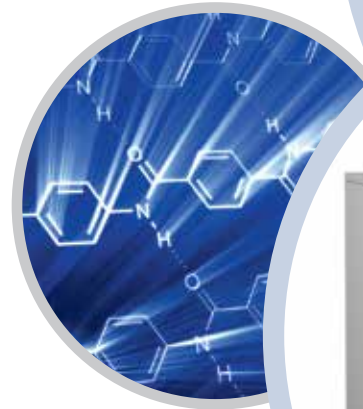


thermoscientific

Thermo Scientific ARL EQUINOX 1000

X-ray Diffractometers



ThermoFisher
SCIENTIFIC

High performance in a compact size

Thermo Scientific™ ARL™ EQUINOX 1000 X-ray diffractometer (XRD) is designed to meet structural and phase analysis requirements in both industrial and research laboratories. The bench-top design is ideal and a cost-effective solution for routine QC/QA, dynamic studies, formulation determinations as well as teaching in university and colleges.

The ARL EQUINOX 1000 instrument features a unique curved position sensitive detector for real-time simultaneous acquisition of full pattern, enabling faster analysis, in situ experimentations, and crystalline phase development and phase transitions.

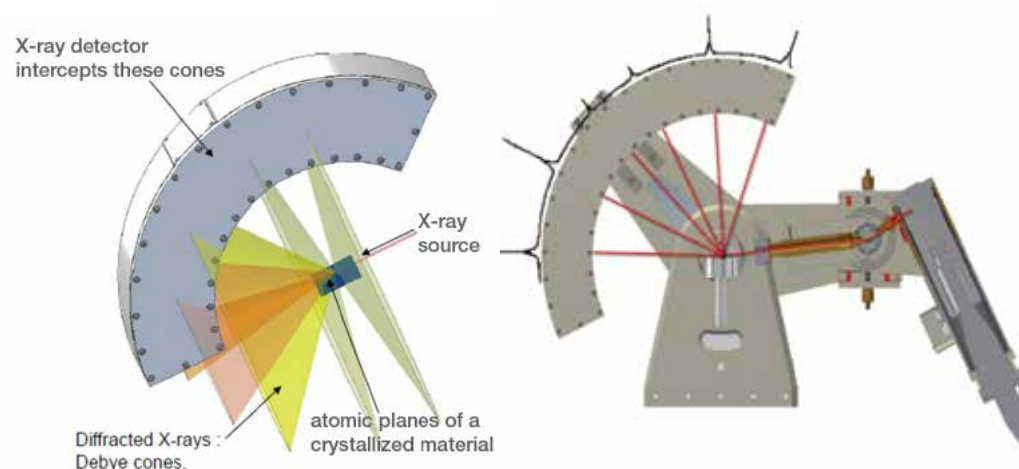
- Reliable and robust with no moving parts
- Unique 3 kW power benchtop instrument
- Real-time simultaneous data acquisition
- Versatile sample entry and analysis



Reliable and robust

Thermo Scientific ARL EQUINOX series is designed for laboratories ranging from mobile labs to production control and central laboratories. This X-ray diffraction (XRD) technology allows for greater flexibility and is quicker in process response times.

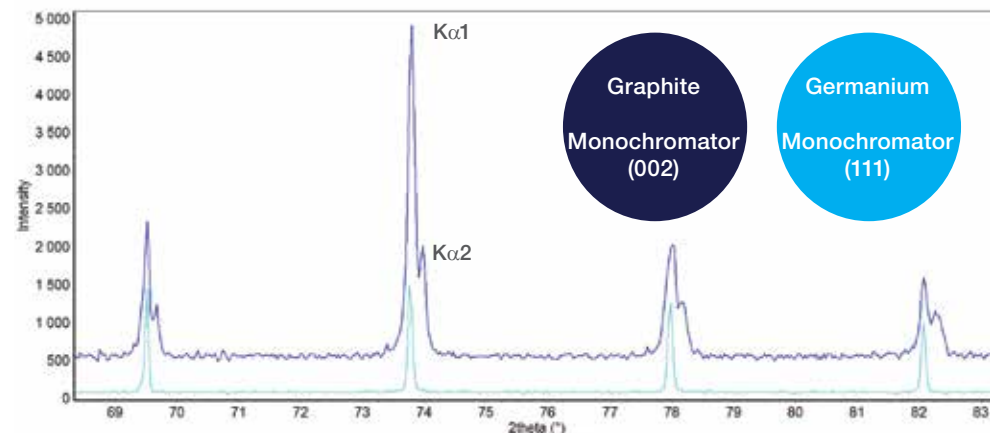
- Stationary X-ray source and detector
- Fixed focal length
 - No realignment needed
- Simultaneous acquisition over $110^\circ 2\theta$
 - Adjustable incidence angle on the sample, from 0°



