

... from development to
implementation



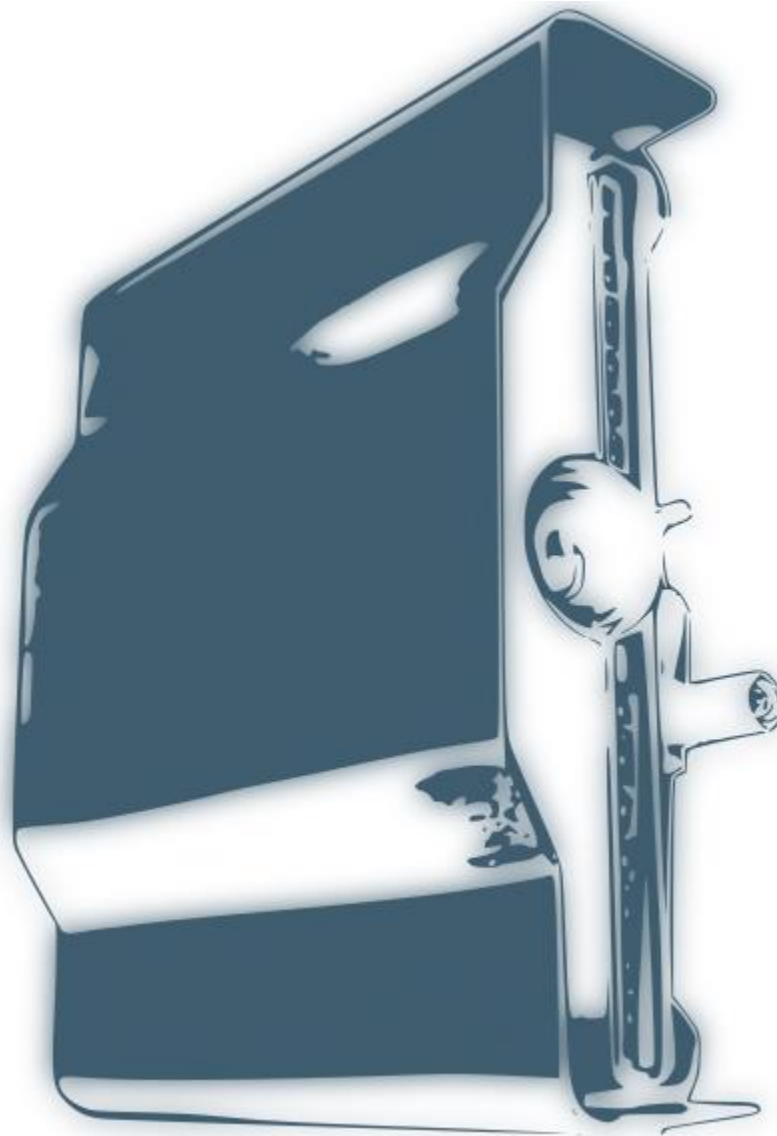
Production of materials testing equipment and automation

Video Extensometer, working on principle Digital Image Correlation

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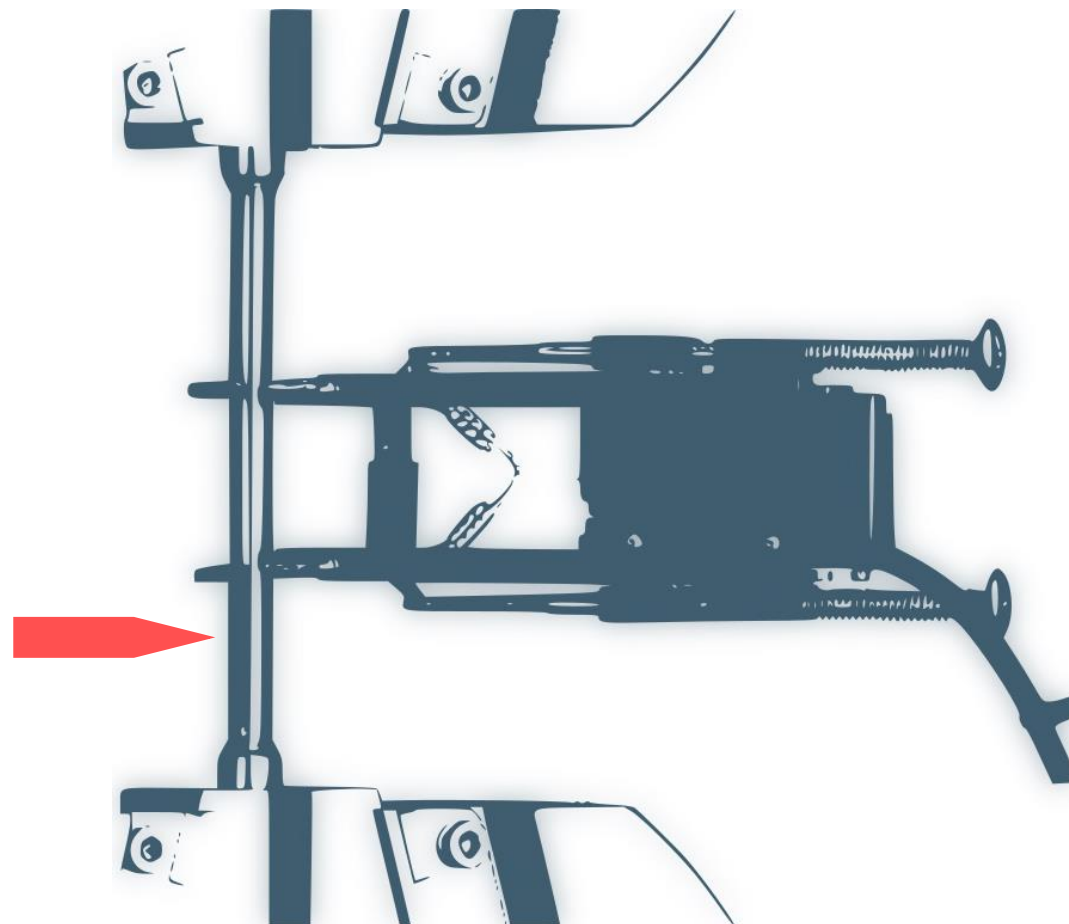


**Why should I prefer
the video system
than a conventional
method?**

The function of conventional methods has been tested for years of use in practice. However, users in modern laboratories have to some extent encountered the limits of these devices and require advanced features.

Such features that help reduce the number of invalid tests caused by sample failure outside of the measured area and help increase the reporting value of each test.

Here is the possibility of automatic neck detection and more point measurement of our optical method.



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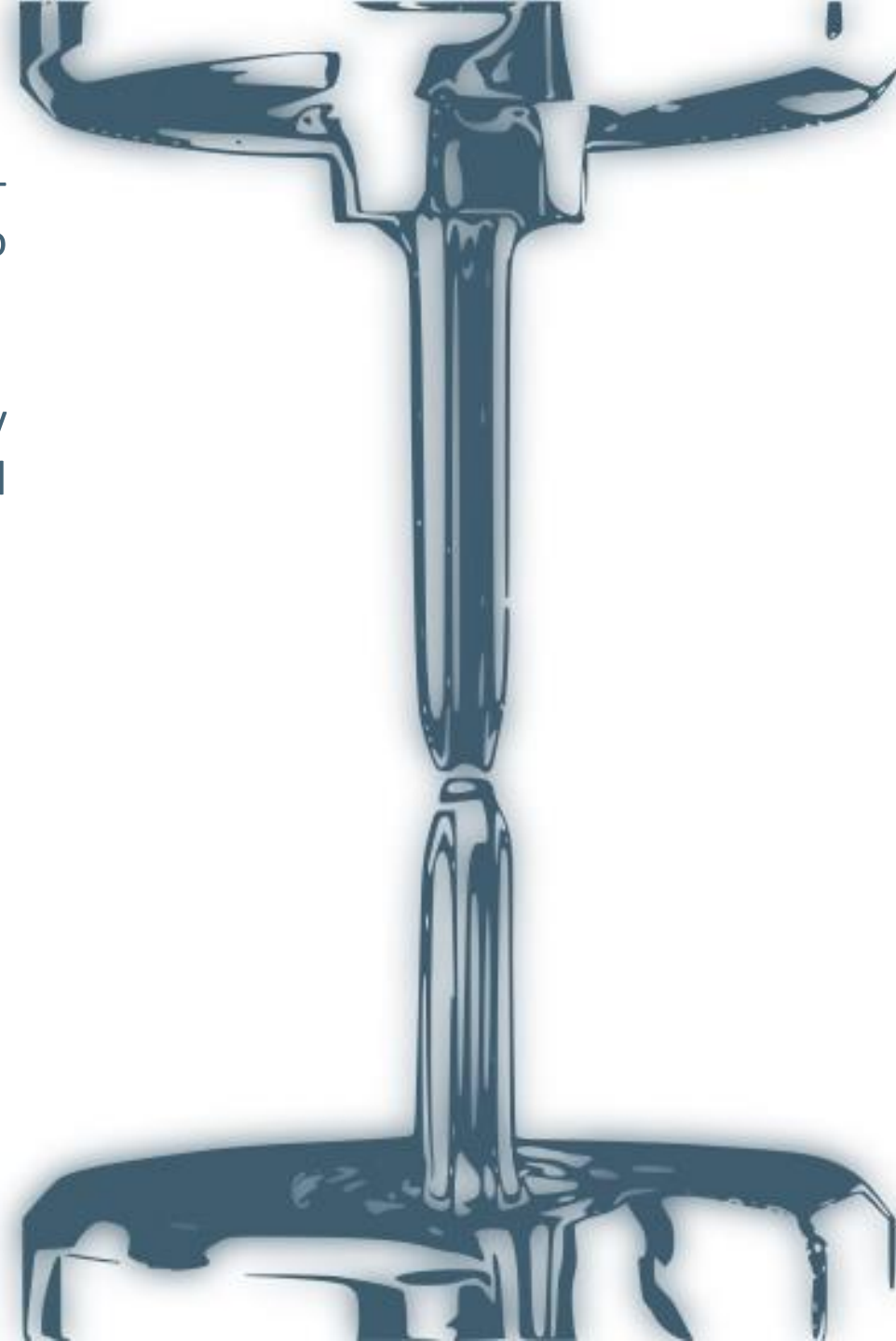
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For optical systems as well as the non-contact method, the problem is not to measure until the sample breaks.

There is no risk of damage caused by the released energy when the material is damaged.

This allows you to obtain stretch data throughout the test.



