REICAT

Efficient hydrogen purification for Power-to-X

We make your hydrogen usable. Our state-of-the-art purification systems use DeOxo catalysts & molecular sieves to produce high-purity green H_2.

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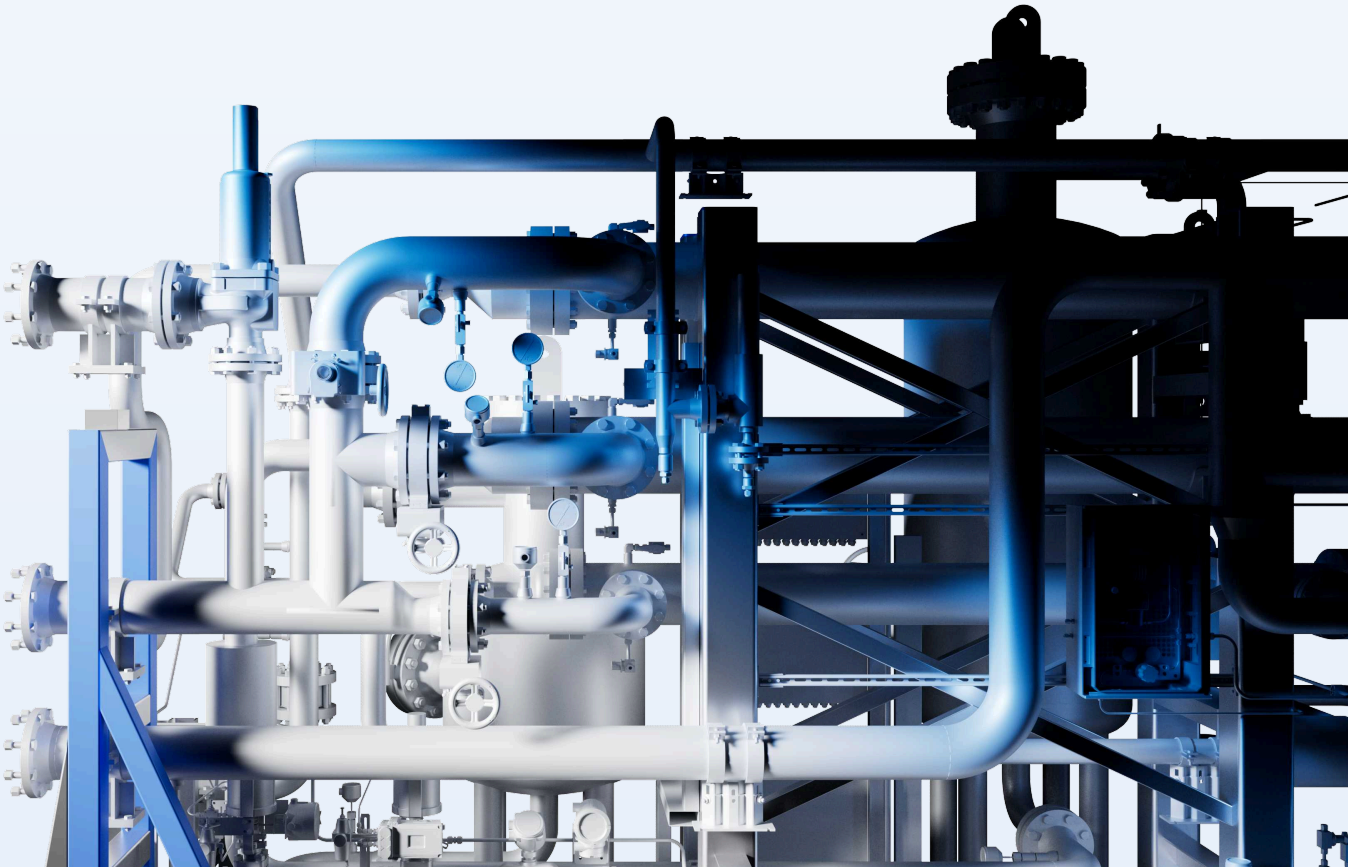


Climate technology made in Europe

Efficient catalytic purification and recycling of technical gases and exhaust air

ReiCat has been developing advanced process engineering solutions since 1982. Our patented technologies for recycling and purifying exhaust air and technical gases including hydrogen, oxygen, helium, argon, nitrogen, CO_2, CH_4, and noble gases (Kr/Xe) support global leaders in driving the transition to green hydrogen, the circular economy, carbon capture, and sustainable exhaust air treatment.

