Zwick / Roell

Intelligent Testing

Digital Image Correlation With videoXtens und laserXtens

Coloured Mapping Of Strain And Deformation

testXpo 2016

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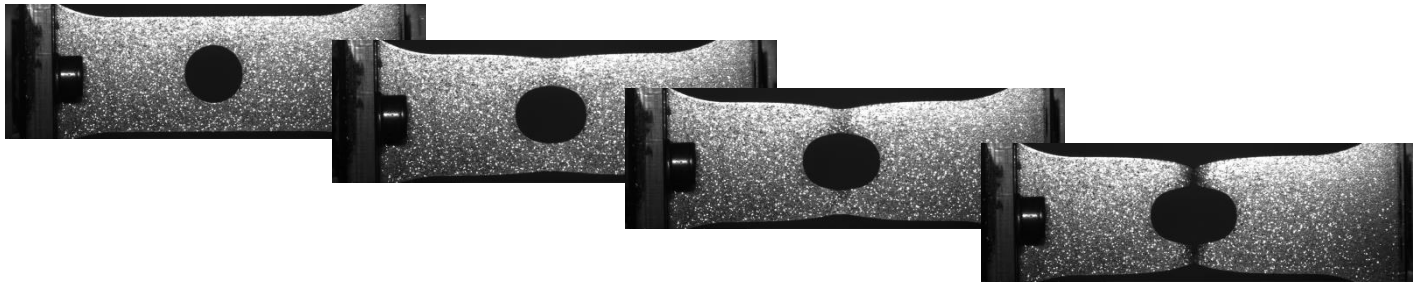
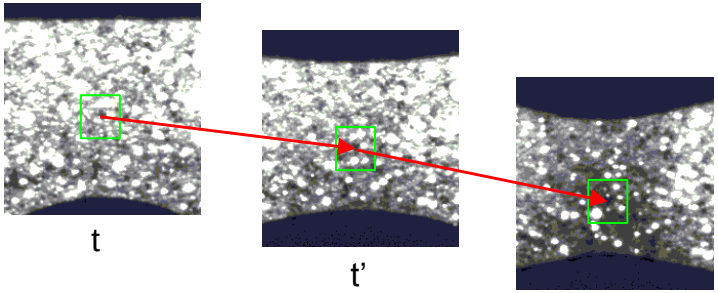
What is Digital Image Correlation?

- Digital Image Correlation (short: DIC) is an optical non-contacting method to measure deformations on the surface of a specimen.
- During loading a digital camera captures a series of images of a specimen which has been marked with fine-grained pattern.

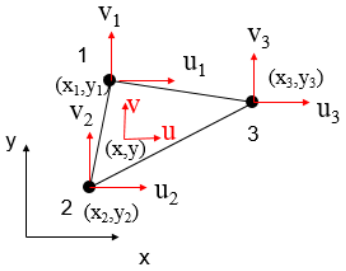


- Image by image the X- and Y-displacements of small regions (“facets”) are obtained by a so-called correlation algorithm.

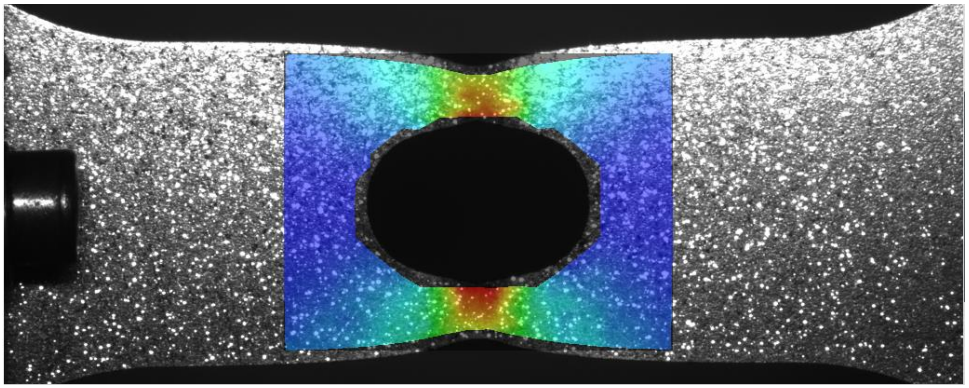


How are strain maps generated?

