



Laser shearography inspection

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Outline

- Dantec Dynamics
- Laser Shearography
- Standardization actions



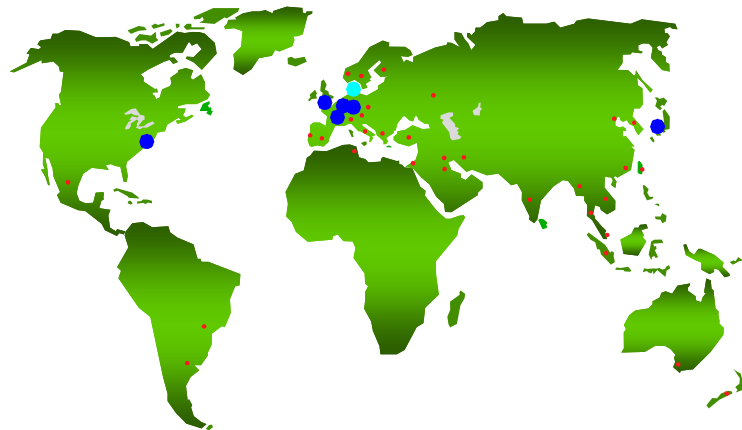
Dantec Dynamics

Who are we? What are we doing?



Dantec Group Overview

- Dantec is the world's leading supplier of optical measurement solutions for research and diagnostics into flows, micro fluidics, particle sizing, combustion and materials/components
- Incorporated in 1992. Activities formerly part of DISA and Dantec Elektronik
- Main office in Copenhagen, Denmark



- **Cyan dot:** Dantec Dynamics main office
- **Blue dot:** Dantec Dynamics company
- **Red dot:** Dantec Dynamics representative

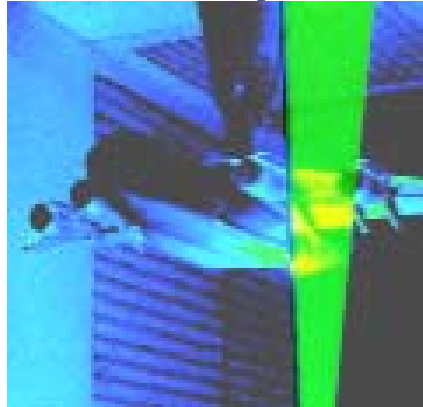
- **A NOVA Instruments Company**
- **5 subsidiary companies in 5 countries and representatives worldwide**
- **120 employees worldwide, many with MScs, PhDs or other post graduate degrees**



Main Business Areas of the Dantec Group

- **Fluid Dynamics**

- Air and gas flow measurements
- Comfort measurement
- Liquid flow measurements
- Particle size measurements

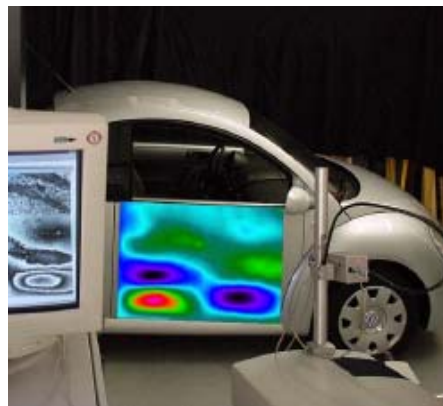
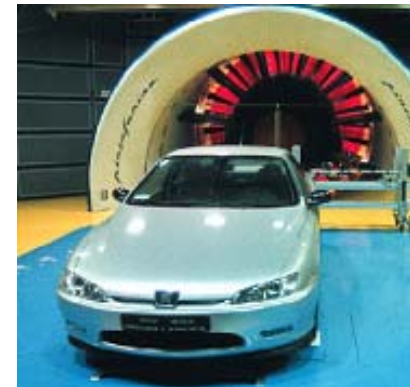


Optimisation of product design and combustion

- **Strain/Stress/Vibration**

- Strain & Stress measurements
- Vibration analysis
- Non-destructive testing

Aerodynamics and hydrodynamics



Optimisation of materials and components

Dantec Dynamics GmbH

Dantec Dynamics GmbH (Ulm, Germany) represents the group's competences into elasto mechanics of materials and components and surface metrology

