

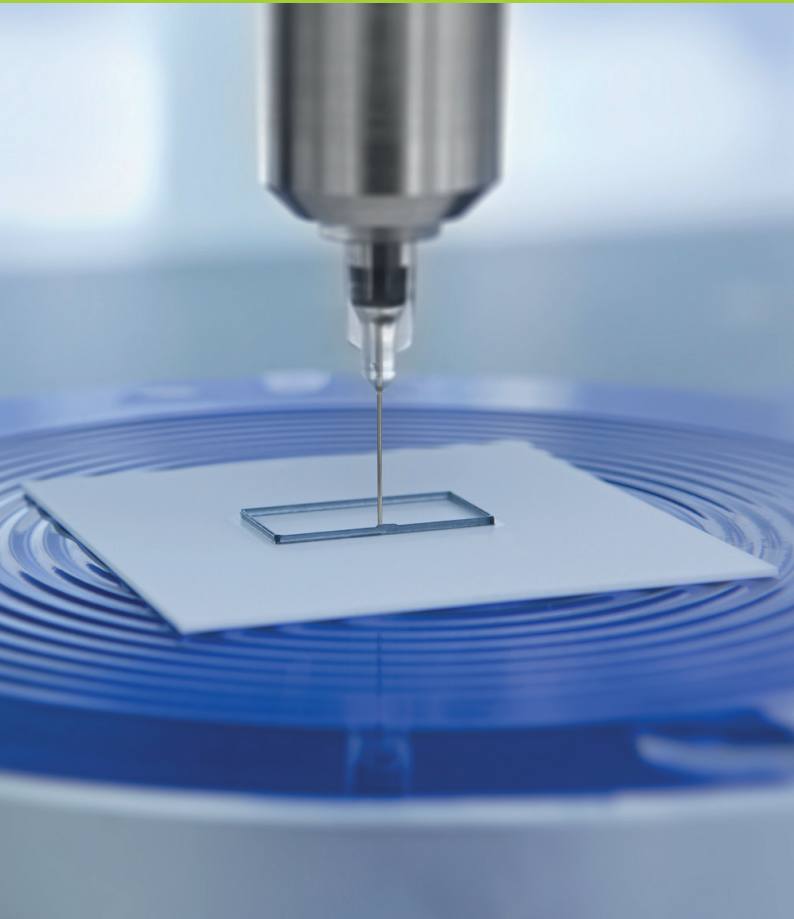


Fraunhofer

IPA

**FRAUNHOFER INSTITUTE FOR
MANUFACTURING ENGINEERING AND AUTOMATION IPA**

**HIGH-PRECISION APPLICATION OF
LOW- TO HIGH-VISCOSITY FLUIDS**

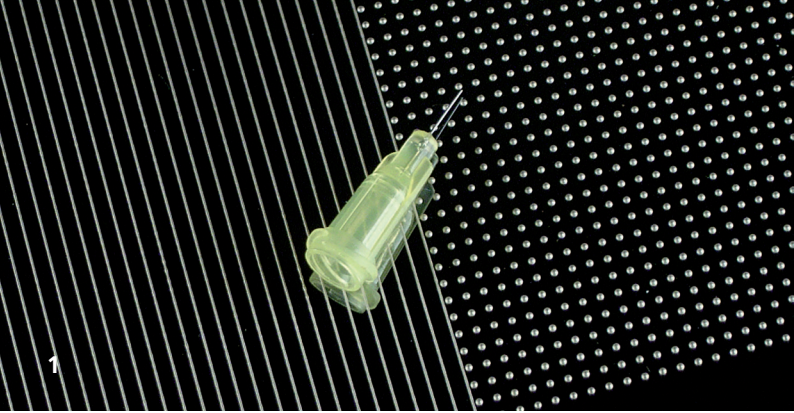


Initial situation

Dispensing fluids in dots or lines or in defined areas is highly relevant to a number of applications and branches of industry, ranging from the application of adhesives in assembly, through the dosing of substances in analytics and the dispensing of conductive adhesives in microelectronics right up to the coating of surfaces in the optics. With the continuing miniaturization of products and associated requirements regarding lower volumes, higher accuracy, improved reliability and also the demand for dispensing systems that are compatible with a whole range of (sometimes filled) fluids, conventional techniques are increasingly reaching their limits as far as capacity and applications are concerned. Industries are calling for solutions, which not only fulfill quantity and material requirements but which are also reliable when used on an industrial scale.

Development of the process technology

Long-term experience has shown that in order to develop an efficient solution adapted to the respective medium and application, all the influencing parameters affecting the dispensing process have to be taken into account. To investigate different dispensing methods and ascertain optimum parameter settings, e.g. feeding pressure, nozzle distance, the cleanrooms of Fraunhofer IPA are equipped with high-precision systems fitted with sensors for