- Local strains εx, εy, εxy are calculated by means of displacement values of a multitude of facets by means of Constant Strain Triangles (simple finite 2D-element).



- That way strain values can be calculated for each and every pixel and a colour values assigned to them.



A short outlook

- DIC has „come of age“ during the last few years and is fast becoming an important and versatile tool in the field of destructive materials testing.

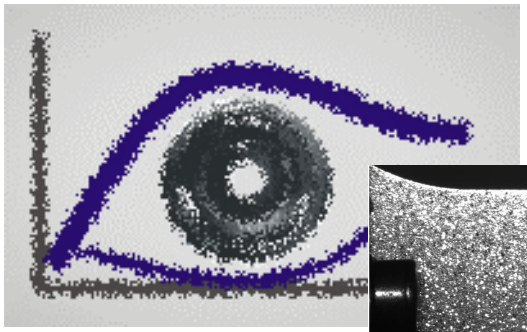
- DIC has not yet found it‘s way into international standards. But ASTM is working on developing or amending it‘s standard for calibration and classification of DIC systems – focussing on 2D-applications.

- 2D-systems cover approx. 80% of all uni- and biaxial tensile, compression or flexural

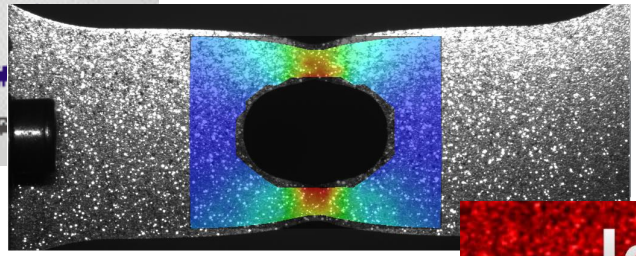
DIC with videoXtens and laserXtens

New feature for videoXtens and laserXtens

Easy to use



Test Rerun



laserXtens

Higher resolution
with Array systems

Online

Without marking
with laserXtens

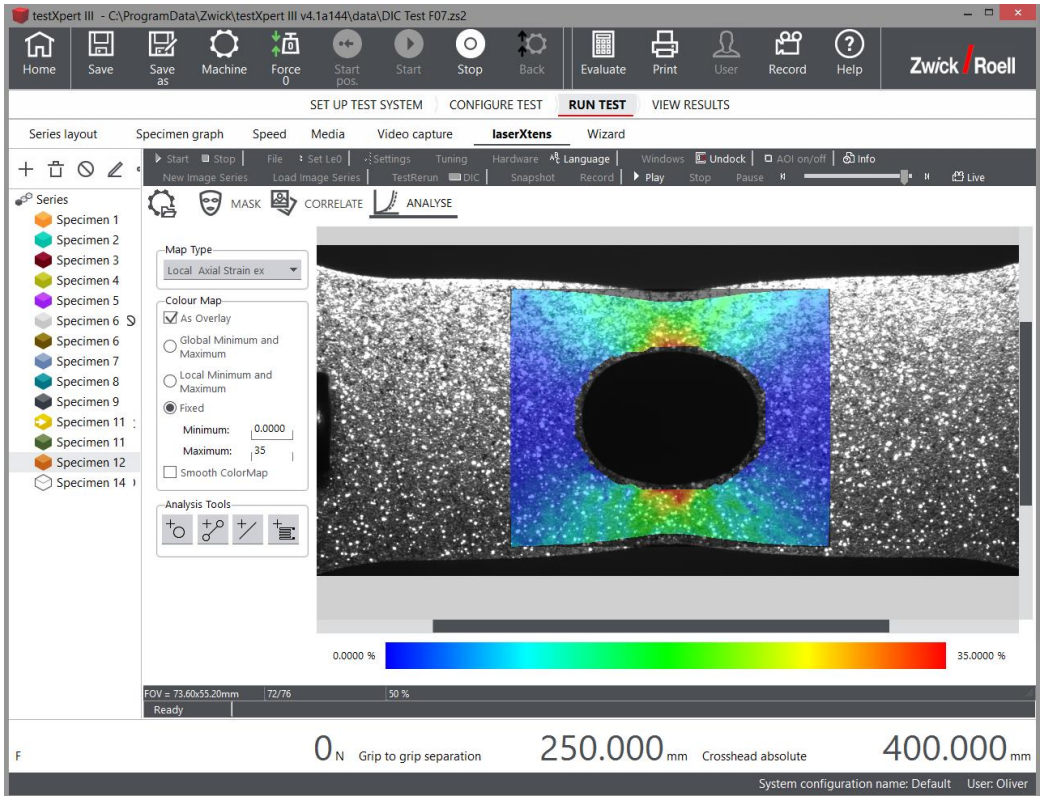
Ease of use: Utilizing existing hardware