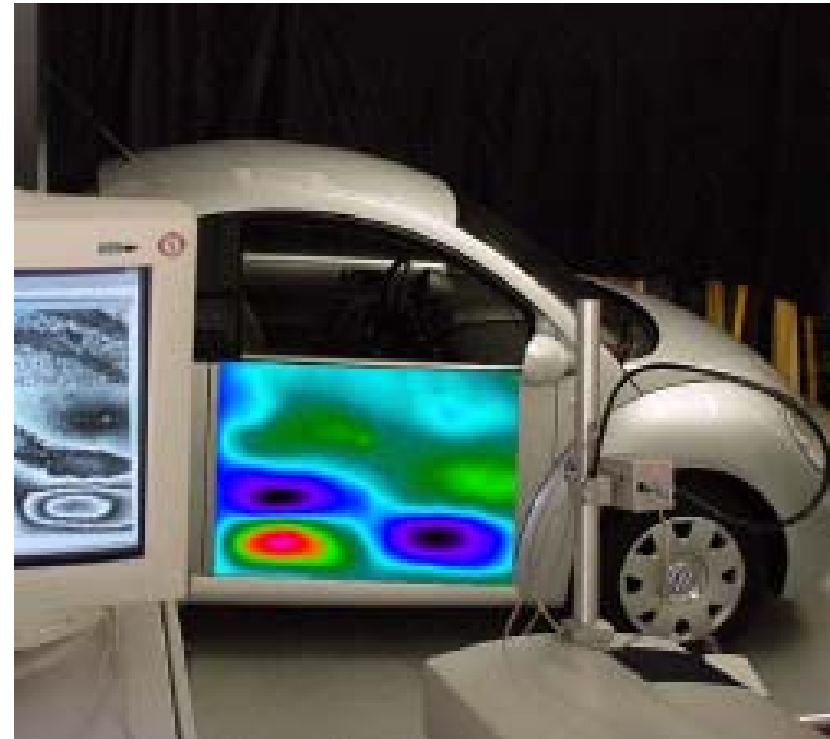
We deliver innovative solutions for

- Strain- / Stress Analysis
- Vibration Metrology
- Nondestructive Testing
NDT/NDI

– *Non contact*

– *Full field*

– *Threedimensional*



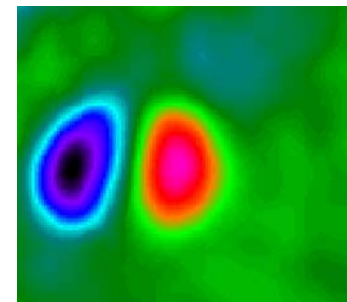
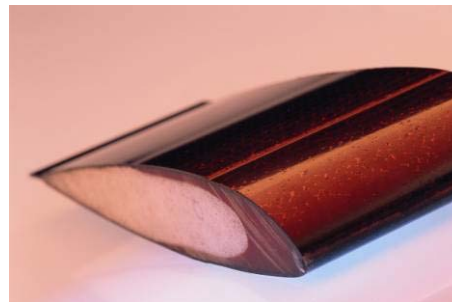
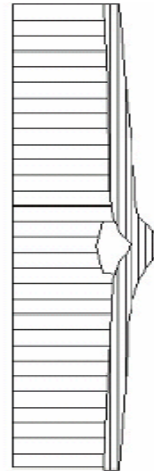


