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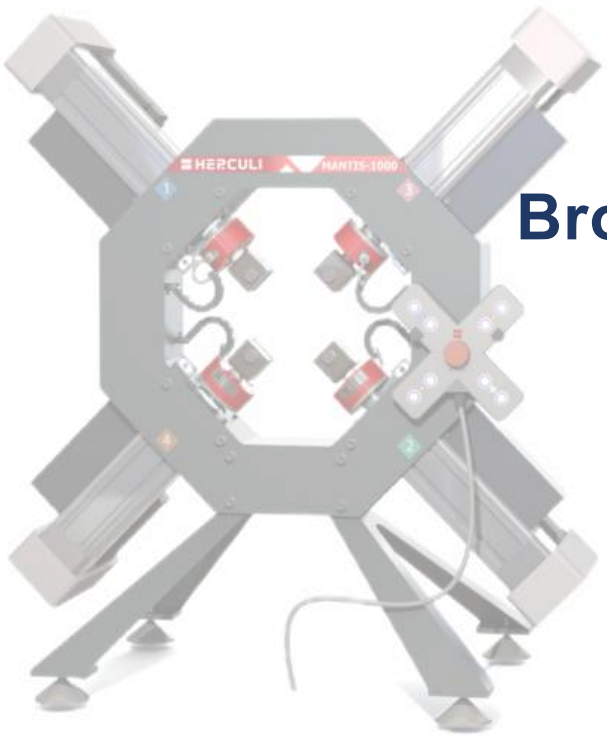
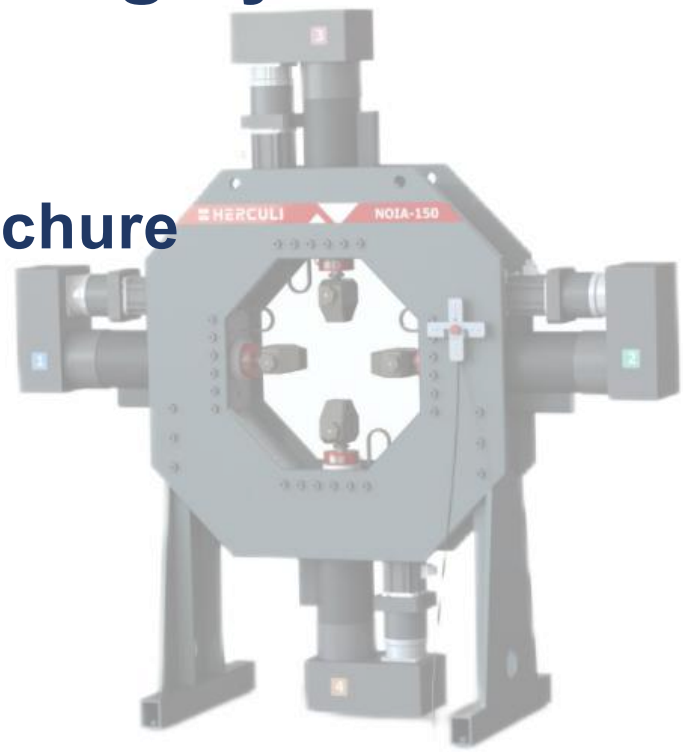
Biaxial multi-channel coordinated loading testing system



Brochure



New Methods for Mechanical Testing

HERCULI Equipment Technology Co.LTD

Company profile

HERCULI Equipment Technology Co.LTD

Our company is a leader in mechanical testing equipment for extreme loading conditions and harsh environments. With our R&D headquarters located in Oxford, United Kingdom, and our manufacturing site in Suzhou, China. We offer a comprehensive range of mechanical testing machines, environmental chambers, and various data acquisition systems. We are also highly adaptable in developing customized testing solutions to meet the demanding requirements of academic research and industrial applications.

One of our distinctive products is the biaxial multi-channel coordinated loading testing machine. This machine is capable of testing the strength, deformation, and failure of materials under biaxial stress with coordinated loading. It finds wide-ranging applications in aerospace, ocean engineering, construction, transportation, and various other fields.Our biaxial testing machines have supported numerous world leading research and industrial projects in recent years, with a strong customer and partner base across the globe.

We also have strong expertise in designing various testing jigs and environmental chambers, for testing in cold temperatures (down to -70℃), high temperatures(up to 1800℃), hydrostatic pressures(up to 120 MPa) conditions, with additional features such as moisture and corrosive liquid testing. Our engineering team boasts over 10 years of experience in mechanical testing and analysis and is fully equipped to provide reliable solutions tailored to your specific requirements!

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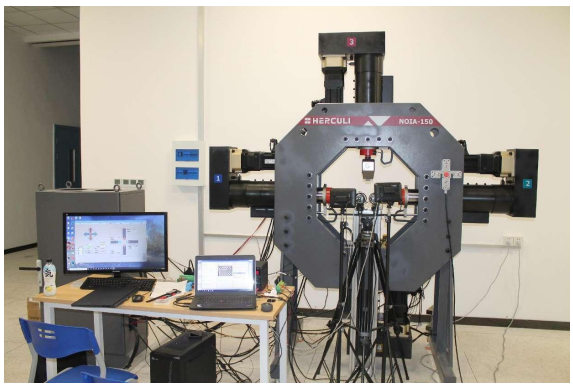
NOIA series biaxial testing machine

