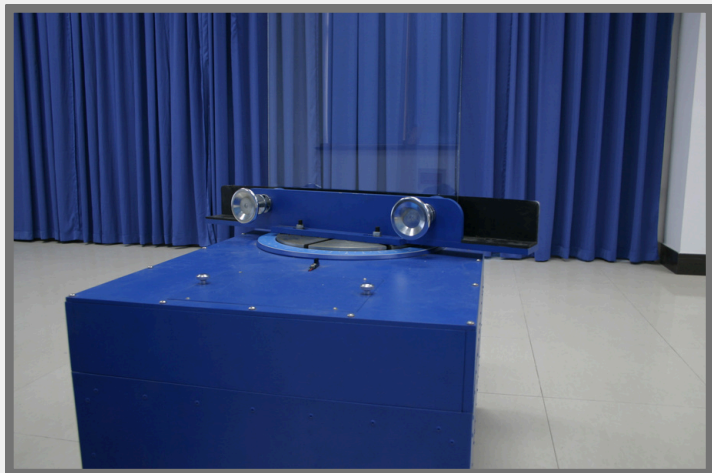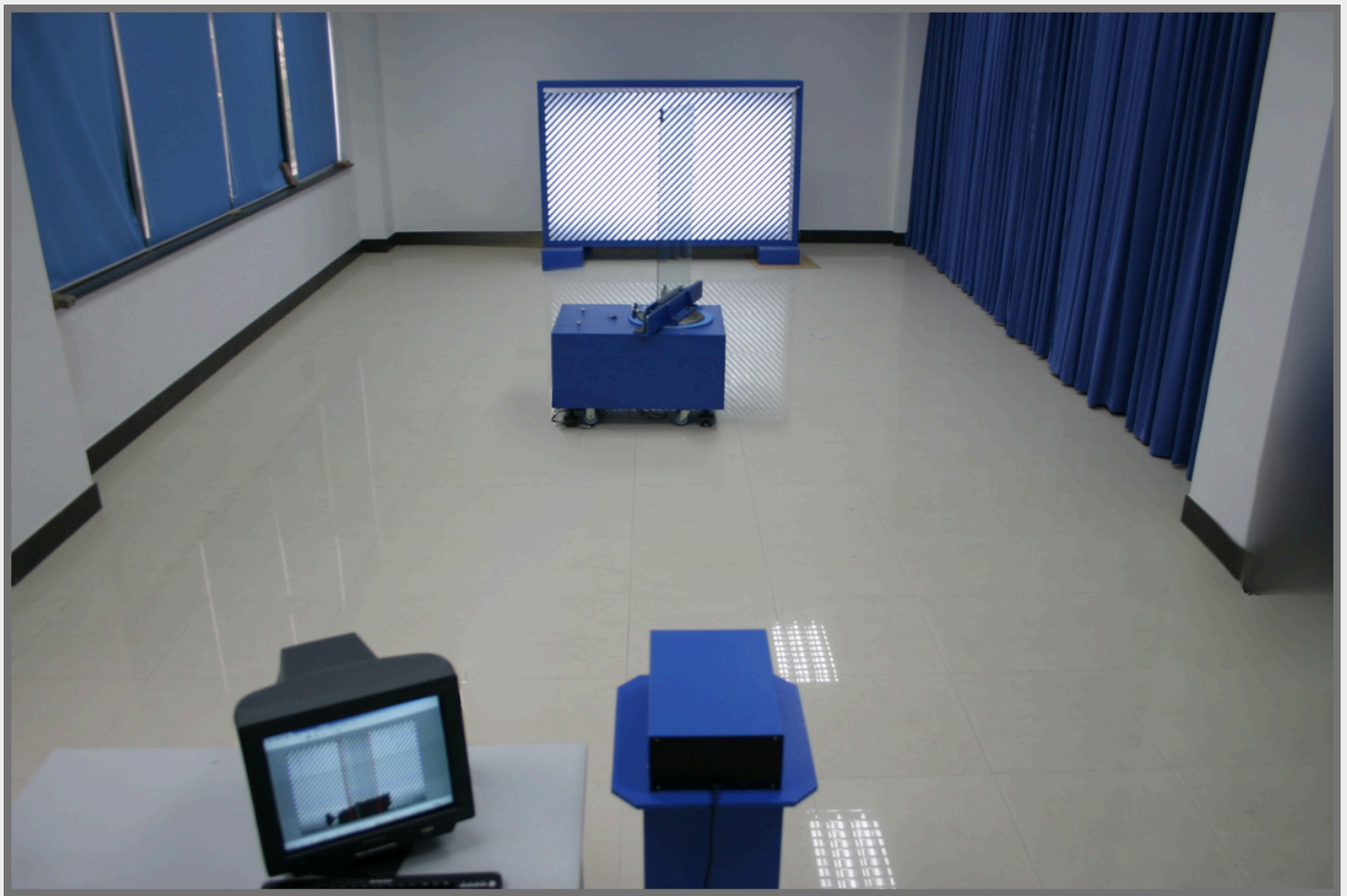# FZT-2

