Optical Testing Application Guide

ARAMIS Optical Strain

Materials & Structural Testing
Strain & Displacement
Vibration & Impact

trilion

Save Labor, Costs and Schedule.
CAE Initial Conditions / Reality

ARAMIS Optical Strain – FEA of Testing

ARAMIS measures Material Properties, Behaviors & Dynamic Structural Response

ARAMIS Optical Strain, using Digital Image Correlation (3D-DIC) and Dynamic 3D Photogrammetry, provides precision measurements of real, complex materials and structures; described by NIAR as the FEA of testing.

Optical Strain provides a holistic understanding of components under test, providing full-field 3D displacements and strains. Like an FEM computer model, each measurement captures the entire measuring volume; your areas of concern, and, more importantly, the areas that you do not know are a concern, are all measured simultaneously.

ARAMIS Optical Strain is the Industry 4.0 tool for R&D labs, manufacturing and structural testing. Full-field optical strain and 3D displacements provide the critical data for accurate measurements of initial conditions and critical measurements to optimize computer models.

Why Use

Cutting-edge Capabilities

Measures tens of thousands of points simultaneously in a fraction of traditional testing time

Ideal Tool

From complex components to entire aircrafts, ARAMIS is the premiere tool for CAE model comparison to reality

Finite Element Measurements

With 10,000 nodes in three axes of deformation, 6-DOF, and the full strain tensor (major, minor, and true shear)

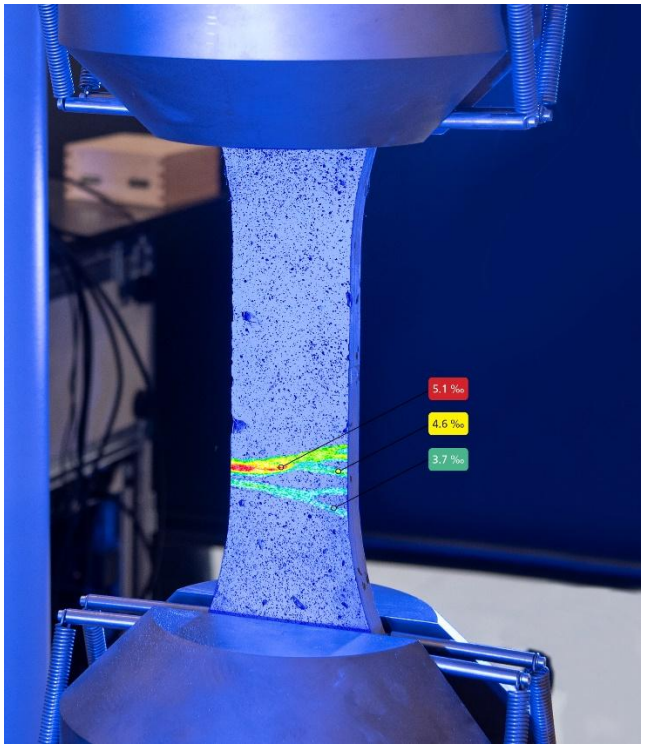
Material Testing

Best Material Properties

ARAMIS 3D-DIC is the ideal tool for measuring material properties to most ASTM and ISO standards. It provides a fully automated material analysis module for fully non-contact, full-field, holistic understanding of the materials under test. Described by NASA as providing the most consistent material properties of any method, for all materials, and simple to use.

Class A Extensometer

ARAMIS is certified as ISO 9513 class 0.5 extensometer, exceeding most clip gauges, foil strain gages, or mechanical extensometers.



Cost Cutting

Automated templates allow you to automatically measure material properties, to Industry Standards, simply and efficiently.

Customers that automate their materials properties measurements save on time, effort, and schedule. These savings translate to reduced costs, and increased accuracy and consistency of material data.

Trilion Engineering Support can customize your templates for you and maintain them year after year.

