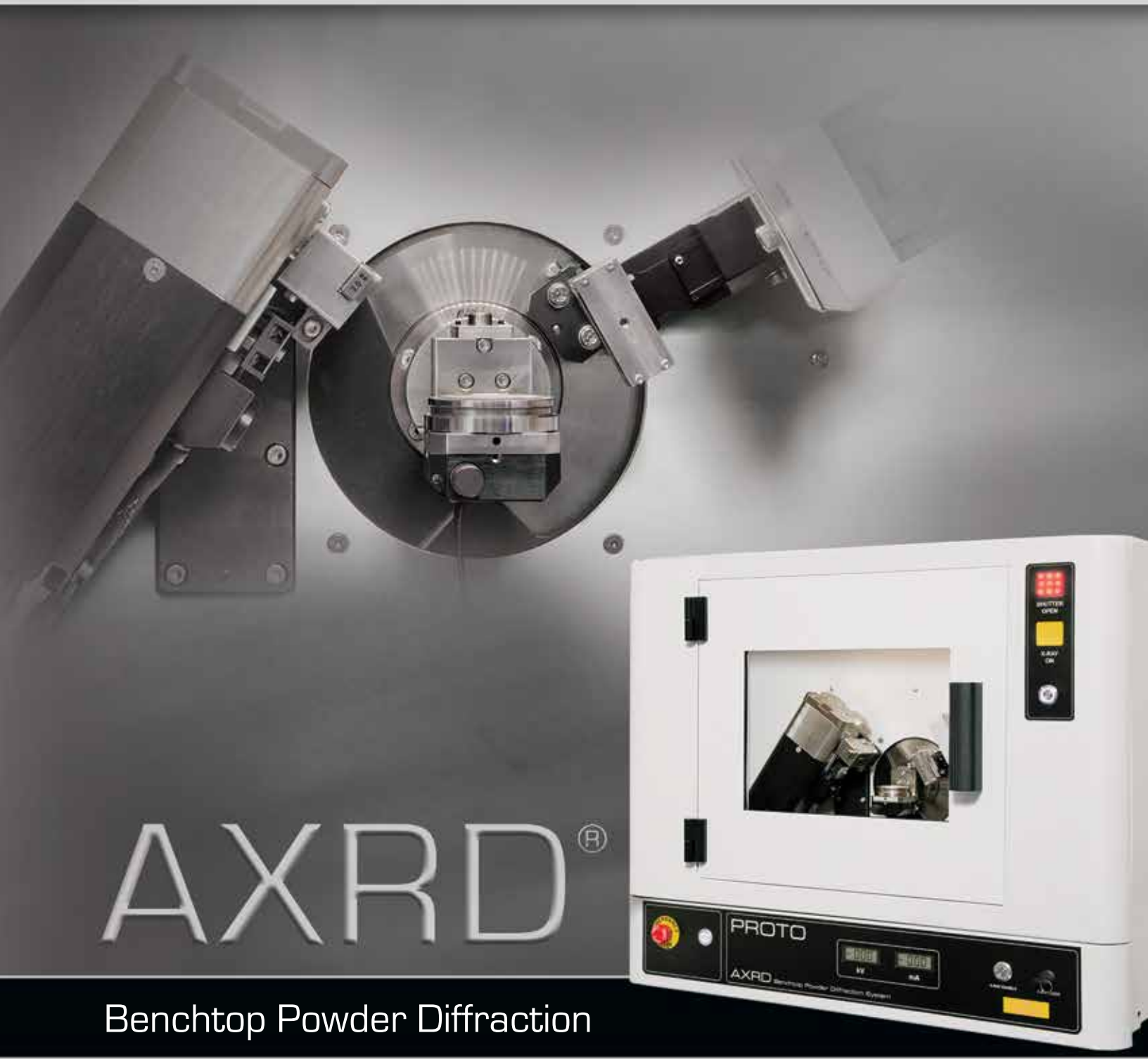
PROTO



AXRD®

Benchtop Powder Diffraction

High Accuracy Powder Diffraction & Reliability in a Benchtop Configuration

The AXRD Benchtop is easy to use and provides accurate and reliable measurement results with comparable speed to full size laboratory units.

