MIDLAND METROLOGY LTD

iMetal-630B/BD

Upright Metallographic Microscope

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Feature and Application

iMetal-630 is a professional-grade upright metallographic microscope designed for material metallographic analysis. It supports bright field, bright-dark field, polarizing observation and differential interference contrast (DIC). Equipped with an intelligent light intensity management LED system featuring a 50,000-hour long-life light source with stable color rendering, it also has a 30° inclined trinocular observation tube and 10X wide-field eyepieces. Optional multi-magnification plan achromatic objectives are available, adapting to various observation modes such as bright field, polarizing and DIC. The microscope adopts a right-handle detachable stage with a stroke of 75*50mm for easy operation, and is compatible with a standard C-mount for flexible expansion of cameras and software. It meets the needs of tissue observation and failure analysis of metals, semiconductors and other materials in scientific research and industrial testing, serving as a reliable tool in the field of material analysis.

Product Feature

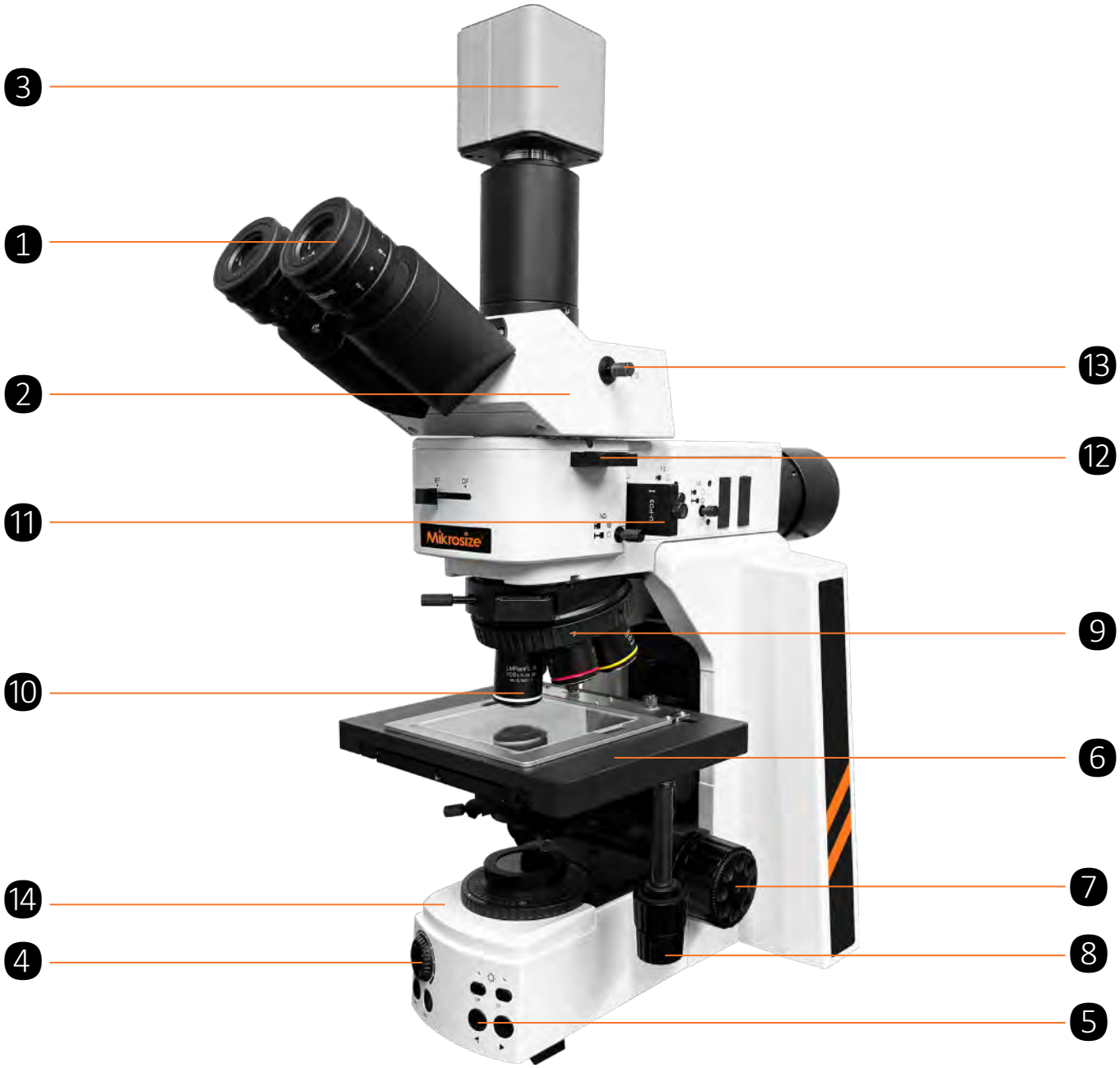
- It adopts an infinite optical system, matched with plan semi-apochromatic objectives and large-field high-eyepoint eyepieces, restoring the true details of metallographic structures to meet high-precision testing requirements. The
- optimal light intensity is automatically matched when switching objective magnifications, eliminating the need for repeated manual adjustment, reducing operational steps, avoiding human errors and greatly improving testing fluency.
- 10W 4500K wide-spectrum LED with CRI≥95, preset centering, stepless brightness adjustment and a variable aperture.
- A rich variety of optional accessories are available, including bright-dark field illumination, polarizing observation and DIC observation.
- The coarse and fine coaxial focusing system (1μm fine adjustment scale value) and 75×50mm large-travel stage are combined with a five-hole encoded nosepiece, realizing precise positioning, smooth operation and stable precision during long-term use.

Feature and Application

Product Application

- Used for grading the grain size and inclusions of steel, non-ferrous metals and other materials, and evaluating the effect of heat treatment processes and material properties.
- Detecting defects such as cracks, blowholes and porosity in castings and weldments, tracing the causes of failure to ensure the quality and reliability of products.
- Accurately observing microstructural changes after processes such as quenching and annea optimizing process parameters to ensure the process stability of mass production. Clearly presenting the microstructures of weld fusion zones and heat-affected zones, detecting defe such as incomplete penetration and slag inclusions to meet the acceptance
- criteria of welding processes.
- Observing the porosity and sintered structure of powder metallurgy parts, as well as the thickness and bonding interface of coatings and platings to control coating quality.
- Suitable for teaching experiments in materials science for metallographic structure observation and material performance analysis.

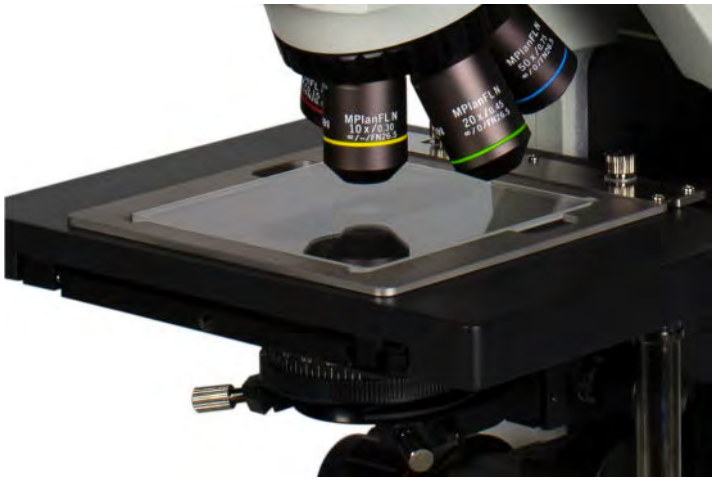
Product Details



1.Eyepiece **2.Trinocular Observation Tube** **3.Camera**
4.Light Source Control Knobs and Buttons **5.Objective Switching Button**
6.Workbench **7.Coarse And Fine Coaxial Adjustment Knob**
8.Workbench Control Handle **9.Nosepiece** **10.Objective Lens**
11.Polarizer **12.Analyzer** **13.Bright-Dark Field Switching Lever** **14.Dic Slot**

Product Details

Product Structure



- Ultra-large travel range of 75*50mm
- Ergonomically designed stage knobs and focusing knobs
- Customizable stage accessories for special samples

- Objective Lens Options
- Plan objectives:5X、10X、20X、50X、100X
- Semi-apochromatic objectives:2.5X、5X、10X、20X、50X、100X
- Apochromatic objectives:5X、10X、20X、50X、100X
- The iMetal-630 is standard equipped with a five-hole encoded nosepiece, which allows for the integration of the microscope's hardware settings with image analysis software, where illumination intensity and objective position are both recorded in the software.