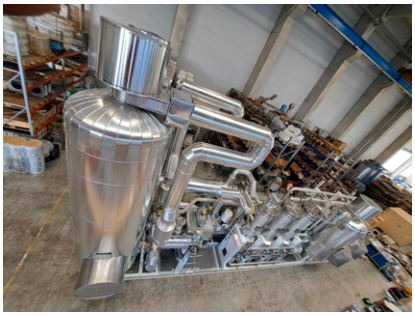
Headquarters in Germany

We engineer and build our systems in and around Gelnhausen, about 50 km from Frankfurt am Main, Germany.

Subsidiary in Italy

Since 2022, we have also been operating a subsidiary in Bologna, Italy.

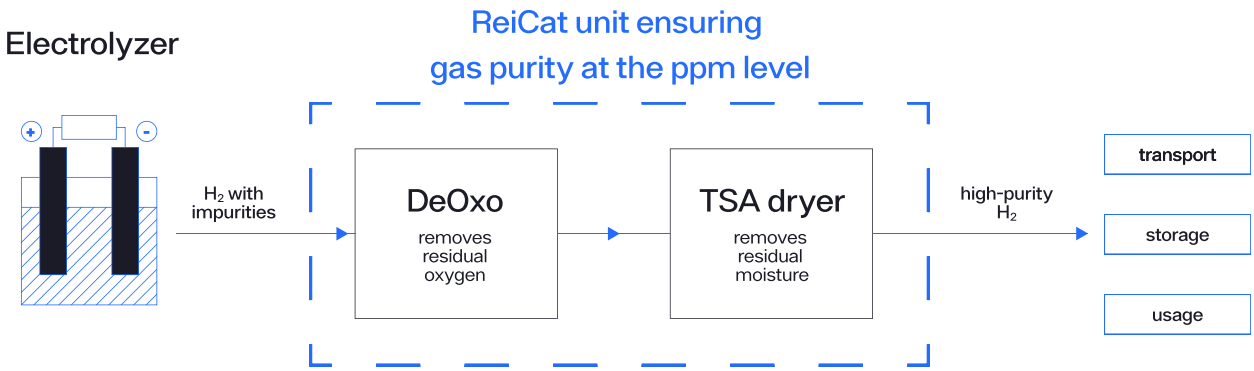
Leading companies rely on ReiCat - worldwide



We are proud to count the most successful global corporations among our regular customers. Over 600 ReiCat systems operate in 59 countries worldwide.

ReiCat's state-of-the-art H_2 purification systems

We combine DeOxo catalysts & TSA dryers to purify hydrogen to quality 5.0 or 6.0



Scope of supply

DeOxo unit: catalytic reactor, chiller, demister for condensate separation; in some cases: pre-demister + heater to prevent water formation in the reactor

TSA dryer: 2x drying vessels, chiller, demister, filter; for regeneration: heater, and in some cases blower

