a wide variety of requirements, you can select from an assortment of chambers for the temperature range from 8 to 3000 Kelvin. Gas pressures up to 20 bar can be implemented. Chambers are available for kinetic reaction studies or humid atmospheres up to 90% RH with sample temperatures up to 90 °C. Your every need is covered.

When you equip your D8 ADVANCE with a Göbel Mirror, you can be sure that the measured angular positions are only affected by changes of the crystalline structure of your sample. The parallel beam geometry makes the experiment immune to fluctuations in the sample height or expansion of the sample. We have completely integrated the sample chamber controller in the DIFFRACplus software so that you can take advantage of all these capabilities. A graphical interface makes preparation of complex measuring sequences easy. Also you can count on the DIFFRACplus software for evaluation and presentation.

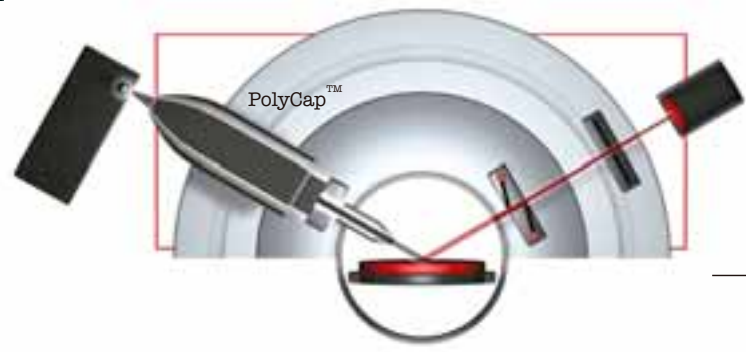
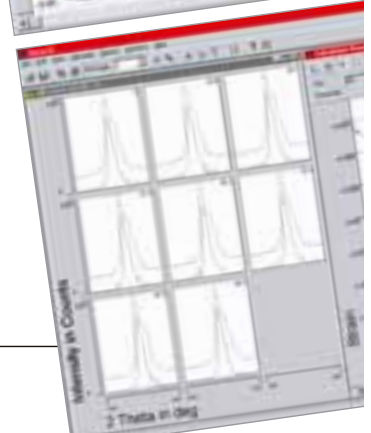
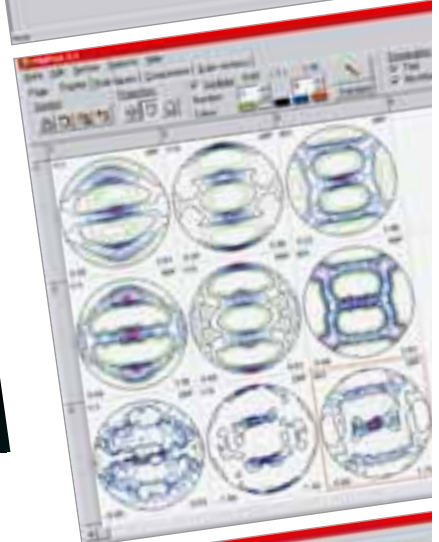
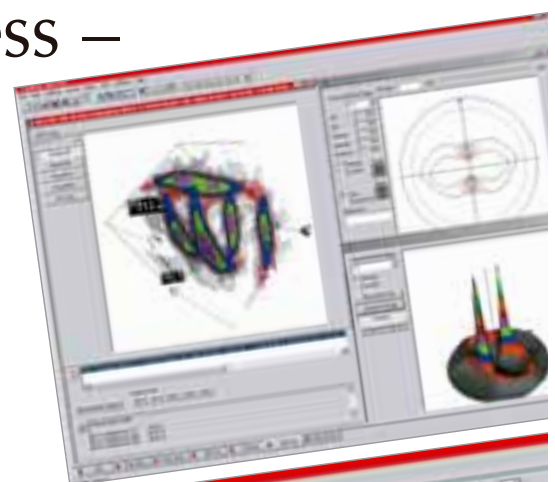


- *Unrestricted sample handling by using vacuum, heating or cooling from the back of the goniometer*
- *Graphically supported user interface in the control software*
- *Low and high temperature for capillary technique*





Stress and texture analysis for the manufacturing process – D8 ADVANCE



■ **Parallel beam geometry with PolyCap™**

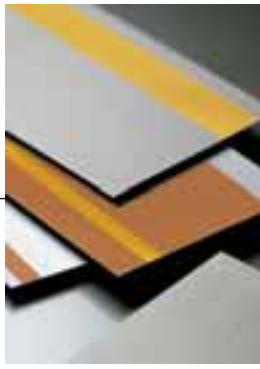
■ **360° Eulerian cradle for vertical mounting**

■ **Stress and texture determination for quality and process monitoring**

■ **Calculation of the X-ray elastic constants with ELASTIX**

■ **Texture determination using the component method with MULTEX**

■ **VANTEC-1 for Snap-Shot residual stress investigations**



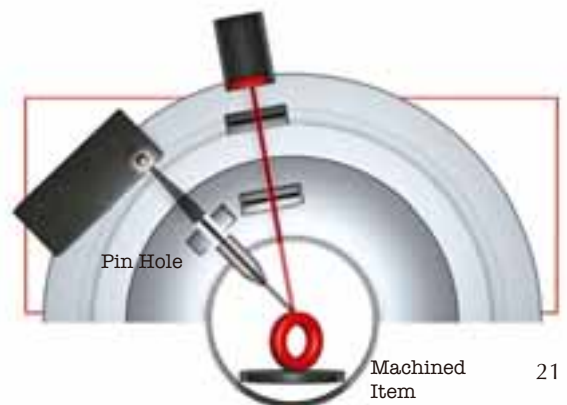
The D8 ADVANCE is the system of choice when it comes to controlling the micro properties of samples.