Product Details

Product Structure

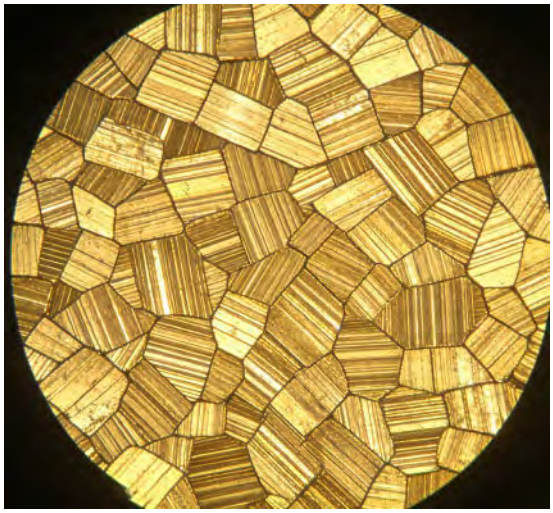
- Coaxial coarse and fine adjustment knobs with adjustable tightness and a 1 μm fine focusing scale value for smooth and accurate adjustment.

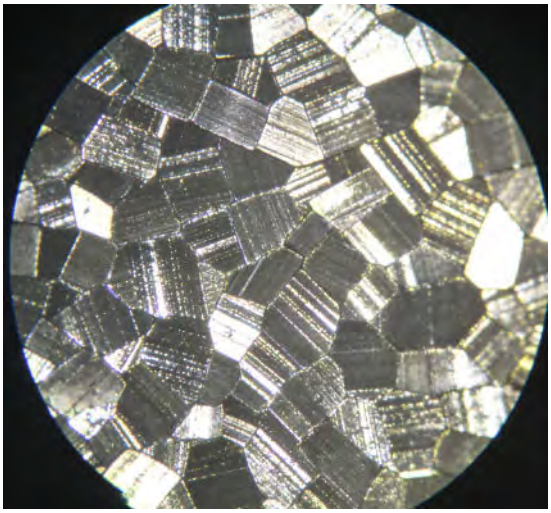
- 4500K wide-spectrum LED with CRI≥95, preset centering, stepless brightness adjustment and a variable aperture; built-in bright field and dark field modules, including a fixed polarizer and a 360° rotatable analyzer.
- True color imaging can be fully achieved at both high and low brightness levels.
- Generates almost no heat, with illumination intensity equivalent to a 100W halogen lamp.
- Stepless adjustment of illumination intensity; the desired illumination intensity can be set for each objective lens, and the illumination intensity is automatically adjusted when switching objectives.

Product Details

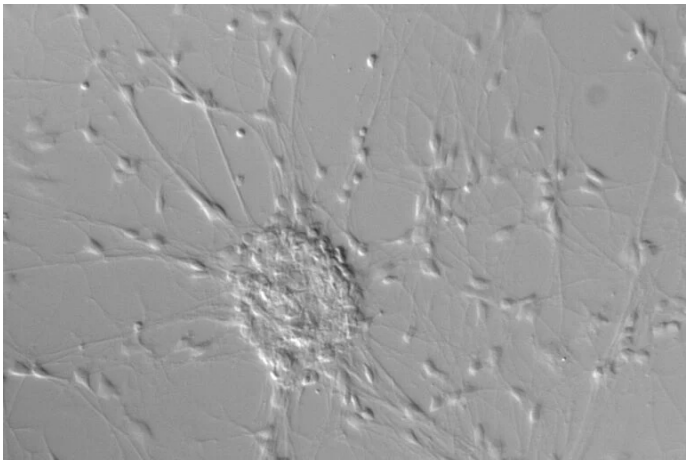
Optical Path Switching

- The iMetal-630 supports optional bright-dark field, polarizing observation and differential interference contrast (DIC), which can be selected by customers according to their needs.





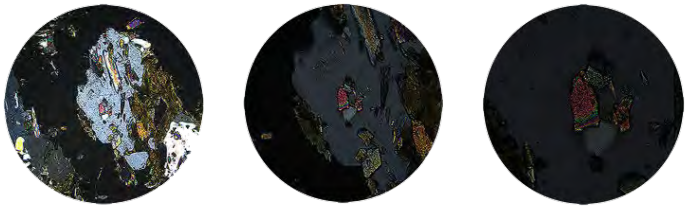
- Simultaneous bright-dark field comparison of samples: the bright field displays the overall morphology, while the dark field highlights defects, particles and transparent edges with stronger contrast for easier flaw detection.



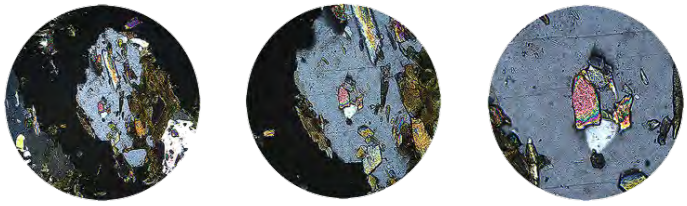
- DIC observation delivers a 3D embossed effect with a strong sense of depth, clear edges and no halation, ensuring more accurate details. It enables sample observation without staining, which is sample-friendly.

Product Details

Intelligent Light Intensity Management System

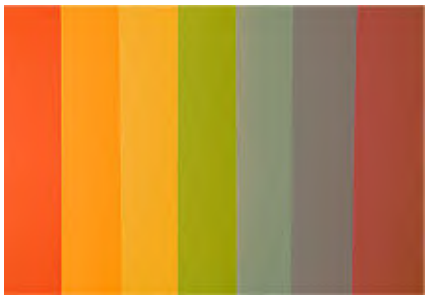


- For traditional microscopes, the image becomes darker when increasing the objective magnification.



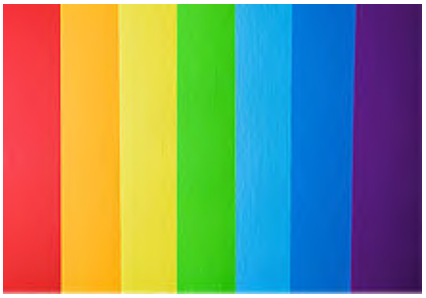
- The intelligent light intensity management system automatically adjusts the light intensity to the optimal level when changing the objective magnification.

LED Light Source



- Halogen lamps: color rendering changes at different light intensity levels.

- LED light source: constant and consistent color rendering at different light intensity levels, with more vivid colors than halogen lamps

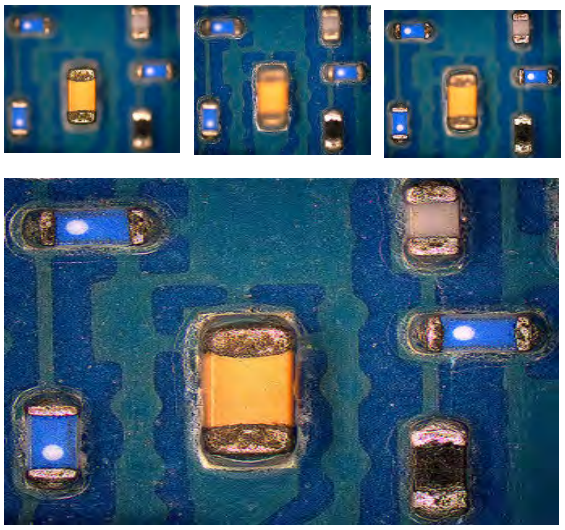


Software (Standard Delivery)

Software Function: Image Stitching

- The real-time image stitching function adopts image recognition technology; a panoramic image can be obtained simply by moving the stage knobs, providing a wider field of view for users.