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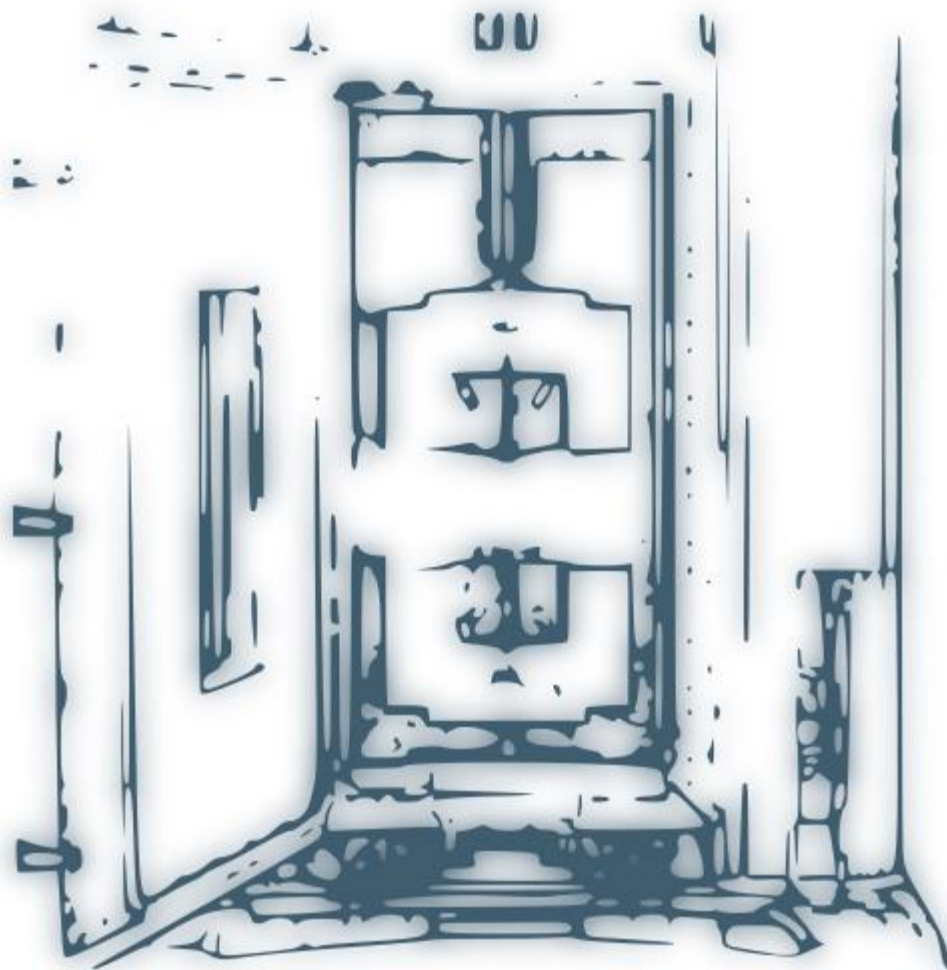
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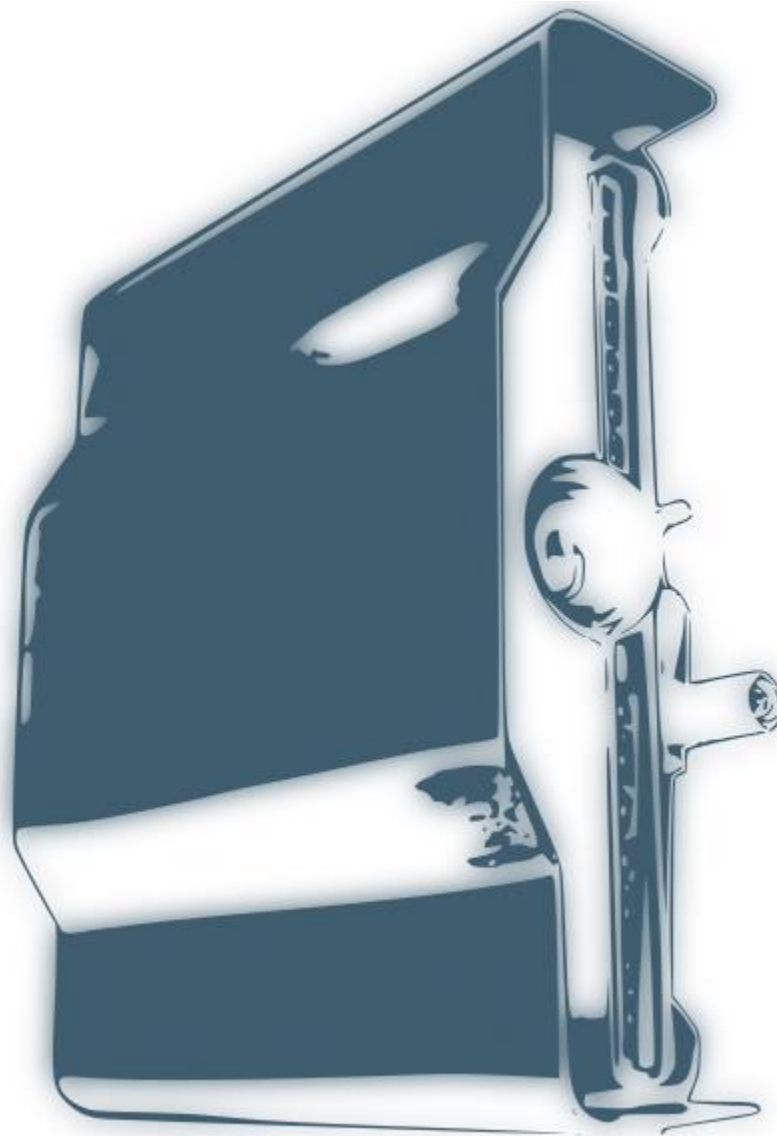
The same system can be used for
room temperature
measurements as well as for
measurements inside the
climatic chamber.

It can simply be measured
through the glass.

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**For what can i use
optical system?**

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Tensile test

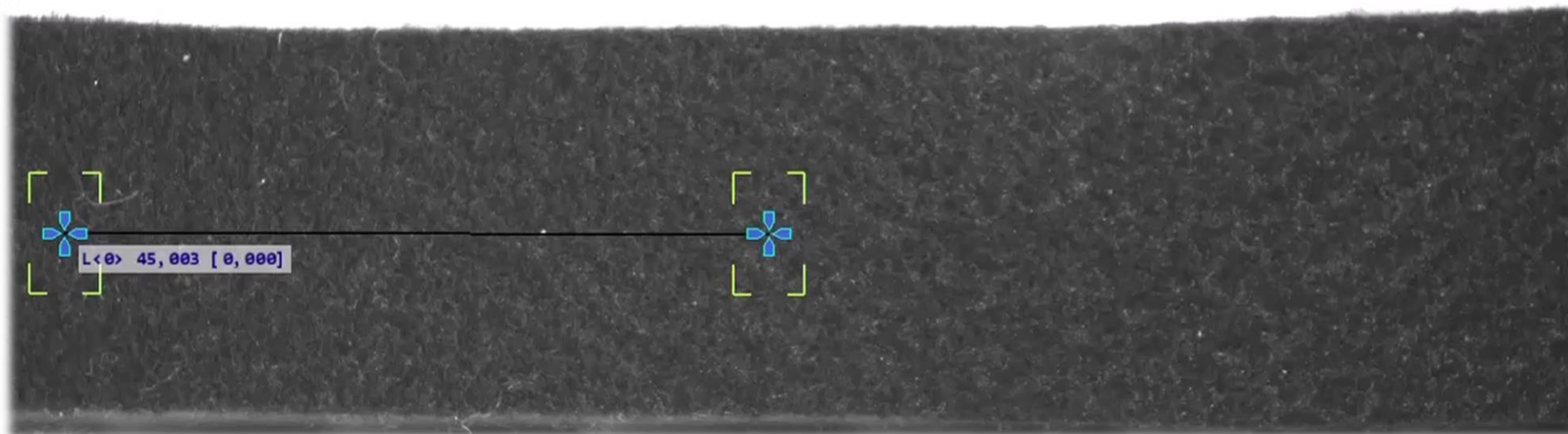
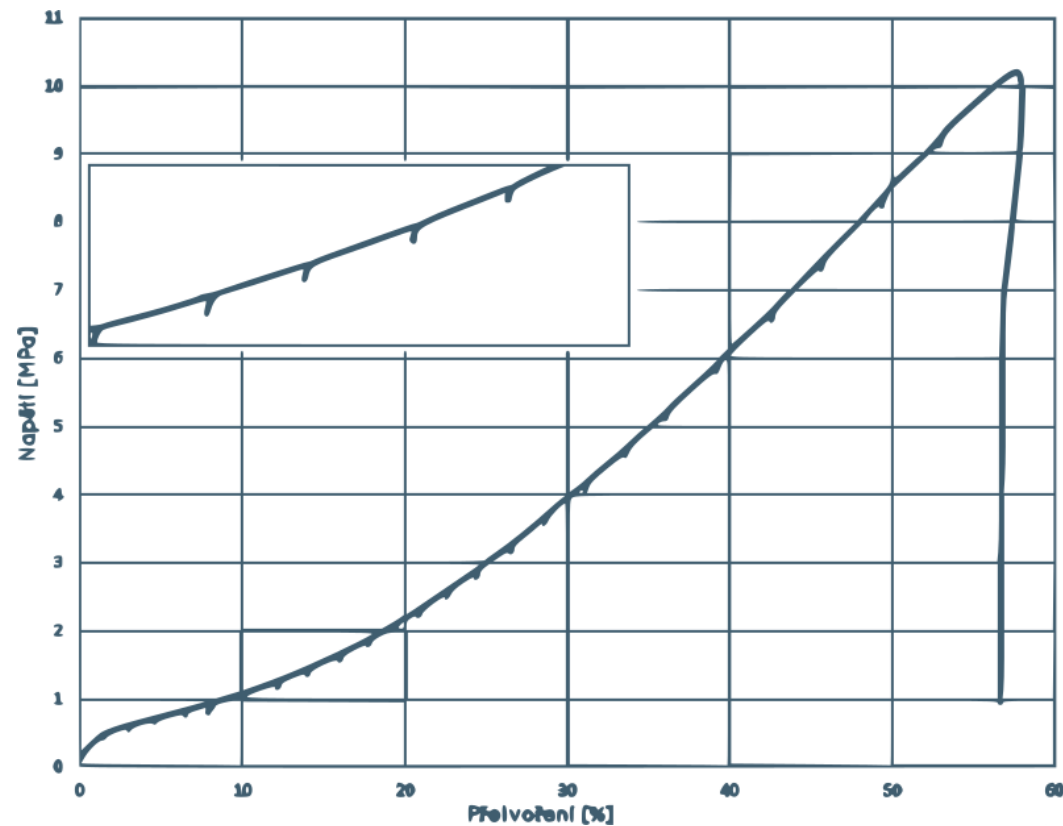
Tensile test on non-woven fabric

Specimen of felt from BTP Brno

Type PDC500

Thickness $t=5\text{mm}$

The chart/diagram shows a jaw slip.



