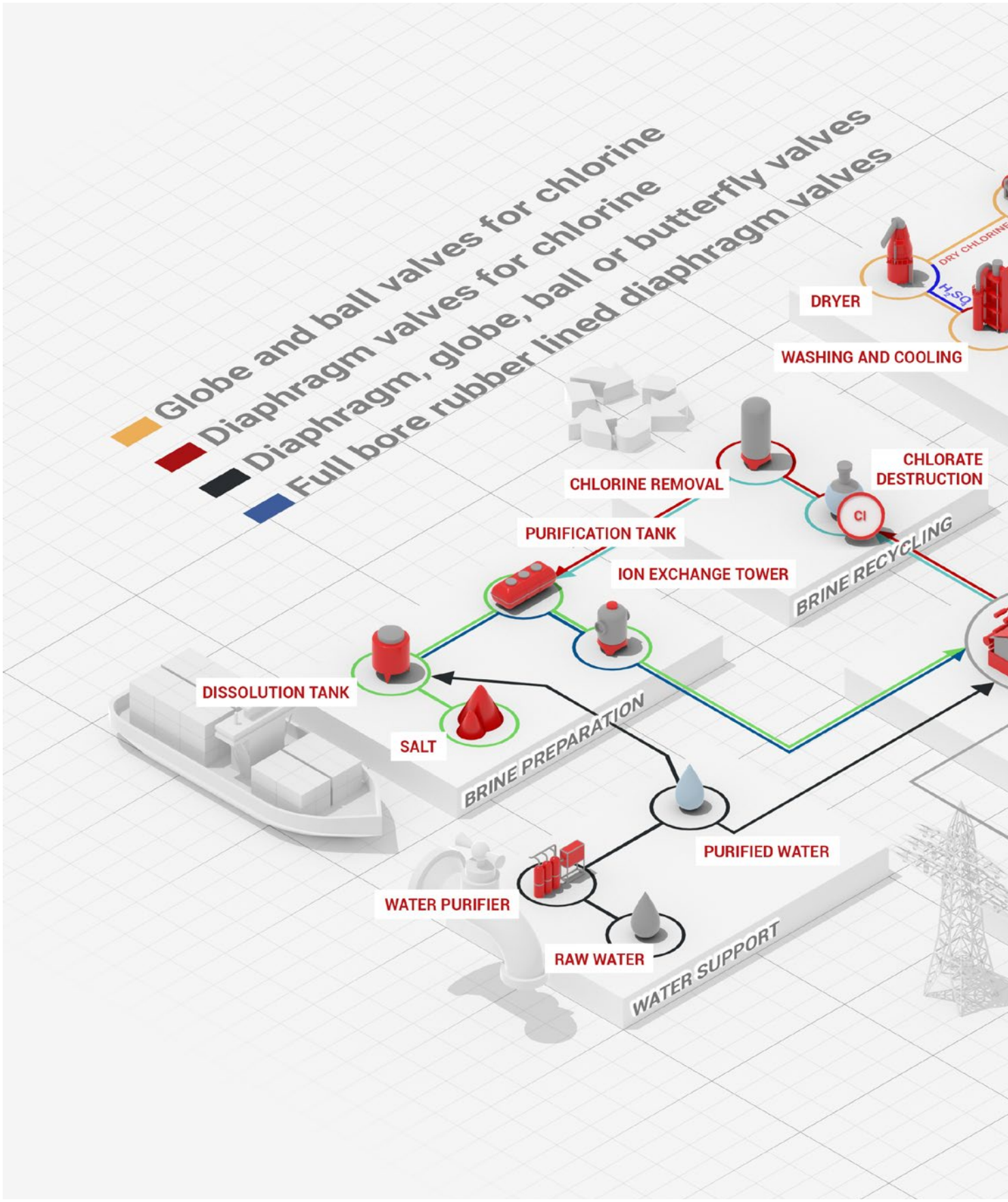
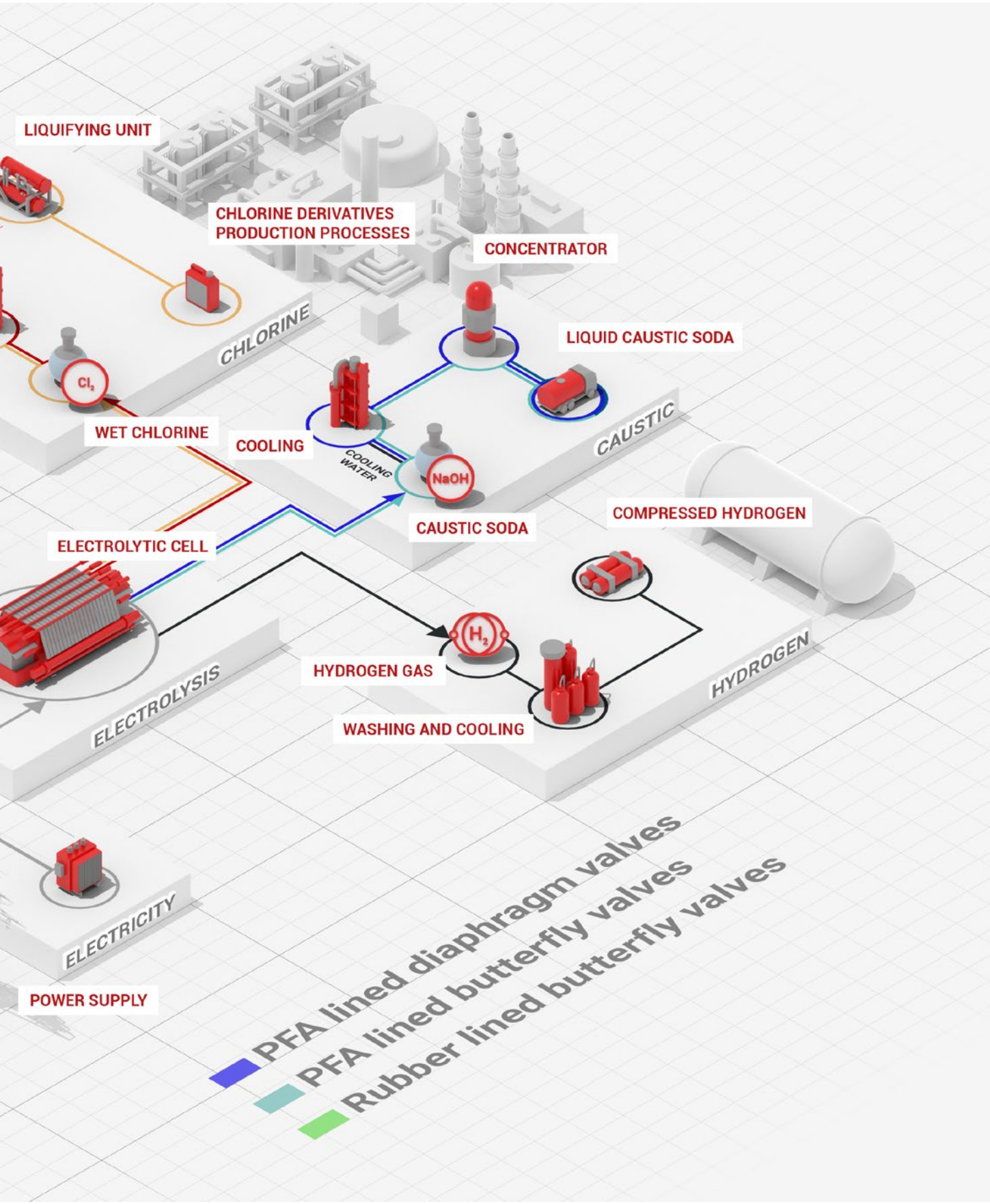
