Valve, Measurement and Control Systems for Hydrogen Applications

Application-based solutions for your project business

Having excellent references in the industrial markets shows that we clearly understand your requirements. With our comprehensive range of products, we meet the demands of applications such as water treatment, electrolysis, gas treatment and Power-to-Liquid: The specific requirements of these sectors are met by our flexible product range.

GEMÜ solution from a single source
As a system supplier we can respond very flexibly to your individual needs. Our worldwide sales network provides fast reaction times, customer-oriented service and a committed project management team.

Plant safety first
At GEMÜ, we only use carefully selected materials and our quality management system ensures continuous monitoring. This is also certified by external institutes.

Partner of BW-Elektrolyse
Industrial Partnership for the development and production of a hydrogen electrolysis in the region of Baden-Württemberg.

Hydrogen as a medium sets high demands on valves. Especially the small molecule size of the volatile gas quickly becomes a challenge when selecting materials. No matter whether it is a question of the right material or the appropriate approval. We will be at your side to help you choose the right valve. Please contact us.

Hydrogen Embrittlement

Hydrogen shows a high diffusion in many materials, in some steels this can lead to hydrogen embrittlement at high temperatures. Therefore, austenitic stainless steels are a preferred material.

We advise you carefully on the choice of material, especially for parts in contact with the medium.

Tightness

In addition to the diffusion tightness of the materials, the tightness of the entire valve is also relevant.

The tightness of GEMÜ valves is proven according to TA-Luft. If desired, additional testing via a helium test rig is possible.

Explosive Atmosphere

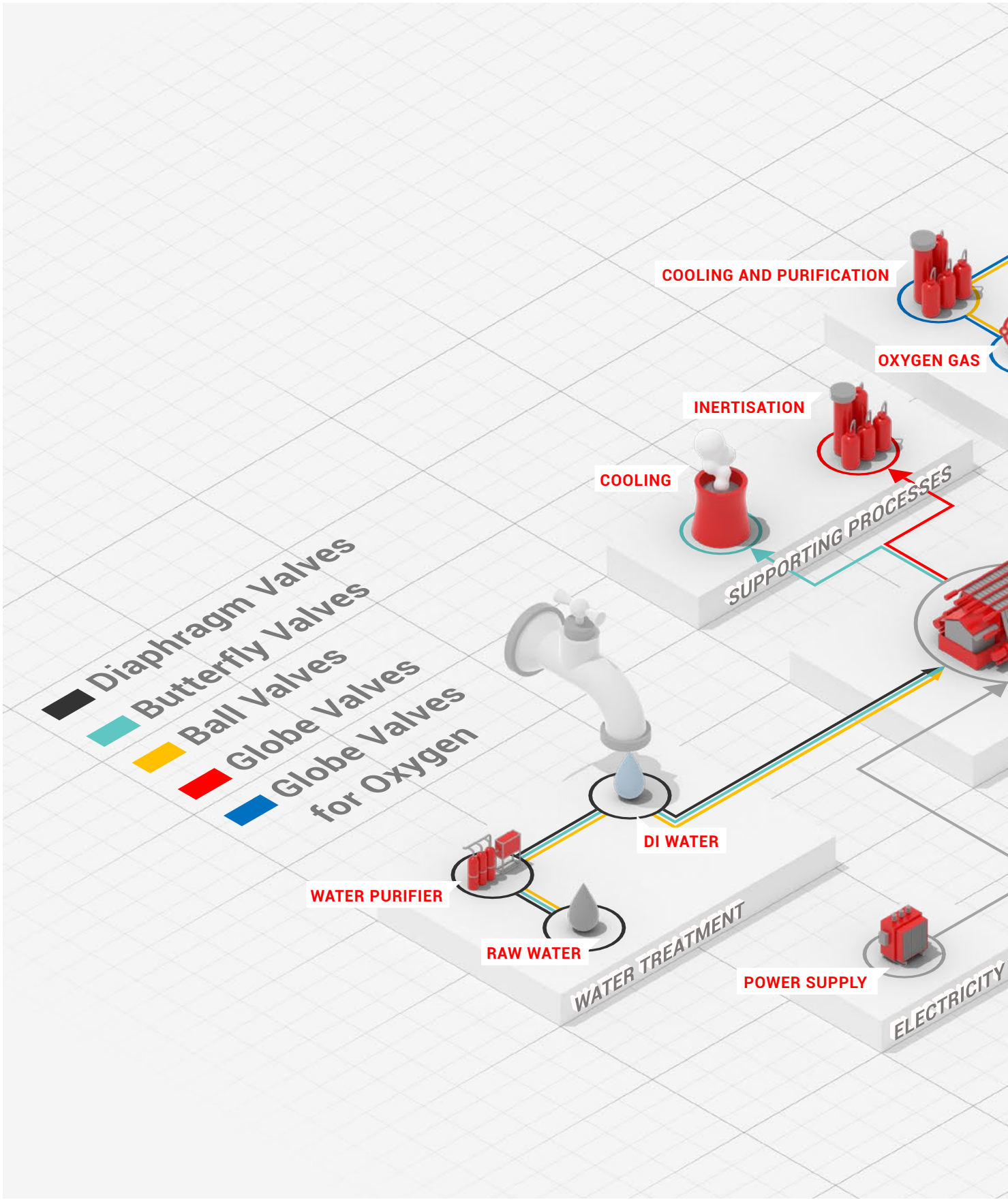
Hydrogen can form explosive mixtures. In addition, the systems are often installed in areas with high safety requirements.

