NAVINERTIA TECH

Precision Measurement Solutions

W350C

Wafer Thickness Measuring System

I. Technical Specifications

1. Product Overview

- The W350C is a fully automatic wafer thickness measuring instrument developed by Navinertia Tech through more than a decade of dedicated R&D and field application experience. It delivers high precision, high performance, high stability, high expandability, high ease of use, and fully automatic measurement.
- The W350C is suitable for measuring the thickness — including TTV, Bow, and Warp — of 4/6/8/12-inch wafers. With its high-precision vision system, the W350C can also be used to measure planar geometric form-and-position tolerances, including but not limited to point, line, circle, arc, curve, angle, distance, plane, position, symmetry, concentricity, parallelism, and flatness.
- Navinertia Tech is committed to the long-term development of technology and products in high-performance, high-barrier-to-entry fields, and has achieved capabilities that fully rival imported brands — helping customers achieve their “domestic substitution” goals while effectively improving industrial quality and controlling overall cost.

2. Key Features

Body Construction & Design

- Refined structural and industrial design, reflecting Navinertia Tech’s uncompromising commitment to product quality and design aesthetics.
- Full granite-structure body, manufactured with ultra-precision processing and validated by FEA (finite element analysis) for long-term physical stability.
- Supports custom extension of Z-axis travel.

Spectral Thickness Measurement System

- High-precision spectral confocal displacement sensor: working distance 36 mm, effective range ±1.15 mm, linearity accuracy 0.46 µm.

- Uses an upper-and-lower dual-laser opposed working mode combined with a high-precision counting glass scale to achieve high-precision thickness measurement of wafers and other thin, precision parts.
- Supports glass-scale pulse-signal-triggered scanning measurement, accurately reproducing the proportions and variation trends of the product surface profile.

Optical Imaging System

- Optical unit: high-precision continuous auto-zoom lens, optical magnification range 0.7X–4.5X, image (display) magnification range 18X–230X, maximum object-space field of view 10.71×8×13.45 mm (H×V×diagonal).
- Imaging unit: 2-megapixel HD color industrial digital camera with a large 1/1.7″ sensor (versus a conventional 1/3″ sensor, yielding a larger field of view at the same magnification), a high-performance Sony CMOS image sensor, and global-shutter exposure.
- Illumination: standard ring surface light, transmitted contour backlight, and coaxial light, all with program-controlled brightness adjustment.

Encoder System

- All three axes equipped as standard with 0.1 µm-resolution, high-precision linear glass scales.
- Minimum display resolution: 0.01 µm.

Motion Control, Drive & Guidance System

- Dedicated full closed-loop CNC motion control system.
- Dedicated AC servo motors.
- Precision linear guideways and ball screws.

iVision Professional Measurement Software

- Fully and independently designed and developed by Navinertia Tech, with 100% proprietary intellectual property and complete source-code ownership — free of any IP disputes. Comprehensive functionality, a clean interface, an easy learning curve, and outstanding performance.
- Supports multiple language environments, including but not limited to Simplified Chinese, Traditional Chinese, English, Korean, and Japanese.
- Supports rapid response to customer customization requirements, with strong cost efficiency.
- Supports flexible integration with customer MES/SPC systems for intelligent upload of key measurement data.

Multiple Sensor Types

- Supports image, contact probe, point laser, line-scan laser, area-array laser, and other sensor types in combined, multi-sensor scenarios, with automatic sensor switching within a single measurement program.

Signature Functions

- Smart code scanning: supports image-based code reading, industrial code readers, and handheld scanners, linking product ID information with measurement data to enhance data management and traceability.
- Temperature error compensation: supports two dedicated modes — “temperature coefficient” and “absolute ratio.”