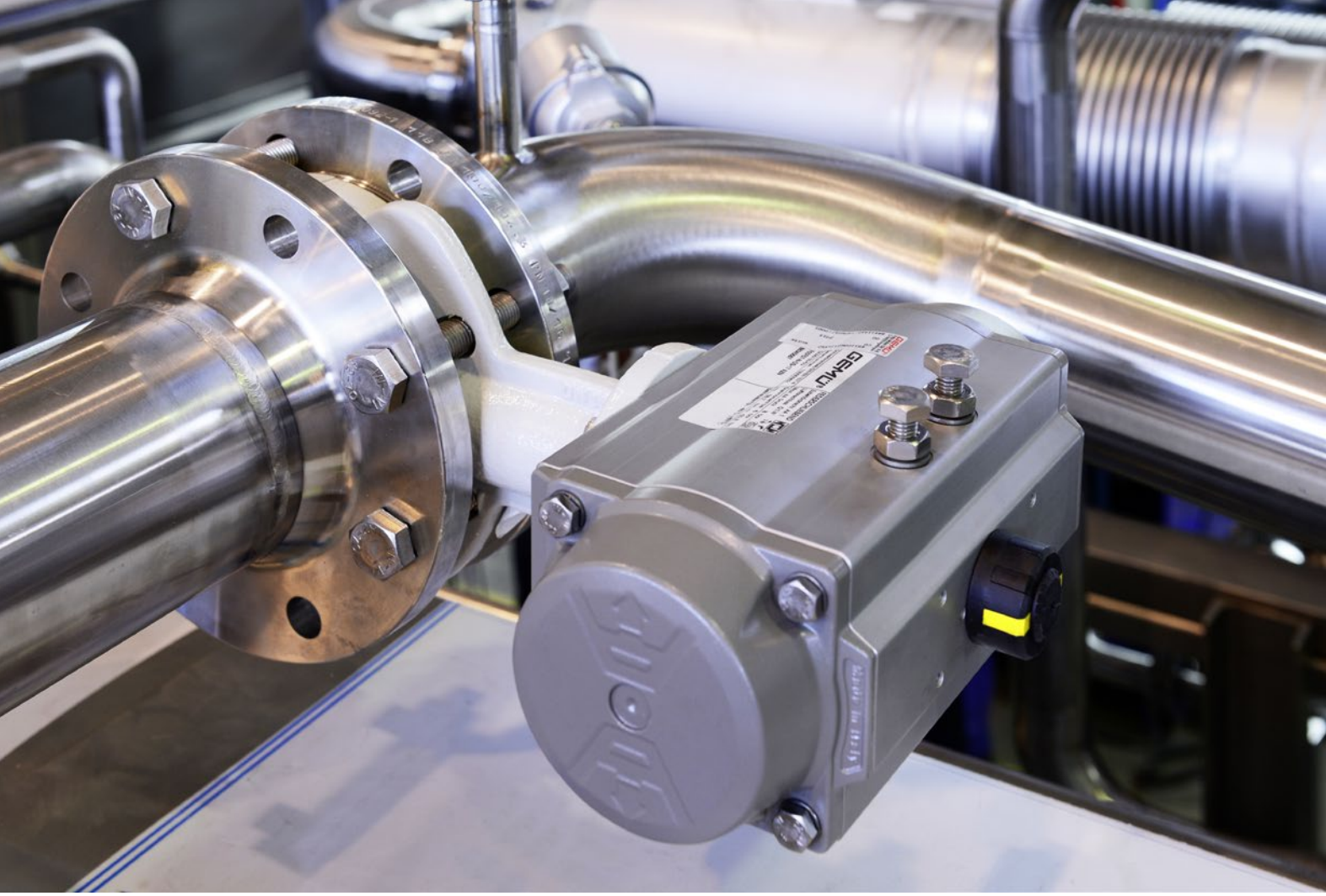
Components and system solutions for the chlor-alkali industry

