MPP
AERO & INDUSTRIAL SOLUTIONS

afaq
EN/AS/JISQ 9100
Aéronautique
AFNOR CERTIFICATION

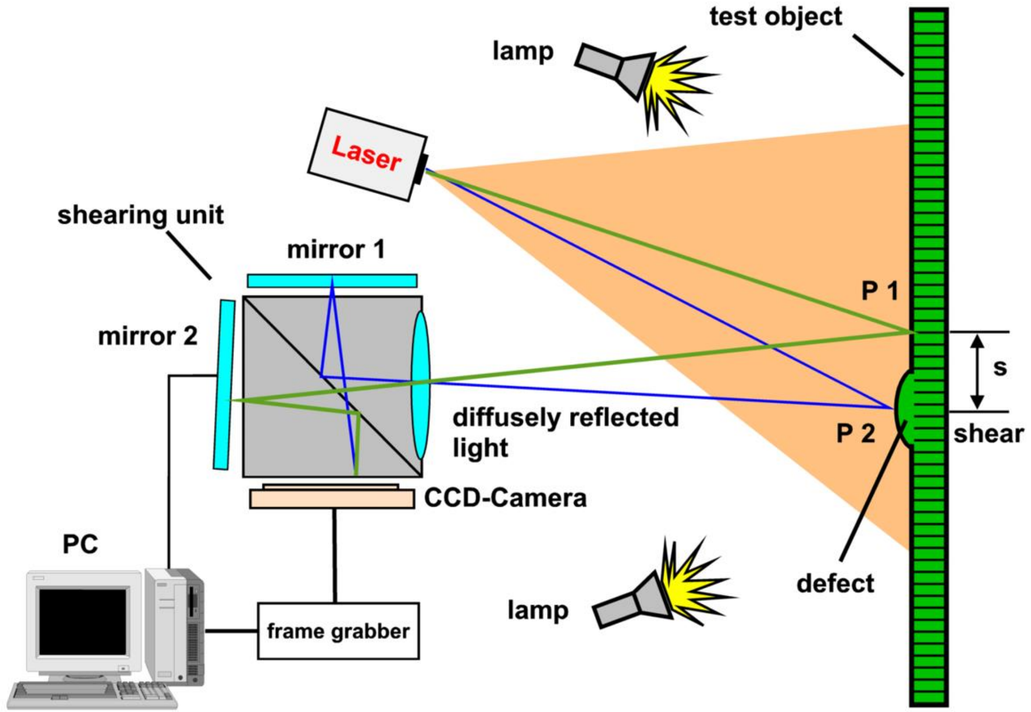
# Inspection par Shearographie

# Shearographic Testing

MPP NON DESTRUCTIVE TESTING
MPP NDT TRAINING & CERTIFICATION
MPP COMPOSITE MANUFACTURING
MPP NDT LEVEL II & III SERVICES
MPP DEBURRING - POLISHING

# Principle

Principle : Inspection by shearography consists of using a heat source or another mechanical solicitation that sends a wave or vibration which penetrates an object being inspected. This wave will interact with any discontinuity present in the object which creates a surface deformation (out of place displacement). This surface displacement is detected by the shearographic camera through the projection of a laser which forms a fringe image where defect creates a discontinuity in the fringes. The image interpretation must be done by a certified level 2 ST (Shearographic Testing inspector. The inspection technique must be validated by a level 3 ST.