Test Machine Alignment

Measurement Validation is inherent with every ARAMIS measurement performed. Perfect alignment of fixturing is critical for getting good data. ARAMIS confirms proper 3D alignment and loading with every test, and providing the most consistent material properties

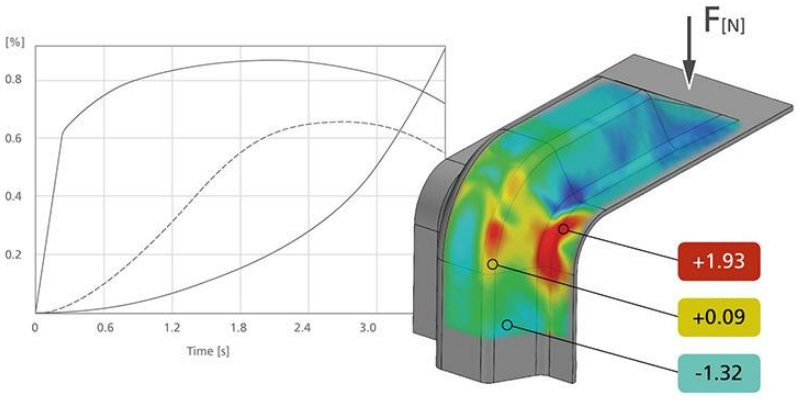
3D Component Testing

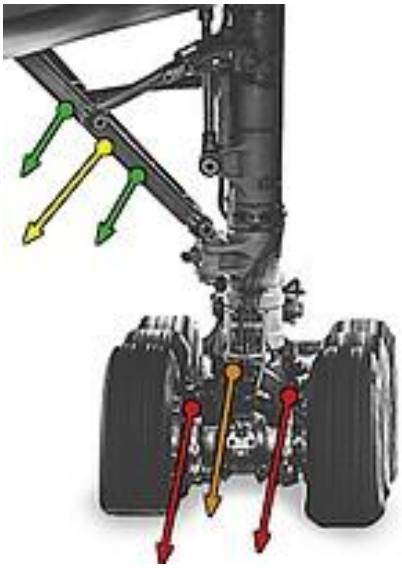
ARAMIS Optical Strain

Full-field component testing that measures *all* points for direct FEM comparison to the real multi-material, structural response.

ARAMIS 3D Photogrammetry

Dynamically tracks individual target points, capturing 3D displacements, 6-DOF, and strains. A superior tool for displacement measurements and systems analysis.

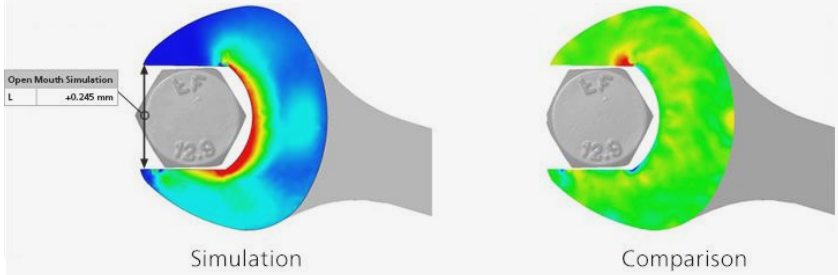




ARAMIS - FEA Model Precision

Our software provides CAD model imports for precise measurement orientation to CAD coordinates. FEA simulation imports allow for direct comparison with 3D displacements and strains, to the computer model for the real structural responses.

Direct import of models and automatic alignment to the 3D measurement data allows direct comparison to full-field measurements for easy model optimization to the real boundary conditions.



