
# Lentus® Hydrogen Compressor Valves

Hydrogen plays a critical role in transforming the world's energy infrastructure, and compression is key in enabling this transition. However, the high pressure, high purity use of hydrogen in vehicle fuel cells creates unique challenges for compression components. Hydrogen is a light gas, which makes sealing difficult, and its compression for H35/H70 refueling requires incredibly high pressures up to 1,000 bar. Compressor OEMs need components with the right design and material properties to withstand the exposure to highly pressurized, pure hydrogen.

Diaphragm and Hydraulic compressors are most commonly used to compress hydrogen for mobility, and their valves must be carefully designed to maximize equipment life in these high-pressure applications. Valves for these services require high strength, good seal properties, flow efficiency and materials that are fully compatible with this hydrogen gas environment. The Lentus valve was designed specifically for hydrogen mobility and can be custom engineered to fit each application.

### Valve Design

At high pressures or high-pressure ratios, a shaped seal element offers many advantages. Shaped elements can reduce tensile stress in materials, which is critical to improving material fatigue lifespan in hydrogen environments. It can also reduce distortions that cause leak paths due to extreme pressure loads, maximize flow efficiency, and minimize clearance volume. The Lentus valve uses metallic and polymer seal elements featuring optimized geometries to deliver an effective seal, increased flow and reduced tensile stress levels.

### Advanced Materials

Materials undergo transformations in high-pressure, high-purity hydrogen environments, and this affects material selection. The material must have high strength, good impact and wear resistance, and function in a non-lubricated environment. Surface finishing techniques and specific heat treatment processes are vital to improving valve life. Cook Compression uses advanced metallics and polymers to provide superior durability and optimum performance characteristics in hydrogen mobility applications.

### ADVANTAGES

- Unique geometries reduce tensile stress levels
- Shaped poppet element increases flow efficiency
- Superior sealing elements reduce leakage paths
- Advanced materials withstand the high pressures, high purity of hydrogen environments
- Minimized clearance volume
- Robust design through FEA (finite element analysis) method


COOK® COMPRESSION

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DOVER® PRECISION COMPONENTS

## Typical Applications

| RPM | GAS | Ps (BAR) | Pd (BAR) | Td (°C) | VALVE Ø (mm) | COMMENTS |
|---|---|---|---|---|---|---|
| **415** | H2 >99% | 200-450 | 1010 | 217 | 8.0 | Diaphragm refueling unit |
| **740** | H2 | 126 | 454 | 182 | 12.0 | Diaphragm refueling |
| **400** | H2 | 81 | 451 | 160 | 27.0 | Diaphragm unit 2 stage |
| **600** | H2 | 50.7 | 455 | 252 | 10.0 | Diaphragm unit 2 stage |
| **420** | H2 >99% | 19.9 | 880 | 169 | 12.0 | Diaphragm unit 3 stage |
| **400** | H2 | 125 | 450 | 190 | 12.0 | Diaphragm unit 1 stage |
| **<4** | H2 | 1001 | 2500 | 155 | 8.0 | Hydraulic drive- R&D unit |
| **430** | H2 | 51-150 | 451 | ~300 | 12.0 | Diaphragm unit 1 stage |

*Specifications subject to change due to continuing product improvements.*

## Your Partner for the Hydrogen Transition

For over 133 years, Cook Compression has developed components critical to the performance and reliability of reciprocating compressors. Today, Cook Compression is investing in the engineering, innovation and materials development capabilities needed to support energy companies as they navigate their pathway to a carbon-neutral world. Our experience, coupled with state-of-the-art research facilities and a deep range of products and engineered polymers, enables us to quickly develop and test new technologies for the next generation of hydrogen applications.