KLINGER
trusted. worldwide.

SOLUTIONS

for Power-to-X-plants



www.klinger-international.com

KLINGER GROUP

Visionary by Tradition



KLINGER is the world's leading manufacturer and provider of sealing and fluid control solutions.

Founded in 1886 as a family enterprise, the pioneer in gasket technology today has evolved into a globally operating corporate group comprising independent global manufacturing, sales and service companies that offer unique know-how and expert on-site consulting services in 60 countries around the world.

Our customers include leading companies form a wide range of industries from manufacturing, infrastructure and automotive to marine, oil & gas, chemicals, pulp & paper, as well as energy, food & beverage, and pharmaceuticals. KLINGER employs around 2,800 people worldwide with total annual sales of around 684 million euros.

€ 684 MIO. ANNUAL SALES

684 million euros in revenue generated by the KLINGER Group per year.

2,800 EMPLOYEES

Our global workforce is 2,800 people strong.

80 MARKETS

KLINGER Group has already exported to 80 countries and counting.

18 PRODUCTION SITES

The KLINGER Group manufactures gaskets, valves, instrumentation, expansion joints and hoses in almost 20 countries.

60 COUNTRIES

The KLINGER Group subsidiaries and representatives are at home all over the world.

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PLANT VIEW
Power-to-X

Power-to-X, also known as Power-2-X (P2X), is the process of turning electricity (power) into sustainable green products (the “X”). The input of this process is renewable power from solar panels, wind turbines, hydropower, etc., and the output is a variety of clean fuels (e-fuels) or chemicals.

The “X”, the energy carriers, are hydrogen, fuel gases and liquid fuels such as gasoline, ammonia, kerosene and diesel, for example. Sector coupling, i.e. the interconnection of the individual energy industries and their joint use and production of energy sources, is in the foreground here.

RENEWABLE ENERGY PRODUCTION

When we get electrical power from sustainable sources like wind, sun or water, we sometimes end up with more power than we actually need at a given moment. This means we have to find a way to store that surplus energy so we can use it when we do need it later. This is where the X comes in. The X stands for all the different energy carriers into which electricity can be transformed.

HYDROGEN PRODUCTION

In order to transform the green power, it is used to power an electrolysis process, which splits water into hydrogen (H_2) and oxygen (O).

The end product of the electrolysis process is pure hydrogen, which can be used in fuel cells, engines and industry, or in a synthesis process in order to store energy.

WASTE HEAT UTILIZATION

The electrolysis process as well as the synthesis of methanol and ammonia creates a great quantities of surplus heat that can be put into heating systems as “free” green heat. As district heating, an energy to heat pump, low value heat source for industry, etc.

SYNTHESIS PROCESS – REUSE OF HYDROGEN

Adding a carbon source to a synthesis process produces methanol or ammonia, which are used in many applications, including heating and the production of (new) electrical power at a later point.

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HYDROGEN COMPRESSION AND STORAGE

Hydrogen can be compressed, stored and/or distributed in gas grids directly from the Power-to-X plant to consumers near and far. A key element of the Power-to-X concept: store it until you need the energy.

ELECTROLYZER

Electrolysis is carried out using 3 different processes: PEM (Proton Exchange Membrane), alkaline water electrolysis and SOEC (Solid Oxide Electrolysis Cells). Balance of electrolysis plants is required for: water treatment, hydrogen separation/drying or heat recovery, etc.

CARBON SOURCE

Carbon needs to be added for the synthesis process. This can come from a nearby source (industry) or from a dedicated carbon capture process (e.g. CO_2 capture).