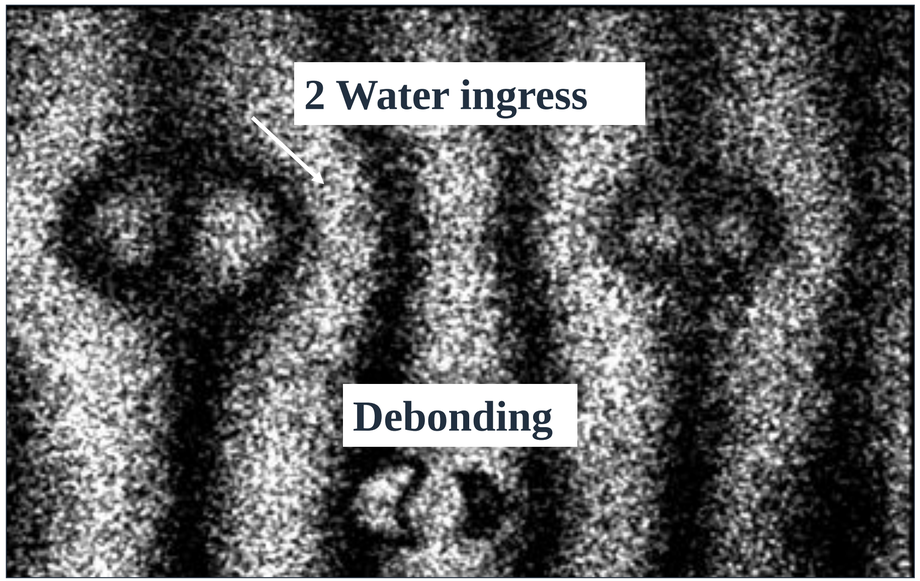


# Application

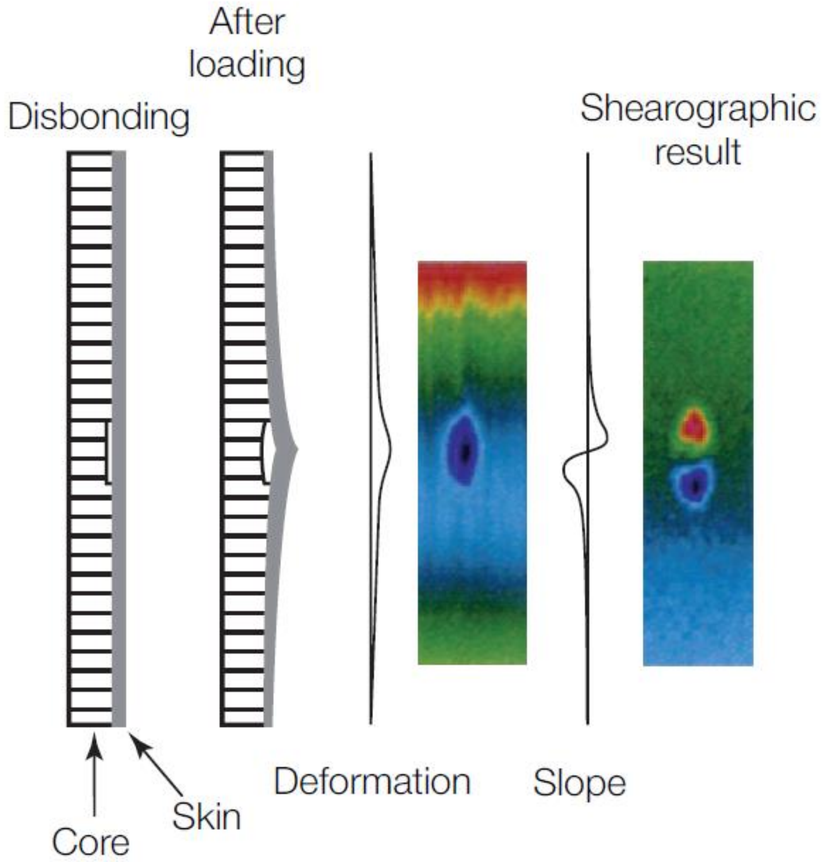
DEFECTS SEARCHED BY SHEAROGRAPHY:

Separation zones
Delamination
Porosity
disbond
Foreign body inclusions
Water infiltration into honeycomb

