

# Integrated Manufacturing by Hydroforming, Laser Welding and Cutting

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**Abstract.** The shortening of process chains and the combination of innovative manufacturing technologies offer the possibility to enhance the complexity of technical products. The presented work describes the development of a process chain for the manufacturing of complex hollow parts out of double sheets and tubes with a big variation of the cross section, e.g. for A-pillars in the automotive sector. Two blanks and a tube are inserted in a hydroforming tool by a handling robot. The processes forming of blanks and tubes as well as joining by clinching are integrated in this tool. After these steps, the handling robot places the part in a laser station, where integrated laser welding and cutting processes take place. This paper focuses on special solutions developed both in the hydroforming and in the laser processing. In particular, the connection between blanks and tube is extremely problematic with regard to the sealing in the hydroforming process and the welding operations due to an existing gap. The requested tightness is reached by reinforcing the tube in the connection area with a ring insert, by placing sealing profiles on the outer surface of the tube and particularly by adding a sealing medium to the hydroforming fluid. In laser operations, special challenges result from complex welding and cutting paths, contaminations of the blanks with hydroforming media and lubricants, gaps between the blanks that occur due to residual stresses after forming and burr formation.