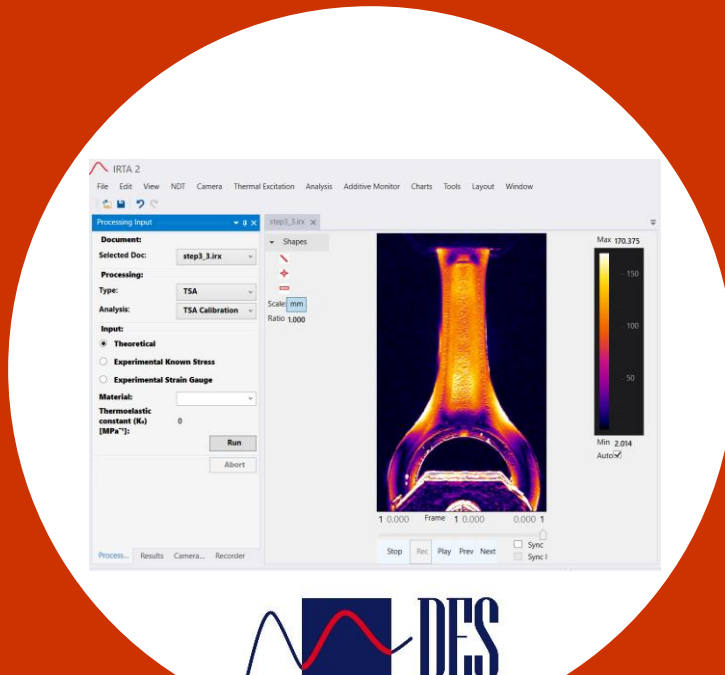


IRTA2 - TSA module

Infrared Testing and Analysis



Topic of interest

The thermoelastic effect concerns all materials subjected to external mechanical loads.

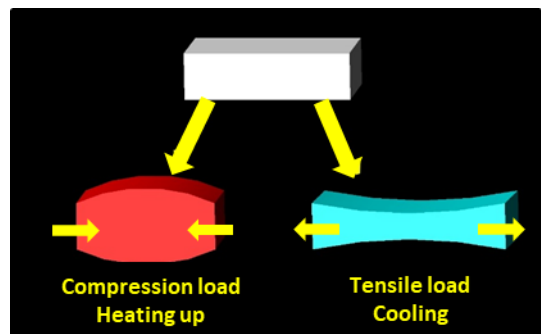
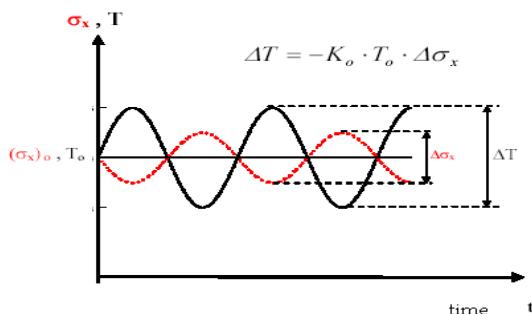
The relative temperature variation allows to:

- Measure the surface stress state of a mechanical component.
- Evaluate the damage status of a component / material.
- Quickly assess the fatigue limit of materials / components.
- Validate FEM models.
- Monitor full scale components subjected to actual load conditions.

TSA - THERMOELASTIC STRESS ANALYSIS

The Thermoelastic Stress Analysis is based on the thermoelastic effect, namely the temperature change that occurs in a solid when subjected to stress in the elastic field.

This technique allows to reconstruct the stress state from the temperature changes. The result is displayed in a colour map.



IRTA2 - TSA module

The infrared sensor of the IR camera detects the heat flux emitted by the surface of a component subjected to the load and returns a signal related to the level of superficial stress.

IRTA2 software allows to manage the IR camera acquisition, process the thermal signal, and display the stress and damage maps of the component.

IRTA2 software main FEATURES are the following:

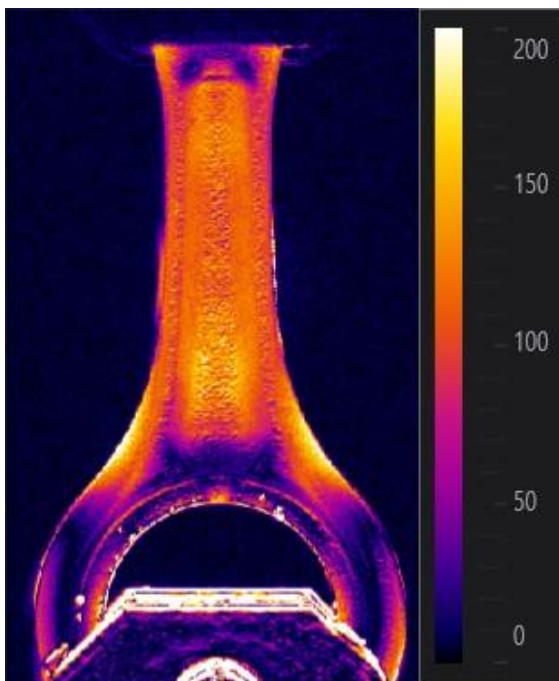
- Reference signal not required

It is not necessary to have a reference signal to obtain the stress maps. However, it is possible to acquire and use the reference signal.

