C227-E029

SHIMADZU
Excellence in Science

MAIVIS Ultrasonic Optical Flaw Detector

MIV-X

Enables inspections according to the object size

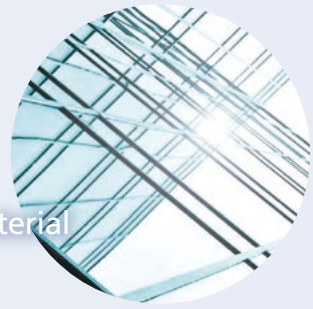
Using a Camera Stand for Small Objects

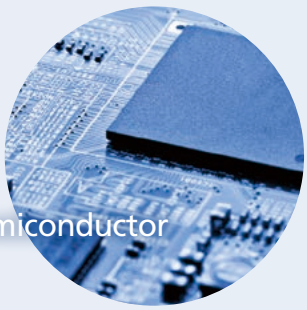
Attach to Tripod for Large Objects

Make It Visible!

Visualizing Cracks, Voids, Delamination, and Other Hidden Defects Normally Impossible to Check Visually

Utilized in Various Industries





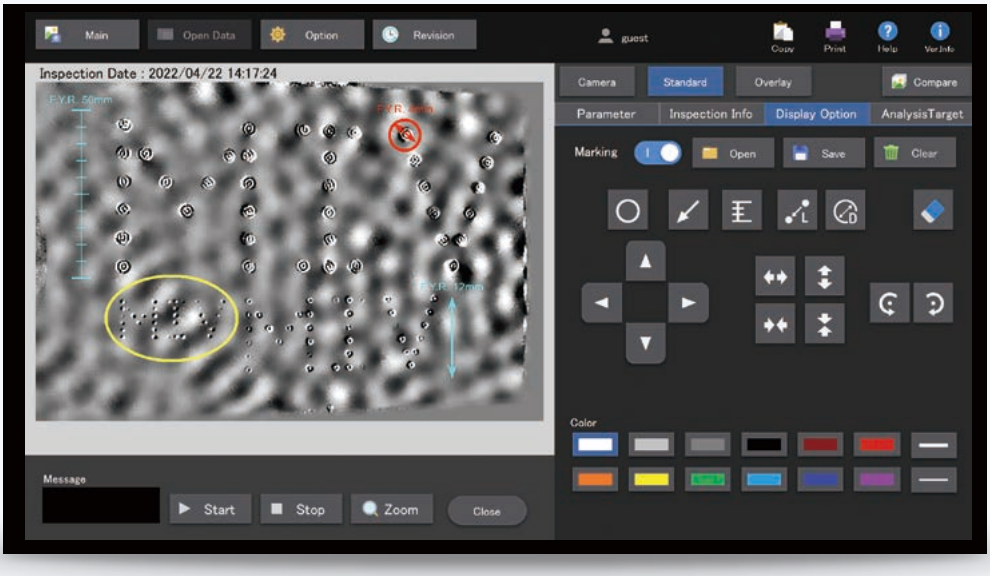
Anyone Can Quickly and Easily Perform a Visual Surface Inspection

Thanks to Shimadzu's proprietary light imagining technique, which combines an ultrasonic oscillator with a stroboscope, defects near the surface of a material, including peeling of the bonding and adhesive surfaces of heterogeneous materials, as well as paint, thermal sprays, and coatings can be inspected easily and non-destructively.

- Simply attach the ultrasonic oscillator to the sample, and position the camera above the inspection surface.
- The propagation of the ultrasound is quickly displayed, and flaws are easily identified from the video.
- The easy-to-operate software is enhanced with functions to mark the flaws and measure the size easily.
- The lineup includes an optional optical zoom set, which can detect smaller flaws.

MIV-X

Ultrasonic Optical Flaw Detector MAIVIS™



Inspection Result Screen

Inspection Case

01 Inspection of Poor Jointing of Dissimilar Materials

A problem thought to be delamination of a bonding surface following friction stir spot welding of steel and aluminum is detected non-destructively.

