



Humphrey developed a custom valve manifold assembly to power and control the operation of a mechanical heart used prior to heart transplant surgery. A special hand pump, also developed by Humphrey, can be used when moving the heart assist device untethered from the drive console.

- ① Reliable Humphrey 320 valve, modified for quiet operation, drives the blood pump.
- ② Hand pump has two sets of check valves built into the head of a custom Humphrey air cylinder.
- ③ Pump unit can be detached to drive the blood pump independently.

Highly Reliable Custom Valve Manifold *with Detachable Hand Pump for Critical Medical Device*



MEDICAL
SIC:3841

THE CUSTOMER'S PRODUCT

- The customer designs and manufactures coronary care equipment, including ventricular assist devices (VADs).
- The customer was developing a new device to assist the heart, permitting a patient's own heart to rest and heal.
- Their engineers were not satisfied with the performance of their supplier's valves.

THE REQUIREMENTS

- Valve must achieve 20 million cycles at 85 cycles per minute.
- Provide a custom valve manifold with modifications for quiet operation and special lubrication.
- Develop a custom hand pump that was easy to use in the event the pump had to be detached from the device.
- Pump must deliver 115cc per stroke and achieve a minimum life cycle of 100 hours at one cycle per second.
- Supplier must meet critical manufacturing audit.

THE HUMPHREY ENGINEERED SOLUTION

- To drive the blood pump, Humphrey utilized a highly reliable standard 320 valve and modified to achieve quiet operation.
- The valve's MTBF of 175 million cycles greatly exceed the customer's specifications.
- Humphrey developed a custom tube-inside-a-tube air cylinder.
- Humphrey incorporated check valves into the custom double acting twin tube air cylinder to create the hand pump, with a special oval handle.
- Both the valve manifold and the hand pump met or exceeded the customer's critical pressure/vacuum specifications.
- Humphrey passed the customer's critical audit of manufacturing procedures, including traceability, ISO 9000 certification and a competent team-focused workforce with great attitudes.
- All assemblies are 100% tested at Humphrey prior to shipping.

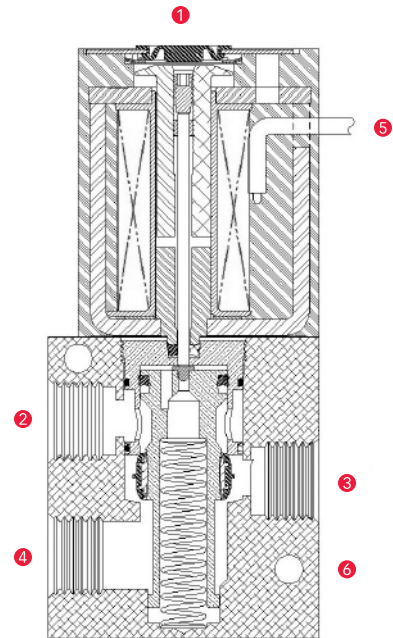
THE SOLUTION

The customer had been aware of Humphrey's experience in the medical device industry. They approached Humphrey and immediately an Engineered Solutions team was assigned to work directly with the customer's engineering department. Together they established the key requirements, including critical pressure ranges, flow rates, life cycle time and quietness. The result was a valve manifold and hand pump that exceeded the customer's expectations for operation, reliability, functionality and size.

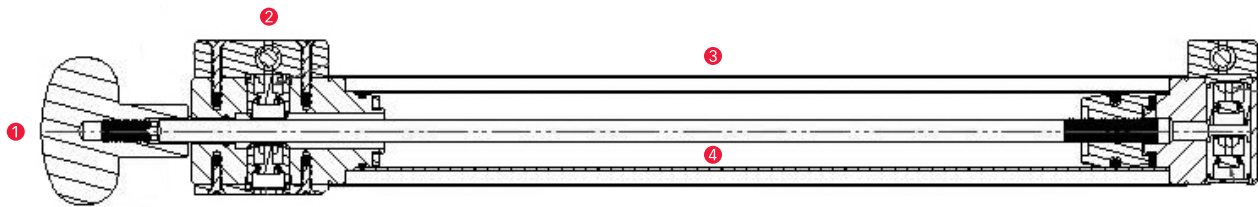
THE PROCESS

Humphrey selected their 320 valve for reliability and modified it for quiet operation. Once testing exceeded the customer's requirements, the valve was approved. Next, the Engineered Solutions team utilized one of Humphrey's standard, proven double acting air cylinders. The team designed the head to incorporate check valves for intake and exhaust. The 8-inch stroke and low operating effort, together with the custom oval handle, allowed the pump to be operated easily with minimum effort.

Direct Acting Single Solenoid Poppet Valve



- 1 Manual override
- 2 Inlet
- 3 Outlet
- 4 Exhaust
- 5 Electrical Connections
- 6 Mounting Holes



- 1 Custom Handle
- 2 Ports
- 3 Outer Cylinder Tube
- 4 Inner Cylinder Tube

Humphrey

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