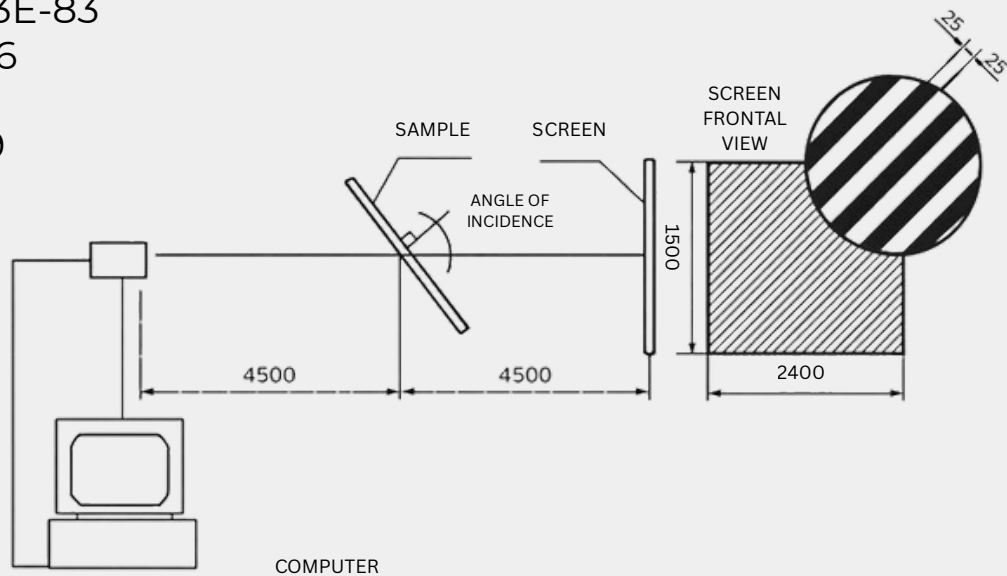## FULLY AUTOMATIC FLOAT GLASS ZEBRA ANGLE TESTER

Overview

The FZT-2 Automatic Float Glass Zebra Angle Tester is a patented, new-generation testing instrument that replaces traditional manual observation with high-precision computerized measurement. Using advanced optoelectronic technology and automated algorithms, it provides stable, objective, and highly accurate zebra-angle evaluation for float glass.

Widely adopted by leading glass manufacturers and inspection institutions, the FZT-2 is an essential tool for laboratory testing and quality control. The instrument is protected by a national patent (Patent No. ZL2004200069278).

Standards Compliance

- ISO TC160 N63E-83
- JIS R3202-1996
- EN 572-2
- GB 11614-2009

SAMPLE SCREEN SCREEN FRONTAL VIEW

ANGLE OF INCIDENCE

1500

4500 4500 2400

25 25

COMPUTER

Zebra Measurement Method

The optical distortion of float glass is internationally evaluated using the zebra method. In this method, a zebra stripe screen is positioned at a fixed distance from the observer, with the glass sample placed between them.

When the glass is rotated, the zebra stripes observed through the glass gradually deform.

