Strain and displacement controls by fibre bragg grating and digital image correlation

Test control is traditionally performed by a feedback signal from a displacement transducer or force gauge positioned inside the actuator of a test machine. For highly compliant test rigs, this is a problem since the response of the rig influences the results. It is therefore beneficial to control the test based on measurements performed directly on the test specimen. In this paper, fibre Bragg grating (FBG) and Digital Image Correlation (DIC) are used to control a test. The FBG sensors offer the possibility of measuring strains inside the specimen, while the DIC system measures strains and displacement on the surface of the specimen. In this paper, a three-point bending test is used to demonstrate the functionality of a control loop, where the FBG and DIC signals are used as control channels. The FBG strain control was capable of controlling the test within an error tolerance of 20 μm m⁻¹. However, the measurement uncertainty offered by the FBG system allowed a tolerance of 8.3 μm m⁻¹. The DIC displacement control proved capable of controlling the displacement within an accuracy of 0.01 mm. © 2014 Wiley Publishing Ltd.