# Digital Twins for Micro Machining

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**Abstract.** The digital twin is a virtual mirror of the physical world throughout its life cycle. A cutting process controlled by digital twins can be a modern solution for manufacturing. Continuous data collection using virtual twin simulation and physical twin experimentation is related to modified vibration micro drilling processes, improving the quality of operations. The main research question is how to quickly create a virtual model, and the mechanism for deploying the connection between the physical world production system and the virtual model it reflects. Over the last two decades, the demands of drilling small holes (Ø 0.5 mm) at high rotational speed (80.0÷180.0 rpm) are increasing due to the trend towards higher density circuits of computer parts and microelectronic packaging products. Compared to various micro machining methods, the main advantages of mechanical micro drilling are: less complicated equipment is necessary, the process is cheaper, the electrical properties of the workpiece do not influence the process, and machining time can be controlled easily. Buckling stiffness of micro drill bit is essential factor in order to secure the quality of micro drilling process, most of micro drill bit failures happen because of buckling. The aim of this study is to investigate the possibilities to increase micro drill stiffness by buckling it on a higher mode of the tool. This would allow to use higher cutting parameters and to increase efficiency of the micro drilling process.

**Keywords:** data collection, vibration drilling, buckling stiffness, higher mode, process efficiency

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