As the incident angle increases, stripe deformation becomes more pronounced. When the deformation reaches a visually imperceptible level, the corresponding angle between the glass normal and the viewing direction is defined as the zebra angle.

Traditionally, this critical angle has been determined by human observation, which suffers from poor repeatability and operator-dependent error. The FZT-2 replaces the human eye with a CCD imaging system and virtual moiré analysis, enabling objective, repeatable, and highly accurate zebra-angle measurement.

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Industrial Applications and Measurement Reliability

Equipped with advanced optical components, upgraded mechanical design, and intelligent software control, the FZT-2 ensures stable and reliable zebra-angle measurement. Its precision and consistency make it suitable for use in laboratories, production lines, and quality-inspection departments throughout the glass manufacturing industry.

Model Upgrade Summary

The FZT-2 Fully Automatic Float Glass Zebra Angle Tester is an upgraded model of the earlier FZT-1. It features higher precision components, faster processing, and a newly engineered low-noise rotating sample table. Together, these improvements deliver significantly enhanced performance compared with the FZT-1.

Core Technology

Powered by virtual moiré technology, the FZT-2 is a powerful tool for glass quality inspection, capable of accurately detecting zebra angles across a wide range of float glass products. The system is fully compliant with major international standards.

Virtual Moiré Technology and Deformation Analysis

The FZT-2 employs virtual moiré technology to quantify zebra-stripe deformation with high precision. The CCD camera captures stripe images at each rotation angle, and the system calculates the stripe deviation from an ideal straight reference line.

The deformation magnitude, defined as L, represents the maximum deviation between the actual stripe and the reference line. By measuring deformation at fixed angular intervals, the system generates a deformation-versus-angle curve.

When the deformation value L falls below a predefined critical threshold—corresponding to the limit of human visual perception—the associated angle is automatically identified as the zebra angle.

DEFORMATION L

STRAIGHT LINE

DEFORMED LINE

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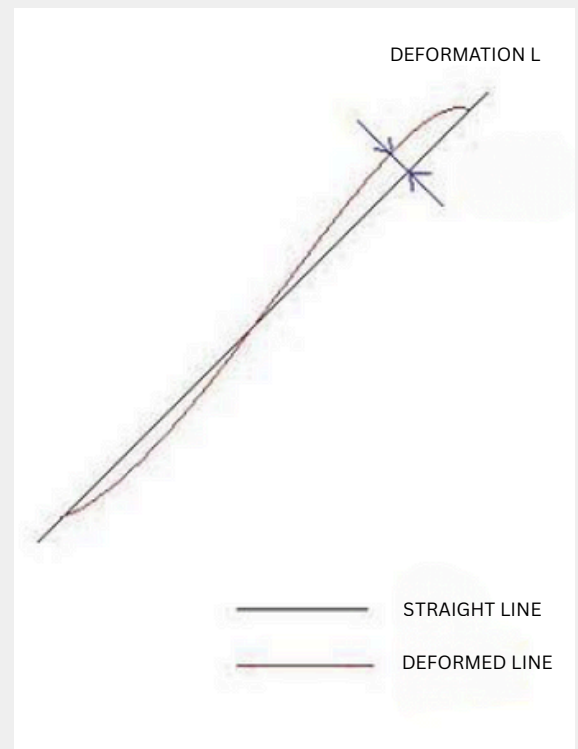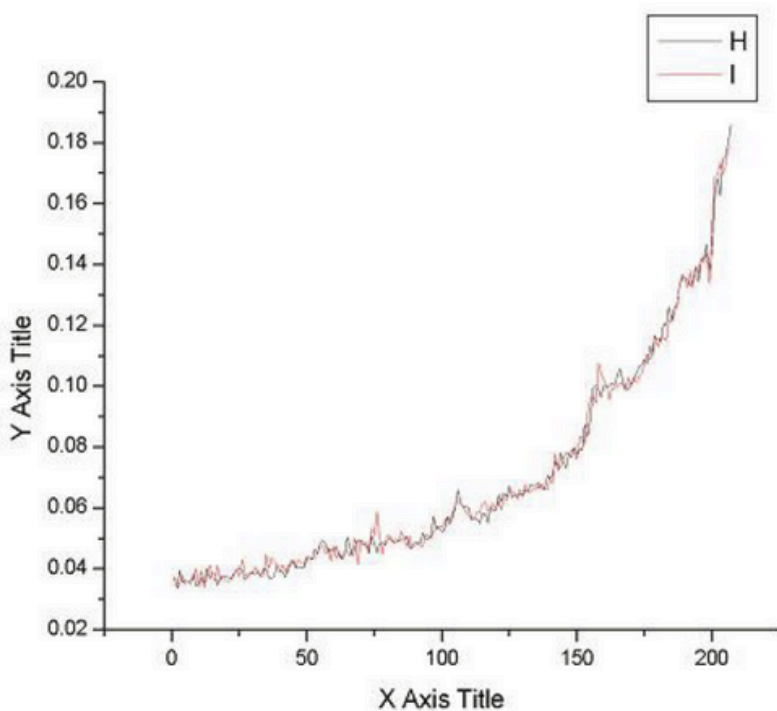
OPERATING CONDITIONS

