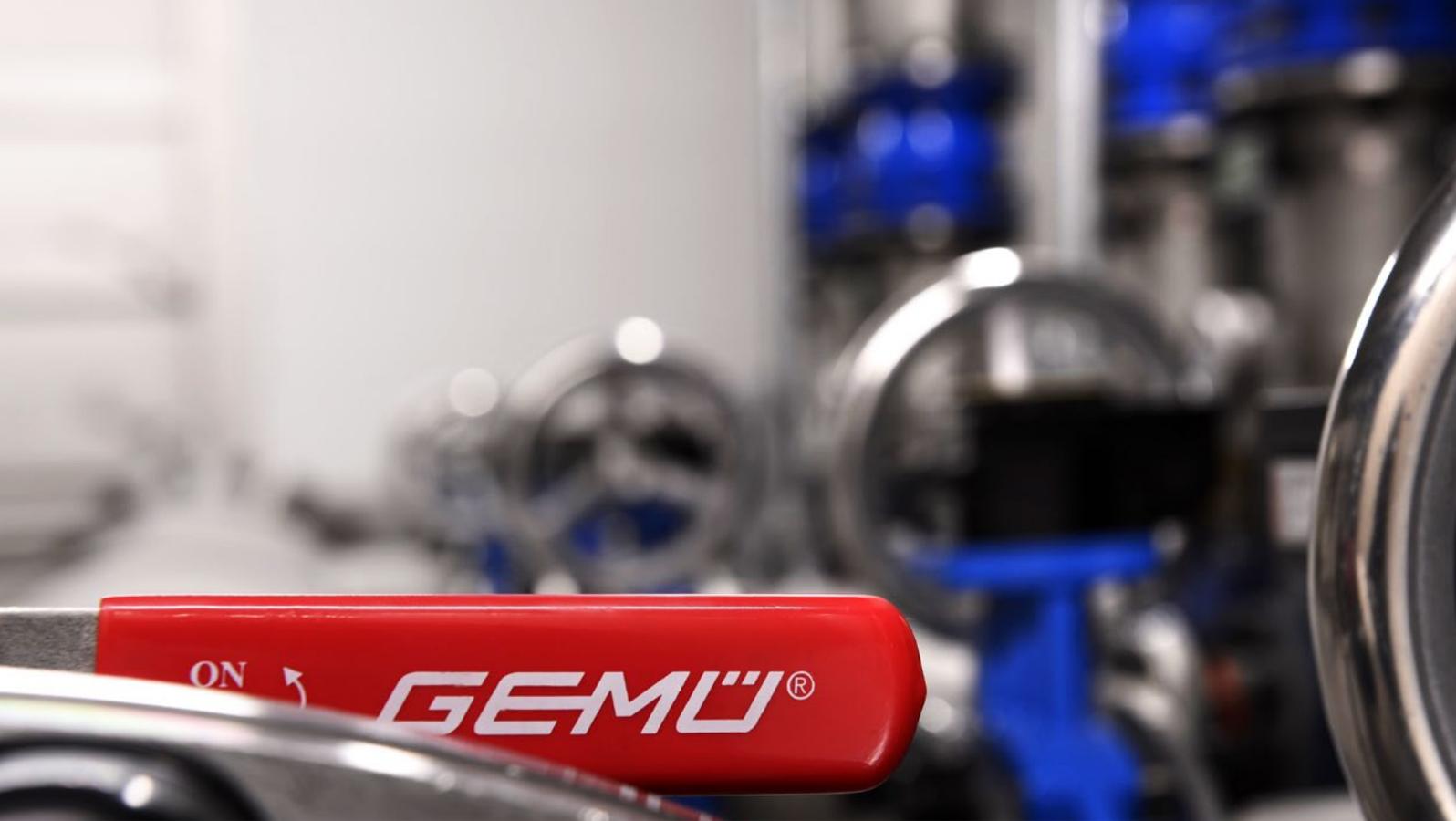




Components and system solutions
for the chlor-alkali industry

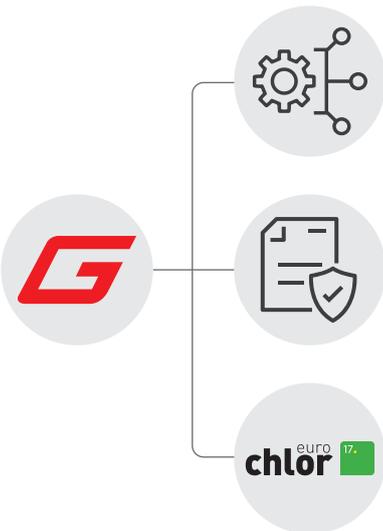
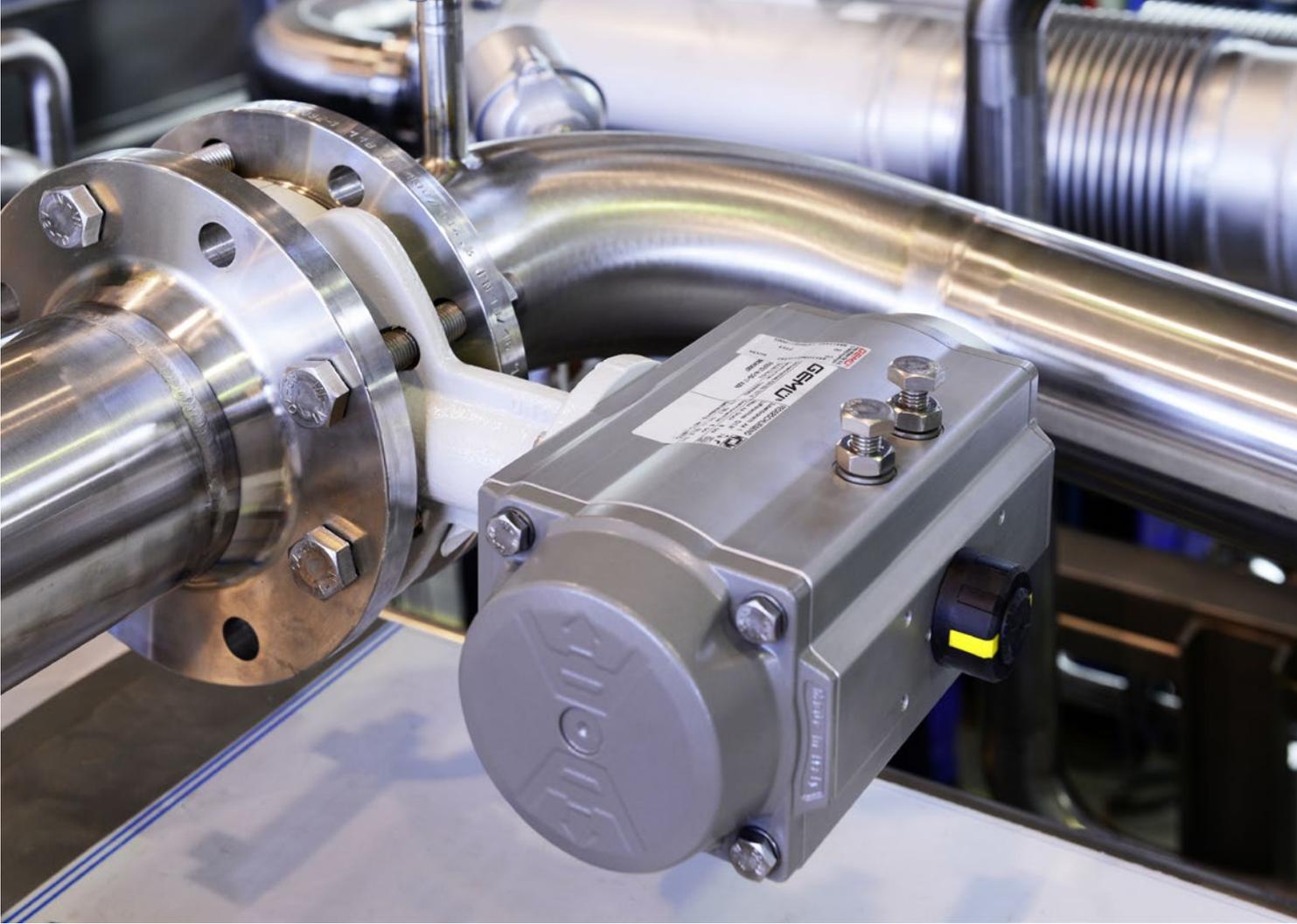
GEMÜ

www.gemu-group.com



Application-based solutions for your project business

Having excellent references in the area of industrial markets shows that we clearly understand your requirements. With our comprehensive range of products, we comply with the requirements of applications such as water treatment, brine purification and electrolysis, as well as chlorine, acid and alkali treatment and handling. The specific requirements of these industrial sectors are fulfilled by our flexible portfolio.



GEMÜ solutions from a single source

As a system provider, we can react very flexibly to your needs on a case by case basis. Our worldwide sales network provides fast reaction times, customer oriented service and a committed project management team.

