

A Flow Measurement Guide
for Industry Bioengineers

OCULAR SURGERY



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Transonic Applications

Transonic began partnering with outside companies shortly after its inception in 1983 to develop innovative devices. Soon, a robust Transonic/Customer synergy developed between Transonic and device manufacturers and this vital Customer/Manufacturer relationship has become part of Transonic's DNA. It lies at the heart of the development of all Transonic products.

Our applications range from utilizing standard products straight off the shelf to creating such novel designs that they would not be recognized as a Transonic product. Together with our collaborators, Transonic has striven to push the limit on flow measurements including ultra-low flow applications in novel measurement mediums. Transonic customized Flowsensors and Flowboards are being used in a wide range of products and applications including:

Mechanical Circulatory Support Devices including:

1. Heart Lung Machines
2. Extracorporeal Membrane Oxygenation (ECMO) circuits
3. Artificial Hearts (AH)
4. Ventricular Assist Devices (VADs)

Renal Replacement Devices: Hemodialysis Machines

Organ Preservation Devices

Treatment Delivery /Therapy Devices

1. Anesthesia Delivery / Pain Management Systems including:
2. Organ Infusion Pumps
3. Urodynamic System / Urometer
4. Pediatric Hydrocephalus
5. Endometrial Ablation
6. Ocular Surgery

Many More Possibilities

A sampling of the broad spectrum of Transonic application will be presented along with the solutions that Transonic offers for each application.

Optimize Ocular Surgery with Flow Measurements

Ocular surgery is used to correct certain eye problems when other treatment methods fail. Types of eye surgery include:

- Cataract surgery is used to clear the vision of an individual when a thin film or membrane has grown over the lens.
- Lens implants are corrective surgery during which the natural lens of the eyes are removed and replaced with artificial lens.
- Performed under local anesthesia, LASEK (Laser Assisted Sub-Epithelial Keratomileusis) surgery is a corneal reshaping process to improve vision. LASIK (Laser-Assisted In Situ Keratomileusis) eye surgery is employed to treat eye problems like astigmatism, hyperopia and myopia.
- Photorefractive Keratectomy (PRK) surgery uses excimer lasers to correct mild to moderate forms of astigmatism, farsightedness and nearsightedness etc. A cool beam of ultraviolet light is passed on the corneal surface to readjust its shape.
- Radial keratotomy reshapes the cornea by using a calibrated diamond knife to make tiny, microscopic incisions, on the cornea to correct its misshape.
- Vitrectomy is performed to restore vision and replace the affected vitreous (vitreous humor) a clear gel that helps the eye maintain its shape and transmit light to the retina.

During any type of ocular surgery understanding the basics of liquid flow in the eye and the principles of the phaco (lens) machine pump-type and its various parameters are essential for safe and effective phaco surgery. A phacoemulsification system is used to aspirate liquid from the eye by activating a pump and the vibration of the phaco needle emulsifies the cataract.

In all ocular surgeries, it is essential to maintain both intraocular pressures to keep the eye from deflating and intraocular liquids to avoid liquid blockage in the tube or excess liquid loss from the eye.

Transonic Solutions: Volume Flow Measurement

Measuring flow during ocular surgery can augment other indicators and provide early warning signs of distress, that could lead to reduction of adverse events and improved clinical outcomes. Transonic's very stable zero flow offset and ability to resolve very small changes in flow rate, makes our implementation of transit-time ultrasound technology optimal for inclusion in such a device.

Bubble Detection

Detects micro-emboli that could lead to fewer embolisms and improved clinical outcomes

References:

<https://healthhearty.com/types-of-eye-surgery>
Benjamin L, "Liquidics and rheology in phaco surgery: what matters and what is the hype?," Eye (2018) 32, 204–209. (Transonic Reference # 11572AHR)