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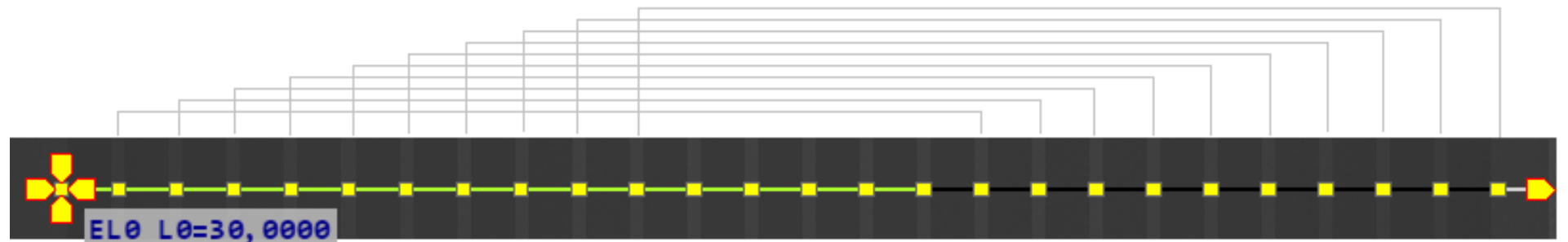
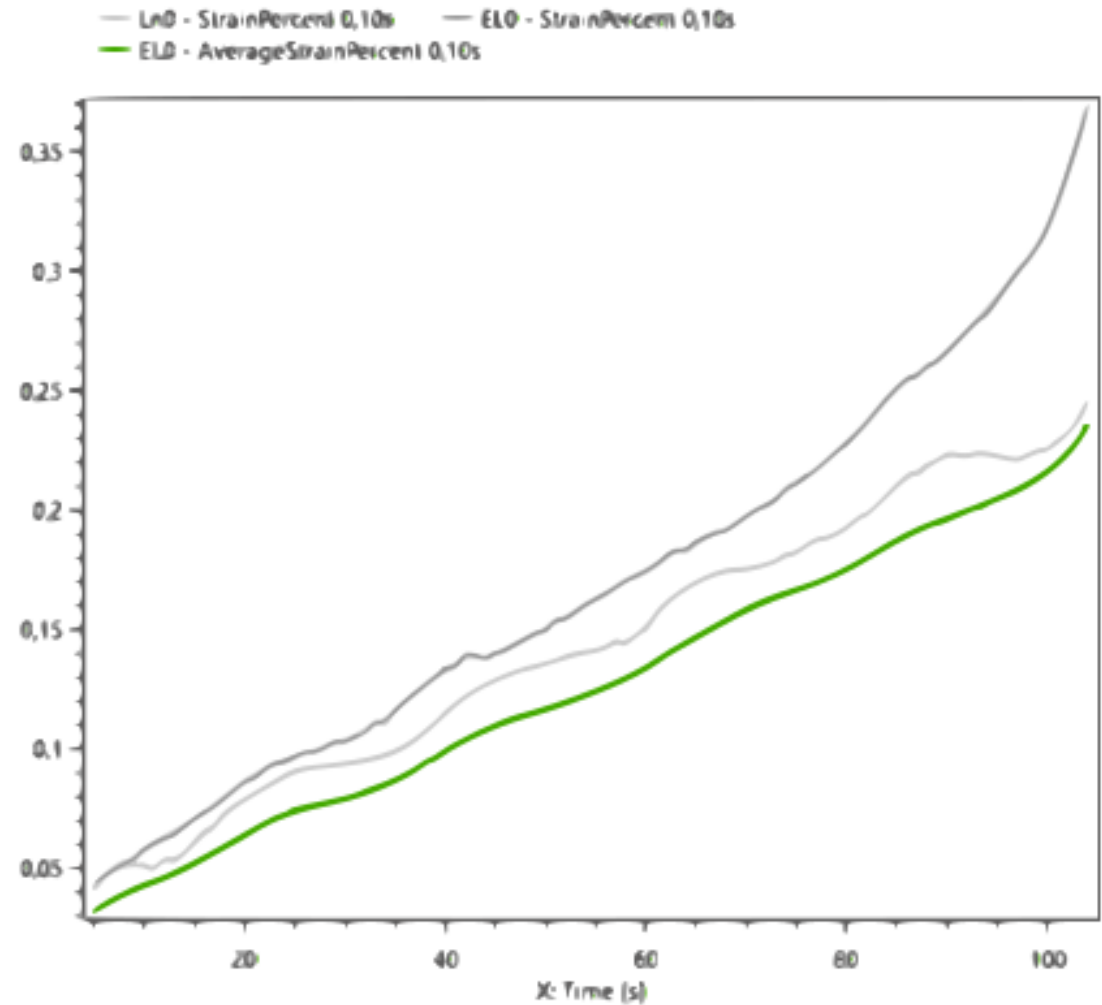
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Tension test using Extreme line

The Extreme Line Advanced Measurement Tool, which is able to represent multiple workflows at once.

This measuring instrument offers a very smooth deduction prolonged during the elastic part of the test. At the same time automatically detects the neck in the longitudinal direction while still maintaining the specified length L_0 .



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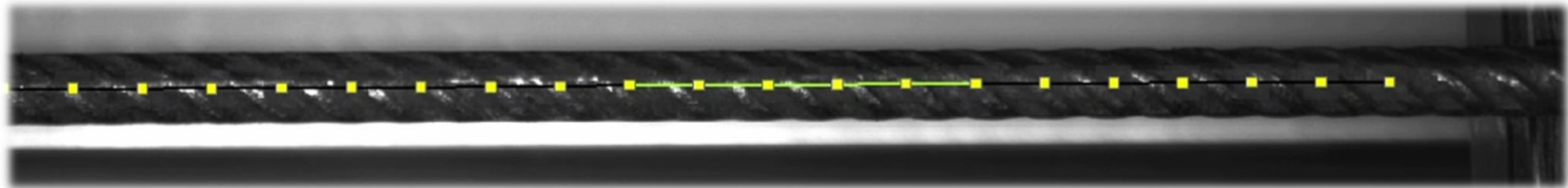
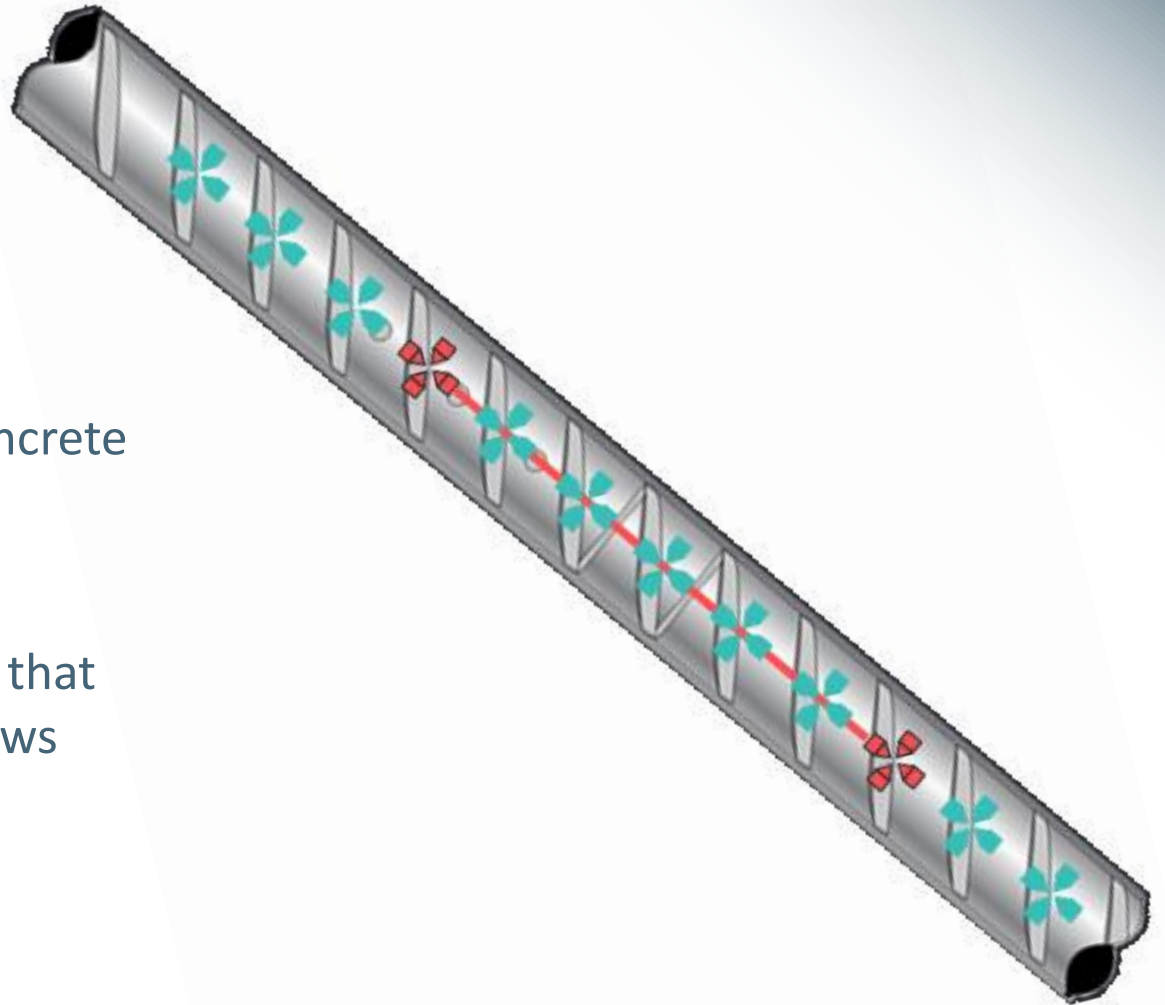
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Concrete steel tension test

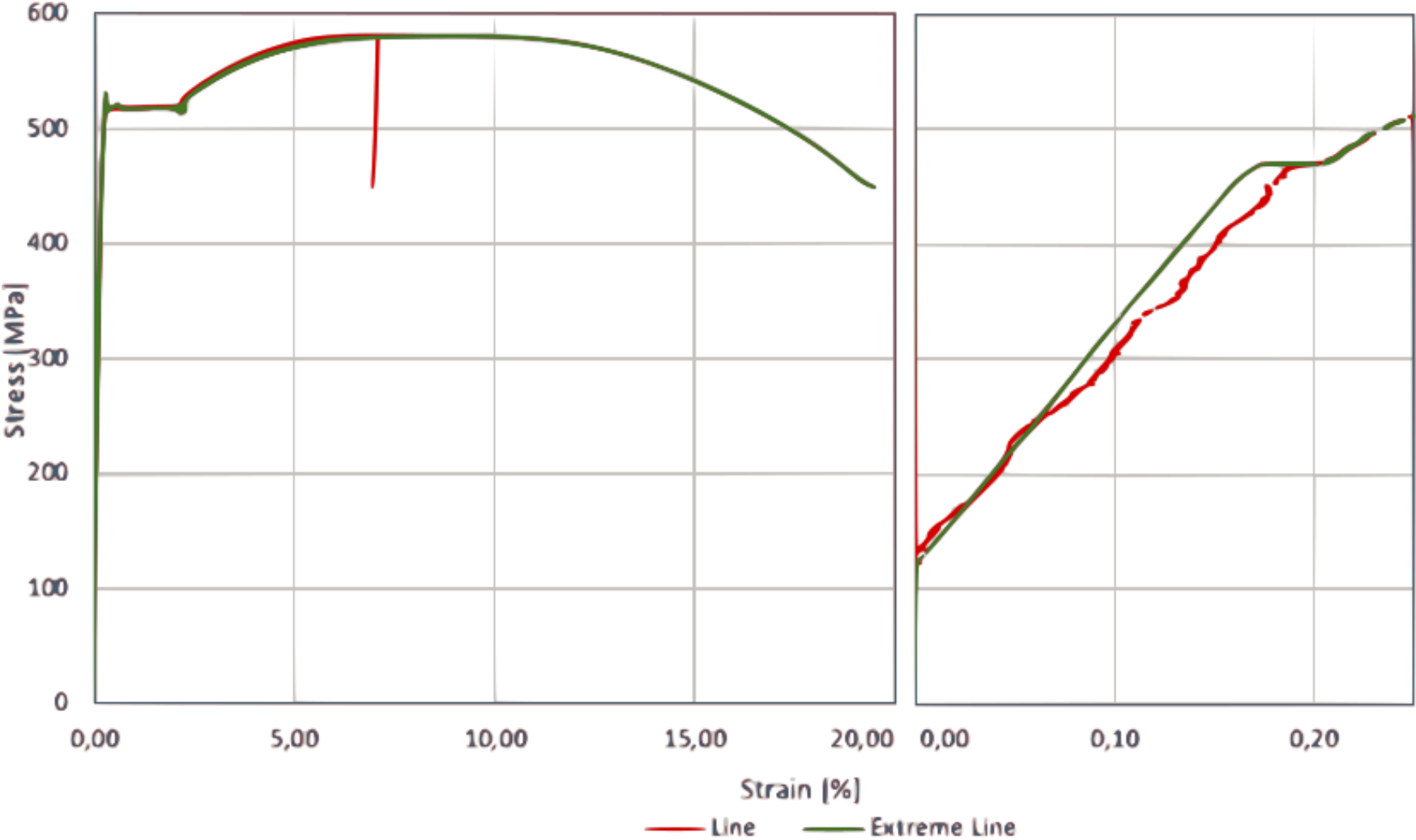
One-axis test at the ROXOR(concrete steel) for gaining values

$$R_e R_m A_t A_g$$

The green area indicates an area that fulfill the specific length that shows the highest stretch value



