



Humphrey's proportional valve technology enabled the customer to recover from a 50%+ production failure rate and enhance their competitive advantage in the adult, pediatric and neo-natal "all-in-one" medical ventilators.



- ① Custom 16 Ohm 6 Watt Servoid
- ② Oxygen Compatible Flow Path
- ③ Industry 25mm flowmeter interface port
- ④ Locking features to maintain valve calibration

*Proportional Valve Allows Versatile  
Critical Care Ventilation*

## Respiratory Care



**MEDICAL**  
SIC:3845 OR 3841

### THE CUSTOMER'S PRODUCT

- Customer designs and manufactures a variety of respiratory care and patient ventilation devices.
- Product is a state of the art critical care ventilator capable of neonatal, pediatric and adult use.
- Ventilator requires precise and reliable flow capability over a wide range of requirements.

### THE REQUIREMENTS

- 50 ml to 200 SLPM air flow at 11 PSI inlet pressure and 600 mA DC current.
- Maintain precise repeatability and low hysteresis over millions of cycles.
- Oxygen compatible with the electrical elements isolated from media.
- Flow stability (no oscillations) over the full flow range (range 50 ml to 200 SLPM).

### THE HUMPHREY ENGINEERED SOLUTION

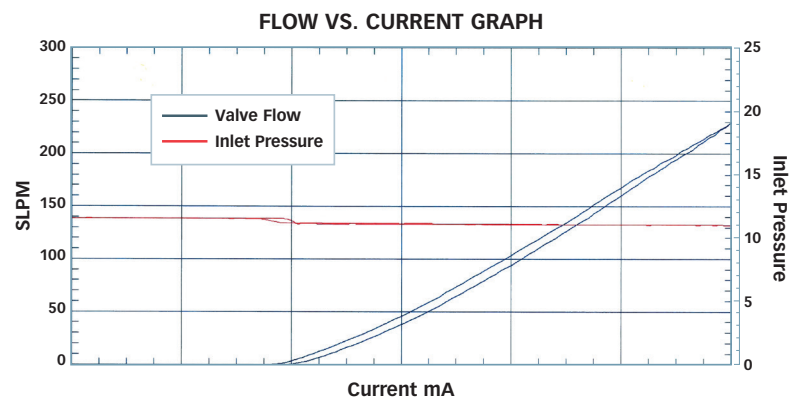
- The Humphrey "Servoid" resolved flow instability issues, improving production yields from approximately 50% to 100%.
- Humphrey provided a design which met the form, function and fit to the existing design without modifications to the customer's device (drop-in replacement).
- The "Servoid's" inherent superior performance allowed the customer to enhance the ventilator's performance.
- The "Servoid's" interface with the flowmeter eliminated flow path induced flow stability issues.

## THE SOLUTION

- Created a drop-in replacement to displace the incumbent valve, eliminating the need for the customer to change the ventilator.
- Ensured compatibility to existing algorithms and control logic.
- Improved manufacturing yields of the ventilator to 100%.
- The “Servoid” was life cycled to 800 million cycles without calibration shift.

*The new, design-incorporated legacy features such as:*

- Completely supported armature allowing no mechanical hysteresis.
- Pressure balancing which allows minimal performance shift with fluctuating inlet pressure.
- Self-aligning metal seats providing reliable and repeatable low flow characteristics.
- Utilization of spring cartridge using two flat helical springs providing excellent repeatability, reliable performance and no sliding friction.



## THE PROCESS

*Engineer to engineer collaboration:*

- Understand current problems and issues.
- Understand current interface and control logic.
- Understand physical parameters and constraints of the existing ventilator.
- Develop a series of prototypes that dials in the valve to the exact performance requirements of the ventilator.

*Develop production readiness:*

- Initial pre-production valves identified a difference in Humphrey test and ventilator performance.
- A second pre-production quantity corrected the mapping of valve testing to ventilator performance.
- Ventilator was re-qualified with FDA and released for production.

**Humphrey**

BUILD ON OUR EXPERIENCE