

eClinching ensures electrical conductivity on fuse boxes

With the strong increase of e-mobility, one topic is gaining in importance, which has always played an important part in the automotive industry, but remained rather hidden in practice: Thermal as well as mechanical joining of sheet metal parts, assemblies and components. In the course of electrification, new challenges arise especially for e-components, for example with regard to electrical conductivity, stability and safety of the connections under any conceivable vehicle operating conditions. Here, the mechanical process of “eClinching” from technology company TOX® PRESSOTECHNIK GmbH & Co. KG, 88250 Weingarten, comes into its own, which originates in the „TOX®-Round Joint process”. This is a cold-forming process, resulting in a positive locking and frictional connection, which is characterized by an optimum electrical conductivity. A crucial aspect of the reliability and future sustainability of TOX®-eClinching is the special formation of the joint zone, as the sheet metals to be joined together are flowing into each other, resulting in positive locking and frictional connection, as well as a material bonding in the form of metallic micro-contacts. The high electrical conductivity of the TOX®-Clinching Joints with different materials was confirmed in different analyses and tests by neutral institutions, and the process was consequently transferred to industrial application. Amongst others, one automotive manufacturer decided on this technology, and commissioned the technology company and supplier Intercable GmbH from South Tyrol (Bruneck/Italy) to join their live components together by means of TOX®-eClinching for the modular assembly of fuse boxes. Intercable is working together with automotive manufacturers as development partner to come up with new solutions in the area of hybrid and e-vehicles. With the TOX®-eClinching Technology, Intercable was able to significantly extend its range of innovative products and services. Intercable commissioned AKE technologies GmbH in Passau, Germany with the construction and manufacturing of the production system required for serial production, which in turn partnered up with the clinching specialists from TOX® PRESSOTECHNIK. The scope of work included the design of the clinching tools as well as the respective production technology equipment. AKE technologies received a total of 12 TOX®-Clinching Tongs ready-to-connect, which, depending on type and design of the “fuse box” assembly, were integrated into the different modules of the production system individually or in blocks with up to three system units.

Technology and production equipment from one source

Designed as single point tongs with adjustable die, the tong systems consist of a TOX®-Tong of type TZ with ram guide and throat depth of 300 mm, a drive on punch side, a stripper on punch side including TOX®-ToolCheck, the TOX®-Control STE with process monitoring as well as the TOX®-Clinching Tool (punch and die). A servo-mechanical TOX®-ElectricDrive drive unit of type EPMR 055, which is designed for press forces up to max. 55 kN, ensures that the required press force is generated as needed precisely and reproducibly. Furthermore, the system or scope of delivery includes TOX®-

Spray Equipment of type SP to provide the lubrication required during the joining process. A cable set and respective test reports complete the scope of delivery. All of the pieceparts to be joined consist of copper of very different thicknesses at 0.40/0.60/1.00/1.50 and 2.50 mm, whereby the join partners can be very different at for example 2.50 mm strength on punch side and 0.40 mm strength on die side. Depending on the join partner or material thicknesses, the clinching points have a diameter of 6 or 8 mm, thus guaranteeing the very good and safe electrical conductivity through the full-faced metallic microcontacting.

Highly flexible and future-proof: eClinching

The example of the test report data for a clinch joint of two join partners made of copper shows that TOX®-eClinching is also suitable for complex joining operations: Component thicknesses on punch side of 2.5 mm and on die side of 0.6 mm, press force incl. retaining force of 23 kN, joint diameter of 6 mm, die depth of 1.6 mm, residual bottom thickness reference dimension X = 0.75 mm. Eight additional combinations of join partners are possible. With the identically equipped clinching tongs selected as standard equipment as well as the servo drives generating max. 55 kN of press force each, there are sufficient reserves for joining further e-assemblies. This is in line with a rational production of variants which is flexible in terms of quantities and with a focus on the future of the automotive industry, which will represent a further ongoing challenge for the industry and its suppliers in addition to e-mobility.

Image descriptions:

Image 1 shows a section of the modular production system developed and manufactured by AKE, into which a total of 12 TOX®-Tongs for the joining of copper components are integrated for the fuse box assembly

Image 2 shows two TOX®-Clinching Tongs at the assembly stage

Image 3 shows a TOX®-Clinching Tong in detail; the ram guide is shown at the bottom based on a linear guide rail, the punch unit (upper tool) is shown above, which is controlled by means of the servo-mechanical drive TOX®-ElectricDrive EPMR

Images 4 and 5 show the TOX®-Clinching Tongs integrated into the production system

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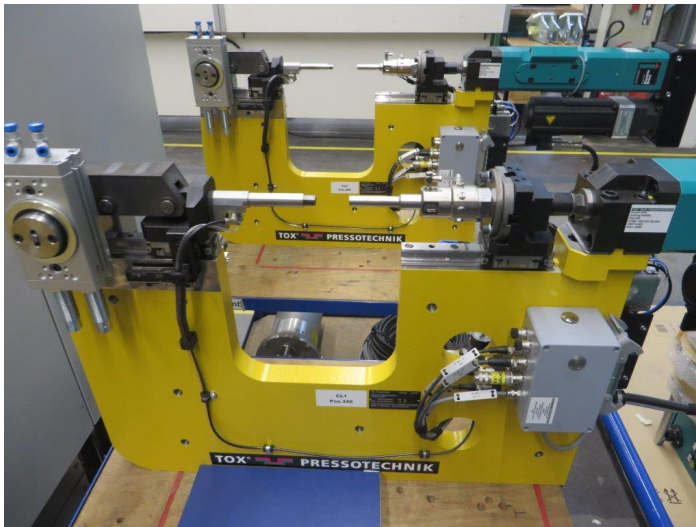
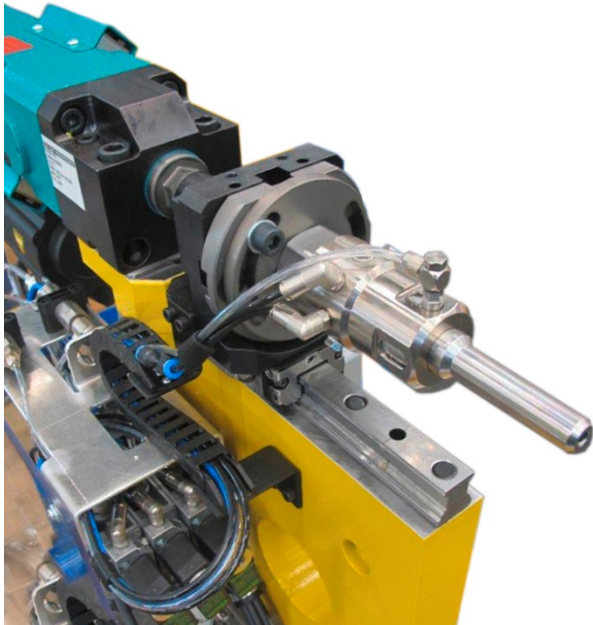


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