

Q-400

Advanced Full-Field Displacement and Strain Analysis

Applications

- Advanced materials (CFRP, wood, fiber injected PE, metal foam, rubber, ...)
- Component testing (Displacements, Strains,...)
- Material testing (Youngs Modulus, Poisson Ratio, Elasto-Plastic Behaviour)
- Fracture mechanics
- FEA Validation

Features

- 3D Full-field, Real-Time display of displacement and strain overlaid on live image
- Fast and easy automated calibration procedure
- Confidence margin for all results
- Enhanced triggering functions
- User definable axis systems
- Real-Time voltage output of measured values



Q-400 - 3D Deformation Measurement on almost any material or contour – non-contact and true full-field

Introduction

The Digital 3D Correlation System Q-400 is an optical measuring instrument for true full-field, non-contact and three-dimensional analysis of displacements and strains on components. It can be used for many tests including tensile, torsion, bending and combined loading on a wide range of materials.

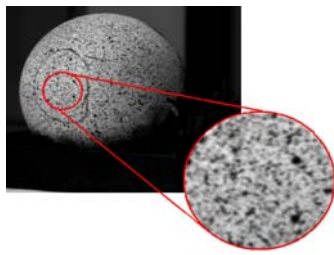
User Friendly System

The software and hardware have been designed to make the Q-400 the easiest system to use on the market. The intuitive software and automatic calibration procedure combined with quality feedback and full-field confidence margins ensure the most accurate results every time with

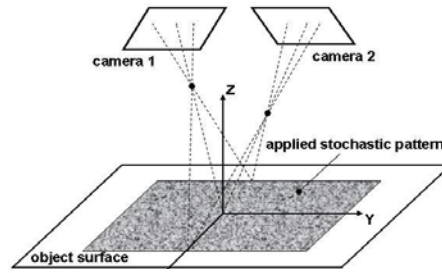
a system that is easy to learn. The purpose-built HiLi Illumination is standard with the system and provides cold and extremely homogenous light which has been shown to increase accuracy

Real-Time Evaluation and Output Voltage

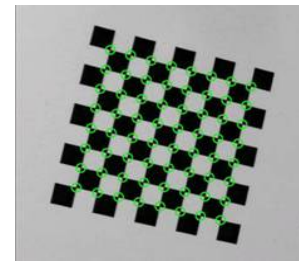
The system is unique in offering full-field, real-time correlation and an analogue voltage output of measured values. The real-time evaluation overlays the constantly updating full-field results onto the live images using state-of-the-art processing. In addition, two output channels allow results to be extracted *live* as voltages to interface with external devices.



Stochastic pattern



Photogrammetric Principle



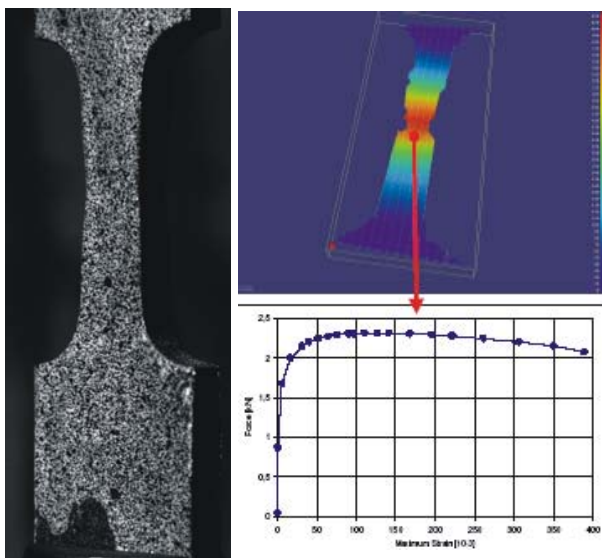
Calibration Plate

Measuring Principle

A stochastic pattern is applied onto the surface of the test object. This pattern can be sprayed with a white base colour and spattering a black colour on top. The surface is observed with two sensors. The contour is measured first, then in each captured image homologous points of the stochastic structure are identified using a specific pattern matching algorithm. All sensor parameters are determined by a fast and easy calibration procedure - the achieved calibration accuracy is displayed. The three-dimensional position of each object point is determined by triangulation performed by the software. If image sequences are recorded during the displacement of the object, the deformation of each object point is calculated automatically.