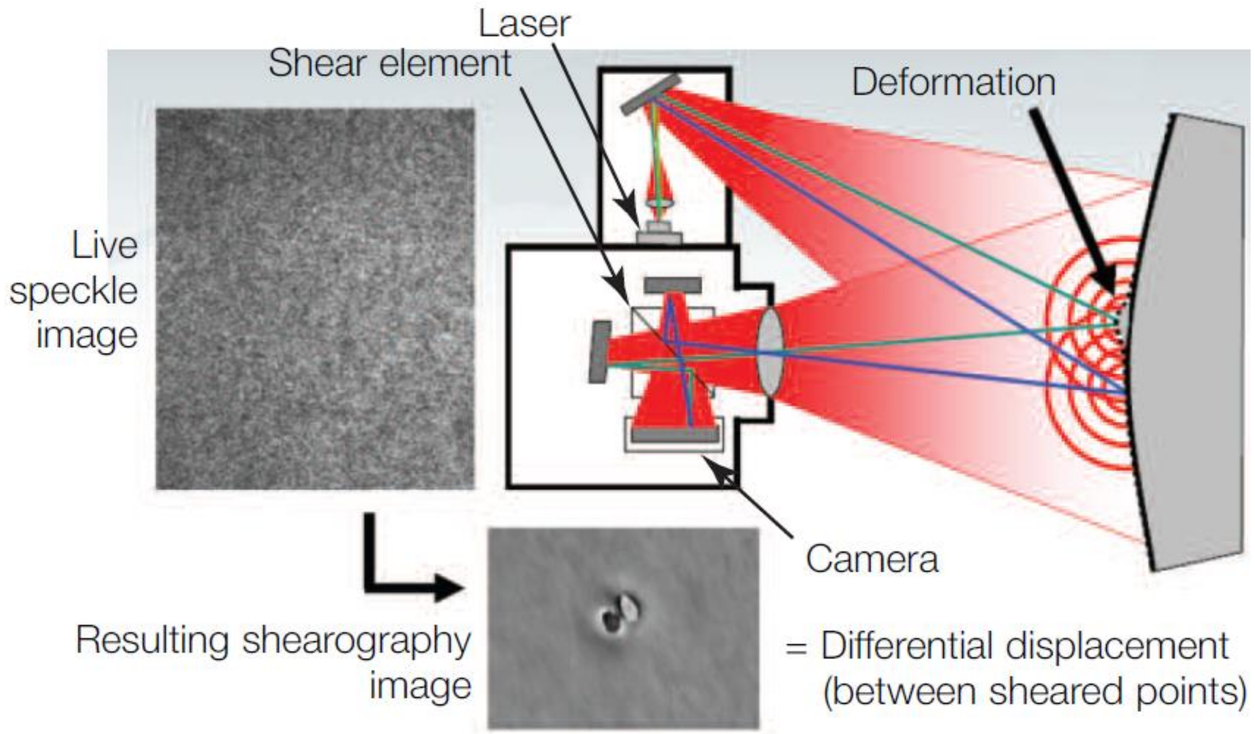
Shallow delamination in composite

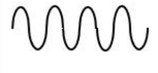
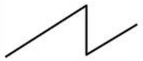


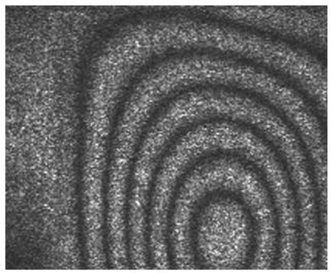

Disbond in honeycomb material



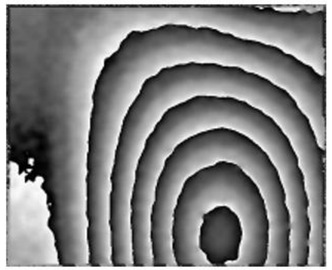
# Configuration

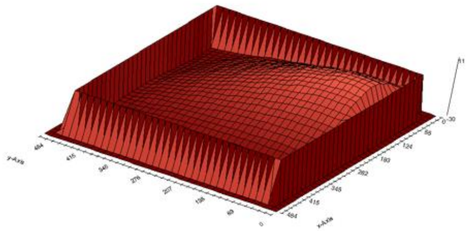



| | Images | Visualization of the results | | |
|---|---|---|---|---|
| Real-time interferometry | Intensity images | $\propto \sin\left(\frac{\Delta\varphi^{t\to t'}}{2\pi}\right)$ |  | Real-time |
| Phase-stepping interferometry | Phase images | $\Delta\varphi^{t\to t'}$ |  | ---------- |
| | Displacement images | $\Delta d^{t\to t'}$ |  | ---------- |



