

Medical technology: Eye surgery with valve technology

Extremely precise incisions

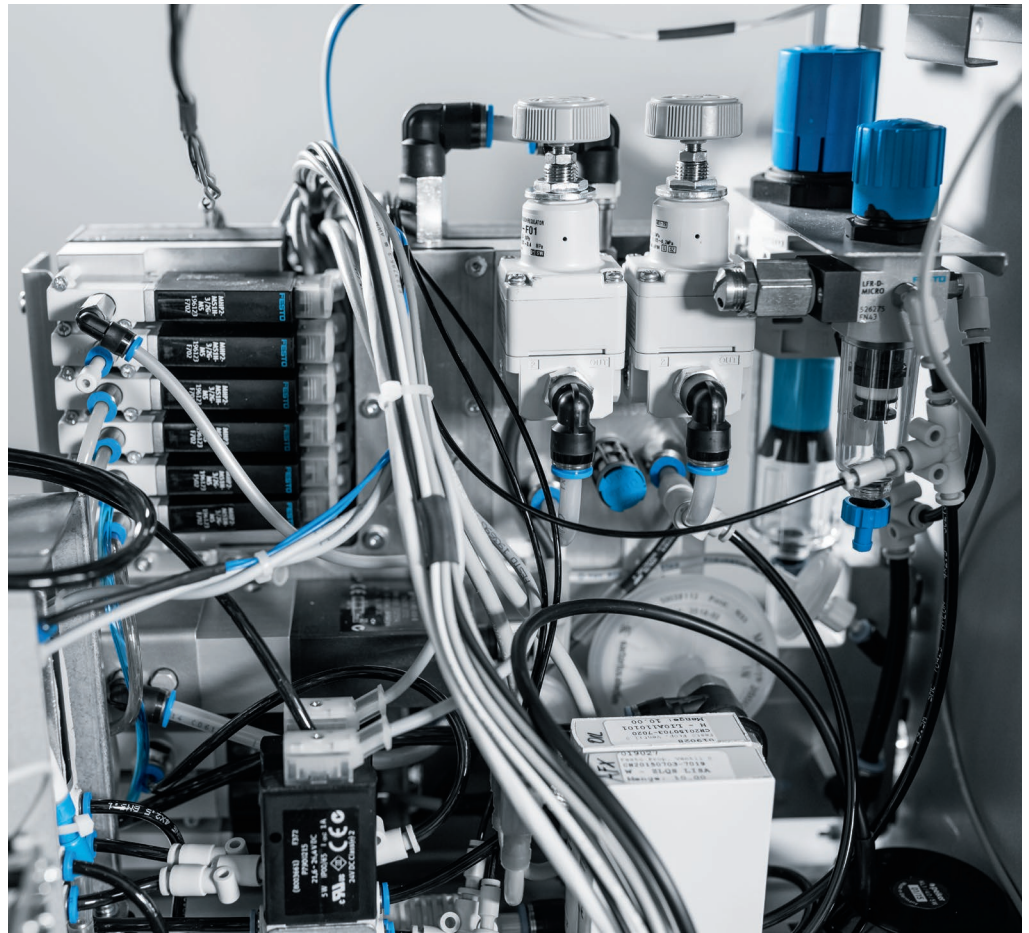
Nowadays, cataract surgery is a routine procedure. But this is only possible because companies like BYTEC Medizintechnik develop devices that enable eye surgeons to carry out operations accurately, error-free and in accordance with their own personal requirements. Piezo, proportional and fast-switching valves from Festo, designed in the form of a control block, allow the necessary rapid incisions to be made.



50% less installation space than a conventional solution with numerous individual tubing connections for each pneumatic component: the valve control block in the QUBE pro



Technical assistant of choice for eye surgeons: the QUBE pro takes individual working methods into consideration and has a dual linear control pedal (photo: Festo AG & Co. KG)



“QUBE” and “QUBE pro” surgical systems are the technical assistants of choice for eye surgeons during cataract operations (grey star) and retina surgery. The specialists at BYTEC adapt software and flexible automation components to the individual needs and requirements of the eye surgeons. This makes it easy and convenient for the surgeons to use the highly precise cutting and suction instruments, which are controlled by the QUBE pro.

Intuitive surgery

An intuitive user interface at the touchscreen simplifies use of the QUBE pro for eye surgeons. A clear display with special symbols makes it possible to navigate through the programs in a logical and reliable way. The user interface was developed by BYTEC together with cataract specialists in clinics and private surgery centres.

