



HIGH-SPEED CONTOUR CUTTING OF STATOR SHEETS FOR ELECTRIC MOTORS

Task

When lasers are used to cut stator sheets, cutting geometries can be flexibly adapted to a particular motor size and motor geometry. In contrast to common die cutting of the stator sheets at high production volumes, for which a new tool has to be manufactured for each contour, a laser cutting system can create any geometry desired at the smallest of lot sizes. Custom manufactured parts or components at low production volumes can be produced economically and adapted to a customer's wishes cost-effectively.

Method

Laser beam cutting allows cutting speeds of more than 100 m/min at 4 kW laser power and 1 mm sheet thickness for steel sheets, for aluminum sheets at speeds over 150 m/min. In order to utilize the potential of the higher speeds the process offers, also for complex contours, highly dynamic machines are necessary. Typically, the cutting head is moved in an axis relative to the workpiece, because lower masses have to be accelerated than is the case with a moving workpiece. This arrangement is, however, unsuitable for process developments by which the observation of the process is desired. On account of the static processing location, the accessibility is optimal for high speed cameras, photodiodes and further sensors in a coaxial or off-axial observation perspective.

Result

The high jerk and acceleration values of the machine developed at Fraunhofer ILT – of 5000 m/s³ and 5 g – enable a complex geometrical form of a stator to be cut with a diameter of 130 mm in a processing time of less than 6 seconds. Since the laser power can be flexibly adapted to the available or attainable process speed, the energy efficiency of such a cutting operation is optimized.

Applications

In addition to the high-speed processing of metals and plastics with low wall thicknesses, the axis system can be used for process analysis in the entire thickness range.

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3 Cutting operation.

4 Laser-cut stator sheet.