E-FUELS

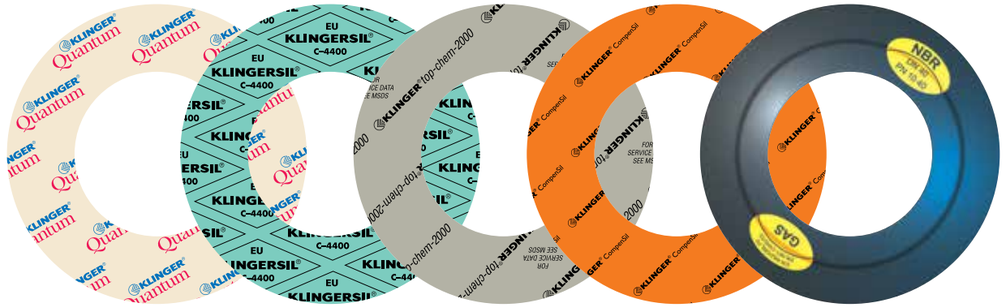
Methanol and ammonia can be refined further into synthetic fuels. Some can be used for heavy-duty transport or shipping, others for aviation. With this technology, we now can envision a future where airplanes, trucks and container ships run on energy from wind, sun and water.

GASKETS

METALLIC, SEMI-METALLIC, PTFE AND FIBER-REINFORCED GASKETS

A gasket is often the most practical and cost-effective way to seal a joint. However, the problem for designers and maintenance engineers with challenging media, such as hydrogen at up to 100% concentration or mixed with H_2S, CO_2, or natural gas, is to select the correct type to ensure process integrity and safe operation.

KLINGER offers a range of gasket products for the production, transport and storage of hydrogen, methanol and ammonia as well as all the utility media in the Power-to-X process, such as water, lye, etc.





SAFE HANDLING

KLINGER products ensure the safe transport, storage and further processing of hydrogen. Metal, elastomer, PTFE and fiber-reinforced gaskets made by KLINGER keep the connections of system components leak-tight and impermeable, even to the extremely small hydrogen molecules.

All KLINGER gasket types are extensively tested and analyzed by the German technical inspection association, because leak-tightness is essential in the handling of hydrogen. It can ignite within seconds when it comes into contact with oxygen and a spark. Preventing this requires the highest quality and safety standards. KLINGER has the expertise for supporting and implementing the new Power-to-X technologies with the suitable sealing technologies.

METALLIC / SEMI-METALLIC GASKETS

BENEFITS / PROPERTIES

Metallic and semi-metallic gaskets are used in areas where soft or cut-from-sheet gaskets are not particularly suitable. They can be preferred for higher temperatures or pressures, higher criticality or where tighter leakage rates are required. They have proven reliable at low temperatures of -200 °C as well as at high temperatures of over 600 °C. They are used at pressures ranging from relatively low to extremely high.

RUBBER-STEEL GASKETS GASKETS

BENEFITS / PROPERTIES

KLINGER rubber-steel gaskets are used with standard flange connections and at rather low temperatures for gas supply, distribution and storage. The Institute for Gas and Environmental Technology (DBI GUT) and the German technical inspection association (TÜV Süd) examined hydrogen with a positive result and certified it as a storage medium.

GRAPHITE LAMINATE GASKETS

BENEFITS / PROPERTIES

KLINGER gaskets on the basis of graphite are suitable for temperatures between -200 °C and up to 460 °C, and offer resistance against a broad range of chemicals. Equipped with an anti-stick finish specifically developed for this purpose, KLINGER graphite-based gasket materials are easy to remove from the flange – even after exposure to elevated temperatures.

FIBER-REINFORCED GASKETS

BENEFITS / PROPERTIES

KLINGER fiber-reinforced gaskets are used in gas distribution, machines and plants such as electrolyzers and process engineering plants, as well as in pumps. They are also available in non-standard sizes. In addition, they offer the advantage of being able to be produced as flat gaskets in every shape. They are certified for use with hydrogen by the Institute for Gas and Environmental Technology (DBI GUT) and the German technical inspection association (TÜV).

PTFE GASKETS

BENEFITS / PROPERTIES

KLINGER PTFE gaskets exhibit high chemical stability and high gas leakage integrity. In addition, they do not deteriorate with use and are certified for use with hydrogen by the German technical inspection association (TÜV).