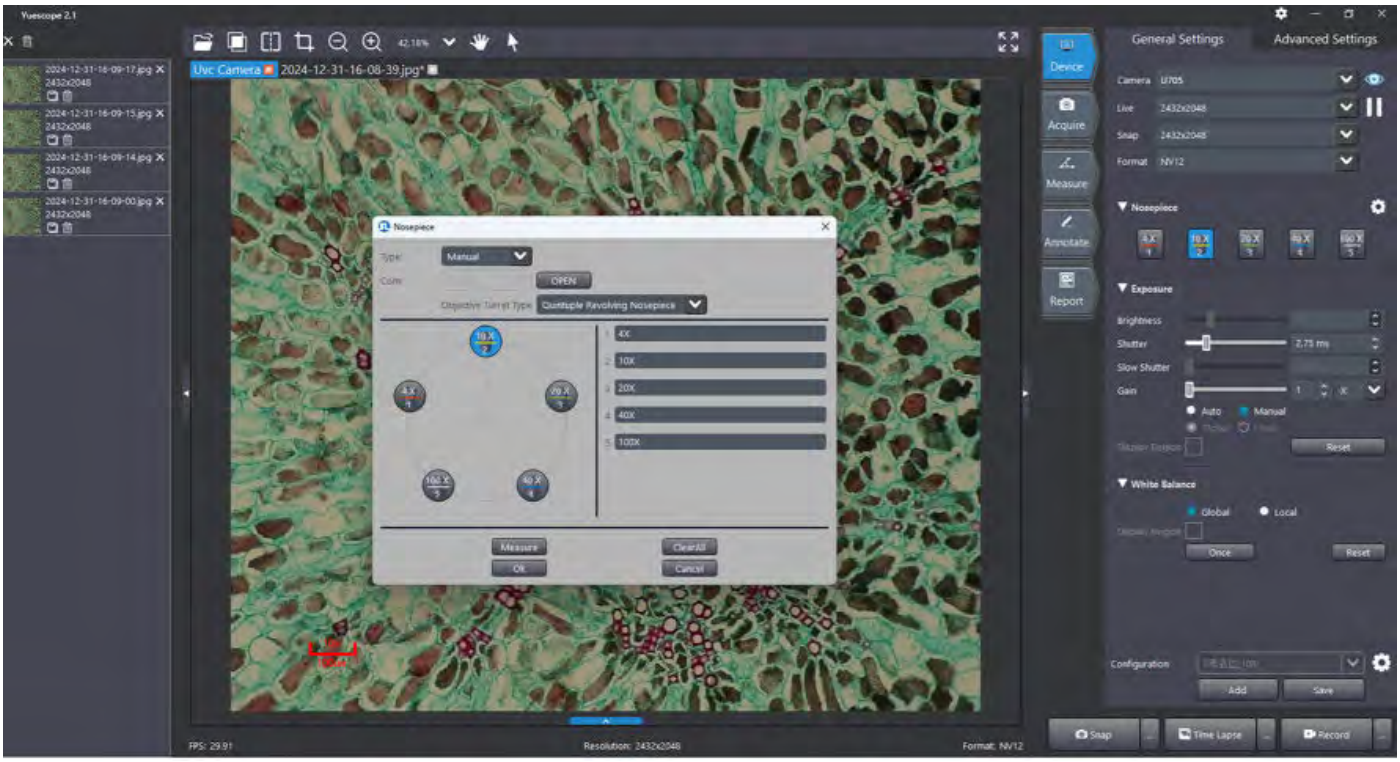
Software Function: Depth of Field Fusion



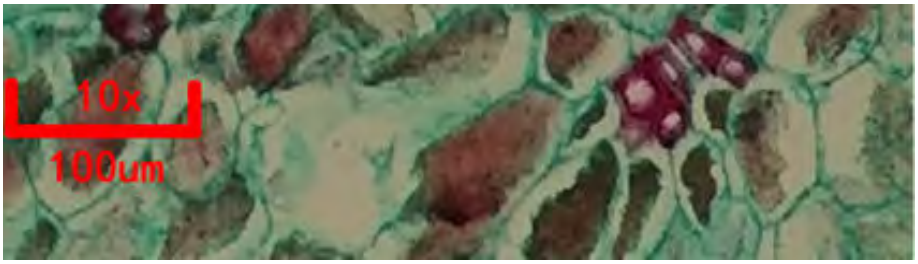
- The real-time depth of field fusion function can capture sample images with a height exceeding the objective depth of field and stack them to create an ultra-depth of field image.

Software Operation Interface

Software Functions



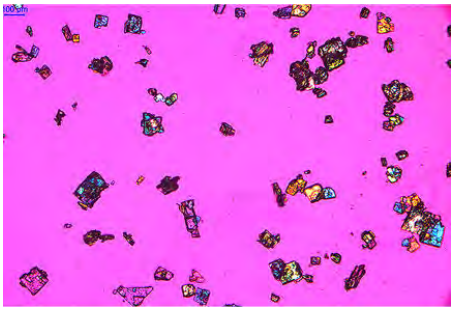
- Active objective lens recognition by software



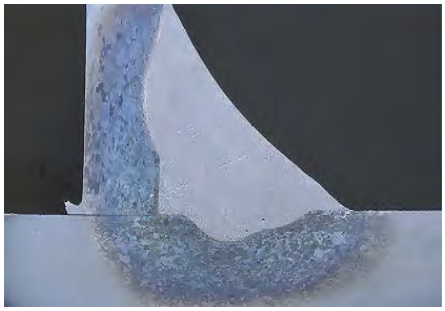
- Automatic scale bar switching by software when changing objectives

Software Operation Interface

Measurement Imaging

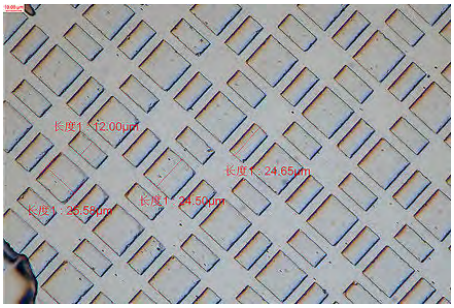


The drug powder under polarized light

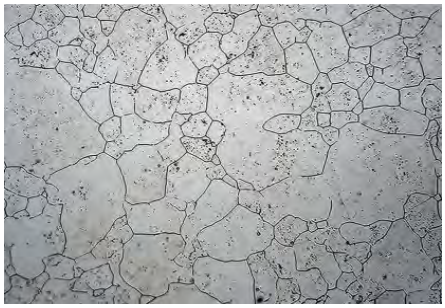


Measurement of aluminum alloy melting depth

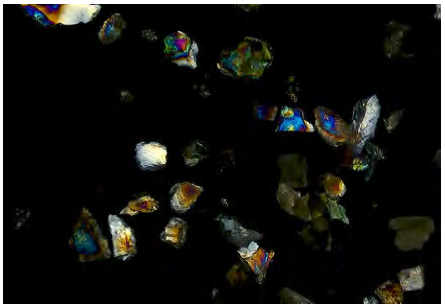
Capacitor tin plating height detection



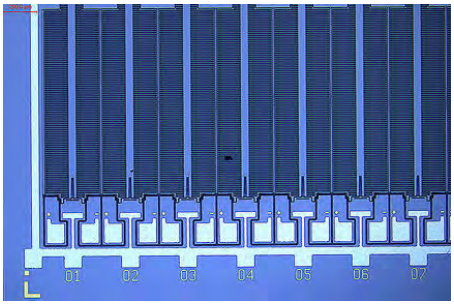
OLED photoresist material



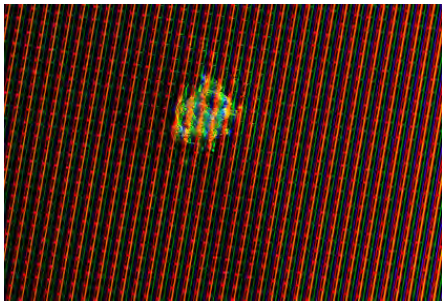
Metallographic structure analysis



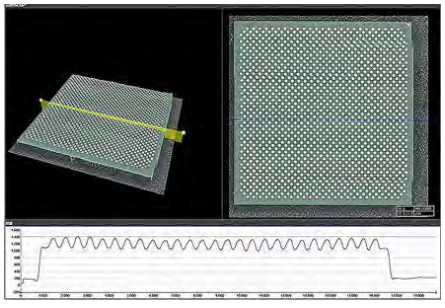
Phase analysis of rocks



Semiconductor testing



Display screen defect detection



The 3D shape of the tin ball

Technical Specification

Model	iMetal-600B	iMetal-600BD
Optical Path	Bright Field	Bright and Dark Field
Optical system	Infinite optical system, intelligent light intensity management LED system	Infinite optical system, intelligent light intensity management LED system
Observation tube	Hinged trinocular observation tube (compatible with imaging system), 30° inclined, interpupillary distance 50-75mm, adjustable eyepoint, beam splitter ratio 100:0, 50:50	Hinged trinocular observation tube (compatible with imaging system), 30° inclined, interpupillary distance 50-75mm, adjustable eyepoint, beam splitter ratio 100:0, 50:50
Eyepiece	Ultra-wide field eyepiece 10X (field number Φ23mm), high eyepoint, diopter adjustable	Ultra-wide field eyepiece 10X (field number Φ23mm), high eyepoint, diopter adjustable
Objective Lens	MPLFL5X,NA=0.15, WD=14.8mm	LMPLFL5X,NA=0.15, WD=16.5mm
	MPLFL10X,NA=0.3, WD=8.5mm	LMPLFL10X,NA=0.3, WD=11.7mm
	MPLFL20X,NA=0.45,WD=3.5mm	LMPLFL20X,NA=0.45, WD=13mm
	MPLFL50X,NA=0.75,WD=3mm	LMPLFL50X,NA=0.8, WD=3.5mm
Polarization Observation	Transmission/ reflection polarizer 360° rotatable analyzer	Transmission/ reflection polarizer 360° rotatable analyzer

