Foam Gasketing and Potting on a Miniature Scale

Micro Sealing of Electronic Components under ESD-Compliant Conditions

At a time of Industry 4.0 and self-driving cars, the amount of complex, highly sensitive electronics packed into ever smaller components is increasing. To protect these components from adverse environmental influences and ensure the longest possible, fault-free operation, they are gasketed, glued or potted. Specific procedures are stored for ESD-compliant contract manufacture of each different component.

Gasket and potting material can be accurately dispensed into the narrow contours of miniaturized components thanks to precision guidance of the mixing head on the fully automated mixing and metering machines (© Sonderhoff)

Protection from uncontrolled electrostatic discharges has a vital role to play in preventing damage to electrostatically sensitive components such as sensors or semiconductor circuits, so avoiding malfunctions. To meet this requirement, Sonderhoff Polymer-Services Austria GmbH (PSA), a contract manufacturer based in Dornbirn, Austria, specializes in foam gasketing, gluing, and potting components for the telecommunications, electronics, and medical technology sectors.

In the border triangle formed by Germany, Austria, and Switzerland, which is Sonderhoff PSA's main market, there are many plastics manufacturers from the above-mentioned sectors, for whom sealing of miniature components is especially important. In light of the progressive miniaturization of components and ever more challenging requirements specified for the tiny sub-units of larger components, there has been increasing demand in recent years for very small housing gaskets, so-called micro gaskets, as well as micro potting of miniature components.

Gasket Application with Precise Path Control

Many years' technical innovation by machinery manufacturer Sonderhoff Engineering of Hörbranz, Austria, led up to the development of its first mixing head for precision metering of minute quantities for very small components. This company, which – like PSA – belongs to the Sonderhoff Group based in Cologne, Germany, went on to take another important step towards ever smaller applications with the subsequent development of the MK 650 mixing head. Among other features, this head is equipped with pressure-controlled recirculation technology and a high-pressure water rinsing system for maintenance-free cleaning of the mixing chamber. With the MK 650, PSA can process minute quantities down to 0.1 g/s for foamed gaskets or even only 0.05 g/s for potting.

Gasket and potting material can be dispensed into the very narrow contours of miniaturized components in exact quantities from 0.05 to 0.2 g/s thanks to precision guidance of the mixing head on the fully automated mixing and dosing machines. The linear robots built by Sonderhoff Engineering ensure a maximum tolerance of ± 0.1 mm for path control repeatability, which makes it possible to position the mixing head precisely at the same place every time.

With the mixing head technology fitted on the MK 650, very narrow liquid foam gaskets can be applied directly on the part with all the advantages of FIPFG (foamed in place foam gasketing). This process has become widely established in recent decades and in many industries is now the standard method for applying housing gaskets of all types. Even complex, three-dimensional gasket contours can be foamed rapidly and reliably in reproducible quality

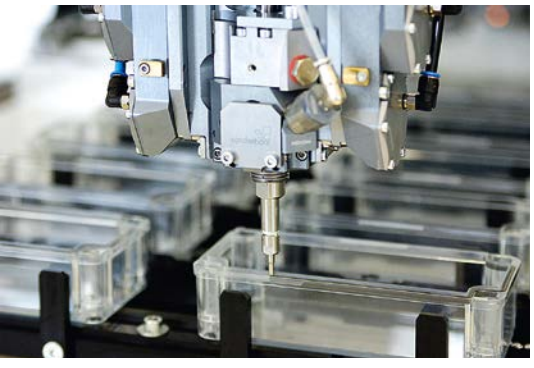
Certified protection zone for ESD-compliant foam gasketing, gluing, and potting at Sonderhoff PSA in Dornbirn (left). The contract manufacturer specializes mainly in micro gasketing and micro potting small components for the IT/electronics industry and medical technology (© Sonderhoff)

Costly Electronic Malfunctions due to Electrostatic Discharge

To protect the electronic workings of sensitive components, this processing step must be ESD-compliant. The phenomenon of electrostatic discharge may be described as the effects involved in the equalization of electrical charges between two unevenly charged materials. When these two materials come into contact, positive and negative charges are exchanged, resulting in a very short but high current impulse. The cause of the potential difference is usually charging due to frictional electricity or electrical influence. Frictional electricity is generated, for example, by walking over a carpet, when a person may generate a charge up to some 30,000 V.

Electrical influence is one of the greatest electrostatic problems in the electronics industry. If conductive uncharged bodies (conductors) are isolated in a static field, a charge is displaced on them. Through this charge displacement, the conductor becomes positively charged, and negatively if the conductor has no galvanic connection to other electrical conductors. In itself, the conductor remains electrically neutral. If the field is briefly grounded a partial charge flows (initial discharge). When the body is then removed from the field, it is charged by the deficit amount and there is a risk of an unexpected second discharge that can damage electronic components.

ESD causes millions of euros' worth of damage in the economy every year. Faults in the IT control of automated production lines do not always lie in the software. Rather, in the case of integrated circuits based on semiconductors, electrostatic discharges are one of the most common causes of malfunction. The growing complexity and faster clock rates of the semiconductor elements, continual miniaturization of electronic component structures from 1.5 µm (1985) to 32 nm (2008), and rapidly increasing performance and interconnection of control units all raise susceptibility to electrostatic discharges. Today, it is thought that 10 % of ESD-stressed semiconductor elements cause faults. If this remains unrecognized, costly recalls may be the result. For this reason, protection from electrostatic discharges is indispensable in all areas of microelectronics today.



MK 650 mixing head technology enables very narrow liquid foam gaskets to be applied directly on the part with all the advantages of the FIPFG process (© Sonderhoff)

ESD-Compliant Contract Manufacture

With its ESD-compliant contract foam gasketing, gluing, and potting of industrial parts and electronic components in accordance with DIN EN 61340-5-1, Sonderhoff PSA in Vorarlberg, Austria, is able to meet increasingly high customer requirements for ESD protection of electrostatically sensitive parts. Certain plastics are particularly susceptible to the formation of charge potentials that could lead to malfunctioning of the electronics if parts are not handled correctly. By providing employees with conductive safety shoes, coats, and gloves to wear, PSA ensures that sensitive components are not damaged by electrostatic discharges.

In PSA contract manufacture, every ESD order is individually handled. For each customer order, a specific production procedure is stored, which is checked by measurements during production. The foam gasketed, glued, or potted components may only be transferred into and out of the ESD protection zone through airlocks in ESD-compliant packaging or special transport containers, so-called trays. ■

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Company Profile

Sonderhoff Polymer-Services Austria GmbH (PSA) offers its industry customers in the border triangle formed by Germany, Austria, and Switzerland a portfolio of services for foam gasketing, bonding, and potting components for a wide variety of applications. These services cover the whole range from prototype sampling and small-lot production to large-scale industrial manufacture. By providing its own mixing and metering equipment, the company acts like an extended workbench for its customers, enabling them to react flexibly to demand, cover production peaks or bridge low production capacities without having to invest in their own machines.

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