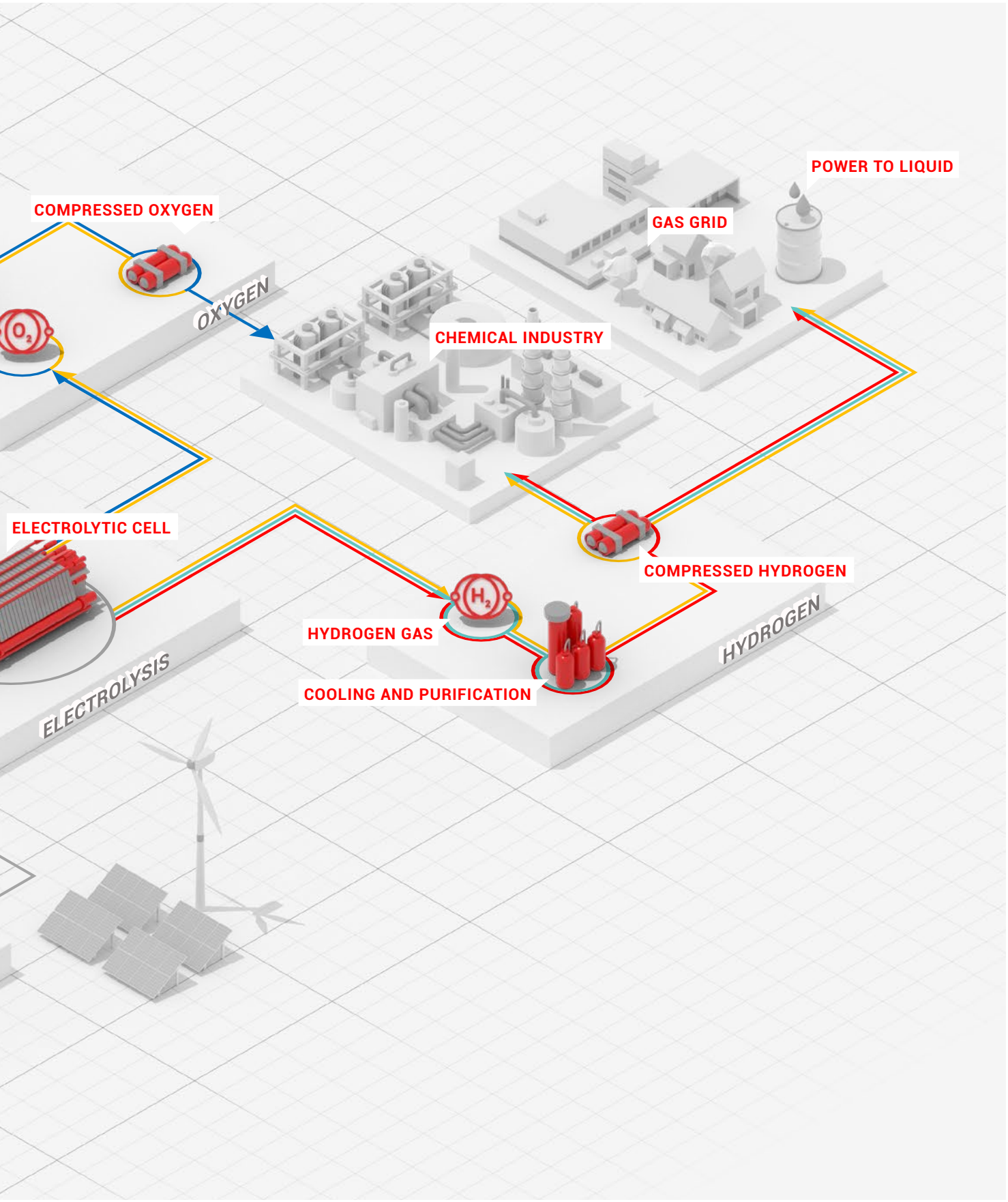
We will be happy to advise you on valve selection in accordance with the required ATEX zone or on handling flammable gases.