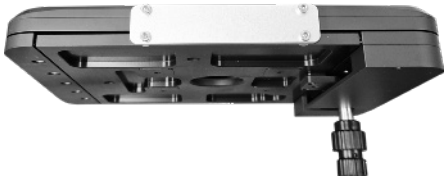
Technical Specification

Objective Nosepiece	Five-hole encoded nose-piece (RMS)	Detachable 5-hole encoded nosepiece (M26) with DIC slot
DIC Observation	High-resolution DIC, adjustable focal length (optional) High-resolution DIC, fixed focal length (optional)	High-resolution DIC, adjustable focal length (optional) High-resolution DIC, fixed focal length (optional)
Reflective Lighting System	LED illumination, color temperature 4400K-4600K, CRI≥95	LED illumination, color temperature 4400K-4600K, CRI≥95
Reflective Observation	Bright field Kohler illumination system, 50,000-hour LED light source	Bright field Kohler illumination system, 50,000-hour LED light source
Focusing System	Coarse and fine coaxial, adjustable tightness, 1μm fine adjustment scale value	Coarse and fine coaxial, adjustable tightness, 1μm fine adjustment scale value
Stage Size	Double-layer mechanical moving stage, 135*125mm, stroke 75*50mm	Double-layer mechanical moving stage, 135*125mm, stroke 75*50mm
Glass Stage Size	101*101mm	101*101mm
Intelligent Management	The control circuit automatically adjusts the light intensity to the optimal level when changing the objective magnification	The control circuit automatically adjusts the light intensity to the optimal level when changing the objective magnification
Camera Interface	Standard C-mount 0.5X, parfocal adjustable, suitable for CCD within 2/3 inch	Standard C-mount 0.5X, parfocal adjustable, suitable for CCD within 2/3 inch

Standard Delivery

Name	Qty	Photo
Mainframe	1pc	
Eyepiece 10X/23mm	2pcs	
Objective (Bright Field Semi-Apochromatic)	MPL5X,NA=0.15,WD=14.8mm	1pc	
	MPL10X,NA=0.3,WD=8.5mm	1pc	
	MPL20X,NA=0.45,WD=3.5mm	1pc	
	MPL50X,NA=0.75,WD=3mm	1pc	
Objective (Bright-Dark Field Semi-Apochromatic)	LMPLFL5X,NA=0.15,WD=16.5mm	1pc	/
	LMPLFL10X,NA=0.3,WD=11.7mm	1pc	
	LMPLFL20X,NA=0.45,WD=13mm	1pc	
	LMPLFL50X,NA=0.8,WD=3.5mm	1pc	
Nosepiece	1pc	

Standard Delivery

Name	Qty	Photo
Stage	1pc	
Polarizer	1pc	
Analyzer	1pc	
20MP Industrial Camera	1pc	
0.5X C-mount Camera Interface	1pc	

Standard Delivery

Name	Qty	Photo
Instruction Manual	1pc	
High-precision Micrometer (0.01mm scale value)	1pc	
Dust Cover	1pc	
Power Cord	1pc	
Camera Cable	1pc	

Optional Delivery

Observation Tube	Trinocular observation tube, 30° inclined; Beam splitter ratio: eyepiece=100:0, 0:100
Eyepiece	10X/25mm, diopter adjustable
Objective Lens	MPLFL2.5X NA0.08 WD9.8
	MPLFL100X NA0.9 WD1
	LMPLFL100XBD NA0.9 WD1.1
	LMPLAP050XBD NA0.6 WD8.8
	LMPLAP0100XBD NA0.85 WD3.3
Camera Adaptor	Standard C-mount 0.65X, parfocal adjustable, suitable for CCD within 1 inch
	Standard C-mount 1X, parfocal adjustable, suitable for CCD within 4/3 inch
Differential Interference Contrast (DIC)	High-resolution DIC, adjustable focal length High-resolution DIC, fixed focal length
Reflected Observation	Bright field/fluorescence switchable critical illumination system with 50,000-hour LED light source
Stage	100*100 stroke stage
Nosepiece	Detachable 6-hole encoded nosepiece (RMS) with DIC slot, 5 holes of which are center adjustable
Metallographic Microscopic Analysis Software	

Metallographic Microscope Camera (Optional Delivery)

L3CMOS05100KPA Metallographic Microscope Camera

Product Introduction

L3CMOS05100KPA adopts the Aptina AR0521 color CMOS sensor and delivers professional imaging performance with 5.1 megapixels. The large pixel size of 2.2μm ensures excellent light collection capability and signal-to-noise ratio performance, and the 73dB dynamic range guarantees rich image gradations. With a full-resolution frame rate of 15.5fps, it strikes an ideal balance between real-time observation and recording, making it an optimal choice for microscopic teaching and scientific research.

Product Features

- Adopts an infinite optical system, matched with plan semi-apochromatic objective lenses and wide-field high-eye-point eyepieces to restore the true details of metallographic structures and meet the requirements of high-precision detection.
- The full range of objective lenses has a long working distance; the max. 50X magnification still maintains an 8.5mm working distance, enabling the observation of large-size and special-shaped samples without frequent sample preparation, thus improving detection efficiency.
- Automatically matches the optimal light intensity when switching objective lens magnifications, eliminating the need for repeated manual adjustment, reducing operational steps, avoiding human errors, and greatly improving detection fluency.
- 4000K-4300K warm white LED light source with a color rendering index (CRI) ≥95 accurately restores the true color of samples, avoids misjudgment caused by color deviation, and is suitable for metallographic rating and image analysis.
- 45° inclined hinged trinocular tube with a beam splitter ratio of 100:0/0:100 supports simultaneous connection of human eye observation and imaging systems, meeting the needs of photographing, video recording and digital archiving.
- Coaxial coarse and fine focusing system (1μm fine focusing graduation) + 50×50mm large-stroke stage, combined with a 5-hole encoded nosepiece, realizes precise positioning, smooth operation and stable precision during long-term use.