PRODUCT OVERVIEW

Metallic, Semi-Metallic, PTFE, Fiber-reinforced Gaskets

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SOLUTION	LEAK-TIGHTNESS WITH HYDROGEN	CHEMICAL RESISTANCE IN P2X PROCESS	RELATED PRESSURE RESISTANCE	TEMPER-ATURE RANGE	
Metallic Weld Ring	Extremely high	High	Extremely high	-200 °C to +800 °C	
Metallic Waveline-WLP	Extremely high	High	Very high	-200 °C to +300 °C	
Metallic RTJ Ring-Type Joints	Very high	High	Extremely high	-200 °C to +800 °C	
Rubber-Steel KLINGER KGS GII	Very high	Very high	Very high	-30 °C to +85 °C	
Semi-Metallic KAM Profile	Very high	High	Very high	-200 °C to +550 °C	

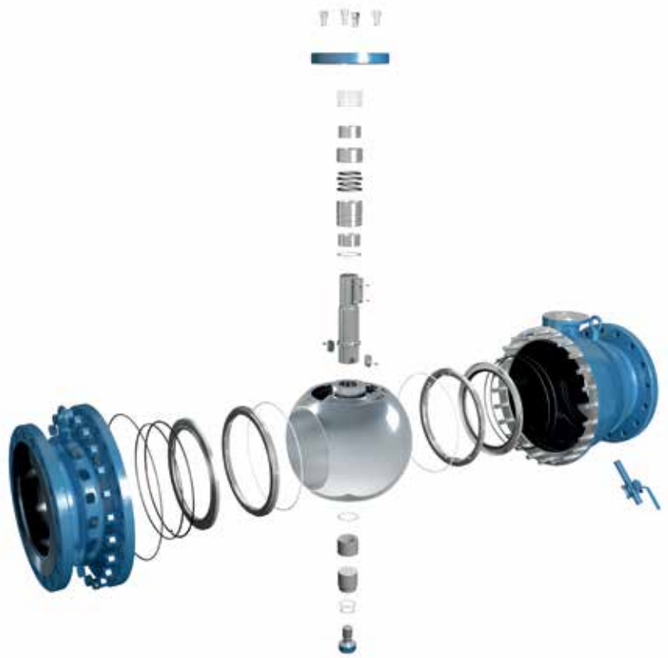
SOLUTION	LEAK TIGHTNESS WITH HYDROGEN	CHEMICAL RESISTANCE IN P2X PROCESS	RELATED PRESSURE RESISTANCE	TEMPER-ATURE RANGE	
Semi-Metallic Spiral-Wound Gasket KLINGER SWG	Very high	High	Very high	-200 °C to +550 °C	
PTFE Materials KLINGER TOP/ SOFT-CHEM	High	Extremely high	High	-200°C to +250°C	
Fiber-Reinforced KLINGERSIL and KLINGER QUANTUM	High	High	High	-100 °C to +250 °C (340 °C)	
Graphite Laminates KLINGER SL/PS/PD/ TS-M	Good	Very high	High	-200 °C to +450 °C	
Fiber-Reinforced Mica Laminates KLINGER MILAM PPS	Good	Very high	Good	0 °C to 1000 °C	

VALVES

KLINGER VALVES – PROVEN IN HYDROGEN APPLICATIONS FOR MANY DECADES

KLINGER valves have been in use in many hydrogen, ammonia and methane applications around the world already for decades – now also in the P2X context. Under pressure, H_2 hydrogen molecules can diffuse into metals and accumulate at points within the metallic lattice reducing its resistance to fracture and causing cracking, resulting in a reduction in tensile strength and ductility. Hence, it is crucial to select the right valve for the right job in the Power-to-X process. KLINGER has decades of experience with hydrogen applications – and is now applying this expertise to valves for Power-to-X.

Electrolyzers are at the heart of Power-to-X processes. They typically need to respond very quickly to fluctuations in the supply of renewable energy. This means that internal processes require rapid adjustment, and valves must provide accurate control with fast response times. KLINGER offers multiple control valve configurations for this purpose ranging from cryogenic to V-port ball valves.