Decentralised Installation

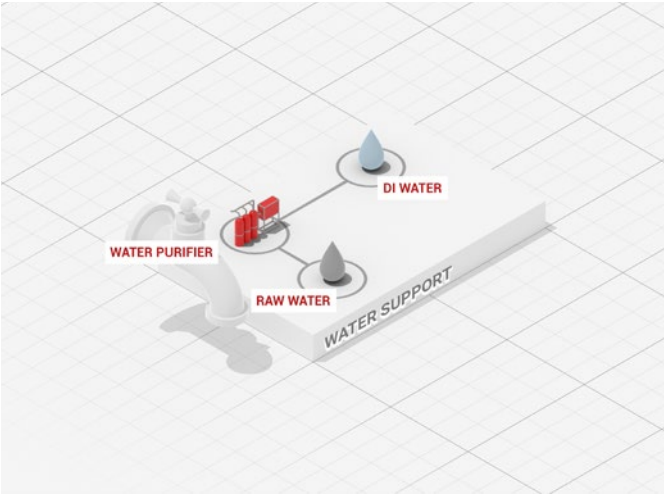
For the decentralised installation of hydrogen electrolysers, compressed air is often not available on site.

GEMÜ offers a wide range of electrically operated valves with corresponding safety positions.


COOLING AND PURIFICATION
OXYGEN GAS
INERTISATION
COOLING
SUPPORTING PROCESSES
Diaphragm Valves
Butterfly Valves
Ball Valves
Globe Valves
Globe Valves for Oxygen
DI WATER
WATER PURIFIER
RAW WATER
WATER TREATMENT
POWER SUPPLY
ELECTRICITY


COMPRESSED OXYGEN
OXYGEN
POWER TO LIQUID
GAS GRID
CHEMICAL INDUSTRY
ELECTROLYTIC CELL
COMPRESSED HYDROGEN
HYDROGEN GAS
HYDROGEN
COOLING AND PURIFICATION
ELECTROLYSIS

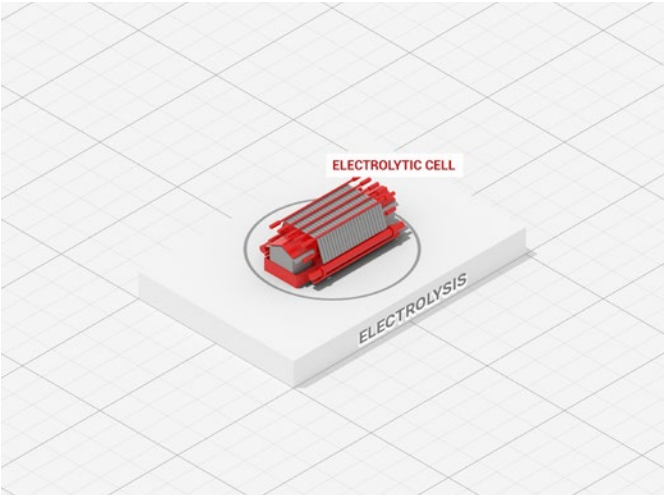
Application Examples



Water treatment

A good and reliable water treatment is essential for electrolysis units. For the electrolysis pure water is required, free of particles and salts. Depending on the water source, usually the raw water for an electrolysis unit must be prefiltered. Very often Membrane processes as Ultrafiltration or Reverse Osmosis are applied. Ion exchangers or EDI units are usually the final stage to purify the water.

GEMÜ portfolio offers a wide rage of valves and measuring equipment for water treatment. For larger nominal sizes, soft-seated butterfly valves GEMÜ R480 are usually used. Further valve choices are depending on electrolysis process in use.



Electrolysis

For alkaline electrolysis systems normal metal valves can be used in the DI water supply. For PEM electrolyser no metal is allowed in the water area to protect the membranes from contamination. The pressure in the electrolysis cell can be controlled by the gas pressure, here can seat valves be applied due to the good regulation quality.

GEMÜ offer metal and plastic butterfly valves. Also a variety of coated discs is available. For regulation stainless steel globe valves offer the best performance.

Valve choice for water treatment depending on electrolysis process

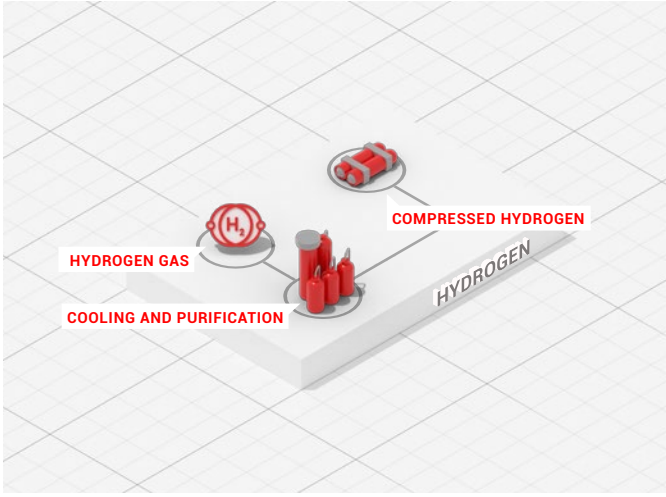
Electrolysis process	Water requirements	Electrolysis process data	Valve choice for electrolysis process
PEM-Electrolysis	Ultrapure water	1-40 bar, 90 °C	Usually plastic or lined valves in contact with water. For gas (H_2/O_2) metal valves are suitable
Alkaline Electrolysis	DI-water	1-40 bar, 90 °C	Potassium hydroxide, usually stainless steel valves
Solid Oxide Electolysis	DI-water / Steam	> 700 °C	High temperature valves, suitable GEMÜ solutions only in up- and downstream