3. Key Performance Specifications

W350C Wafer Thickness Measuring System	Item	Specification
Overall Dimensions	Instrument dimensions L×W×H (mm)	1430 × 740 × 1550
	Net weight (kg)	900
Travel	Point Spectral Confocal Displacement Sensor: X / Y / Z (mm)	X: 350 Y: 350 Z: 100
	Imaging: X / Y / Z (mm)	X: 250 Y: 350 Z: 100
Measurement Accuracy	Point Spectral Confocal Sensor: static linearity accuracy (µm)	±0.46
	Point Spectral Confocal Sensor: thickness measurement accuracy (µm)	±2
	Point Spectral Confocal Sensor: E UZ, MPE (µm)	±(3.0 + L/200)
	Imaging: E UXY, MPE (µm)	±(2.5 + L/200)
L = length of the measured object, in mm.		
Motion Performance	X/Y-axis speed (mm/s)	200
	Z-axis speed (mm/s)	150
Imaging System	Camera type	HD industrial digital camera
	Resolution	2 megapixels
Optical System	Lens type	Continuous auto-zoom lens
	Optical magnification range	0.7X – 4.5X
	Image (display) magnification range	18X – 230X
	Lens working distance (mm)	90 ± 2
Magnification values are approximate; actual values depend on monitor size and resolution.		
Illumination System	Surface light	LED cold light source, programmable brightness level
	Contour light	LED cold light source, programmable brightness level
	Coaxial light	LED cold light source, programmable brightness level
Encoder System	High-precision linear glass scale (µm)	0.1
Point Spectral Confocal Displacement Sensor	Working distance	36 mm
	Effective range	±1.15 mm
	Static linearity accuracy	±0.46 µm
	Dual-head opposed / single-head transmission thickness accuracy	±2 µm
	Measurement modes	Displacement mode: flatness, warpage, height difference, etc. Thickness mode: direct-penetration thickness measurement of

W350C Wafer Thickness Measuring System	Item	Specification
		transparent materials Opposed mode: dual-sensor opposed thickness measurement
Motion Joystick	High-performance configuration	LCD display for real-time monitoring of machine status; one-touch emergency-stop button for safe operation; speed-adjustment knob for flexible motion control
Industrial Computer	High-performance configuration	Intel i7 processor • 16GB DDR4 RAM • 1024GB SSD • 27" HD LCD monitor • Windows 10 OS
Worktable Load	Load capacity (kg)	5
Power Requirements	Voltage	AC 200–240V, 50/60Hz
	Power consumption	≥1500W
	Grounding	Mandatory; ground resistance ≤ 4Ω
Operating Environment	Temperature range	20 ± 2℃
	Temperature gradient	0.5℃/h, 2℃/24h
	Relative humidity	30%–80%
	Vibration level	< 0.002g, below 15Hz, away from vibration sources
Specifications are subject to change without prior notice due to continuous product improvement.		

II. Standard Configuration List

No.	Category	Item / Specification	Qty	Unit
1	**Mechanical Body**	Main frame — Granite full-body structure	1	set
		Motion control system — Dedicated full closed-loop CNC motion control	1	set
		Guidance system — Precision linear guideways	6	sets
		Drive system — Dedicated AC servo motor	3	sets
		Transmission system — Precision ball screw	3	sets
2	**Encoder System**	High-precision linear glass scale — 0.1µm	3	sets
3	**Sensing System**	Imaging — 2-megapixel HD industrial digital camera	1	set
		Point spectral confocal — High-precision point spectral confocal displacement sensor	2	sets
4	**Optical System**	High-precision zoom lens — 0.7X–4.5X, continuous auto-zoom	1	set
5	**Illumination System**	Surface light — Custom-configured	1	set
		Contour light — Custom-configured	1	set
		Coaxial light — Custom-configured	1	set
6	**Motion Joystick**	High-performance configuration — With LCD display, emergency-stop button, and motion-speed adjustment knob	1	set
7	**Industrial Computer**	High-performance configuration — Intel i7 CPU / 16GB RAM / 1024GB SSD / 27" HD LCD monitor / keyboard & mouse set / computer desk	1	set
8	**Measurement Software**	Integrated Laser & Vision Measurement Software — Independently designed and developed; 100% proprietary IP	1	set
9	**Technical Documentation**	Certificate of Conformity — Factory quality inspection certificate	1	set
		Factory Accuracy Report — Measured accuracy data prior to shipment	1	set
		User Manual — Instrument operation and maintenance manual	1	set
		Measurement Software Manual — Software application manual	1	set
		Warranty Card — Proof of eligibility for in-warranty service	1	set
10	**Other**	Pixel calibration target — Complimentary	1	set
		Positioning fixture — Wafer-dedicated positioning fixture	1	set

III. iVision Professional Measurement Software

iVision is a fully proprietary, domestically developed video measurement software platform created by Navinertia Tech. Refined over nearly a decade of field application, it now matches the level of comparable imported products and supports fully automatic measurement across a wide range of high-precision, high-efficiency, high-magnification application scenarios.