- No time-consuming positioning of tripods, illumination units, setting-up and calibration of cameras necessary
- The measuring heads of videoXtens und laserXtens are rigidly mounted to the test frame, optimized for the application and always ready for DIC.

DIC with videoXtens and laserXtens

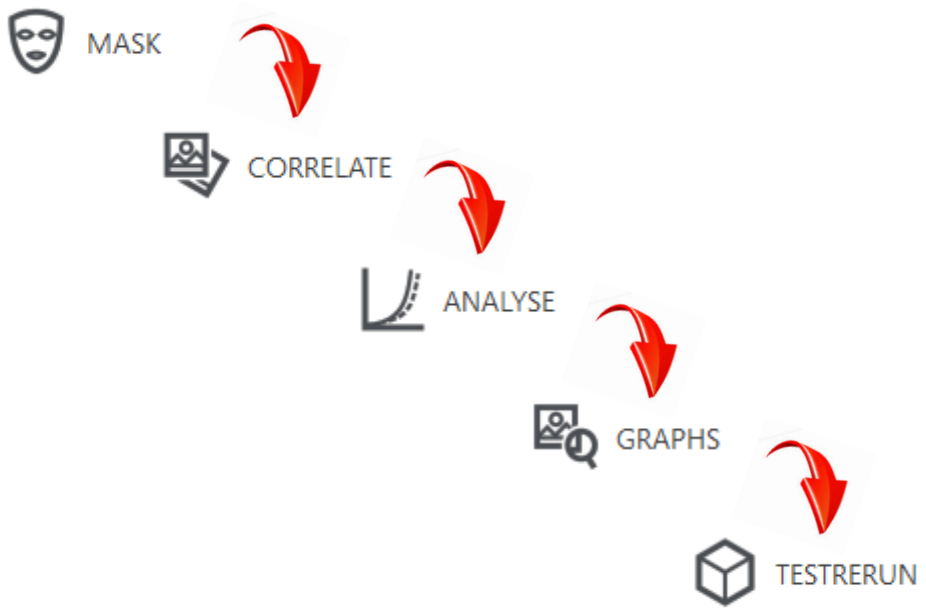
Ease of use: Fully integrated into testXpert III

- Only one single programme to operate
- Starting a test also triggers the capturing of images
- Images and readings are perfectly synchronized
- Data, images and parameters are managed by testXpert.