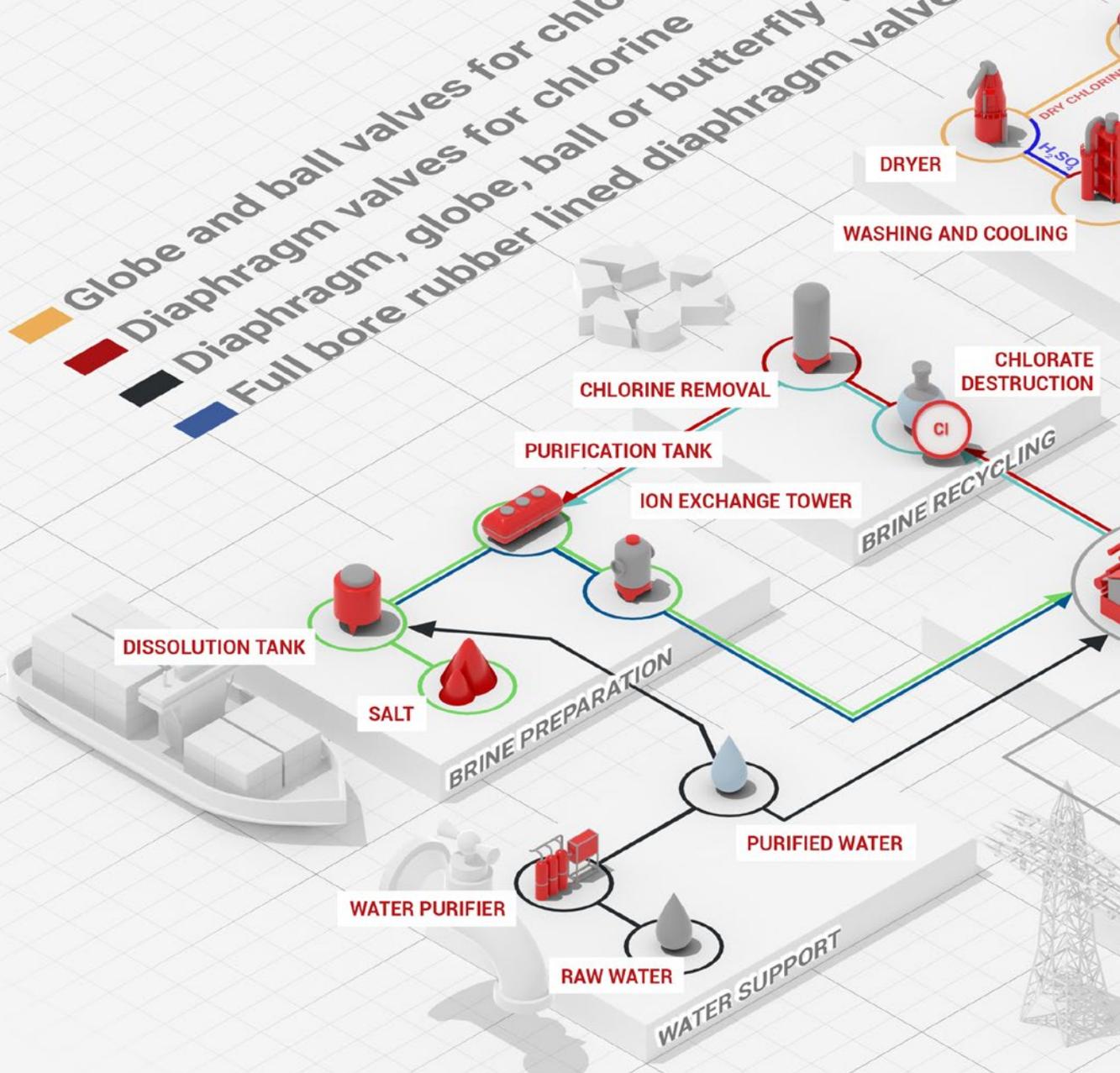
Plant reliability comes first

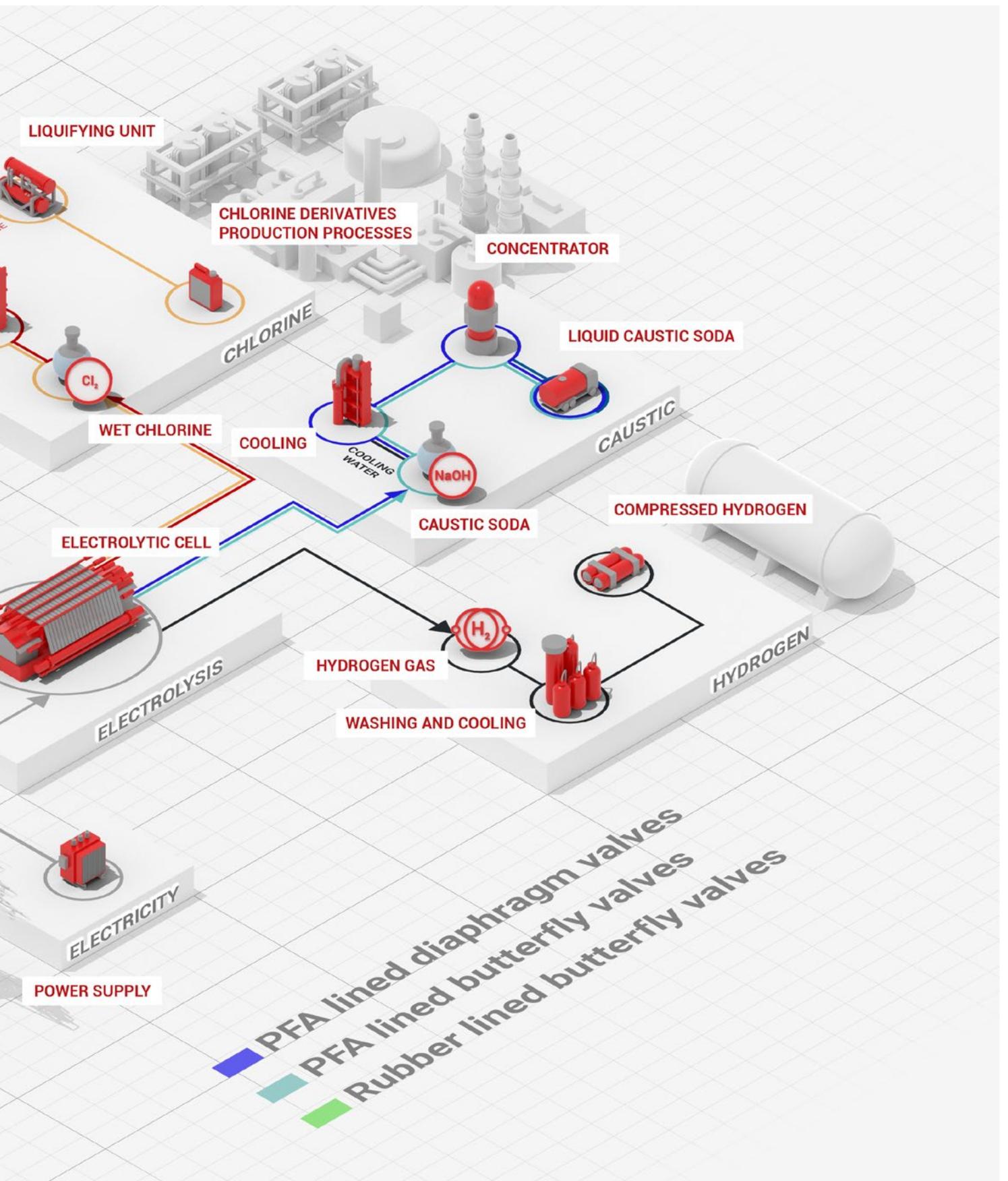
We only use carefully selected materials, which are continuously monitored by our quality management system. This is also certified by external institutes.

