



## ALTAIR LI

Infrared imaging software suite  
for lock-in thermography applications



- > Non-contact measurement
- > Lock-in thermography processing for Stress Analysis, Electronics and Non Destructive Evaluation
- > Fast determination of full field stress
- > Complex structures undergoing real loading
- > Versatile loading capabilities
- > Advanced Large motion displacement compensation
- > Fast measurement of fatigue limit
- > Temporal stress analysis

# Camera systems for non-contact imaging of stress in materials and structures

Based upon a high performance focal plane array camera and digital image processing software the ALTAIR LI system produces high quality images of stress field in materials and structures under dynamic loading conditions.

## Non-contact measurement technique

ALTAIR LI uses a SC5000 Series & SC7000 Series camera which provides thermal images of the scene at fast frame rate. The transformation of these thermal images into stress images is calculated in second by software, without any contact with the material surface.

## Full-field stress imaging in real time

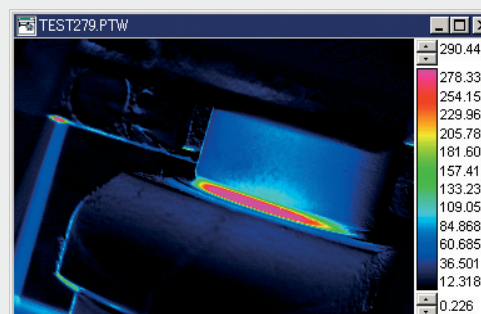
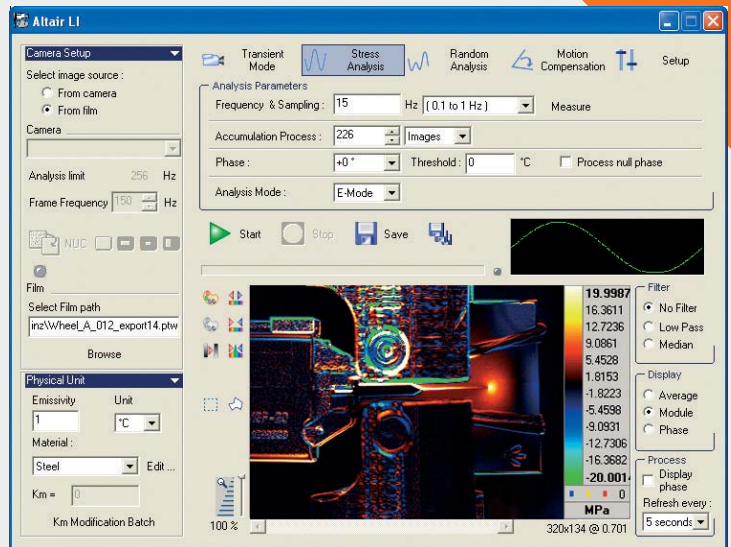
ALTAIR LI provides full field stress images in real time by using the thermoelastic effect which states there is a linear relationship between the temperature changes induced by loading and the stress at the material surface. The required thermal resolution to achieve a resolution of 1 MPa depends on the material properties, it is typically equal to 1 mK for steel and 2 mK for aluminium.

## Versatile loading capability even with large displacement

ALTAIR LI allows testing of structural components undertaking random, transient or dynamic loading. In some applications where there can be large displacement, a software feature is available to provide accurate motion compensation.

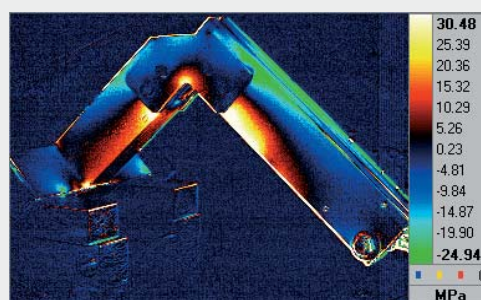
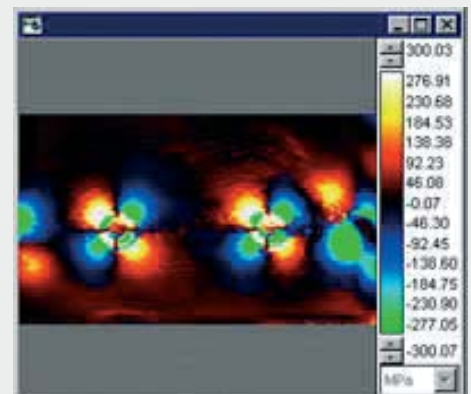
## Fast measurement of fatigue limit

The assessment of heat dissipation on a structure under dynamic loading can give information on the damage mechanism involved. The D-MODE, which is available with ALTAIR LI, allows measurement of the dissipated energy. A unique application of this technique is the fast determination of fatigue limit in engineering materials.



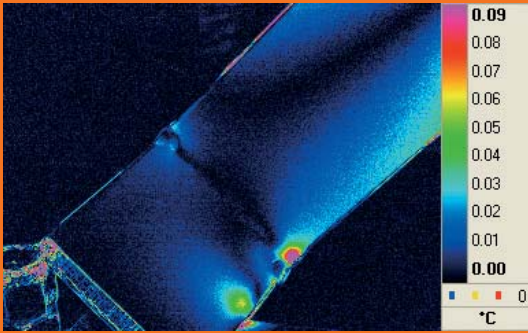
Non contact measurement technique

Provide full field stress images in real time



Accept any type of loading even with large displacement

# ALTAIR LI Advanced Features



## Random loading

Real structures are not only subject to harmonic or sine loading but also to real loading signals (including fully random multi axis signals) commonly known as random loading. The ALTAIR LI system is capable of analysing any type of loading, as a result of real time image correlation that processes the incoming thermal images.