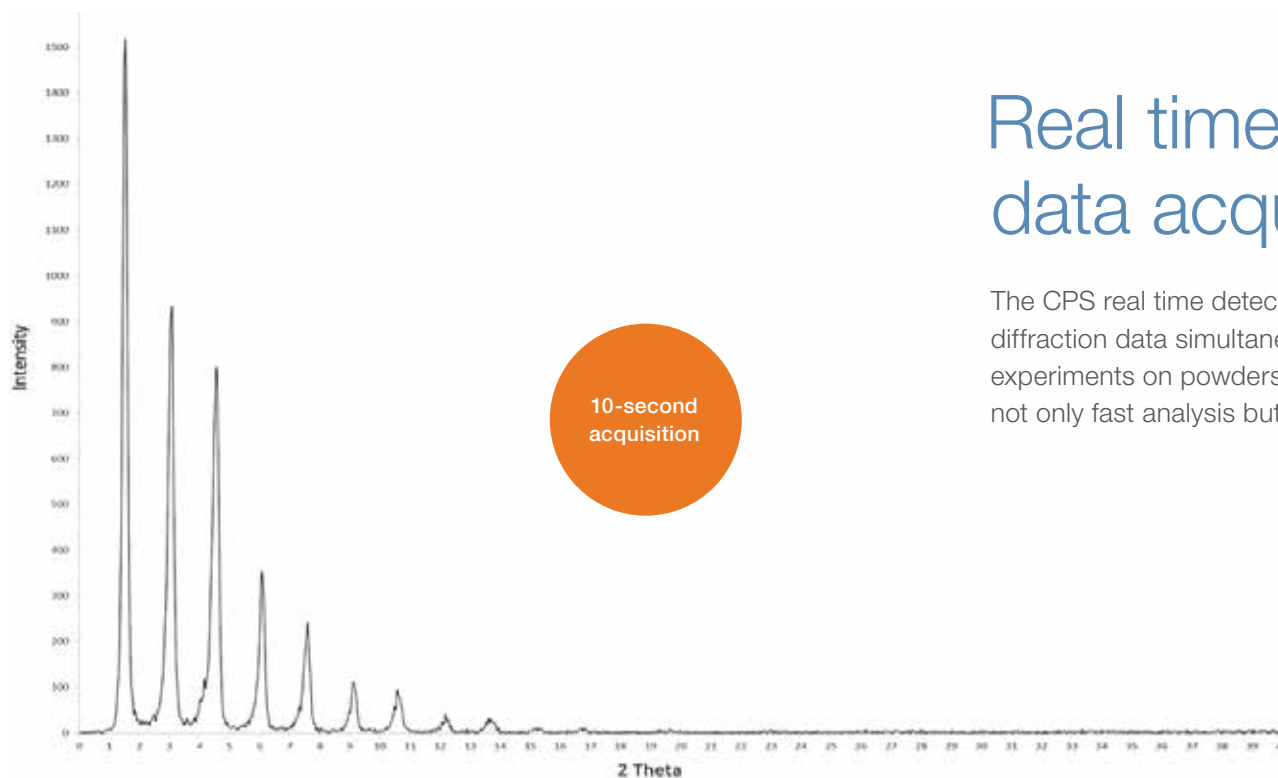
Resolution and high intensity in the same instrument

The ARL EQUINOX 1000 uses a standard high power X-ray tube for sample excitation. The optical path incorporates a flat monochromator allowing parallel beam mode studies to either increase sensitivity with graphite or resolution with germanium.