1. Industry-Leading Functions

- Ultra-fast autofocus: a single image autofocus operation takes approximately 1.5 seconds; only the image within the focus frame refreshes, while the image outside the focus frame remains temporarily locked until the autofocus operation completes.
- Ultra-high autofocus accuracy: repeatability of image autofocus at magnifications above 1000X is ≤ 1 µm.
- Simultaneous multi-point autofocus: multiple focus frames can be set within the same field of view, enabling simultaneous autofocus at multiple positions — substantially improving overall measurement efficiency — and can output a fully in-focus composite source image for professional review or analysis.
- Ultra-high image magnification: maximum magnification up to 2800X. [Requires special supporting hardware.]
- AI edge detection: AI (Artificial Intelligence) edge detection is purpose-built to resolve automatic, intelligent recognition of complex elements with poorly defined features; supports large-model deep learning with short single-model training time; simple interface and convenient operation substantially reduce manual point-selection workload, eliminate human measurement error, and greatly improve overall measurement efficiency. [Requires special supporting hardware.]
- Dedicated semiconductor bonding measurement: directly measures key semiconductor dimensions via high-precision, fast image autofocus, including but not limited to ball size, ball shift, maximum diameter (of the extruded ball), ball height, loop height, and automatic fishtail recognition. [Requires special supporting hardware.]
- 3D extended-depth-of-field image synthesis: enables automatic Z-axis autofocus image stacking at ultra-high magnification and generates a three-dimensional composite image for professional review or analysis. [Requires special supporting hardware.]
- Fly-shot ultra-fast motion measurement: completes measurement of target product dimensions rapidly and without pausing, at motion speeds more than 5 times faster than conventional video measurement. [Requires special supporting hardware.]
- Cosmetic-defect detection assistance: uses a dedicated optical system to assist with image capture for cosmetic-defect inspection, then transmits images at high speed via a dedicated protocol to a professional cosmetic-defect analysis server, supporting reception and processing of the server's returned analysis status — helping customers effectively reduce the overall procurement cost of dedicated cosmetic-defect imaging equipment. [Requires special supporting hardware.]

2. Basic Environment Parameters

- Length units: millimeter, micron, foot, mil.
- Angle units: degree, radian, degree/minute/second.
- Minimum data display resolution: 0.01 µm.
- Language environments: Simplified Chinese, Traditional Chinese, English, Italian, Japanese, and others.