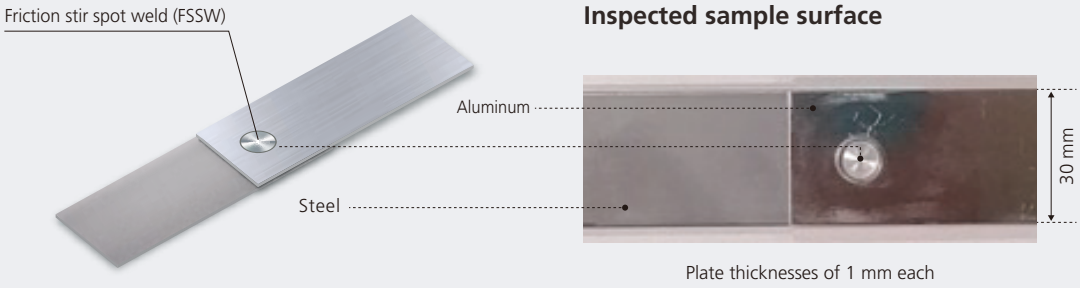
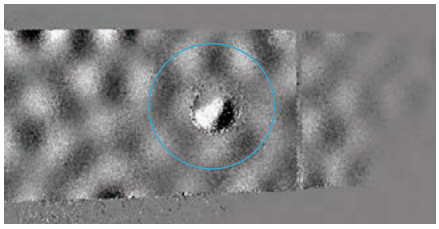


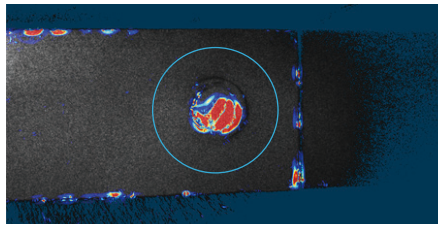
Plate thicknesses of 1 mm each

Inspection results (ultrasonic field image)



Blue frame: Defect region

Overlay



Blue frame: Defect region

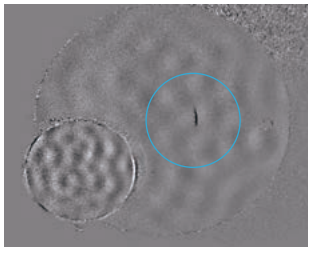
Scan here for a video.

02 Inspection of Cracks in a Base Material Below a Film (Simulated Coating)

A crack in the surface of a base material below a film (coating), which was not visible to the naked eye, is detected without peeling back the film.

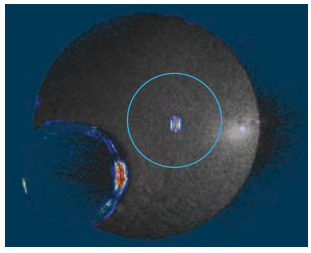
Inspected sample surface

Inspection results (ultrasonic field image)



Blue frame: Defect region

Overlay



Blue frame: Defect region

Scan here for a video.

03 Inspection of Adhesive Surface Delamination between CFRP and Stainless Steel

[Sample provided by: Nagoya Municipal Industrial Research Institute]

Artificially created delamination is detected non-destructively. Further, with X-ray fluoroscopy, unconfirmed delamination (bottom right) is also detected.

Adhesively bonded CFRP/ stainless steel material (CFRP surface)

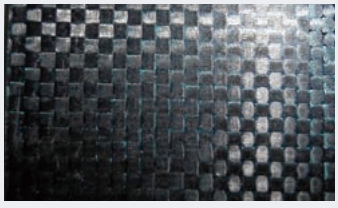
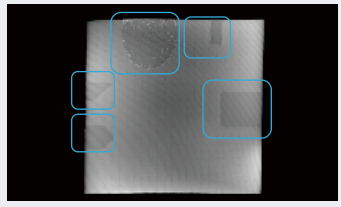