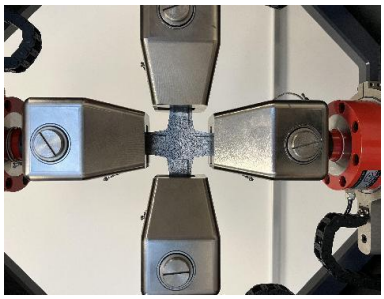


NIOA-150

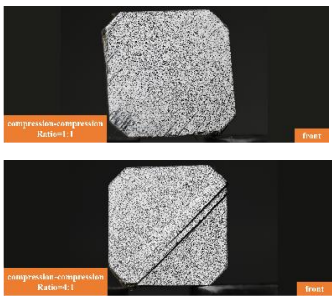
NIOA-300

Performance features

- ◆ 1.The NOIA series products are vertical heavy-duty biaxial testing machines, with a load capacity of up to 500 KN.
- ◆ 2.Can be used for biaxial testing of materials on a wide range of materials, including metals, composites, ceramics, and concrete.
- ◆ 3.Can carry out various combinations of loading such as tension-tension, tension-compression, and compression-compression.
- ◆ 4.Can be equipped with strain gauges and collection units, enabling strain ratio loading at specific positions, can also be used in conjunction with optical strain measurement systems.



Biaxial test



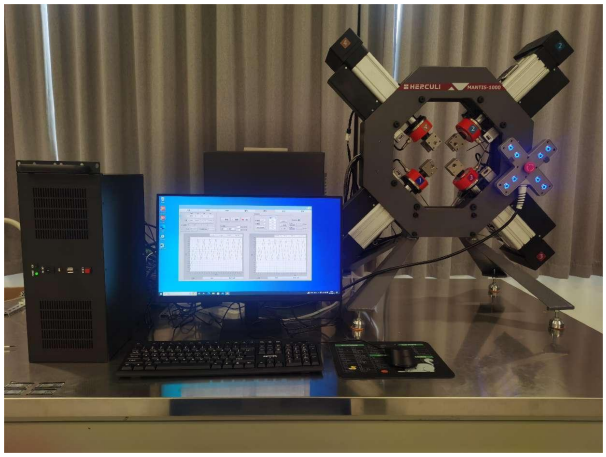
Speckle pattern

Technical parameters

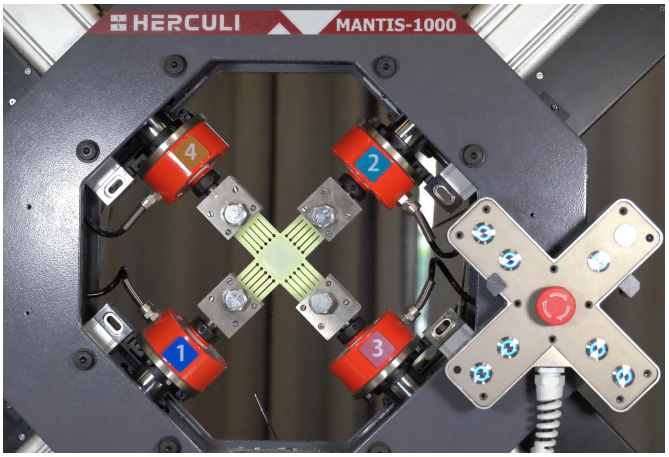
Type	NOIA-50	NOIA-150	NOIA-250	NOIA-300	NOIA-500
Load capacity (KN)	50	150	250	300	500
Stroke (mm)*	50-200	50-200	50-200	50-200	50-200
Sensor accuracy (%)	0.1	0.1	0.1	0.1	0.1
Displacement accuracy (μm)	1.0	1.0	1.0	1.0	1.0
Maximum speed (mm/min)*	10	10	10	10	10

Note:The* parameters can be customized.

MANTIS series desktop biaxial testing machine



Mantis-1000



Biaxial test

Technical parameters

Type	Mantis-100	Mantis-200	Mantis-500	Mantis-1000
Load capacity (KN)	1	2	5	10
Stroke (mm)*	40-100	50-100	50-100	50-100
Sensor accuracy (%)	0.1	0.1	0.1	0.1
Displacement accuracy (μm)	1.0	1.0	1.0	1.0
Maximum speed (mm/min)*	10	10	10	10

Note:The* parameters can be customized.

Performance features

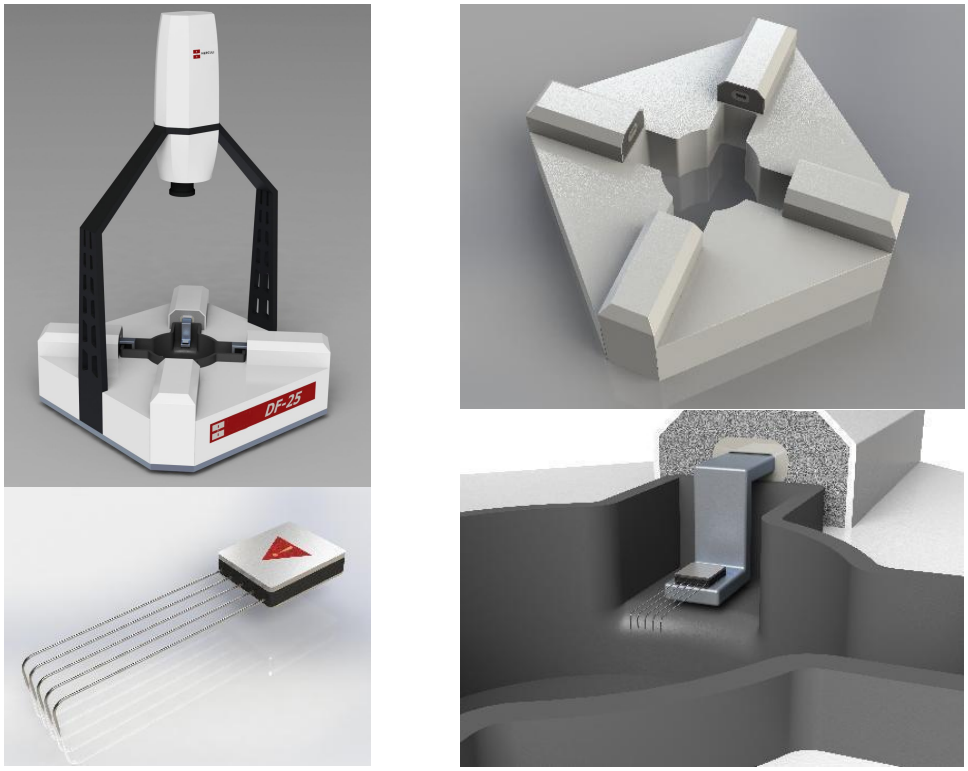
◆ 1.The MANTIS series equipment is a desktop biaxial testing machine, which is lightweight and takes up minimal space.

