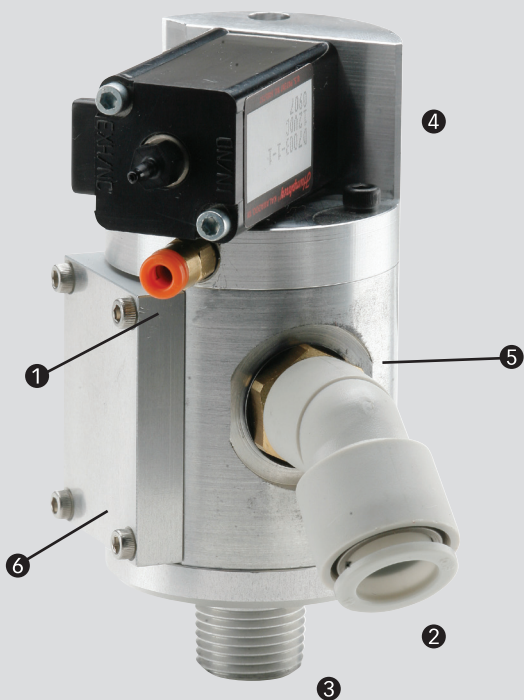




Humphrey's custom valve assembly enabled customer to create a ventilator that met the respiratory care needs of both adults, and infants and young children. No longer will hospitals need to purchase two separate ventilators.



- ① High pressure oxygen pilot supply
- ② Low pressure air/oxygen supply to insert valve
- ③ Air/oxygen outlet
- ④ Mini-Mizer solenoid pilot valve
- ⑤ Modified Humphrey Y500 Insert Valve (Inside)
- ⑥ Check valve (inside) determines air/oxygen flow rates

*Custom Valve Assembly Provided Two Different Flow Rates on*  
**New Respiratory Care Unit**



**MEDICAL**  
**SIC:3842**

**THE CUSTOMER'S PRODUCT**

- The customer designs and manufactures a wide range of respiratory care and rehabilitation equipment.
- Responding to a need in the hospital market, the customer began designing a ventilator unit that would provide the appropriate air/oxygen delivery pressures and volumes for both adults and children.
- The oxygen supply valve function was critical because it had to provide two different flow rates, one for adults and a lower rate for infants and young children who have a more fragile pulmonary system.
- An extremely tight space envelope eliminated the possibility of using an assembly of standard valves.

**THE REQUIREMENTS**

- Design a 2-way high-flow pilot-operated poppet-valve assembly with an integral check valve to stop the high flow air/oxygen supply when poppet is closed.
- Valve must be capable of delivering air/oxygen volumes from 2 ml/min up to 2.5 L/min.
- Meet existing space limitations with provisions for easily mounting the valve assembly.
- Medical grade air/oxygen ports to be 3/8-18 NPT.

**THE HUMPHREY ENGINEERED SOLUTION**

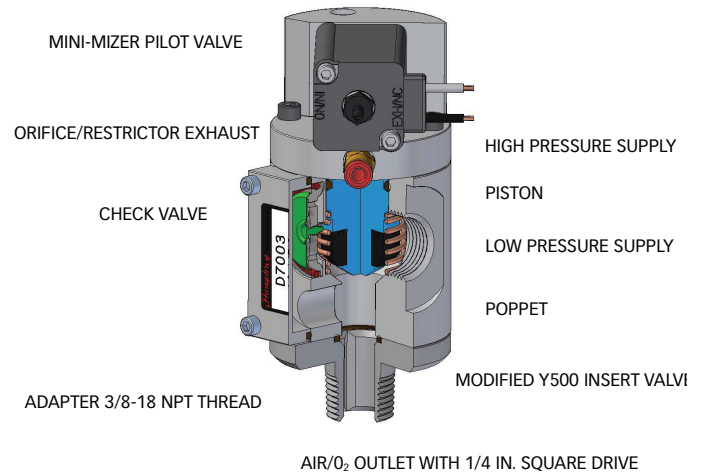
- Humphrey engineers designed a custom manifold to meet space, porting and mounting requirements, and included the customer's specified check valve.
- The Humphrey proven, standard model Y500 insert valve was modified, using only the top portion with the piston redesigned to ensure correct poppet-to-seat orientation.
- The Humphrey Mini-Mizer poppet solenoid valve, used as a pilot valve, achieved the desired 0.5 Watt current consumption.
- The mounting adapter was designed to permit easy attachment to the unit inside the cramped space using a readily available 1/4" square drive socket.

## THE SOLUTION

The Humphrey Engineered Solutions team started with their Y500 insert valve, using only the top half containing the poppet. They extended the skirt on the poppet to act as a guide, ensuring the correct orientation of the poppet to the seat. They selected the low current consumption Mini-Mizer solenoid valve to control the pilot flow of high pressure oxygen that actuates the modified Y500 insert valve.

Next they designed a custom manifold incorporating the customer's qualified check valve and provided 3/8-18 NPT inlet and outlet connections. The manifold was designed so that the valve was normally open, supplying the flow volume of air/oxygen required for adults. When the unit was switched to the lower flow volume mode, the air/oxygen was routed through the check valve and a subsequently smaller orifice to meet the reduced flow requirement for children and infants.

Then the Engineered Solutions team designed an adapter plate that could be screwed onto the mounting bracket using a simple 1/4" square drive socket. This eliminated the need for special tools. With the adapter in place, the valve assembly could be aligned and attached to the adapter from the top.



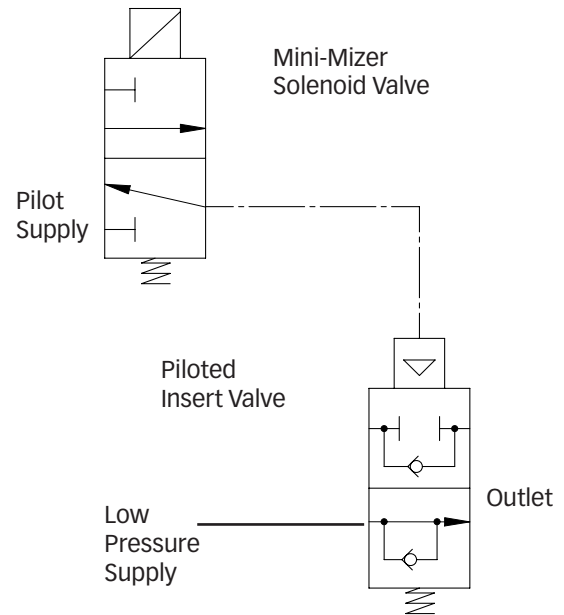
## THE PROCESS

After looking on Humphrey's website for a high flow 2-way valve, the customer contacted Humphrey for assistance in developing a custom valve assembly that would meet the performance requirements and fit in the limited space available.

Originally the customer had considered Humphrey's Y500 cartridge insert valve. Employing the Humphrey Engineered Solutions team approach, a Humphrey engineer worked directly with the customer's engineer to identify all the customer's requirements and the opportunities to improve the customer's concept.

The Humphrey engineer determined that only the top half of the Y500 insert valve containing the poppet was needed. At that point Humphrey modified the poppet to ensure proper operation, and developed a custom manifold to provide for two different air/oxygen flows. The Humphrey Mini-Mizer Solenoid valve was selected as the pilot operator to control the flow of high-pressure oxygen that actuated the valve.

Having determined the space limitations, Humphrey engineers designed a screw-in adapter plate that used a 1/4" square drive socket. After 100% testing, each valve assembly was shipped separately from the adapter plate, enabling rapid assembly at the customer's facility.



**Humphrey**

BUILD ON OUR EXPERIENCE