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Assessing Deformation Monitoring Systems For Supporting Structural Rehabilitation under Harsh Conditions

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This paper deals with the evaluation of four measuring systems for the detection of potential deformations that can occur during structural rehabilitation measures. For this purpose, a test object resembling the shape of a tunnel structure was constructed. The structural properties of this test object are discussed in the related paper by Strauss et. al submitted for the same session.

In the paper, the installed measuring systems are presented first. These are a lamella system based on fibre optics, an array of accelerometers, a digital image correlation system and a profile laser scanner based system. The operating principles of the systems are briefly introduced.

A long-term measurement on the object in an unloaded state, which extended over several weeks, enables statements about the capturing of temperature-related deformations, the temperature dependence of the measured values and drift effects of the investigated systems. Selective loading of the test object was generated via four screw rods and applied both in the elastic as well as in the plastic deformation range. This enabled knowledge gain regarding the precision and the sensitivity of the analysed measuring systems.

Environmental conditions may have a strong influence on the measurement values. The former can be determined by permanent installations on the structure and its operating conditions as well as by the undertaken rehabilitation measures. Representative for the first category we investigated the influence of magnetic fields and light conditions on the measuring systems. For the second category, strong dust formation and increased humidity were generated during a test procedure.

An assessment regarding data handling, including storage, transfer and processing, completes the investigation of the four measuring systems. A summarising evaluation concludes the article.