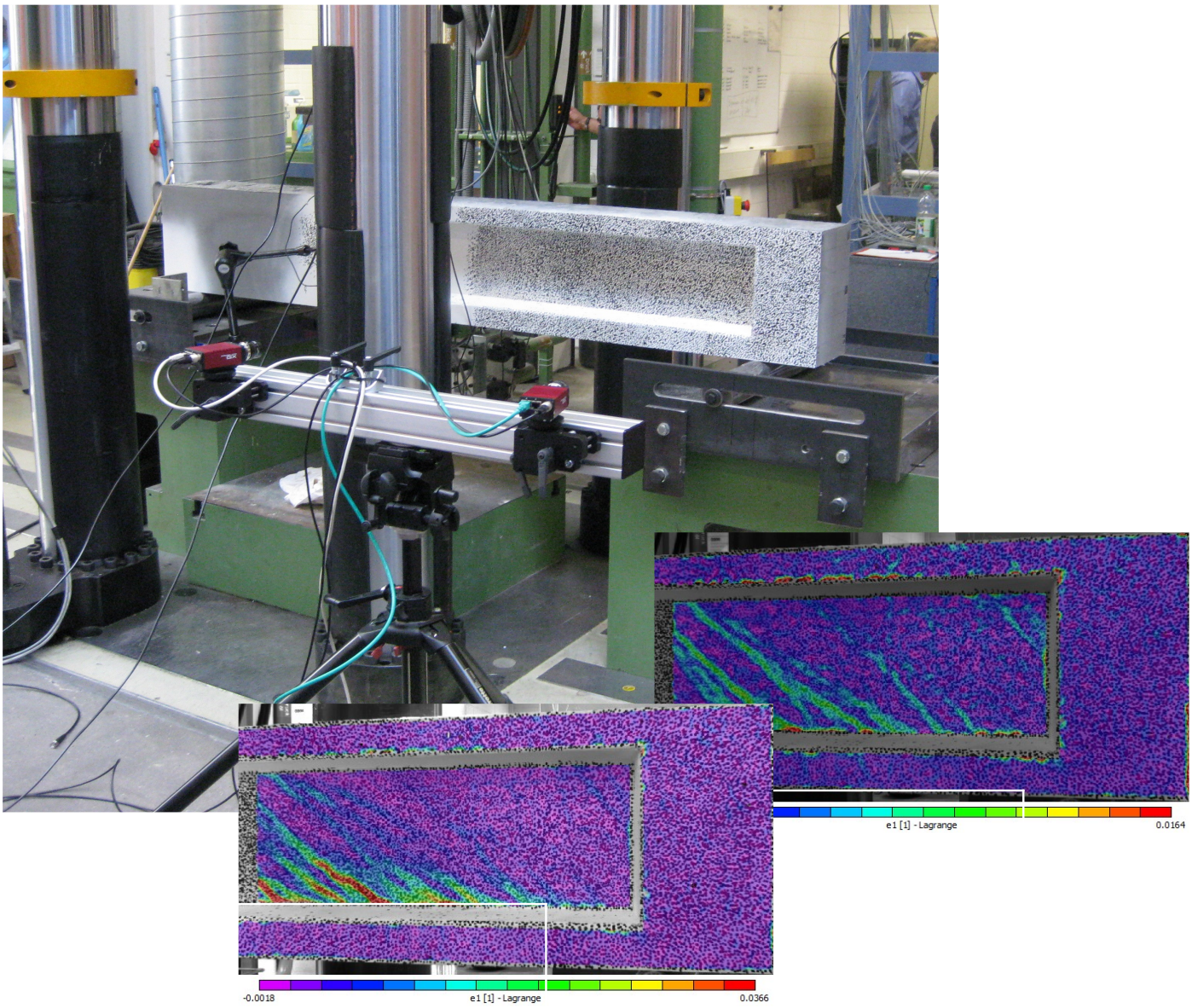
Fast strain measurement on high-strength concrete by DIC