Application Examples

Gas treatment

The generated gases (hydrogen and oxygen) from the electrolysis cell have to be dried and purified for the required gas quality. Very often PSA-units are applied here. With high switching cycles PSA-units have a high requirements on valves. For oxygen application and high purity hydrogen there are also high requirement on the manufacturing of the valves.

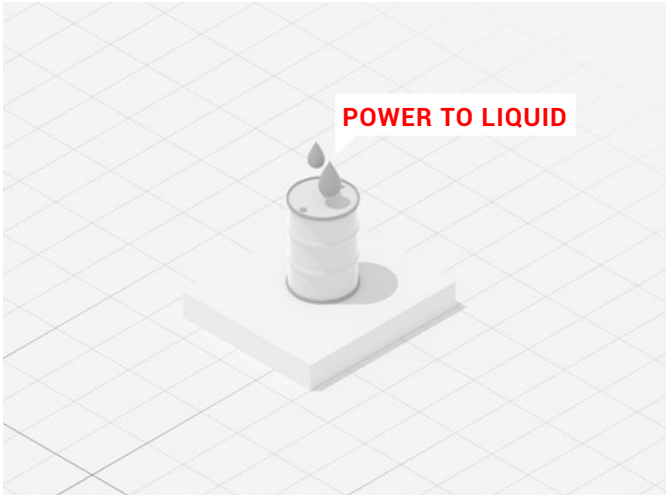
GEMÜ offers a wide range of valves that have been deemed suitable for use with gaseous oxygen by external institutes (BAM). For PSA-units GEMÜ supplies globe valves and high-performance butterfly valves. A multi-port valve block can also be an attractive solution in this area. Please contact us.



Power-to-liquid

Green hydrogen from electrolysis units can be used in Power-to-liquid processes to generate alternative green fuels. In those units Hydrogen reacts with CO_2 in presence of catalysts to hydrocarbons. These hydrocarbons can replace fossil fuel, diesel and kerosene in the future.

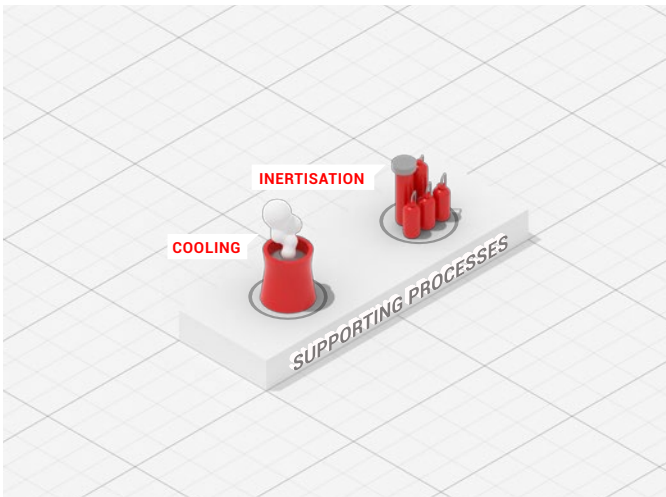
GEMÜ offers valves to handle the gases H_2, CO_2 and the liquid products. Depending on the pressure and temperature here are often globe valve or ball valves applied.



Supporting processes

The temperature of the process is very important for a safe operation and high yield. Pre-heating and cooling of the media is a simple, but important process step.
To prevent the danger of explosion, hydrogen plants are often flushed and inerted with nitrogen gas. The gas is fed into the pipelines during shutdown to displace the flammable hydrogen.

GEMÜ has many valves like e. g. butterfly valves, ball valves and globe valves for the cooling water distribution and control as well as for inertisation. If required specified customer solutions can be designed for measurement and control systems.