Power Supply	Single-phase AC 220 V, 50 Hz
Grounding Requirement	Instrument must be properly grounded
Environmental Requirements	Clean workspace; dim lighting; no direct sunlight
Ambient Stability	Indoor conditions must remain stable; no dust, strong vibration, or rapid environmental changes

TECHNICAL SPECIFICATIONS

Zebra Screen Size	2400 × 1500 mm
Zebra Stripe Width	25 mm
Dial Resolution	1°
Measurement Accuracy	±0.2°
Measurement Stability (Repeatability)	≤ 1°
Supported Glass Thickness	0.25 mm – 19 mm
Ultra-Thin Glass	Requires dedicated fixture
Tendon Display	Capable of displaying positions of the five most prominent glass tendons
Supported Transmittance	Suitable for glass with 10%–95% optical transmittance

Function Introduction

1. Manual and Automatic Measurement Modes

To support both traditional and automated testing workflows, the FZT-2 Zebra Angle Tester is equipped with manual and automatic measurement functions.

In manual mode, the operator controls the rotation of the glass bracket. The measurement process is similar to the traditional zebra-angle method performed by the human eye, allowing direct comparison between manual and instrument-based results.

In automatic mode, the operator simply places the glass sample onto the rotating bracket. All subsequent testing steps are completed automatically by the instrument. The system intelligently determines the critical deformation state of the zebra stripes and calculates the zebra angle without operator intervention. Measurement results—including the positions of the five most prominent glass tendons—are automatically displayed on the computer screen.
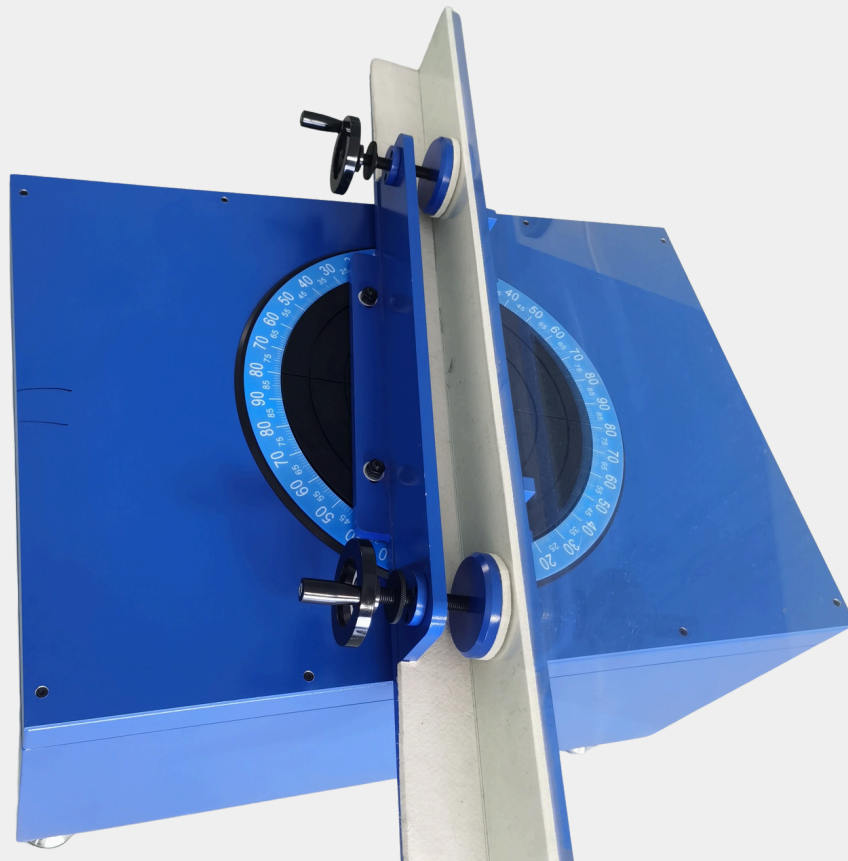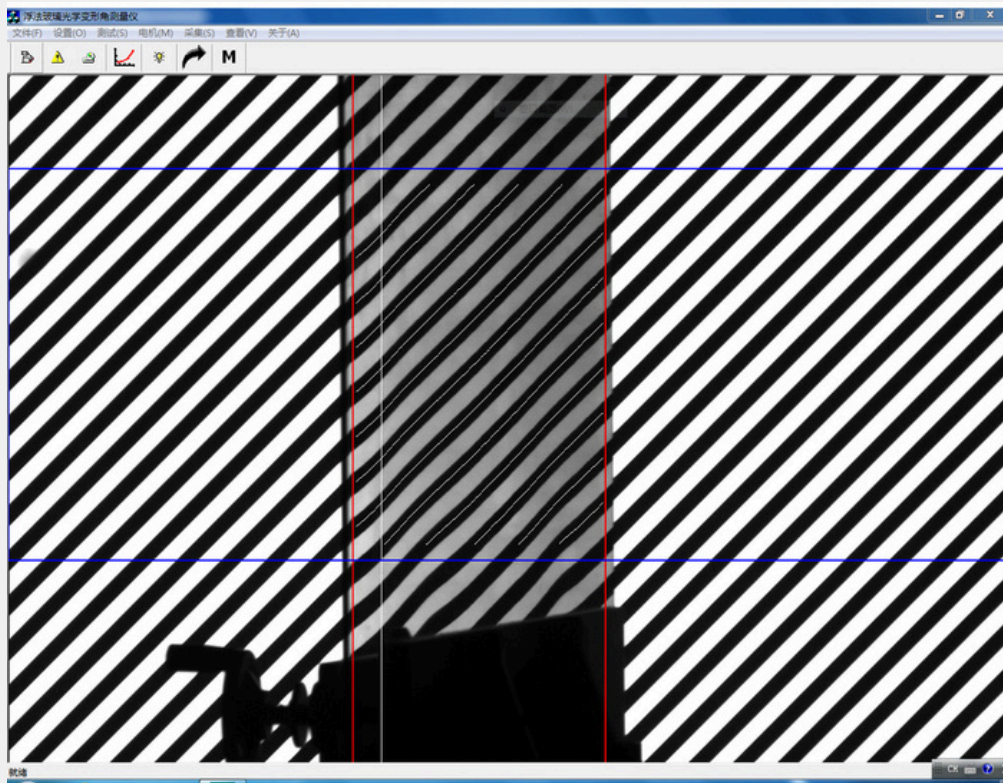

Fig. Rotating sample table and angle dial assembly used for manual and automatic zebra-angle measurement.