3. Basic Measurement Functions

- Basic geometric elements: point, line, circle, arc, ellipse, ring, rectangle, slot, angle, distance, open curve, closed curve, plane, point cloud, cylinder, cone, sphere, etc.
- Constructed elements: points (intersection, endpoint, center, extremum, symmetry point, geometric center), lines (centerline, parallel line, bisector, perpendicular, tangent, symmetry line, multi-point line, polyline), circles (multi-point-constructed, multi-circle-constructed, symmetric, three-line inscribed, two-line-radius inscribed), arcs, angles (2D planar, 3D spatial), distances (maximum, minimum, center, average, 2D planar, 3D spatial), ellipses, rings, rectangles, slots, open curves, closed curves, planes, point clouds, cylinders, cones, spheres, etc.
- Form and position tolerances: straightness, roundness, profile, flatness, parallelism, perpendicularity, symmetry, position (LMC, MMC, multiple datums), runout, concentricity, coaxiality, angularity, cylindricity, etc.
- Edge-detection methods: full-edge detection, segmented edge detection, contour detection, mouse point picking, proximity point picking, highest-point picking, best-edge-point picking, image auto-focus point picking, probe point picking, laser point picking.
- Coordinate systems: supports Cartesian and polar coordinate systems; one-click coordinate system setup; multiple coordinate systems within a single measurement program; spatial alignment (leveling), translation, and rotation of coordinate systems; multiple complex spatial coordinate-system construction methods such as “3-2-1” and “plane-plane-plane”; multiple reference coordinate-system modes (current coordinate system reference, independent coordinate system reference).
- Annotated elements: supports rapid on-screen dimension callouts for extracted elements directly in the image or drawing area, including point coordinates, radius, diameter, arc length, planar distance, X distance, Y distance, angle, height, etc.
- Preset elements: within a specified coordinate system, key constraint parameters (e.g., center coordinates + radius) can be entered to pre-generate target elements for auxiliary or comparative measurement, including points, lines, circles, planes, cylinders, cones, spheres, etc.
- Element duplication: translation copy, mirror copy, rotation copy, array copy, serpentine copy, multi-workpiece copy.
- Tolerance settings: unified default tolerance presets by element type; apply a dimensional tolerance to all elements of the same type or to all elements; multiple tolerance-grade ranges for a single dimension with matched grading status (for downstream sorting); combined grade-tolerance evaluation across multiple dimensions (for downstream sorting); centralized display and management of all controlled (toleranced) dimensions in a dedicated interface (e.g., sortable export).
- Element aliases: assign aliases to extracted elements, exportable into the measurement results report.
- Re-measurement: re-measure extracted elements; automatically re-measure all out-of-tolerance elements after a program run; targeted refresh and re-measurement of results within an existing data report (without regenerating the report).
- Measurement review/playback: caches one image per edge-detection location for later review, allowing verification of edge-detection accuracy at the time of measurement.
- Element parameters: view all key parameters for extracted elements in a dedicated “Element Parameters” panel, with direct parameter adjustment, including but not limited to reference coordinate system, lens magnification, light-source brightness level, camera exposure time, focus parameters, edge-detection parameters, and laser parameters.
- Edge-detection parameters: multiple adjustable parameters, including but not limited to effective gradient, threshold, threshold method (Otsu, iterative, fixed), point count, spacing, precision, detection direction, number of edges, algorithm (standard detection, dirty-edge handling, blurred-edge handling), and effect preview.
- Shortcut operations: run program, select all elements, delete elements, re-measure, parameter settings, etc.

- Run log: real-time display of software operating status parameters, aiding in troubleshooting during measurement.

4. Enhanced Measurement Functions

Pattern Recognition

- A breakthrough, dimension-level, multi-point image positioning technology that supports template definition, automatic recognition, and precise localization of any target pattern within the field of view. Unlike conventional “feature matching,” Pattern Recognition delivers true “facial-recognition-style” automatic identification of the target product.
- Frees customers from complex constrained coordinate systems and costly custom fixtures, enabling automatic recognition and precise localization of complex products — laying the groundwork for effortless automated measurement.
- Supports multiple identical or different pattern templates within a single measurement program (no quantity limit), enabling a flexible “insert as needed” programming approach.

Array Measurement

- Supports two measurement modes — standard array and free-offset array — purpose-built for fast, automatic measurement of large batches of identical products.
- Standard array: for products held in fixtures with a regular multi-station layout. Supports setting the number of array units in the X/Y direction, the X/Y step spacing between units, multiple measurement path directions (horizontal, vertical, boustrophedon), and a customizable reference array unit (program starting position).
- Free array: for products placed randomly or in free positions. Supports creating any number of base array units at arbitrary product locations.
- For each base array unit, supports individual operations including but not limited to activate/deactivate, move to this unit, mark as “with workpiece”/“without workpiece,” and measure/re-measure this unit individually.
- Can be combined with Pattern Recognition: before measuring each array unit, the system can first perform a pattern-recognition step to automatically and precisely identify and locate the product within that unit — eliminating the need for high-precision locating fixtures, substantially improving measurement efficiency and convenience, and helping customers reduce overall quality-control costs.

Feature Matching (One-Click Flash Measurement)

- Purpose-built for fast, batch measurement of multiple identical products within a single field of view or a stitched panoramic image.
- By extracting and defining a feature location on the product, the system automatically and rapidly matches and identifies all products meeting that feature, enabling simultaneous, fast measurement of multiple target products.

Stitched Measurement (Panorama Flash Measurement) & Map Navigation

- Unlike conventional video measurement, which extracts dimensional features sequentially at different product locations, Stitched Measurement first captures and stores the entire target measurement area via repositioned imaging, then merges the captures into a single large image with measurement-grade pixel accuracy, on which dimensional programming is then performed (also known as “large-image programming”).
- When multiple identical products exist within the stitched region, “Feature Matching” can be executed on the large image to enable simultaneous, fast measurement of all target products (also known as “one-click flash measurement”).

