thyssenkrupp nucera

Industrial-Scale Water Electrolysis for Green Hydrogen Production

World-leading electrolysis technologies

> 10 GW
of capacity installed

> 1 GW/yr
supply chain established

> 3 GW
contracted capacity

Who We Are

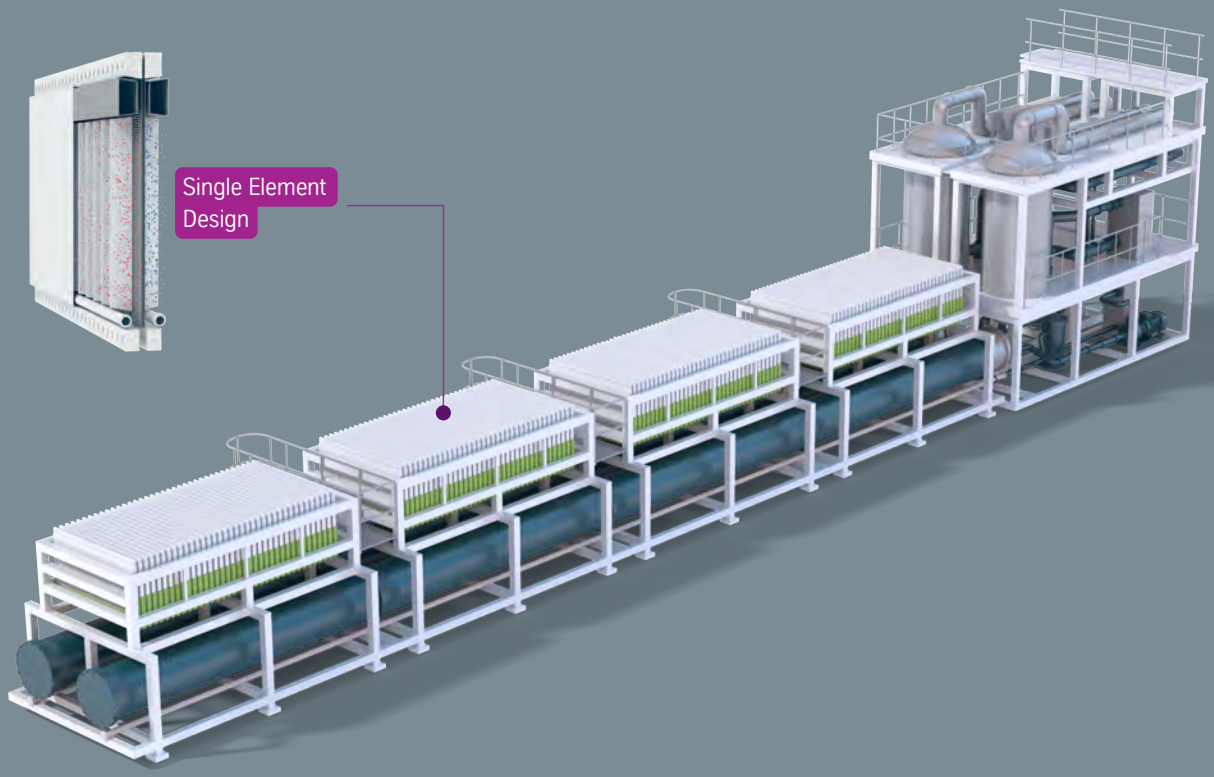
Driven by chemical engineering innovation, thyssenkrupp nucera pioneers high-efficiency electrolysis technology with 50+ years of experience. Throughout our journey, we have developed two strong portfolio segments that create synergies and provide innovative solutions for industrial progress and green value chains: chlor-alkali and green hydrogen.

We provide state-of-the-art electrolyzers worldwide that harness the power of solar, wind and water energy to produce hydrogen, leaving no harmful greenhouse gas emissions behind. We believe, by producing green hydrogen at a commercial scale, we enable sustainable transformation and provide our customers with access to clean, renewable energy that will last for generations to come. Safety anchors our pursuit of high-tech breakthroughs, embracing challenges with resilience.

8
regions

600+
employees worldwide

600+
successful projects



scalum®

Key features & benefits

- Modular, skid mounted design
- Proven and highly durable cell design based on long-term technology experience
- Low power consumption
- Higher current density allows more compact footprint
- Fast dynamics suitable to renewable power sources
- Fully automated operation is possible
- Mass production & supply chain at gigawatt scale
- Safety | Single-element monitoring
- Leading total cost of ownership (TCO)

scalum® 20 MW Unit

Design capacity H_2	4000 Nm³/h
Power consumption (DC) at start up	4.5 kWh/Nm³
Water (demineralized) consumption	<1l/Nm³ H_2
Standard operation window	10% - 100%
H2 product quality at electrolyzer outlet	> 99.9% purity (dry basis)
H_2 product quality after treatment (optional)	as required by customer, up to 99.999%
H_2 product pressure at electrolyzer outlet	~300 mbar

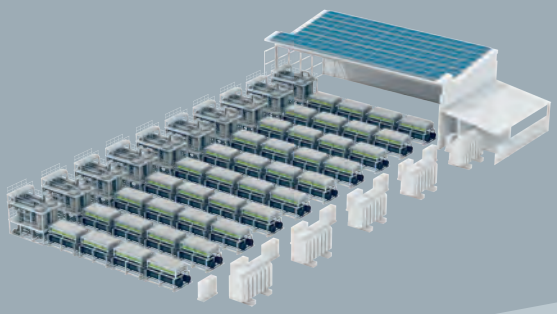
All figures above are to be understood as „expected values“ and may vary depending on operating conditions.