## Transient loading

The transient analysis mode allows producing a stress maps a single load shock by recording and processing the thermal behaviour of the structure induced by the shock.

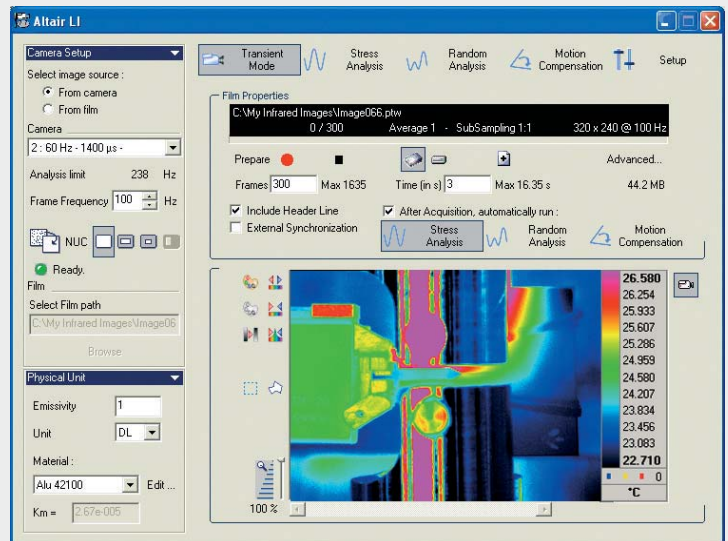
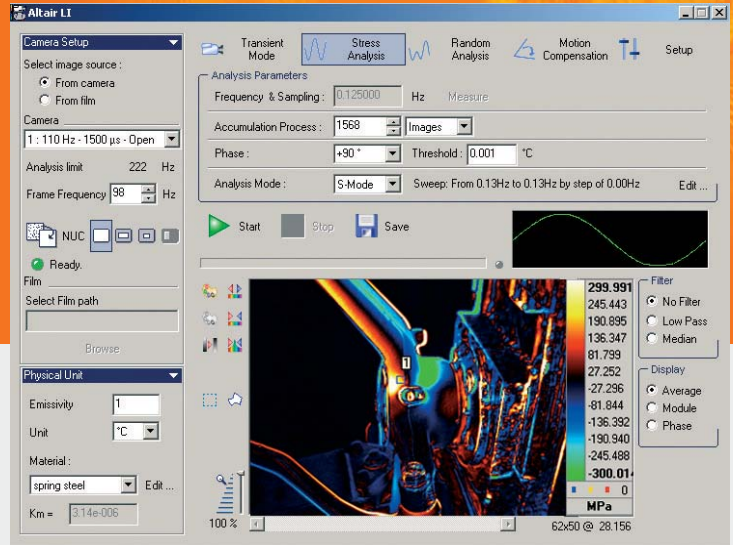
## Dissipated energy measurement

The assessment of heat dissipation on a structure under dynamic loading can give information on the damage mechanism involved. The D-MODE, which is available with ALTAIR LI, allows measurement of the dissipated energy.

## Motion compensation

When dealing with real structures, the relative motion of parts can create artefact images. To eliminate these unwanted ghost images, Cedip has developed proprietary software for motion compensation with sub-pixel accuracy.

This software allows correction of any displacement within the image plane (in 2D mode), allowing you to achieve a perfect measurement.



## A wide range of applications

Application	Typical use
Automotive Industry	Stress measurement Finite Element Analysis comparison Fatigue limit measurement High temperature stress measurement High concentration stress area detection Transient loading
Aerospace & aeronautics	Stress measurement Crack detection during fatigue testing High frequency loading Fracture mechanics
Research centers	Thermo-mechanical studies Dissipated energy measurement Material damage Dislocation analysis
Non-destructive testing	Composite materials Thermal materials
Electronics	Solar cell Quality control on memory chip
Steel industry	Material evaluation Tensile textile Fast loading



# ALTAIR LI is compatible with SC5000 Series & SC7000 Series cameras

## System

Lock-In electronic	Real Time correlator 0-10V ; 2x+/-5V 3 input signals 80-240VAC input power Portable with SC7000 Series cameras
Software	ALTAIR LI Database of most widely used engineering materials Sine mode Random mode Advanced Large Motion compensation mode Transient mode Temporal stress analysis
Computer	Operating system Windows XP

## Stress Measurement

Range	+/- 2000 MPa
Resolution	0.4 MPa on aluminium
Analysis Frequency	0.1Hz to 20000Hz Sine mode Random mode
Motion compensation	Full field by software / Random & Sine
Transient loading	By software from fast frame rate analysis
Dissipation analysis	By software from sine loading
Spatial resolution	Down to 10 µm
Data output	Absolute temperature up to 1500 °C Amplitude of temperature, phase Data field with stress components, sum of principal stress, comparable stress
Measuring area	327 000 measurement points from mm <sup>2</sup> to m <sup>2</sup>
Spectrum	1 Hz to 20 kHz for stress analysis 0.005 Hz to 5 Hz for Non Destructive Testing
Record module	Recording up to 3 external analogue signals (e. g. force, temperature, pressure, etc.)



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