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, brine purification and electrolysis as well as chlorine or caustic treatment and handling: The specific requirements of these sectors are met by our flexible product range.


Globe and ball valves for chlorine
Diaphragm valves for chlorine
Diaphragm, globe, ball or butterfly valves
Full bore rubber lined diaphragm valves
DRY CHLORINE
DRYER
WASHING AND COOLING
CHLORINE REMOVAL
CHLORATE DESTRUCTION
Cl
PURIFICATION TANK
ION EXCHANGE TOWER
BRINE RECYCLING
DISSOLUTION TANK
SALT
BRINE PREPARATION
PURIFIED WATER
WATER PURIFIER
RAW WATER
WATER SUPPORT


LIQUIFYING UNIT
CHLORINE DERIVATIVES PRODUCTION PROCESSES
CONCENTRATOR
LIQUID CAUSTIC SODA
CHLORINE
Cl_2
WET CHLORINE
COOLING
COOLING WATER
NaOH
CAUSTIC
CAUSTIC SODA
COMPRESSED HYDROGEN
ELECTROLYTIC CELL
H_2
HYDROGEN GAS
ELECTROLYSIS
HYDROGEN
WASHING AND COOLING
ELECTRICITY
POWER SUPPLY
PFA lined diaphragm valves
PFA lined butterfly valves
Rubber lined butterfly valves

