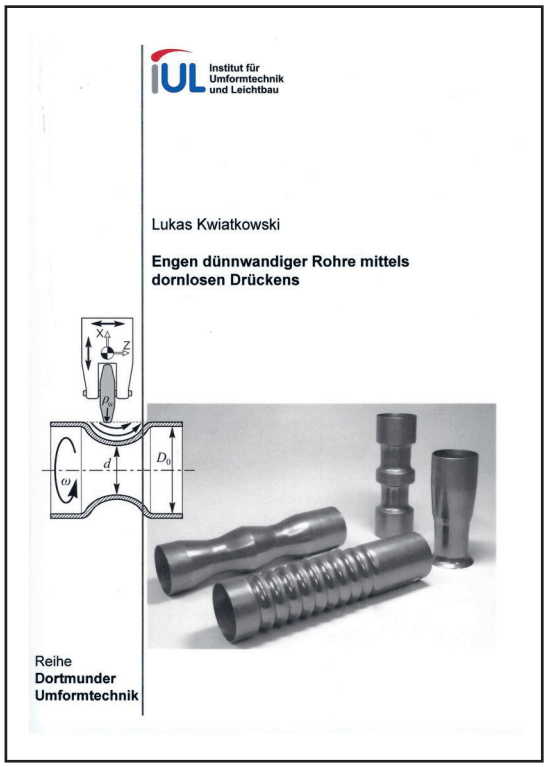
English version below

Institut für Umformtechnik und Leichtbau

Engen dünnwandiger Rohre mittels dornlosen Drückens

Lukas Kwiatkowski



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Zusammenfassung

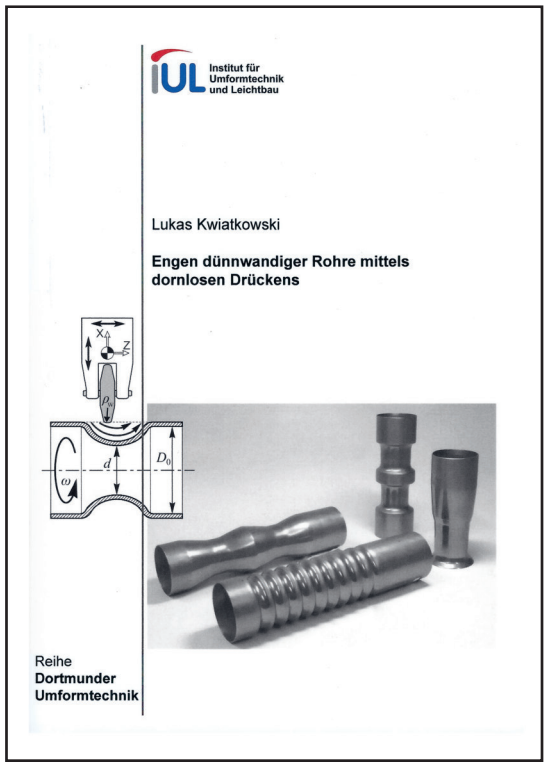
In this work, the spinning process is used to reduce the diameter of thin-walled tubes. This forming process is defined as incremental necking-in. In this process, workpieces are formed locally by moving a roller tool along a predefined tool path. As this forming operation is done without any mandrel, tubular parts with nearly arbitrary contours can be manufactured.

The present work is focused on the identification and explanation of cause-and-effect principles of this flexible forming process. Therefore, process and part properties are analyzed by experiments and by numerical simulations. Effects on strains, forming forces, circumferential cracks, required process time and the waviness of the workpiece surface are explained by theoretical models. Effects of parameters on stress distribution, dimensional accuracy and undesired deformations, residual stresses, fiber flow, forming temperature and cold hardening are clarified using phenomenological explanations. Dimensionless parameters are used within all models to allow a universal application of the gained results. A final combination of all results allows a comprehensive overview of the effect of single process factors on a multiple number of target values. Consequently, the results can be used as a basis to design and to optimize this process. This is finally presented by three specific case studies.

Institut für Umformtechnik und Leichtbau

Necking-in of thin-walled tubes by dieless spinning

Lukas Kwiatkowski



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