◆ 2.Used for tensile-compressive and quasi-static or low cycle fatigue testing of test specimens.

◆ 3.Can carry out various combinations of loading such as tension-tension, tension-compression, and compression-compression.

◆ 4.Full digital measurement and control system ensures accurate and stable load/displacement ratio loading.

DF series biaxial testing machine for biomaterials



Overall and partial schematic diagram of the DF-25

Technical parameters

Type		DF-5	DF-10	DF-15	DF-25
Load capacity（N）	Static load	5-20	5-60	5-80	5-100
	Dynamic load	50-200	50-600	50-800	50-1000
Stroke（mm）*		0-30	0-30	0-30	0-30
Sensor accuracy（%）		0.1	0.1	0.1	0.1
Displacement accuracy（μm）		1.0	1.0	1.0	1.0
Maximum speed (mm/min)*		20	30	35	40

Note：The* parameters and creature claw size can be customized.

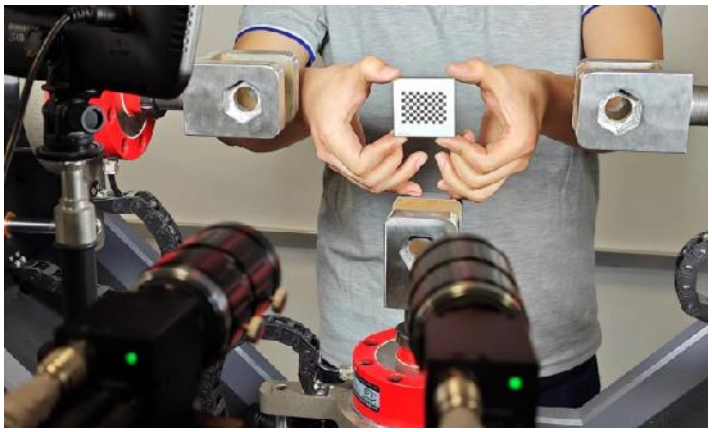
Performance features

◆1.The equipment is versatile and can conduct biaxial testing on a wide range of materials, including biomaterials, soft tissues, and thin films, etc.

◆2.The fixture of this machine utilizes biological claws and is securely fixed using magnetic force, allowing for easy and convenient in-situ replacement.

◆3.The sample can be tested in various environments, such as a water bath or heated liquid, providing flexibility in experimental conditions.

3D digital image correlation analysis system



3D-DIC analysis system

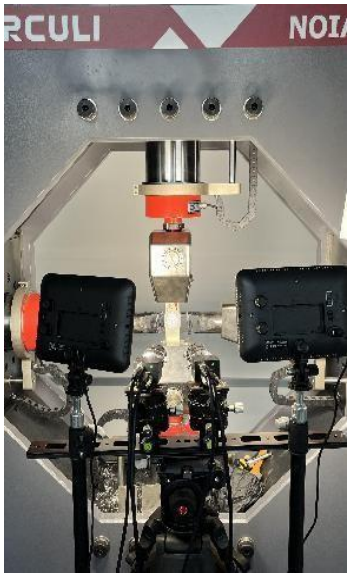
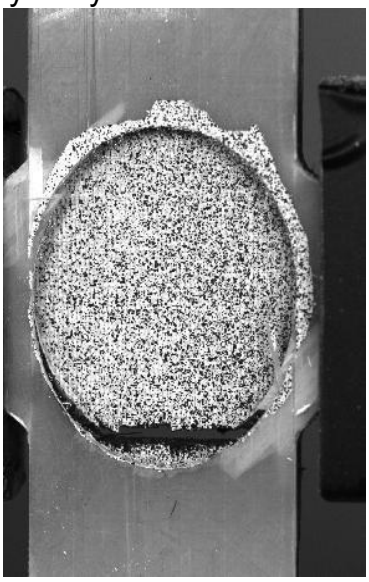
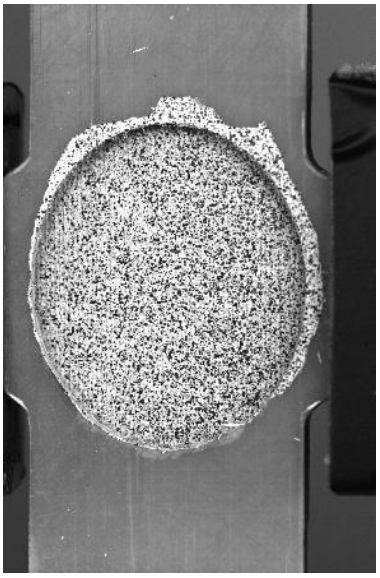


Image acquisition





Speckle pattern

Performance features

◆ 1.The biaxial testing machine is equipped with a synchronization system that allows for the setting of the camera frame rate through the control software of the testing machine.

