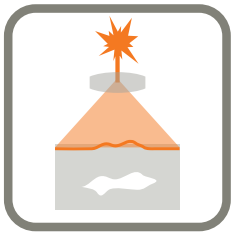
edevis®

SHEAROvis

Shearography / Vibrography
testing system

SHEAROvis



edevis®

OVERVIEW

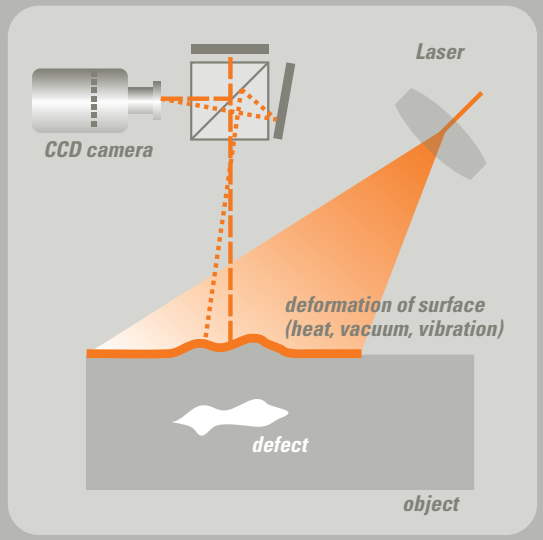
SHEAROvis –Shearography system for NDT and vibration analysis

Shearography is a non-destructive testing method for non-contact measurements of deformation and vibration. Especially aerospace and automotive components with sandwich structures can be inspected.

The sensor measures deformation - respectively strain - distributions revealing defects due to their different local mechanical behavior. Shearography is a highly sensitive method, so that only small loads are required. Excitations methods include thermal, mechanical, vacuum and vibration loading. Dynamic or ultrasound excitation by piezoshakers in combination with the vibrography modes are versatile and reliable especially for mobile in-service inspections. In particular, it is possible to detect delamination and debonding to the honeycomb or foam core even on the backside, where other methods such as ultrasound or thermography fail.

All SHEAROvis testing systems are modularly designed and can be upgraded with all other edevis excitation sources and software packages.

FUNCTIONALITY



Concept of Shearography for NDT applications

Shearography is an interferometric technique. It determines the relative phase differences of laser light which is scattered at different points of the object surface. Deformations of the surface change the light phase differences and can therefore be monitored. Although only the surface is measured, also deep-lying defect can be detected as long as they affect the deformation behavior of the component.

The deformation can be generated with different excitation methods:

- *Vibration excitation (piezoshakers)*
- *Thermal excitation (pulse and halogen lamps, laser, induction, high-power ultrasound)*
- *Mechanical excitation (vacuum chamber and hood, pressure, tensile test machine)*

Summary of Advantages:

- *High quality measurement: High resolution (5 MPixel), 10 nm light phase sensitivity*
- *Simplicity: Robust and reliable design, rapid operation*
- *Modularity: Modular design of system (sensor, laser, excitations sources, software)*
- *Applicability: Rapid and rigid mounting of sensor by vacuum tripod in various positions*
- *Transportation: System based either on Laptop and stormcase or workstation and 19" flight case*
- *Low maintenance and operational cost*

edevis®

SPECIFICATIONS

Sensor SE2

Interface:	*Digital sensor (via IEEE 1394) for timed phase shifting shearography*
Spatial resolution:	*5 Mega Pixel CCD with special binning filter for data reduction*
Lens system:	*Wide range of lens selection based on F-Mount (Nikon, Zeiss, Tamron, Sigma ...)*
Laser:	*Array of 5 modules with 100mW (each laser class 1), used in sets of 2, 4 or 6; stroboscopic illumination up to 50 kHz (100 kHz optional)*
Interference filter:	*High performance bandpass filter permits measurement at day light*
Dimension:	*Compact and robust aluminum housing: 116 x 68 x 58 mm (without lens)*
Adjustment:	*Manual shear vector control, remote setting optional*
Field of view:	*From < 10mm (with extension tube and long focal lens) to > 1m (image diagonal)*
Sensitivity:	*Standard derivation of phase reconstruction below ±10°, which corresponds to ±18 nm at 658 nm wavelength distance/shearing (+/-9 nm displacement or +/-9 nm per superposed pixel/ shearing)*