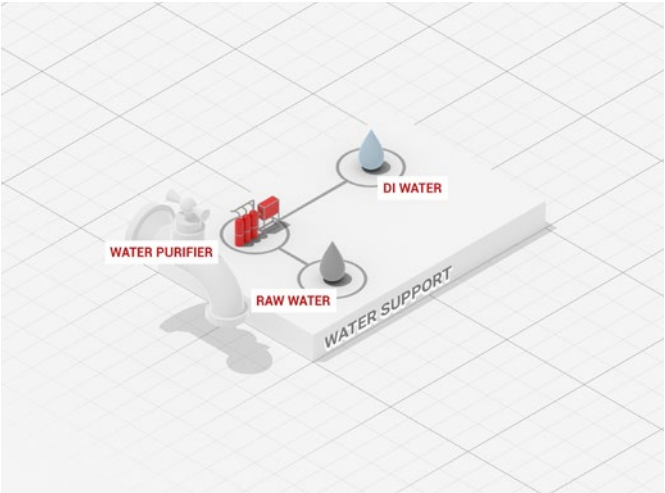


GEMÜ solution from a single source
As a system supplier we can respond very flexibly to your individual needs. Our worldwide sales network provides fast reaction times, customer-oriented service and a committed project management team.

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 Euro Chlor
Euro Chlor represents the interests of chlor-alkali producers in Europe, encourages best practices in safety, health and environmental protection and promotes the economic and social benefits of chlor-alkali and the many industries that rely on them.

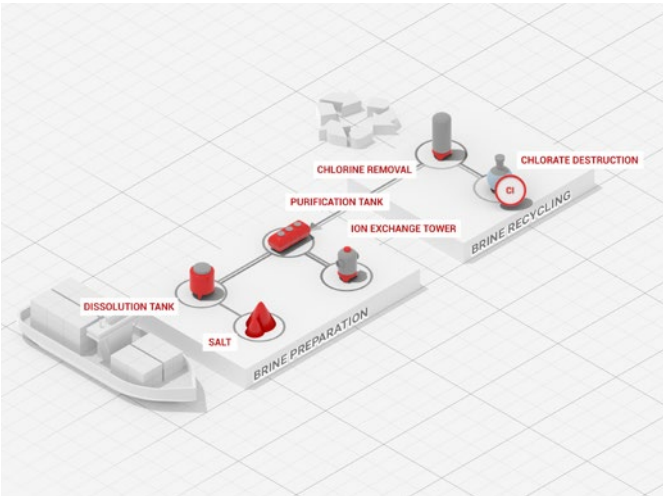
Application Examples



Water treatment

The chlor-alkali plant uses pure water for brine preparation, dilution, and flushing. Source water must be treated and purified before it enters the process. Mixed-bed filters, microfiltration and ion exchangers may be used to remove suspended solids, dissolved metal ions and organic contaminants.

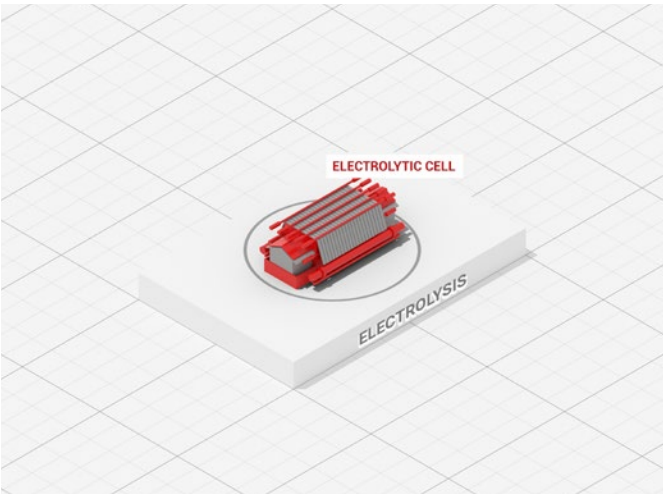
Many plant designers and skid builders rely on tried-and-tested GEMÜ technology for this purpose, and our application experts are happy to advise and support customers on valve and material selection.