- Supported across multiple optical paths, including telecentric wide-field stitching (also known as “panorama flash measurement”), high-precision variable-magnification field stitching (also known as “small-field stitching”), and map-navigation field stitching.
- Map-navigation field stitching provides a rough calibration of feature locations across the product surface, generating a “product map” that can subsequently be used to quickly navigate near a specified location. Note: images produced via map-navigation stitching do not carry measurement-grade pixel accuracy.

Code-Scanning Measurement

- Supports multiple scanning methods, including image-based scanning, industrial code readers, and handheld scanners, primarily used to decode and capture product ID information and link it to the final measurement results report.
- Image-based scanning: automatically scans and decodes the product’s 2D code directly within the field of view.
- Industrial code reader: dedicated scanning hardware with a proprietary communication protocol; the measurement software can send scan commands via the protocol, suitable for scenarios requiring automatic scanning actions interspersed during program execution, and supports a custom “scan element.”
- Handheld scanner: the most common scanning method, operated manually, typically before the measurement program starts.

CAD Import Quick Measurement

- Supports importing theoretical product CAD drawings (typically *.dxf format), automatically parsing the contained target elements — including but not limited to points, lines, circles, and arcs — as well as dimensional annotation information such as nominal values and tolerance bands.
- Supports rapid coordinate alignment between the CAD theoretical drawing and the physical part; once key edge-detection parameters (Z-axis height, light-source brightness, lens magnification, etc.) are set, a measurement program can be generated quickly without manually programming each target element, substantially reducing program preparation time.
- Supports overall comparison, within the image area, between the CAD theoretical drawing and the physical part’s outer contour; through rotation and translation, quickly determines dimensional conformity for the part (particularly useful for irregularly shaped parts).

Image Scanning (Reverse Engineering)

- Supports capturing the outer contour of a target product via image scanning and generating a contour point cloud, which can be used for reverse engineering (also known as “digitizing”).

Comparative Measurement

- Supports preset scale lines, angle lines, and standard circles within the image area for comparison against the physical part.
- Supports drawing dimension lines and angle lines directly from the imaged edge contour of the product, enabling dynamic observation of length, angle, step height, diameter, and other dimensions.

3D Display

- For three-dimensional elements, the software supports 3D display within the drawing area and export to 3D CAD file formats (e.g., *.igs).

Calculator

- Supports secondary computation on extracted element dimension results, including but not limited to addition, subtraction, multiplication, division, absolute value, maximum, minimum, average, variance, exponentiation, root extraction, and trigonometric functions; results can be stored as new elements within the measurement program and automatically output to the measurement results data report.

Adaptive Light Adjustment

- After the software automatically completes a lens magnification change, the light-source brightness level can be actively and automatically adjusted, keeping image brightness essentially consistent before and after the magnification change (eliminating manual light-source parameter adjustment after zooming).

Screen Recording

- Supports real-time video recording of the full software interface, generating recording files to a specified path and naming format for later traceability and review.

Image Saving

- Supports saving an image at each edge-detection location, with configurable save path and naming format; measurement elements can be displayed on the saved images.

User Access Levels

- Supports defining and creating users with different permission levels, including but not limited to administrator, programmer, and operator, enabling access control by user level to help safeguard the customer's production system security.

Cable Wall-Thickness Measurement

- Supports measurement and evaluation of cross-sectional wall thickness for various types of cable insulation, with evaluation functions and algorithms strictly compliant with GB/T 2951.11-2008.

O-Ring Measurement

- Supports measurement of key O-ring dimensions, including but not limited to outer diameter, inner diameter, and maximum/minimum/average thickness.
- Supports cross-field image stitching for precision measurement of larger O-rings.
- Supports simultaneous measurement of multiple O-ring types within a single measurement program.

Contact Probe Measurement

- Supports triggered point acquisition via contact probe; captured coordinate points can be used to construct new target elements or dimensions, including but not limited to distance, plane, sphere, cone, and cylinder.
- Supports adding safety waypoints along the probe's motion path to effectively avoid interference and collision risk.