◆ 2.This synchronization system ensures that the camera shooting and testing machine load data are collected simultaneously and displayed on the same timeline, ensuring accurate correspondence between data points with an error of no more than 0.1 ms.

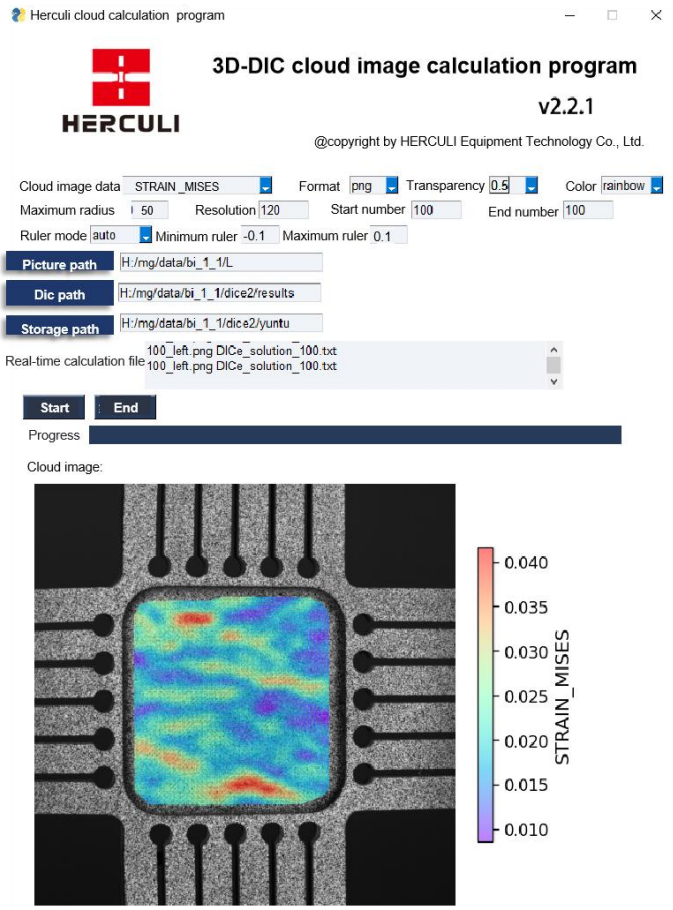
◆ 3.The camera used in this system has a minimum resolution of 12 million pixels and a full frame rate capability of up to 28 fps.

◆ 4.The measuring range of the system is from 10 mm² to 200 mm².

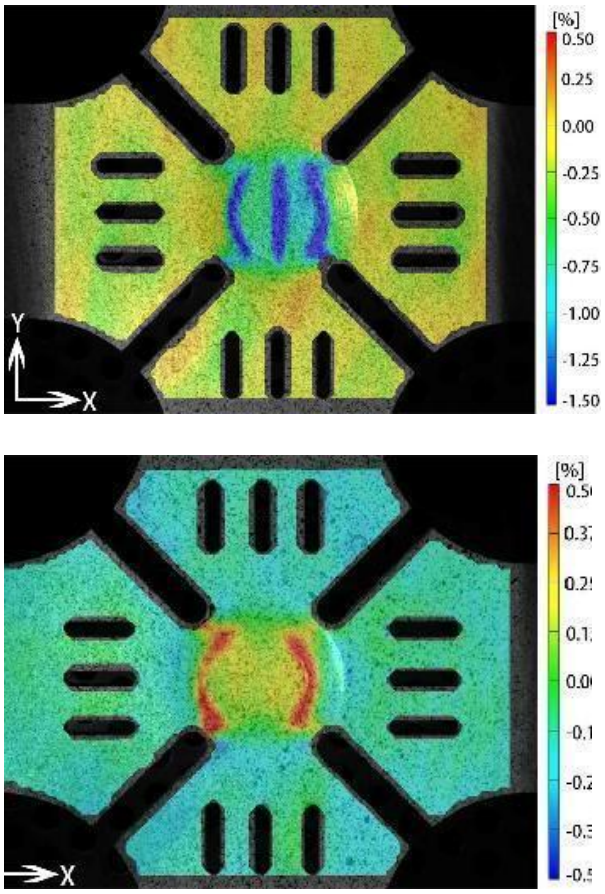
◆ 5..Equip with 25×25 mm²、50×50mm²、 100×100mm² calibration plate 2 pieces.

◆ 6.The fill light used in the system is a DC cold light fill light, with a minimum power output of 40 W.

3D digital image correlation analysis system



3D-DIC software run shot



DIC cloud map

Performance features

◆1.The strain measurement accuracy is notless than 10ue.while the displacementmeasurement accuracy is less than 0.1pixel.

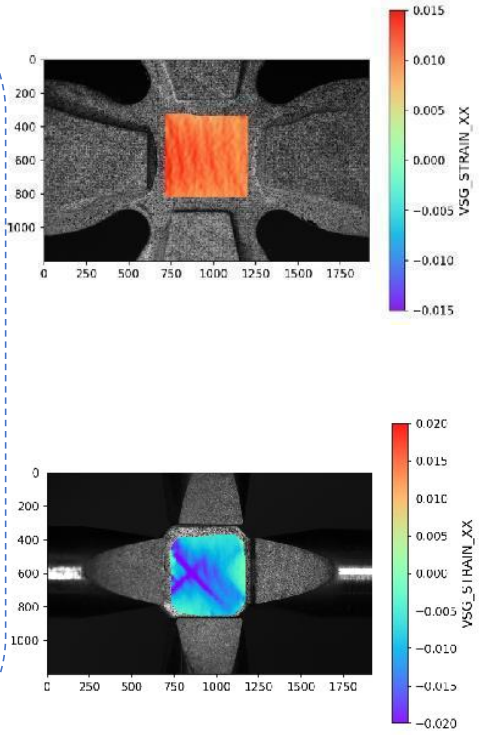
◆2.The strain measurement range is 0.01%～2000%.