Brine treatment and purification

Purity of brine is a key factor affecting the process and product quality. More so for modern membrane cell units, where efficiency and cell lifetime are critically influenced by impurities in the electrolyte. Several purification steps are used in this area: salt saturation, precipitation, clarification, filtration and ion exchange purification. Additionally, spent brine (anolyte) from the electrolyser, is recirculated and recycled. Chlorinated side-product must be removed from the diluted stream before it re-enters the brine preparation step.

The presence of both chlor-compounds and solids must be considered carefully in the selection of construction materials, as this application area experiences abrasion and corrosion at the same time.



Electrolysis

From the older generations of mercury cells, through diaphragm cells, to the current membrane cell state-of-the-art, electrolyser technologies steadily improve in efficiency, safety and environmental impacts. Further developments in the design are achieved through collaboration between equipment manufactures and end users. Each electrolyser technology presents different challenges and difficulties. It is a demanding application which requires high safety standards and careful design.

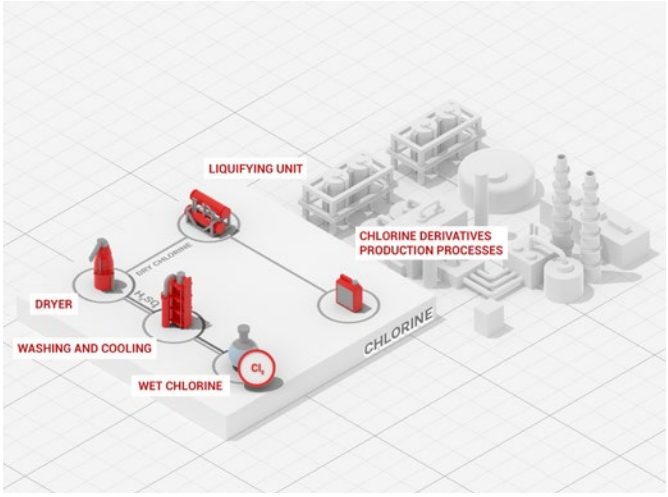
Owing to the high voltage application, valves directly at the electrolyser may be required to be plastic. GEMÜ portfolio includes butterfly and diaphragm valves in PVC, PVDF and PP perfectly suitable for such applications.

Application Examples

Chlorine treatment and handling

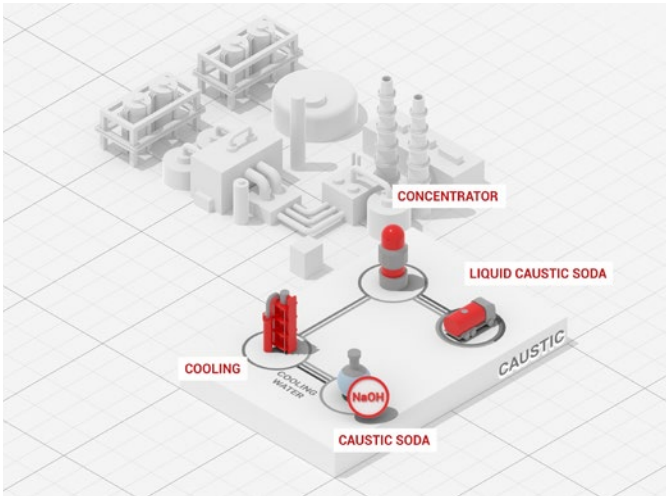
Warm, humid chlorine gas evolving from the electrolyser is cooled and dehydrated by washing with concentrated sulphuric acid. Afterwards, the dry chlorine gas can be compressed and liquified for storage. In this process chain the chlorine is distinguished between “dry” and “wet” chlorine. The choice of material strongly depends on this fact. For corrosion reasons only C-steel and alloys like hastelloy are allowed in the “dry” part. In the “wet” part, titanium grade 7 alloy (with palladium) is the matter of choice. Another important aspect is the permeation of chlorine gas through many materials, leading to unwanted corrosion in surrounding areas.

GEMÜ diaphragm valves with a 3-layer diaphragm and titanium grade 7 mounting pin was designed to cope exactly with the challenges arising from permeation issues.



Caustic treatment and handling

The caustic solution (catholyte) leaving the electrolysis cell is at a concentration of 25–30% NaOH. In addition, it may contain chlorides. The caustic solution is then cooled and concentrated.
Valves in concentrated caustic service may suffer failures due to precipitate formation. Caustic lines may be supplied with heating to avoid crystallisation. 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 caustic solutions where chlorides are present.