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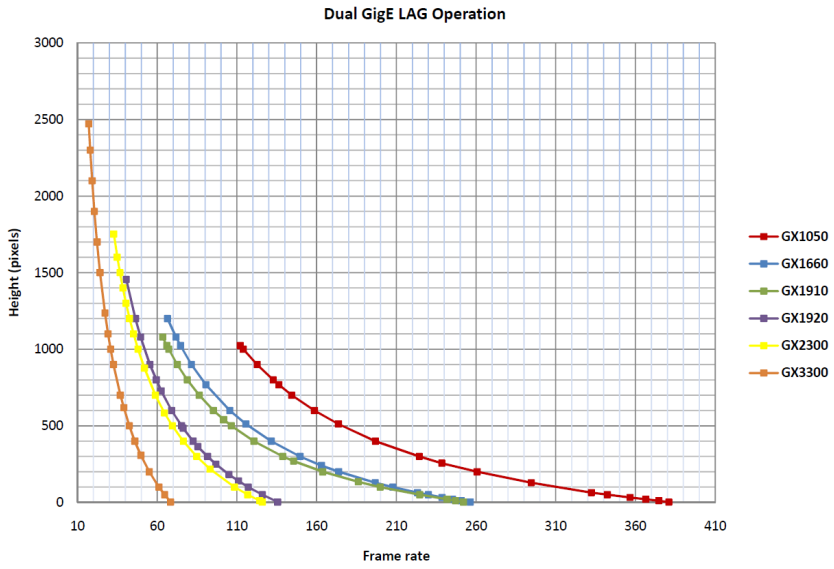
System configuration:

The applied stereo camera system of is based on two 1,05 Mpixel cameras with a frame rate of 112 Hz at full resolution. The used Chip Kodak KAI01050, 1/2" CCD; mono; 1024x1024; 112fps; 14 Bit ADC included to GX1050 with double GigE output permits o run the system with high streaming rates writing the data to the computer memory or to an SSD drive for long recording times. The table below provides an overview of frame rates and resolution options for the GX-Series. For application on slower loading rates , cameras with higher resolutions and slower frame rates are recommended for crack observation offering a higher resolution on larger surface (e. g. 5Mpixel at 9-15Hz base on IEEE1394). Higher frame rates with 200Hz at 4Mpixel are possible with camera link interface. The applied Software was VicSnap and Vic3D 2010 Version of Correlated Solutions. The fast camera also are recommended and suitable for VicGauge3D or online control of tensile machines with highest accuracy.



Overview of frame rates of GX Camera series with double GigE

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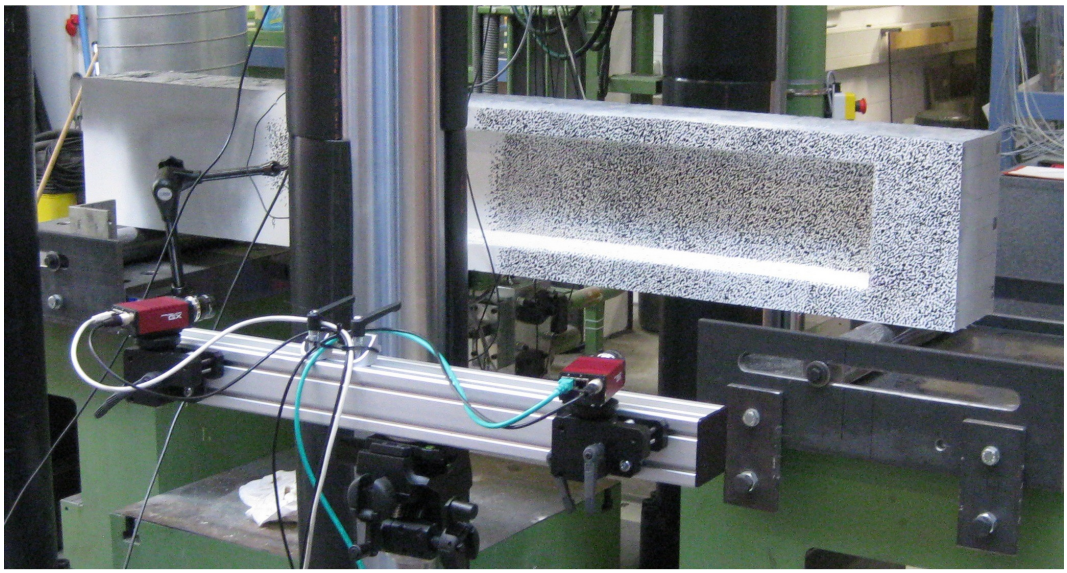
Measurement:

The measurement was done on a high-strength concrete beam under three point bending load by a hydraulic testing rig. The field of view width was approximate 1m. The object was painted with white color and black speckles. The following selected results show the principal strains projected on the beam. Each selected measurement has it own scale to identify local crack propagation over time. Depending on the evaluation parameters the correlation stops strain calculation across the crack (e.g. see last image) or provides a strain value across a crack to identify its location. The crack opening distance can be evaluated using a virtual extensiometer in post processing.

