



**AUTOMATED RESIDUAL  
STRESS ANALYSIS**

# LXRD

*Laboratory Non-Destructive  
Residual Stress Measurement System*



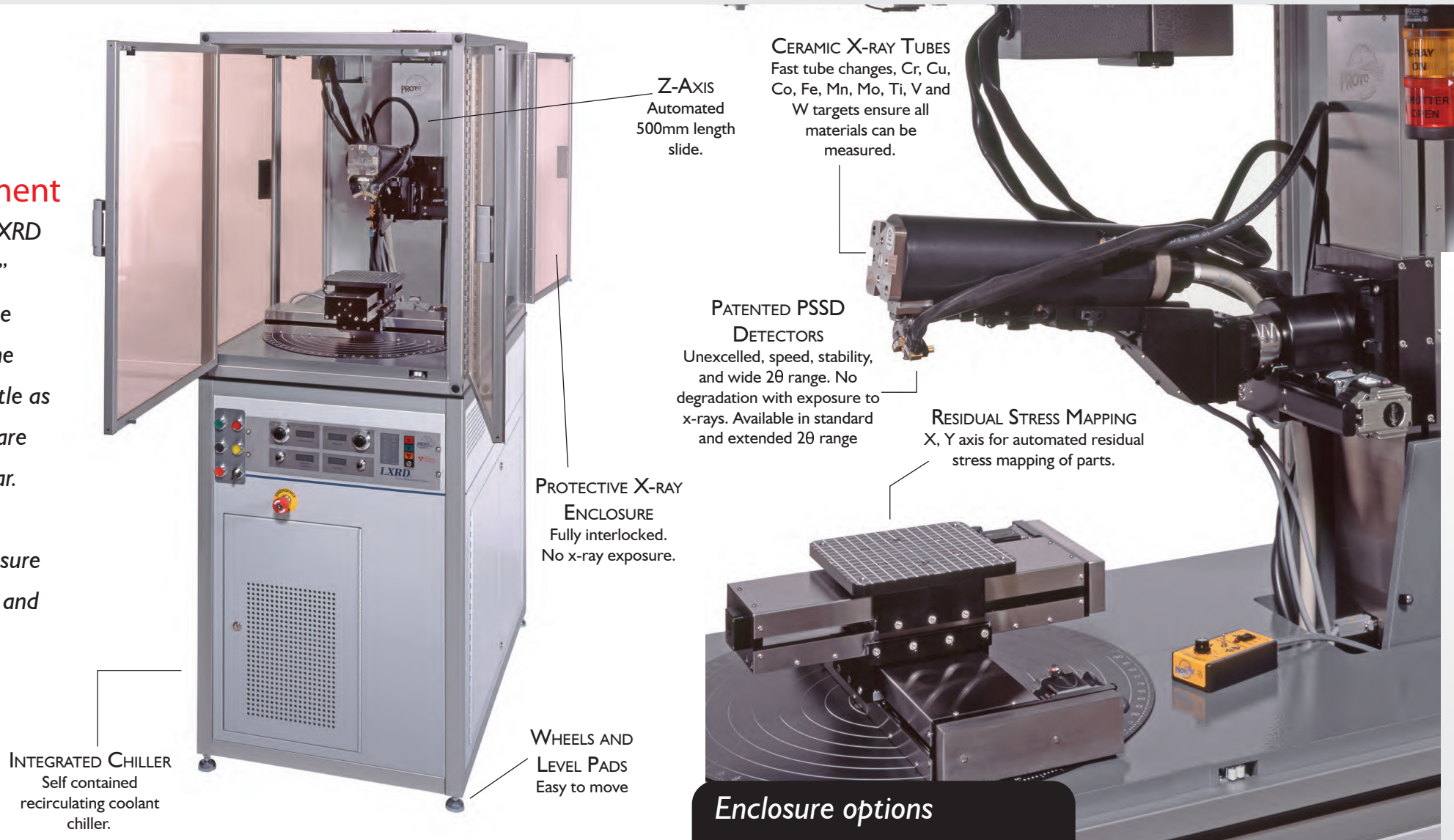
*A world of solutions*

# LXRD

## Laboratory High Speed Measurement

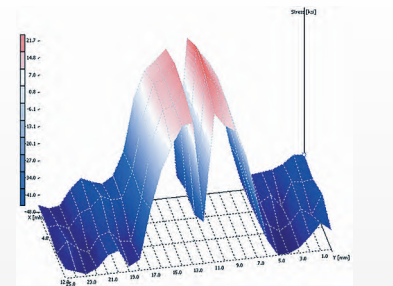
A laboratory and factory floor star performer the LXRD has been designed for heavy duty “round the clock” operation. Extremely fast, accurate and reliable the LXRD offers the highest return on investment in the industry. Measurements can be performed in as little as a few seconds. Easy access maintenance features are designed to keep you up and running year after year.