Material Selection

Process step	Process characteristics	Possible valve and equipment materials
Water treatment	Water, acids and alkaline liquids for purification issues, addition of salts (e.g. $FeCl_3$) for purifying	Plastics (PP, PVC, …) or metal (steel) for valve body; elastomers (mainly EPDM) for sealings
Brine treatment and purification	Solid handling (salt, precipitation agents); purified neutral water, slurries, acids or alkalines for ion exchange recovery	Plastics or metal for valve body; rubber lined when abrasion is expected; mostly EPDM as sealant material; butterfly valves with coated discs (Rilsan, Halar)
Anolyte recycling	Maybe higher temperature, acidic and alkaline environment. Attention: Anolyte contains chlorine, therefore chlorine diaphragm valves are necessary!	Plastic or metal valve body; lining material can be PVDF, PTFE, PFA, TFM
Electrolysis	Higher temperatures (approx. 90 °C); high voltage at electrolyser cell	Plastics valve body material (PVC, PVDF, PP) depending on temperature regime; 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 plastics or plastic lined metal valve bodies; can be PFA, PVC, PVDF; rubber lining is also possible; usual metal in “wet” part is titanium grade 7
Caustic treatment and handling	High pH-value, warm solutions, when cooled down precipitation can occur	Plastics (PP, PVC) and metal valve bodies possible (when higher temperatures are expected), lining material can be rubber or plastics; PVDF can not be used at high pH-levels

Product examples by application area

Metal Butterfly Valves

Soft seated GEMÜ R480 Victoria and PTFE-seated GEMÜ 490 Edessa

Due to the variety of materials, the GEMÜ butterfly valves are universally compatible in 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 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

safe
Design approved for ATEX inside and outside version

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

outperforming
TFM seat as upgrade to standard PTFE with better permeation

robust
120µm epoxy coating as standard, further on demand

efficient
Low torque due to special liner geometry, suitable for high vacuum

GEMÜ R490 Edessa

Go online! GW-490

Areas of application for

Soft-seated GEMÜ R480 Victoria

- DI-Water treatment before brine preparation
- Brine treatment and clear brine
  - preparation of saturated brine solution
  - precipitation stage
  - filtration and purification to clear saturated brine solution (not chlorinated brine)
- Caustic soda discharge, transport and storage
- Hydrogen cooling
- Cooling of electrolyser

PTFE-seated GEMÜ 490 Edessa

- Anolyte service
  - chlorate destruction and production
  - chlorine removal from depleted brine
- Warm concentrate caustic soda solution
- Hydrogen cooling

Metal Diaphragm Valves with 3-layer diaphragm

Weir type GEMÜ 695, 675 and full bore GEMÜ 655, 656

One of the major advantages of diaphragm valves is that only two components come into contact with the working medium – the diaphragm and the valve body. The diaphragm provides hermetic separation between the process medium and all moving parts.
Thanks 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.

handy
Robust ergonomic handwheel

made by GEMÜ
In-house machining and high quality PFA, PP or rubber lining

state-of-art
Stainless steel fastening elements with PTFE-based coating

flexible
High quality coating according to ISO 12944 or customer specification possible

GEMÜ 675

Go online! GW-675

also available with pneumatic actuator

GEMÜ 695

Go online! GW-695

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

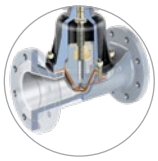
consistent
High quality lining with strict quality control

robust
High quality metal body with several linings available

flow-optimized
High flow rate due to straight through flow

GEMÜ 655

Go online! GW-655



Cut section of full bore diaphragm vale GEMÜ 655

also available with pneumatic actuator

GEMÜ 656

Go online! GW-656

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 to 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

Metal weir type GEMÜ 675 and 695

- Pure wet chlorine handling, best with 3-layer diaphragm GEMÜ Code 71
- Anolyte service
  - Chlorate destruction and production
  - Chlorine removal from depleted brine
- Caustic soda discharge, transport and storage
- Caustic from cell and caustic recycling to cell in catolyte service
- H_2SO_4 line for dehydration of wet chlorine
- Hydrochloric acid by-production