Setup of the stere system in front of the testing machine and concrete beam:



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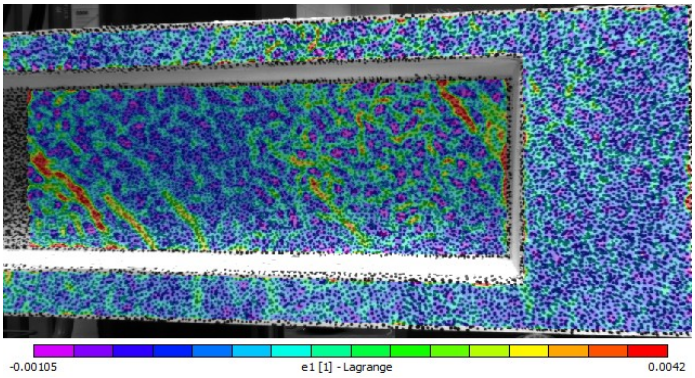
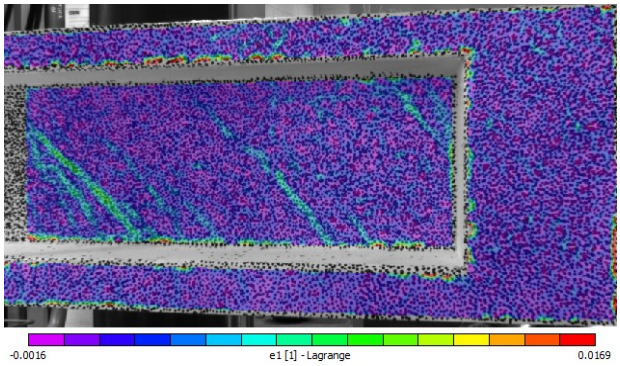
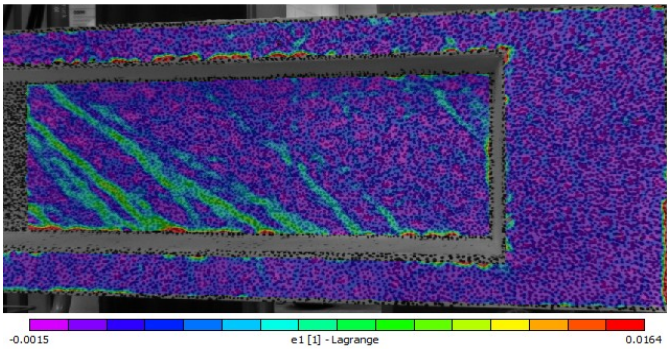
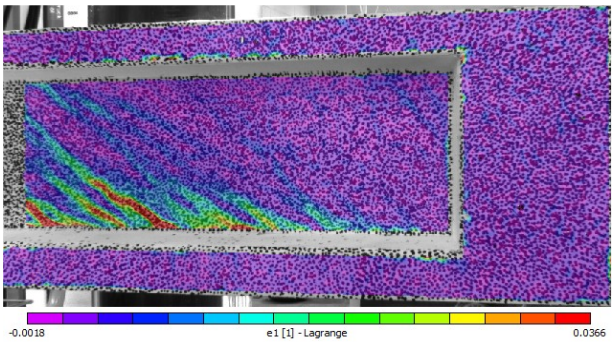
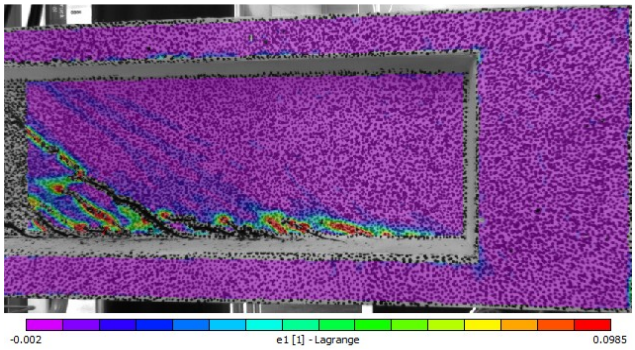
Selected images of principle strain distribution during the loading process:











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