Technical Specification

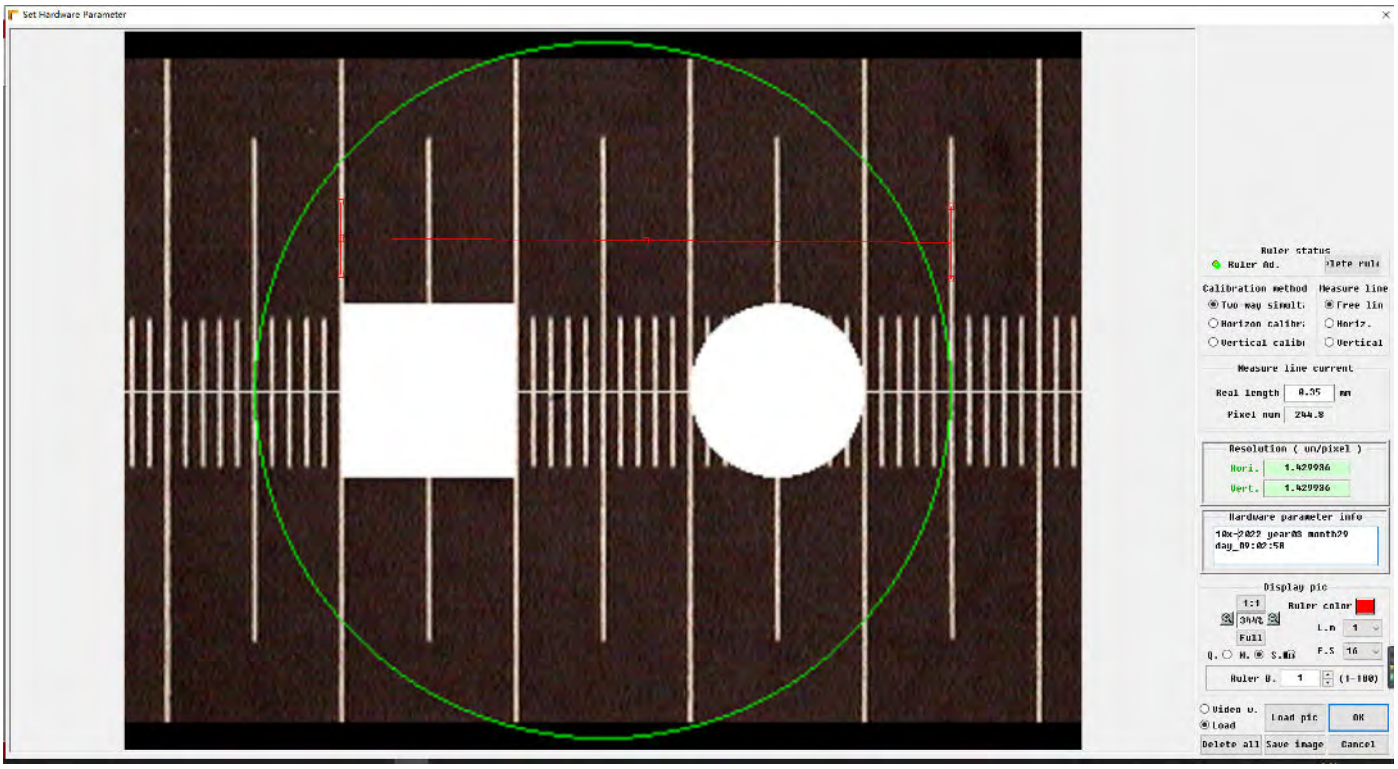
Sensor	AR0521(C)
Effective Pixels / Resolution	5.1 Megapixel (2592×1944)
Frame Rate (Full Resolution)	15.5fps@2592x1944; 49.5fps@1296x972; 97.5fps@648x486
Shutter Type	Rolling Shutter
Color Type	Color
Pixel Size	2.2μm × 2.2μm
Target Surface Size	5.70mm × 4.28mm
Diagonal	0.4" (7.13mm)
Dynamic Range	73dB
Bit Depth	8bit
Sensitivity	18.8ke-/lux
Data Interface	USB3.0
Lens Mount	C-mount
Overall Dimension	80*80*45mm
Weight	0.8Kg
Power Supply	USB Powered
Operating Temperature / Humidity	-10°C ~ 50°C / 30%~80%RH
Storage Temperature / Humidity	-20°C ~ 60°C / 10%~60%RH

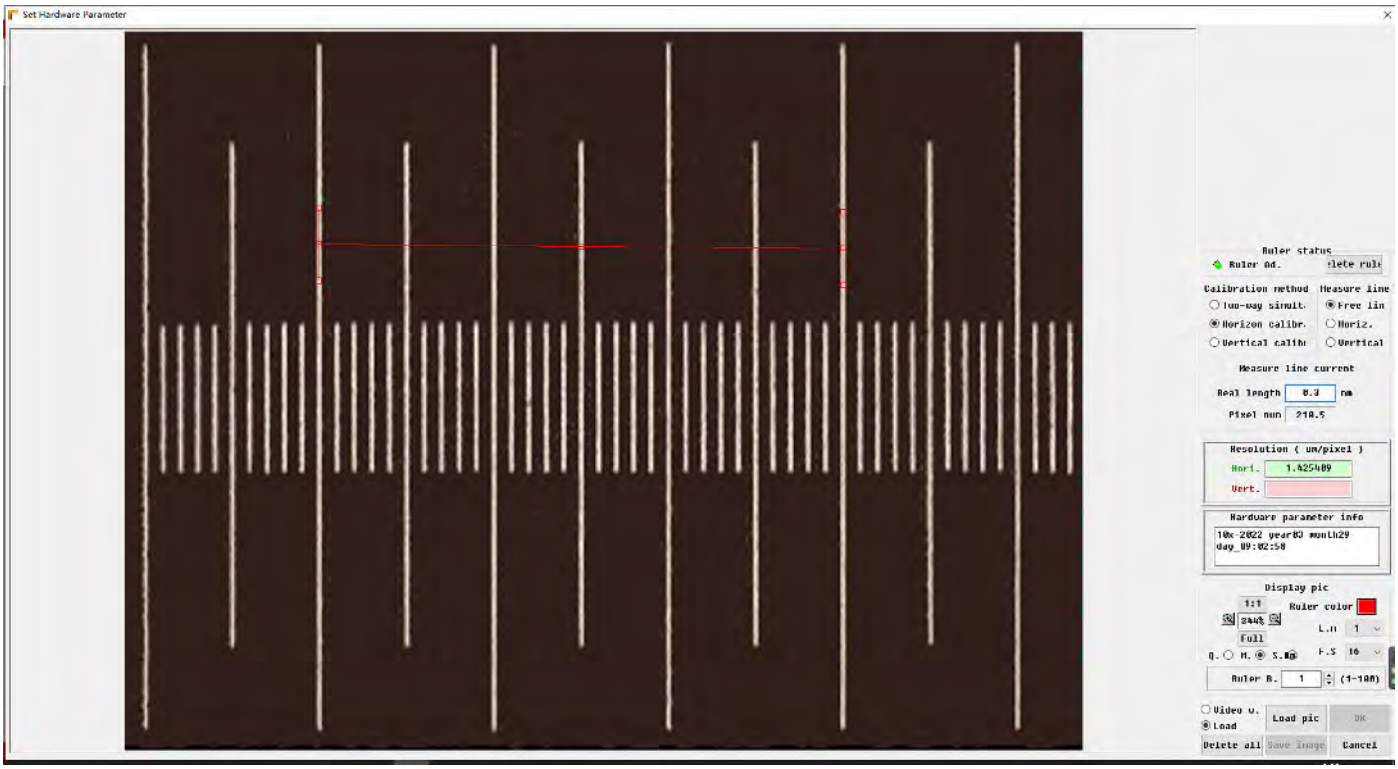
iMetal-MA Metallographic Analysis Software

- The software supports hardware calibration and metallographic grade evaluation, covering international testing modules for grain size, inclusions etc. It has basic functions such as image preprocessing, accurate geometric measurement, multi-format report export and fixed-magnification printing, as well as image stitching, video acquisition, confocal imaging and 3D optical imaging etc. It supports atlas comparison and data statistics, It meets the standardized requirements of the entire metallographic testing process and is compatible with the Windows 7, 10 and 11 operating systems.

