

Xstress 3000 G3/G3R

X-ray Stress Analyzer

Portable X-ray diffractometer
specially designed for residual stress
and retained austenite measurements





Xstress 3000 G3 measures residual stresses and retained austenite contents by using X-rays, based on the phenomenon known as Bragg's law. This conventional and time-proven X-ray diffraction technique is ideal for ferritic steels and is applicable to all crystalline materials including ceramics.

Designed especially for stress measurements, Xstress 3000 G3 is easy to use but is so sophisticated that it will satisfy the most demanding researcher. The software

allows access to all of the test parameters and measurement data at any stage of the measurement routine.

Xstress 3000 G3 is suitable for both laboratory and field use. It can be easily loaded, unloaded and carried by one person. It is self-contained and only requires a power supply. From the point at which it is unloaded to the moment it is ready to perform a measurement takes only ten minutes. Extensive use of embedded microprocessors, and communications

between the main unit, goniometer, and computer with only one cable makes fast installation possible. Thanks to the implementation of the state of the art, patented, semiconductor detector technology, the measurement time on a typical steel sample is two minutes or less.

Xstress 3000 G3 consists of the main unit X3003, Goniometer G3, and versatile software for running the equipment and handling the data.

Taking the circle out of the X-ray goniometer

The centre-less goniometer expanding the possibilities for measuring stresses



G3's design, without a tilting arc, leaves room under the goniometer allowing easy measurements to be made, for example on the inside of tubes or on crankshaft lobes. Changing the measurement distance and taking the sample alignment into account is possible with the installed software. G3 includes as a standard feature the capability of measuring line stress distribution, for instance, over a weld seam.

G3 recognises the tube's serial number automatically and therefore helps in keeping track of the total tube operating time. Measurement points can be located accurately with the help of the laser pointer through the collimator.

G3 has an internal dial indicator with an accuracy of 0.001 mm for all movements, which makes the automatic measurement

of the removed material thickness possible. New detectors deliver increased efficiency and shorter measurement times.



G3 with Floor stand



G3 with Floor stand, X-Y unit, Floor stand model



X-ray elastic constant device



G3 with Floor stand, X-Y unit, vertical measurement position



G3 with Floor stand, X-Y unit, table top model



G3 with Floor stand



Xstress 3000 G3, table with safety shield



Rotation Unit G3R



Software

Accurate and safe, expandable and flexible

Main Features

- Control of residual stresses
- Retained austenite measurements
- Accuracy at the laboratory
- No parts cutting
- Measurements in hard-to-reach areas
- Flexibility in field applications
- Custom inspection stations
- Measurement services

Main Unit X3003

- Containing
 - power supply
 - controls electronics and firmware
 - high voltage generator
 - self-contained liquid cooling system
 - all interlocks required for complete safety
- Universal power input
- Ready for use in field or factory, plant or laboratory
- Super compact unit for unique portability

Technical Specifications

- Safety
 - Meets or exceeds ANSI N43.3-1993 and other industry standards for open beam X-ray operation, including
 - fail-safe "X-rays on" and "shutter open" lights.
 - automatic shutdown if shutter is stuck, open or removed; tube shielding is loose or removed; coolant temperature is too high or its flow disturbed.
- Cables
 - 5 meters standard.
- Electrical
 - 90–260 VAC, 50–60 Hz, 600 VA.
- Dimensions W x H x D mm:
 - Main unit X3003: 552 x 413 x 254
 - Goniometer G3: 555 x 492 x 574
 - Goniometer G3R: 966 x 573 x 605 (G3 installed)
- Weights
 - Main unit X3003: 25 kg 55 lb
 - Goniometer G3: 16 kg 43 lb
 - Goniometer G3R: 35 kg 77 lb

Main Unit X3003

- X-ray Power Supply
 - 5–30 kV/0–10 mA freely adjustable within limits. Ultra-compact design.
- Cooling
 - Self-contained re-circulating water cooling with heat exchanger for X-ray tube and power supply. No external water supply needed.