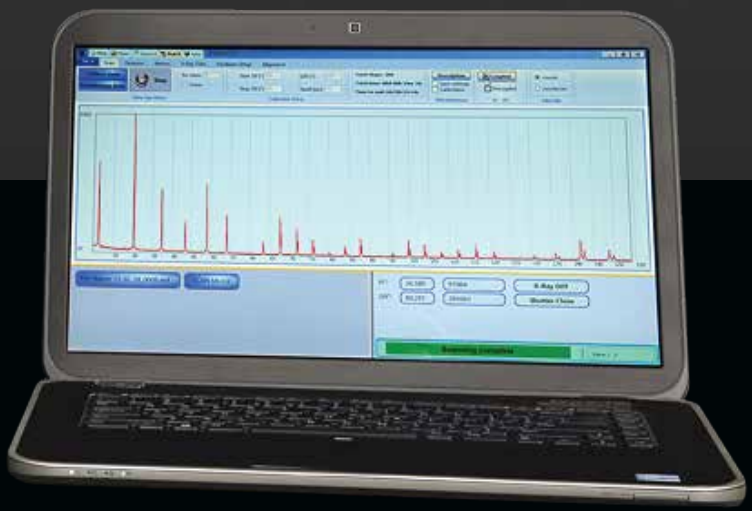
Equipped with our powerful hybrid photon counting detector, the AXRD Benchtop has extremely fast data collection capabilities. Collect low-resolution scans in 3 minutes. Collect high-resolution scans in 15 to 30 minutes.

AXRD

HIGH ACCURACY BENCHTOP POWDER DIFFRACTION

The PROTO AXRD Benchtop powder diffraction system provides a low-cost alternative for powder diffraction. With an achievable FWHM peak resolution of < 0.05° 2θ and an angular accuracy of < ± 0.02° Δ2θ over the full angular range, the AXRD Benchtop provides the necessary level of performance for even the most demanding x-ray diffraction material investigation.

- Phase Identification
- Rietveld Refinement
- Crystallite Size & Strain
- Thin Films & Coatings
- Glancing Incidence
- Quantitative Phase Analysis
- Percent Crystallinity
- Structure Analysis
- Rocking Curves

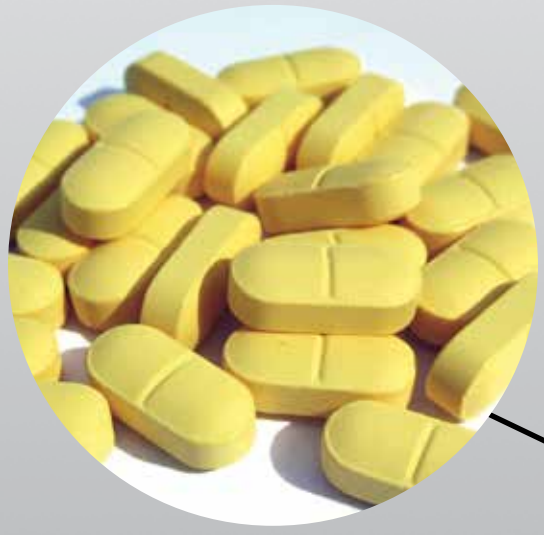


EDUCATION AND RESEARCH

The AXRD Benchtop is excellent for supporting R&D efforts and training in many fields of study such as geology, chemistry, physics & engineering.

PETROCHEMICALS

Analysis of solids obtained during the drilling process can be used to direct drilling efforts.



PHARMACEUTICALS

Quality control of formulations, identification of discovery drugs and polymorphs.

MINERALS, MINING AND CEMENT

Determine the composition of raw material, clinker and cement products.

