



## Implantable medication delivery systems: Where every microliter counts.

**Implantable medication delivery systems can have a decisive influence on the quality of life of the patients. In many cases, such delivery systems are vital for the survival of the patients – the systems have to be absolutely reliable. maxon motor manufactures high-precision micro drives for medication delivery systems.**

Patients that suffer from chronic pain, metabolic disorders, diseases of the central nervous system and tumor diseases require accurately dosed medication. Here implantable medication delivery systems are used. Through the localized medication delivery, the dosage can be reduced to the required minimum. These infusion systems thus improve the quality of life of the patients. For many patients, it is only the medication delivery system that allows them to have a life outside of the clinic. Repetitive invasive, painful operations can be avoided. The risk of medication dependency and undesired side effects are reduced to a minimum. All these factors can contribute to the disease no longer being the central focus of the patient's life.

For example, an active implant is implanted in the lower abdomen directly underneath the skin, where it delivers the medication dosage, programmed by the physician, to the body at the defined times of the day. The implantable unit has a wireless data interface to a patient interface by which the dosage can be adapted at any time. At regular intervals, the internal medication reservoir can be refilled by a specialist. The life span of the active implants measures many years and is limited only by the life of the battery. The core of the active implant is a piston pump manufactured by maxon medical, which specializes in medical technology and is a division of the maxon motor Group. However, the micro drives for implantable medication delivery systems are not comparable with customary maxon motors. In a customary motor, rotary motion is generated and yields torque and speed of rotation.

The reciprocating piston pump generates a linear movement that results in liquid pumping. The individual parts of the pump have very narrow tolerances and allow the pump volume to be adjusted with a precision of less a microliter per piston stroke.

As active implants are in direct contact with human tissue, biocompatible materials are an absolute requirement. Therefore, in most cases, titanium is used for the implants. Machining of titanium, especially safe and reliable laser welding, requires a very high level of expertise. Special testing and quality methods, such as inspecting the penetration depth, microhardness and density of the weld seams, are established procedures at maxon medical. The customer requirements on the product are thus fulfilled and the reliability and constant quality of the manufacturing processes are guaranteed. The entire assembly of the implantable micro drive takes place under cleanroom conditions.

### **maxon medical – Specialist for medical drive solutions and active implants**

maxon medical specializes in the manufacturing of medical drive solutions for active implants. The division received ISO 13485 certification in December 2008. The quality management system and the project organization ensure safe, reliable and standard-compliant products and provide the customer with a sound basis for statutory approval of the final products.

Professional project organization and a proven risk management system allow efficient implementation of customer projects. Strict maintenance of statutory requirements has top priority in the implementation of medical technology projects with risk class IIb + III. Production processes, production systems and testing systems always fall under GMP (Good Manufacturing Practice, Commission Directive 2003/94/EC), regardless of the classification of the product.

maxon medical meets highest customer requirements – from selection of suitable suppliers to multi-tier quality control, from the individual parts to the final product. Manufacturing processes in the field of medical technology have very high documentation requirements during the entire value-added chain. All the way from the project idea to series production. In the end, a comprehensive and detailed documentation of all processes is required, including verification of process capability and traceability right back to the individual parts. This process control, matured to the last detail, characterizes maxon medical. It is an important and indispensable component of the entire production process and guarantees the high quality of the micro drives used for active implants of maxon medical.

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*Figure 2: maxon medical pump mechanism.  
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