Material Properties

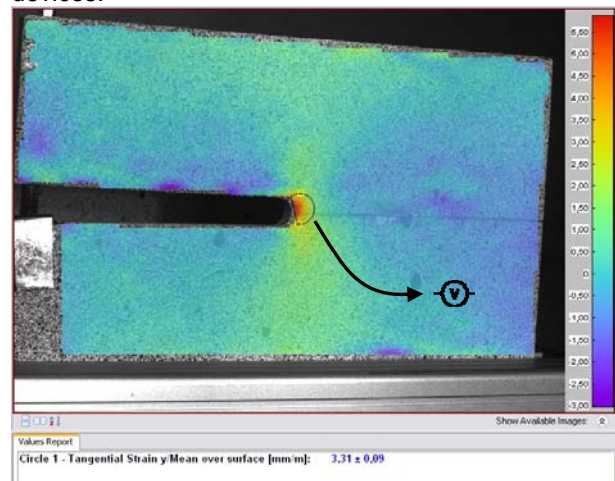
Characterization of material parameters far into the range of plastic deformation: powerful data analysis tools allow the determination of the location and amplitude of maximum strain, which are important data in material testing.



Tensile Loading up to Plastic Deformation

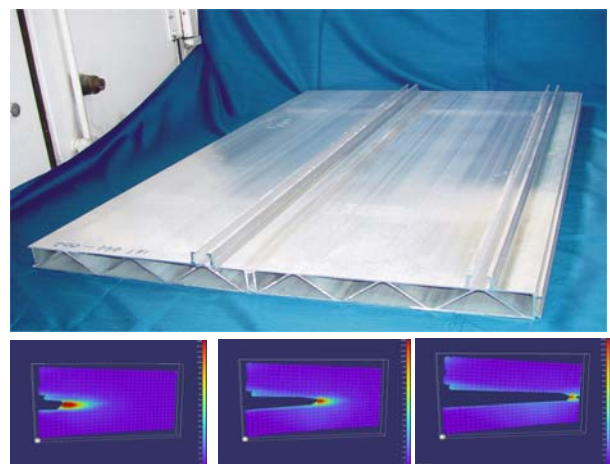
Real-Time Evaluation

The system is capable of displaying the full-field results real-time up to 5Hz on the live image with advanced algorithms and state-of-the-art processing. The displacements and strains can be displayed as the test proceeds and the values of 2 key areas can be extracted as proportional voltages to interface with external devices.



Real-Time Strain overlaid on the live image

Fracture Mechanics



Crack Propagation in Aluminium

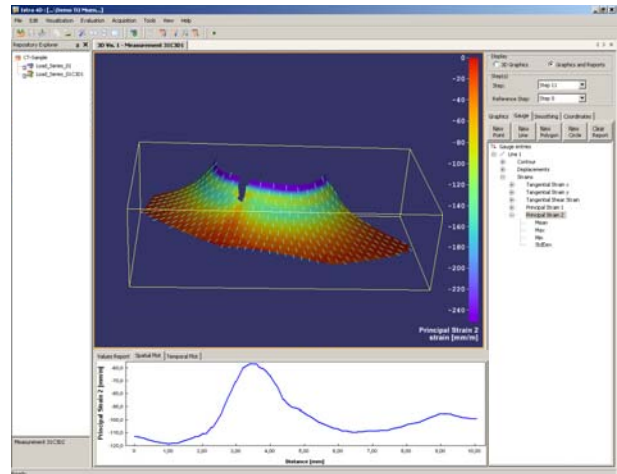
With information about local and global strain distribution, crack propagation can be tracked.

Measuring Standards and Traceability

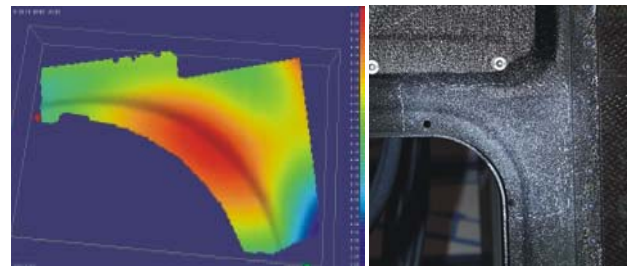
Currently there is still a lack of standards and reference materials for optical strain/stress measurement methods. Therefore, Dantec Dynamics has been actively involved with measuring standards and traceability programs including SPOTS and ADVISE. For more info visit www.opticalstrain.org. In this European Project, standards, optimized methodologies, physical and virtual reference materials and recommended procedures or traceability will be developed. This will allow reproducibility and comparability of measurement accuracies according to official standards.