Partner of Euro Chlor

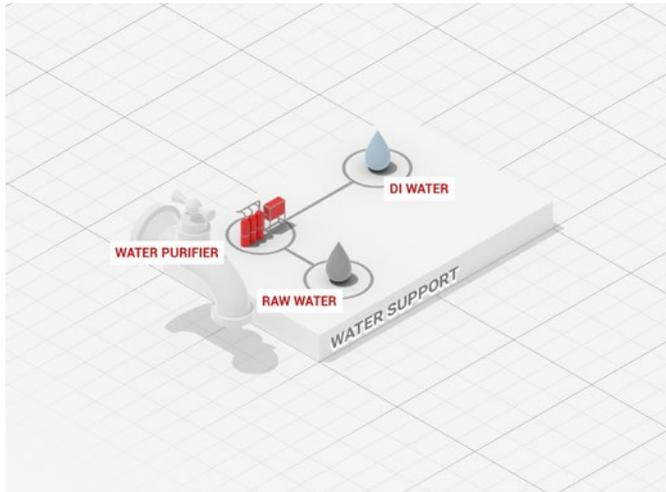
Euro Chlor represents the interests of chlor-alkali producers in Europe, encourages tried and tested procedures in the areas of safety, health and environmental protection and promotes the economic and social benefits of chlor-alkali and the numerous industrial sectors that rely on them.

- █ Globe and ball valves for chlorine
- █ Diaphragm valves for chlorine
- █ Diaphragm, globe, ball or butterfly valves
- █ Full bore rubber lined diaphragm valves





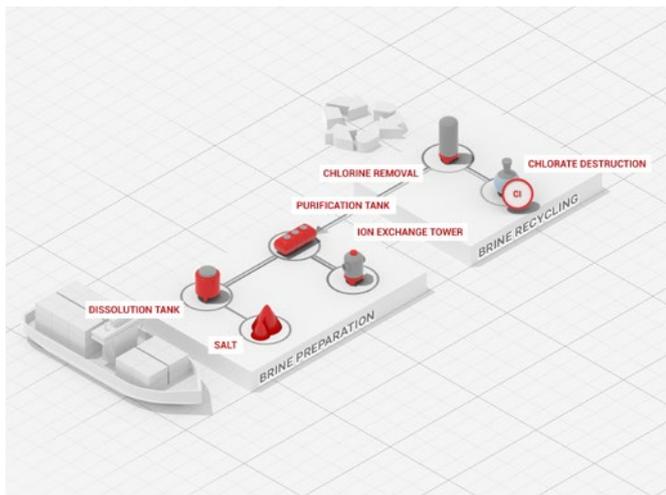
Application examples



Water treatment

Chlor-alkali plants use pure water for brine treatment, dilution and flushing. Raw water must be treated and purified before it enters the process. Mixed-bed filters, microfiltration and ion exchangers may be used to remove suspended matters, dissolved metal ions and organic impurities.

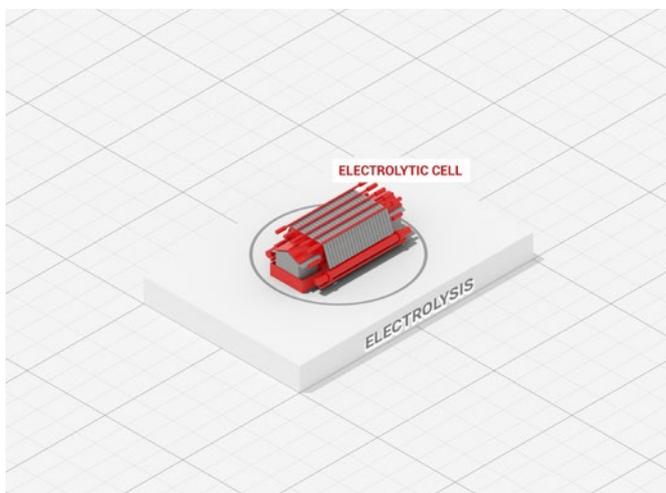
Many plant designers and skid builders thereby rely on the tried and tested GEMÜ technology. We as application experts will be happy to advise and support you in your valve and material selection.



Brine production and recovery

Purity of brine is a key factor affecting the process and product quality. More so for modern membrane cell units, where efficiency and cell service life are critically influenced by impurities in the electrolyte. Several purification steps are executed in this area: Salt saturation, precipitation, clarification, filtration and ion exchange purification. Additionally, used brine (anolyte) from the electrolyzer is recirculated and recycled. The by-products such as chlorates, etc. must be removed from the diluted stream before it re-enters the brine preparation step.

The occurrence of both chlorine compounds and solids must be considered carefully in the selection of construction materials, as this area of application experiences abrasion and corrosion simultaneously.



Electrolysis

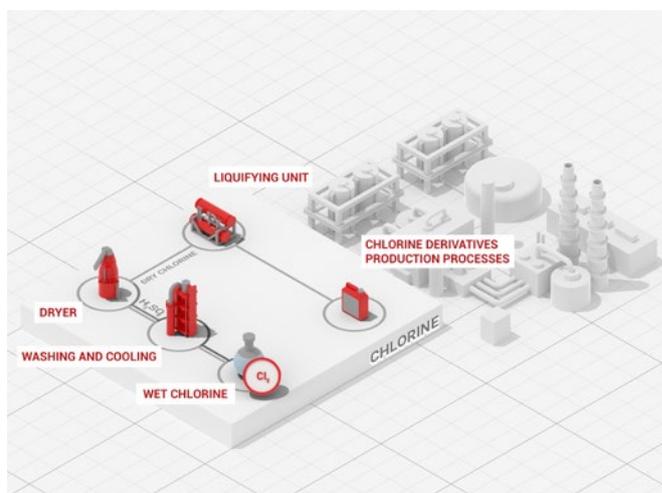
From the older generations of mercury cells, through diaphragm cells to the current state-of-the-art membrane cells, electrolyzer technologies have continuously improved in relation to efficiency, safety and environmental effects. Further developments in the design are reached through collaboration between equipment manufacturers and end users. Each electrolyzer technology presents different challenges and difficulties. It is a demanding application which requires high safety standards and careful design.