Real-Time Visualization of Zebra-Stripe Deformation During Measurement

The system interface provides live imaging of the sample with overlaid reference lines, enabling real-time observation of zebra-stripe deformation and immediate confirmation of measurement alignment.
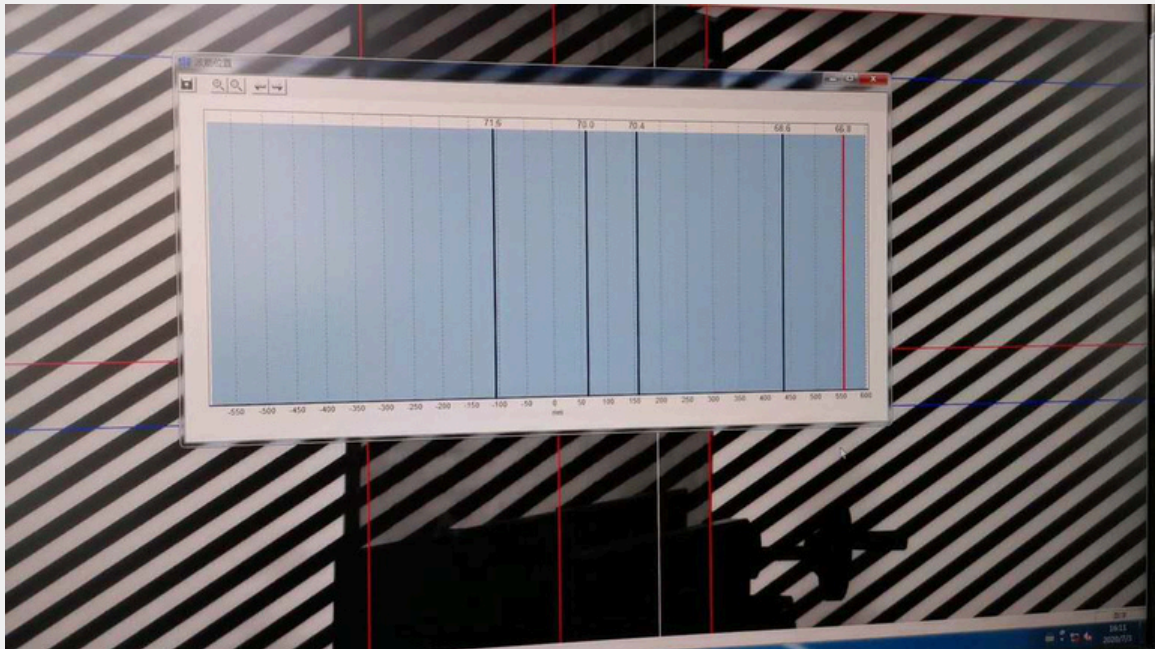
Automated Mapping of the Five Tendons With the Highest Stress Signal

This diagram illustrates the system's automatic identification and spatial positioning of the five most pronounced stress tendons, allowing operators to assess structural uniformity and localized deformation.

3. Deformation Curve Interpretation

The deformation curve plots stripe deformation value L against incident angle. The horizontal axis represents the rotation angle of the glass, while the vertical axis represents stripe deformation magnitude.