If no chilled water is available, external chiller

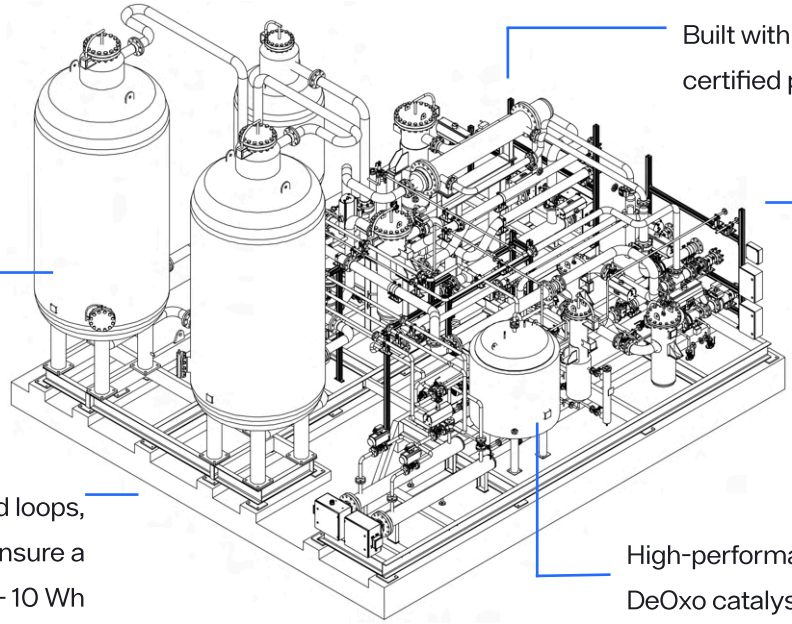
Analysis unit for O_2, H_2O

All interconnecting piping and instrumentation within the skid

Control system

We build according to all major standards

EUROPEAN NORM EN · DIN · ASME · KOREA GAS SAFETY CORPORATION



Dryers with low maintenance molecular sieves for efficient Temperature Swing Adsorption (TSA)

Built with ISO 9001 certified processes

Skid-mounted for plug & play commissioning

Few moving parts, closed loops, and catalyst technology ensure a high energy efficiency of 6 - 10 Wh per Nm^3 and low maintenance

High-performance ReiCat DeOxo catalyst "DeOxy Pro"

Proven technology tailored to your needs

A modular system allows us to customize our units according to your specifications

Capacity

Scalable between 200 Nm^3/h (1 MW) – 20,000 Nm^3/h (100 MW) per unit - stacked from 100 MW onwards

Pressure

Operating pressure 0.5 bar – 400 bar

Compatibility

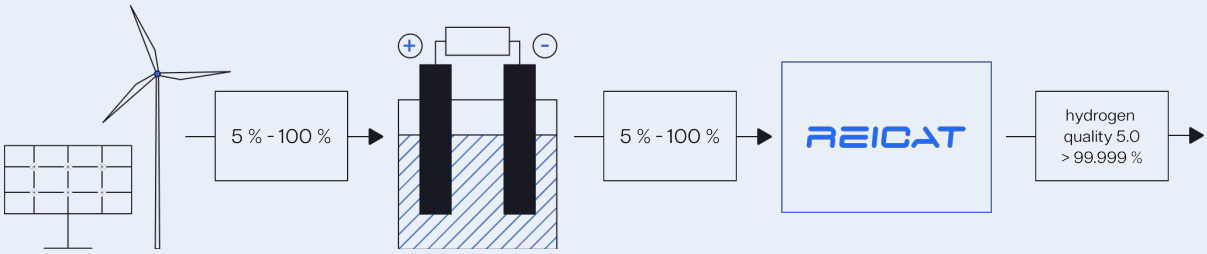
Pairable with any electrolyzer (PEM, Alkaline, SOEC, AEM) – realized projects with electrolyzers from Siemens Energy, Sunfire, thyssenkrupp and more

Optional add-ons for maximum performance

Our HighFlex H_2® Technology and our Closed Loop Technology can be added to any unit

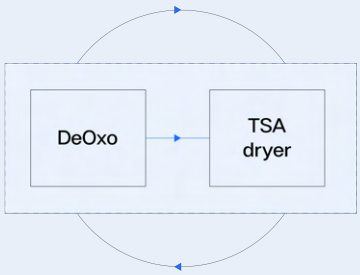
HighFlex H_2® Technology

Dynamic load balancing between 5 % - 100 % of hydrogen volume flow



Closed Loop Technology

Removes impurities with minimal to zero losses



Our four design standards are tailored to different setups

Internal blower

- minimal losses & high energy efficiency
- can operate in start-stop mode
- independent regeneration from gas flow
- popular among PtX customers