Owing to the high-voltage application, valves directly at the electrolyzer may be required to be plastic. The GEMÜ portfolio includes butterfly and diaphragm valves in PVC, PVDF and PP, which are perfectly suitable for such applications.

Application examples

Chlorine treatment and handling

Warm, wet chlorine gas from the electrolyzer is cooled down. The water is removed by washing with concentrated sulphuric acid. Afterwards, the dry chlorine gas can be compressed and liquefied for storage. In this process chain, a distinction is made between "dry" and "wet" chlorine, which significantly influences the choice of material. For corrosion reasons, only C-steel and alloys like hastelloy are permissible for dry chlorine. For wet chlorine, titanium grade 7 alloy (with palladium) is the appropriate/ideal material. Another important aspect is the permeation of chlorine gas through many materials, leading to unwanted corrosion in surrounding areas. GEMÜ diaphragm valves with a three-layer diaphragm and grade 7 titanium mounting pin were designed to cope explicitly with the challenges arising from permeation issues.



Alkali treatment and handling

The alkali (catholyte) leaving the electrolytic cell is at a concentration of 25–30% NaOH. Furthermore, it may contain chlorides. The alkali is cooled and upgraded. Valves that come into contact with concentrated alkali may suffer failures due to crystallization. Alkali lines may be equipped with heating to avoid crystallization. Minimal dead space and good cleanability are important in valves for this application. Both plastic (PP, PVC) and rubber lined valves are suitable for handling of alkalis where chlorides occur.



Material selection

Process step	Process characteristics	Possible valve and equipment materials
Water treatment	Water, acids and alkaline liquids for purification purposes, addition of salts (e.g. FeCl ₃) for purification	Plastic (PP, PVC, etc.) or metal (steel) for valve bodies; elastomers (mainly EPDM) for seals
Brine treatment and purification	Solid handling (salt, precipitants); purified inert water, slurries, acids or alkalis for ion exchange recovery	Plastic or metal for valve body; rubber lined when abrasion is expected; mostly EPDM as sealant material; butterfly valves with coated discs (Rilsan, Halar)
Anolyte recovery	Maybe higher temperature, acidic and alkaline environment. Please note: Anolyte contains chlorine, therefore chlorine diaphragm valves are necessary.	Valve body made of plastic or metal; possible lining material: PVDF, PTFE, PFA, TFM
Electrolysis	Higher temperatures (approx. 90 °C); high voltage at electrolytic cell	Plastic valve body material (PVC, PVDF, PP) depending on temperature range; where chlorine is expected: Chlorine diaphragm valves are necessary
Chlorine treatment and handling	High to low temperature (> 15 °C), acidic environment; distinguishing between "wet" and "dry" chlorine; liquification can be at -35 °C (1 bar) or 18 °C (7–12 bar)	For wet chlorine: Plastic or plastic-lined metal valve bodies; can be PFA, PVC, PVDF; rubber lining is also possible; usual metal for wet chlorine is grade 7 titanium
Alkali treatment and handling	High pH value, warm solutions, precipitations can occur upon cooling	Plastic (PP, PVC) and metal housing possible (when higher temperatures are expected), lining material can be rubber or plastic; PVDF cannot be used at high pH values



Product examples by area of application

No other area subjects valves to such a versatile range of requirements as those found in industrial applications. Our decades of application experience feed directly into the new and further development of valves. That's why, even in this demanding environment, GEMÜ valves have proven so very successful to date.

GEMÜ products are in use around the globe in water treatment and waste water treatment, the chemical industry, power generation and environmental systems, the industrial plant and machinery sectors, the paper industry, the steel and metallurgical industries, mining and metal extraction, surface finishing and in many other areas.

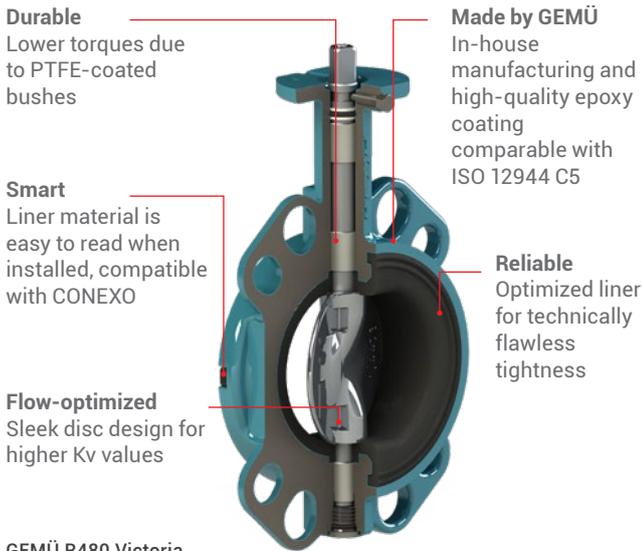
The specific product range includes diaphragm valves, globe and control valves, butterfly valves, ball valves and solenoid

valves, each available in metal or plastic versions, as well as accessories for measurement and control systems. The wide field of applications makes GEMÜ valves reliable all-rounders. As customized system solutions, GEMÜ multi-port valve blocks in plastic and metal versions are being used successfully in industrial plant and process engineering.