◆3.The measured data include the dimensions and directions of 3D displacement, principal strain and support dynamic image generation of measurement process.

◆4.The software can specify the range of measurement pictures to be imported into the calculation.

◆5.Cloud map supports user-definedcolor mapping.

◆6.Cloud image can be made transparentbased on user preferences.



DIC cloud map

High/low temperature environment chamber

Biaxial testing machine with environmental chamber

Performance features

◆1.The temperature range of the environmental chamber extends from -70 ℃ to 1800 ℃, and the internal dimensions can be customized.

◆2.Includes transparent observation window and meets the optical full field strain measurement function.

◆3.With an intuitive operating interface, offers automatic and manual temperature control options.This interface displays realtime temperature curves, providing precisetemperature monitoring and control.

◆4.Temperature distribution accuracy fluctuation: ± 1.5 ℃, temperature control display accuracy: ≤ ± 0.1 ℃.

◆5.Equipped with a vertical bracket for easy installation and disassembly.

Deep sea environment chamber

Performance features

◆1.The simulation depth range spans from 0 to 12000 meters, with a pressurerange of 0 to 120 MPa, and the internal dimensions can be customized.

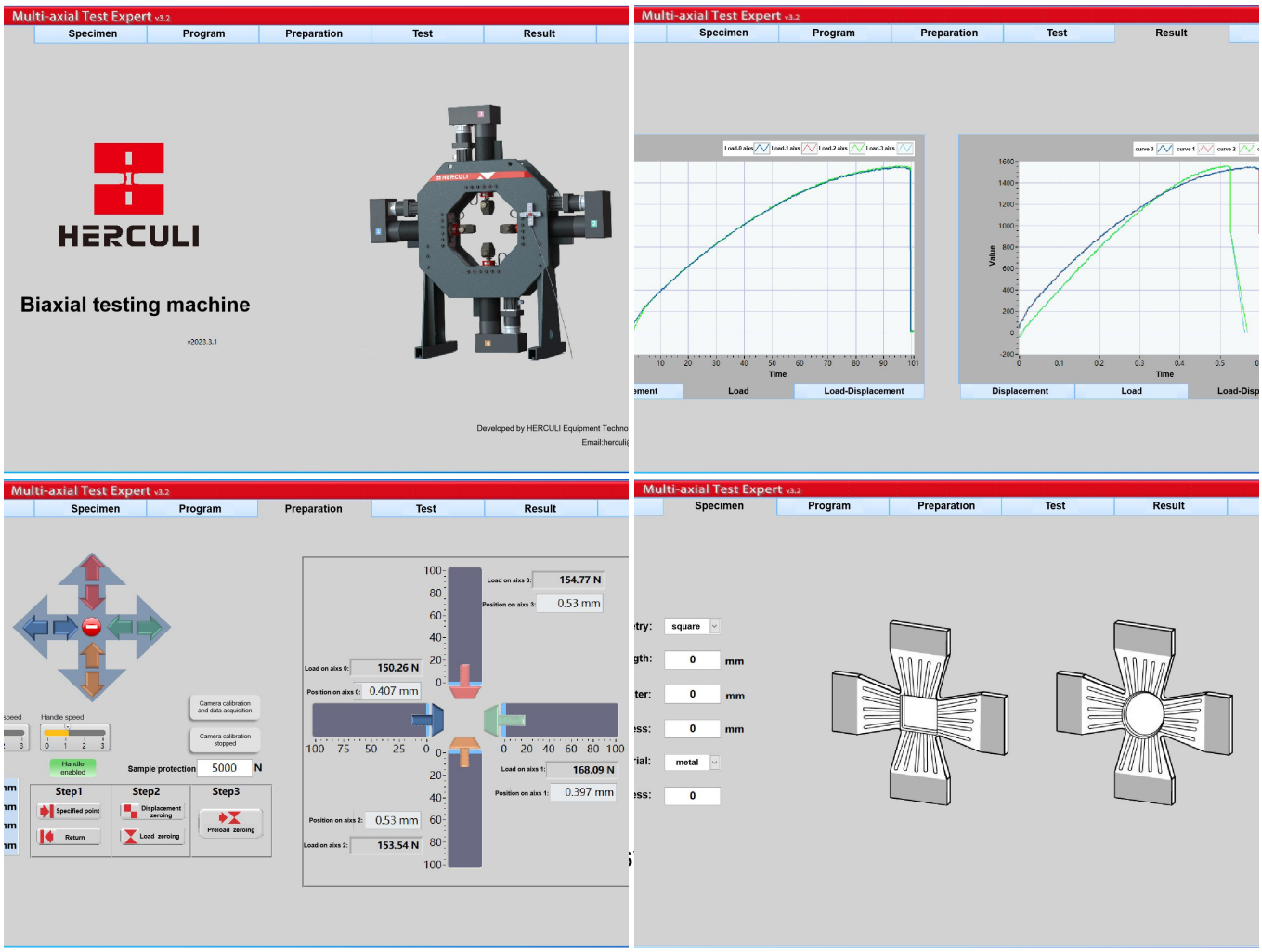
◆2.Includes transparent observation window and meets the DIC optical full field strain measurement function.

◆3.Support the implementation of biaxial four-way plane creep, quasi-static and low cycle fatigue loading in the cabin, and achieve non proportional synergistic changes in biaxial load and water pressure.