Laser Shearography

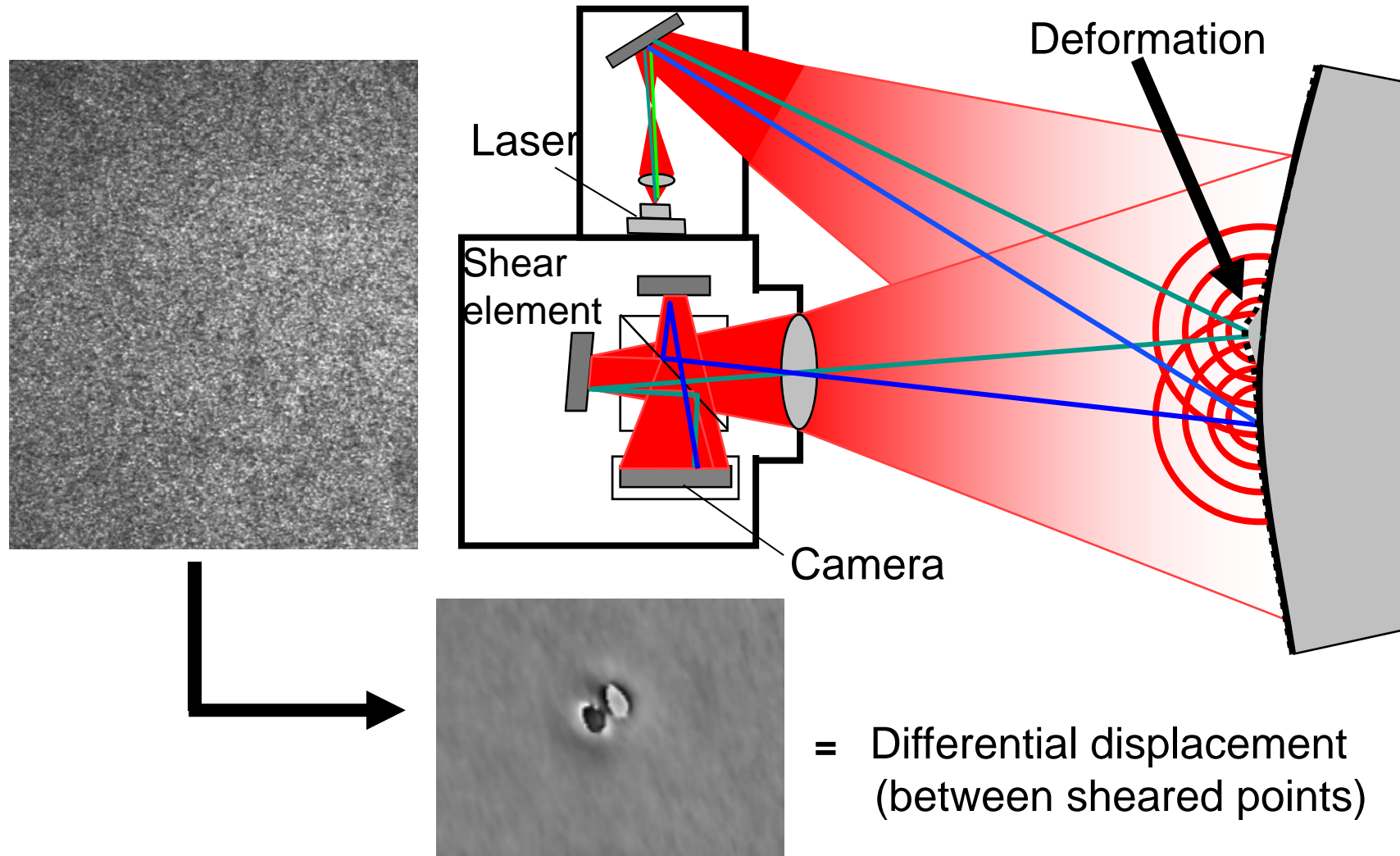
NDT inspection using Shearography

Non-Destructive Inspection With Shearography

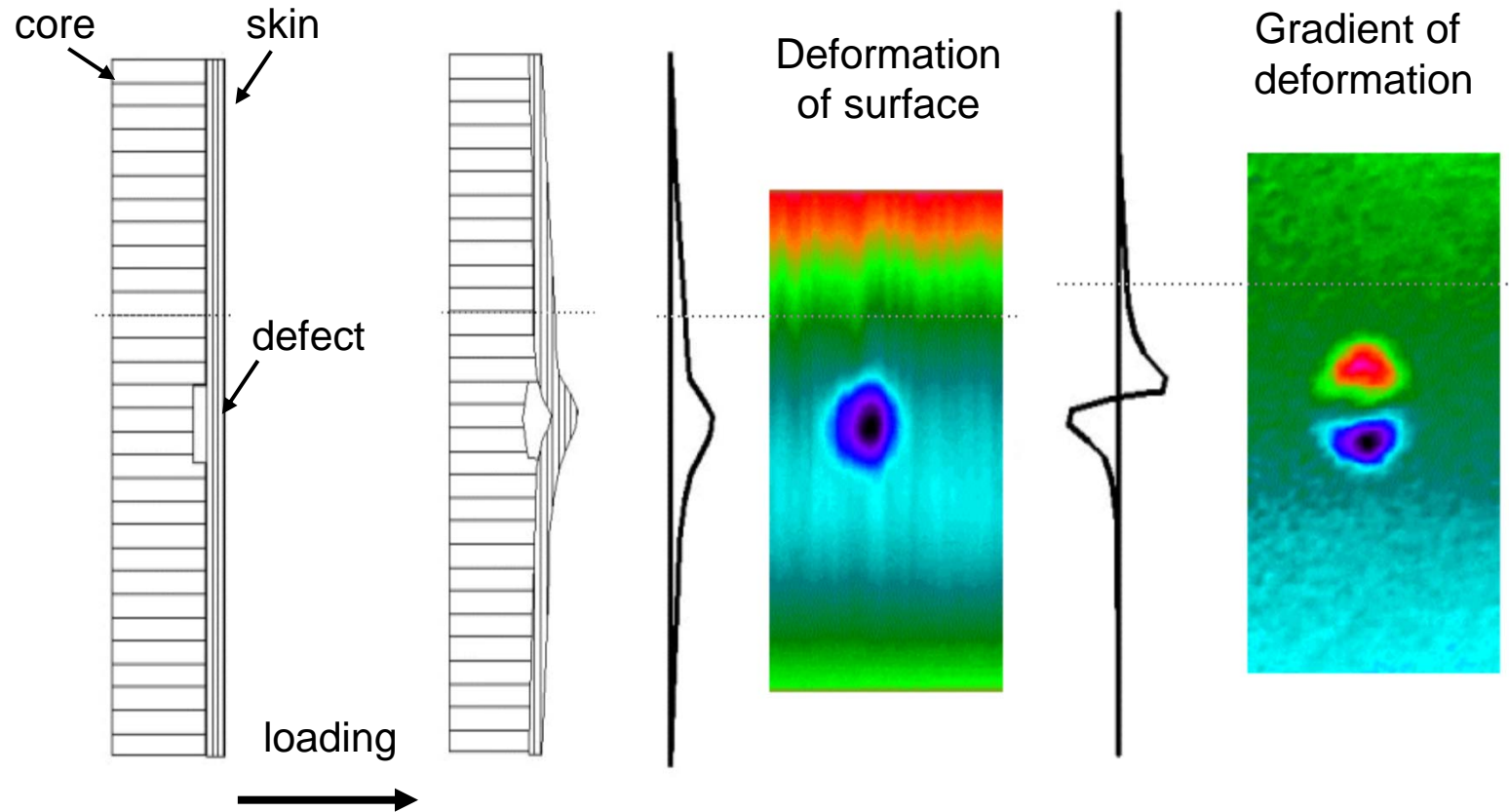
- Technique to identify defects in almost any material
- Slightest surface excitation leads to surface deformations from the internal flaws
- The shearography system can detect these very small deformations
- Full-field, non-contact technique



