



MULTIFUNCTIONAL LASER ROBOT FOR CUTTING, JOINING AND ADDITIVE MANUFACTURING INCL. A DIGITAL TWIN

Task

If components are to be flexibly produced for electric vehicles, multifunctional tools, especially in the area of small and medium quantities, are required. To spur their development, a digital twin supports commissioning them and preparing their production and will also ensure seamless monitoring of production in the future.

Method

The starting point is the development and construction of a flexible laser processing head in which cutting, joining and additive manufacturing are integrated. A digital twin maps the robot kinematics and the complete system control – including the PLC-programmed head functions and clamping device. This enables virtual commissioning and accelerated change-over of the process chain and product. In the future, the feedback of sensor signals from the hardware and the process will be used to monitor and optimize the overall system.

Results

The beam parameters to be adapted for the individual processes can be set in the multifunctional laser head through variable beam shaping. Integrated in the head are devices for the supply of working media and additive materials as well as for the capturing of process signals. The digital twin of the laser robot cell has been largely configured and now allows users to program PLC-controlled functions virtually and to design the production sequence optimally.

Applications

For the first time this development will make a tool available that can perform all three manufacturing processes without retooling. Thanks to the virtual model, the entire system can be commissioned quickly and production preparation is less susceptible to errors. Applications can be found wherever industry needs high variant diversity, fast product changeovers and agile manufacturing in small to medium quantities. The development is aimed at the production of electric vehicles, but can also be transferred to numerous other product classes.

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Contact

Dipl.-Ing. Martin Dahmen, Ext.: -307
martin.dahmen@ilt.fraunhofer.de

Dr. Dirk Petring, Ext.: -210
dirk.petring@ilt.fraunhofer.de

3 Simulation of component, fixture and machining head in the digital twin.