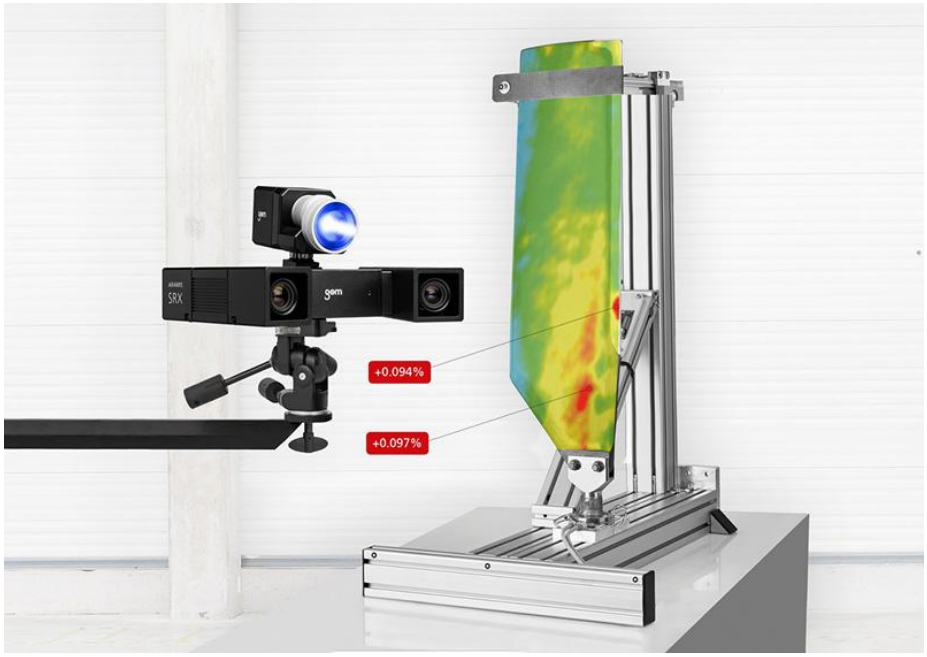
TRITOP CMM Photogrammetry

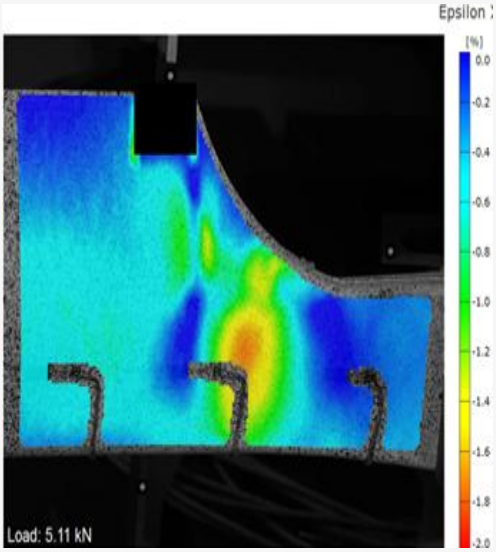
Portably measure 3D coordinates of large, complex objects precisely. The system automatically stitches ARAMIS and ATOS data, the perfect tool for larger fields of view.

Structural Testing

ARAMIS Structural testing is a core power

ARAMIS provides holistic 3D measurements of shape, deformation, and strain, all in true CAD coordinates. ARAMIS data is more accurately placed and aligned than foil strain gages direct CAD. You can even check alignment of your mounted strain gages for position and strain vector.



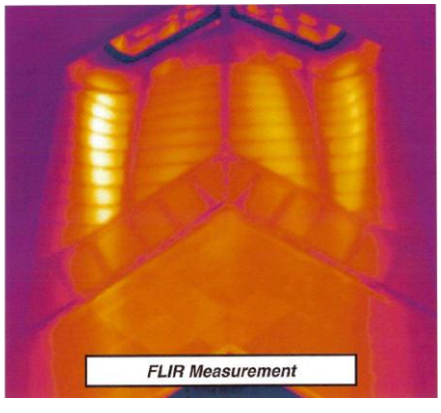


Holistically understand the structural response of your test structures.

ARAMIS Thermography couples full-field thermography to your 3D deformation and strain; key to precision strain measurements in hot environments and for non-destructive testing. Full-field 3D thermal data allows the ARAMIS strains to be corrected for thermal expansion, displaying true mechanical strains, as well as full-field temperature in CAD coordinates.