Principle of Shearographic Measurement

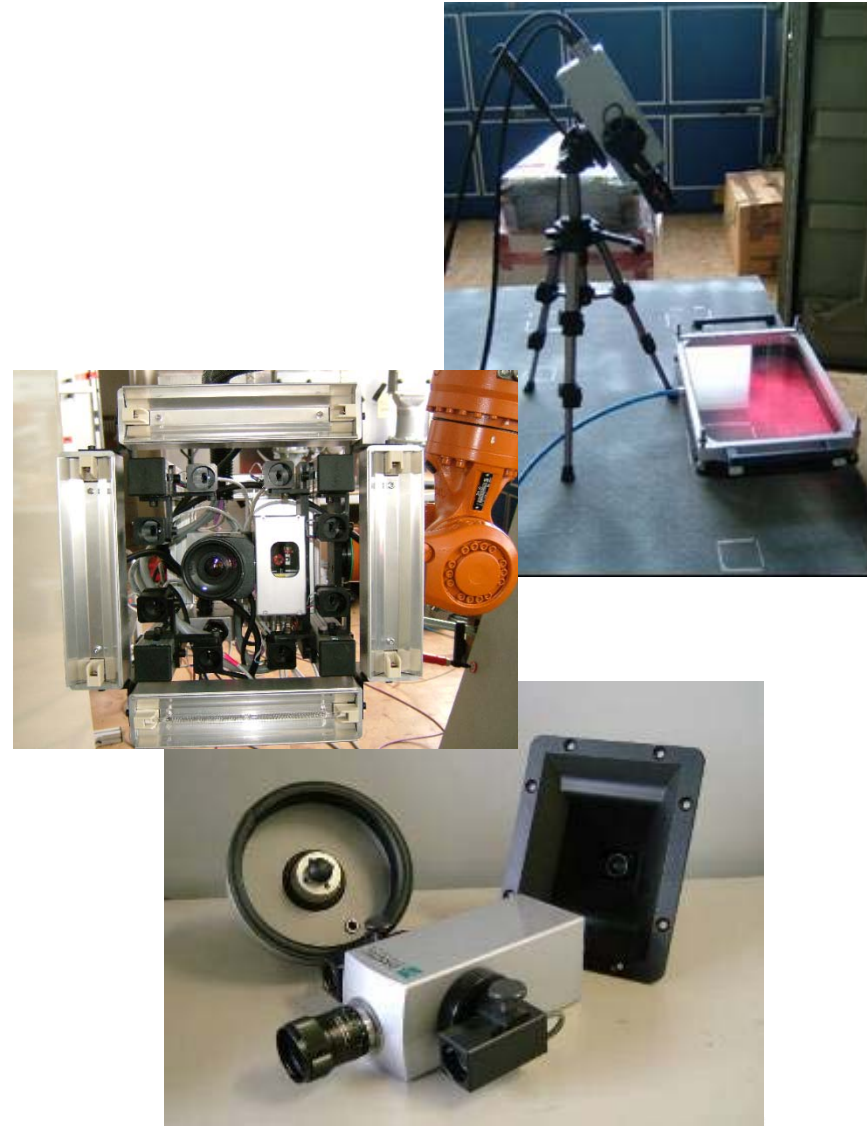


Typical Result



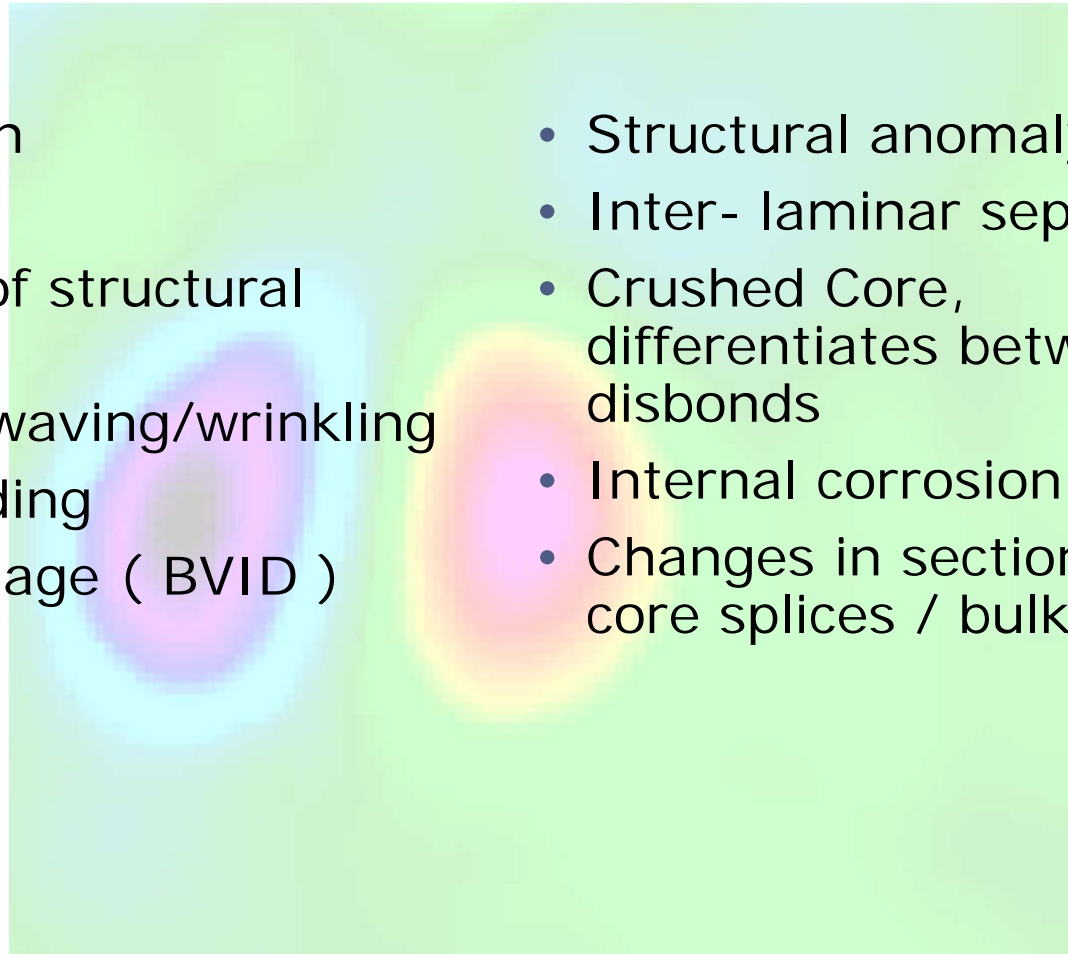
Loading

- Vacuum Loading
- Heat Loading
- Mechanical Loading
- Vibration Loading



Detectable Defects with Shearography

- Delamination
- Debonding
- Separation of structural components
- Undulation/waving/wrinkling
- Kissing bonding
