

thermo scientific

# Thermo Scientific ARL EQUINOX 100

X-ray Diffractometers



**ThermoFisher**  
SCIENTIFIC

# High performance in a compact size

Thermo Scientific™ ARL™ EQUINOX 100 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 in industrial labs, dynamic studies, formulation determinations and teaching in university and colleges.

The ARL EQUINOX 100 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/phase transitions.

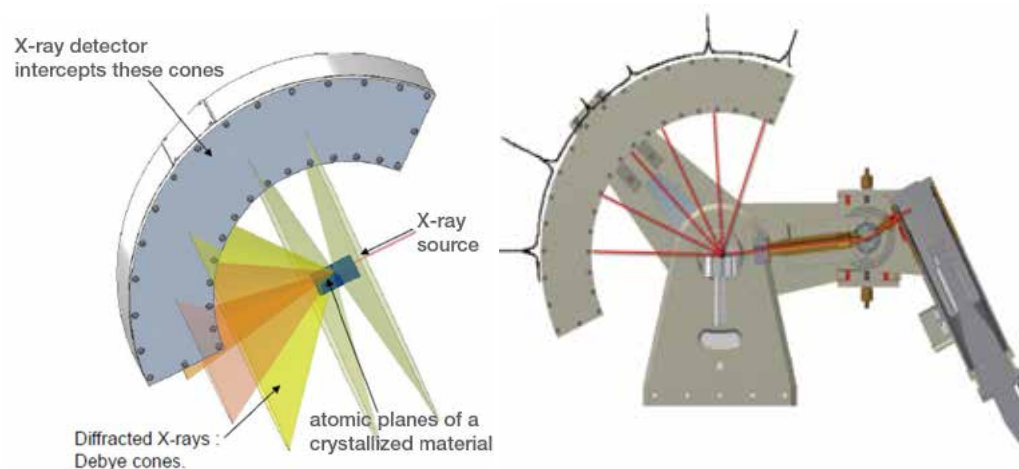
- Reliable and robust with no moving parts
- High intensity from low power microfocus source
- Real-time simultaneous data acquisition
- Versatile sample entry and analysis



# 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.

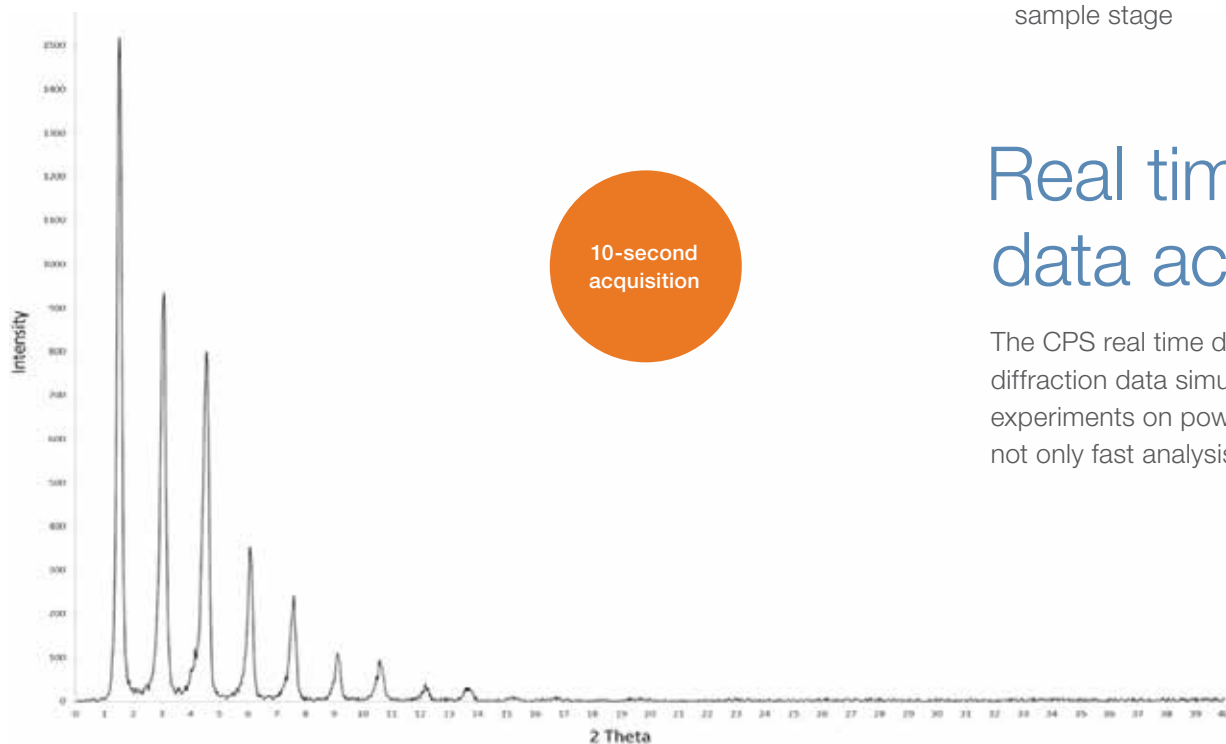
- Stationary X-ray source and detector
- Fixed focal length
  - No realignment needed
- Acquisition in asymmetric mode over  $110^\circ 2\theta$ 
  - Adjustable incidence angle on the sample, from  $0^\circ$