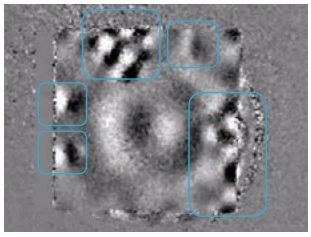
Plate thickness
CFRP: 2 mm
Stainless steel: 0.5 mm

X-ray fluoroscopic image



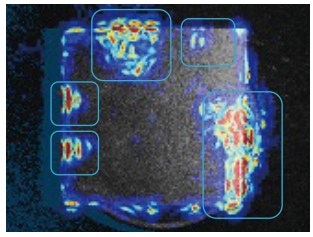
Blue frame:
Simulated defect

Inspection results (ultrasonic field image)



Blue frame: Flawed region

Overlay



Blue frame: Flawed region

Scan here for a video.

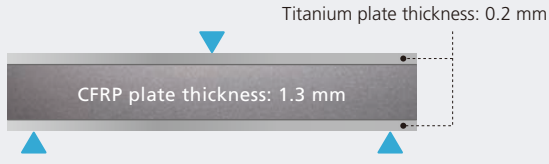
04 Inspection of Adhesive Surface Delamination between CFRP and Titanium Alloy

[Sample provided by: Kyushu University]

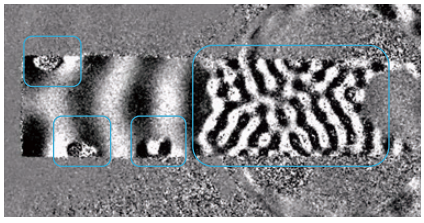
A defect thought to be delamination due to a 3-point bending load is detected non-destructively. It is evident that the delamination is significant at the center of the loaded region.

Adhesively bonded CFRP/ titanium alloy (titanium surface)

3-Point bending load before inspection

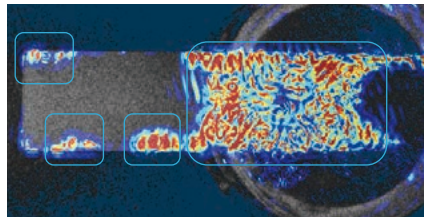


Inspection results (ultrasonic field image)



Blue frame: Defect region

Overlay



Blue frame: Defect region

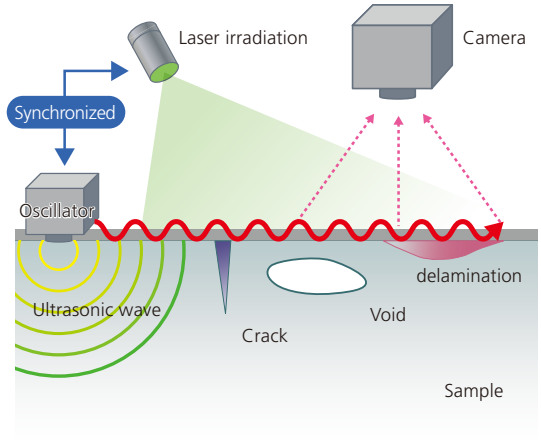
Scan here for a video.

Measurement Principle

With ultrasonic optical flaw detection technology, the sample is encouraged
the displacement of the surface is detected optically,
and the propagation of the ultrasonic wave on the surface is observed.

- **The sample is loaded by continuous ultrasonic vibrations.**
- **Microscopic out-of-plane displacement of the surface due to propagation of the ultrasonic wave is visualized optically using laser irradiation and a camera*.**
- **Defects are detected by observing disturbances in the propagation of the ultrasonic wave.**

*Shimadzu's proprietary light imaging technology combines speckle shearing interferometry via ultrasonic vibration with a stroboscopic technique. (Patented in Japan, China, and the USA)

