



Safety valves and fittings for technical gases



OXYGEN

ELIXIR OF LIFE

Handling (compressed) oxygen requires care to the power of two - in the entire production process and in the application. This is the only way to effectively avoid hazards. Our safety valve meets these very high standards, especially for gaseous compressed oxygen (Gaseous Oxygen = GOX) - the 492GOX. This is explicitly tested for oxygen in the application range 50 - 420 bar / 60°C with adiabatic pressure surges. We also offer other safety valves, overflow valves and pressure reducing valves for oxygen applications.

The high-quality steels, cast materials and brass as well as sealing materials with BAM approval and the Goetze cleaning and manufacturing process, Goetze is also your partner in terms of safety.



Lubricants

ASTM G93 Level C specifies that mineral oil based greases and oils are removed to a minimum of 66 mg/m² or less. Only non-hydrocarbon based lubricants are used when assembling components. For example, Krytox® 240AC.

What materials does Goetze use?

Inorganic materials that are not combustible in oxygen may be used without restriction.

- Monel
- Brass
- High-quality gunmetal

Metallic materials for oxygen-carrying systems:

- High-alloy Cr-Ni steels with a combined mass content of chromium and nickel of at least 22 %
- High-alloy Cr-Si steels with a Cr content of at least 22% by mass
- Copper and copper alloys with a mass fraction of at least 55%
- Copper
- below 16 bar also grey cast iron
- under 10 bar other metallic materials



Seals

- Metallic seal / Monel / Stellite
- EPDM
- PTFE / PCTFE
- NBR
- FKM / FFKM

In the area of oxygen applications, it is necessary to use sealing materials that have been tested by the Federal Institute for Materials Testing (BAM) for the area of application.

Flow rate

In pipelines for conveying gaseous oxygen, the cross-section of pipes at operating overpressures of more than 1 bar must be selected in such a way that the flow velocity, which is harmless in terms of safety, is not exceeded. Adjusting the flow rate in systems with

- 1 bar to 40 bar: v = 25 m/s
- p > 40 bar: v = 8 m/s

Determination according to highest flow rate at the lowest pressure!

Technical Data

Series 492 GOX

- Temperatures** from -40°C to +60°C
- Threaded connections** from 1/4" to 3/4"
- Pressures** from 50 bar to 420 bar



Technical Data

Series 684

- Temperatures** from -40°C to +120°C
- Threaded connections** from 1/4" to 2"
- Pressures** Inlet pressure up to 60 bar; Outlet pressure from 0,5 bar to 50 bar



Cleaning request

The surfaces of the safety valves in contact, either temporarily or permanently, with the oxygen must be free of oxidisable substances such as grease, oil, lubricants, dust and textile lint. These substances, especially organic but also metallic ones, can react with oxygen in the event of a spark and cause the safety valves to catch fire. This risk must be reduced as much as possible by:

- Material
- Cleaning
- Manufacturing

A purity level of 500 mg/m² is specified as the max. permissible contamination (DIN EN 12300).



Packing

The valves are packed at their own assembly stations.

To maintain cleanliness, each safety valve or spare part must be cleaned immediately after the functional or acceptance test in a storage package made of moisture- and dust-proof packaging material.

A label is affixed to the outside of the packaging.

HYDROGEN

ENERGY STORAGE FOR THE FUTURE

The energy transition and the use of sustainable resources for power generation pose major challenges to the energy industry.




By using innovative splitting processes and electricity from renewable energy sources, hydrogen can be produced without the consumption of fossil fuels and also without emitting CO₂. This process and its further use make green hydrogen a promising resource for energy production and storage, as well as for the industrial sector.

One thing is indisputable: The future will be based on green energy.

H₂

Technical Data

Series 2400

-  **Temperatures**
from -200°C to +200°C
-  **Threaded connections**
from ¼" to 1½"
-  **Pressures**
from 0,2 bar to 70 bar



Hydrogen embrittlement

Hydrogen embrittlement occurs, when atomic hydrogen, which is generated, diffuses into the material faster than it can gather to get into tightly diffusible H₂ molecules on the material surface.

Mainly occurs at

- Compressed gaseous hydrogen > 100 bar
- Higher and lower temperatures (>200°C / <-200°C)
- Load changes
- The material becomes brittle or fatigued, cracks form

Avoided by

- Use of materials with a higher nickel content (higher-grade austenitic stainless steels)
- Use of resistant steels




What materials are suitable for H₂?

If a material meets the requirements to be used with hydrogen cannot be said in general terms.

The selection of a suitable material depends on the expected stresses (e.g. pressure, tension, temperature, alternating load). So far, **austenitic steels** with a nickel content > **10%** have proven to be effective.

Technical Data

Series 455

-  **Temperatures**
from -255°C to +400°C
-  **Flange connections**
from DN 15 to DN 100
-  **Pressures**
from 0,3 bar to 40 bar



What materials does Goetze use?






Forged material:
1.4404 / 316L for inlet body and internal parts

Stainless steel investment casting:
1.4408 / CF8M for housing and partly for spring housings

Stainless steel ≠ Stainless steel

Technical Data

Series 492

-  **Temperatures**
from -60°C to +200°C
-  **Threaded connections**
from ¼" to 1"
-  **Pressures**
from 50 bar to 1.500 bar



Cleaning requirement

- With a hydrogen purity of <5.0 (<99.999 %), oil and grease-free production is recommended.
- With a hydrogen purity of >5.0 (>99.999 %), production according to oil- and greasefree is explicitly recommended, in order to ensure the required purity of the hydrogen for use e.g. in fuel cell systems.



Technical Data

Series 451

-  **Temperatures**
from -60°C to +400°C
-  **Threaded connections**
from ½" to 2"
-  **Pressures**
from 0,5 bar to 70 bar



Up to which pressure can hydrogen be safely used?




Most high-pressure applications for hydrogen involve the storage of preferably large quantities in small volumes. For example, to ensure a high range for H₂ vehicles, their storage system is designed for pressures of up to 700 bar.

To ensure that the required pressures can be provided during refuelling, a hydrogen filling station is equipped with high-pressure storage tanks at around 500 bar as well as compressors to compress the hydrogen to over 900 bar when refuelling a fuel cell car. In the future, pressures of up to 1,100 bar will be possible.

Goetze is very well prepared for this with the **safety valve 492**. For this valve, pressures up to 1,500 bar do not pose a challenge.

Technical Data

Series 420

-  **Temperatures**
from -40°C to +260°C
-  **Threaded connections**
from ¼" to ¾"
-  **Pressures**
from 0,5 bar to 50 bar



Seals

Elastomers:

- EPDM
- FKM / FFKM
- NBR
- IIR
- CR

Thermoplastic materials:

- PTFE / PCTFE
- PVDF
- PA
- PE PEEK
- PAI

1 kg of hydrogen contains as much energy as 2.1 kg of natural gas or 2.8 kg of petrol (based on the lower calorific value).



Further technical information on hydrogen can be found in this white paper.



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