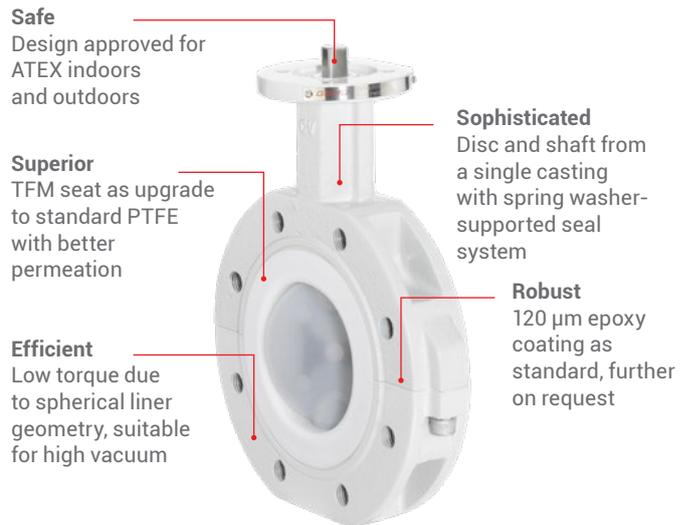
Butterfly valves made of metal

GEMÜ R480 Victoria and GEMÜ 490 Edessa

Due to the multitude of materials, the GEMÜ butterfly valves are universally suitable for chlor-alkali applications. 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 or motorized actuators are available for all GEMÜ butterfly valves.



GEMÜ R480 Victoria



GEMÜ R490 Edessa



Areas of application for

GEMÜ R480 Victoria, soft seated

- DI water treatment before brine preparation
- Brine treatment and clear brine
 - Preparation of saturated brine solution
 - Precipitation stage
 - Filtration and purification for the clarification of saturated brine solution (not chlorinated brine)
- Discharge, transport and storage of sodium hydroxide
- Hydrogen cooling
- Cooling of electrolyzer

GEMÜ 490 Edessa, PTFE seal

- Anolyte service
 - Chlorate destruction and manufacture
 - Chlorine removal from depleted brine
- Warm concentrated sodium hydroxide solution
- Cooling



Diaphragm valves made of metal with a three-layer diaphragm GEMÜ 695, 675 in weir-type design

One of the major advantages of diaphragm valves is, among others, that only two components come into contact with the working medium – the shut off diaphragm and the valve body. The diaphragm provides hermetic separation between the process medium and all moving parts. Due to the high-quality plastic lining, the GEMÜ types are suitable for particulate and abrasive media and can also be used with highly corrosive, volatile media and at high media temperatures in the chlor-alkali industry.

Easy-to-grip
Robust ergonomic handwheel

Made by GEMÜ
In-house manufacturing and high-quality PFA, PP or rubber lining

State-of-the-art
Stainless steel fastening elements with PTFE-based coating



Flexible
High-quality coating acc. to ISO 12944 or customer specification possible



Also available with pneumatic actuator

GEMÜ 675



GEMÜ 695



Areas of application for

GEMÜ 675 and 695 in weir-type design

- Pure wet chlorine handling, ideally with three-layer diaphragm (GEMÜ code 71)
- Anolyte service
 - Chlorate destruction and manufacture
 - Removing chlorine from used brine
- Discharge, transport and storage of sodium hydroxide
- Alkali from cell and alkali recovery to cell in catholyte service
- H₂SO₄ line for dehydration of wet chlorine
- Hydrochloric acid by-production



GEMÜ code 71 diaphragm

Three-piece PTFE/PVDF/EPDM diaphragm

The GEMÜ code 71 diaphragm is a three-piece diaphragm that has been developed for use in industrial applications. The diaphragm is made up of a PTFE face, a PVDF intermediate layer and an EPDM backing. The diaphragm shows excellent permeation properties against gases. Due to the PVDF intermediate layer and the titanium mounting pin, the diaphragm is extremely resistant against wet chlorine. This makes it particularly suitable for use in critical processes in the chlor-alkali industry.

Features

- PVDF layer with 1 mm thickness offers a good permeation block*
- Good resistance against wet chlorine**
- Mounting pin made of grade 7 titanium offers tried and tested corrosion resistance against chlorine, bromine and their derivatives
- Simple and defined mounting thanks to the threaded pin that is sintered in place with integrated screw-in stop
- The diaphragm has no leakage holes in the EPDM backing in order to improve the permeation properties
- Tried and tested GEMÜ design concept offers all known GEMÜ quality features such as optimized setting behaviour, high wear resistance and traceability

* externally tested and confirmed based on DIN EN 1779

** externally tested and confirmed based on ISO 1817



Areas of application for

GEMÜ code 71 diaphragm

- Pure, wet chlorine
- Anolyte service
 - Chlorate destruction and manufacture
 - Removing chlorine from used brine
- Alkali
- Acids, oxidizing agents and salts



Diaphragm valves made of metal in full bore design

GEMÜ 655 and 656

Lined full bore diaphragm valves produced by GEMÜ in-house are very versatile as they can sustain both corrosive media and high temperatures. They are used, for example, in water treatment, the chemical industry, the paper industry and in mining. Their virtually full through flow gives them an advantage over other conventional shut-off valves, particularly when working with viscous media such as slurries and liquids with a high solid or fibre content.

Made by GEMÜ
In-house development, production and quality control

Consistent
High-quality lining with strict quality control



Robust
High-quality metal body with several linings available

Flow-optimized
High flow rates due to maximum inside diameter



Also available with pneumatic actuator

GEMÜ 655



Sectional view of a GEMÜ 655 full bore diaphragm valve

GEMÜ 656



Areas of application for

GEMÜ 655 made of metal in full bore design

- Brine concentration and pre-filtration
- Brine sludges
- Handling, cooling and storage of sodium hydroxide solution
- For abrasive media e.g. salt water



Diaphragm valves made of plastic

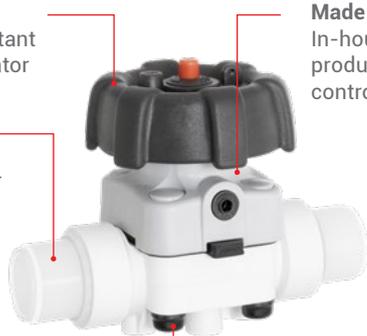
GEMÜ R677 and R690 with high-flow valve body

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 implemented.