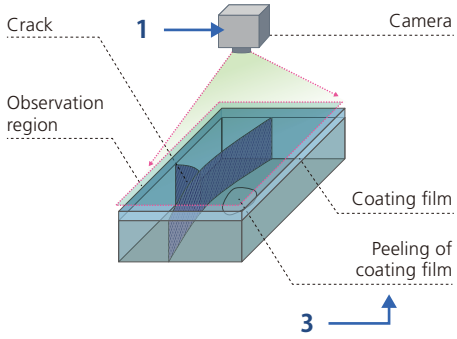
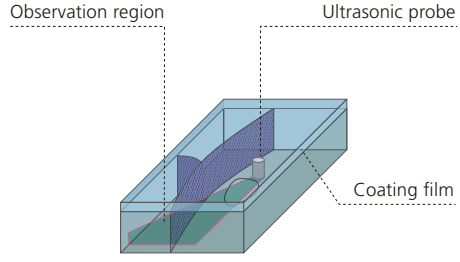
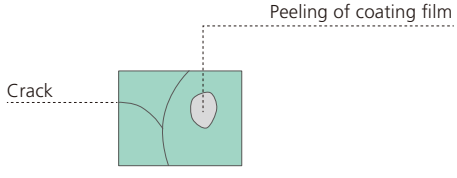
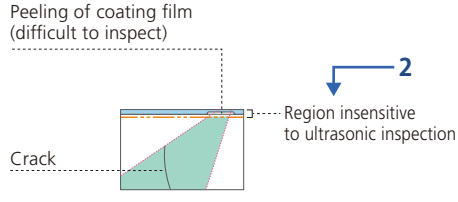


Difference from Ultrasonic Flaw Detection

The MIV-X Ultrasonic Optical Flaw Detector assists with regions where ultrasonic testing (UT) is difficult.
Leave the non-destructive inspection of surfaces and near surfaces to MIV-X!

Here are the advantages!

1. **Batch inspection of a wide area within the camera's field of view**
2. **Good at inspecting surfaces and near surfaces**
3. **No need to worry about differences in acoustic impedance even for dissimilar materials**

	MIV-X	Conventional ultrasonic testing
Layout of the observation system		
Visualization example		

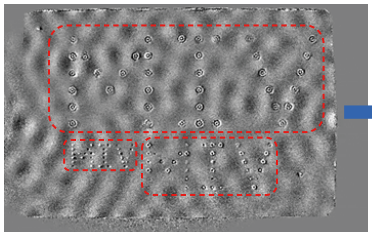
Useful Functions

Scan here for a video.

Noise Removal Function Simplifies Defect Identification

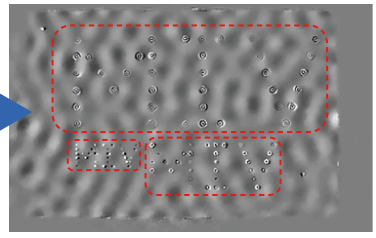
Observation sample: Plate with film affixed.
The plate is engraved with the characters "MIV" in three places.
(with engraved diameters of 1, 2, and 4 mm).
(The region with the engraved MIV is marked with a red frame.)

Standard image (ultrasonic wave image)



Some noise remains

Noise removal ON



The noise is removed, leaving a clear image.

Background wave filter ON

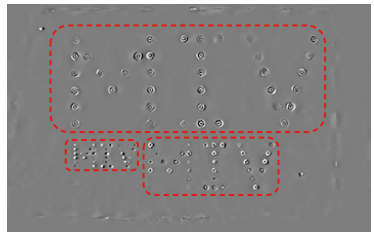
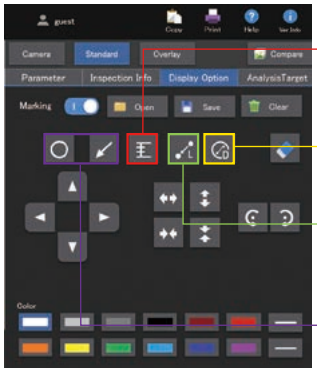


Image with highlighted text

Dimension Display and Marking Functions Simplify Identification of Defect Position and Size



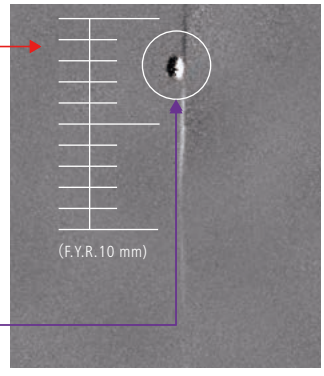
Operational UI window

Scale display button
Displays the scale within the window

Diameter display button
Displays a circle and its diameter through two arbitrarily selected points