◆4.Equipped with a vertical bracket for simplified installation and disassembly.

Deep sea environment chamber

Multi-channel coordinated control system



◆1.The operating system of the visualtesting machine is user-friendly.

◆2.Friendly interface and simple operation.

◆3.The testing machine program is comprehensive and highly customizable,offering various parammeter settings and data processing functions.

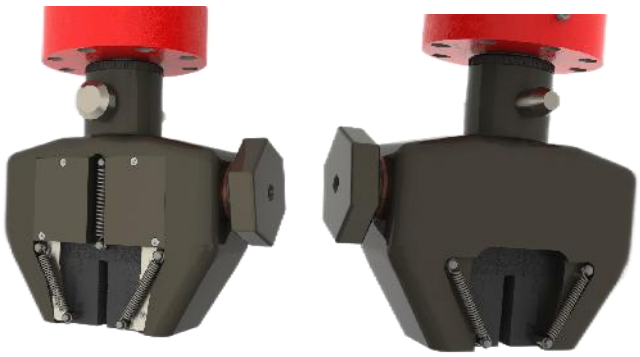
◆4.Autonomous control algorithm, customizable testing requirements; The four axes of the inspection machine can be moved and continuously controlled through the software interface, with adjustable speed.

◆5.The handle control can be conveniently turned on or off from the software interface of the testing machine.

◆6.The software has the ability to controlthe acquisition frequency of the DIC system.

◆7.Regular updates and maintenance are provided, along with free software upgrade services after delivery.

Clamps for biaxial testing machine



Special fixture of biaxial testing machine tensile

Performance features

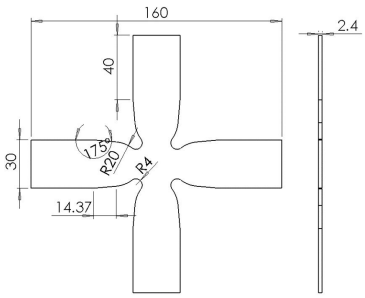
- 1.The special fixture for the biaxial testing machine is designed to securely hold a wide range of large tonnage test pieces.
- 2.This fixture is easy to operate, with a time-saving and labor-saving loading and unloading style. The fixture can be statically frictional and self-locking, effectively preventing the style from slipping.
- The fixture is crafted from high-strength alloy steel that undergoes a carburizing and quenching process,ensuring exceptional stiffness and wear resistance.

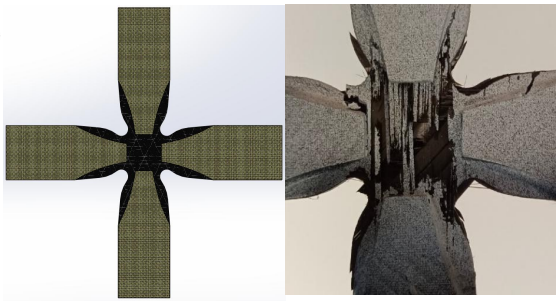
Technical parameters

Clamp number	SGLS-50	SGLS-150	SGLS-300	SGLS-500
Maximum holding force (KN)	50	150	300	500
Weight (kg)	8	15	25	37
Clamping width (mm)	40	50	60	75
Clamping length (mm)	40	60	75	90

Testing cases

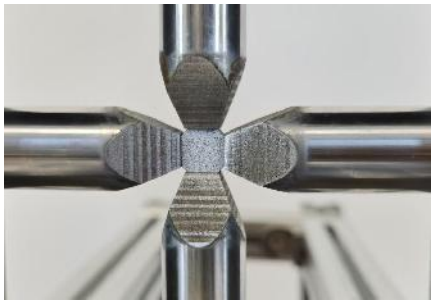
Design of biaxial tensile test specimens for composite materials and the test specimens after attaching reinforcing plates

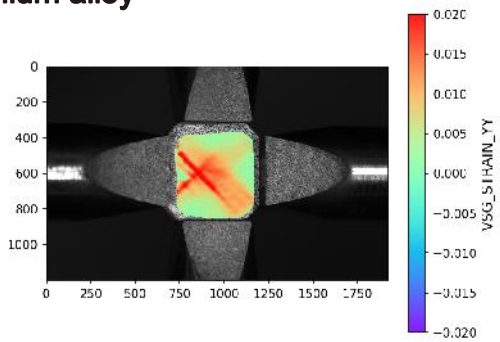


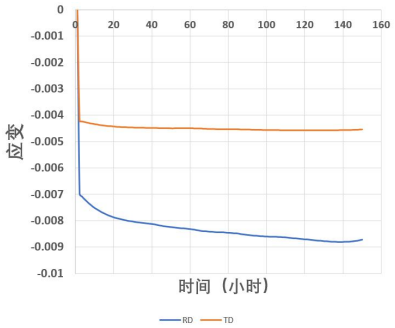


Biaxial quasi isotropic layering stretching results in fiber failure, delamination, in-plane shear, etc. leading to specimen failure.