Booster / compressor

- zero losses
- suitable when a compressor is already present in your system

Regulator

- zero losses
- low maintenance
- minimum pressure losses

Suction side on-site compressor

- zero losses & highest energy-efficiency
- low maintenance
- can achieve H_2 quality of 6.0
- suitable when a compressor is already present in your system

Key benefits of ReiCat's H2 purification solution

ReiCat's H2 purification solution	Competitor H2 purification solutions
Best performing DeOxo catalyst Proprietary, field-proven high-performance DeOxo catalyst DeOxy Pro with high KOH tolerances for alkaline electrolysis (up to 10 mg/Nm3)	Standard catalyst from supplier - often with limited tolerance of catalyst poisons and lower performance
Low maintenance molecular sieve Specialized molecular sieve with a service life of 10 years in line with the legally required periodic inspections of pressure vessels	Use of desiccants like silica gel or alu gel with a service life of approximately 2 years → results in drastically higher downtime and maintenance cost
Lowest OPEX Energy-efficient design with heat recovery – average energy consumption of 6–10 Wh/Nm^3	Less energy-optimized designs with higher consumption per Nm^3
High flexibility and minimum loss HighFlex H2® technology allows the system to operate with a minimum outlet flow rate of 5 % and ReiCat Closed Loop TSA technology minimizes H2 losses down to 0 %	Conventional purification systems are limited to a minimum flow rate of 20 % and operate with standard TSA technology, resulting in up to 3 % gas loss
Proven production setup ensures quality A proven production setup in Germany, developed over more than 40 years, together with a highly specialized team and state-of-the-art equipment, ensures the highest quality standards	Often newly set up production facilities with less mature production and quality assurance processes

We have more than 60 H_2 treatment units in operation

Selected references with world-class petrochemical and energy customers:

Industry	Application	Flow rate Nm^3/h	Pressure bar(g)	Country of installation
Energy	Power-to-X	60,000	91.5	Germany
Energy	Power-to-X	21,574	40	Germany
Energy	Power-to-X	10,506	48	Denmark
Energy	Power-to-X	3,000	35	Denmark
Energy	Power-to-X	1,830	36	Germany
Technical gas production	Chlorine-alkali-electrolysis	16,593	25	Belgium
Technical gas production	Chlorine electrolysis	3,500	300	Asia
Technical gas production	Electrolysis / cylinder filling	500	250	Germany
Chemistry	Chlorine-alkali-electrolysis	15,000	20	Germany
Chemistry	Chlorine-alkali-electrolysis	10,000	20	Germany
Chemistry	Chlorine-alkali-electrolysis	6,000	60	Germany
Chemistry	Fine chemical production	confidential	4	USA & Spain
Metal & automotive	Tungsten powder production	10,000	0.5	confidential

Selected ReiCat case studies of recent projects

Customer:	European Energy
Product:	Green hydrogen purification for PtX
Electrolyzer:	Siemens Energy Elyzer P-300
Location:	Kassø & Esbjerg, Denmark
Size:	52 MW & 15 MW
Project:	ReiCat delivered two H_2 purification units to European Energy, one of them for Kassø, where they built the world's largest e-methanol facility. Methanol end-customers include Maersk, Lego, and Novo Nordisk.

Customer:	Major EPC company
Product:	Green hydrogen purification for PtX
Electrolyzer:	confidential
Location:	Germany
Flow rate:	21,574 Nm3/h (100 MW)
Project:	ReiCat is currently building a hydrogen purification system for one of Europe's lighthouse PtX projects. Green hydrogen is purified before being fed into a pipeline to be transported to the end-customer.

Selected ReiCat case studies of recent projects

Customer:	EWE
Product:	Green hydrogen purification for PtX
Electrolyzer:	Siemens Energy
Location:	Emden, Germany
Size:	320 MW
Project:	ReiCat has been awarded the contract to supply hydrogen purification systems for EWE's 320-megawatt electrolyzer in Emden. The hydrogen production plant is the core element of the multi-part flagship project Clean Hydrogen Coastline.