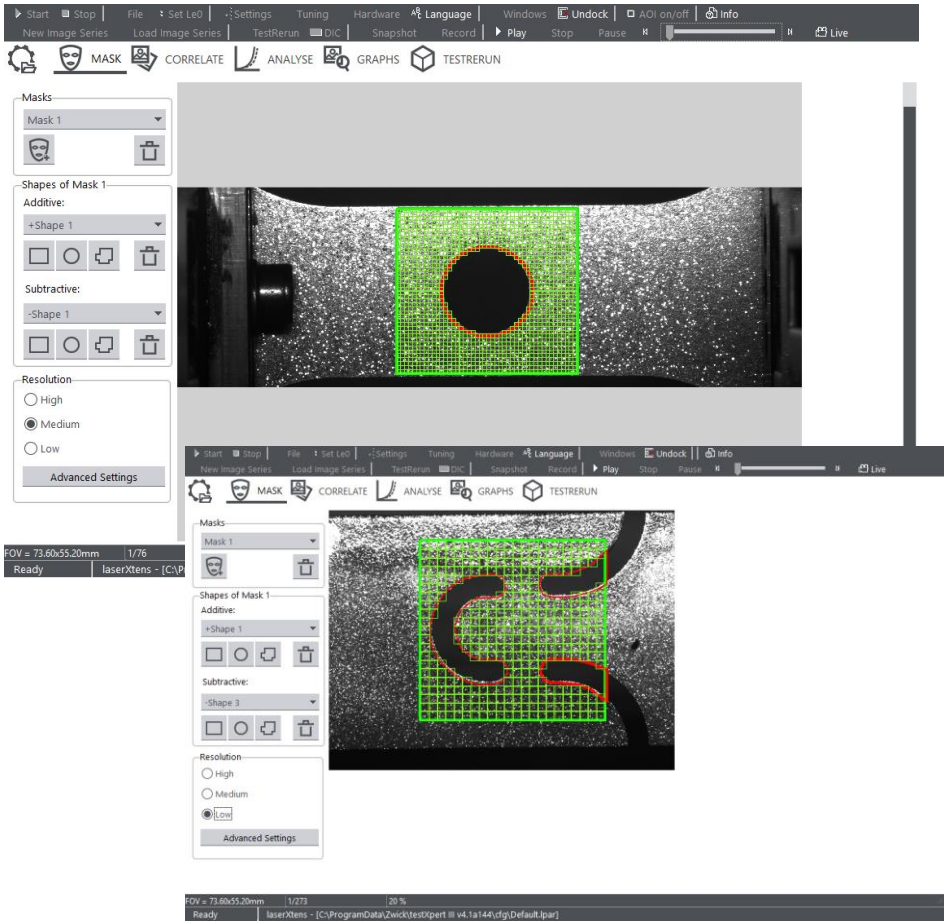
Ease of use User guidance by workflow

- Easy to use, step-by-step operation
- In a few steps from start to finish
- Clearly arranged, intuitive
- Avoids operating errors



Masks – regions of interest

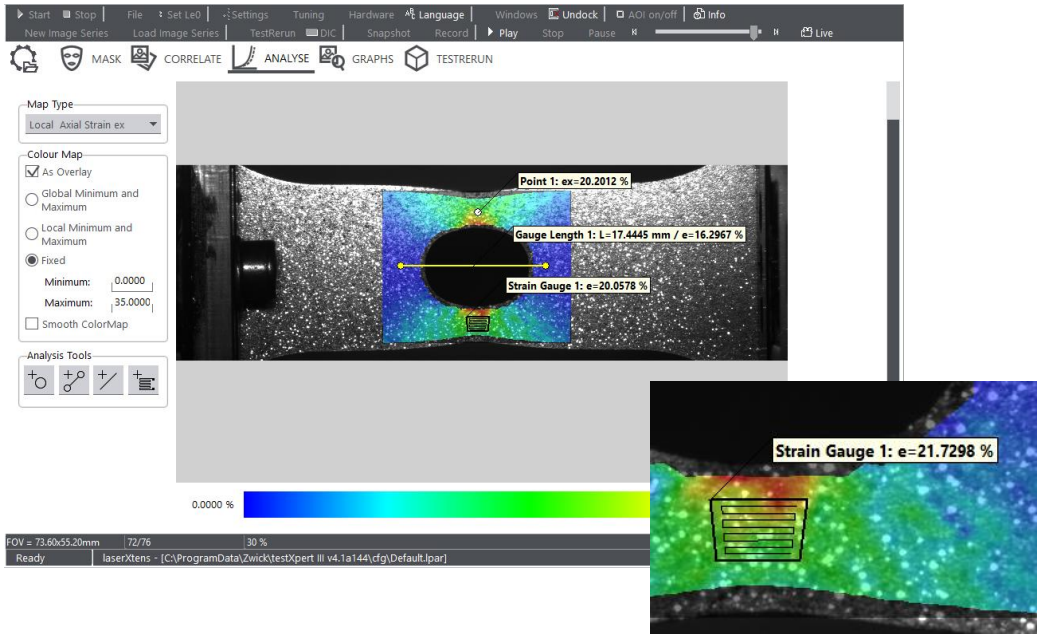
- Masks define the regions of the image to be analysed
- One or several masks
- Simple to complex
- Definition of accuracy by varying the size of the facets.