- Impact Damage (BVID)
- Structural anomaly
- Inter- laminar separations
- Crushed Core, differentiates between disbonds
- Internal corrosion
- Changes in section and core splices / bulkheads



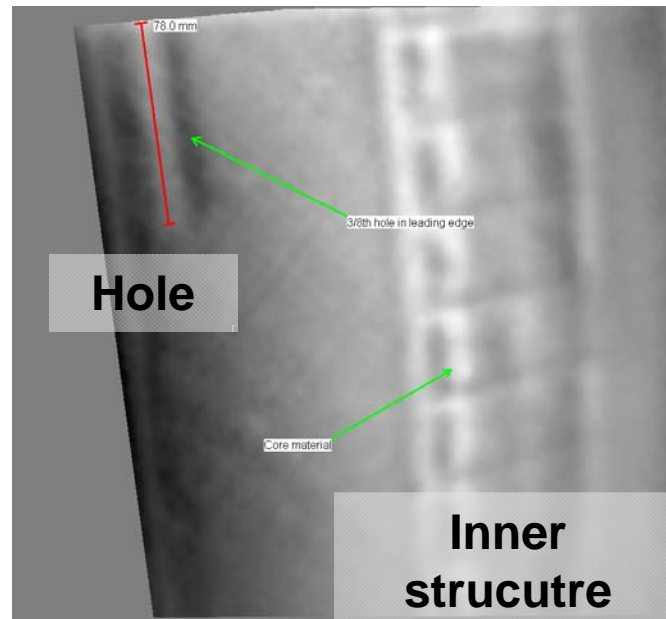
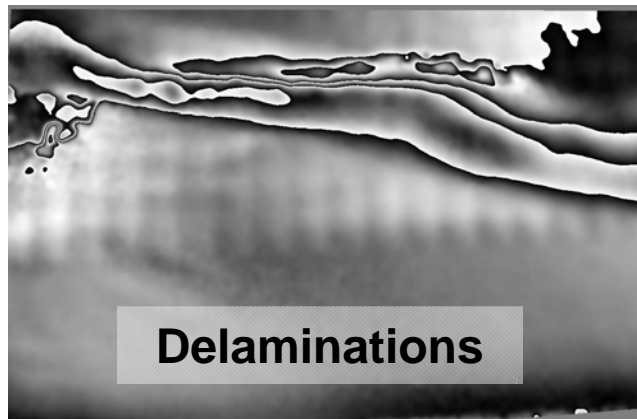
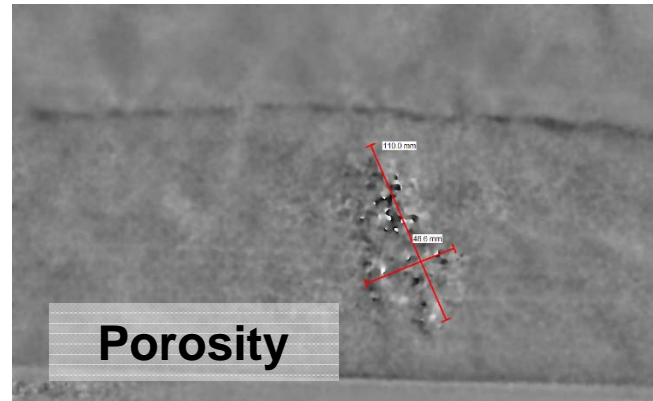
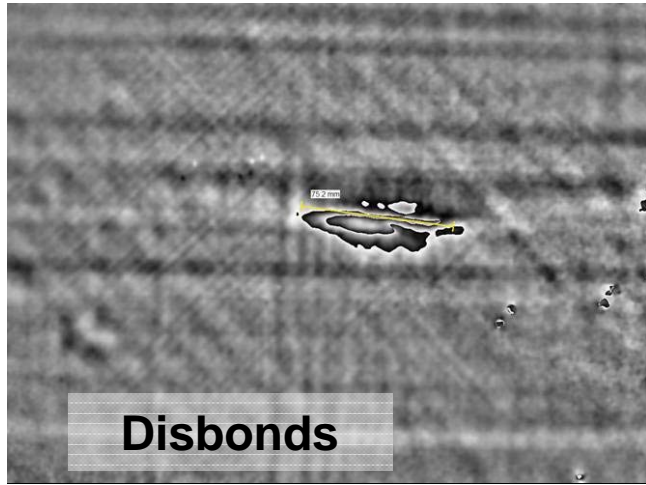
Standard Q-800 System

