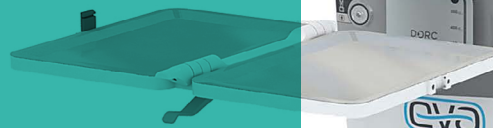
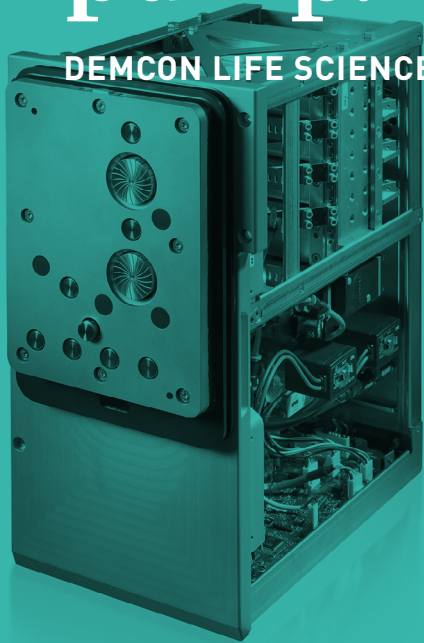


# a fluidic eye surgery pump.

DEMCON LIFE SCIENCES & HEALTH



## CORE COMPETENCIES

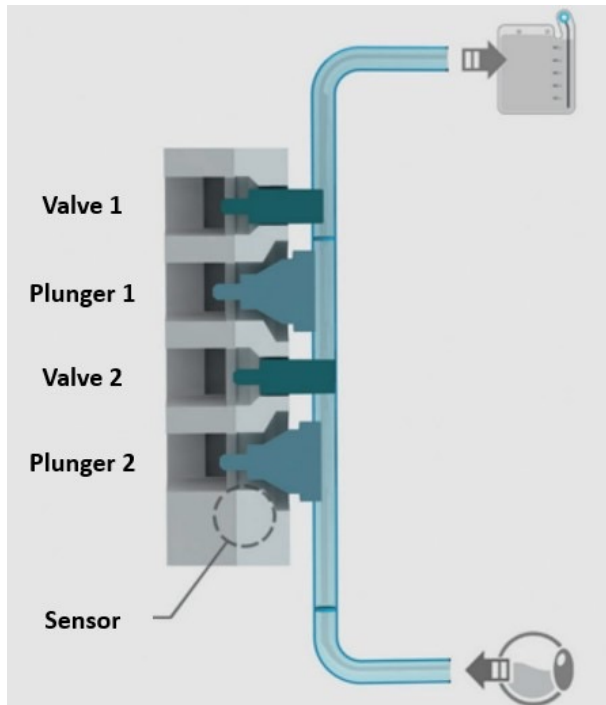
1. Thorough knowledge of the field
2. In-depth knowledge of system requirements
3. Expertise in sterile design
4. Creativity to steer for simple effectiveness
5. ISO 13485 / Certification
6. Production

For ophthalmic surgeries such as cataract and vitreoretinal procedures, a surgeon removes the cloudy natural lens and replace it with an artificial one. The surgeon uses a hand tool with a piezo-driven high frequent needle to perform the procedure. The morcellation needle cuts up tissue into smaller particles. These particles are subsequently extracted from the eye through the hollow needle by an aspiration flow. An irrigation flow created by a pump keeps the eye pressure intact. This pump is vital to the functioning of the entire system, it needs to provide stability and safety control.

### Redefining stability and safety in eye surgery

Available technology was not able to provide the required stability, safety and costs. Therefore, a novel technology was developed by Demcon. With the superior pump design it is possible to control either the eye pressure or flow seamlessly to the eye and maintain dynamic safety levels to prevent overshoots when occlusions occur. The fluids only come in contact with the sterile disposable cartridge. The rubber

membranes of the cartridge are vacuum clamped onto the pump plungers of the unit. In this way the displacement of the plungers is proportional to the fluid displacement in the cartridge. The compensation plunger is fundamental to smooth out the flow variations in order to provide the required stability.



The pressure inside the cartridge is measured with the load cells in the unit via a rubber membrane. In this way both the flow and the pressure are accurately known and controlled. Each plunger is driven by a linear motor. The movements of the copper motor coil and the plungers are guided by elastic leaf spring hinges. This results in a hysteresis free, maintenance free, play free and high bandwidth control of the plungers. Its ingenious design provides stability and safety control. For eye surgery it outperforms alternative pump systems like venturi and peristaltic.

#### **What were our challenges?**

The removal of tissue during the surgical procedure proved to be a challenge, as it may result in occlusions of the aspiration flow. With the novel pump design, it is possible to control either the pressure or flow dynamically and maintain safety levels in the eye to prevent overshoots when occlusions occur. It was our main challenge to ensure this.

#### **Our role developing this system**

Demcon was involved in the project from the concept phase until production. The development of the fluidic eye surgery pump was part of the development of the EVA eye surgery system, for which Demcon was the primary development partner as well.



**“delivering on safety,  
performance and costs”**