Real-time





Phase-stepping

Optical Setup for Laser Shearography inspection

Different output from shearographic images

# Equipment

**portable shearographic system from our partner Optrion in Belgium**

OPTRION
SHEAROGRAPHY NDT SYSTEMS

Non-Destructive Testing
for Composite Materials

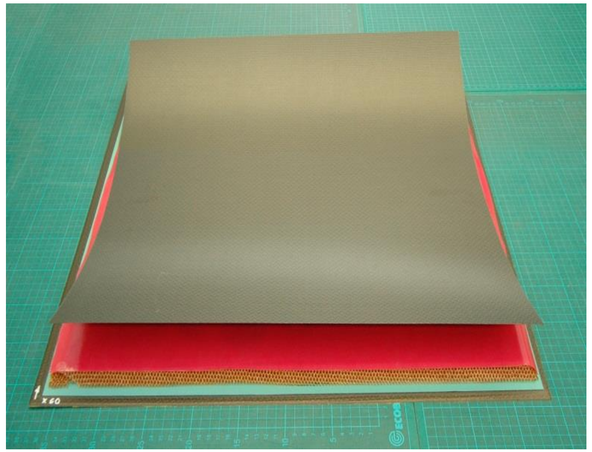

**Camera Specifications**

Dimensions (L x H x W): 300x150x105 mm
Weight: 5.2 kg (with IR)
Aircraft cabin compatible dimensions and weight
Light source: laser 200 mW SLM @ 532 nm (green) – Class 1M
CMOS Sensor: GiGE camera (H x V) 2464×2056 pixels – FOV 17° - 12 bit resolution
Thermal sensor: 640 x 480 px – 55 mK – 50 fps
Power: 85 – 264 VAC / 50-60 Hz 60W
Laser telemeter

