

Research Report 268

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Computer controlled tensile testing according to EN 10002-1

Results of a comparison test program to validate a proposal for an amendment of the Standard Final report of the European project TENSTAND - Work Package 4

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Tensile testing according to EN 10002-1 is one of the basic mechanical tests to characterise the mechanical properties of metallic materials. This testing procedure has been regularly under development for many decades in order to modify and amend it and to bring it up to an up to date standard. Today tensile testing for quality control in metals manufacturing industry is routinely performed automatically with computer controlled testing machines. Due to economical needs of industry proposals were made by a European Standard Committee to amend the standard EN 10002-1. A European research project with the acronym TENSTAND was started to validate the proposed modifications of the tensile testing standard. The work package 4 of the project was to validate the machine control characteristics. A comparison test program was started with ten partners, 4 test piece geometries and 3 test parameters for 6 materials, partly with upper and lower yield strength and partly with 0.2 % proof strength to compare experimental results according to the proposal to modify the standard EN 10002-1. Initially testing in the strain control mode was introduced as well as switching of the control mode to crosshead control 1 and switching of the testing speed at appropriate points during the test. The comparison test was evaluated statistically and scientifically.

The following conclusions were derived from the comparison test and summarised as recommendations to the standard committees. The scatter of the material properties were not significantly reduced by introducing the amended testing procedure. Few of the reasons for the continuously observed scatter can be identified as follows: The material properties are observed to be widely dependent on the testing speed.

As a consequence the range for the allowed testing speed must be reduced. The closed loop control was not optimised sufficiently in some tests, the use of complicated testing machine software led to misinterpretation of software commands, individual testing equipment and implementation of the tensile testing procedure led also to scatter of the material properties which lay in a range of few percent. This is blurred by the inhomogeneity of the material.