Product examples by application area

Modular system for GEMÜ valves

Using the example of butterfly valves

With the GEMÜ modular system, we provide the opportunity to put together a suitable valve in line with your requirements. Discover all configuration options at ***www.gemu-group.com***

Measurement and control technology
Electrical position indicators and combi switchboxes | Positioners and process controllers | Accessories



Actuators
Manual | Pneumatic | Motorized
Metal | Plastic



Liners and discs
Elastomer | Elastomer/thermoplastic
Metal | Plastic



Bodies
Metal | Plastic



Configure your valve online
at *www.gemu-group.com*

Metal and Plastic Butterfly Valves

Soft seated GEMÜ R480 Victoria and GEMÜ D450

Due to the variety of materials, the GEMÜ butterfly valves are universally compatible. The construction enables many possible combinations of disc, liner and body. For all nominal sizes, butterfly valves are effective as short shut-off valves with high flow rates. Various manual, pneumatic and motorized actuators are available for all GEMÜ butterfly valves.

durable
Lower torques thanks to PTFE-coated bushings

made by GEMÜ
In-house machining and high quality Epoxy Coating

smart
Liner material is easy to read when installed, compatible with CONEXO

reliable
Optimized liner for technically flawless tightness

flow-optimized
Sleek disc design for higher Kv values

GEMÜ R480 Victoria

Go online!
GW-R480

weather resistant
resistant to UV radiation

flexible
Wafer bodies for various standards: ISO/DIN, ANSI/ASTM, British Standard, JIS

efficient
butterfly disc design ensures low torque

GEMÜ D450

Go online!
GW-D450

Areas of application for

Soft-seated GEMÜ R480 Victoria

- Water treatment
- Hydrogen cooling
- Cooling of electrolyser

Soft-seated plastic GEMÜ D450

- DI-water treatment
- Electrolyser water supply (PEM)

Metal Butterfly Valves

Soft seated GEMÜ R470 Tugela and PTFE-seated GEMÜ 490 Edessa

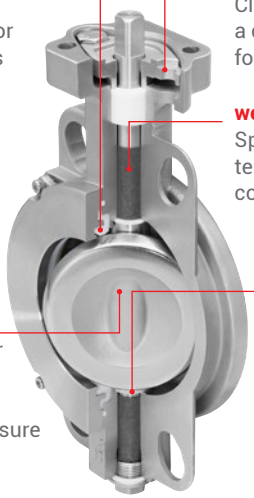
resistant
TFM sealing ring with excellent properties for chemical applications

reliable
Clamping system with a coaxial control ring for sealing

wear-optimized
Spindle protected by temperature-resistant, copper-alloyed bush

durable
Minimized friction of the disc thanks to double-eccentric structure

high-quality
Spherical surfaces for improved mechanical behaviour under temperature and pressure fluctuations



GEMÜ R470 Tugela

Go online! GW-R470

versatile
Liner and disc materials can be flexibly combined

flexible
Standardized top flange acc. to ISO 5211 for various actuators

efficient
Low torque due to special liner geometry

sophisticated
Disc and shaft from a single casting with spring loaded seal system

GEMÜ 490 Edessa

Go online! GW-490

Areas of application for

Double-eccentric GEMÜ R470 Tugela

- PSA plants for gas treatment
- Shut-off valve for hydrogen
- Hydrogen cooling
- Cooling of electrolyser

PTFE-seated GEMÜ 490 Edessa

- DI-water treatment
- Electrolyser water supply (PEM)

Plastic Diaphragm Valves

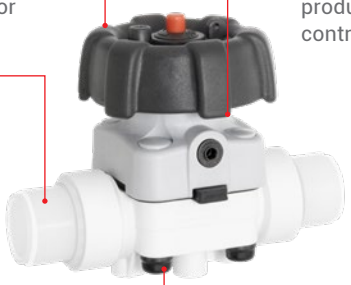
GEMÜ R677 and R690 with high flow body

GEMÜ offers a wide range of highly resistant plastic valves. Due to a large material selection GEMÜ diaphragm valves are ideally suited for chemically corrosive media, which are often found in chlor-alkali processes. Further advantages of GEMÜ plastic diaphragm valves come from the sophisticated valve design. With the flow-optimized valve bodies, a compact system design can be realized.

resistant
Corrosion resistant all plastic actuator

compact
High flow body for smaller actuator size

made by GEMÜ
In-house engineering, production and quality control



robust
A2 stainless steel screws with plastic cover for corrosion protection

also available with pneumatic actuator

GEMÜ R677

Go online! GW-R677

GEMÜ R690

Go online! GW-R690

also available with electric actuator

GEMÜ R649 eSyDrive

Areas of application for

- Water treatment
- Ion exchanger
- Chemical dosing

Metal Globe Valves

2/2-way metal globe valves GEMÜ 537, 530 and 539 eSyDrive

Globe valves are suitable for clean, liquid media as well as gases and steam. Due to the linear movement and favourable mechanical conditions, they often take on automated tasks as control of cooling water and hydrogen. For oxygen applications GEMÜ offers a wide range of valves that have been deemed suitable for use with gaseous oxygen by external institutes.

robust
Standard gland packing suitable for vacuum up to 20 mbar (abs.)