Excitation sources

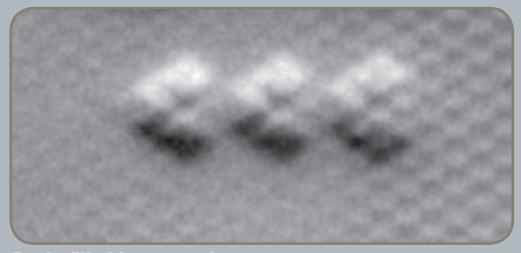
Dynamic excitation:	*+/- 100 V, 5 A, 50 kHz (100 kHz optional)* *Vacuum coupled piezoshakers*
Thermal excitation:	*2 kW halogen lamp* *6 kJ flash lamp* *250W laser* *10 kW induction generator, 4 kW ultrasound generator*
Vacuum excitation:	*Vacuum chamber (800 mbar pressure difference)* *Vacuum hood or frame with glass window (500 mbar pressure difference)* *Vacuum generation by stationary or mobile pumps or vacuum ejectors (using pressurized air)*

APPLICATIONS

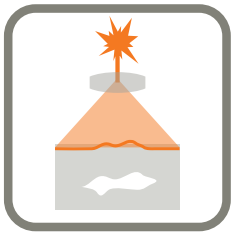
Materials/flaws

CFRP/GFRP:	*Delamination, impact, kissing bond, voids, cracks*
Sandwich:	*Debonding of honeycomb or foam core from cover (near and far side), debonding of inserts, resin- and water-filled honeycombs, cracks*
Adhesive joints:	*Interruption/narrowing of adhesive bead, kissing bonds*
Rubber:	*Air-bubbles (e.g. in tires)*
Stacked films:	*Air-pockets (e.g. in Li-Ion-batteries)*

Bonded and debonded insert (on the left / right) in aluminum honeycomb panel

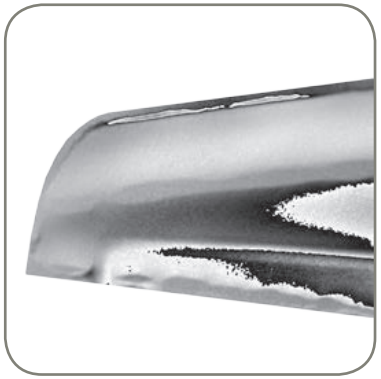


Resin-filled honeycombs in aluminum honeycomb panel

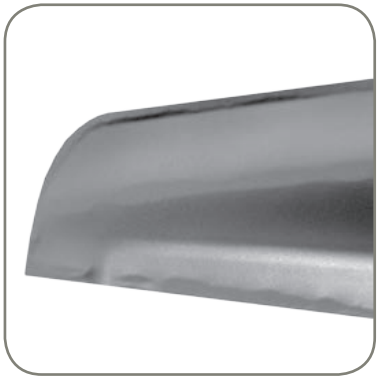


edevis®

Defects in bonding of spar, leading edge and trailing edge of GFRP-/foam-sandwich tailplane ...



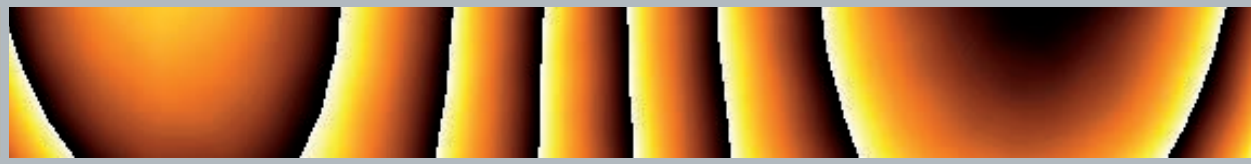
... wrapped shearogram



... unwrapped

... filtered

Impacts in CFRP stringer panel



edevis®

edevis GmbH
Handwerkstraße 55 · 70565 Stuttgart
Tel ++49 711 93 30 77-20 · info@edevis.de
www.edevis.de