SAFE HANDLING

The KLINGER range of valves includes specialized products that feature the leak proofing and material quality needed for working with hydrogen, including gas-tight and aging-resistant components that meet the pressure, temperature, and corrosion specifications required for alkaline and proton exchange membrane electrolysis. KLINGER valves have been in use in the hydrogen, methane and ammonia industries for decades as key isolating, control, and safety components.

ON/OFF VALVES FOR GASES (HYDROGEN, METHANE, AMMONIA)

BENEFITS / PROPERTIES

The KLINGER range of ball valves includes specialized products that provide the leak proofing and material quality needed for working with hydrogen. They are manufactured from gas-tight and aging-resistant components that meet the pressure, temperature, and corrosion specifications necessary for working with hydrogen, ammonia and methane gases. They offer the lowest leakage rate on the market and are tested in accordance with TA-Luft and have already been proven for decades.

CONTROL VALVES

BENEFITS / PROPERTIES

KLINGER control valves are designed for the precise control of the flow of gases or liquids. The valve body is manufactured from stainless-steel bars or special alloys, depending on the type of use which span from cryogenic and high-temperature to simple flow control applications. The seat or ball (V-port) of control valves feature linear characteristics, making them perfect for any control application.

ON/OFF VALVES FOR PROCESS MEDIA WASTE STREAMS, ETC.

BENEFITS / PROPERTIES

KLINGER ball, butterfly, and gate valves are suitable for a wide range of applications, particularly for shutting off flows. They are used in a variety of process media waste streams and the like.

SPECTACLE BLINDS, STRAINERS, CHECK VALVES

BENEFITS / PROPERTIES

Strainers in various configurations help remove solid bodies from your pipelines by directing the flow through a screen to remove contaminants. Spectacle blinds are manufactured in standard sizes or to customer specifications in accordance with actual plant demand.

STEAM VALVES

BENEFITS / PROPERTIES

KLINGER steam valves are perfect for steam and condensate systems and offer the lowest possible Total Cost of Ownership (TCO) for a steam valve. They are also available as steam control valves.



PRODUCT OVERVIEW

KLINGER valves – proven in hydrogen applications for many decades

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SOLUTION	LEAK-TIGHTNESS WITH HYDROGEN	CHEMICAL RESISTANCE IN P2X PROCESS	PRESSURE RESISTANCE	TEMPER-ATURE RANGE	
On/Off Valves for Gases - INTEC Series	Extremely high	Extremely high	Up to 500 bar	-196 °C to +800 °C	
Control Valves in Cryogenic Applications - S2000	High	High	Up to 40 bar	-200 °C to +250 °C	
Control Valve Applications - V-Port	Extremely high	High	Up to 40 bar	-10 °C to +260 °C	
On/Off Valves for Gases and Harsh Media -KHA -KHD	Very high	High	Up to 40 bar	-10 °C to +260 °C	
On/Off Valves for Waste Heat -KHO -KKD -KHD	High	High	Up to 16 bar	-10 °C to +120 °C	

SOLUTION	LEAK-TIGHTNESS WITH HYDROGEN	CHEMICAL RESISTANCE IN P2X PROCESS	PRESSURE RESISTANCE	TEMPER-ERATURE RANGE	
Plant Isolation Spectacle Blinds	High	Extremely high	High	-100 °C to +250 °C	
Utility On/Off Valves -KKD -KAD	N.A.	High	Up to16 bar	-10 °C to +200 °C	
Check Valves -KRG	N.A.	High	Up to16 bar	-20 °C to +260 °C	
Steam Valves -KVN	N.A.	High	Up to 63 bar	-10 °C to +400 °C	
Strainers -KFD	N.A.	High	Up to 40 bar	N.A.	

INSTRUMENTATION

KLINGER INSTRUMENTATION

Measuring levels is essential for monitoring crucial steps in the Power-to-X process from the water treatment to hydrogen post-treatment plant and more. KLINGER measurement instruments are used for monitoring, control, and regulation purposes. They also serve the same vital purpose in boilers as well as in storage and ballast tanks.