Comparative diagrams: Extreme Line against conventional video extensometer



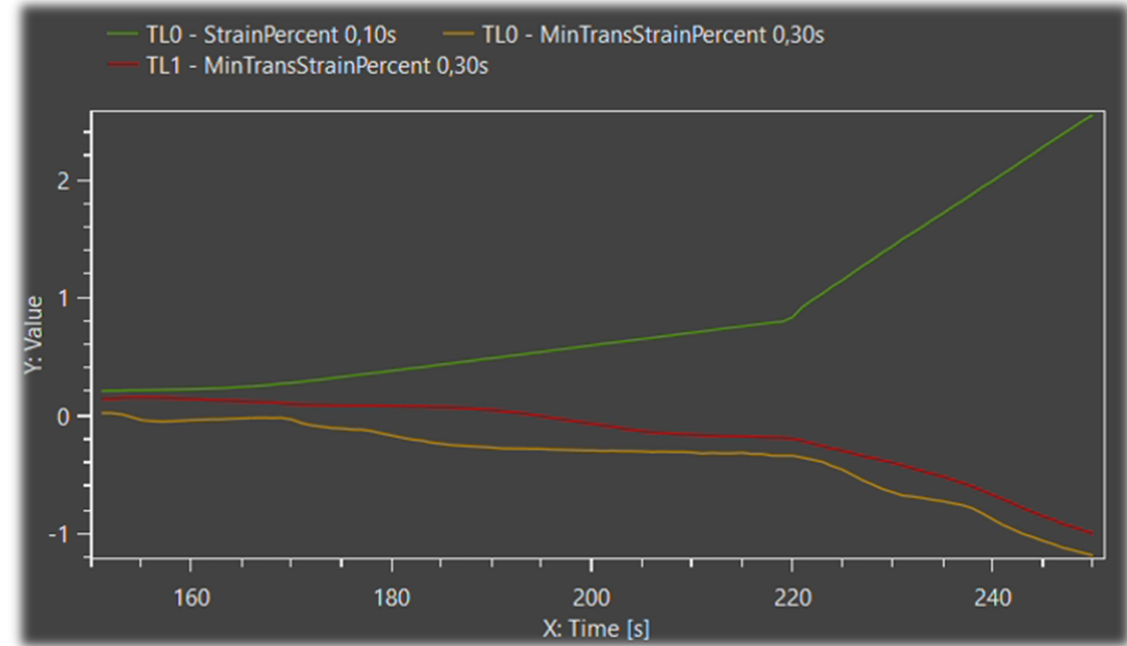
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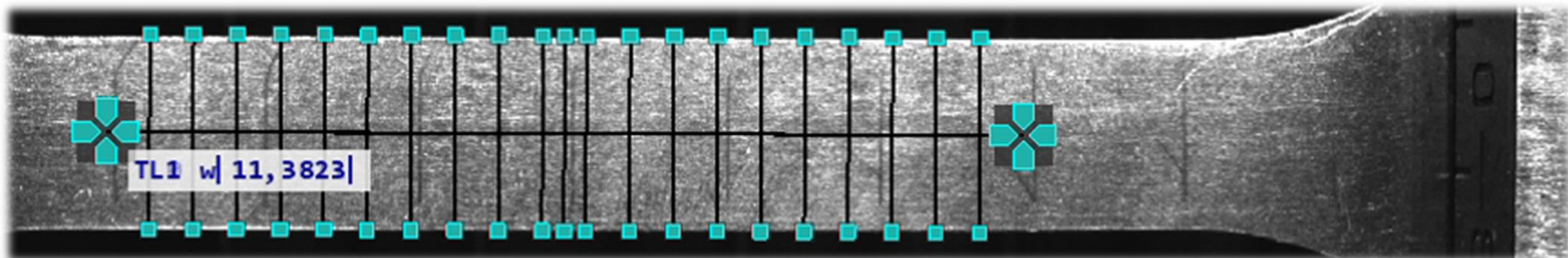
Tensile test using Trans Line

Videos show the using of two Trans Line gauges placed over one another to show the advantage of multi-point measurement.



Trans Line 1 – yellow data line – only one transverse position that lies outside the neck area

Trans Line 2 – red data line – more transverse positions, search for the highest narrowing



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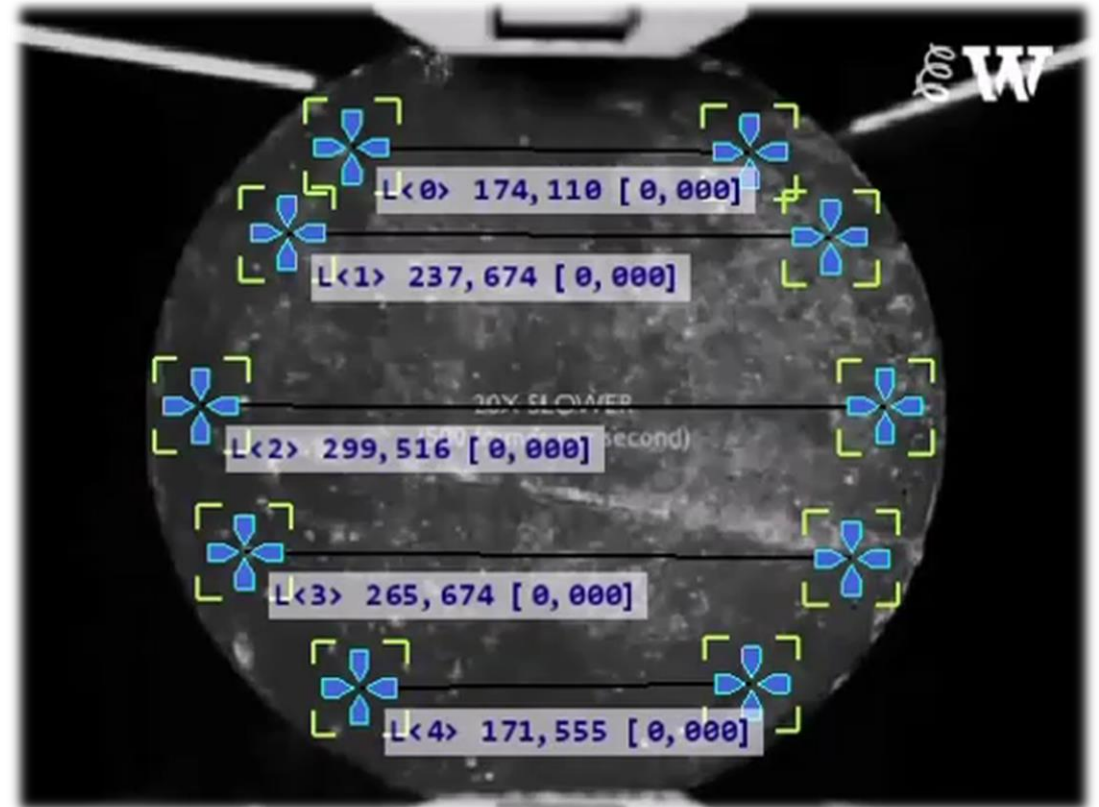
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Compression test

compression test on concrete specimen

The concrete roller was loaded with radial pressure.

The strain was evaluated using five bar tools



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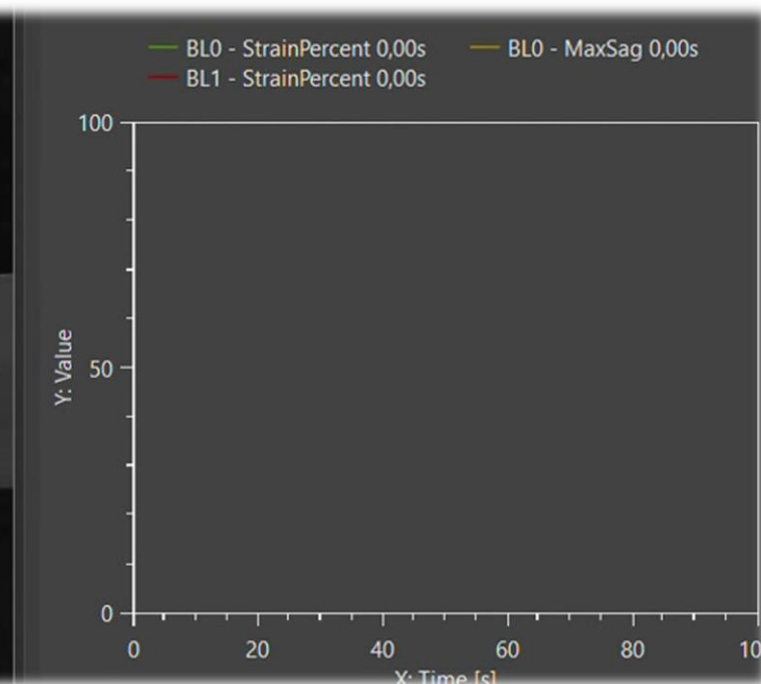
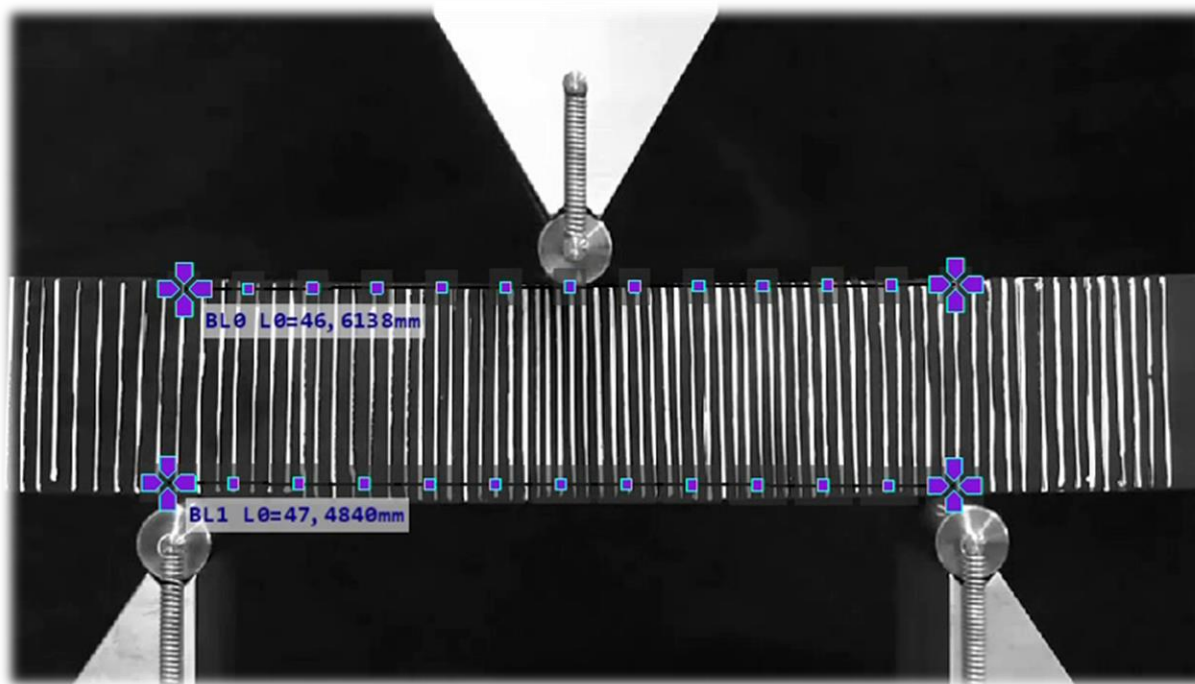
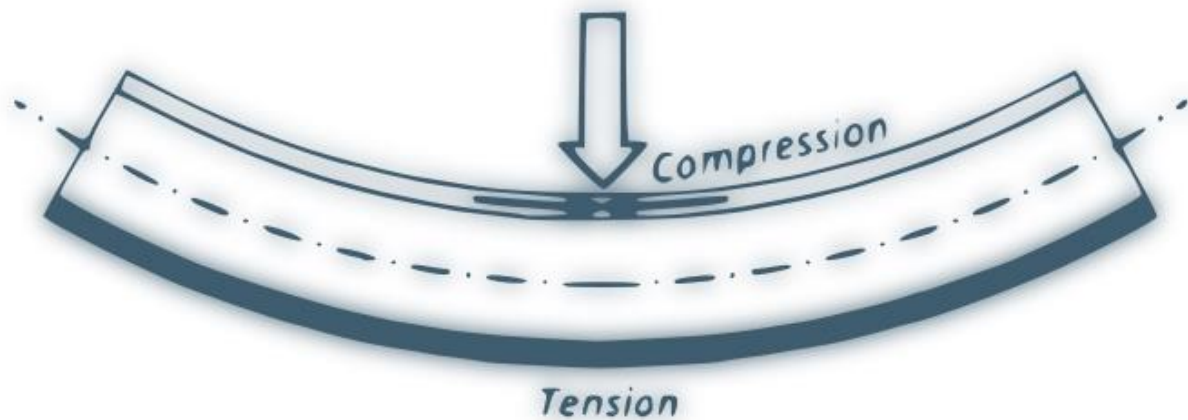
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Bend test