- Fatigue Damage Characterization (Output Types)

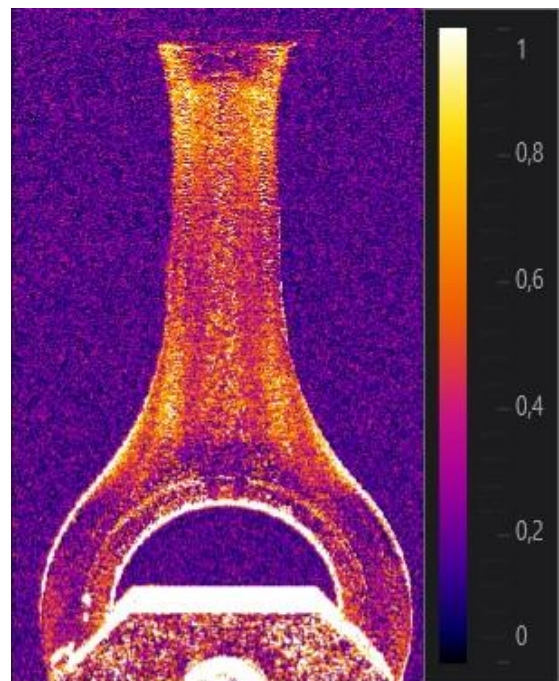
The built-in algorithm allows to obtain multiple and synergistic information from a single thermographic sequence by analysing the thermal response at different frequencies. The signal at the same loading frequency provides information on the stress and damage, while the signal at twice the frequency gives information on the damage-related dissipative behaviour.

Stress Map



MPa

Damage Map



Signal Unit

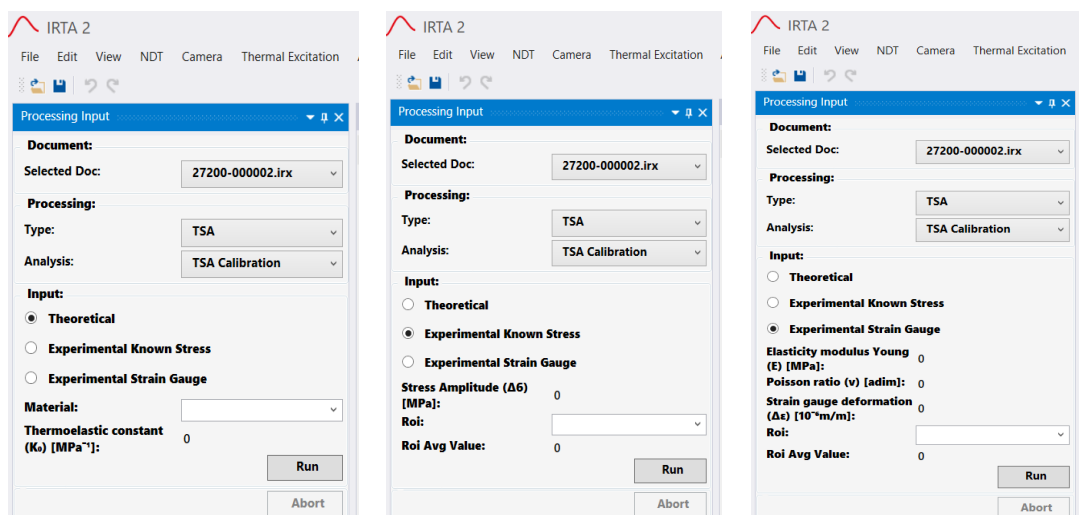
IRTA2 - TSA module

- Thermoelastic calibration (theoretical and experimental)

To evaluate the stress, the signal calibration is required.

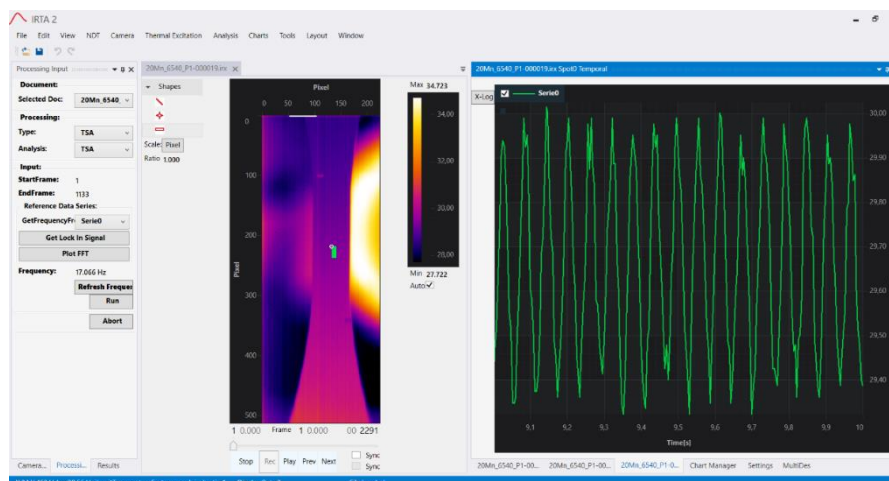
Theoretical calibration: Calculation of the thermoelastic constant through the manual insertion of the thermo-physical parameters of the material or through the material selection from the preloaded library.

Experimental calibration: Calculation of the thermoelastic constant by experimental evaluation using samples of the same material with known stress or strain value corresponding to the measured signal.



- Stress map with ramp load

Compared to the sinusoidal characteristic load, the ramp type load requires a simpler management and hardware configuration. With **IRTA2** it is possible to obtain an accurate stress map from a ramp type load tensile test.



IRTA2 - TSA module

- Acquisition frequency

There is no software capture limit, the maximum capture rate depends on the IR camera used.

- Compatibility with TeledyneFLIR SC-series IR cameras

Ax5, A3xx, and A6xx Series

A400-A700 Series science kit

AX8

ETS320

Cx Series

Ex and Exx Series

T4xx, T5xx, T6xx, and T1xxx Series

SC6100, SC6200, SC6700, SC6800, SC8200, and SC8300 Series

RS67xx, RS83xx, and RS85xx Series

A62xx, A67xx, and A85xx Series

X68xx, X69xx, and X85xx Series