Operation Interface

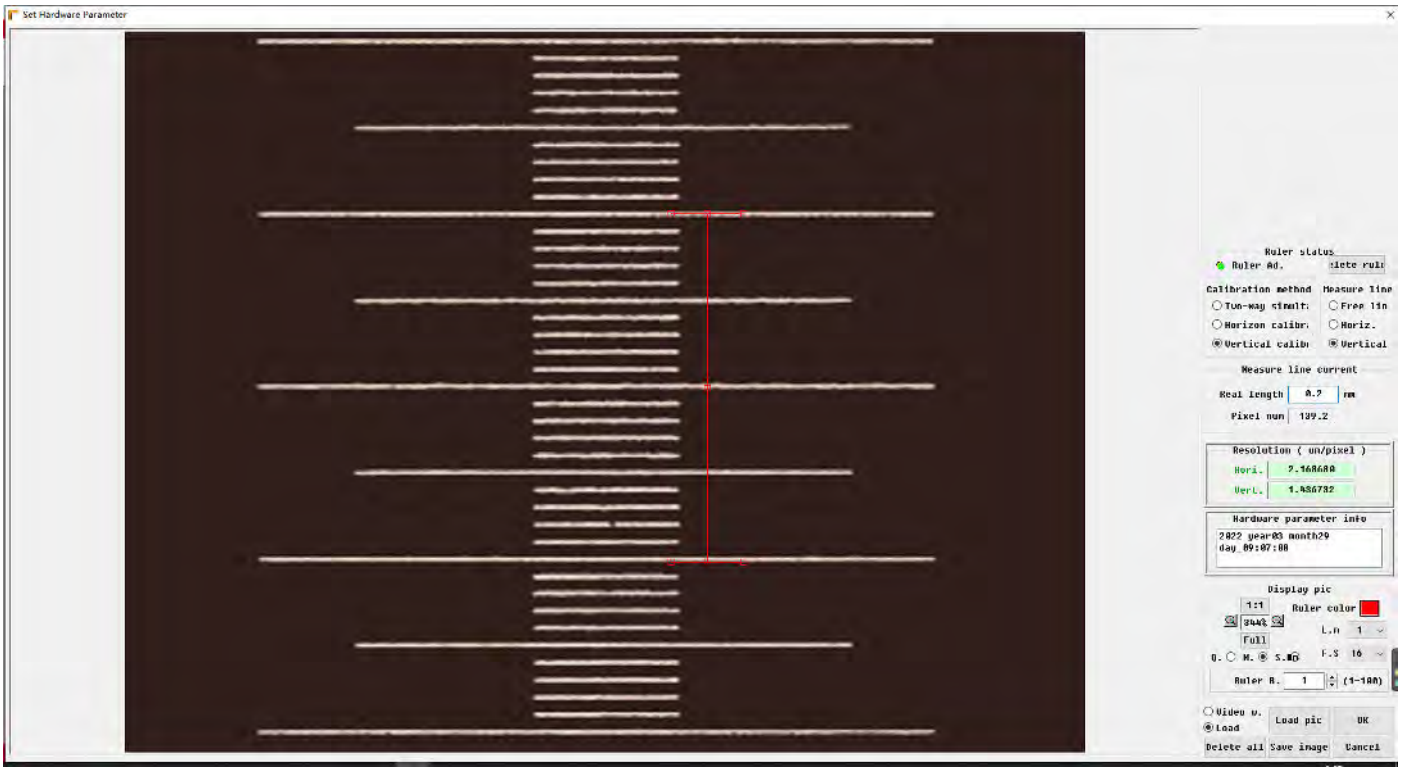
Image Calibration





Operation Interface

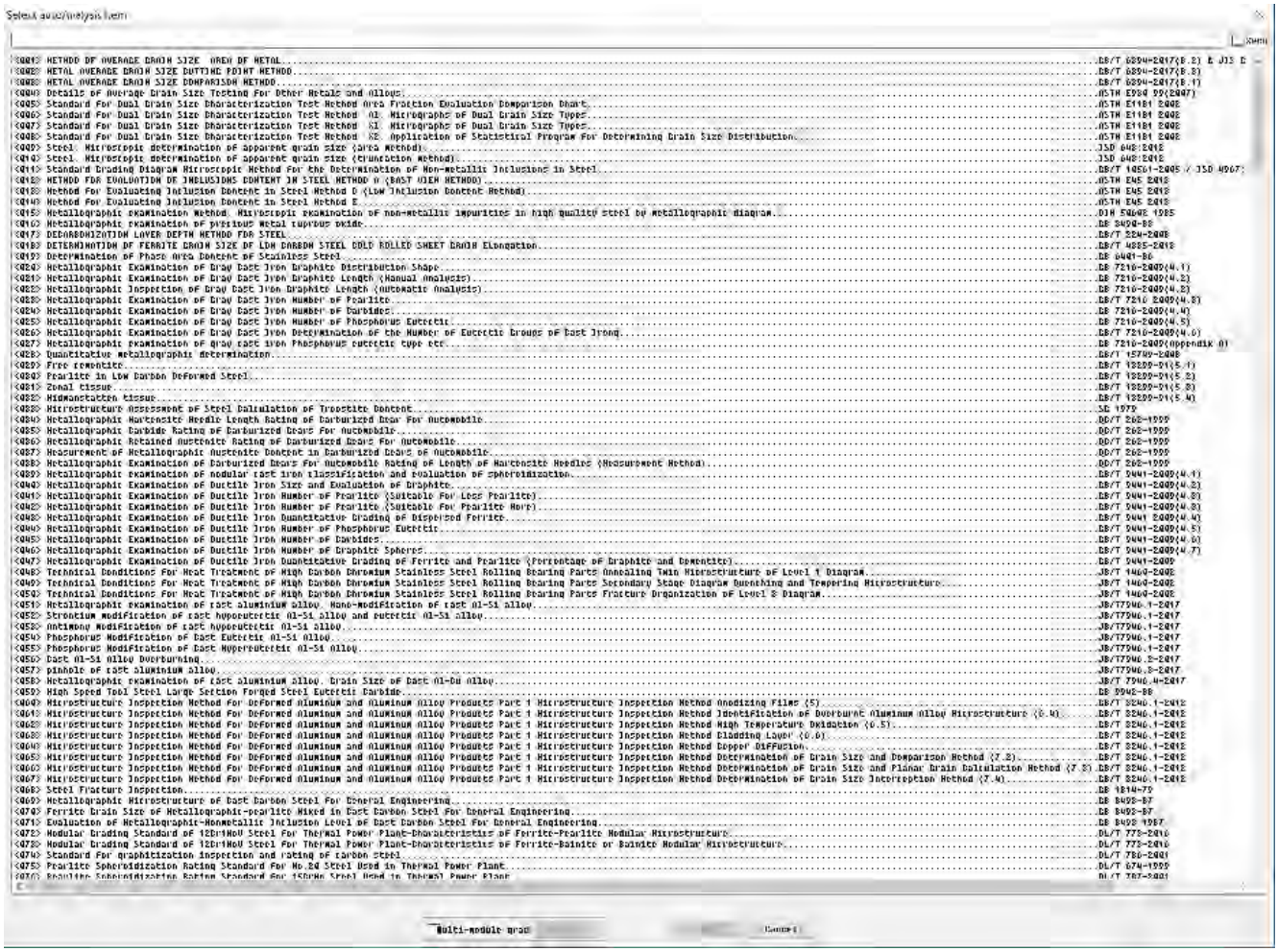
Image Calibration

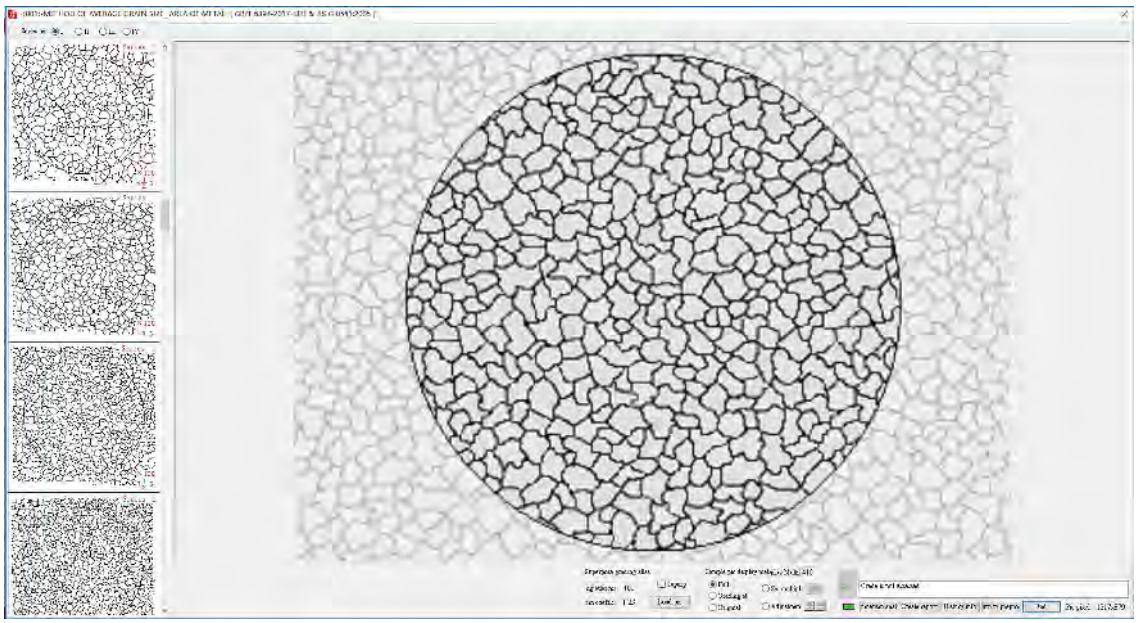


- The software supports three calibration methods (bidirectional simultaneous, horizontal and vertical) to adapt to different testing scenarios.
- The resolution can be automatically calculated only by loading the micrometer image, dragging the scale and entering the actual length, featuring simple and easy operation.
- The calibration results can be verified through geometric measurement with the error controlled within a minimal range, laying an accurate hardware foundation for subsequent measurement and grading. Meanwhile, it supports the export and import of resolution parameters to realize rapid reuse across multiple devices and scenarios.