Q-400 system



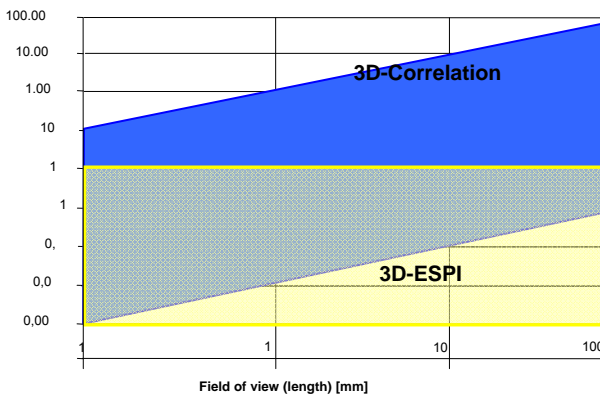
The Q-400 software offers convenient data handling, reliable evaluation and extensive post processing and analysis capabilities



Deformation analysis on the corner of a helicopter structure (carbon fibre reinforced plastics)

Measuring range of Correlation and ESPI

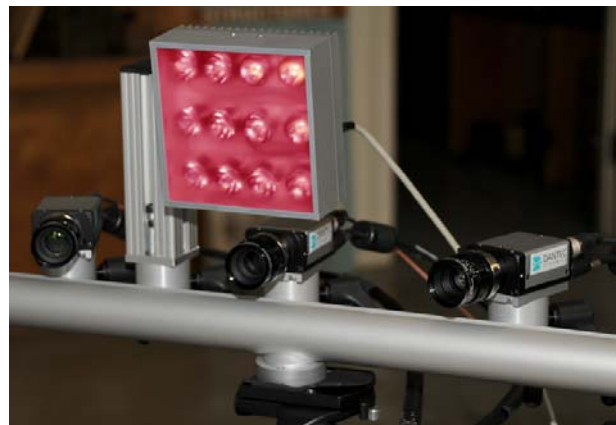
Digital Image Correlation and ESPI are complementary techniques. Together a nearly unlimited measurement range can be covered. While ESPI, due to its high sensitivity covers the lower range of displacements with corresponding higher accuracy. Correlation is best suited to higher deformations, including plastic deformation. Overlapping areas assure high practical suitability.



Complementary fit of ESPI and Correlation measurement ranges

True Multi-Camera System

Increase your accuracy and the ability to measure on curved surfaces with the multi-camera system. The system uses multiple images to create the results and is not a combination of 2 camera systems.



Additional information

For additional information please contact your Dantec Dynamics representative. The specifications in this document are subject to change without notice

General Specifications Q-400	
Measurement area	Typical measurement areas are 5 x 5 mm ² up to 1000 x 750 mm ² . Larger / smaller measurement areas on request
Measuring results	Full-field surface contour, 3D displacements and strains.
Measuring range	Up to several 100% strain
Precision calibration plates	Range of sizes from 5 x 5 mm ² up to 750 x 750 mm ² .
Control Electronics	Desktop or Notebook Options, Windows 7, Vista or XP Professional Integrated analogue data acquisition and recording input: 8 independent configurable analogue Data Acquisition Channels, 16 Bit resolution, ± 0.05 V to ± 10 V synchronized to camera triggering 2 analogue voltage outputs for data extraction ± 10 V
Illumination	Cold Light Illumination system HILIS for homogenous illumination of the specimen and improved measuring accuracy.
Sensor chip	Different Sensor types up to 16MP are possible; Standard 2MP or 5MP
Sensor details	Shutter speed: 47 μ s – 67 s, Frame rate: up to 30 Hz (Adjustable Region of Interest)
Measuring sensitivity Displacement Strain	Up to 1/100.000 of the Field of View depending on measuring conditions e.g. up to 1 μ m displacement sensitivity for a given Field of View of 100 mm up to 0.01% local
Software Features	
Real-Time Correlation up to 5Hz	
Unrestricted, open data format for measurement data	
Fast and easy automated calibration procedure with accuracy feedback	
Results displayed on 3D model or 2D overlay	
Confidence Margin for every data point	
Selectable filtering of measurement data and free definition of reference step	
Enhanced external and internal triggering functions	
Convenient GUI follows Universal Guideline of Dialog and Window Frame	
Different axis systems available - additionally a user definable axis system can be used	
Extended export and import functionality – e.g. STL, AVI	
Easy post processing of data	
Comfortable visualization and analysis of dynamics processes	
Options	
Multi-camera System	Optional usage of multiple sensors
Different sensors and lenses	Resolution and focal length adapted to your individual application
Illumination	Customer specific illumination systems on request.
Tensile Testing Machine Adaptation	Mounting Kit for application of Q-400 to Tensile Testing Machines
Analogue Output	Extract measured data as a live voltage
Remote Support Functionality	System maintenance and Remote User Support via Internet connection

The specifications in this document are subject to change without notice.