Optical 3D deformation analysis for static or dynamically loaded components and structures is an effective non-contact and material independent full-field measurement solution.

**Applications**
- Surveying a structure for potential problem sites
- Visualisation of strain gradients and hot spots
- Visualisation of crack growth, crack tip opening and local/global strain fields/distribution
- Measurement of in-plane strains and 3D out-of-plane displacements
- Verification and iteration of Finite Element Models
- Verification of failure behaviour
- Investigation of fracture mechanics
- Design tool validation
- Tracking damage in (composite) materials
- Test of Non-Homogeneous and Anisotropic Materials
- Impact studies and non-stationary responses
- Moving and rotating objects
Optical 3D deformation analysis facility

The optical 3D deformation analysis facility uses principles of 3D digital image correlation (DIC) photogrammetry that gives full-field out-of-plane displacement and in-plane strain results of the surface of the component. A random or regular (sprayed) pattern with good contrast is applied to the surface of the test object, which deforms along with the object and is tracked with the stereo metric camera’s of the system.

Specifications:
- Full-field analysis of small specimens (mm²) up to large components (> m²)
- 4000x3000 pixels camera resolution
- 58 images/sec
- High speed option with 2 high speed camera’s (up to 7000 fps at 1024x1024 pixels resolution)
- 3D point/marker target tracking function

Results
- Full-Field 3D coordinates
- In-plane strains
- 3D out-of-plane displacements
- 3D velocities
- Fine resolution 3D mesh
- Plain strain tensor
- Object contour based visualization

Example of design tool validation by DIC

FEM strain prediction
DIC processed strain results
Example of design tool validation by DIC of full-scale sandwich panel

The optical 3D deformation analysis system is very attractive to look for typical physical phenomena with panel testing:
- Onset of buckling, type of buckling
- Delamination growth
- Failure behaviour (skin rupture, stiffener pop-off)

DIC is also ideal for fracture mechanics investigation. The full-field measurement delivers exact information about local and global strain distribution, crack growth, and can be used for the determination of important fracture mechanics parameters.
3D point target tracking function

The additional 3D point target tracking function is based on Stereo Pattern Recognition (SPR) technology (type of Digital Image Correlation). SPR is based on the recognition and tracking of visible reflective markers on the object surface using stereo metric camera’s. With the use of high-speed cameras, the system is also suitable for measuring fast processes and motion sequences, e.g. for impact testing.

SPR is ideal for:
- Full field Structural Monitoring
- Complex motion tracking and analysis
- Component deformation analysis
- Mode shapes and relative motion

Advantages
- Simple specimen preparation with ultra-light self-adhesive reflective markers
- Frame rates independent of the number of markers
- Insensitive to ambient conditions, such as vibrations and light changes
- Easy adjustment to different measurement areas and tasks

Results
- 3D Coordinates
- 3D in-plane and out of plane displacements
- 3D Velocity and acceleration