"Any university that is not teaching DIC is in the dark ages."

Dr. Michael Mello
The California Institute of Technology



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ARAMIS High-Speed

ARAMIS High-Speed, originally developed for the NASA Space Shuttle Return-to-Flight ballistic impact testing, has become a mainstay of Industry 4.0 high-speed measurements.

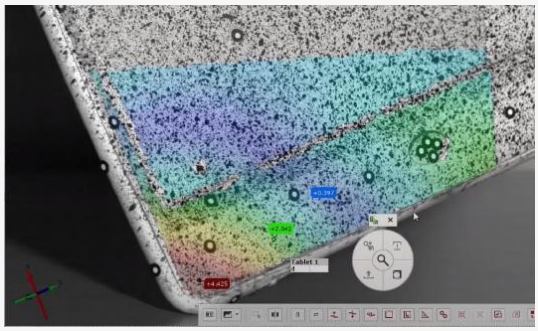
Drop Testing (1k-20k fps) → Ideal for consumer goods designers to test for reliability. Measure the dynamic behavior of dropped components and its 3D deformation during impact. ARAMIS included in ISO Standards.

Impact & Crash Testing (5k- 50k fps) → From automotive and aerospace crash tests to sport equipment design, ARAMIS High-Speed's full-field measurements of acceleration, dispalcement strains, and buckling rapidly generate meaningful data without installing contact sensors.

Ballistic & Blast Testing (20k-300k fps) → The ARAMIS High-Speed system measures thousands of data points during highly dynamic events, like this military helmet response during impact as seen in the data to the right.

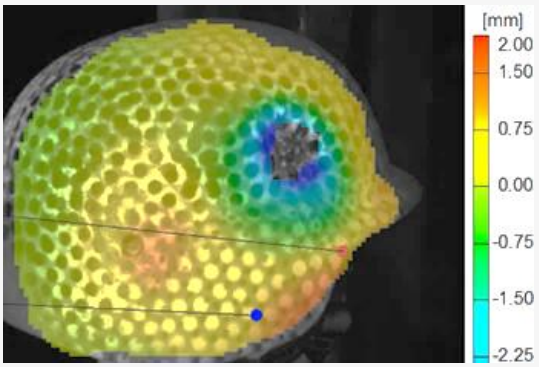
Shock & Brittle Fracture (100k-5M fps) → Ultra-high acquisition rates for Split-Hopkinson Bar to glass fracture such as a bullet impacting glass as seen in the data to the right.

ISO Drop Testing

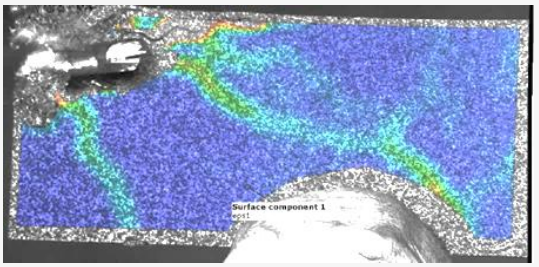


Impact & Crash Testing

Ballistic & Blast Testing



Shock & Brittle Fracture

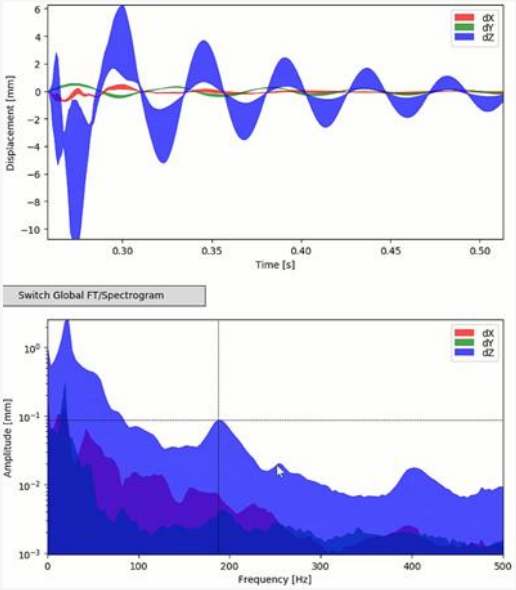


Vibration, NVH & ODS

ARAMIS High-Speed, measures all points, directly measuring 3D displacements and accelerations.