Point-Laser Triggered Scanning

- Supports laser scanning triggered by linear-scale pulse signals, capturing an equally spaced point set that reproduces the true surface profile of the product on a 1:1 basis.
- Supports secondary element construction from the captured point set, including but not limited to point, line, circle, arc, distance, angle, plane, and sphere.
- Supports a thickness measurement mode that penetrates transparent materials directly to extract product thickness information without any prior surface treatment.
- Supports a dual-laser, top-and-bottom opposed measurement mode for measuring the thickness of non-transparent materials, such as semiconductor wafer thickness.

Line-Laser Triggered Scanning

- Similar in principle to point-laser triggered scanning, except the scan captures a large point cloud over a defined area, with each measured point carrying Z-height information.
- Supports intuitive "thermal map" (also known as "rainbow map") rendering of the scanned point cloud by height, making overall height-variation trends across the scanned area easy to observe.

- Supports extracting target feature points (e.g., highest point, lowest point, average point) at specific locations on the thermal map using a dedicated programming tool; multiple feature points can be further used to construct height-difference, flatness, and other dimensional results.

MES/SPC Data Upload

- Supports custom development to integrate with the customer's internal MES/SPC systems, uploading measurement results in an agreed format for centralized data management and quality-issue traceability.

5. Programming & Automated Measurement

- Supports generating automated measurement tasks through programming, saving them as dedicated program files for later direct recall; programs can also be copied to other measuring instruments of the same type for direct use, reducing repeated programming effort.
- Supports flexible program editing, including establishing coordinate systems, adding elements, inserting elements, deleting elements, reordering elements, adjusting edge-detection methods, adjusting edge-detection parameters, and adjusting element parameters.
- One-click program execution, automatically completing measurement of all target dimensions.
- Automatic stage motion control.
- Automatic lens magnification switching (requires a continuous auto-zoom lens).
- Automatic light-source parameter adjustment.
- Automatic pixel calibration.
- Automatic image auto-focus.
- Automatic probe point acquisition.
- Automatic laser point acquisition.
- Automatic extraction of target elements (except in manual point-and-click mode).
- Automatic sensor switching (for combined imaging/laser/probe scenarios; all sensors share a common coordinate system).
- Automatic determination of measurement result status (OK/Pass, NG/Fail, UD/Measurement Failed).
- Automatic determination of measurement grade status (Grade A, B, C, etc., for scenarios with graded tolerances), with automatic triggering of grade-status signals to a specified I/O interface to assist downstream sorting.
- Automatic saving of edge-detection location images.
- Automatic program pause on out-of-tolerance results.
- Automatic skipping of failed measurement elements.
- Automatic generation of a data results report at program completion.
- Automatic display of run time at program completion.
- Automatic re-measurement of out-of-tolerance dimensions at program completion.
- Automatic return to a safe position at program completion.

6. Data Output & SPC Statistical Analysis

- Supports multiple output formats for measurement results reports, including but not limited to Excel, PDF, Word, TXT, CSV, and CAD.
- Supports output of multiple result parameters, including but not limited to header information, product ID, CAD graphics, element name, dimension name, nominal value, tolerance value, range value, deviation value, out-of-tolerance value, result status (OK/NG), and measurement time.

- Supports custom report display colors, including but not limited to font and background colors for pass/fail dimensions.
- Supports custom “sort and export” of measurement results — e.g., grouping output by dimension type (distances first, then angles, then diameters) for quick review and analysis.
- Supports output of multiple professional SPC statistical indicators, including but not limited to Cpk, Cp, and Ca.
- Supports direct compatibility with, and invocation of, customer-defined report templates, outputting measurement results directly into customized reports (no manual intervention required, saving effort and reducing the risk of data-handling errors).
- Supports personalized settings for data report output, including but not limited to output orientation (landscape/portrait), report naming format, automatic report saving, and report storage path.

7. Open Sensor Compatibility

- Supports multiple types of professional measurement sensors, including but not limited to imaging (various camera, lens, and light-source models), contact probes (star probe, cylindrical probe, TP20), point laser (triangulation and spectral confocal), line-scan laser (triangulation and spectral confocal), and area-array laser; new technologies and products can be integrated over time as the sensor market evolves.
- Different sensors share a common coordinate system, enabling automatic, alternating switching between sensors during program execution to complete a wide range of complex measurement tasks in an orderly sequence.

