1.9.11. A NEW TEST PIECE FOR GEOMETRY AND DEFECT MEASUREMENTS WITH MICRO-CT

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Computed tomography (CT) is an established method for quality control in industrial production, e.g. in the automotive industry [1]. A method for getting quantitative information on its ability to measure the geometry and to detect defects is to measure calibrated test pieces. We present a modified aluminium casting, which is especially suited as test piece for measuring the geometry and casting-defects with cone-beam micro-focus X-ray systems.

The accuracy of dimensional measurements of outer surfaces with CT can be determined by comparison with tactile measurements. But CT is the only non-destructive method to measure inner surfaces which are inaccessible with tactile or optical methods.

To get a test piece with inner geometries measured by tactile means, we divided a small (roughly 10×10×10 cm) aluminium cylinder-head (casted by the company ACTech in Freiberg, Germany) into four pieces in such a way that most inner surfaces can be reached with a tactile probe. Reference geometries (spheres and cylinders) were applied to define a coordinate system for aligning the measurements in the disassembled and re-assembled state (see fig. 1). The four pieces were reassembled after the tactile measurement (see fig. 2).

The test piece also contains casting defects. For being able to use the assembled cylinder-head also as reference sample for defect detection, measurements with higher spatial resolution and better signal-to-noise ratio were performed on the single parts. For improving the reliability of the reference measurements, CT-measurements of each part were carried out in three different orientations, and the individual defect detections were reconciled to obtain a reference data-set with a high probability of defect detection and a low rate of erroneous detections.

We discuss the results of measurements in the assembled state with respect to the reference data for both, dimensional measurement and flaw detection.

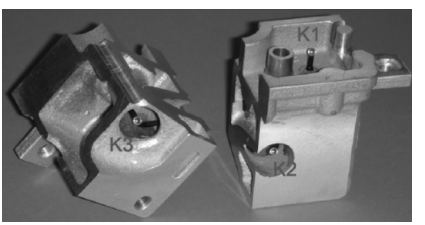

Fig. 1. Two segments of the test piece with visible inner surface and some reference structures (zylinders and callipers)

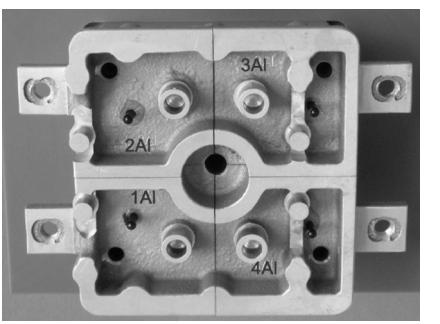

Fig. 2. Test piece, re-assembled

References:

1. **Bartscher M.** et al., Industrial Computed Tomography, an Emerging Coordinate Measurement Technology with High Potentials, Proc. of NCSL International Workshop and Symposium / 3–7.08.2008 / Orlando.