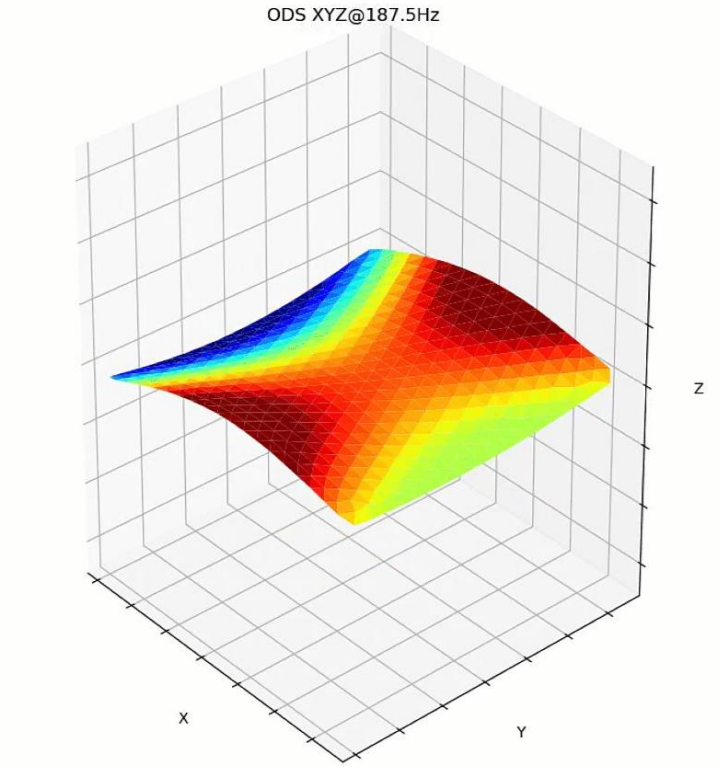
Vibration Analysis

ARAMIS provides non-contact, massless acceleration, ODS, and vibration data with minimal set-up time, providing precision FFT and vibration waveforms at any point on complex structures.



Ground Vibration Testing

Measure everything from global 3D displacements to local buckling and modal response across an entire object. TRITOP automatically aligns every ARAMIS result into CAD coordinates for seamless measurements.

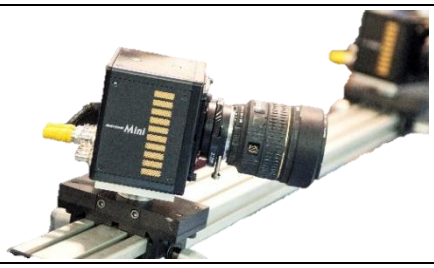


Modal Analysis

Display full-field testing, ok the operational deflection and mode shapes at each frequency.

All points are captured synchronously, allowing for the full phase relationship on the modal response to be highly accurate, unlike single point measurement systems like laser vibrometers.

