

Industrial Solutions

Hydrogen from large-scale electrolysis

Efficient solutions for
sustainable chemicals
and energy storage



thyssenkrupp





Picture: electrolysis plant during construction.

High-efficiency, world scale water electrolysis

Hydrogen production needs to be as efficient and flexible as possible. thyssenkrupp delivers both in a modular, cost-effective solution for multi-megawatt H₂ installations.

At the center of thyssenkrupp's electrolysis technologies are our patented large electrochemical cells which allow very high efficiency in industrial scale hydrogen production. The principal design is well-proven in hundreds of electrochemical plants worldwide, making thyssenkrupp the world's No. 1 supplier for electrolytic production equipment.

Global engineering, procurement and construction expertise
In addition to our technology expertise, you will profit from decades of experience in realizing complete electrochemical and chemical plants. thyssenkrupp Industrial Solutions has built more than 2,500 chemical plants and complexes around the world, offering numerous process chains completely in-house.

Your benefits: integrated plant concepts, optimized value chains, and the peace of mind of having one reliable partner for the complete project – and throughout the complete life cycle.

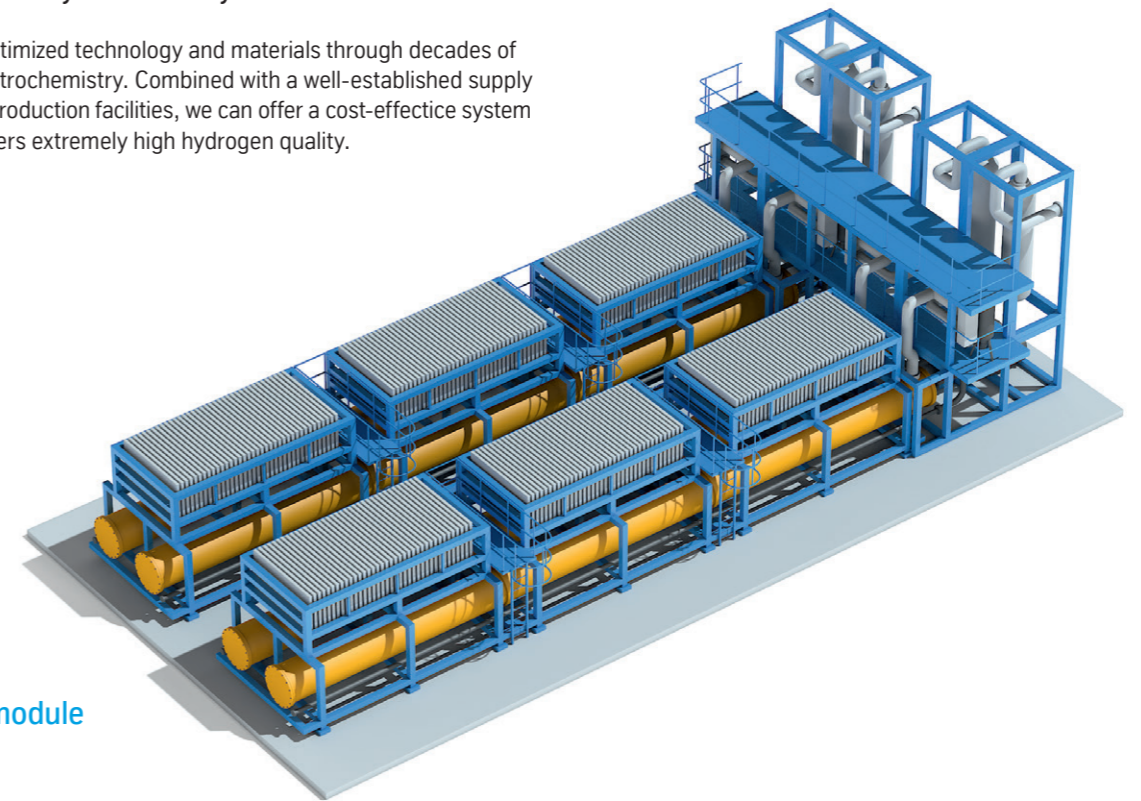
Key benefits

- Low power consumption
- Flexible and fast responding operation
- Modular, skid mounted design
- EPC turnkey execution worldwide
- Global service

Your building block for green hydrogen production

Our modular, skid-mounted water electrolyzers are optimized for efficiency and ready to install with minimum effort.

We have optimized technology and materials through decades of R&D in electrochemistry. Combined with a well-established supply chain and production facilities, we can offer a cost-effective system which delivers extremely high hydrogen quality.