BENCHTOP POWDER DIFFRACTION FOR ALL YOUR APPLICATIONS

IMPROVE YOUR SCIENCE™ WITH THE AXRD BENCHTOP DIFFRACTOMETER

PAINTS AND COATINGS

Quality control of pigments and extenders.

METAL CORROSION AND FAILURE ANALYSIS

Analysis of scale and corrosion products.

CHEMISTRY AND FORENSICS

Characterize unknown materials and support R&D efforts in the laboratory.

FOOD AND COSMETICS

Food mixtures and cosmetic powders are monitored using XRD to ensure safety and quality control.

AXRD

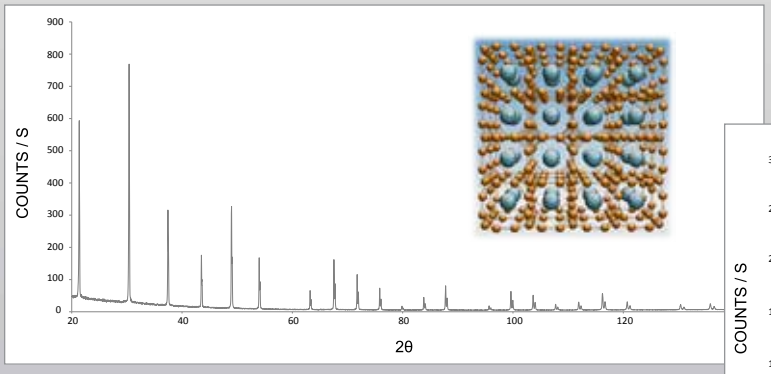
COMPREHENSIVE BENCHTOP POWDER DIFFRACTION

The AXRD Benchtop has everything you need for phase identification, quantitative phase analysis, percent crystallinity, crystallite size and strain, Rietveld refinement, characterization of thin films, and structure analysis.

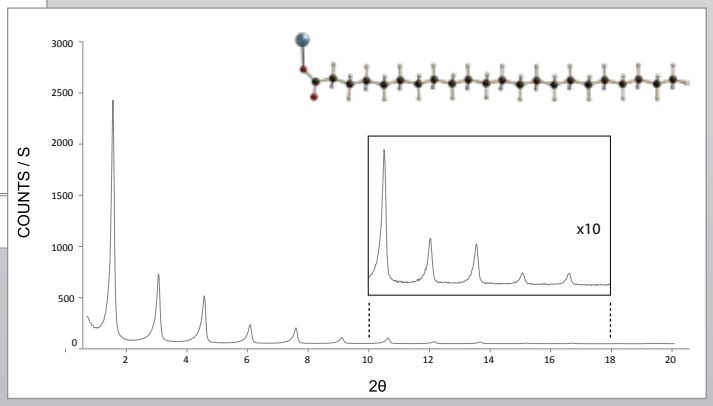
With advanced detector options, multiple sample stages and holders, powerful software and database options, the AXRD Benchtop provides the versatility you need for your measurement needs.

EXCELLENT RESOLUTION, ACCURACY & DATA QUALITY

Scan of Lanthanum Hexaboride (LaB_6)



Low Angle Scan of Silver(I) Behenate Nanocrystals



ACCESSORIES

1. **TEMPERATURE STAGE/ENVIRONMENT CHAMBER.** Heat samples from room temperature to 500°C or cool sample to -10°C in a controlled environment under inert gas such as nitrogen (N_2) or argon (Ar).
2. **ROTATING SAMPLE STAGE.** Variable speed sample spinner for improving particle statistics of samples with preferred orientation.
3. **SAMPLE CHANGER.** Our automated six position sample changer enables unattended operation of the AXRD. Each position has a built-in rotating stage.
4. **PORTABLE WORKSTATION.** Storage for accessories, keyboard, mouse, monitor mount and wheels for ease of mobility.

XRD - A POWERFUL ANALYSIS TECHNIQUE

Powder samples are exposed to a beam of monochromatic x-rays to generate an x-ray diffraction pattern. This pattern is a unique fingerprint of the material and provides structural information about the material.