3-point bend test

Measurement of strain and maximum deflection during the test



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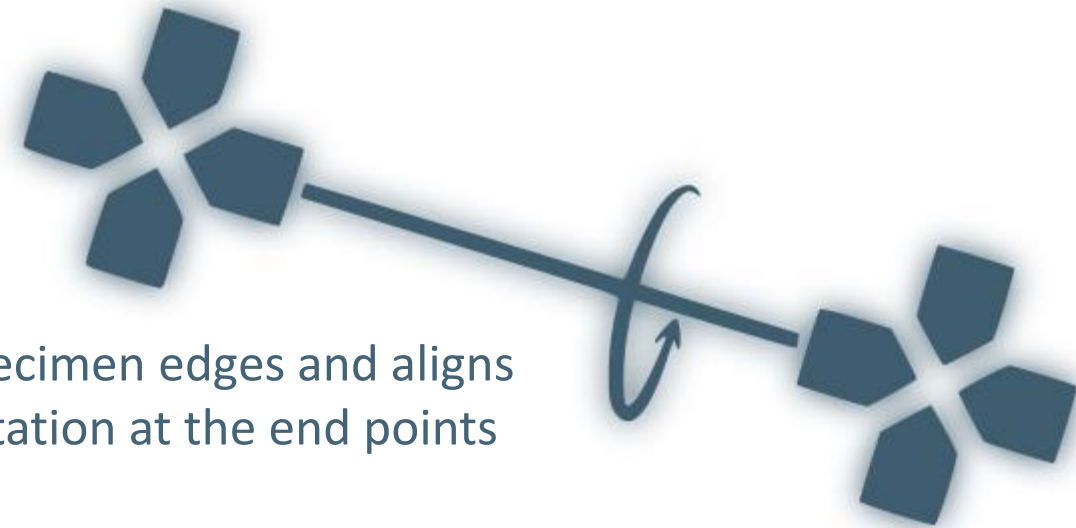
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Torsion test

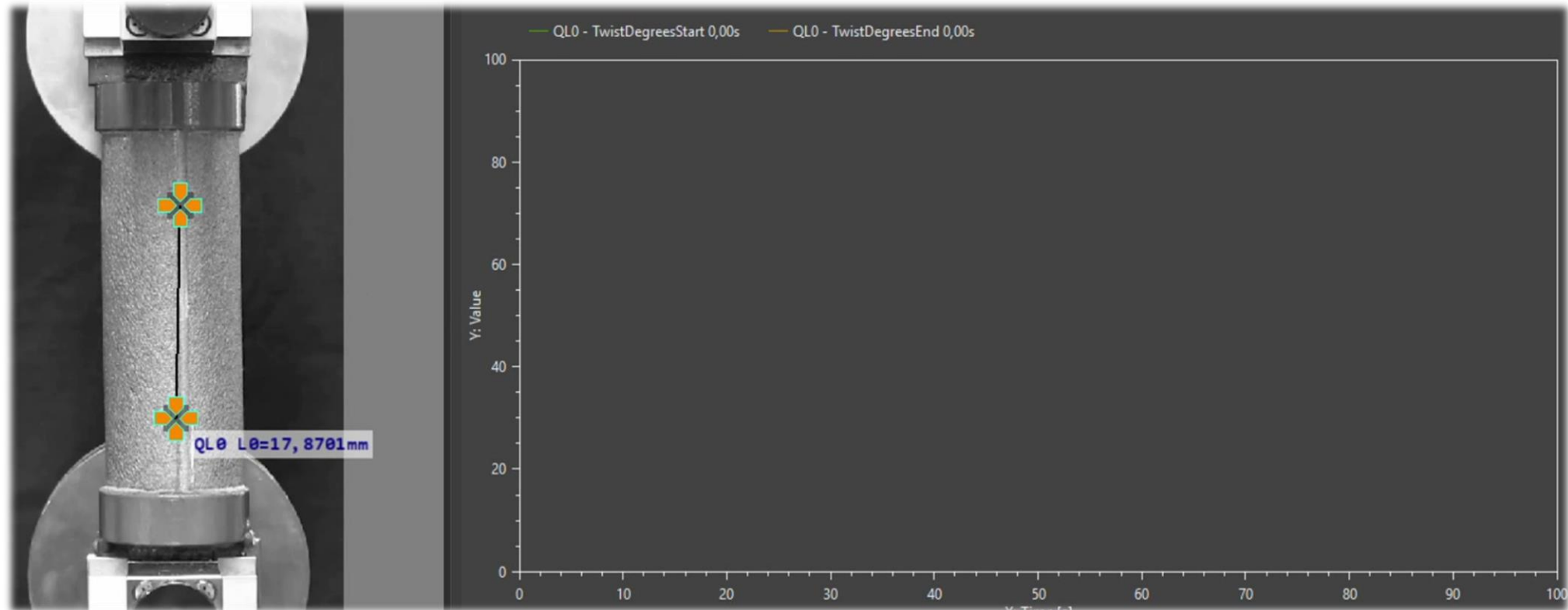
A unique Torsion Line gauge to measure the angle of rotation



The Torsion Line automatically detects specimen edges and aligns with its axis. After that, the changes of rotation at the end points of the gauge are monitored

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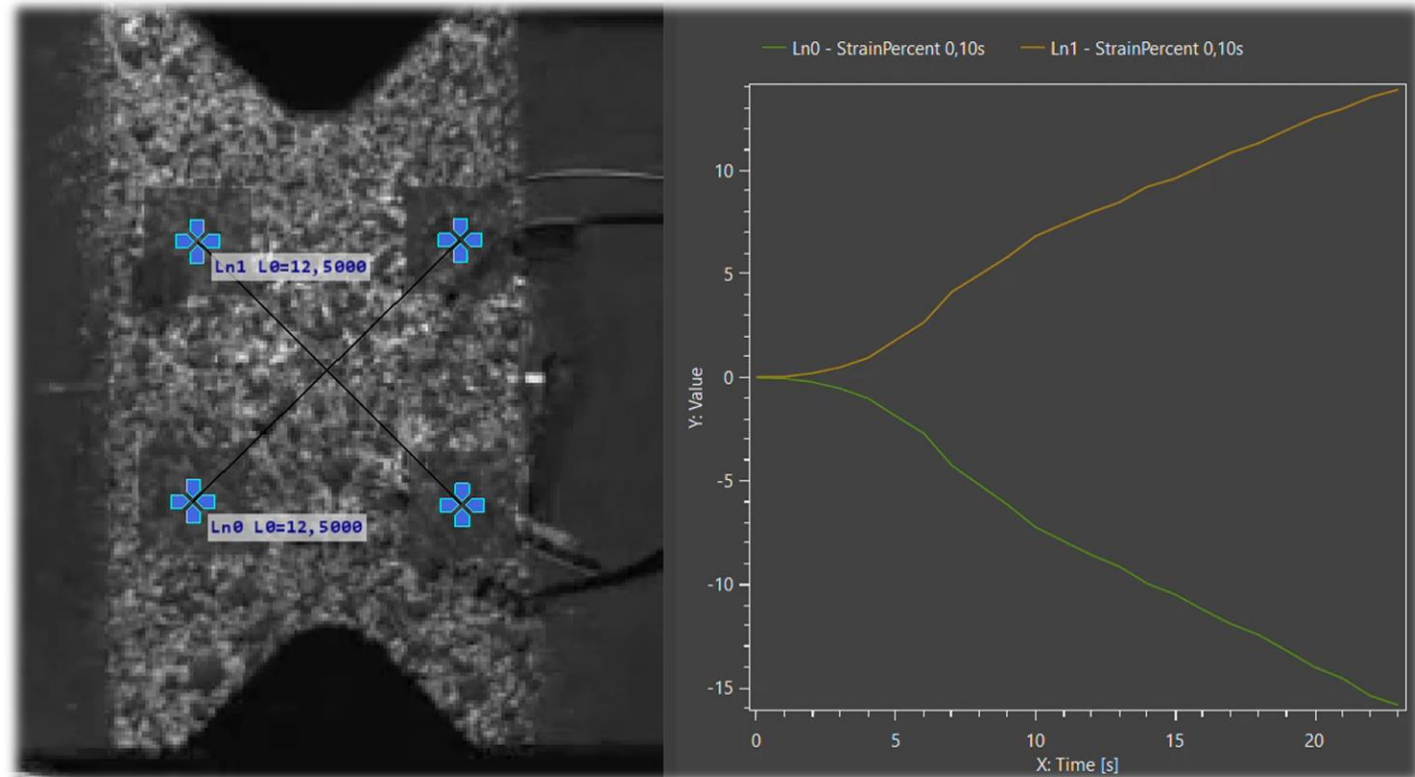
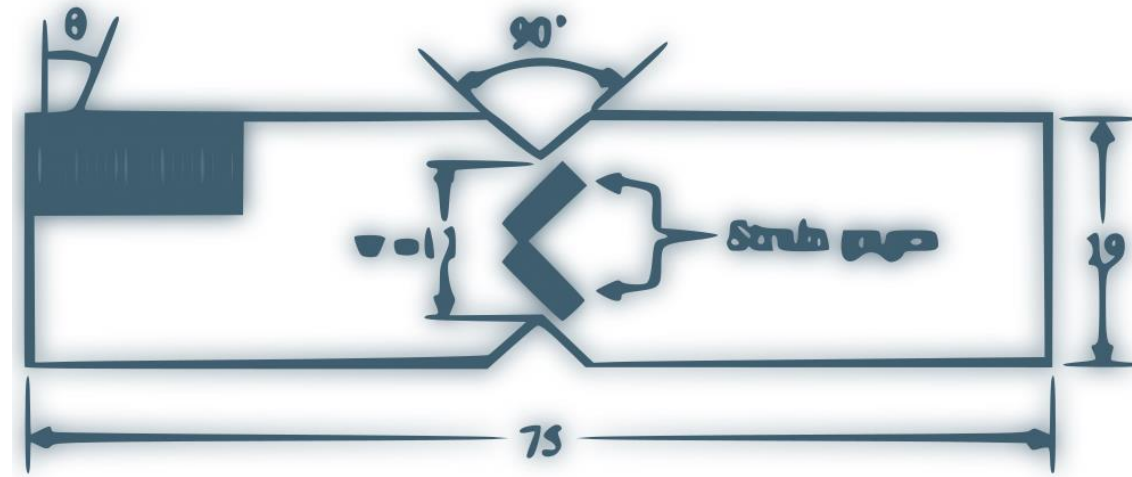
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Shear test