Operation Interface

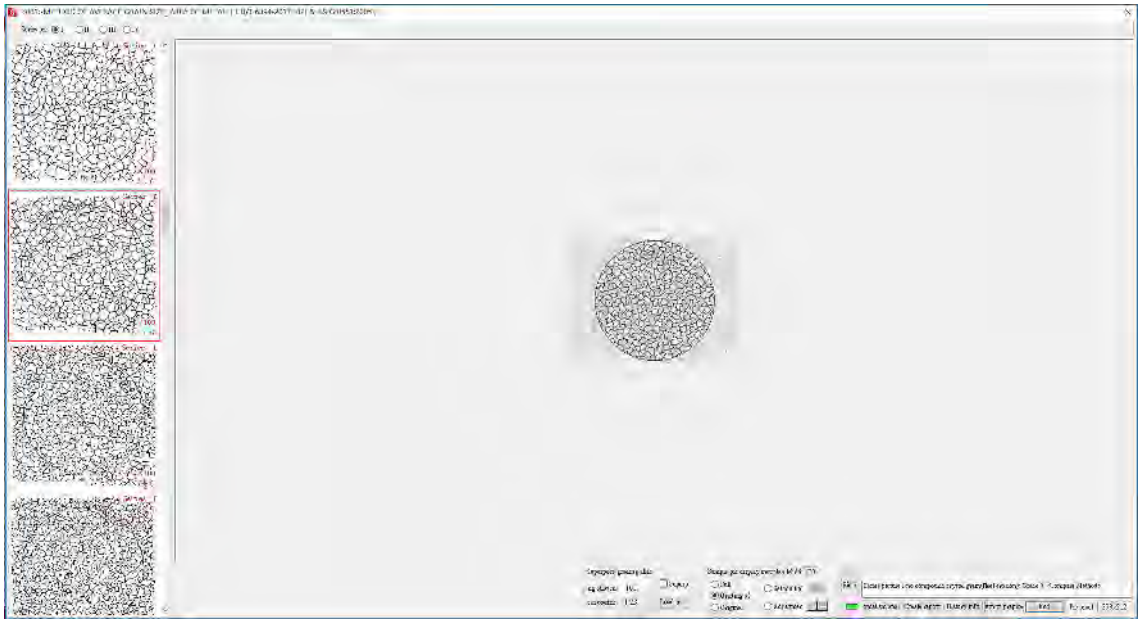
Metallographic Grade Evaluation Function





Operation Interface

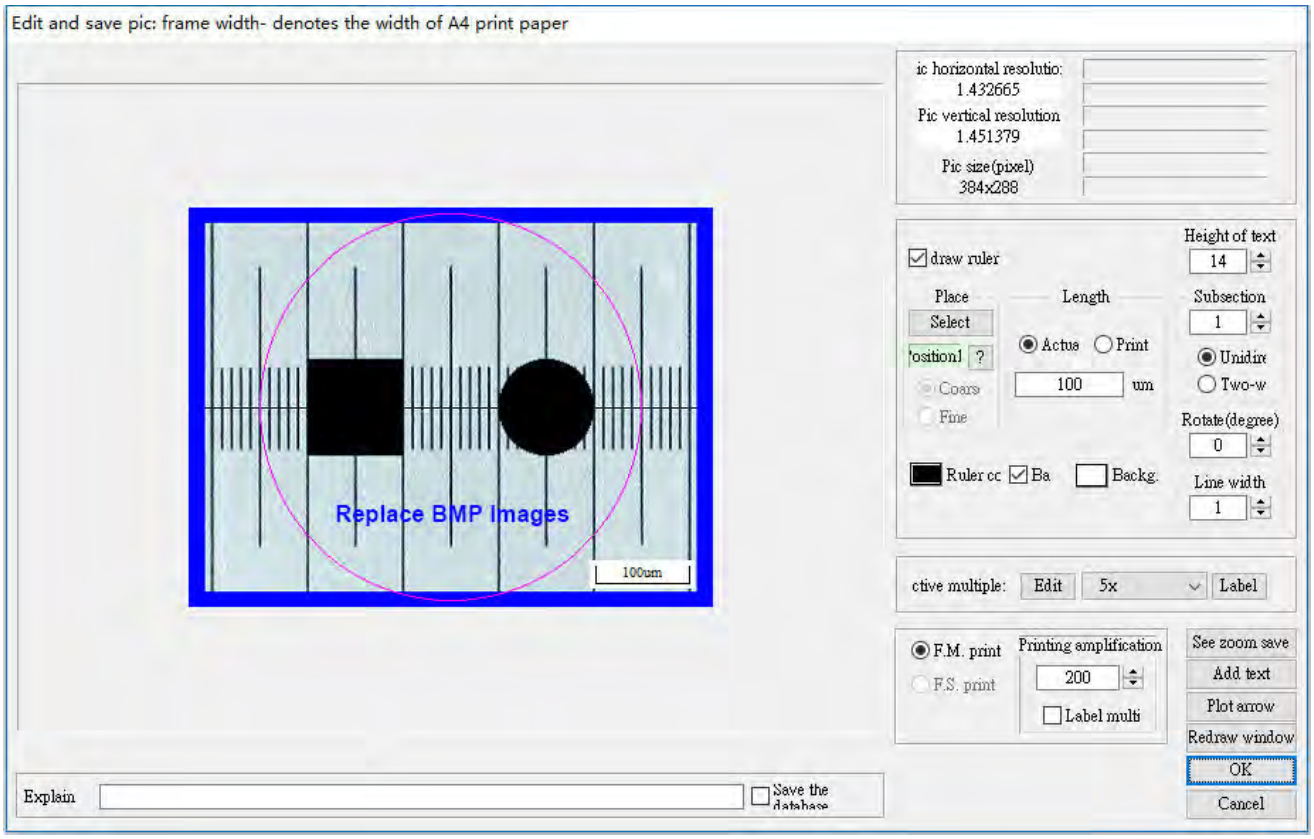
Metallographic Grade Evaluation Function



- Comprehensive testing coverage: It covers mainstream testing items such as grain size, non-metallic inclusions, ductile iron and ferrite in stainless steel welds, and is adapted to national and international standard modules to meet the metallographic testing needs of various products.
- Adaptation of dual grading modes: It supports manual comparison grading and automatic quantitative grading. The former enables intuitive atlas comparison, while the latter accurately identifies microstructures and automatically calculates parameters, taking into account different testing scenarios and precision requirements.
- Convenient module retrieval: Testing modules can be sorted by number/standard number or quickly retrieved by keywords, which greatly improves the efficiency of module searching and makes the operation more efficient.
- Manual correction of results: It supports manual adjustment of metallographic microstruc-ture attributes, addition/deletion of feature points and correction of automatic identification deviations. It also supports multi-field statistics for averaging to ensure the accuracy of grading results.
- Seamless connection of results to reports: Grading results can be directly linked to the report generation function, and standardized reports in PDF/WORD/EXCEL formats can be exported with one click, realizing a closed loop of the entire process from testing and grading to report generation.