These patterns can be compared to known patterns in databases such as the ICDD PDF 4+ to uniquely identify the material.

EASY AND CONVENIENT TO USE

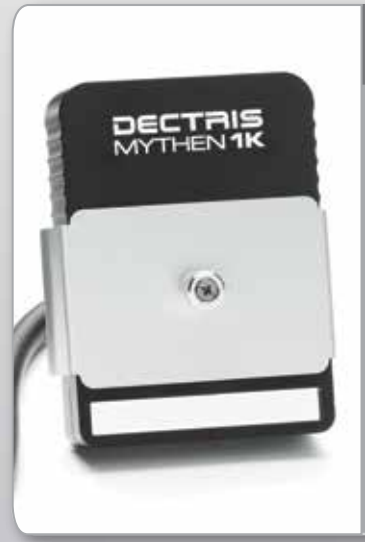
1. **INTEGRATED WATER COOLING.** Tank, pump and heat exchanger are all integrated into the AXRD.
2. **INCLINED X-RAY TUBE.** Prevents powders from spilling by reducing sample tilt.
3. **SAFETY WARNING LIGHTS.** X-ray on, shutter open, status lights for user safety.
4. **FLEXIBLE SLIT OPTIONS.** Divergence, anti-scatter, Soller, receiving. Optional auto divergence slit system.
5. **SAMPLE HOLDERS.** 25 mm round (shallow and deep cavities), Si zero background plates, Si zero background plates with cavity, air-sensitive and custom sample holders.

DETECTORS

PHOTON COUNTING DETECTORS – THE ULTIMATE IN ACCURACY AND SPEED

All detector options for the AXRD Benchtop are Photon Counting Detectors.

Choose between our single channel silicon detector or our linear strip Hybrid Photon Counting Detector. In either case you will ensure that every photon is correctly captured and processed to ensure low noise and high counting rates.



DECTRIS® HYBRID PHOTON COUNTING DETECTOR

HIGH SPEED DATA COLLECTION

- High speed solid state linear detector
- Simultaneous multiple channel collection enables collection times up to 100 times faster than a scintillation counter
- Direct detection of x-rays using silicon strip technology
- Global count rate of $1x10^9$ counts/s
- High speed collection times
- 64 mm x 8 mm sensor area
- Excellent signal-to-noise ratio and very high dynamic range
- Fluorescence suppression mode