REFLEX LEVEL GAUGES

APPLICATION

KLINGER reflex level gauges allow the medium, e.g. water, liquids, gases, and steam, to be viewed through a reflex glass: the side of the glass which is exposed to the medium has a prismatic surface, while the other side is smooth. The level of the medium inside the gauge is indicated based on the light refraction principle.

SPECIFICATIONS

- Built in carbon steel, stainless steel and special materials on request
- Suitable for steam and process applications
- Design temperature up to 400 °C
- Pressure up to 400 bar



TRANSPARENT LEVEL GAUGES

BENEFITS / PROPERTIES

This type of KLINGER level gauge contains the medium, e.g. water, liquids, steam, between two sight glasses whose surfaces are both smooth. The level of the medium can be easily observed by looking through the glasses.

SPECIFICATIONS

- Built in carbon steel, stainless steel and special materials on request
- Suitable for steam and process applications
- Design temperature up to 400 °C
- Pressure up to 250 bar
- In order to improve visibility an illuminator can be mounted



MAGNETIC LEVEL GAUGES

BENEFITS / PROPERTIES

KLINGER magnetic level gauges are particularly suitable for operations involving toxic or hazardous liquids or gases and when the following is required: immediate and safe response to level changes, provision of perfect visibility, continuous indication of fluid level, local or remote display.

SPECIFICATIONS

- Built in stainless steel and special materials on request
- Suitable for steam and process applications
- Design temperature up to 400 °C
- Pressure up to 312 bar
- Suitable for toxic and hazardous fluids
- Alarm switching facilities
- Very high length feasible

EXPANSION JOINTS

KLINGER EXPANSION JOINTS & HOSES

KLINGER offers metal bellows, lens expansion joints, braided hoses, boiler hoses, high-pressure expansion joints, and expansion joints manufactured from various nickel alloys and stainless steels. In addition, we provide fabric and rubber expansion joints as well as rectangular expansion joints for waste streams, steam pipes as well as chemical and other applications within the Power-to-X process.



SF TYPE (FIXED FLANGE)

BENEFITS / PROPERTIES

Metal expansion joints are fitted with carbon-steel or stainless steel pipe or flange connections. These types of expansion joints can be supplied with liners, covers, rods, hinges, or gimbals.

SPECIFICATIONS

- Size: DN 25-1000 (please check with us for other sizes)
- Design pressure: Up to16 bar(g), (higher pressure check with us)
- Design temperature: Up to 400 °C (please check with us for higher temperatures)
- Bellows material: AISI 304, 316, 321 or nickel alloys

RUBBER EXPANSION JOINTS

BENEFITS / PROPERTIES

Rubber provides excellent flexibility in short lengths. Flanges manufactured from various grades of carbon and stainless steel and cast iron in accordance with various industry standards. Up to 110 °C operating temperature and 16 bar operating pressure. Rubber expansion joints are used in a variety of applications, in particular to absorb vibrations.

SPECIFICATIONS

- Size: DN 25-800 (please check with us for other sizes)
- Design pressure: Up to 16 bar(g), (please check with us for higher pressures)
- Design temperature: Up to 110 °C
- Bellows material: EPDM, NBR, CR, SBR
- Flange material: Carbon-steel, stainless steel, nodular cast iron

KLINGER METAL HOSES

BENEFITS / PROPERTIES

KLINGER flexible metal hoses are manufactured from stainless steel to ensure a long service life. They come in braided and non-braided versions for use in multiple applications and for a wide variety of purposes. The hoses can be supplied with various types and fittings/ connections. They provide extremely good flexibility for connecting and transferring various types of process fluids. KLINGER hoses offer a very long service life and require minimal maintenance.

SPECIFICATIONS

- Size: DN 6-150 (please check with us for other sizes)
- Design pressure: Up to 245 bar(g)
- Design temperature: Up to 400 °C
- Bellows material: AISI 304, 316/316L, 321
- Flange & hardware material: Carbon-steel, stainless steel, custom

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