A Flow Measurement Guide
for Industry Bioengineers

ANESTHESIA DELIVERY / PAIN MANAGEMENT

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THE MEASURE OF BETTER RESULTS.
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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.

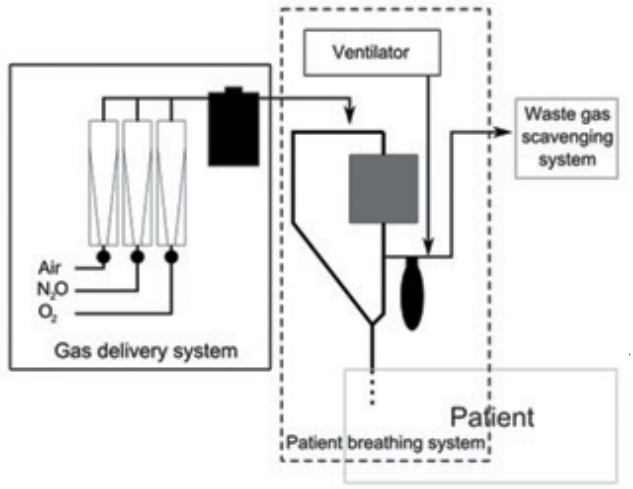
Verify Anesthesia Delivery/ Pain Management

Anesthesia delivery systems integrate several devices into one combined freestanding unit, referred to as the "anesthesia machine" that is used is to induce and maintain anesthesia in a patient undergoing surgery.

The most common type of anesthesia machine used in the developed world is the continuous-flow or "Boyle's machine," designed to provide an accurate supply of medical gases mixed with an accurate concentration of anesthetic vapor, and to deliver this continuously to the patient at a safe pressure and flow.

An anesthesia system includes an anesthesia machine that generates and mixes a fresh gas flow of medical gases and inhalational anesthetic agents; a mechanical ventilator, breathing system, suction equipment, and patient monitoring devices. Components include at minimum the following:

- Connections to piped oxygen, medical air, and nitrous oxide from a wall supply in the healthcare facility, or reserve gas cylinders of oxygen, air, and nitrous oxide attached via a specific yoke with a Bodok seal;
- Pressure gauges, regulators and 'pop-off' valves, to monitor gas pressure throughout the system and protect the machine components and patient from excessive rises;
- Flowmeters such as rotameters for oxygen, air, and nitrous oxide;
- Vaporisers to provide accurate dosage control when using volatile anesthesia;
- A high-flow oxygen flush, which bypasses the flowmeters and vaporisers to provide pure oxygen at 30-75 liters/minute;



A simple schematic of an anesthesia machine showing three main subsystems: gas delivery, patient breathing circuit (showing both the absorber and ventilator), and waste gas scavenger. Not shown are safety and monitoring devices.

- Systems for monitoring the gases being administered to, and exhaled by, the patient, including an oxygen failure warning device.

Transonic Solution

Volume Flow Measurement

Provides more accurate dosing which reduces adverse events and improves clinical outcomes.

Bubble Detection

Helps reduce micro-bubbles that could lead to fewer embolisms and improved outcomes.