High quality
Valve bodies available in SG iron and stainless steel

optimizedGood flow
capability and compact design

also available with pneumatic actuator

GEMÜ 537

Go online! GW-537

GEMÜ 530

Go online! GW-530

also available with electric actuator

GEMÜ 539 eSyDrive

Go online! GW-539

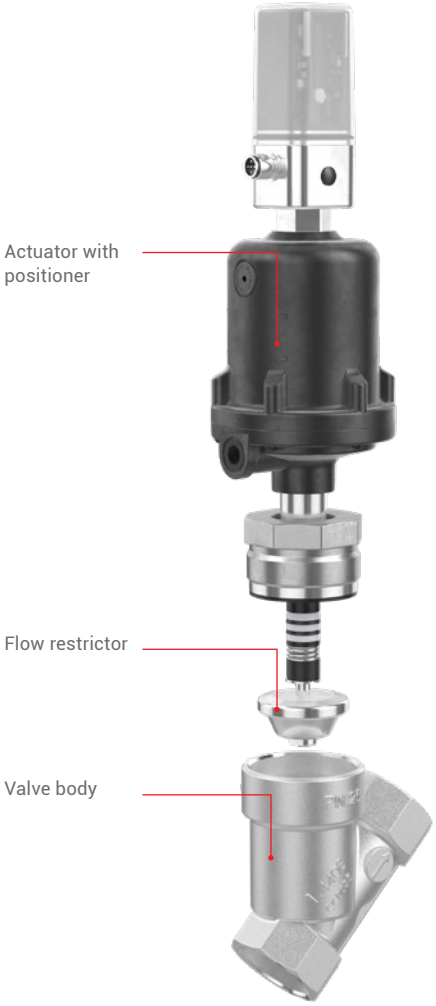
Areas of application for

- Hydrogen pressure control
- Oxygen pressure control (up to 10 bar with BAM certified materials)
- System inertisation by nitrogen
- Temperature control
- Maintenance
- Drainage

Globe valves as control valves

Thanks to the long stroke distance, combined with the small increase in cross-section at the valve seat, GEMÜ globe valves are ideally suited to control tasks. Moreover, they are distinguished by jolt-free actuation and a long service life in terms of switching frequency.

This is how a globe valve becomes a control valve



The incorrect design of control valves can result in poor control results or premature wear. This is why GEMÜ places particular importance on the precise design of the control valves.
Our technical advisors and specification sheet can help you to design control valves.

Flow restrictors with different geometries

With increasing opening of the valve, the flow restrictor changes the ring-shaped gap at the valve seat providing a defined control characteristic. Depending on the type of globe valve and the nominal size, flow restrictors may have widely different geometries.

Regulating needles are used for very small nominal sizes and high pressures because they can control with high precision. For larger diameters, modified regulating cones or regulating cages are preferred for weight reasons.

The most frequently used control characteristics are linear and equal-percentage 1:25 and 1:50. Linear means that the flow increases linearly with the opening stroke of the valve. The flow is 50% at the 50% open valve position. This provides good valve control over the whole stroke range. The equal-percentage control characteristics have the character of an exponential function. In the lower range, with an opening stroke of approx. 20% to 60%, these valves can be very finely controlled depending on the valve stroke.

Regulating needle

Regulating cone

Regulating cage

Overview of control systems

Pneumatic

GEMÜ PCS 514

GEMÜ PCS 550

GEMÜ PCS 554

GEMÜ PCS 530

GEMÜ PCS 532

GEMÜ PCS 534

GEMÜ PCS 536

Electric

533 eSyStep

543 eSyStep

539 eSyDrive

549 eSyDrive

343 eSyDrive

For pneumatic actuators, our positioners and process controllers are fitted ex works and tested and delivered as an entire system.

Not only can you obtain all components from a single source, you also reduce the effort required for logistics and installation of the system on site, as well as for documentation.

For motorized actuators, the controller is mostly fully integrated. These actuators are an optimum alternative to control valves in sterile environments or when considering service life.

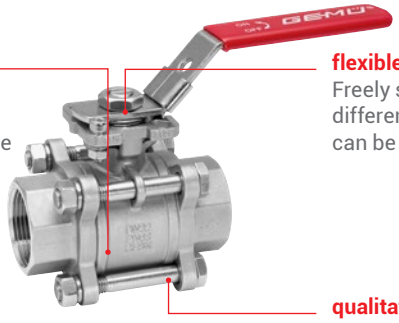
If required, the positioner in question can also be commissioned at the place of use by GEMÜ service engineers.