Operation Interface

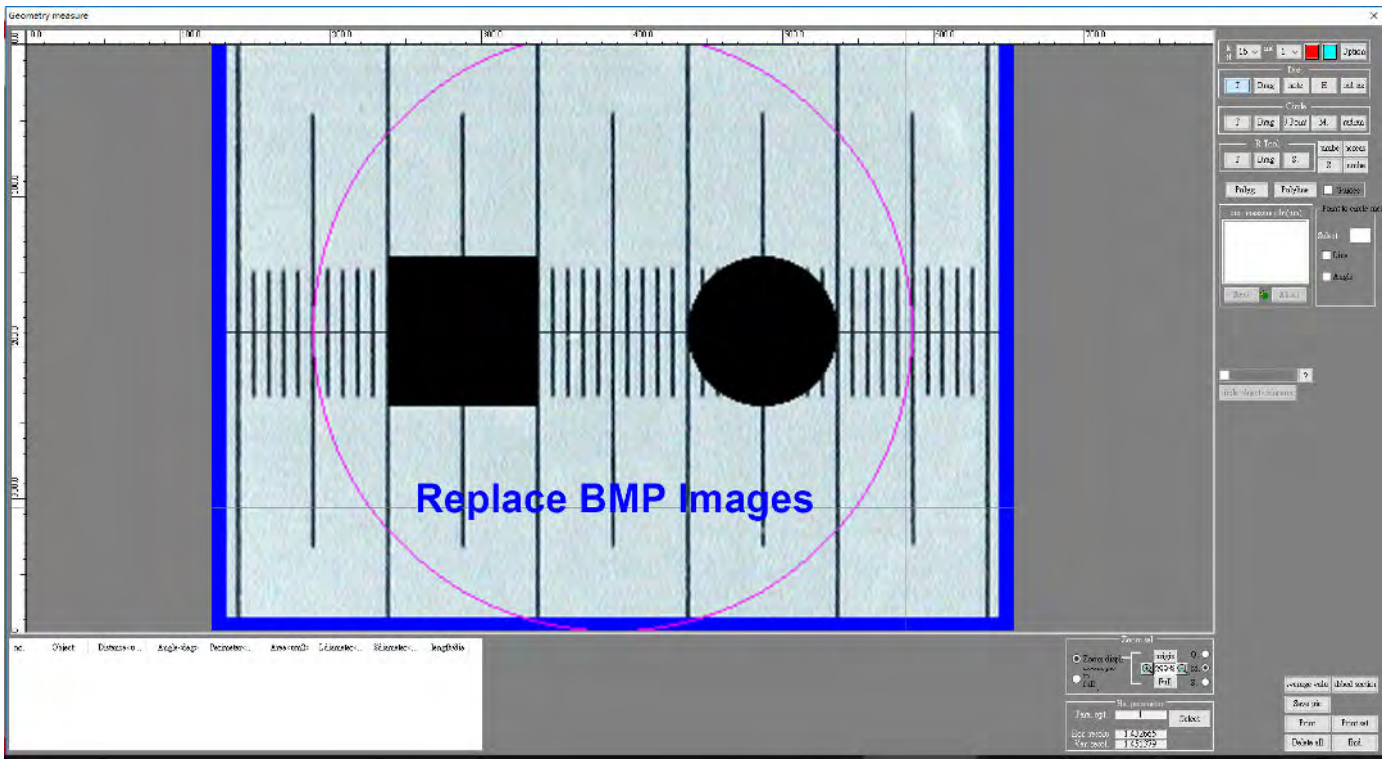
Image Preprocessing



- Rich processing tools: It is equipped with dozens of professional tools such as brightness/-contrast adjustment, binarization, sharpening and softening, filtering and deno and morphological operations to meet the optimization needs of various metallographic image
- Flexible selection operation: It supports multiple selection methods including rectangle, ellipse and polygon. Selections can be moved and rotated, and precise pixel-based selection is also available, adapting to local and overall image processing scenarios.
- Customized output: Scales, text and arrows can be added when saving images, the printing magnification can be customized, and fixed-scale printing settings are supported to meet the requirements of standardized output.
- Efficient and convenient operation: Commonly used processing functions are integrated into exclusive panels, which can be called with one click without searching through multiple layers of menus, greatly improving the efficiency of image preprocessing.
- Complete data retention: It supports saving selected areas/entire images in BMP/JPG formats, the processing process is traceable, and the processed images can be directly connected to grading, measurement and report functions for smooth process connection.

Operation Interface

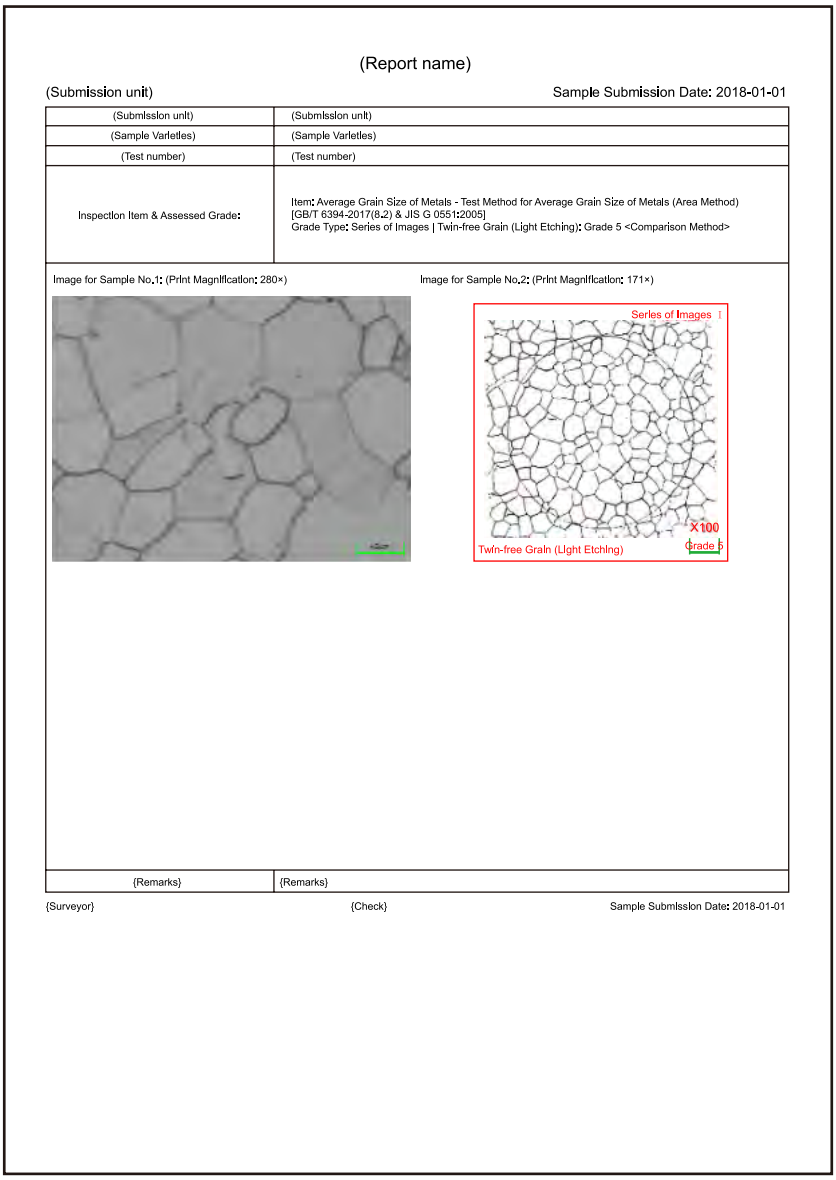
Geometric Measurement



- Complete measurement tools: It supports various types of measurement including distance, rectangle, circle, polygon, angle, radian and point-to-center distance, covering the full-dimensional geometric measurement needs of metallographic testing.
- Units such as nm/um/mm can be freely selected, and the directions of measuring lines, arrows and text can be customized.
- Measurement results can generate image-text reports in real time and can also be directly imported into Excel for secondary analysis.

Operation Interface

Report Export



(Report name)

(Submission unit) Sample Submission Date: 2018-01-01

(Submission unit)	(Submission unit)
(Sample Varieties)	(Sample Varieties)
(Test number)	(Test number)
Inspection Item & Assessed Grade:	Item: Average Grain Size of Metals - Test Method for Average Grain Size of Metals (Area Method) [GB/T 6394-2017(8.2) & JIS G 0551:2005] Grade Type: Series of Images | Twin-free Grain (Light Etching): Grade 5 <Comparison Method>

Image for Sample No.1: (Print Magnification: 280×)

Image for Sample No.2: (Print Magnification: 171×)

{Remarks}	{Remarks}

{Surveyor} {Check} Sample Submission Date: 2018-01-01

- It supports universal report formats for single/multiple images, which can be selected on demand to adapt to the report presentation needs of different testing scenarios. Grading and measurement results can be exported in three mainstream formats (PDF/WORD/EXCEL) with one click, meeting different usage needs such as filing, editing and data statistics.
- Grading and measurement results can be directly linked to report generation without manual data entry, realizing the seamless connection of testing, results and reports and improving the efficiency of report generation.