Shearing test on a carbon fiber reinforced composite sample

The test was carried out according to ASTM 5379. Therefore, two line gauges under an angle of 90° were used



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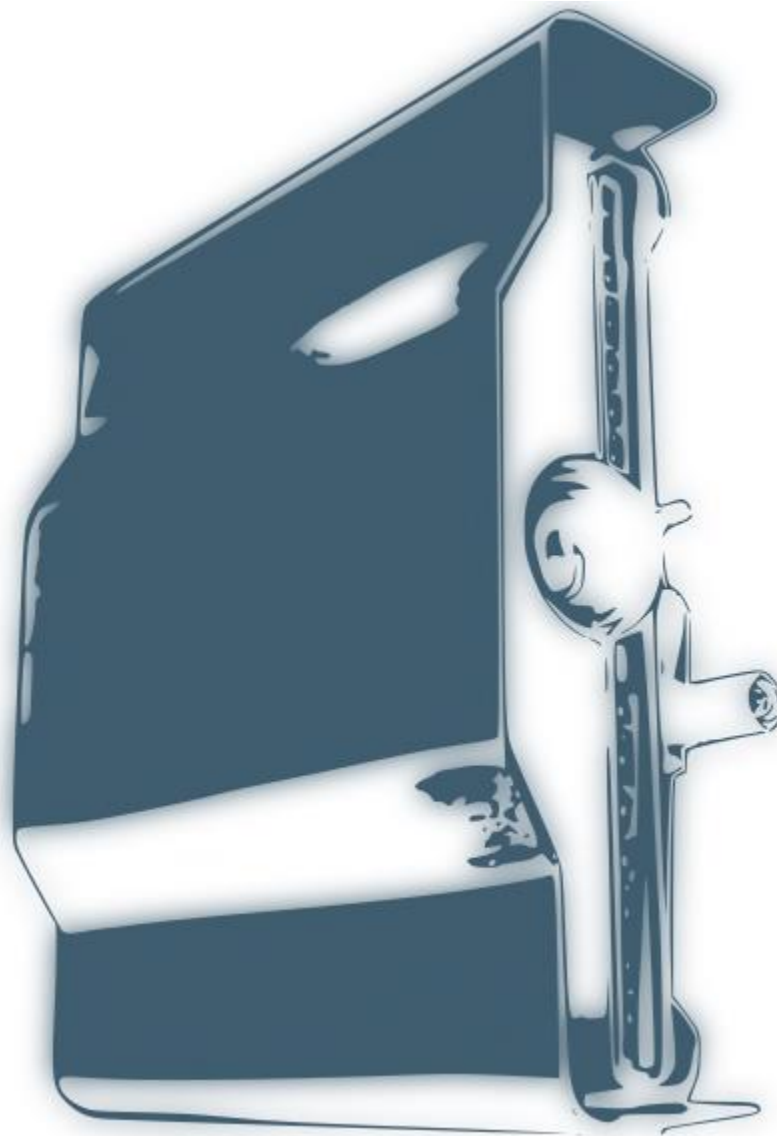
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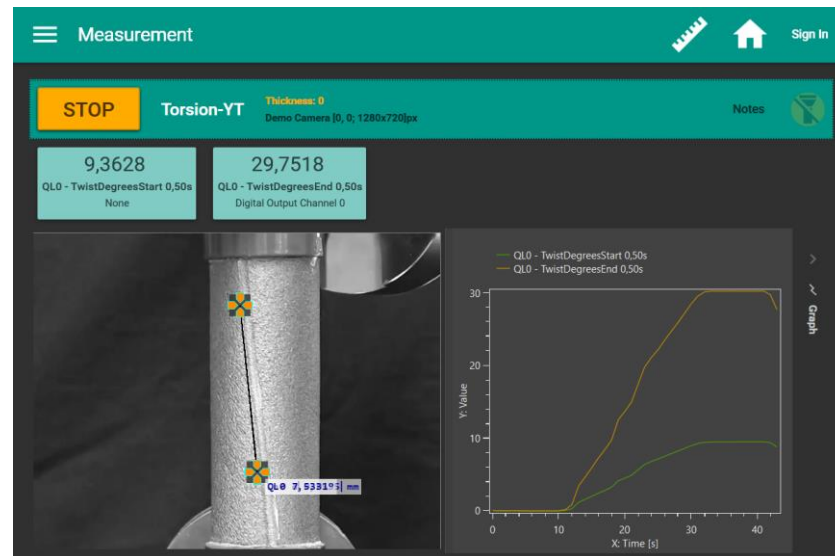
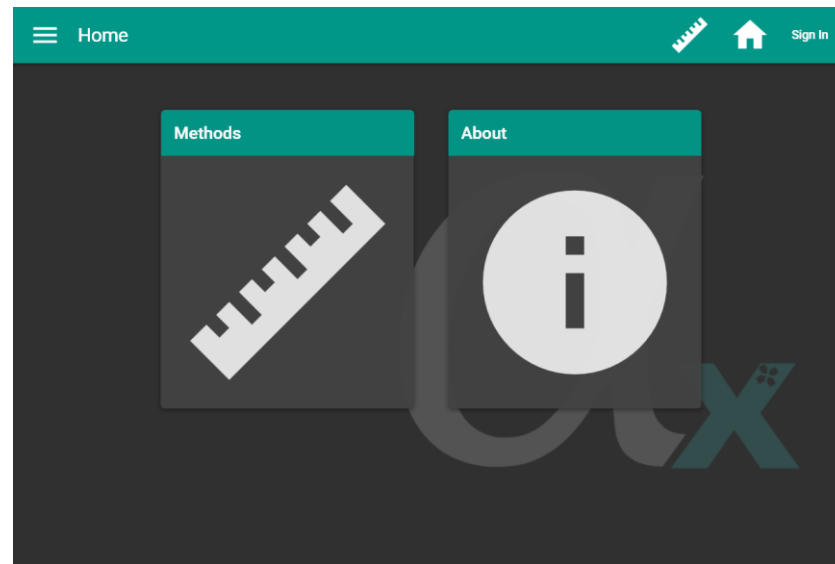


**Why we should
choose this video
system?**

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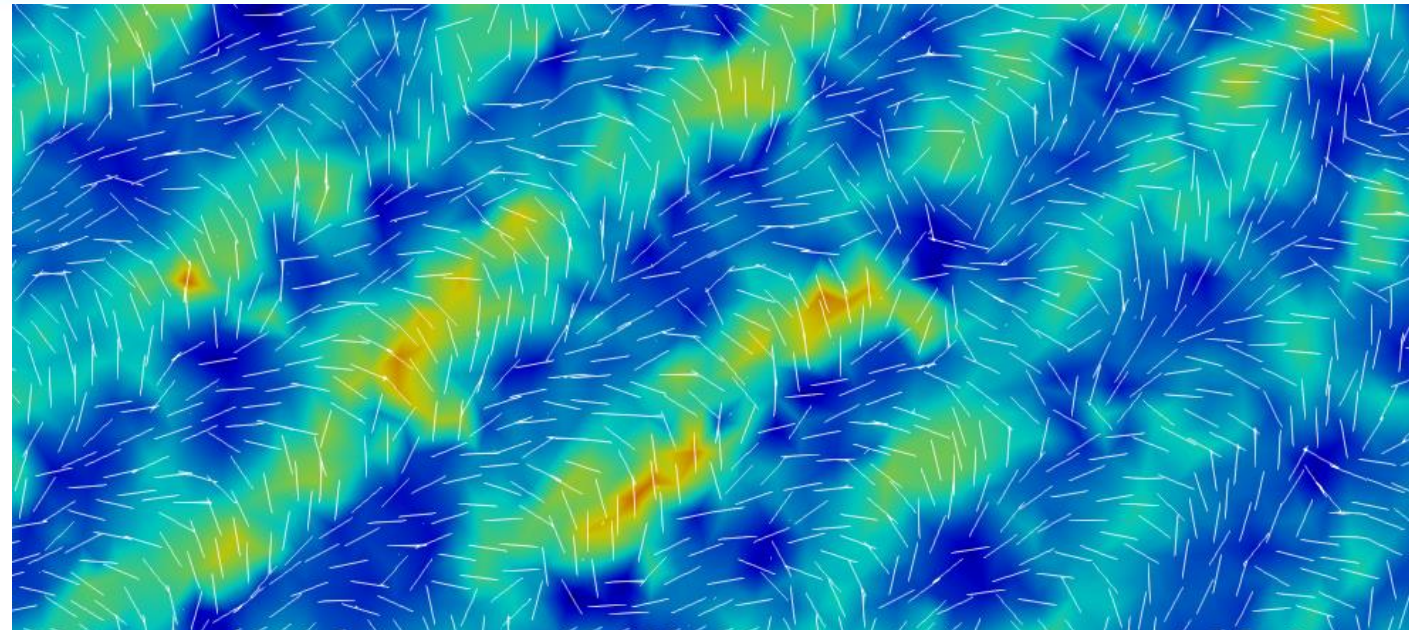
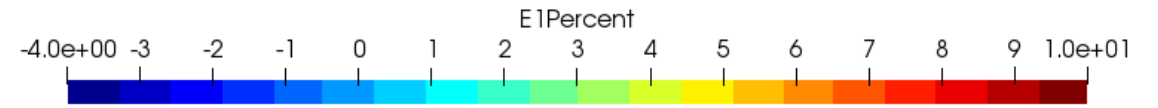
User-friendly graphical interface

All software has been designed to make it easier for the user to work. It's simple operation ensures easy work and better focus on the test.

