

Testing machines with advanced methods for high-speed, in-line ultrasonic inspection of bar and wire stocks

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Typical industrial applications of rotationally symmetric objects are related to the inspection of round, hexagonal, or square bar and wire stocks, which need to be integrated in the production workflow and thus require large throughput. In most cases the inspected specimens serve as base material for high-quality products. Therefore, test requirements are constantly increasing over the last years. This includes the detection of smaller defects, higher demands on the reproducibility as well as advanced evaluation methods and statistics culminating in the implementation of principles of NDT4.0. This contribution demonstrates latest improvements due to the implementation of advanced PAUT methods for an in-line phased array inspection system, which is based on the Krautkrämer ROWA™ Ux machine. After a short description of the setup special focus is given on the implemented test concept for multi-zone inspection allowing a highly reliable detection of small defects over a wide depth range in the material. Characteristic reference reflectors in aerospace applications are flat bottom holes (FBH) with diameters smaller than 1 mm. The powerful electronics allows e.g., a flexible setting of focus point, aperture size and filters. This significantly reduces the need for special probes and allows fast adaptation to different geometries, also including the switch from round to hexagonal bars. Moreover, multiple evaluation increases the probability of detection and features the use of dynamic depth focusing (DDF) thus reducing the number of test shots. At the final part, advanced analysis tools such as the multi-layered C-Scan are presented, which can be used in context of NDT4.0 for further quality control and feedback to the previous production process.