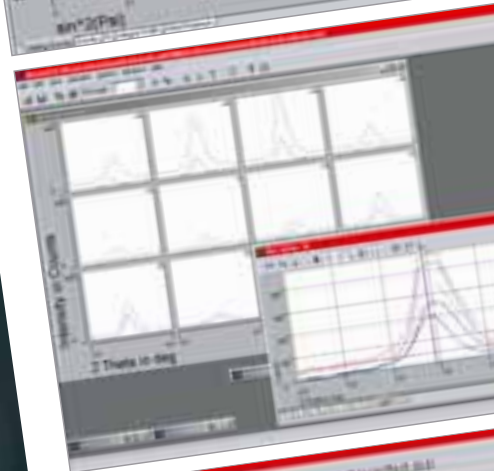
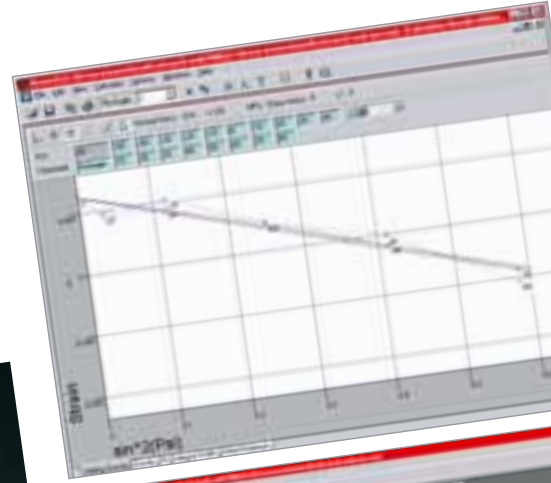
With the compact, 360° Eulerian cradle, you can measure your sample in all orientations. Our PolyCap™ provides the necessary beam intensity on the sample. In a short time, you are able to measure the entire texture and then evaluate the measuring data traditionally or with the component method (MULTEX).

Our D8 ADVANCE even reveals the secrets of finished highly machined items. The result of a sequence of measurements with large diffraction angles is the residual stress. Using this value and the X-ray elastic constants precisely calculated by ELASTIX and the help of DIFFRACplus, you obtain the precise value of normal stress which plays a decisive role in the physical properties of your work piece.

Sample throughput and data quality can significantly be improved by using our VANTEC-1 linear detector. With it's huge 2Theta coverage data sets can be collected every second using the unique Snap-Shot mode.

You have your manufacturing process firmly under control thanks to X-ray diffraction and our D8 ADVANCE.



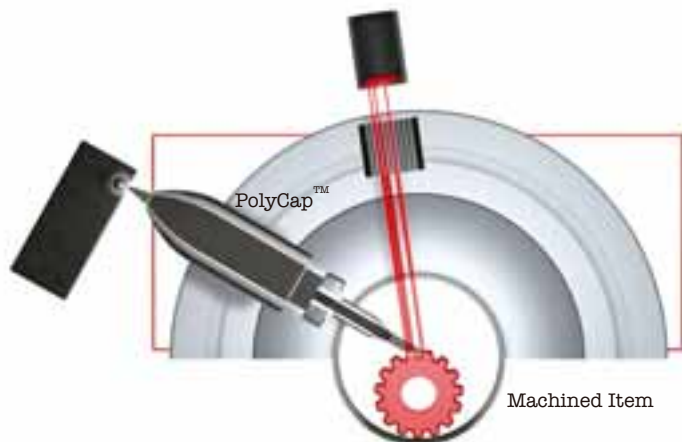


XXL analysis – parallel beam for large samples, high intensities, and special geometries

Since the introduction of X-ray optics for parallel beam geometry, exact positioning of the sample in diffraction plays only a subordinate role thanks to our Göbel Mirror and the PolyCap™ optics. Mount your samples in the X-ray beam and you are ready to start. Use the sample mounting which is appropriate. Regardless of whether you require to study unformed samples or objects with uneven surfaces, you will always obtain clear and useful diffractograms. The large central opening in the D8 goniometer even lets you study all areas of very long objects without the need to damage them.

Another advantage of using parallel beam optics is the resulting intensity increase. This drastically reduces measuring times during the residual stress analysis, for example. Parallel beam optics puts you in the position to perform analyses which were inconceivable in the past.

Diffraction Solutions with the D8 ADVANCE: from micro powder to XXL analysis.



- Parallel beam with Göbel Mirrors
- Parallel beam with PolyCap™ for all X-ray wavelengths
- Fast and highly accurate analysis of large, unusual or hard-to-handle samples

Technical Data

Configuration	Horizontal or vertical, Theta/2 Theta or Theta/Theta geometry (can be reconfigured on-site)
Measuring circle diameter	Measuring circle diameter 435, 500, and 600 mm predefined, all other intermediate settings possible
Angle range (Theta and 2 Theta, without additional equipment)	360°
Max. usable angular range (depends on extra equipment)	$-110^\circ < 2 \text{ Theta} \leq 168^\circ$
Angle positioning	Stepper motors with optical encoders
Smallest addressable increment	0.0001°
Reproducibility	$\pm 0.0001^\circ$
Maximum angular speed (depends on extra equipment)	30°/s
General space requirements	
Exterior dimensions	2035 x 1400 x 1260 mm 80.12 x 55.12 x 46.90 inch (h x w x d)
Weight (without optional electronics)	550 kg
Cooling water supply (without optional internal water chiller)	≥ 3.6 l/min, pressure: 4.0 to 7.5 bar with no back pressure, Temperature: 10 to 20 °C
Power supply	Single phase: 208 to 240 V, Three phases: 120 V, 230 V, 240 V; 47 to 63 Hz
Maximum power consumption (without controllers for optional equipment)	6.5 kVA

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