

Table of Contents

Preface

Chapter 1: Joining by Forming

New Approach for Versatile Self Piercing Riveting: Joining System and Auxiliary Part F. Kappe, M. Bobbert and G. Meschut	3
Influence of the Rivet Coating on the Friction during Self-Piercing Riveting B. Uhe, C.M. Kuball, M. Merklein and G. Meschut	11
Investigation of Different Joining by Forming Strategies when Connecting Different Metals without Auxiliary Elements D. Römisch, M. Kraus and M. Merklein	19
Friction Characterisation for a Tumbling Self-Piercing Riveting Process S. Wituschek and M. Lechner	27
Modeling of Stiffness Anisotropy in Simulation of Self-Piercing Riveted Components M. Otroshi, G. Meschut, C.R. Bielak, L. Masendorf and A. Esderts	35
Determination of the Interface Structural Resolution of an Industrial X-Ray Computed Tomograph Using a Spherical Specimen and a Gap Specimen Consisting of Gauge Blocks M. Busch and T. Hausotte	41
Temperature Dependent Modelling of Fibre-Reinforced Thermoplastic Organo-Sheet Material for Forming and Joining Process Simulations B. Gröger, A. Hornig, A. Hoog and M. Gude	49
A Finite Plasticity Gradient-Damage Model for Sheet Metals during Forming and Clinching J. Friedlein, J. Mergheim and P. Steinmann	57
Effect of Different Tool Geometries on the Mechanical Properties of Al-Al Clinch Joints L. Ewenz, J. Kalich, M. Zimmermann and U. Füssel	65
Load Path Transmission in Joining Elements C. Steinfelder, S. Martin, A. Brosius and T. Tröster	73
Development of a Method for the Identification of Friction Coefficients in Sheet Metal Materials for the Numerical Simulation of Clinching Processes M. Rossel, M. Böhnke, C.R. Bielak, M. Bobbert and G. Meschut	81
A Method for Characterization of Geometric Deviations in Clinch Points with Computed Tomography and Transient Dynamic Analysis D. Köhler, B. Sadeghian, R. Kupfer, J. Troschitz, M. Gude and A. Brosius	89
A First Approach for the Treatment of Galvanic Corrosion and of Load-Bearing Capacity of Clinched Joints S. Harzheim, C. Steinfelder, T. Wallmersperger and A. Brosius	97
Approach for the Automated Analysis of Geometrical Clinch Joint Characteristics C. Zirngibl and B. Schleich	105
Surface Treatment to Promote Joining of Glass Fiber Reinforced Plastic and AZ31 Magnesium Alloy for Fiber Metal Laminates via Hot Metal Pressing L. Lizzul, M. Sorgato, A. Ghiotti and S. Bruschi	111
New Joining Concepts for Self-Pierce Riveting L.M. Alves, R.M. Afonso and P.A.F. Martins	119
Numerical and Experimental Fracture Mechanical Investigations of Clinchable Sheet Metals Made of HCT590X D. Weiß, B. Schramm and G. Kullmer	127

Chapter 2: Forming

Stretch Forming of Ti-6Al-4V Hybrid Parts at Elevated Temperatures J. Hafenecker, R. Rothfelder, M. Schmidt and M. Merklein	135
---	-----

Introducing Residual Stresses on Sheet Metals by Slide Hardening under Stress Superposition	
J. Lehmann, H. Chen, M. Kruse and N. Ben Khalifa	143
Assessment of Springback Behaviour of 800-1200 MPa Dual-Phase Steel Grades	
U. Durmaz, S. Heibel, T. Schweiker and M. Merklein	151
Functional Gradation in Precipitation Hardenable AA7075 Alloy by Differential Cooling Strategies	
E. Scharifi, M. Roscher, S. Lotz, U. Weidig, E. Jäggle and K. Steinhoff	159
Towards Automatic Part Identification in Sheet Metal Workshops	
A.T. Garcia, N. Levichev, V. Vorkov, D. Cattysse and J.R. Duflou	167
Effect of Stretching on Springback in Rotary Stretch Bending of Aluminium Alloy Profiles	
J. Ma, T. Welo, J. Blindheim and T. Ha	175
Investigation of the Influence of a Superimposed Oscillated Forming Process on Forming Characteristics	
P. Müller, S. Hübner, D. Rosenbusch, H. Vogt and B.A. Behrens	181

Chapter 3: Incremental Forming

Development of Magnetic Field-Assisted Single-Point Incremental Forming	
M. Gucciardi, D. Benson, L. Fratini, G. Buffa and H. Yamaguchi	189
Multistep Incremental Forming beyond 100°	
H. Vanhove and J.R. Duflou	195
On the Effectiveness of SPIF Process to Re-Form End-of-Life Components as Compared to Conventional Forming Approach	
O. Zaheer, G. Ingarao, R. Di Lorenzo and L. Fratini	201
Incremental Roller-Flanging of Thick Metal Sheets	
A. Ghiotti, B.M. del Tito, E. Simonetto, S. Bruschi and S. Filippi	209
Geometry Compensation Methods for Increasing the Accuracy of the SPIF Process	
Y. Carette, M. Vanhulst and J.R. Duflou	217

Chapter 4: Welding and Bonding

Influence of Roughness and Curing Temperature on the Strength of Aluminum Adhesively Bonded Joints	
G. Rotella, M.R. Saffioti, M. Sanguedolce and L. Filice	227
Laser Welding of Laser Powder Bed Fusion Manufactured Inconel 718: Microstructure and Mechanical Properties	
T. Rautio, J. Mälikangas, J. Kumpula, A. Järvenpää and A. Hamada	234
Laser Welding of Laser Powder Bed Fusion (LPBF) Manufactured 316L Stainless Steel Lap Joint	
J. Mälikangas, T. Rautio, J. Jalava-Kanervio, A. Mustakangas and A. Järvenpää	242
Microstructural Evolution and Tensile Strength of Laser-Welded Butt Joints of Ultra-High Strength Steels: Low and High Alloy Steels	
M. Hietala, A. Hamada, M. Keskitalo, M. Jaskari, J. Kumpula and A. Järvenpää	250
Microstructure and Formability of Laser Welded Dissimilar Butt Joints of Austenitic-Ferritic Stainless Steels	
M. Keskitalo, A. Hamada, M. Hietala, M. Jaskari and A. Järvenpää	258

Chapter 5: Characterisation

Investigation of the Micro Hardness at the Cut Surface of Fine Blanked Parts with Variation of Sheet Material and Cutting Temperature	
I.F. Weiser, A. Feuerhack and T. Bergs	269
Material Model for the Production of Steel Fibers by Notch Rolling and Fulling	
A. Biallas and M. Merklein	277
The Frictional Force between Slug and Die in Shear Cutting after Material Separation	
J. Stahl, I. Pätzold, L. van den Bosch, A. Kindsmüller, R. Golle and W. Volk	285

Fracture Characterisation by Butterfly-Tests and Damage Modelling of Advanced High Strength Steels	
B.A. Behrens, K. Brunotte, H. Wester and M. Dykiert	294
Determination of the Biaxial Anisotropy Coefficient Using a Single Layer Sheet Metal Compression Test	
P. Hetz, M. Lenzen, M. Kraus and M. Merklein	303
Local Strain Measurement in Tensile Test for an Optimized Characterization of Packaging Steel for Finite Element Analysis	
F. Knieps, M. Köhl and M. Merklein	309