Metal full bore GEMÜ 655

- Brine concentration and pre-filtration
- Brine sludges
- Caustic soda solution handling, cooling and storage
- For abrasive media like e.g. salt water

Plastic Diaphragm Valves

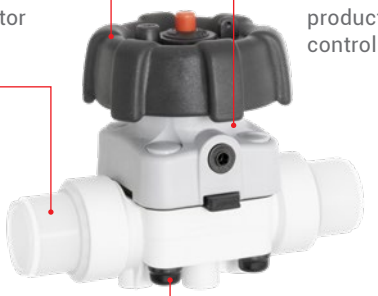
GEMÜ R677 and R690 with high flow body

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

robust
A2 sainless steel screws with plastic cover for corrosion protection



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

also available with pneumatic actuator

GEMÜ R677

Go online! GW-R677

GEMÜ R690

Go online! GW-R690

Areas of application for

Plastic weir type GEMÜ R677 and R690

- Recommended on direct electrolyzer contact
- Chlorine production
- Saturated purified brine
- Caustic
- Anolyte service: Chlorine removal from depleted brine
- Catolyte service: Caustic from cell and caustic recycling to cell
- Ion exchangers

Metal globe and control valves

Metal globe valve GEMÜ 514, 554, measurement and control systems

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. Particularly in small nominal sizes, they are very well-suited to 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.

positioner
GEMÜ 1434 µPos

positioner
GEMÜ 1435 ePos

positioner
GEMÜ 1436 cPos

pressure and temperature
sensors GEMÜ 3140 and 3240

angle seat globe valve
GEMÜ 514

angle seat globe valve
GEMÜ 554

flowmeter
GEMÜ 805

Areas of application for

Metal globe valves and control systems

- H_2 production from catolyte service
- Dosing lines brine treatment, precipitants, flocculants for brine cleaning
- Cooling water, chilled water, deionized water
- Heating service lines, steam aplications

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

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
–	–	●	●	●

Check valves

Strainers

Customized solutions

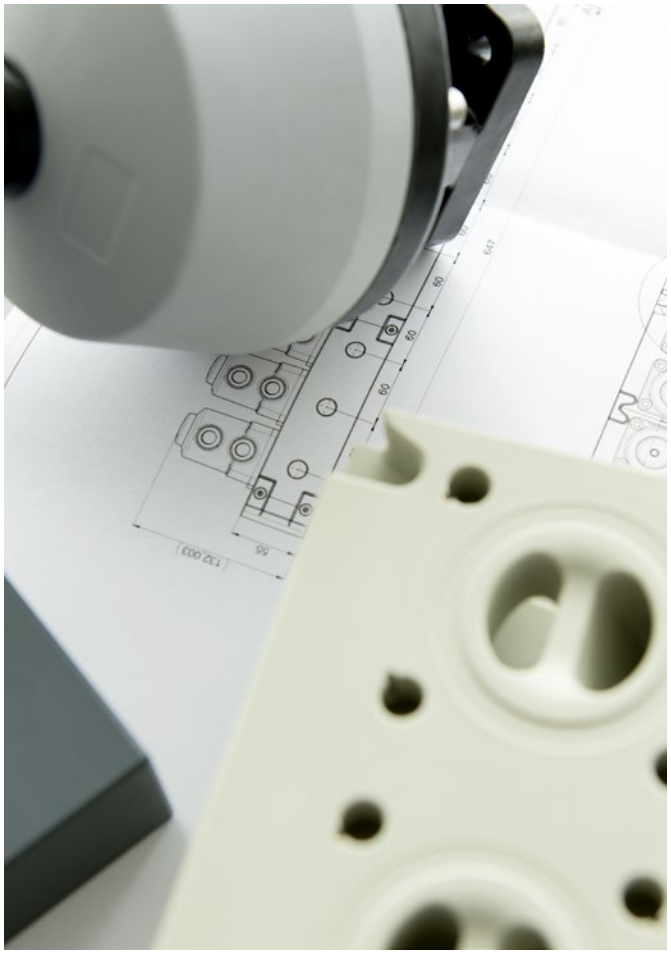
As a partner to its customers, GEMÜ wants you to be able to fully realise your plant potential. That's why, in addition to our standard product range, we also offer high level modifications, up to individual customized valve concepts.

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.

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