

# Technologies for the Mechanical Joining of Aluminum Die Castings

T. Grimm<sup>1, a)</sup>, M. Jäckel<sup>1, b)</sup> and W. G. Drossel<sup>1, c)</sup>

<sup>1</sup> Fraunhofer Institute for Machine Tools and Forming Technology IWU  
Nöthnitzer Straße 44, 01187 Dresden (Germany)

<sup>a)</sup>Corresponding author: [thomas.grimm@iwu.fraunhofer.de](mailto:thomas.grimm@iwu.fraunhofer.de)

<sup>b)</sup> [mathias.jaekel@iwu.fraunhofer.de](mailto:mathias.jaekel@iwu.fraunhofer.de)

<sup>c)</sup> [welf-guntram.drossel@iwu.fraunhofer.de](mailto:welf-guntram.drossel@iwu.fraunhofer.de)

**Abstract.** Self-pierce riveting with semi-tubular rivet (SPR-ST) or solid rivet (SPR-S) are standard joining techniques for processing aluminium die cast alloys in the automotive car body manufacturing. When using these conventional SPR methods cracking in the casting components may occur due to the limited ductility of the material. To address this problem new process variants like self-pierce riveting with solid formable rivet (SPR-SF) and self-pierce riveting with moveable die element (SPR-MD) were developed at the Fraunhofer IWU. By the use of these new processes the cracking in the aluminium die castings can be prevented through the implementation of alternative rivet designs or additional cinematics in the die tool. This paper shows different problems during the conventional mechanical joining of the aluminium die cast alloy AlSi9Mn F and at the same time demonstrates the potential for improvement through the newly developed processes. Thereby the numerical process development of the new rivet technologies will be illustrated. Additionally the conventional and new process variants will be compared by joint formation and strength tests.

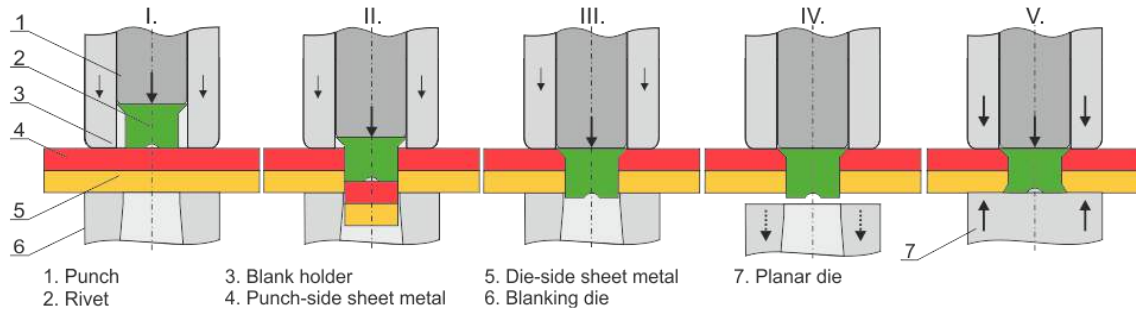


Figure 1: Process steps of self-pierce riveting with solid formable rivet (SPR-SF)

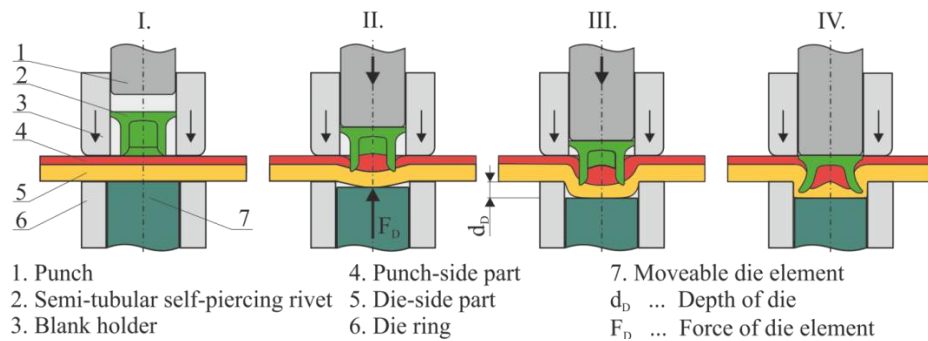


Figure 2: Process steps of self-pierce riveting with moveable die element (SPR-MD)