Resistant
Corrosion-resistant
all-plastic actuator

Compact
High-flow valve
body for smaller
actuator size

Robust
A2 stainless steel screws
with plastic cover for
corrosion protection



Made by GEMÜ
In-house development,
production and quality
control



Also available with pneumatic actuator

GEMÜ R677



GEMÜ R690



Areas of application for

GEMÜ R677 and R690 made of plastic in weir-type design

- Recommended on direct electrolyzer contact
- Chlorine production
- Saturated purified brine
- Alkali
- Anolyte applications: Removing chlorine from used brine
- Catholyte applications: Alkali from cell and alkali recovery to cell
- Ion exchanger



GEMÜ eSyDrive, eSyStep and eSyLite motorized actuators

Electrification is also changing the processing industry. At GEMÜ, we offer a multitude of electrically operated valves. A range of actuator systems and valve types is available. For more than 55 years, we have been developing electromagnetic and motorized actuators and continuously expanding our expertise.

Overview



GEMÜ 343
eSyDrive



GEMÜ 549
eSyDrive



GEMÜ 649
eSyDrive



GEMÜ R649
eSyDrive



GEMÜ 533
eSyStep



GEMÜ 639
eSyStep



GEMÜ R639
eSyStep



GEMÜ 519
eSyLite



GEMÜ 629
eSyLite



GEMÜ R629
eSyLite

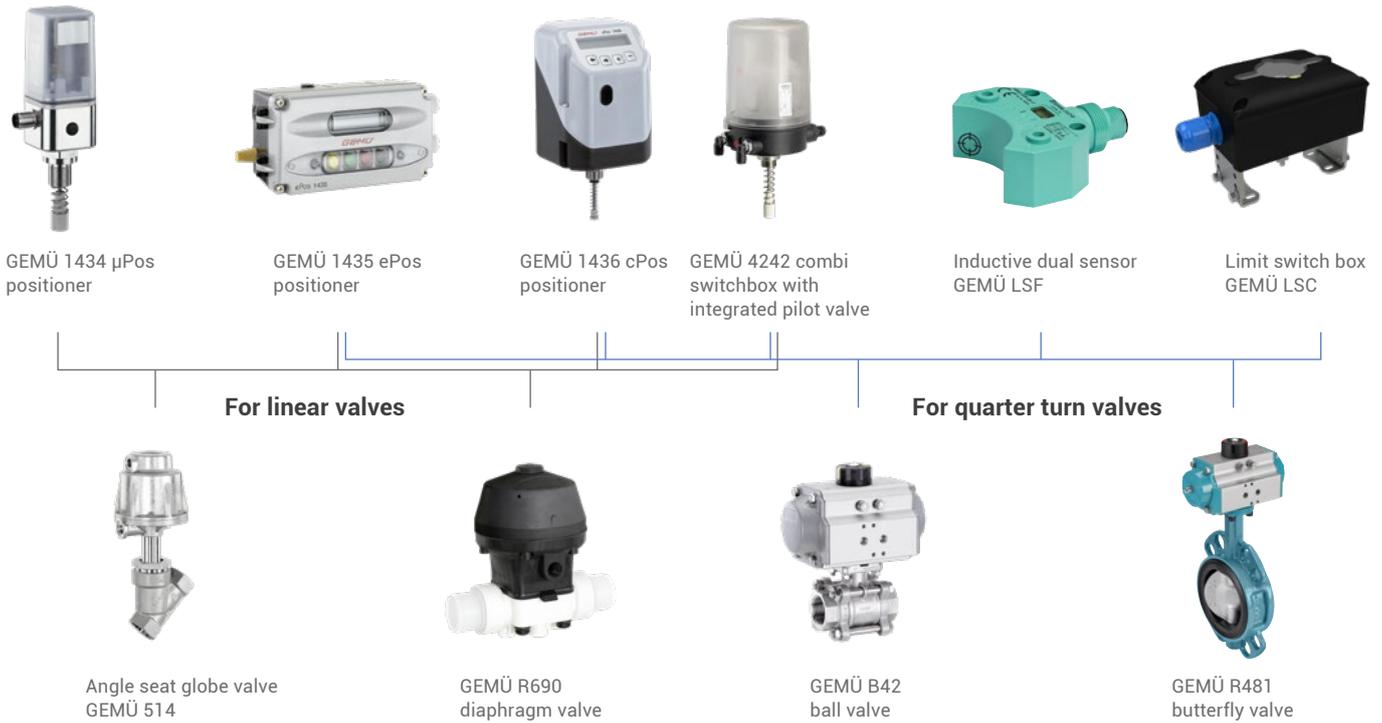
For motorized actuators, the controller is mostly fully integrated. These actuators are an optimal alternative to control valves in sterile environments or when considering service life. If required, the respective positioner can also be commissioned at the place of use by GEMÜ service engineers.



Globe and control valves

Measurement and control systems for linear and quarter turn valves

Globe valves are suitable for clean, liquid media as well as for gases and vapours. Due to the linear movement and favourable mechanical properties, they often take on automated tasks. Particularly in small nominal sizes, they are very suitable for fast cycle duties and high switching frequencies. In conjunction with the relevant positioners and measuring instruments, they are the best possible control valves in chlor-alkali applications.