Q-800 Shearography Sensor for various applications in production or in-field

- Variable field-of-view
- Lightweight
- Compact design
- Any excitation method



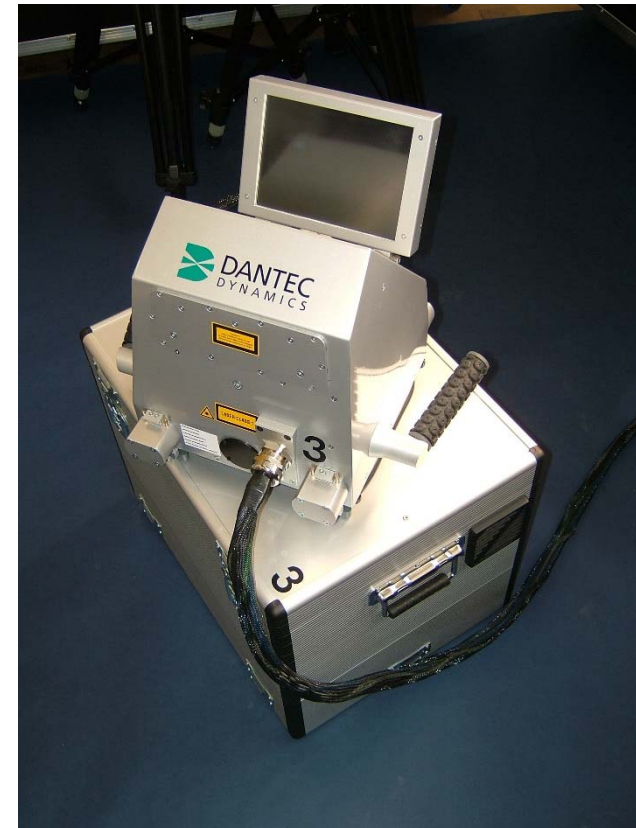
Examples of Defects



Q-810 Vacuum Hood System

Q-810 portable Shearography System for applications in production or in-Field Service

- Large area coverage (15sqm/hr)
- Hood mounted touch-screen monitor
- Thermal and vacuum loading
- Lightweight
- Long cable connection >20m



Shearography on Rotorblades

- High Speed inspection for large areas
- In Field Inspection Systems
- Wrinkling Detection