LXRD is available with standard or widebody enclosure for large part capacity, flexible goniometer options and optional laboratory residual stress mapping.



## RESIDUAL STRESS MAPPING WITH XRDWIN 2.0 SOFTWARE

An exclusive feature of Proto systems, automated stress mapping can be the key to solving many residual stress problems.



STRESS MAP OF WELD.

## Goniometer Options

### MG2000L



Our standard laboratory goniometer. With a 40 mm focal distance and a 60 mm high power x-ray tube, the MG2000L offers incredible speed and accuracy.

### MG30L



The MG30L is our smallest laboratory goniometer available. With a 30 mm focal distance and a 16 mm x-ray tube the MG30L is an ideal choice for tight locations.

### MG40L



The MG40L with a 40 mm focal distance and a 30 mm x-ray tube, offers a great balance between speed and part accessibility.

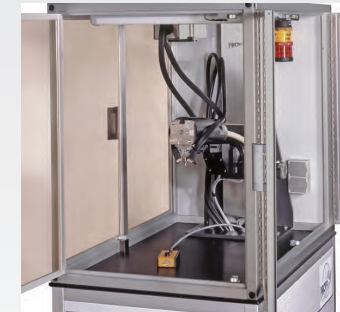
### MGBH40L



Bolthole head. The MGBH40L is designed to measure on the inner diameter of small holes.

## Enclosure options

### BASIC



A radiation proof enclosure with an automated 800 mm length Z-axis. Can accept future upgrades such as a Phi table or laboratory mapping stages.

### LABORATORY MAPPING



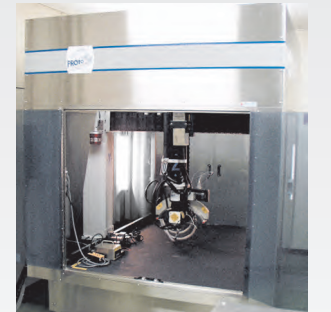
Automated X, Y &  $\Phi$  axis for full featured laboratory mapping. Can be added to either the standard or the widebody enclosure.

### WIDEBODY



Optional widebody enclosure for increased part size capacity. Standard Dimensions (L x W x H): 1045 x 665 x 1885 mm Widebody Dimensions: 1095 x 865 x 1885 mm

### LXRD-GR GANTRY ROBOT



The LXRD-GR features the largest enclosure capacity of any residual stress system in the world and is designed for easy large part access from three sides. This unit includes an integrated  $\Phi$  axis and gantry robot X, Y and Z axis.

# LXRD Specifications

## LXRD INSTRUMENT MODULE

Computer controlled high voltage power supply features 3000 watt capacity with integrated interlock display, kilovolts, milliamps, filament current and total x-ray tube kilowatt backlit LCD displays. Key lock enable/disable, Arc suppression, over voltage, over current and over power protection. Preset controls on all voltage and power levels. System control panel with main power on, main power off, system enable, system disable, local/remote switch.

## ENCLOSURE

Provides a safe, large volume work space fully accessible from three sides that can be tailored to your requirements. Locked utility panel doors provide easy access for maintenance and service. Integrated "Z" axis with 500mm range and Modular Goniometer System mounted on Z axis ready to accept your choice of LXRD goniometer. Built in fluorescent enclosure light and electrical outlet to provide power to accessories. Enclosure "floor" made with heavy duty anodized 25mm thick 6061 T6 tooling plate ready to accept fixtures etc. Unit rolls on 75mm diameter urethane wheels and stabilized with four built in leveling pads. Integrated, recirculating coolant, temperature regulating high efficiency chiller.

## WEIGHT

310 kg approx. weight will vary with options selected.

## DIMENSIONS (L x W x H)

Overall: 1045mm x 665mm x 1885mm  
Upper enclosure: 1045mm x 665mm x 865mm  
Wide Body option is available

## OPERATING TEMPERATURE RANGE

0°C to 35°C non-condensing humidity

## POWER REQUIREMENTS

200-240 VAC (50 Hz or 60Hz please specify) 30 amps

## GONIOMETERS

$\psi$  (Omega) geometry or  $\chi$  (Side inclination) geometry  
Manual and automatic focusing.  
MG2000L, MG40L, MGBH40L - 40 mm focal distance  
MG30L - 30 mm focal distance  
Fully adjustable  $\psi$ , X, Y,  $\Phi$ , range and oscillation  
"Through the collimator" spot indicator.