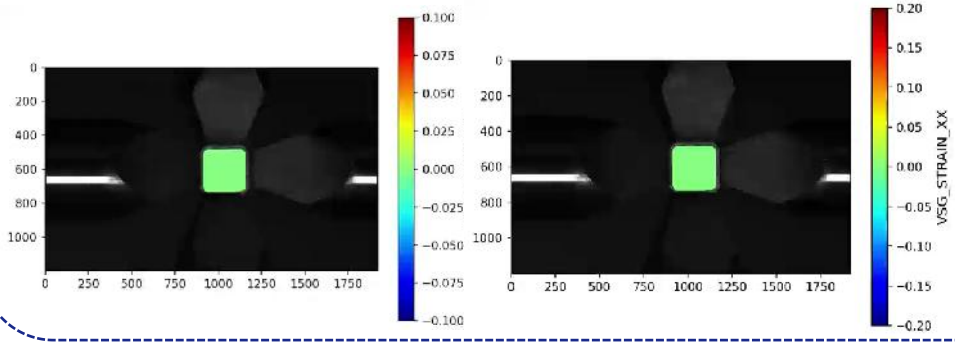
Biaxial creep testing of titanium alloy

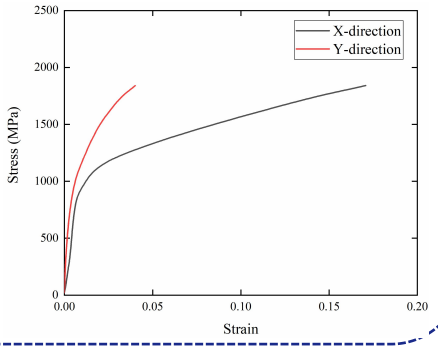




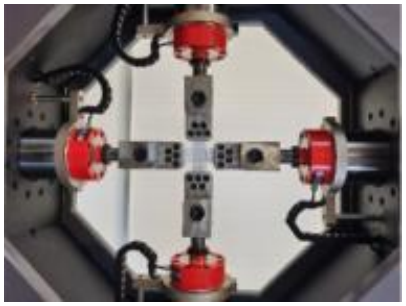


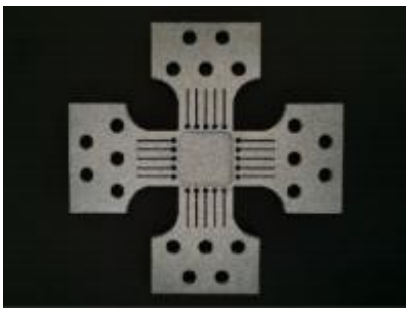
Biaxial equal load compression testing of titanium alloy





Biaxial equal load compression testing of titanium alloy





Testing cases

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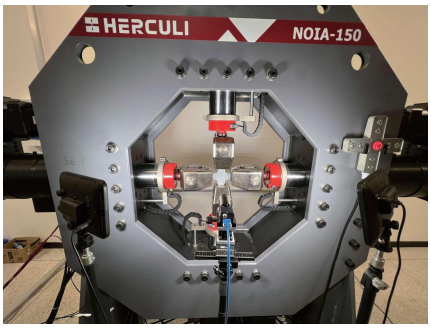
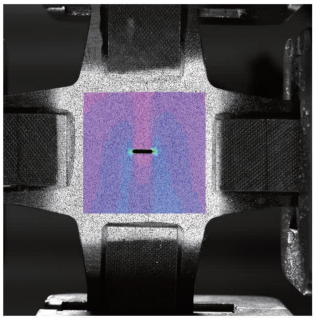
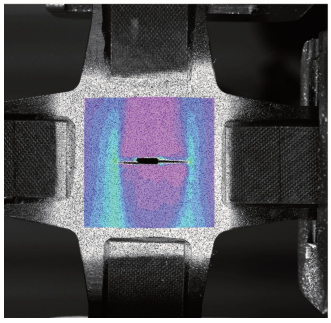
Biaxial tensile break test



Test specimen

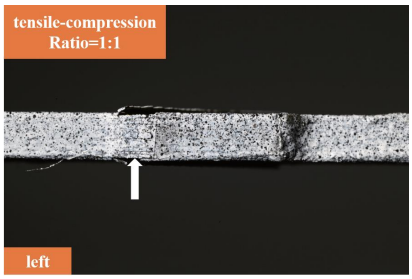

Fracture failure


DIC cloud map before stretching

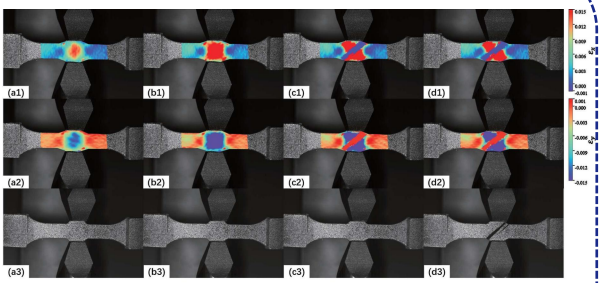

DIC cloud map at the time of break occurrence

45 ° layer biaxial test

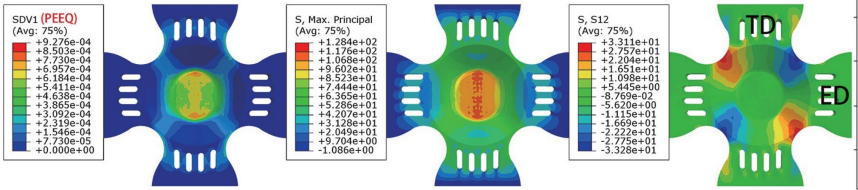
1: 1 Front view of tension-compression



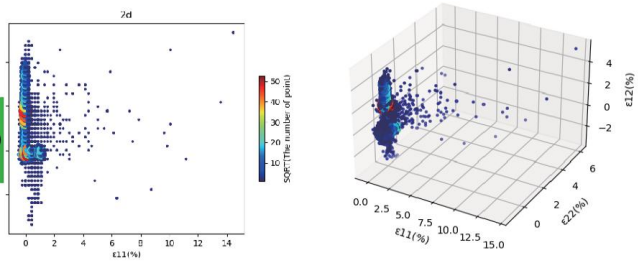
1: 1 Left view of tension-compression



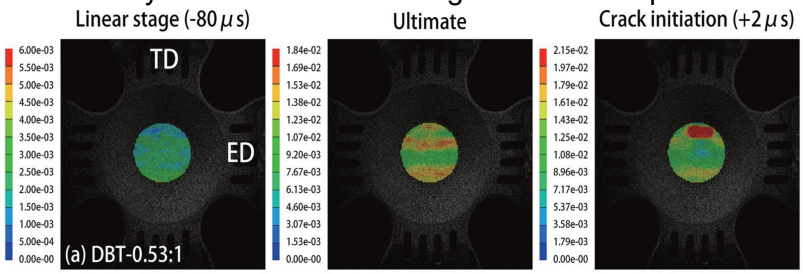
DIC cloud map of the entire process of tension-compression