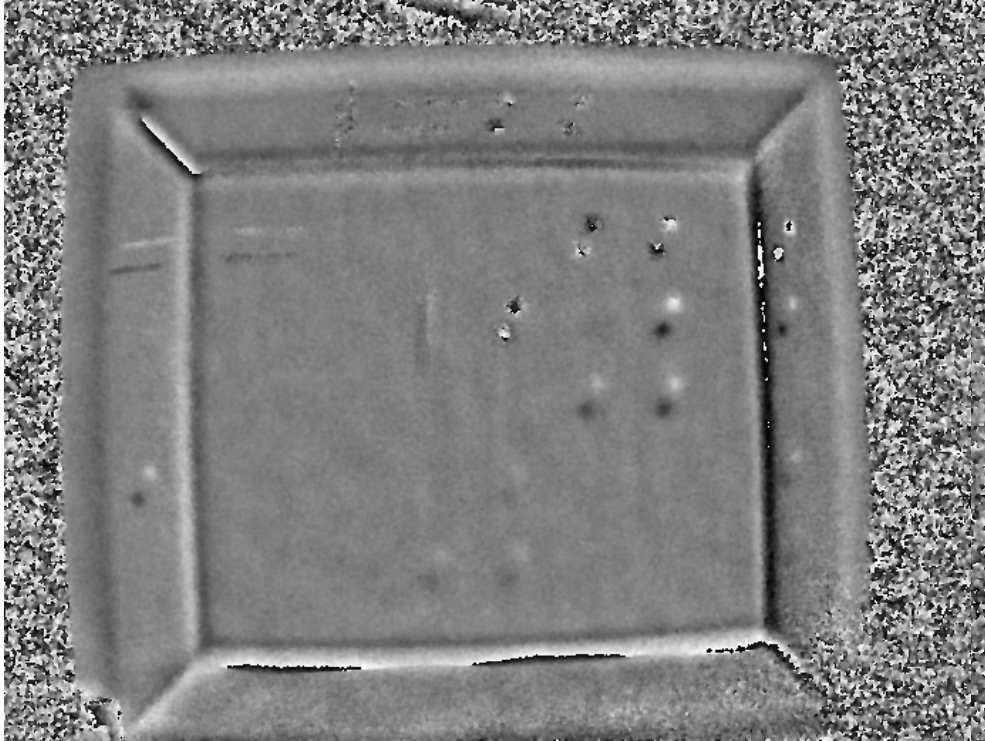
Customized Systems

Q-8xx customized
Shearography System
for applications in production or
in-Field Service

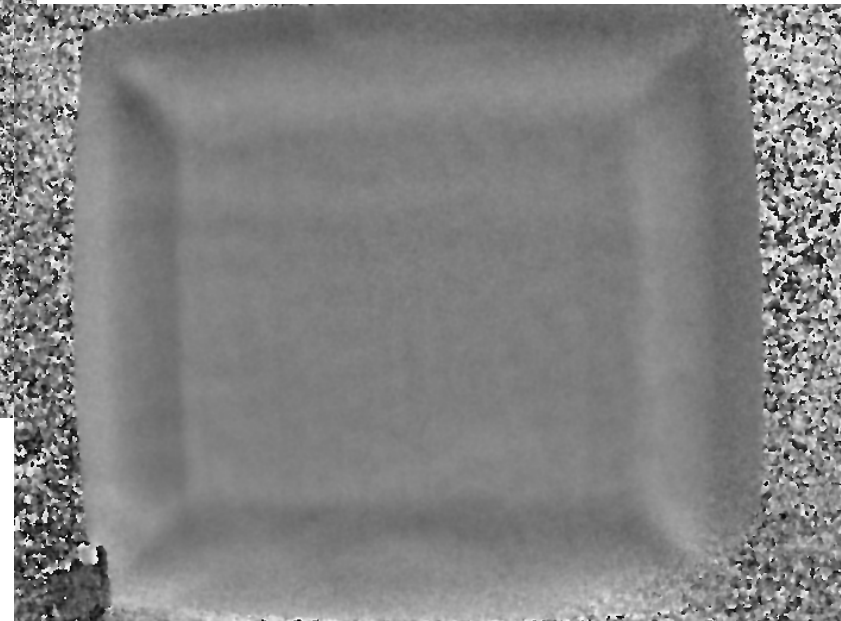
- Combination with robot
- Large objects with complex shape
- Combination with crawler for inspection inside
- Fully automated



Results



Part with
defects



Part without
defects



Standardization

Standardization actions

Standardization

EU founded projects

- Series of projects (SPOTS, ADVISE, VANESSA) on standardization of
 - optical techniques for full field strain measurement
 - validation of numerical simulations

Digital Image Correlation (DIC)

- Member of VDI committee for creating a DIC directive (Germany)
- DIC Challenge (world wide)

Shearography

- Member of DIN committee (DIN 54180-1, Germany)
- Member of ASNT committee (ASTM E2581-07, USA)
- Part of the industrial advisor board of VITCEA project (EU)