# High intensity from low power microfocus source

Microfocus X-ray sources are low power X-ray tubes that generate a very brilliant beam. This design gathers incidence scattered X-rays using a mirror system to collect and focus the beam. Thus, even at low power the X-ray flux diffracting the sample is much higher than traditional systems.

- X-ray flux close to a standard X-ray source
- Focusing mirror for higher intensity
- Mirrors capture and focus X-rays onto sample for better efficiency.
- Beam size is approximately 5 mm x 300  $\mu$ m
- Focusing beam geometry



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

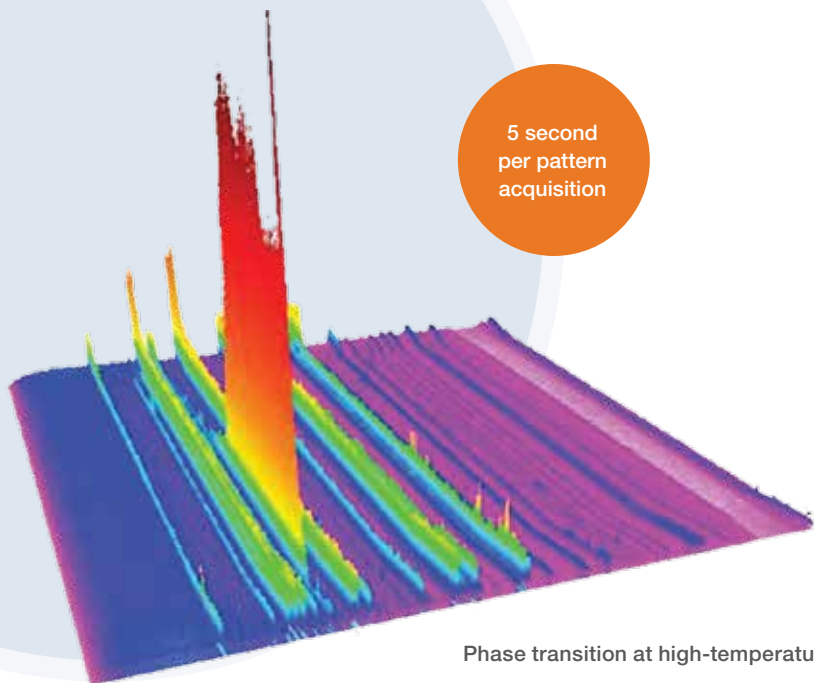
# Versatile sample entry and analysis

The ARL EQUINOX 100 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 with no re-alignment needed. Accessory stages are as follows:

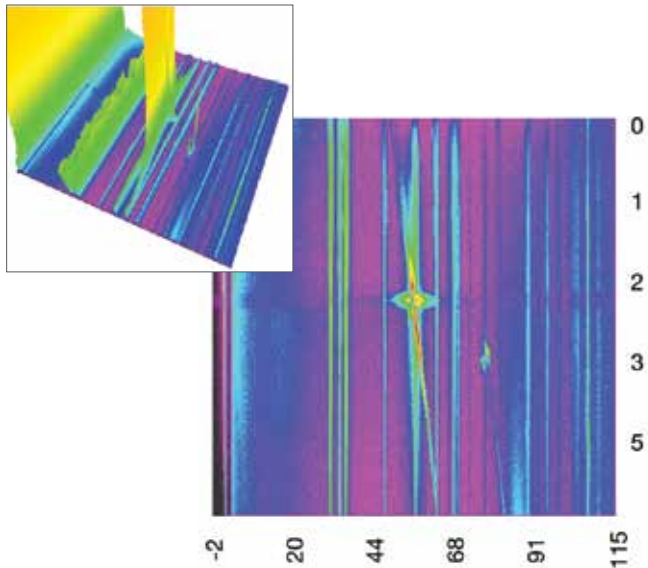
- Fixed non-spinning sample stage
- Single position spinning stage for reflection and transmission
- Reflection mode spinning stage with height adjustment
- Controlled atmosphere reflection sample stage
- Capillary transmission sample stage
- 6-position automatic sample changer with spinning stages
-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

