



Humphrey's custom valve assembly for a dental gas analgesia system enabled the customer to redesign the device to enhance its reliability and performance.



- ① Modified Humphrey Mini-Mizer solenoid valve
- ② Custom-developed Humphrey Cartridge Insert Valve
- ③ One-piece assembly makes installation fast and easy
- ④ Design fits small space constraints

Custom Valve Assembly Delivered Higher Flow and Smaller Footprint for
Dental Sedation Device



DENTISTRY
SIC:8021

THE CUSTOMER'S PRODUCT

- The customer manufactures a wide range of medical and dental equipment, supplies and tools.
- They wanted to upgrade their dental sedation device that precisely meters oxygen and nitrous oxide medical gases for conscious sedation of patients in dental offices and hospitals.
- The equipment enables the attending physician or dentist to set both the percentage of nitrous oxide and the total flow to a desired level of sedation and flow.

THE REQUIREMENTS

- Design a single-valve assembly combining a solenoid pilot valve and a cartridge insert valve.
- Valve had to be normally open.
- Higher flow rate than currently obtained from existing valves to give dentists a wider range of sedation options.
- Low leakage.
- The entire valve assembly must fit into an extremely tight space inside the unit.

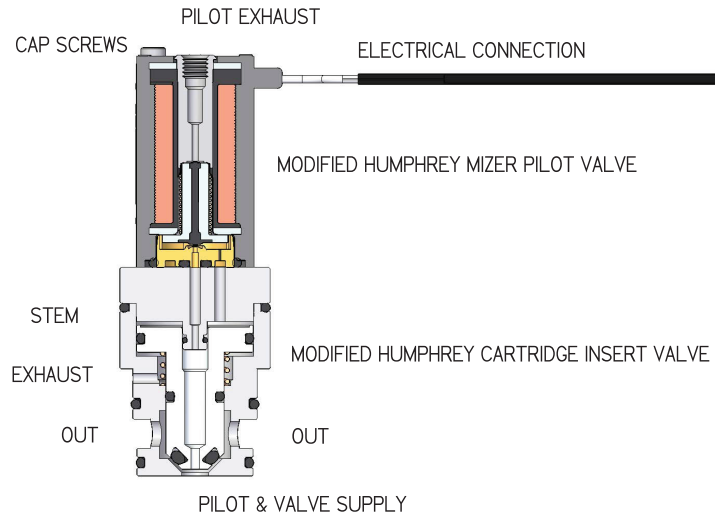
THE HUMPHREY ENGINEERED SOLUTION

- Modified Humphrey proven, standard Mini-Mizer solenoid valve and custom-developed Humphrey cartridge insert valve to provide high flow in normally open operation.
- Custom insert valve achieves normally open function with unique flow path and low leak rate.
- Custom seals to withstand a pure oxygen environment.
- FDA-approved oxygen compatible lubricant.

THE SOLUTION

The Humphrey Engineered Solutions team started with the problem of maintaining high flow characteristics and low current consumption in a valve assembly that must function in a normally open state.

Humphrey modified both the Mini Mizer and their insert valve by running the flow path up through the center of the stem in the insert valve. This would deliver pressure to the Mini-Mizer valve, maintaining the optimal poppet-seat seal. When the Mini-Mizer valve is energized, it delivers pilot pressure to the piston in the insert valve, shifting the piston down, sealing the insert valve poppet.

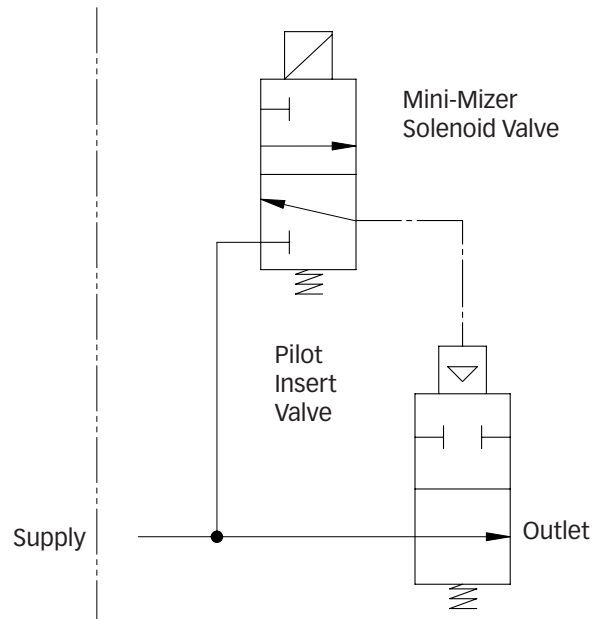


THE PROCESS

Working with the customer's engineering department, the Humphrey Engineered Solutions team learned the requirements of the new valve assembly. The customer's gas delivery device precisely metered oxygen and nitrous oxide medical gases. It had built in safety features to prevent the level of oxygen gas from falling below 30% of total flow, mechanical features to prevent the mix-up of gases, and fail-safe features to prevent the flow of nitrous oxide in the absence of oxygen gas.

The requirement for a valve assembly that was in a normally open condition was a vital part of the customer's safety features. Since this valve assembly was used in the oxygen side of the machine, a higher flow rate would potentially offer a greater safety benefit.

In addition, the Engineered Solutions team worked with the customer's engineers to design the assembly to fit a very tight space envelope, and developed the optimal retaining method using a simple cap screw. This ensured that should any field service work be required, removal and replacement would be fast and easy.



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