- Germanium Monochromator Ge (111)
 - Pure $K\alpha_1$ radiation only
- Graphite Monochromator HOPG (002)
 - $K\alpha$ 1&2 radiation
 - 5 times acquisition compared to Ge (111)



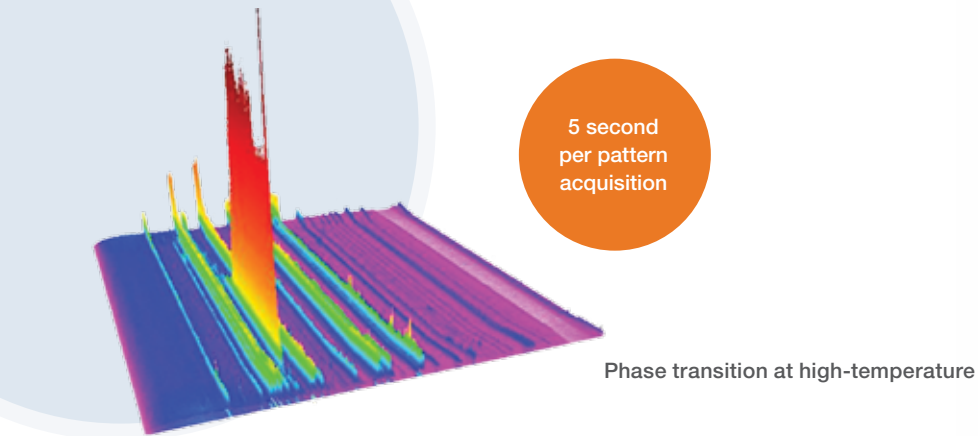
Comparison between Germanium (resolution) and Graphite (high flux) monochromators



Acquisition at low angle on Silver Behenate powder recorded in reflection mode

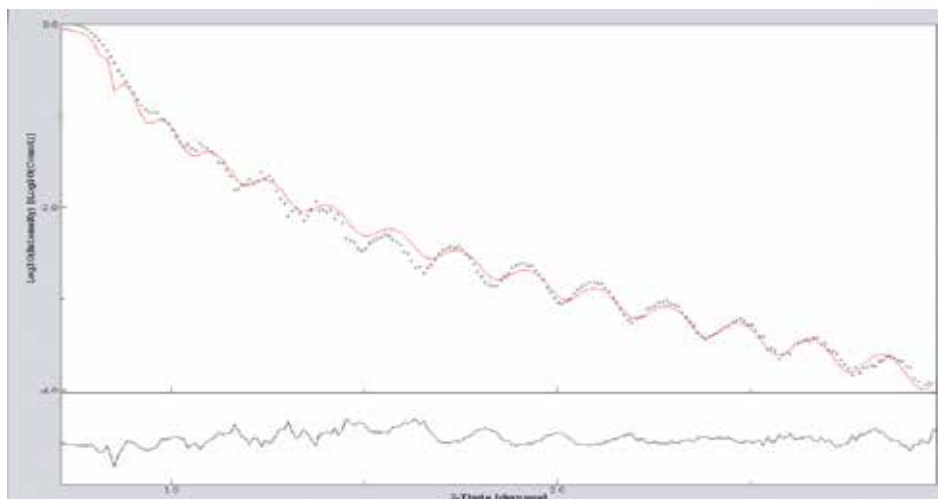
Real time simultaneous data acquisition

The CPS real time detectors are unique acquisition tools that collect all diffraction data simultaneously. These detectors can perform diffraction experiments on powders, bulk material, and thin films all in real time, enabling not only fast analysis but also dynamic studies.



Thin film applications

Grazing incidence diffraction identifies phases, determines texture or structure of a thin crystallized deposit on a substrate. X-ray reflectometry determines thickness of films deposit with extreme accuracy as well as roughness of interfaces.