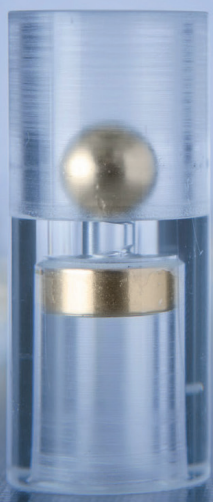


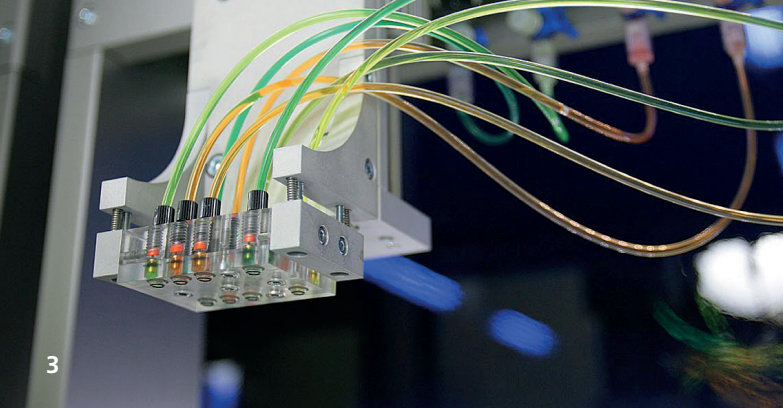
process control and visualization. State-of-the-art testing and analysis technology enable structural features relevant to quality to be determined. Selective processes such as CO₂ and plasma are also available if contact surfaces require pre-treatment. Customized solutions are developed with a special focus on cost-effectiveness, reliability and quality.

Development of the system technology

One of the challenges is to put the process tested in the laboratory into practice in the manufacturing environment. Increasing requirements regarding reliability and process stability often mean that additional sensors need to be integrated. For many years now, Fraunhofer IPA has been developing system solutions for the application of low- to high-viscosity fluids (where necessary filled) in dot or line form or larger surface areas. Developments concentrate on the application of low volumes (μl – nl – pl).

For example, the intelligent piston dispenser »IPA.smartDispenser« has been developed with a pressure sensor integrated into the tip of the piston. The direct contact of the sensor with the medium enables the force actually being applied inside the cartridge to be measured and controlled. With the system, low- to high-viscosity fluids can be applied highly-accurately as dots or lines, e. g. soldering paste in a line width of less than 100 μm . Among other things, optional adjustment of the feed volume during the dispensing





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process also allows traversing, intersecting or angular structures to be applied evenly. A further development is the universal magnetic valve »IPA.VALVE«, which is composed of two permanent magnets that are located either side of the valve seat. Whereas the ring magnet through which the medium flows is fixed, the spherical magnet used to close the valve in a normal state can be deflected radially to open it. The valve is activated by increasing or reducing the feed pressure applied to the closing sphere according to the threshold value set for the distance between the two magnets. With is type of valve, there is no further need to completely reduce pressure on completion of the dispensing step, or to retract the medium by vacuum. Alternatively, the valve can be activated by a magnetic unit which controls the closing sphere externally. Implemented as a component, the valve can be adapted to a conventional system, e. g. time/pressure system, thus preventing any typical post-dripping, or it can be integrated directly inside a product. It is also available as a single-use injection-molded product.

- 1 *Application of dot and line structures.*
- 2 *Magnetic valve IPA.VALVE.*
- 3 *Multiple dispensing system.*



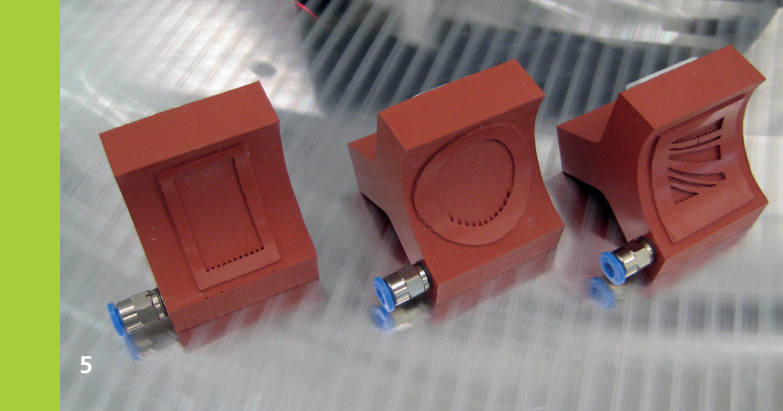
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With the IPA.selectiveCoating technology, a defined surface of a product is selectively coated with a liquid. Consequently, a liquid can be applied in line structures or to extensive areas, with the inner area remaining uncoated if required. Not only rigid but also flexible substrates with smooth or uneven surfaces, such as foils or printed circuits, can be processed in this way, e.g. coated, activated or cleaned. Lateral surfaces and edges of components can also be treated, for example glass substrates. One of the main elements of the system is a tool-head with channel structures made in the surface, whose patterns correspond with the application image desired. To generate the pattern, the medium selected is triggered by a vacuum applied at the outlet and fed through the tool onto the substrate that is simultaneously sucked onto the tool-head. The areas of the substrate opposite the channels are thus wetted or coated by the medium. Optionally, the tool can be used as a vacuum gripper and apply fluid while the part is handled.

TITLE *Dispensing three-dimensional structures.*

4 *Intelligent piston dispenser IPA.smartDispenser.*

5 *IPA.selectiveCoating tools.*



As well as dispensing systems, Fraunhofer IPA also develops equipment-based solutions for integrated quality control.

Our range of services

- Feasibility studies
- Independent evaluation of dispensing processes
- Development of customized process and system solutions
- Quality assurance through integrated process monitoring and control

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For further information about our range of services, solutions and consultancy, please contact our experts.

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