Ball Valves

2/2-way metal ball valve GEMÜ B22, GEMÜ B46 and GEMÜ B56

Ball valves are versatile and can also be used in extreme circumstances. This valve type is particularly well-suited to safely shutting off liquid and gaseous media at a very high operating pressure. As media travels between the ball and the body when opening and closing, ball valves are suitable for mechanically pure, inert or corrosive liquids, gases or steam.

modular
3-piece body design enables simple mounting



flexible
Freely selectable, different actuators can be mounted

qualitativ
Design acc. to DIN12516-2, ASME 16.34

pneumatic ball valve

GEMÜ B22

Go online! GW-B22

GEMÜ B46

Go online! GW-B46

electric ball valve

GEMÜ B56

Go online! GW-B56

Areas of application for

- Water treatment
- Maintenance
- Drainage

Further process accessories

positioner
GEMÜ 1434 µPos

positioner
GEMÜ 1435 ePos

positioner
GEMÜ 1436 cPos

Combi switchbox with integrated pilot valve
GEMÜ 4242

Inductive dual sensor
GEMÜ LSF

Limit switch box
GEMÜ LSC

for linear valves

for quarter turn valves

angle seat globe valve
GEMÜ 514

diaphragm valve
GEMÜ R690

ball valve
GEMÜ B46

butterfly valve
GEMÜ R481

Flowmeter
GEMÜ 805

Pressure and temperature sensors
GEMÜ 3140 and 3240

Metal solenoid valve
GEMÜ 8253

Metal check valve
GEMÜ ZRSK

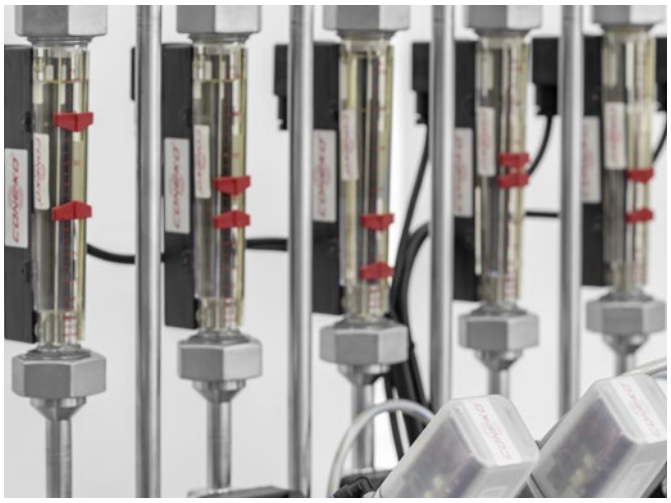
GEMÜ portfolio at a glance

The following table aims to give you an overview of which valve function is most appropriate for which processes and media. In addition to these categories, we also offer valves for special applications.

Criterion	Diaphragm valves		Globe valves	Butterfly valves	
	Metal	Plastic	Metal	Metal	Plastic
MEDIUM					
Gaseous	○	○	●	–	–
Steam	○	–	●	●	–
Liquid	●	●	●	●	●
Viscous	●	●	○	●	●
Particulate, abrasive	●	○	–	○	○
Granular	○	○	–	○	○
Corrosive (depends on material)	●	●	–	–	●
PROCESS					
Multi-port design available	●	●	●	–	–
Piggable	–	–	–	–	–
Controllable	○	○	●	For larger diameters	
Media temperature	up to 100 °C	up to 80 °C	up to 185 °C*	up to 230 °C	up to 90 °C
Operating pressure	up to 10 bar	up to 10 bar	up to 40 bar	up to 40 bar	up to 10 bar
Frequent cycle duties	○	○	●	–	–

* higher degrees on request
● Very suitable
○ Conditionally suitable
– Not suitable

Further process accessories



Flow meters

Pressure and temperature sensors

Ball valves		Diaphragm globe valves	Process solenoid valves	
Metal	Plastic	Plastic	Metal	Plastic
●	●	○	–	–
●	●	○	–	–
●	●	●	●	●
○	○	●	○	○
–	–	–	–	–
–	–	–	–	–
–	●	●	–	○
●	●	●	●	–
●	●	–	–	–
○	–	●	–	–
up to 220 °C	up to 100 °C	up to 150 °C	up to 60 °C	up to 60 °C
up to 137 bar	up to 16 bar	up to 6 bar	up to 20 bar	up to 6 bar
–	–	●	●	●

