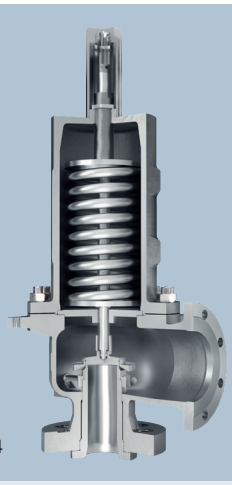
Hydrogen

LESER safety valves for hydrogen applications



Type 5264

Already today, more than 600 billion cubic meters of hydrogen are produced each year worldwide for the process industry. Hydrogen is a basic material in many industries, e.g. in refineries, in ammonia production or other chemical processes. Hydrogen is produced by chemical processes or electrolysis processes using electrical energy.

In addition to these needs, the technology for using hydrogen as an energy source in combustion engines or via fuel cells is now also ready to replace petroleum products in the future.

The advantages of hydrogen as an energy carrier are among them:

- **Neutral CO_2-footprint:** Hydrogen produced from renewable energies is a CO_2-neutral energy carrier and basic material.
- **Flexible energy storage:** Hydrogen produced from renewable energies can be stored in liquid or gaseous form in tanks and caverns. It is distributed over the area using mobile tanks and existing gas pipelines.
- **Power to X:** Hydrogen can be used flexibly as an energy supplier in fuel cells, fuel in combustion engines and as a coke substitute in steel production. With the addition of CO_2, it can also be used as a fuel and combustible.

Technical challenge for safety valves in hydrogen applications

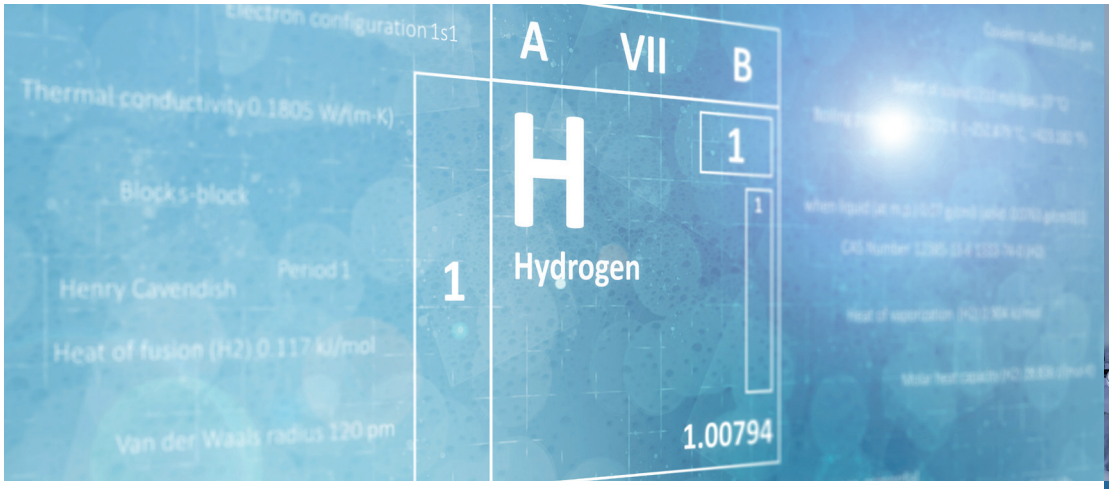
Hydrogen is stored and transported with the highest possible energy density. This means temperatures of up to -253 °C and in refueling systems pressures of up to 900 bar for cold liquefied hydrogen. The materials used in these processes must be insensitive to hydrogen embrittlement.

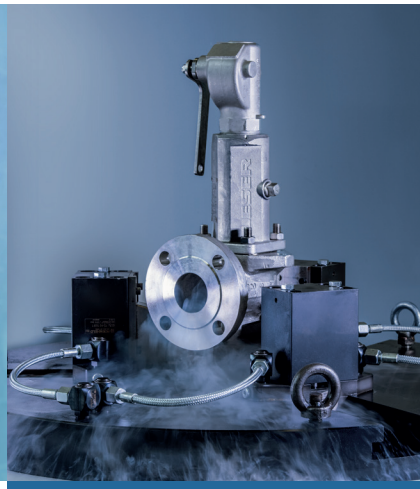
Hydrogen embrittlement

Cause:
Atomic hydrogen (H) is produced on metal surfaces in contact with hydrogen, for example by electroplating. This penetrates into the metal structure and forms molecular hydrogen (H_2) there again.

Effect:
The metal loses its elasticity and breaks without an expansion phase.

The LESER solution:
Austenitic steel e.g. 1.4404, which LESER uses for its plates and seat bushes in hydrogen applications as standard, is largely insensitive to hydrogen embrittlement.





LESER products for various hydrogen applications

The following product groups are preferred:

- **Compact Performance**
- **High Performance**
- **API**

LESER recommends austenitic stainless steels such as the LESER standard materials 1.4404/316L or 1.4408/CF8M for wetted safety valve parts. These materials are insensitive to hydrogen embrittlement. Whether cast or forged material is to be used depends on the respective application conditions.

LESER Safety Valves have proven their suitability for cryogenic temperatures from -150 °C/ -238 °F to absolute zero for years. For best sealing results under these conditions, the following product configuration is recommended:

- Safety valve with nozzle – Product group API Type 5264
- Metallic sealing surfaces - standard version
- Stellited disc - LESER option code J25
- Stellited nozzle - LESER option code L65

Hydrogen, whether gaseous, highly compressed or liquefied, contact us and we will find the right solution for your application. LESER tests safety valves for cryogenic applications on its own cryo test bench.

LESER reference applications

LESER covers the entire hydrogen value chain. From production in process plants, compression with high-pressure compressors, distribution in tanks, pipelines and refueling systems to consumption in mobile tanks on ships and fuel cells.


H_2 gas station Hamburg Hafencity

Ariane rocket

LESER cryo test bench

The test stand is based on the standard DIN EN 13648-1.

The testing is certified with a 3.1 or 3.2 acceptance test certificate according to DIN EN 10204.

On the test bench safety valves are tested at -196 °C up to 155 bar and DN 150 / 6".

All valve sizes relevant for hydrogen can be tested for leaks under real conditions with nitrogen.