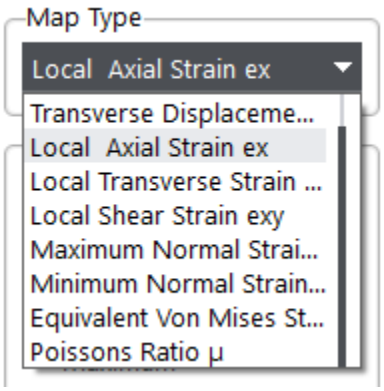


DIC with videoXtens and laserXtens

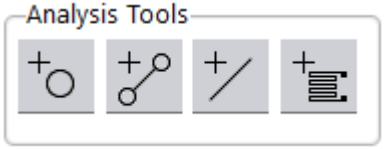
Analyse

- Display and configuration of various strain maps
  - Axial and transverse displacements
  - Axiale and transverse local strains
  - Shear strains
  - Maximum and minimum normal strains
  - Equivalent Von Mises strains
  - Poisson’s ratio





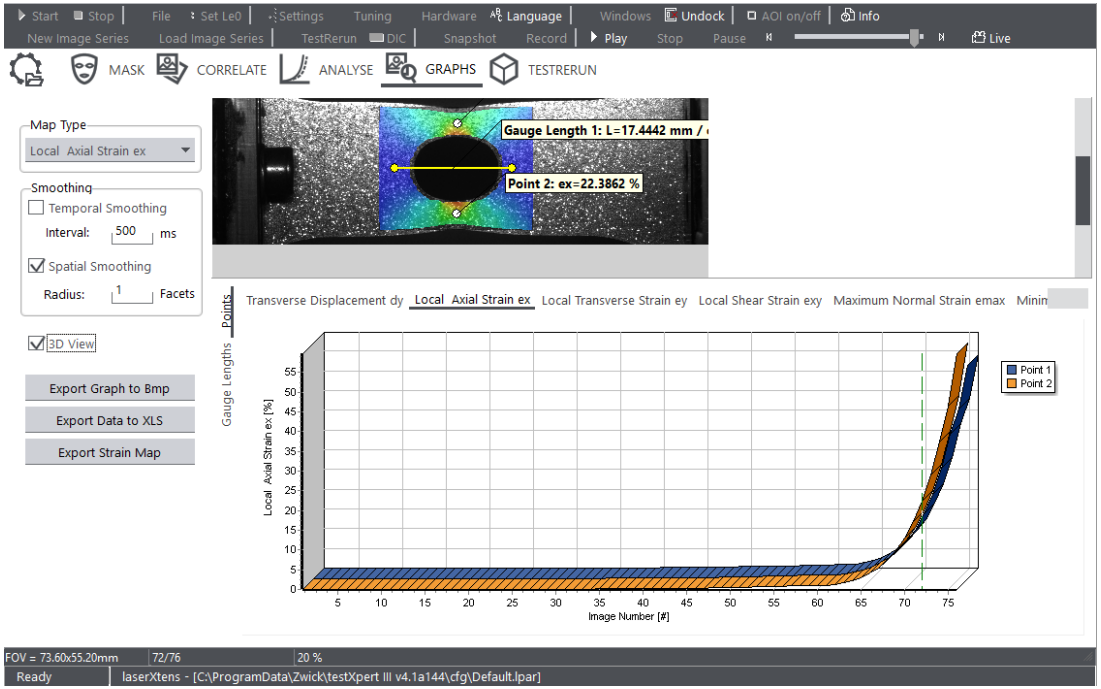
- Creation of analysis tools
  - Points
  - Gauge lengths
  - Cutting lines
  - „virtual“ strain gauges