Length measurement button
Displays the length between two points

Marking button
Marks a region with an arrow or a circle



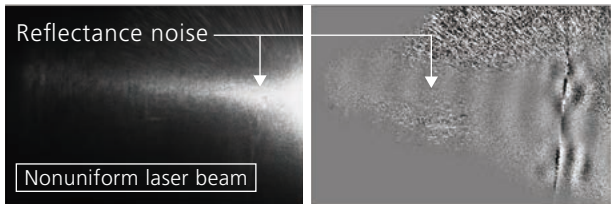
Resulting image (ultrasonic field image)

Optical Zoom Set (Optionally Available) for Detecting Smaller Defects

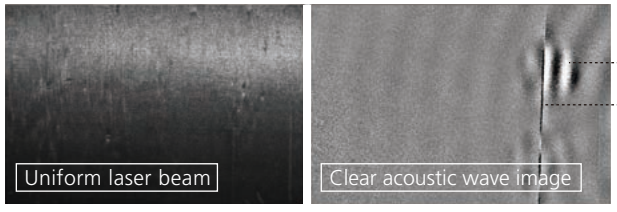
Decreases the minimum detection size by a factor of approximately two
(MIV-X standard: From approximately 1 mm dia. to 0.5 mm dia.)
Laser optical axis adjustment is also possible, improving irradiation uniformity

Optical axis adjustment
Zoom-lens

No optical axis adjustment



Optical axis adjustment



Delamination defect
Crack defect

Specifications

Configuration

MIV-X Universal set 331-30400-58	
Camera unit	331-30340-11
Control unit	331-30275-11
Oscillator unit	331-30178-11
Software	331-30502

Personal computer, couplant, power cable and camera stand are not included in the set.

Main specifications

Parameter	Specifications
Use	Detection of defects such as voids and cracks near the surface of a sample and peeling of joining area of multimaterial
Inspectable material	Metal, Ceramics, Composite, Dissimilar joint, Multi-material, etc.
Camera distance	250 to 1000 mm
Inspection area / Curvature radius	Approx.100×150 mm / R150 mm (Camera distance 250 mm) Approx.200×300 mm / R300 mm (Camera distance 500 mm) Approx.400×600 mm / R600 mm (Camera distance 1000 mm)
Minimum detection size	Approx. 1/100 of inspection area (depends on sample and inspection condition) Camera distance 250 mm → Minimum detect size is approx. φ1 mm.
Inspection time	Approx. 25 seconds or less (Observation + Analysis, except condition setting time)
Frequency	20 kHz to 400 kHz
Laser safety (Class)	IEC60825-1 Class 1, FDA 21 CFR Part 1040.10 Class 1, JIS C6802 Class 1
Standard function	Frequency scan, Analysis area specification, Marking, Dimension display, Defect rate calculation, Multi- condition compound analysis, Noise remove, Background wave filter, Inspection condition automatic search, Data storage / output
Power requirements	Single phase 100 to 230 V, 250 VA Power connection port on the Control unit : IEC60320-C13
Operating temperature	+10 to +30 ℃
Dimensions / Weight	Camera unit: 180 mm (W) × 170 mm (D) × 88 mm (H); approximately 2.7 kg Control unit: 165 mm (W) × 390 mm (D) × 406 mm (H); approximately 12 kg Oscillator: 60 mm (Dia.) × 60 mm (H); approximately 0.9 kg

Options

Camera stand	331-30450-42	Maximum camera distance 1000 mm, With camera angle adjustment mechanism
Optical zoom set	331-30410-42	Camera distance: 50 to 200 mm, Inspection area: Approx. 28 × 42 mm (camera distance 50 mm), Minimum detect size: φ0.5 mm (depends on sample and inspection condition)

SHIMADZU

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