8. Comprehensive Calibration & Error Compensation

- Supports multiple pixel calibration methods, including but not limited to single-circle calibration, four-circle calibration, multi-circle calibration, angle calibration, circular-array calibration, and CCD horizontal calibration.
- Supports multiple spatial error compensation methods, including but not limited to linear compensation, segmental compensation, perpendicularity compensation, planar compensation (single-layer and multi-layer accumulation), temperature compensation, lens-center compensation, and lens-origin compensation.
- Temperature compensation supports two dedicated modes — “temperature coefficient” and “proportional coefficient” — each suited to different scenarios.

9. Rapid Response to Custom Feature Requests

- The software is fully and independently designed and developed, with complete, self-controlled source code. Custom development in response to customer-specific functional requirements can be delivered quickly and cost-effectively.

10. Lifetime Free Upgrades

- Navinertia Tech continuously upgrades and updates the standard software version, regularly releasing new features and improvements. Customers receive lifetime free upgrade service, lowering the overall cost of ownership throughout the product’s life cycle.

IV. Installation, Acceptance & Service

1. Delivery, Installation & Commissioning

- The Buyer shall formally notify Navinertia Tech within 3 working days of the goods' arrival, so that qualified service engineers can be scheduled for an on-site visit.
- Before Navinertia Tech's service engineers arrive on site, the Buyer is responsible for properly storing the goods. Unauthorized unpacking is prohibited, as is storing the goods outdoors or in locations unsuitable for precision measuring instruments — including direct sunlight, high temperature, high humidity, dust, or highly corrosive environments.
- Navinertia Tech is responsible for unpacking, positioning, installation, and commissioning of the goods at the Buyer's site, and will actively support the Buyer in completing the final acceptance process. The Buyer shall assist by providing the necessary site access, forklifts, cranes, tools, and manpower.
- Given the demanding environmental requirements of precision measuring instruments, all packaging for the goods may only be opened under the on-site supervision and approval of Navinertia Tech's service engineers.

2. Acceptance Terms

- Final acceptance of the goods shall be based on applicable international, national, and industry standards.

3. Training Terms

- Navinertia Tech will provide the Buyer's operating personnel with timely, professional, and comprehensive on-site training, ensuring trained personnel are capable of day-to-day operation and maintenance. Training content includes, but is not limited to, an overview of key modules, standard operating procedures, software programming, and routine maintenance and precautions.
- For newly purchased goods, Navinertia Tech commits to a cumulative on-site training duration of, in principle, no less than 2 working days. For first-time customers, Navinertia Tech will give due consideration to reasonable requests to extend the training duration.
- The Buyer shall promptly designate suitable trainees and actively participate in training organized by Navinertia Tech. Trainees designated by the Buyer should have basic knowledge of precision metrology and basic computer operating skills.
- While conducting training at the Buyer's site, Navinertia Tech personnel shall comply with the Buyer's policies regarding information confidentiality, organizational discipline, and workplace safety.

4. In-Warranty Service

- During the warranty period, for any malfunction or damage to the goods attributable to Navinertia Tech, the company will repair or replace the affected components free of charge and restore the goods to normal working condition.
- As the goods are precision measuring instruments with strict installation and operating environment requirements, unauthorized software upgrades, in-plant relocation, or cross-site relocation are prohibited without Navinertia Tech's prior consent, in order to keep the goods in normal working condition. Note: such unauthorized actions will immediately void the remaining warranty period and may cause abnormal or damaged hardware/software conditions; any resulting consequences shall be borne entirely by the Buyer.
- Online service response: within 4 hours of receiving the Buyer's formal notification, via channels including but not limited to phone, online communication, and remote access.

- On-site service response: on-site arrival within 24 hours of receiving the Buyer's formal notification, applicable when the issue cannot be effectively resolved online.
- General technical consultation: flexible response available 7×24, including technical engineering consultation service.

5. Out-of-Warranty Service

- For goods outside the warranty period, Navinertia Tech commits to providing long-term paid technical support, and recommends that the Buyer discuss and sign a long-term maintenance agreement with Navinertia Tech to optimize the overall cost of use and maintenance throughout the product's life cycle.