Enabling green transformation

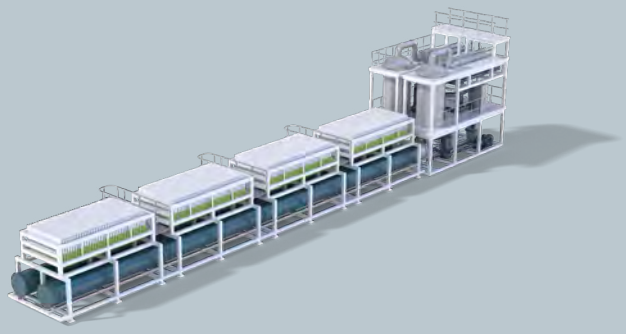
Alkaline Water Electrolysis (AWE) technology delivers the two vital components: speed and scale. Based on proven quality, safety, reliability, and the passion to innovate we set a benchmark: scalum®

scalum® marks a significant milestone in our unique, long time development path. We combine about 300 high-efficiency cells into one powerful unit with a system capacity of 20MW. scalum® is designed as a standardized modular solution that can be easily interconnected and scaled up unit by unit to match highest demands. scalum® becomes the key to ramping up our production capacity and shaping the new era of clean energy – fast.

An Efficient and Highly Scalable Module Concept to Match Market Requirements

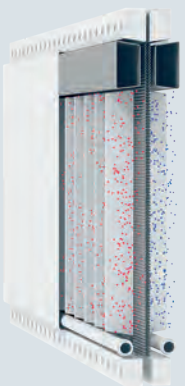


Highly scalable to gigawatt (GW) plant size



scalum® 20 MW electrolyzer unit

- Quality & Longevity | proven cell design with high durability
- High Performance | long-term technology experience
- Design certified | by TÜV Rheinland to meet requirements of chapter 4 of ISO 22734:2019
- Service | global service network



Single-element

- Each cell is isolatable
- Repairable at single-cell level without having to replace entire stacks
- During cell refurbishment, plant operation can continue with all electrolyzers running
- Single element monitoring promotes safety

Passionate for Innovation: Working Towards Progress Every Day

We are committed to the development of innovations and the continuous optimization of our cutting-edge technologies.

With a history spanning over 60 years, we bring together the collective expertise of three renowned global leaders in the field of electrolysis. Our chemical engineering DNA serves as solid basis for a bankable technology that is a leading partner in the new energy market and defines a new global standard according to the art of engineering “Made in Germany“. Through dedicated research and development with long-standing partners at our side, we continuously optimize our technologies to deliver fast and efficient value to our clients worldwide.

Thanks to our longtime cooperation in our chlor-alkali business, we can rely on a fully set-up supply chain for our water electrolysis cells. Today, we can deliver a total of 1 GW electrolysis cells per year and have already set the course for expanding to a 5 GW supply chain.

In the upcoming years, our research will focus on optimizing the cell and stack design even further, in order to enable fully automated series production and thus reduce the overall target costs of AWE. Simultaneously, full automation of manufacturing and assembly processes centers our development roadmap in order to realize efficient gigawatt supply chains in the long term. Our aim is to make hydrogen accessible, available, and affordable - to establish a new market standard and contribute towards a fully automated and integrated gigawatt supply chain.

360° Service Solutions for Green Hydrogen Applications

360° Service for your thyssenkrupp nucera electrolyzers

To ensure you obtain optimized performance from your electrolyzers, we offer a holistic service portfolio supported by thyssenkrupp nucera's global network and expertise. Our skilled engineers, specialists, and trainers assist customers with innovative service solutions throughout the entire plant lifecycle – from start-up to on-site operations and maintenance support.

Cell refurbishment promotes circularity and sustainability

To maintain the planned hydrogen production over the electrolyzer's lifetime and to achieve initial start-up performance, we refurbish the cells by recycling certain components. Thanks to the nucera single-element design, each cell is isolatable and repairable at a single cell level without having to replace entire stacks. This means plant operation can be continued during the entire refurbishment campaign, with all other electrolyzers running.

First point of contact for customers worldwide

Providing fast, efficient, and high-quality support to customers across the globe is not only our aim but, most importantly, our passion. thyssenkrupp nucera's local personnel is your first point of contact for on-demand predictive, preventive, and corrective maintenance support and execution.

Key features & benefits

- Long Term Service Agreement is configured for optimizing operation, maintenance, and asset value over scalum's® entire lifetime It includes essential services such as operations and maintenance personnel training (remote and on-site), predictive and preventive maintenance support, advisory services and more.
- Professional support enables maximized efficiency, improved reliability, high safety standard, and sustainable operations.
- As part of our innovative software solutions, thyssenkrupp nucera offers an interactive product navigator to efficiently manage spare parts supply.
- Major cell refurbishment can be executed via the lifecycle service team of thyssenkrupp nucera to achieve start-up performance levels.
- During the entire refurbishment campaign, plant operation can be continued with all other electrolyzers running.

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