The software is built on a guide system and can be run in two modes

- Operator
- Administrator

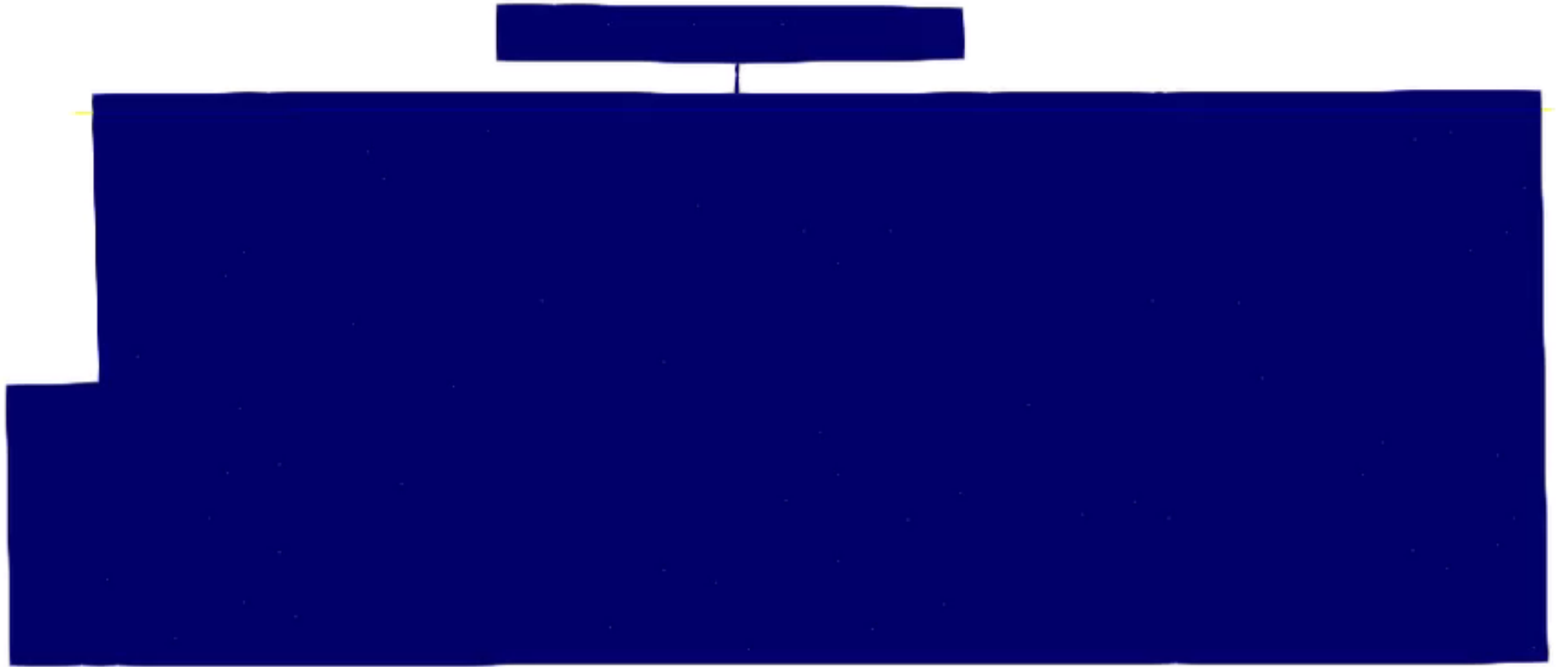
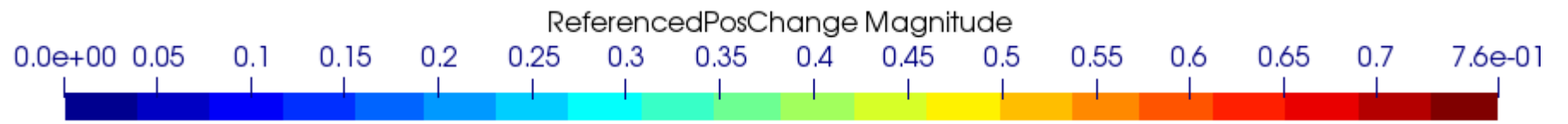
Options of areas deflection rendering and shifts using DIC



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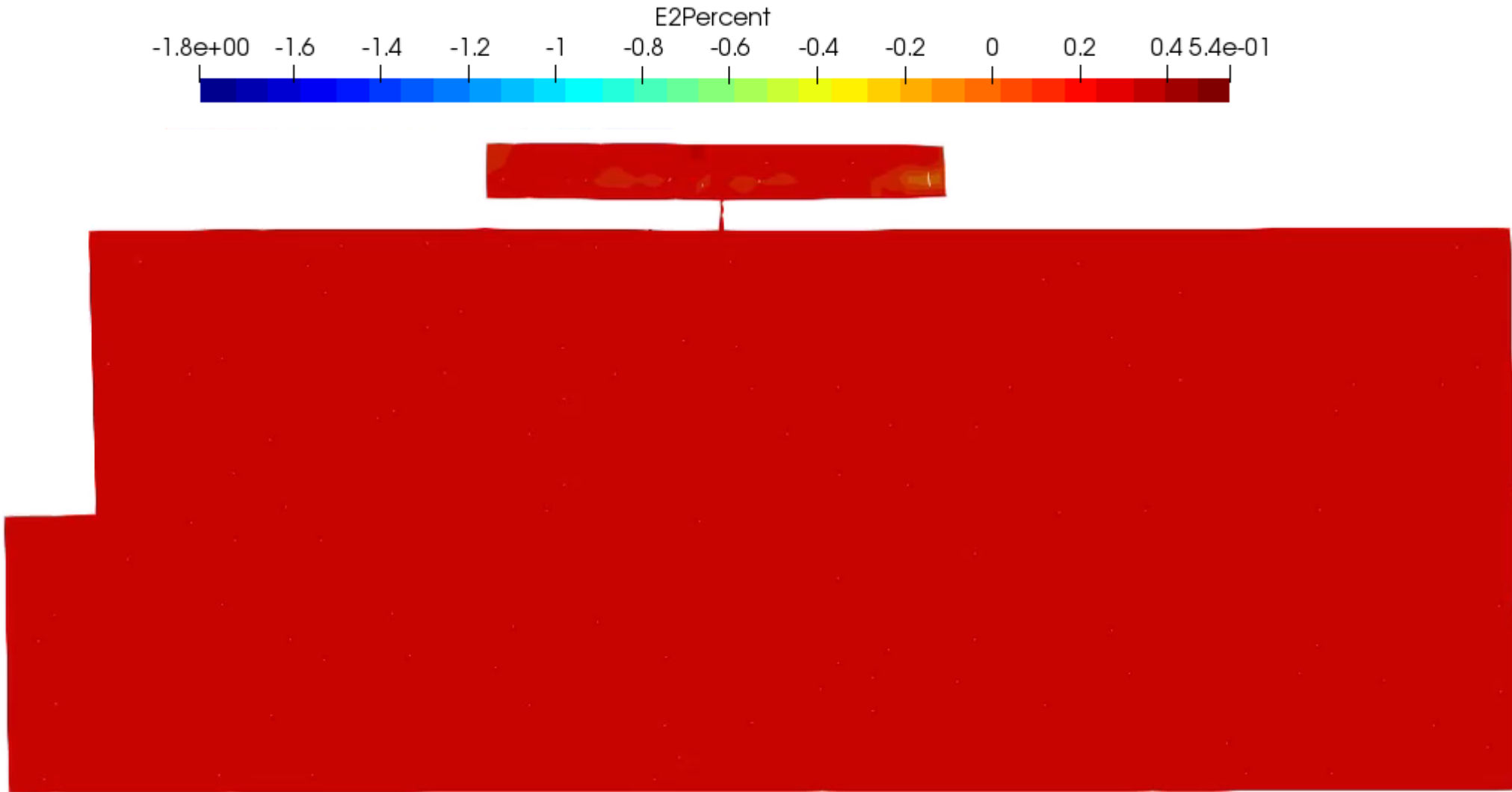
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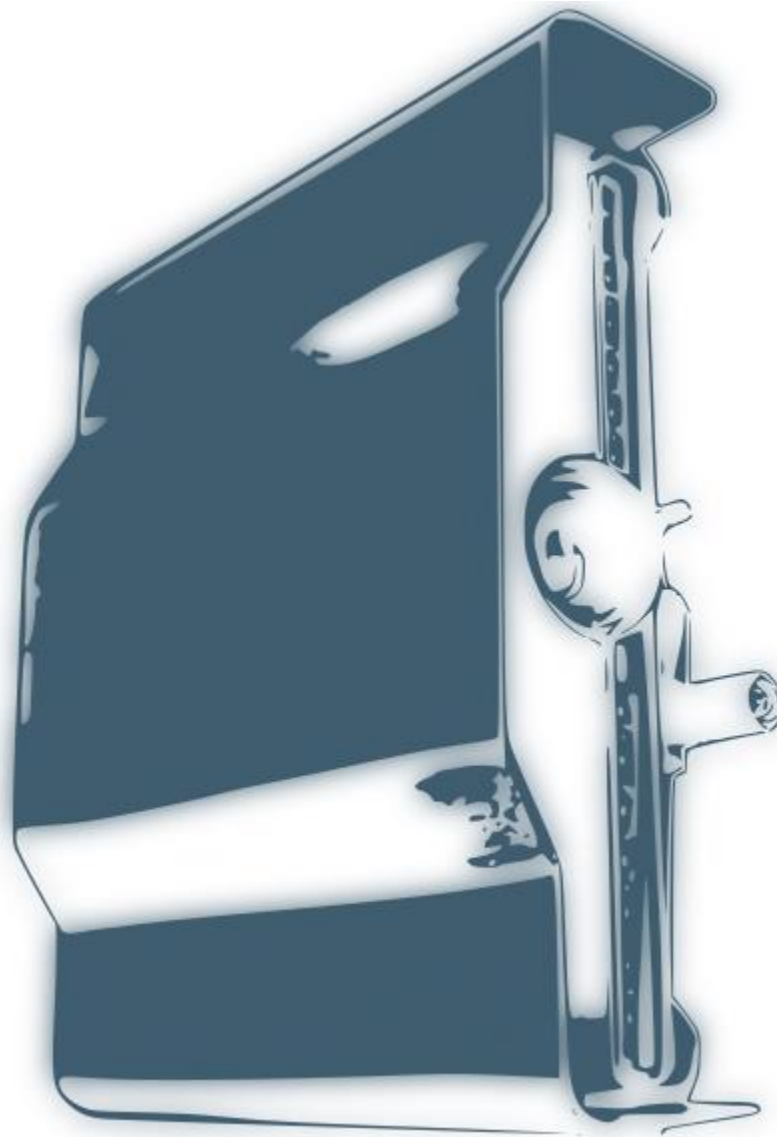
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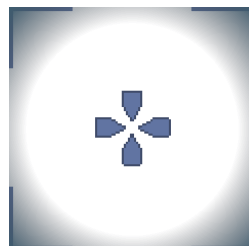
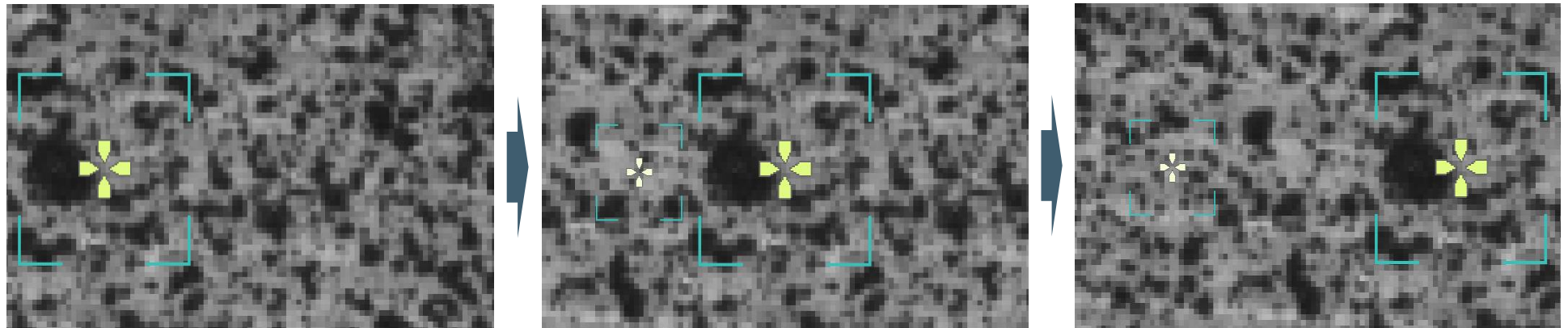
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How DIC works?