SPD SILICON POINT DETECTOR

XRD & XRF IN ONE CONVENIENT PACKAGE

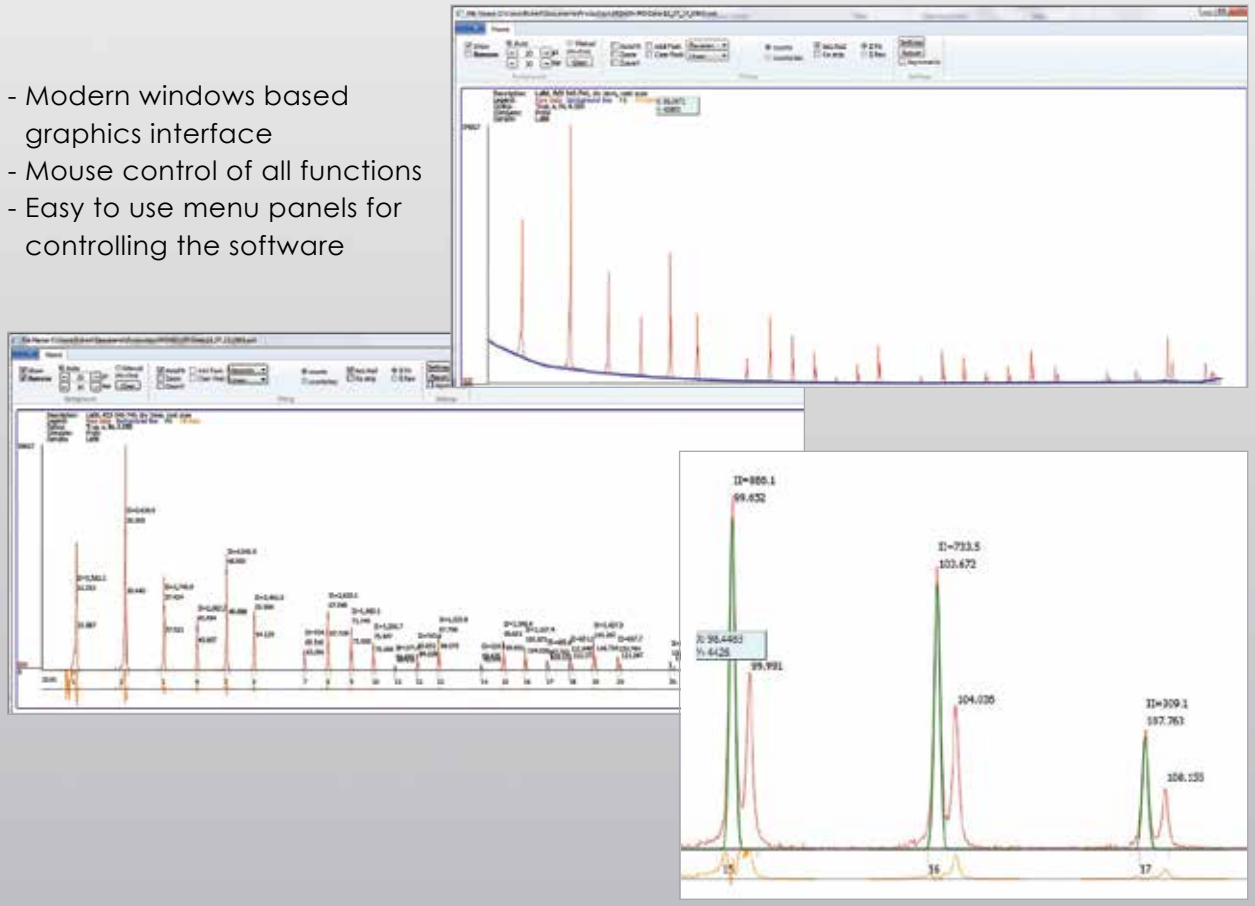
- Energy discriminating single channel solid state detector
- Recommended for samples with high fluorescence (i.e. Fe and Co)
- Eliminates need for a diffracted beam monochromator
- Kβ suppression capabilities
- Powder pattern collection using $K\alpha_{1,2}$ or Kβ
- Use XRF spectrum to assist in chemical identification of sample and improve search match results

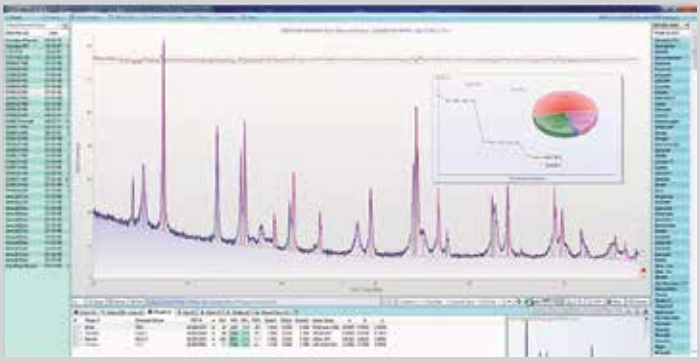
SOFTWARE

XRDWIN PD

Our all-in-one software for both data collection and analysis of powder patterns is the perfect solution for basic qualitative and quantitative analysis. Some of XRDWIN's unique features include: instrument warm-up and control, data collection, k-alpha 1 and k-alpha 2 separation, data smoothing, integrated intensity, background fitting, peak search, peak fitting, intensity ratio method for quantitative analysis, spike method for quantitative analysis, crystallite size and strain. Also available is the ICDD database search match and an MDI Jade interface.