20 MW module

	10 MW module	20 MW module
Design capacity H ₂	2000 Nm ³ /h	4000 Nm ³ /h
Efficiency electrolyzer (DC)	> 82% _{HHV} *	> 82% _{HHV} *
Power consumption (DC)	max. 4.3 kWh/Nm ³ H ₂	max. 4.3 kWh/Nm ³ H ₂
Water consumption	<1l/Nm ³ H ₂	<1l/Nm ³ H ₂
Standard operation window	10% - 100%	10% - 100%
H ₂ product quality at electrolyzer outlet	> 99.95% purity (dry basis)	> 99.95% purity (dry basis)
H ₂ product quality after treatment (optional)	as required by customer, up to 99.999%	as required by customer, up to 99.999%
H ₂ product pressure at module outlet	~300 mbar	~300 mbar
Operating temperature	up to 90 °C	up to 90 °C

* HHV = calculated with reference to higher heating value of hydrogen. All values may vary depending on operating conditions.

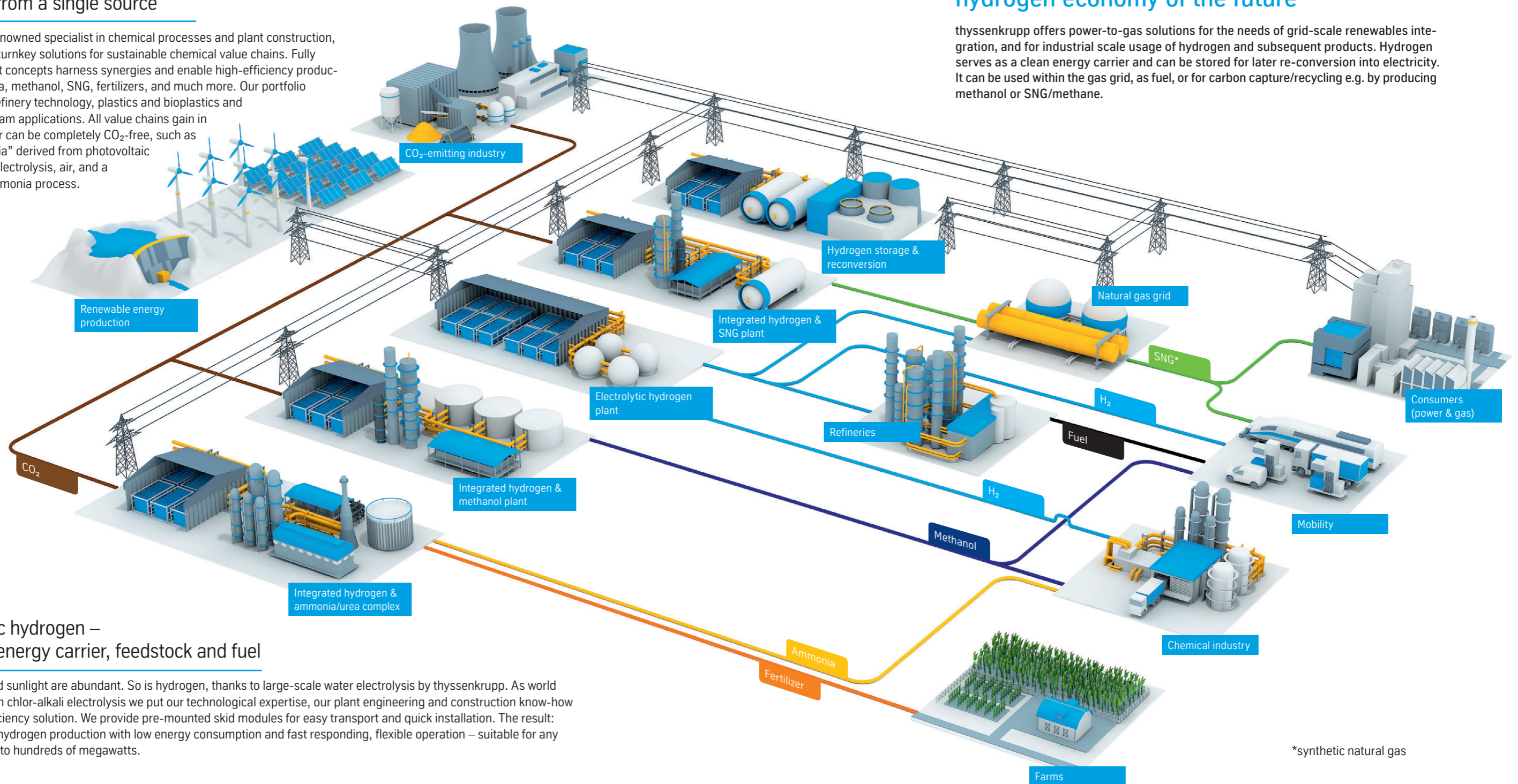
Clean energy, renewable fuels & chemicals, carbon recycling

Sustainable chemicals – integrated solutions from a single source

As a globally renowned specialist in chemical processes and plant construction, we can deliver turnkey solutions for sustainable chemical value chains. Fully integrated plant concepts harness synergies and enable high-efficiency production of ammonia, methanol, SNG, fertilizers, and much more. Our portfolio also includes refinery technology, plastics and bioplastics and other downstream applications. All value chains gain in sustainability or can be completely CO₂-free, such as “green ammonia” derived from photovoltaic energy, water electrolysis, air, and a world-class ammonia process.