DIC with videoXtens and laserXtens

Graphs

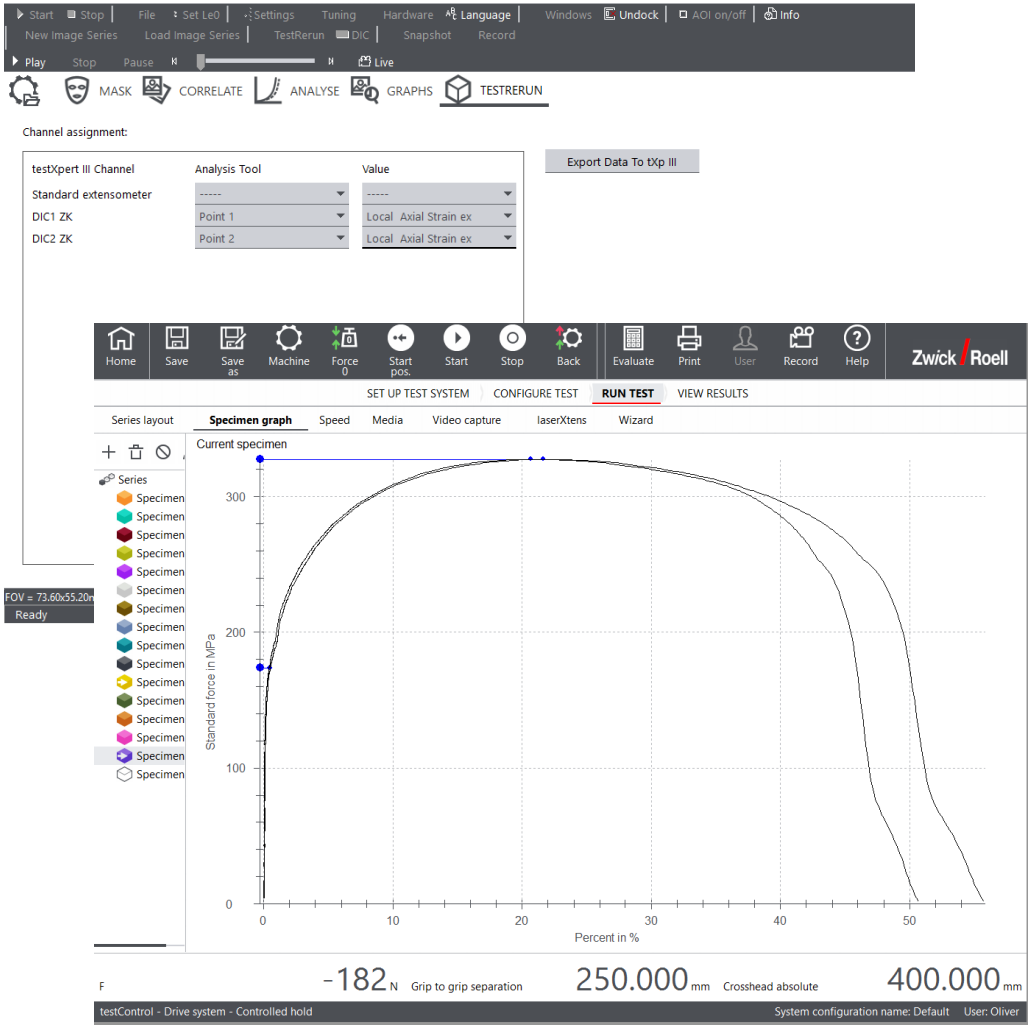
- Selection of various graphs for each analysis tool.
- Export functions
  - Graph to Bitmap
  - Graph to Excel-Table
  - Strainmap to Bitmap



DIC with videoXtens and laserXtens

Test Rerun

- Assignment of DIC readings to testXpert III channels
- Creation and evaluation of a “new” specimen based on those DIC readings



