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The increasing market share of electrified powertrains is driving demand for efficient and powerful electric traction motors. Hairpin technology is well established in automotive manufacturing systems for the production of high quality distributed stator windings. This is due to its high level of automation and the resulting productivity. However, the robustness of the industrial process is limited by variable mechanical and geometric properties. For example, the enameled rectangular copper wire causes different springback effects during hairpin bending and twisting. Both, the mechanical forming properties of the copper conductor and the insulation coating of the rectangular winding wire must be specified and analysed in a universal but application-oriented manner in order to increase process reliability.

This presentation shows a methodology for characterising the mechanical forming properties of rectangular enameled copper wire. The method exceeds existing standards and it can be used for both statistical delivery control and numerical process simulation. Therefore, Young's modulus, yield strength and flow curve, as well as the adhesion of the insulation coating are analysed.