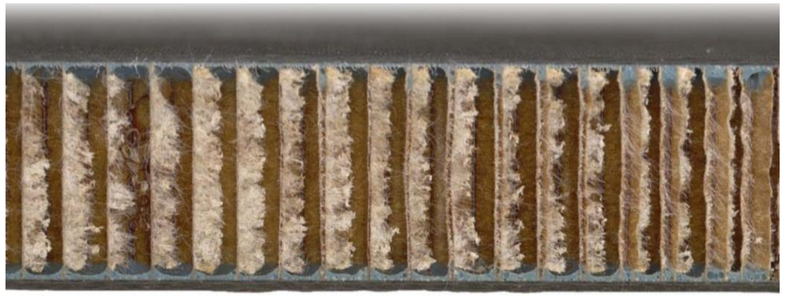
# Inspection

## Part inspected

## 2 carbon skins with honeycomb

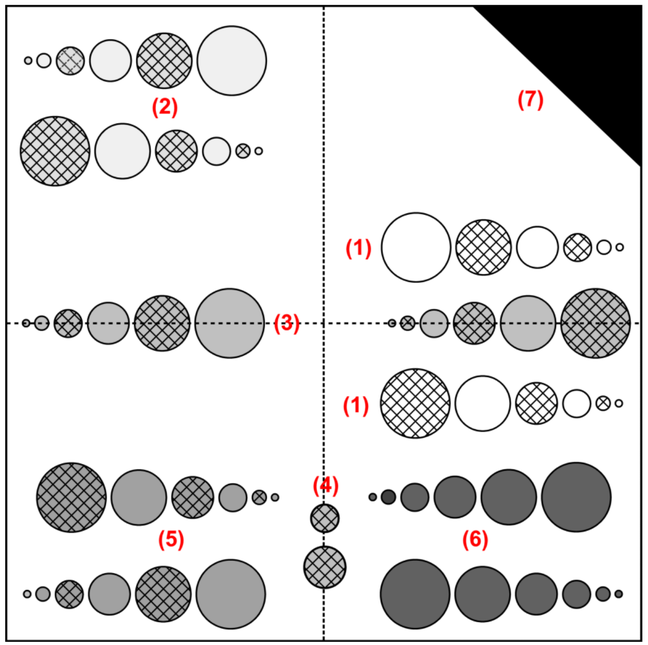


CFRP sandwich specimen; 50 x 50 cm

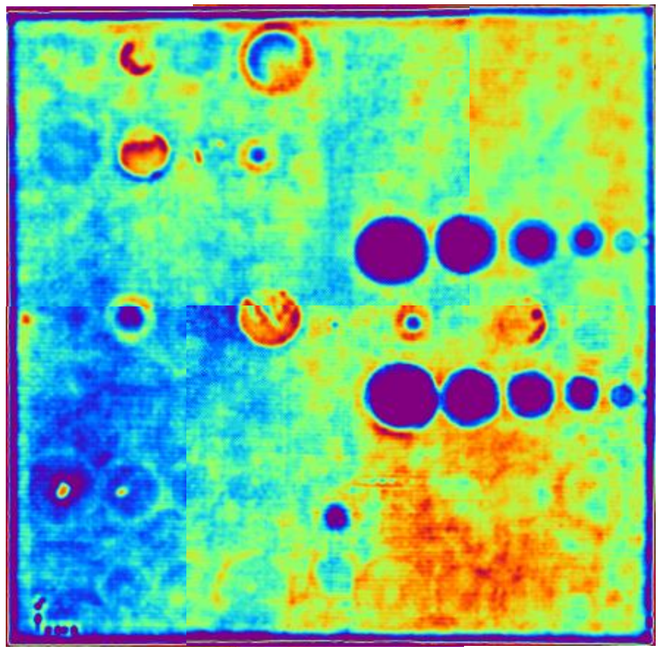


skin thickness: 1 mm
core thickness: 16 mm

## 4 x 1000 W Heat Pulse




## Shearographic result



# Capacité

| Method | Equipment / Techniques | STAFF |
|---|---|---|
| **RT**<br>**Radiographic Testing** | • Digital radiography (from 50KV – 320KV)<br>• Resolution from 50 µm – 200 µm | 2 RT Level1<br>2 RT level 2 and 1 RT3 |
| **UT**<br>**Ultrasonic Testing** | • Immersion Testing<br>• Thickness measurement<br>• Phased Array Pulse Echo | 1 UT level 1<br>2 UT level 2<br>1 UT level 3 |
| **PT**<br>**Penetrant Testing** | • Red Dye or Fluorescent penetrant<br>• Alkaline or Solvent Degreasing | 4 PT level 2<br>1 PT level 3 |
| **MT**<br>**Magnetic Particle Inspection** | • Hand yokes<br>• Stationary MT bench | 3 MT level 2<br>1 MT level 3 |
| **IRT**<br>**Infrared Thermography Testing** | • Hot air heater or 4 x 1000 W Halogen heaters<br>• IR Camera Flir T450sc | 2 IRT level 2<br>1 IRT level 3 |
| **ST**<br>**Shearographic Testing** | • Hot air heater or 4 x 1000 W Halogen heaters<br>• Optrion Digital Shearographic Camera | 1 ST level 1<br>1 ST level 3 |
| **ET**<br>**Eddy Current Testing** | • High and low Frequency Eddy Current Testing<br>• Rotating Probe ET | 2 ET level 2<br>1 ET level 3 |
| **VT**<br>**Visual Testing** | • Direct VT of welds, castings and composite parts<br>• Indirect VT (endoscopy and digital microscope 220x) | 1 VT level 2<br>1 VT level 3 |

# Contact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