# 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.



Phase transition at high-temperature



Grazing incidence measurement • Observation of an interference with the substrate peak

## 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.

## Thin film applications

Grazing incidence diffraction identifies phases, texture or structure of a thin crystallized deposit on a given substrate, while reflectometry determines the nature and thickness of films deposit as well as roughness of interfaces.

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



## Fixed non-spinning sample stage

- Stationary sample mount for powders, small solids or samples on glass plate
- Reflection or transmission mode
- Sample position aligned by positioning screw



## 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 cement application

- Reflection mode on cement powder
- 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

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



## 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



## 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



## 6-position automatic sample changer

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



## Thin layer attachment

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

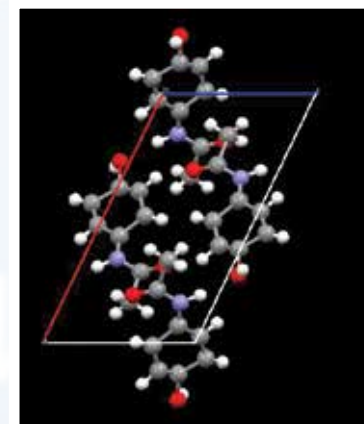
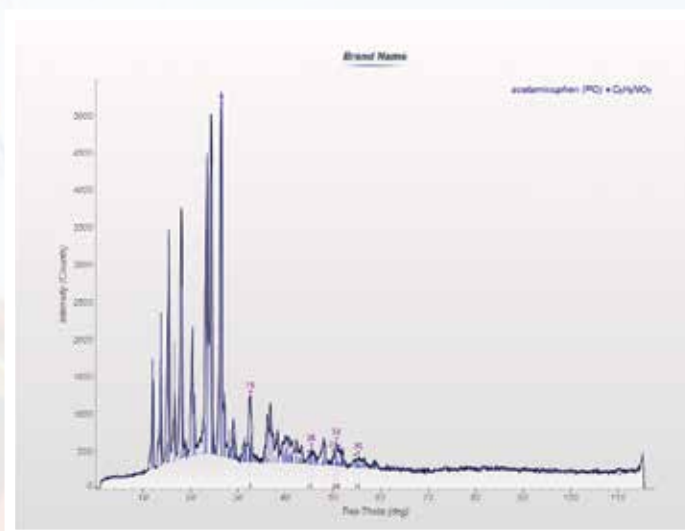
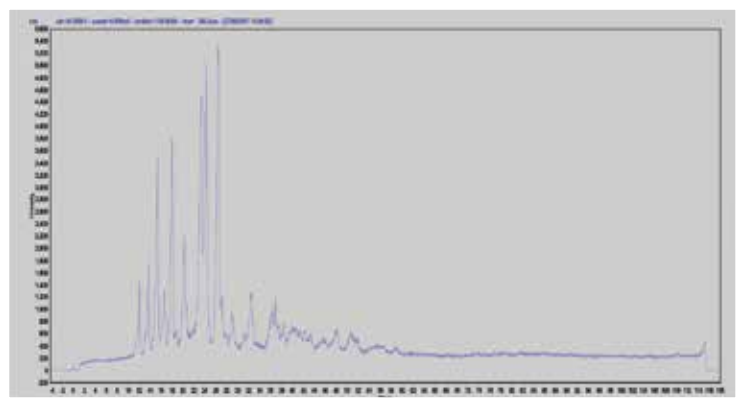


## Temperature controlled stage

- 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
- Thermocouple 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 100. 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 100 X-ray diffractometer.



ARL EQUINOX 1000



## 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](https://thermofisher.com/xrd)