

# **UCI-Hardness Testing in Production Industries**

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**Abstract - Mastering challenges with mobile hardness testing** Mobile hardness testing is an important, sometimes even indispensable part of quality assurance in the metalworking industry. Here, the two physical testing methods rebound measurement according to Leeb (HL, since 1974) and UCI hardness testing according to Kleesattel (Ultrasonic Contact Impedance, since 1965) bear the brunt in a multitude of applications in steel construction, pipe and boiler construction, in the aircraft, automotive and machine industries, in the maintenance sector, in the testing of tight weld seams, etc.. Sometimes engines, couplings, wheel suspensions that have already been manufactured have to be subjected to a subsequent examination on the object, at points that cannot be reached with classical methods. This reduces the need for costly disassembly. Originally, mobile methods were preferred on large components due to their speed and ease of handling. Due to the high practical value and the corresponding gain in knowledge, the applications, especially with the UCI method, were then constantly extended to smaller and smaller components in the direct vicinity of production - also automated - so that today the accessibility of the test position is essentially the decisive criterion in addition to the requirements from the specification using corresponding test forces between 1 N (0.1 kgf) and 100 N (10 kgf). However, the variety of applications also results in a whole range of requirements for the preparation and execution of mobile hardness tests. The applicability and limits of each test method must be determined separately, as the boundary conditions vary individually depending on the principle. In the following, a short comparison of the two physical methods Leeb and UCI with their ranges and the relation to the classical hardness measurement according to Vickers is made. Afterwards, some applications will be discussed in detail. The emphasis will be on applications of the UCI method, which offers far more possibilities for solving problems in the metal sector. These include small or complex shaped components and more recently NFe materials such as Aluminum parts, which in the past could only be solved with the introduction of SonoDur3 due to limitations in the use of Leeb testers (size, thickness) and lack of adaptability of other UCI testers through adjustment. Other topics include automotive sheet metal (1.4 mm thickness) and the testing of thin metallic coatings. **Keywords:** Ultrasonic Contact Impedance (UCI), Leeb, Material Characterization, Quality Assurance, minimum invasive (Non-destructive) Testing, Hardness testing