A dual linear control pedal ensures a continuous, processes-oriented surgical procedure. During initial start-up, BYTEC service specialists program each and every instrument together with the eye surgeons, taking their individual working methods into consideration. Additional functions, including safety functions, can be activated via eight foot pedals.

Piezo and proportional technology

During cataract surgery, the opacified lens is broken up by an ultrasound probe. A high-precision suction/rinsing device, which is controlled by proportional valve MPYE from Festo, removes the resulting lens fragments. During this procedure, the required infusion

pressure is controlled by piezo valve VEAB from Festo. After the residual tissue has been rinsed and removed, the surgeon inserts the new, artificial and clear lens. High-precision pressure regulation is also used during surgery on the anterior segment of the eye (vitrectomy).

“Safety takes first priority in our development goals. During the development phase, we go to the limits of what is technically feasible for all the components and systems used in order to finally obtain certifications from approval organisations like the FDA,” reports Dipl.-Ing. Paul Willi Coenen, President and CEO of BYTEC. Redundant valves are therefore included for each valve function.

The technical basis for most functions is a complete pneumatic control unit consisting of solenoid valves and piezo valves. It drives the surgical tools, the vacuum-assisted suction removal and the delivery of liquids. Positive characteristics of piezo valves: they are lightweight, quiet and accurate with minimal heat generation and practically wear-free.

Fast-switching valves

“The higher the cutting rate, the better and more precisely the surgeon can work with the cutter in the anterior segment,” says Coenen, “which is why we were looking for valves which would make these high cutting rates possible.” The fast-switching valves MHA2 from Festo achieve rates of up to 7500 cuts per minute in the QUBE pro in order to be able to use the cutter for removing tissue accurately.



“During our search for the right fast-switching valves, we came across Festo.”

Paul Willi Coenen, BYTEC President and CEO

“Our collaboration with Festo made us reach our development goal quickly.”

Harald Pauls, developer of the QUBE pro at BYTEC



“And thus the valves are designed to go to the limits of what is technically feasible,” explains Frederick Klasen, Project Engineer at Festo.

Dipl.-Ing. Harald Pauls, developer of the QUBE pro eye surgery device at BYTEC: “Approaching the technical limits can only be done by searching for new solutions as collaborative partners.” This means involving specialists from a great variety of disciplines, such as physicians, physicists and chemists. “And it is important for us to have suppliers of automation technology who advance products like the QUBE pro to series maturity together with us, step by step, interactively and with short reaction times,” says Pauls and adds: “We’re very happy to have a network of suppliers like Festo, whose experts understand and implement what we need and what we demand.”

Perspective with integration technology

Together with BYTEC, Festo developed a compact valve control block for the QUBE pro. By using so-called integration technology, a manifold duct plate was created which integrates all the pneumatic connections for a protected, tubeless supply in the form of ducts. In addition, the integration technology also allowed various hollow spaces and silencers to be included. Otherwise, this would have required separate special components.

As a result, the control block requires 50% less installation space than a conventional solution with numerous individual tubing connections

for each pneumatic component. The manifold duct plate has a common electrical interface for all solenoid coils and sensor signals.

A further advantage is that, thanks to pre-assembled, pretested connections, a control block can be quickly integrated into the QUBE pro surgery device. The control block is compact, easy to access and extremely quiet. “Collaboration with our project partners at Festo was a great help to us. They responded very quickly to our requirements by suggesting creative solutions and thus made a great contribution to our mutual goal,” says QUBE pro developer Pauls from BYTEC.

Company profile

BYTEC Medizintechnik GmbH
Hermann-Hollerith-Str. 11
D-52249 Eschweiler, Germany
Contract service provider for developing and manufacturing of medical devices for surgery, therapy and diagnostics
www.bytecmed.com



About Festo:

Festo AG is a global player and an independent family-owned company with headquarters in Esslingen am Neckar, Germany. The company supplies pneumatic and electrical automation technology to 300,000 customers of factory and process automation in over 40 industries. The products and services are available in 176 countries.

With about 18,800 employees in over 250 branch offices in 61 countries worldwide, Festo achieved a turnover of around €2.74 billion in 2016. Each year around 8% of this turnover is invested in research and development. In this learning company, 1.5% of turnover is invested in basic and further training. Yet training services are not only provided for Festo's own staff – Festo Didactic SE also supplies basic and further training programmes in the field of automation technology for customers, students and trainees.