## APERTURES

"Snap in" style apertures can be changed in seconds.  
Standard set: 0.5, 1.0, 2.0 mm round, 0.5x3, 3x0.5, 1x3, 3x1, 0.5x5, 5x0.5, 1x5, 5x1, 1.5x5, 5x1.5 mm  
Extended set: 0.2, 1.5, 2.5 mm round, 2x5, 5x2, 0.2x3, 3x0.2, 0.5x2, 2x0.5, 1x2, 2x1 mm  
Large grain aperture set: 3.0, 4.0mm round, 2x3, 3x2, 2x5, 5x2, 2.5x5, 5x2.5, 1.5x4, 4x1.5, 2x4, 4x2 mm  
Stress profiling and mapping aperture set: 0.2 mm round 0.2x3, 3x0.2, 0.2x5, 5x0.2, 0.5x2, 2x0.5, 1x1, 2x2, 1x2, 2x1 mm  
Custom apertures also available.

## X-RAY DETECTORS

Patented position sensitive scintillation detectors (PSSD). These x-ray detectors provide unexcelled speed, stability and wide  $2\theta$  range, and, unlike other x-ray detectors, do not deteriorate with exposure to x-rays. No expensive replacements required. The detectors can be quickly positioned in  $\psi$  (Omega) geometry or  $\chi$  (Side inclination) geometry. Two detectors for unsurpassed accuracy and speed. Available in standard and extended  $2\theta$  range.

## DETECTOR SPECTRA WINDOW

Standard Detector  
MG2000L, MG40L, MGBH40L - 18.4°, MG30L - 24.1°  $2\theta$  per detector.  
Optional Wide Detector  
MG2000L, MG40L, MGBH40L - 29.5°  $2\theta$  per detector

## $2\theta$ RANGE

123°-171° is standard, extended ranges are available. Detectors are easily moved into position and secured by hand along the arcs.

## X-RAY TUBES

Proto manufactures its own line of x-ray tubes specifically designed to enhance the performance, reliability and capabilities of our laboratory and portable x-ray diffraction systems. Our unique designs have advanced the state-of-the-art in x-ray tube performance, size and ruggedness. Our fine focus x-ray tubes feature an advanced ceramic body with optimized liquid cooling.



Available in standard (60 mm diameter) tubes for the MG2000L, miniature (30 mm diameter) tubes for the MG40L and MGBH40L goniometers and micro (16 mm diameter) tubes for use in the MG30L goniometer. Available x-ray tube targets include Cr, Cu, Co, Fe, Mn, Mo, Ti, V and W, with nominal power ranges from 40 to 2000 watts depending on the target material and x-ray tube size. Custom x-ray tubes and targets are also available. Water cooled with quick disconnects. Pre aligned x-ray tubes can be exchanged in less than 3 minutes.

## FILTERS

K $\beta$  filters are placed in front of the PSSD detectors in pre-machined slots and are supplied in pairs with each Proto x-ray tube.

## SAFETY

Independent warning light beacons for "x-ray on" and "shutter open".  
Emergency Stop with Lockout Key  
X-ray protective glass for zero x-ray emission from enclosure.  
Fully interlocked "Clear View" doors on three sides for easy access.

## COMPUTER

Proto provides the latest generation brand name desktop or laptop computer with each LXRD.

## SOFTWARE

Powerful yet easy to use XRDWin 2.0. A comprehensive Windows™ based data collection and stress analysis package. Linear and elliptical regression, Dolle-Hauk method, triaxial method. Parabolic, Gaussian, Pearson VII, Cauchy, centroid, centered centroid, mid-chord fitting. Graphical display of "d", " $2\theta$ ", "intensity", "breadth", "FWHM" vs.  $\sin^2\psi$  or  $\sin^2\chi$ . Residual stress mapping with 3D map display. X-ray elastic constant determination. Principle stress calculator, material removal corrections, depth of penetration correction. Retained austenite measurement. Inline inspection monitor.

## ACCESSORIES

Alignment scope, X-ray Elastic Constant determination.  
4 Peak Retained Austenite Measurement (Manual or Automated)  
Extended warranty and maintenance agreements are available.

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[www.protoxrd.com](http://www.protoxrd.com)

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