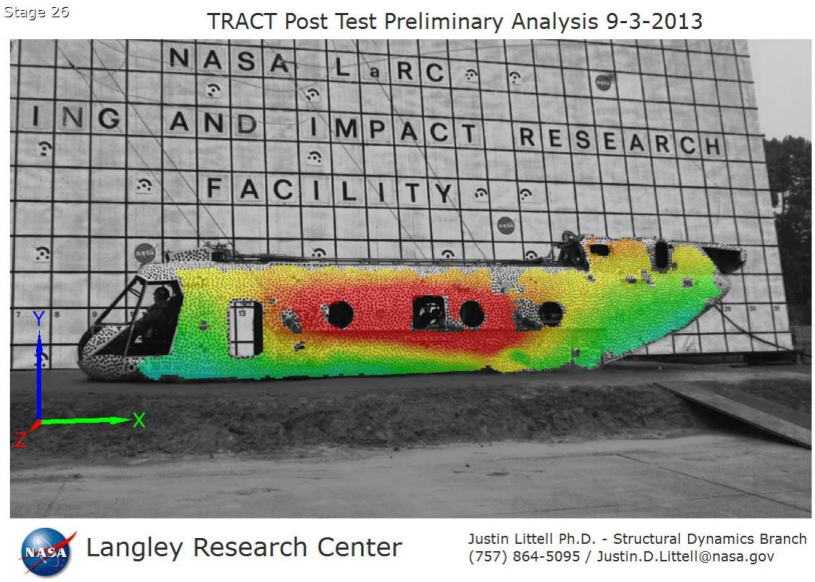
3D Metrology Toolbox

ARAMIS Optical Strain		ARAMIS Optical Strain is a full-field, non-contact measuring system based on 3D digital image correlation & dynamic photogrammetry.
ARAMIS High-Speed		ARAMIS High-Speed is the ideal 3D tool for high-speed measurements, shock vibration, dynamic testing, and analysis.
TRITOP CAM Photogrammetry		TRITOP system portably measures 3D coordinates of complex objects precisely and provides large area automatic stitching for ARAMIS & ATOS
ARGUS Forming Analysis		ARGUS Forming Analysis supports the optimization of the sheet metal forming process and optimization of tools. ARGUS Laser Etcher provides perfect etching; option: automated gantry
RVAT Digital Assembly		Digital Manufacturing with RVAT (Real-time Virtual Assembly Tooling) provides precision assembly guidance and complete data for manufacturing Digital-Twin.
ZEISS CT (3D X-Ray)		ZEISS (CT 3D-X-ray) is a state-of-the-art metrology CT scanner capable of the highest accuracy and resolution in the industry, for internal dimensioning, SPC, AM, QA, etc.
ATOS 3D Scanners		ATOS and the portable T-Scan Hawk are non-contact 3D scanners were developed for repeatable and precise measurements of 3D shape prior to testing.

Benefits & ROI

ARAMIS 3D Optical Strain provides transformational measurements for test & manufacturing.

ARAMIS allows you to validate models precisely to complex structures. Gain full-field and integrated measurements to understand precisely how multi-material components work together in real world industrial tests.



Complex models precisely matching reality improves products and reliability.

10x less expensive than traditional gages

Takes 50x less labor

Provides 100x more data

(Findings from Boeing)

Trilion Engineering Services

Trilion Engineering Services is the perfect solution for solving complicated applications and/or developing methods for critical measurements, providing precison data. We provide experienced engineers, with industry specific experience in aerospace, automotive, microelectronics, civil, power, biomechanics and consumer products.

Services include:

- Dynamic component testing in-situ or in the field
- Optical strain reality for FEA initial conditions and response
- High-speed measurements and vibration analysis
- Large scale structural testing

We look forward to supporting our customers and applying our technologies to solve , providing precison data their problems. We get professional results every time.

All-in-One Solution

For over 25 years, Trilion Quality Systems has been an industry leader in Optical Metrology Systems, developing and supporting unique applications throughout North America. Optical metrology brings long-awaited advanced Factory 4.0 capabilities to the manufacturing industry.

Trilion Engineering Services is the perfect solution for companies with complicated applications and data requirements. We provide measurement method development and precision measurements. Our experienced level 3 engineers and precision optical measurement systems get professional results every time.

A manufacturing revolution, reducing costs and improving quality!

ARAMIS Optical Strain is the tool of choice for industry leaders.

For more information, visit:

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