

#### 4.24 Cryogenic Hydraulically Actuated Isolation Valve

**Statement:** Cryogenic isolation valve that utilizes the upstream line pressure of cryogenic fluids for actuation.

**Problem:** Valves controlling and redirecting cryogenic fluids can be electromechanically controlled, however, such systems also need gearing elements or components and motor controllers that monitor the various positions of the valves, which makes them expensive and energy intensive. Alternatively, cryogenic fluid control valves can be pneumatically controlled utilizing helium, which is in limited supply. Also pneumatically controlled cryogenic valves require various support systems which include storage tanks, various fluid lines or conduits, other control valves, isolation valves, and the like.

**Solution:** By using the upstream line pressure of the cryogenic fluid for actuation, the proposed cryogenic isolation valve eliminates the need for the complex support systems that are necessary with electromechanical and pneumatic actuation systems.

**Technology description:** The new cryogenic isolation valve technology uses solenoid valves powered by direct current electrical energy to control and redirect the energy stored in the upstream line pressure. Powering the solenoid valves only requires a DC power source capable of supplying small wattage that can be distributed and controlled in an on/off manner. By achieving actuation using only upstream line pressure and a low wattage DC power source, many additional support systems that are required for electromechanical and pneumatic actuation are eliminated. This reduction of parts results in several benefits, including reduced footprint, weight and complexity, as well as potential cost of the valve in addition to lower energy consumption.

**Benefits:**

- Requires only upstream line pressure and low wattage DC power source for actuation, eliminating.
- the need for support systems; reducing footprint, energy consumption, and cost; and significantly reducing weight.
- Has no external dynamic seals and no external actuation devices.
- Designed to be serviceable and rebuilt in-line.

**Areas of application:** The technology has potential applications in the following areas:

- Liquefied natural gas.
- Air separation.
- HVAC refrigerant.
- Semiconductor manufacturing.
- Pharmaceutical processing.