Goniometer G3

- χ -geometry with two symmetrically positioned detectors
- Instantly adjustable 2θ -angle
- Computer controlled DC-servomotor drives for all movements
- Three measurement distances as standard: 50, 75 and 100 mm.
- Automatic distance adjustment between goniometer and the measurement point
- $\pm\chi$ -tilt and optional Φ -rotation unit, possibilities for χ - and Φ -oscillations
- Can be operated in any position

Goniometer G3

- Xstress 3000 goniometer type G3 mounted on a tripod with magnetic anchoring as standard.
- χ -inclination: Programmable, max. -60° to $+60^\circ$
- χ -oscillation: Programmable, 0° to $\pm 6^\circ$.
- Distance between goniometer and the measurement point automatically adjusted to ± 0.001 mm accuracy.
- Detectors
 - Dual position sensitive MOS Linear Image Sensors in symmetrically χ (side inclination) geometry.
 - Angular resolution: 0.014° – 0.057° /pixel
 - 2θ -angle is instantly adjustable by manually sliding the detectors to the desired angular position along the arc-shaped detector holder.
 - X-ray Tube
 - Miniature, 30 kV/6.6–10 mA/200–300 W; Cr, Cu, Co, Fe, V, Ti, Mn. Cr-tube provided as a standard. Tube can be replaced in less than ten minutes without special tools.
 - Collimator
 - Replaceable, to provide 1, 2, 3, 4, and 5 millimetre spot sizes. Special collimators available as an optional extra.

Software

- A Microsoft Windows-compatible application with a powerful performance level
- One program for the user interface, numerical analyses and machine control
- Uses Ethernet for communications between the computer and main unit X3003
- Provides user-friendly, menu-driven operations
 - $d\text{-sin}^2\chi$ measurement mode
 - retained austenite measurement mode
 - libraries for material parameters
 - ASTRIM triaxial stress analysis
- Options: Project manager, X-ray elasticity constant determination, Ω -mode

Software

- Fully featured Windows software using thread-based multi-tasking
- X-ray run-up and control
 - Multiple $d\text{-sin}^2\chi$ exposure mode; peak shift calculation by cross-correlation and three other methods
 - Library functions for material and measurement parameters
 - Automated calibration for goniometer to sample distance
 - Controlling detectors, DC motors, power supply, shutter, safety interlock functions, etc.
 - Operating system Microsoft Windows 2000 Pro, Windows XP, Windows Vista, or newer

Options

- Four Peak Retained Austenite Testing
- Project Manager
- Ω -mode
- Software for Triaxial Stress Analysis
- Automatic Φ -rotation unit (G3R)
- X-ray Elasticity Constant Determination
- X-Y unit

Global partner for process and quality control

Instruments for measuring surface treatment quality and stresses

Stresstech Group instruments make the monitoring of quality during the manufacturing process or the optimising of the process setup fast and easy. The instruments, which are based on Barkhausen Noise, X-ray Diffraction, and hole-drilling, are non-destructive and environmentally friendly. They measure the surface treatment quality and residual stresses, giving you instant feedback on the manufacturing process. The applications are especially suitable for inspecting the machine components that need a long lifetime in the automotive, aviation, energy production and gas and oil industries.

Long experience in the automotive and aviation industries

Stresstech Group's know-how is recognised all over the world by famous car and aircraft component manufacturers. The experience gained during over two decades of operation has brought applications to the market for many different components such as camshafts, crankshafts, gears, bearings and many other component types. Close cooperation between Stresstech and the industry, combined with intensive research and development work, ensures that Stresstech solutions are capable of meeting even the most demanding customer needs.

Services available worldwide

Through the offices of Stresstech Oy in Finland, Stresstech GmbH in Germany, and American Stress Technologies Inc in the USA, and a worldwide agents network, Stresstech's instruments and services are easily available all over the world.



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