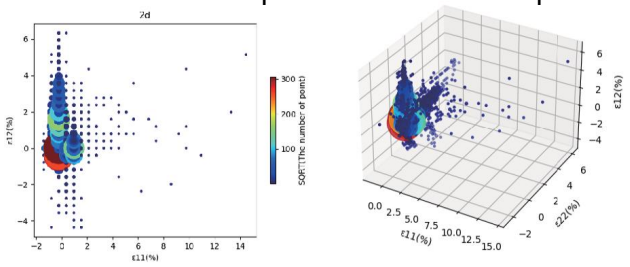
Dynamic biaxial stretching DIC cloud map



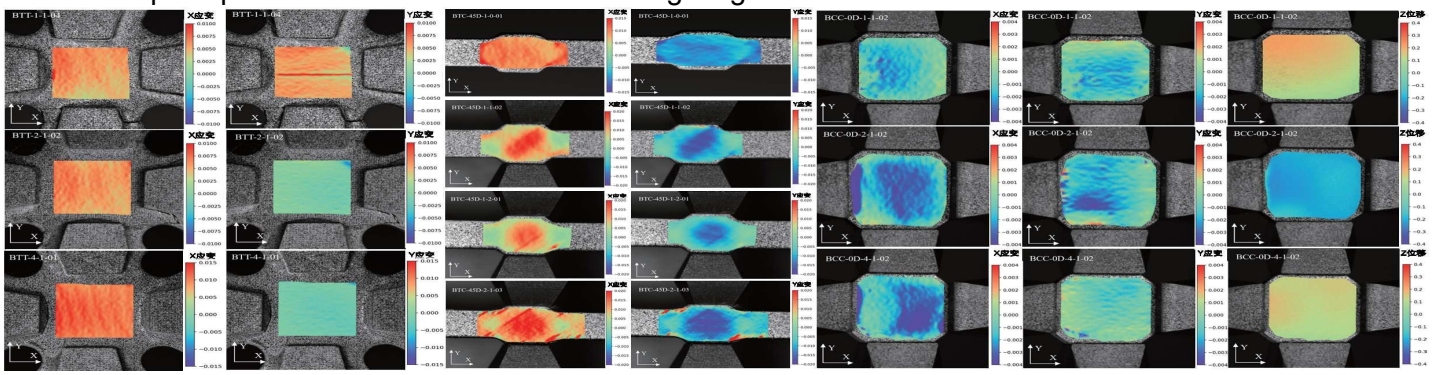
Biaxial tensile-compressive total strain spectrum

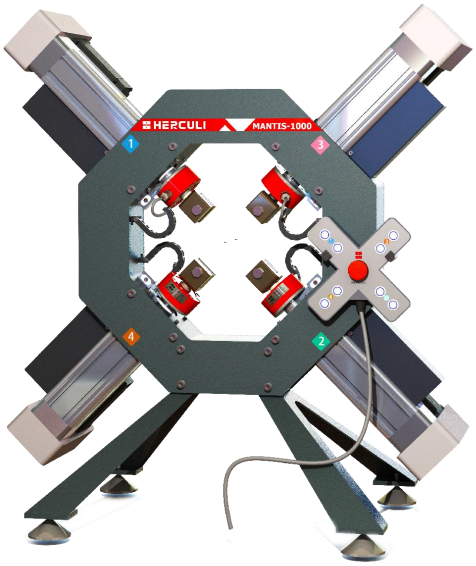


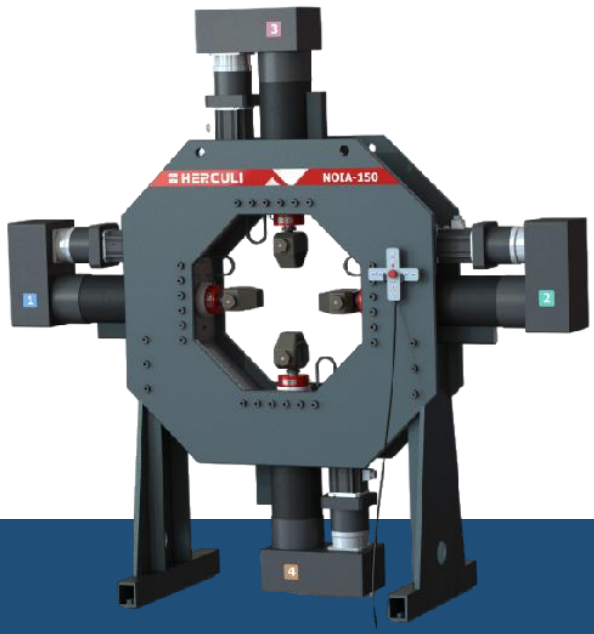
Maximum principal strain field at different stretching stages



Biaxial tensile total strain spectrum


Stretch DIC cloud map of different materials





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