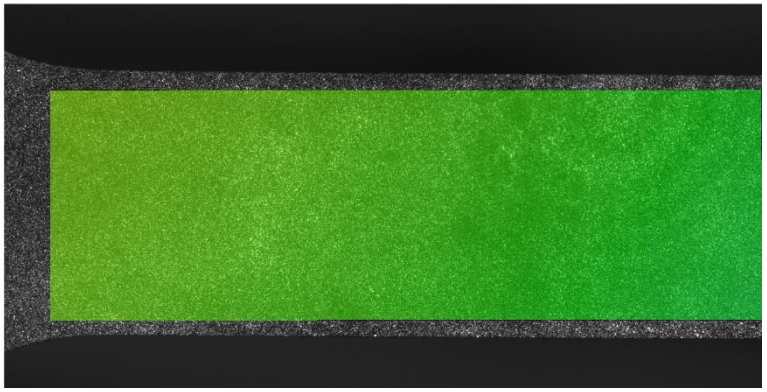
DIC with videoXtens and laserXtens

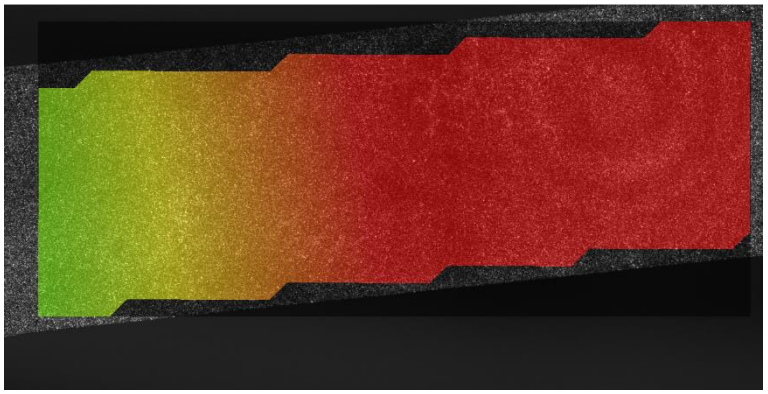
Online DIC

- Online DIC provides a preview of strainmaps already during testing.

- Visualization of material behaviour and also of misalignment.

- Low resolution in online-mode, higher resolution in postprocessing mode due CPU capacity.



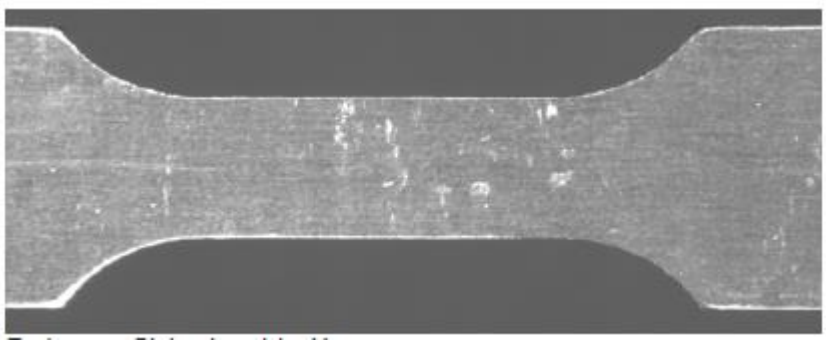


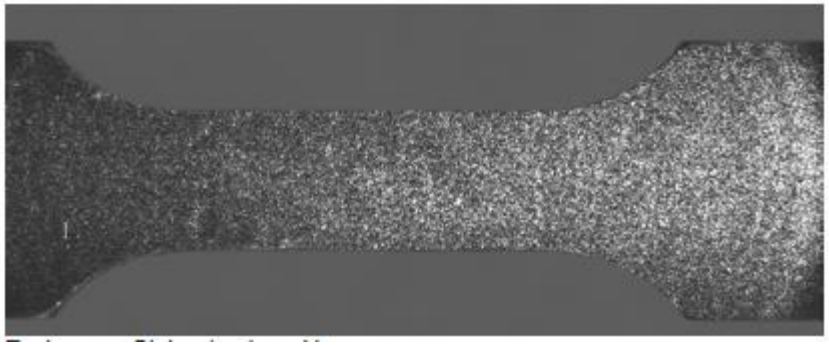
DIC with Array-Systems

- videoXtens Array and laserXtens Array use multiple cameras to increase resolution. The images of these cameras are „stitched“ together to obtain a big, high resolution image of the specimen
- This advantage also applies to DIC! This increases resolution several times.

DIC with laserXtens – NO MORE MARKING THE SPECIMEN!

- In most cases a fine-grained pattern has to be applied to the specimen‘s surface (e.g. by spraying or stamping)
- With the laserXtens the laser light „marks“ the specimen with a speckle pattern.
- No specimen preparation, no influence on the specimen whatsoever





Thank you!