A comprehensive set of solutions for the hydrogen economy of the future

thyssenkrupp offers power-to-gas solutions for the needs of grid-scale renewables integration, and for industrial scale usage of hydrogen and subsequent products. Hydrogen serves as a clean energy carrier and can be stored for later re-conversion into electricity. It can be used within the gas grid, as fuel, or for carbon capture/recycling e.g. by producing methanol or SNG/methane.



Electrolytic hydrogen – the clean energy carrier, feedstock and fuel

Water, wind and sunlight are abundant. So is hydrogen, thanks to large-scale water electrolysis by thyssenkrupp. As world market leader in chlor-alkali electrolysis we put our technological expertise, our plant engineering and construction know-how into a high-efficiency solution. We provide pre-mounted skid modules for easy transport and quick installation. The result: Plug-and-play hydrogen production with low energy consumption and fast responding, flexible operation – suitable for any application, up to hundreds of megawatts.

*synthetic natural gas

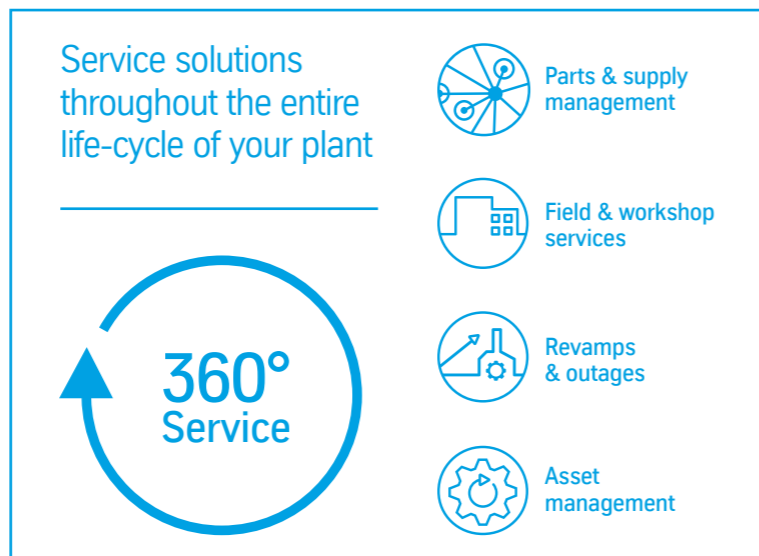


A global player
at your service

Performance at your fingertips: service by thyssenkrupp

We bring all our experience into our service portfolio aiming to maintain maximum plant efficiency and making operation of the plant as easy as possible. With digitized solutions for remote condition monitoring, safeguarding and performance evaluation, you can get the most from your assets.

With our know-how we assist you throughout the plant's life cycle – from start-up to on-site support by thyssenkrupp engineers, specialists and trainers for your personnel. We are your single point of responsibility for all maintenance inspections, spare parts or capacity increases.



Global EPC experience, strong footprint & supply chain

We have planned, built and commissioned hundreds of electrolysis plants and installations all over the world – experience you can rely on.

As a globally renowned EPC specialist for electrochemical plants, we are a leading supplier of electrolysis equipment, solutions and services. You benefit from our proven competence in realizing complete plants which operate smoothly and safely over decades. Through continuous improvements and dedicated research and development, we deliver cutting-edge technologies for high efficiency and maximum revenue.

A partnership of global leaders

With De Nora, we have a strong partner who is also in our joint venture thyssenkrupp Uhde Chlorine Engineers. As a globally renowned specialist in electrochemistry, De Nora is not only our JV partner, but also our high-quality supplier for cell manufacturing and coatings, and our global partner for repairs. Together, we deliver fast and efficient service all over the world from 23 De Nora locations and over 70 thyssenkrupp Industrial Solutions sites.



Experience cannot be copied.

#1 supplier for electrolysis plants & equipment

600 electrochemical projects worldwide

600 MW/year highly automated supply chain established

over 10 GW of power installed

Industrial Solutions
Electrolysis and Polymers Technologies

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