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A New Micro Injection Molding Machine

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Microtechnique is a key technology of the 21st century with expected annual growth rates of 20 %. The arguments for miniaturization are the same as for microelectronics. From the high degree of integration of a system, it follows its high functionality, reliability, and availability. The diverse applications include automotive industry, IT, biotechnology, and medical engineering. Especially polymers open up new markets due to their favorable processability and additional favorable properties.
We report studies of the plunger injection molding principle applied to the manufacturing of microparts leading to the development of our new injection molding machine (IMM). For manufacturing of microparts, only small amounts of polymer have to be plastificated and have to be injected into the mold cavity with highest precision. For this purpose, the limitations of the "classical" screw plastification principle for low shot weights are discussed. We offer the plunger injection molding principle as an appropriate solution for plastificating small amounts of polymer allowing at the same time short resident times.
The plunger plastification principle is discussed in terms of its feasibility, constructive implementation, and its advantages. The simple one-step plunger injection molding is compared with the more complicate two-step plunger injection molding including plunger pre-plastification with subsequent plunger injection. Based on a wide variety of parts arising from industrial applications, we show that our IMM allows to manufacture microparts in high-quality with the required high reproducibility. Furthermore, the manufacturing is economically efficient within small series and large series as well. A simple and economical adaptation to the actual processing task can be achieved by the modular construction and a flexible concept of the micro mold.
Our new IMM shows potential promise for its wide range use.