Reflectometry measurement • Nature of the sample: optic deposit • Displacement in Omega from $0,1^\circ$ to 1° with attenuator and from $0,8$ to 4° by step of 0.005° • Total acquisition time ~ 3h • Observation of an interference with the substrate • Data treatment for calculation of film thickness, critical Q_c and rugosity

Dynamic studies

Studies of physical and chemical properties of materials, as a function of temperature, environment, pressure and other conditions, require dynamic crystallographic measurements in real time. Structural phase transitions or modifications of materials can be captured as they occur thanks to Position Sensitive Detectors (PSD). The PSD acquires the complete XRD spectrum simultaneously, ensuring that no transition is missed during a measurement, which is especially true with unstable compounds.

Versatile sample entry and analysis

The ARL EQUINOX 1000 is the most versatile benchtop XRD instrument on the market, adapted for several sample types in various analytical conditions. Sample adaptors are easily switched in the matter of seconds without tedious re-alignment needed each time. Accessory stages are as follows:

- Fixed non-spinning sample stage
- Single position spinning stage for reflection and transmission
- Reflection mode spinning stage with height adjustment
- Controlled atmosphere reflection sample stage
- Capillary transmission sample stage
- 6-position automatic sample changer with spinning sample holders
- 30-position automatic sample changer with spinning sample holders
- GIXRD thin layer analysis stage
- Gandolfi chamber
- Temperature controlled stage

The largest selection of sample holders on the market for benchtop XRD



Spinning stage for powder sample

- Reflection and transmission mode on powder
- Continuous sample rotation
- «Zero background» holder for sample in micro quantity
- Special cups for air sensitive sample protection



Spinning stage with height adjustment

- Reflection mode on powder and bulk
- Sample maximum size: 40x20 mm with a centered sample
- Height adjustment on 30 mm
- Continuous sample rotation



Spinning sample holder for studies on filter

- Specific measurement in reflection mode on filter
- Continuous sample rotation
- Available with Silver membrane filter of 25 mm diameter



Spinning stage for pressed pellet

- Reflection mode on cement, minerals and other powders
- Continuous sample rotation
- Choice according to customer's specifications
 - C1: 51 mm steel rings, Polysius ring
 - C2: 40 mm steel rings, Herzog ring
 - C3: 40 mm pressed pellets



Sample stage with controlled atmosphere

- Reflection mode on powder
- Continuous sample rotation
- Modes of operation:
 - Completely isolated cell with closed connections
 - Gas control in the cell
 - Gas circulation for atmosphere recycling

The largest selection of sample holders on the market for benchtop XRD



Automatic sample changer

- 6 or 30 sample positions in reflection mode
- Continuous sample rotation
- «Zero background» holder available



Capillary stage for transmission measurement

- Transmission mode on sample in capillary
- Goniometric head support
- Continuous sample rotation
- Borosilicate or quartz capillaries available with a diameter from 0.1 to 3.5 mm



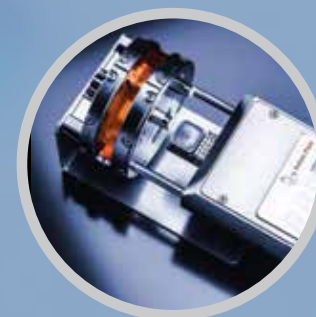
Thin layer attachment

- Specific attachment for thin film application
- Sample size up to 25x25x10 mm
- High accuracy motors in θ and Z adjustments
- Excellent for Grazing Incidence (GIXRD)
- X-Ray Reflectometry (XRR)



Gandolfi chamber

- Specific attachment used to obtain a powder pattern from a single crystal or a small cluster of crystals
- Crystal holder with 2 continuous sample rotation device
- Sample mounted on capillary
- Ex-situ adjustment camera