As the angle increases, deformation increases gradually. By defining a critical deformation threshold, the system determines the zebra angle at the intersection point between the curve and this threshold.
Measurement sampling at fixed angular intervals enables zebra-angle resolution of ±0.2°, ensuring excellent repeatability and accuracy.
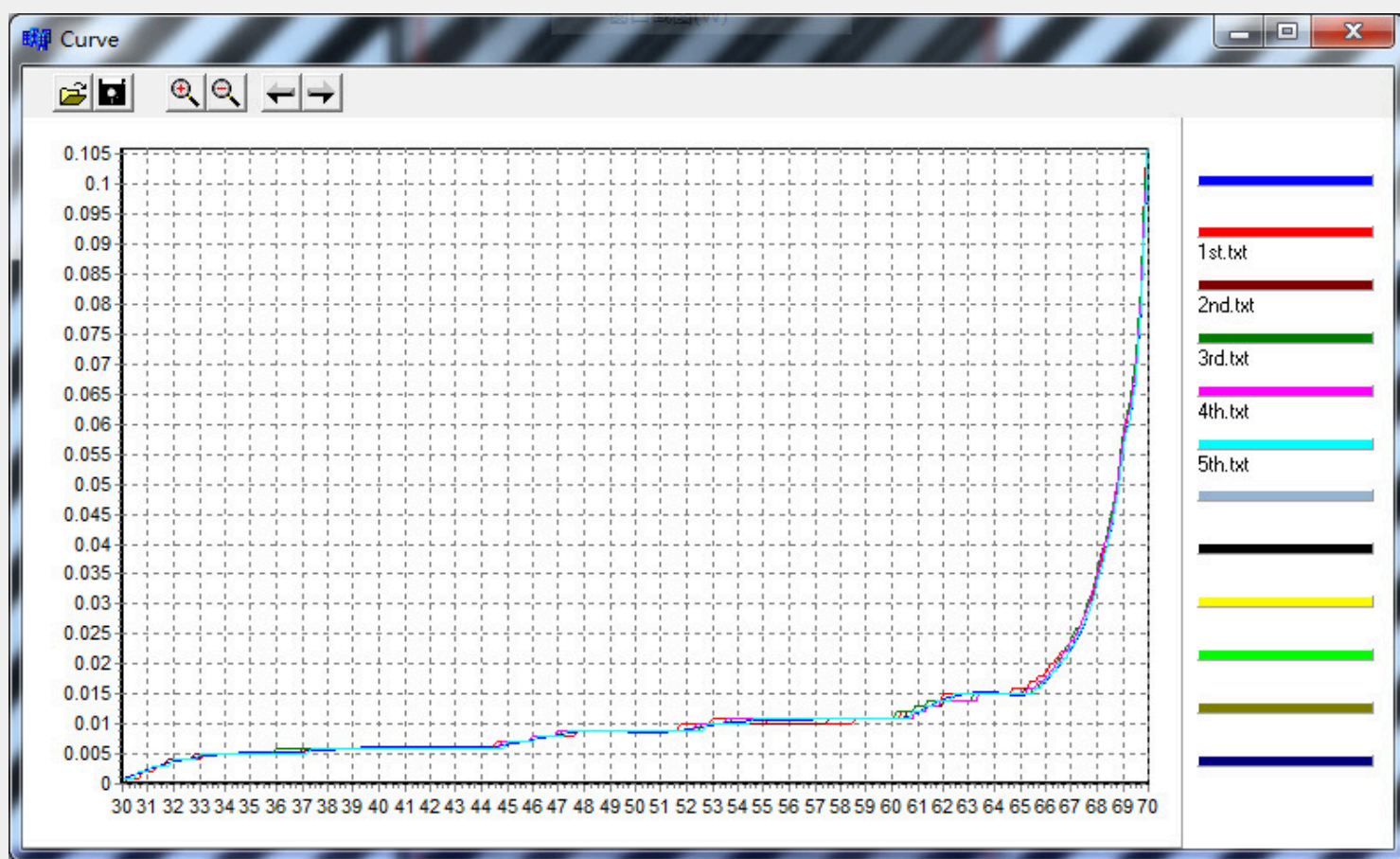
Repeatability Curves Demonstrating Zebra-Angle Measurement Stability

This chart displays multiple consecutive test curves (1st–5th runs), illustrating the system's ability to produce highly consistent zebra-angle calculations across repeated measurements.

1

DUAL MODES
Manual and automatic measurement modes

2

FULL AUTOMATION
Automatic mode performs full testing after sample placement

3

SMART DETECTION
System detects zebra-stripe deformation and calculates angle automatically

4

CLEAR RESULTS
Displays zebra angle and top five tendon positions

5

HIGH ACCURACY
Provides stable, objective, and accurate measurement data

6

INDUSTRY ADOPTION
Trusted by major manufacturers

Advantages Over Traditional Visual Inspection

Prior to automated zebra-angle instruments, measurements relied entirely on human visual judgment, resulting in poor repeatability and significant observer-to-observer variation, often exceeding ±3°.

By replacing the human eye with CCD imaging and algorithm-based deformation analysis, the FZT-2 delivers objective results with repeatability better than ±1°, independent of operator experience.

Technical Support & Enquiries

For technical enquiries, installation support, or operational assistance, please contact:

Telephone: +44 7377366178/ +44 7939992902
Contact Person: Lu Lin
Email: admin@luari.uk

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