- Modern windows based graphics interface
- Mouse control of all functions
- Easy to use menu panels for controlling the software





JADE

For advanced analysis of your diffraction patterns we offer MDI's Jade 2010 software. This program integrates with XRDWIN PD to provide seamless access to advanced analysis tools such as Rietveld refinement.

DATABASES

Our XRDWIN PD software can interface with most common x-ray diffraction databases. We can ensure that you have the best database for identification of your materials.

ICDD PDF-2	Over 260,000 inorganic and organic experimental powder data entries for rapid material analysis.
ICDD PDF-4+	Over 340,000 inorganic and organic entries. Includes atomic coordinates for Rietveld analysis.
ICDD PDF-4/ ORGANICS	Over 475,000 organic and organometallic entries. Designed for the pharmaceutical, regulatory, specialty chemical, biomaterials and forensic fields.
ICDD PDF-4/ MINERALS	Over 40,000 minerals and related materials. A subset of the PDF-4+ database.
MDI MINERAL	Over 9,000 minerals and related materials.
COD	Open-access collection of over 320,000 crystal structures of organic, inorganic, metal-organic compounds and minerals

MAINTENANCE & SUPPORT

At PROTO we understand the importance of meeting deadlines and adhering to timelines. We offer support and training for all of our instruments and software, and are diligent about providing the service you require in an efficient manner.

Our customer service is provided from the same offices and technicians that designed and developed your AXRD benchtop diffractometer.

PROTO'S HIGH QUALITY X-RAY TUBES

Our ceramic/metal x-ray tubes are produced in-house to provide you with the best quality, performance, warranty and support. These durable, stable and high flux tubes provide years of accurate measurements . For optimal results we utilize a wide range of anodes to ensure the best possible x-ray diffraction peaks on your materials.

Available anodes: Cu, Cr, Co, Mo

	AXRD BENCHTOP SPECIFICATIONS
Geometry	Vertical Parafocusing θ/2θ
Goniometer Radius	142 mm
Max. usable angular range	-4 …154 deg 2θ
Scanning Speed	0.0001° ~ 100°/min (2θ)
Max Motor Speed (Slew)	1000°/min
Motor Step Resolution	0.0001°
Accuracy	< ± 0.02° 2θ
Slits	Divergence and Antiscatter: 0.25°, 1.0°, 2.0° (fixed), Soller slits 5°, Receiving: 0.015°, 0.04°, 0.08° 0.12° (fixed). Other sizes available on request. Actual slits sizes depends on detector selection.
Achievable peak width	< 0.05° 2θ
X-ray Tube	Standard: 1500W Fine focus Cu ceramic x-ray tube Optional Focus: normal, broad, long fine focus Optional Anodes: Cr, Co, Mo
X-ray tube cooling	Internal water cooling radiator and tank
X-ray Power Supply	600W Safety key to enable and disable x-ray generation. Regulation features include: arc suppression, over voltage, over current and over power. Automated tube warm up, tube ramping.
Detectors	Hybrid Photon Counting Detector Si Point Detector
Standard Software	XRDWIN PD Measurement Software Instrument warm-up and control, Data collection k-alpha 1 + k-alpha 2 fitting capabilities Data smoothing Integrated intensity Background fitting Peak search and fitting Intensity ratio method for quantitative analysis Spike method for quantitative analysis Crystallite size & strain ICDD and COD database compatibility
Advanced Software Option	JADE
Computer	Desktop PC with Windows
Interface	USB/ethernet
Standards and Safety	Compliant with CE, ANSI N43.2 Interlocked enclosure door for auto x-ray off.
Sample Holders	6 standard sample holders 25 mm diameter
Reference Sample	LaB_6 powder
Dimensions (W x D x H)	77 x 56 x 66 cm (30" x 22" x 26")
Weight	95 kg (210 lbs)
Power Requirements	90–264V, 47 - 63 Hz, 10A

PROTO engages in continuous research and development, therefore specifications in this publication are subject to change. Please call for details.
Various items and methods in this brochure are covered by patents or patents pending.

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