Control systems

Customized solutions

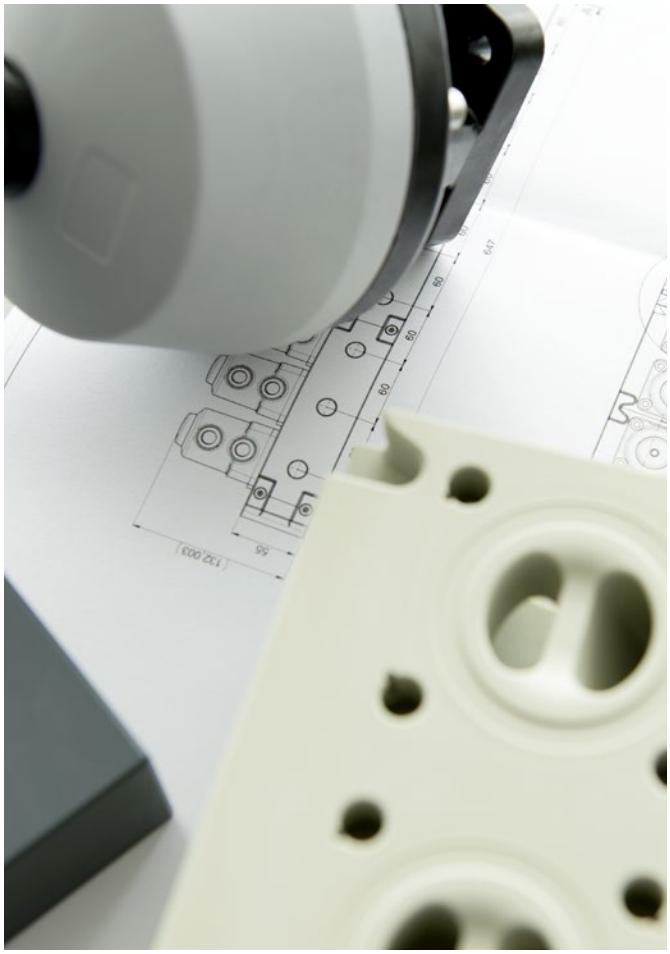
As a partner to its customers, GEMÜ wants you to be able to fully realise your plant potential. That's why, in addition to our standard product range, we also offer high level modifications, up to individual customized valve concepts.

Whether it concerns a modification or a new development, our modular system with proven standard modules allows plenty of flexibility for individual design possibilities.

When searching for reliable plant components, our engineers begin by drawing on our tried and tested standard modules, even for new developments. Wherever possible, they combine new technologies with these proven components. This is cost-effective and also guarantees safety.

You will benefit from:

- More than 50 years of experience and engineering expertise in the field of customized valve designs
- Personal support in more than 50 countries wordwide
- GEMÜ's wide range of products and modular system
- Maximum performance in manufacturing with modern machinery



Extensive standard range
with a wide selection of operating principles, materials and connection standards

Product modification
application-optimized such as special coatings or extended material selection

New development
in close cooperation between customers and experienced GEMÜ engineers

Challenge us!

There is a lot more to find behind the GEMÜ standard product program.

Contact us for an individual consultation.

Process reliability due to tested quality

If you value high quality, in-house quality assurance is a must. That's why the GEMÜ test laboratory is equipped with state-of-the-art measuring equipment to allow comprehensive testing of our products. This also enables us to test highly customized designs in order to determine the parameters for the most economically efficient operation.

At GEMÜ, we only use carefully selected materials and our quality management system ensures continuous monitoring. External institutes also testify to this quality.

TÜVRheinland® CERT ISO 14001

TÜVRheinland® CERT ISO 9001

DVGW CERT

Safety Integrity Level GEMÜ SIL IEC 61508 / IEC 61511

Technical consultation and service

The correct installation and predictive maintenance of valves, measurement and control components are important prerequisites for efficient operation and optimum operating cycles for a plant. This is why we also support you in this regard and offer various additional services.

All-round service

Our well-trained advisors and service engineers support designers, equipment manufacturers and operators, in addition to service providers, in planning, configuring, commissioning and maintaining pipework components. They have in-depth knowledge of the market and can find the optimum technical and cost-effective product version for the relevant application from our comprehensive range. Repair and maintenance work can be carried out at the service centres or directly on site. If you wish, our qualified fitters can also assume responsibility for component inventory, data management and retrofitting for CONEXO.

Furthermore, we offer a variety of technical training courses. With a multi-stage training system and individual training models, we pass all the required knowledge and tools for installing and maintaining GEMÜ products on to employees from Installation and Service. This also includes an innovative, specially designed VR training course (virtual reality training). This lets you practice and internalize the movements required when carrying out maintenance work with CONEXO, for example.

Prepared for Industry 4.0

With CONEXO, we offer an RFID system architecture that enables clear identification of wearing parts, paperless maintenance and process documentation.

To meet the growing requirements of digitalization, we founded a new start-up company in the GEMÜ Group called “inevvo solutions” in 2018. Its core expertise is the sale and further development of the CONEXO RFID system. This allows positive electronic identification of our valve components using the integrated RFID chip.

In addition, the CONEXO software supports the user with paperless maintenance. An app for mobile devices guides maintenance technicians through the fully customizable maintenance workflows step by step. Clear identification of components, coupled with innovative elements such as photo documentation or assessment schemes, ensures transparent and reliable maintenance. The recorded data can then be processed electronically. Further information can be obtained from ***www.inevvo-solutions.com***

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