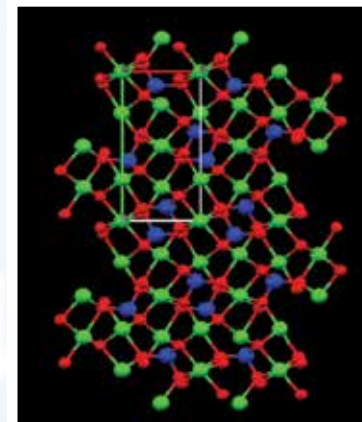
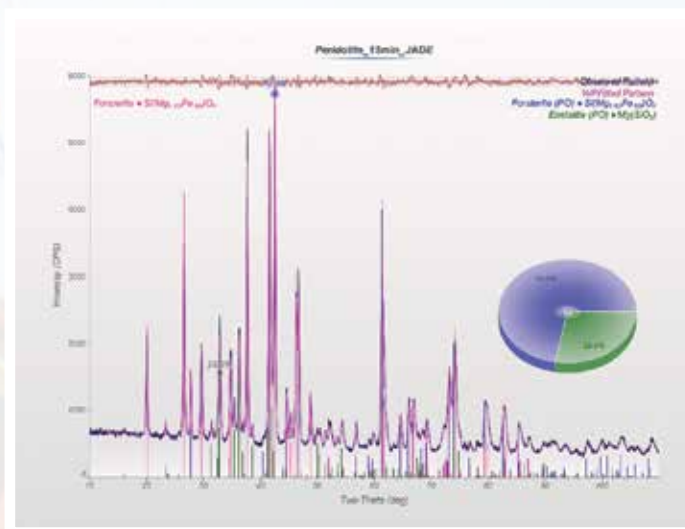
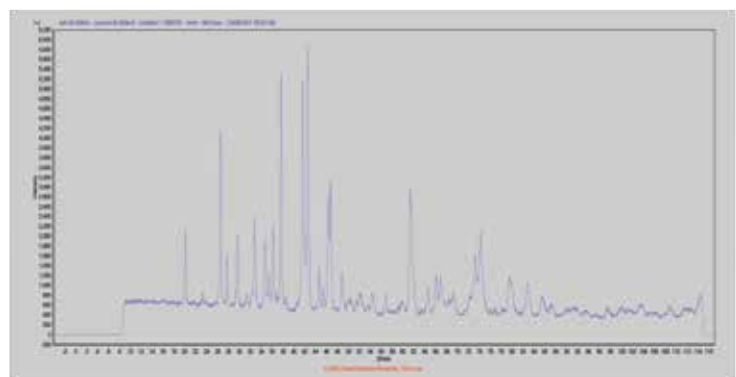


Temperature controlled stage

- BTS500 Temperature range from ambient to 500 °C
- BTS150 Temperature range from -10 °C to 150 °C
- Reflection mode
- Sample conditioning in vacuum, air or inert gas possible
- Fast heating and cooling
- Thermo temperature sensor close to sample
- 10^{-1} mbar to 1 bar relative

Analytical performance

Analysis of materials ranging from minerals to pharmaceuticals can easily and accurately be performed using the ARL EQUINOX 1000. The resolution and speed of the instrument is exceptional for a benchtop instrument thanks to simultaneous acquisition of the whole pattern. Everything from phase identification, quantitative, percent crystallinity calculations and even crystal structure solution can be performed using the ARL EQUINOX 1000 X-ray diffractometer.



ARL EQUINOX 100



X-ray diffraction portfolio

Thermo Fisher Scientific offers a broad X-ray diffraction portfolio using Position Sensitive Detectors (PSD) from simple bench-top instruments to the most advanced platforms which enable material scientists and engineers to perform qualitative, quantitative and advanced structural investigations on a variety of materials. Applications vary from routine QC/QA related phase quantification in industrial process control to real-time determination of structures, texture, residual stress, polymorphism, reactivity or kinetics of advanced materials in the form of powders, solids, or thin films. Thermo Scientific X-ray Diffraction products are designed to exceed your analytical needs.



ARL EQUINOX 3000



ARL EQUINOX 5000

Find out more at thermofisher.com/xrd