Customer:	Symrise
Product:	Hydrogen recycling
Integration:	Fine chemical production system
Location:	USA & Spain
H_2 recovery rate:	98 %
Project:	Following the successful delivery of a hydrogen recycling system to the USA, we have now supplied a second unit to Spain. The ReiCat system recovers up to 98 % of hydrogen from the production process, resulting in annual CO_2 savings of 6,263 tonnes.

FAQ

Gas quality and technical specifications

1. **Which impurities can be removed from hydrogen from electrolysis?**

   The main impurities of H_2 from electrolysis are residual oxygen and moisture. In case of alkaline electrolysis there might also be traces of liquid alkaline. Oxygen, moisture and aerosols can be removed by standard ReiCat hydrogen purification units producing hydrogen of quality 5.0 / grade 99.999 %. Further impurities might be removed by enhancing our standard systems.

2. **Can you also purify to quality 6.0 / grade 99.9999 %?**

   Yes, under the condition that there are only oxygen and moisture as impurities and that the gas can be dried up to - 60 °C and at > 20 bar, our systems can purify hydrogen to grade 99.9999 %. This requires a bigger reactor and a bigger chiller.

3. **What are your inlet requirements regarding temperature and pressure?**

   Our systems are flexible in terms of temperature. The standard pressure range is 1 - 40 bar(g). However, a special ReiCat design allows pressures up 400 bar(g).

4. **Which Closed Loop design standard is best for my application?**

   The choice depends on your requirements and needs. See page 5 for details on each design.

Catalyst & process efficiency

5. **What are the standard adsorption and regeneration times of your systems?**

   8 h - 24 h adsorption cycles (depending on the size of the unit), 8 h regeneration.

6. **What are the standard H_2 losses in a system without ReiCat Closed Loop Technology?**

   A standard systems loses around 3 % of H_2. ReiCat Closed Loop Technology can reduce this to zero.

7. **What is the energy consumption of a standard system?**

   Approximately 6 - 10 Wh per Nm^3.

Scope of supply

8. **What is ReiCat's scope of supply?**

   Gas purification unit, packaging, transportation (upon request), supervision of commissioning & startup service, spare parts package, custom maintenance package (upon request).

9. **What is included in the budget offer of a standard system?**

   Engineering, all components within the skid incl. HighFlex H_2® and Closed Loop Technology (pressure vessels, piping, fittings, catalyst, molecular sieve), O_2 & H_2O analysis, design according to EN code, manufacturing.

FAQ

Scope of supply

10. **What is included in the commercial and technical quotation after basic engineering?**
    - Commercial quotation: unit price, price of requested add-ons and delivery time.
    - Technical quotation: basic PFD diagram, basic layout plan, utility requirements, utility consumption, basic overall diemensions, basic overall weight, scope of supply / list of materials, process description; in our “Basic Engineering Plus” package the following additional deliverables are included: preliminary P&ID, information about noise emissions, HAZOP on-site study, general arrangement drawing (incl. dimensions).

Engineering standards & delivery times

11. **Is construction according to ASME or other engineering standards/codes possible?**

    Yes, it is possible. We generally follow EN standards. Upon request we are happy to follow other engineering standards like ASME, China Stamp, etc. We have delivered systems for every common international standard in the past.

12. **What is the standard delivery time?**

    Delivery time highly depends on your specifications and our capacity at time of order.

Installation & setup

13. **Is outdoor installation possible?**

    Yes, outdoor installation is possible with accompanying heating and insulation elements.

14. **How long does installation and commissioning take?**

    This heavily depends on the system size and scope. For a system size of 15,000 Nm^3/h, commissioning and startup typically take around 2 – 3 weeks.

Why should I choose ReiCat?

- Experience matters! ReiCat builds on 40 years of experience in gas purification.
- More than 60 hydrogen treatment systems worldwide proof the longevity of our systems beyond the industry standard of 20 - 25 years.
- Our modular systems allows for tailored engineering according to your needs.
- Our systems are designed for highest energy efficiency to ensure lowest OPEX.
- Our proprietary Closed Loop Technology and HighFlex H_2® Technology guarantee minimum to zero H_2 loss and optimal adaptation to fluctuating volume flows in PtX systems.