The principle of digital image correlation

The monitored region is transformed into a matrix of values representing the gray level. This matrix is then searched around its last known position in the following image of the record. This information is to evaluate the displacement of the observed point.



Watching one pixel is not possible due to light interchangeability.

For this reason, you need to monitor the pixel matrix. Typically, for example, 33x33px

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The principle of digital image correlation

What the human eye sees on the computer screen as a black cross on a white background is represented by gray values in computer memory.

For the 8 bit system($2^8 = 256$) it represents 0 black and 255 white.

0	0	255	255	255	255	255	255	255	255	0	0
0	0	0	255	255	255	255	255	255	0	0	0
255	0	0	0	255	255	255	255	0	0	0	255
255	255	0	0	0	255	255	0	0	0	255	255
255	255	255	0	0	0	0	0	0	255	255	255
255	255	255	255	0	0	0	0	255	255	255	255
255	255	255	255	0	0	0	0	255	255	255	255
255	255	0	0	0	255	255	0	0	0	255	255
255	0	0	0	255	255	255	255	0	0	0	255
0	0	0	255	255	255	255	255	255	0	0	0
0	0	255	255	255	255	255	255	255	255	0	0

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The principle of digital image correlation

The image shows the shift of the Matrix by an integer multiple of the pixel.

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$(x;y)=(8;8)$

$(\Delta x;\Delta y)=(1;1)$

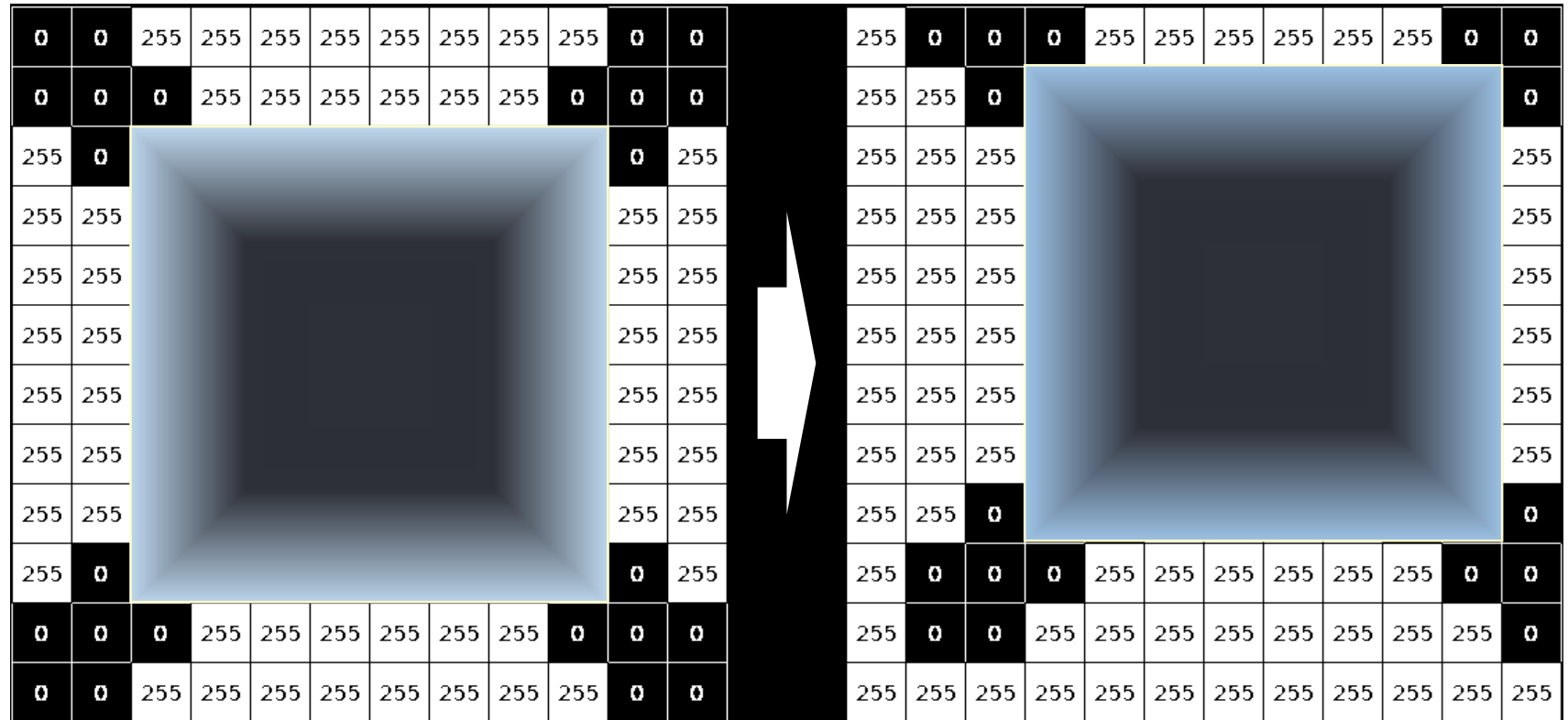
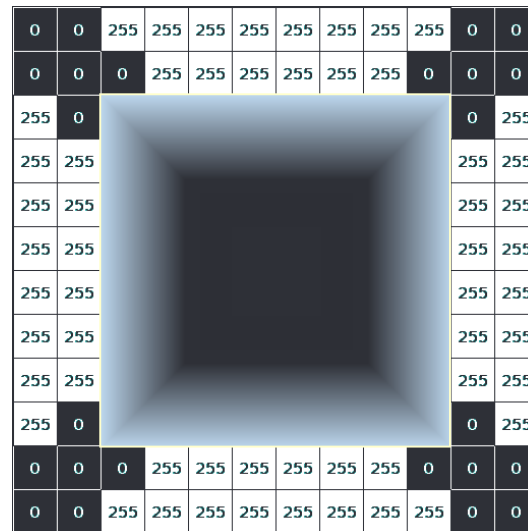


Image before moving

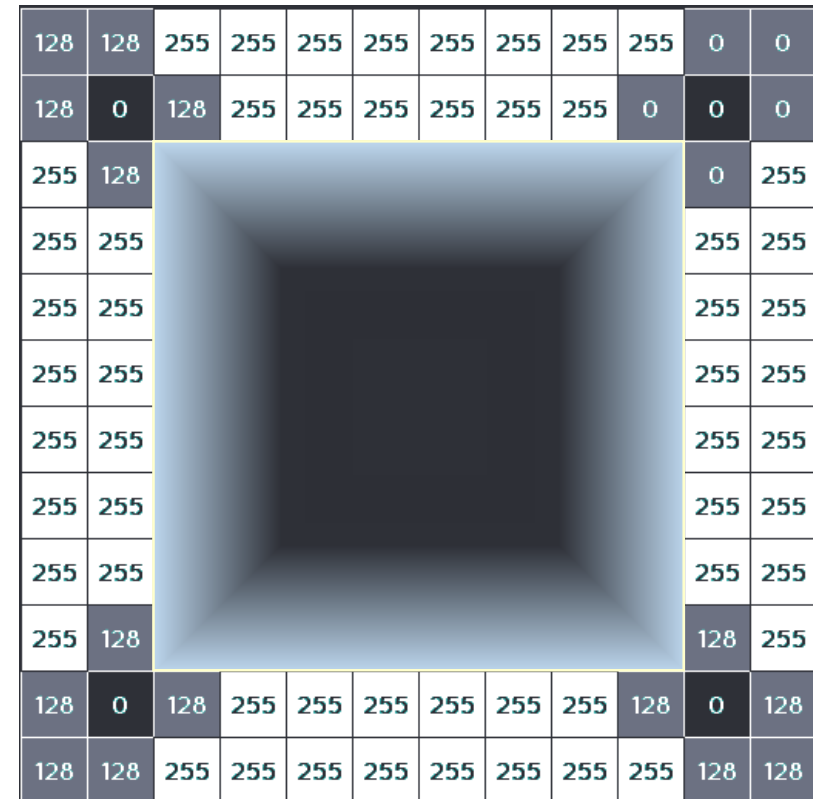
Image after moving

The principle of digital image correlation

During the sub-pixel shift, it is necessary to engage the appropriate type of interpolation to determine the exact position of the point. Use interpolation using higher order polynomials and weighing information in a matrix can be up to 0.003px resolution. When considering camera noise, the DIC resolution is 0.01px



$(\Delta x; \Delta y) = (0.5; 0)$

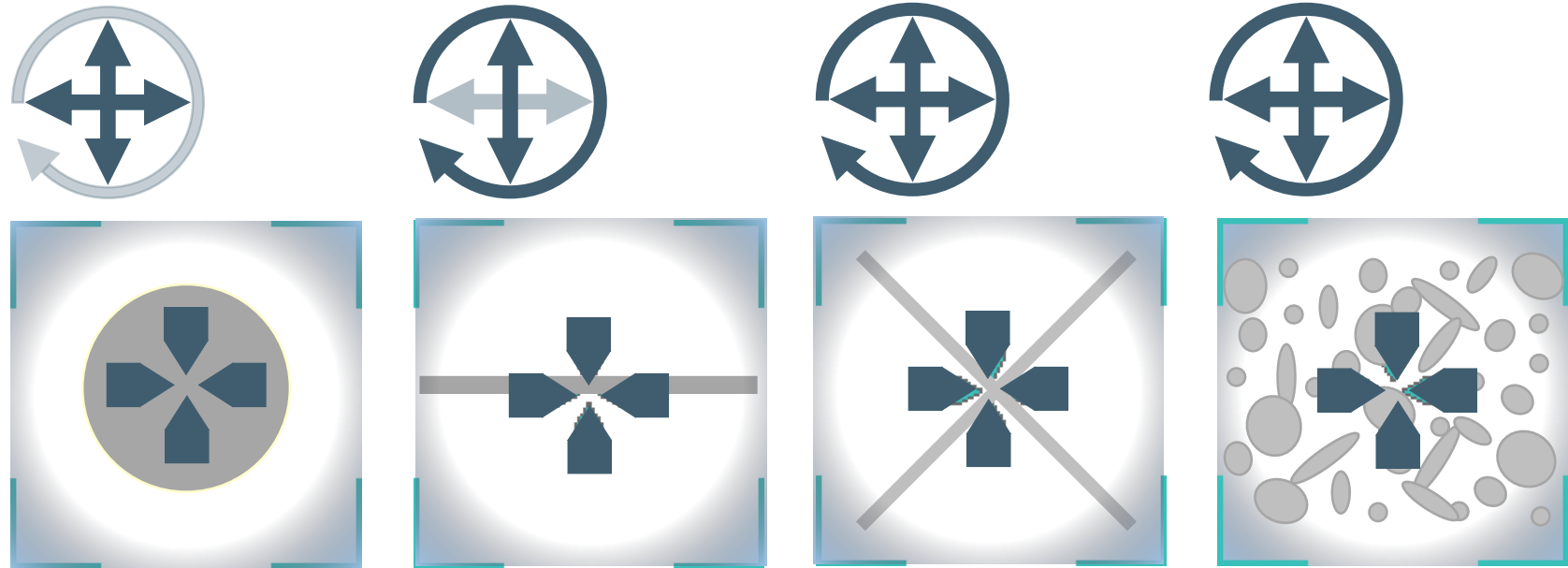


The principle of digital image correlation

For proper operation of the DIC video extensometer, the surface of the specimen must have a certain amount of contrast artifacts.

These can be either natural or delivered (most commonly with marker or with spray painter).

However, it is necessary for the artifacts to describe three degrees of freedom - one rotation and two translation.



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LABORTECH in the world



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