Areas of application for

Metal globe valves and control systems

- H₂ production from catholyte service
- Dosing installations for brine treatment, precipitants, flocculants for brine cleaning
- Cooling water, cold water, deionized water
- Heating pipes, steam applications

Metal ball valves



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	○	○	●	–	–

- Very suitable
- Conditionally suitable
- Not suitable

Further process accessories



Control systems



Flowmeters

Criterion	Ball valves		Diaphragm globe valves	Process solenoid valves	
	Metal	Plastic	Plastic	Metal	Plastic
MEDIUM					
Gaseous	●	●	○	–	–
Steam	●	●	○	–	–
Liquid	●	●	●	●	●
Viscous	○	○	●	○	○
Particulate, abrasive	–	–	–	–	–
Granular	–	–	–	–	–
Corrosive (depends on material)	–	●	●	–	○
PROCESS					
Multi-port design available	●	●	●	●	–
Piggable	●	●	–	–	–
Controllable	○	–	●	–	–
Media temperature	up to 220 °C	up to 100 °C	up to 150 °C	up to 60 °C	up to 60 °C
Operating pressure	up to 137 bar	up to 16 bar	up to 6 bar	up to 20 bar	up to 6 bar
Frequent cycle duties	–	–	●	●	●

- Very suitable
- Conditionally suitable
- Not suitable



Check valves



Strainers, pressure and temperature sensors



Customized solutions

As your partner, we would like you to be able to fully utilize your plant potential. That's why we also offer high-grade modifications right up to customized valve concepts on a case by case basis, in addition to our standard range.

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

When searching for reliable plant components, our engineers begin by drawing on our tried and tested standard modules, even for new developments.

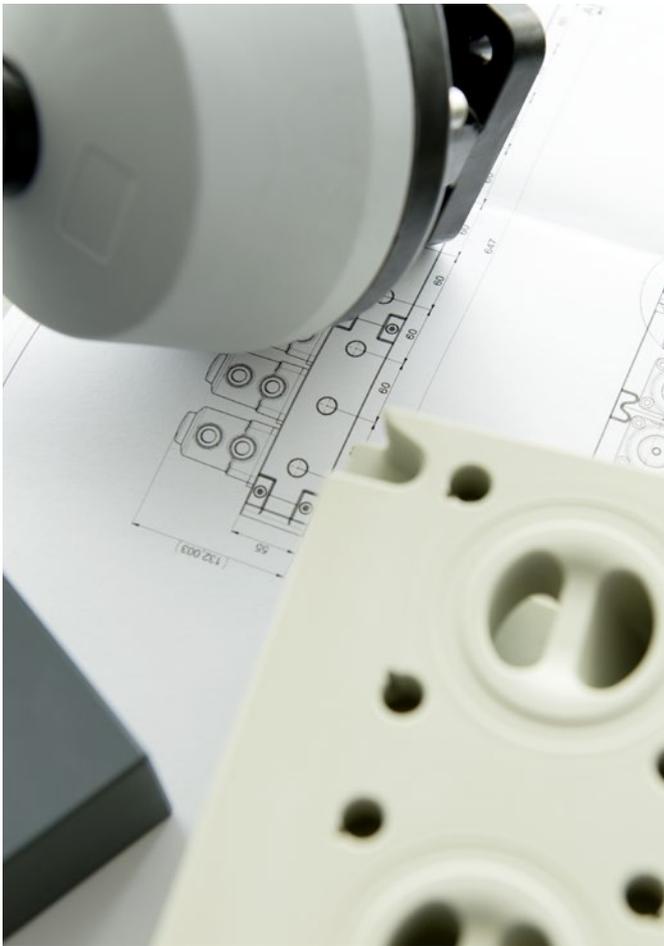
Wherever possible, they combine new technologies with these tried and tested components. This is cost effective and also guarantees safety.

You will benefit from:

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



TA Luft



Extensive standard range

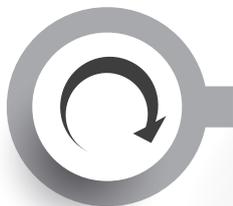
With a wide selection of operating principles, materials and connection standards

Product modification

Application-optimized such as, for instance, special coatings or extended material selection

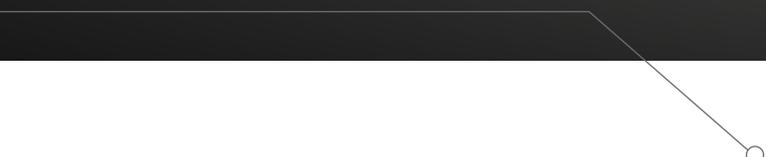
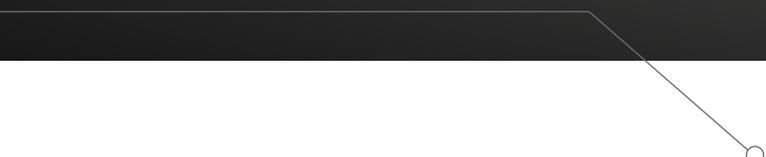
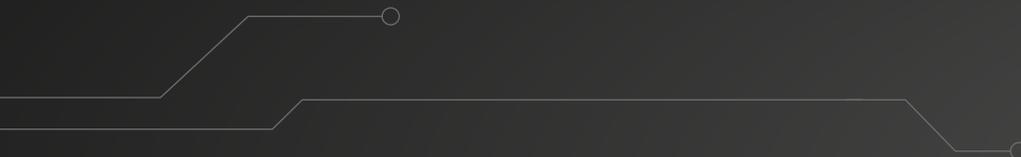
New development

In close collaboration between customers and our experienced engineers



Please contact us.

There is a lot more to find behind the GEMÜ standard product programme.
Contact us for advice on a case by case basis.



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