

Laser cutting and heat treatment of shaped blanks made from cold-rolled strips for lightweight construction

Cold-rolled special steels are characterized by high strength, customized surfaces and narrow tolerances. Thus, they serve the special requirements of lightweight automotive construction excellently. In cooperation with the BILSTEIN GROUP (Hagen site), Fraunhofer ILT is developing a process to cut – tool-free, wear-free and flexibly – shaped blanks from cold-rolled strip using high-speed laser blanking and to soften them selectively using laser heat treatment. The processes offer significant advantages: In addition to the consistently high edge quality, the components can be formed and their crash behavior adjusted specifically. Both projects are being run within the BILSTEIN GROUP under the brand names BILCUT and BILTIC.

Targeted exploitation of laser flexibility

A major key to optimizing high-speed laser blanking in terms of productivity, quality and flexibility is to adapt all the parameters of the laser beam source and optics to the required output for the targeted product portfolio. These optimization tasks are solved by simulation calculations and experimental verification on highly dynamic processing equipment. Local heat treatment is also performed by means of laser radiation. Zoom optics allow flexible adaptation of the beam to the area to be softened.

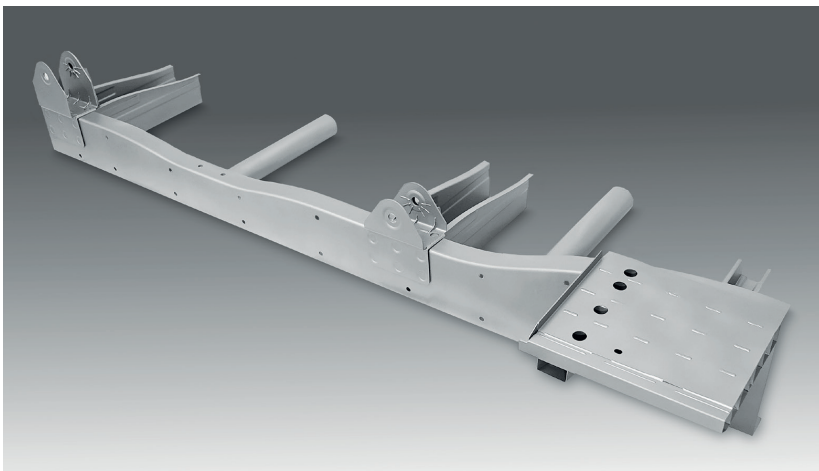
Fast to optimum performance characteristics

The reference material is BILSTEIN grade CR600LA with a thickness of 2 mm. This can be cut at speeds of up to 52 m/min at a laser power of 6 kW. With a thickness of 1 mm, speeds of over 100 m/min are achieved. The low heat input of the cutting process minimizes edge hardening with significantly less penetration than punching. During local heat treatment, the microstructure is recrystallized in the desired component areas. By adjusting the process parameters, the industry can specifically adapt the degree of softening or the forming behavior to the required manufacturing operations and performance characteristics.

Applications in automotive lightweight construction

The applications are mainly seen in the automotive sector. One example is the demonstrator shown in the picture from the FlexHyBat project funded by the BMWK. The side member integrated in it was designed and 3D roll-formed by DataM. The associated molded board was laser-cut and partially softened by Fraunhofer ILT on behalf of the BILSTEIN GROUP.

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Section of a laser-cut, partially laser-debonded and 3D roll-formed longitudinal member with add-on parts, © Dörken Coatings GmbH & Co. KG.