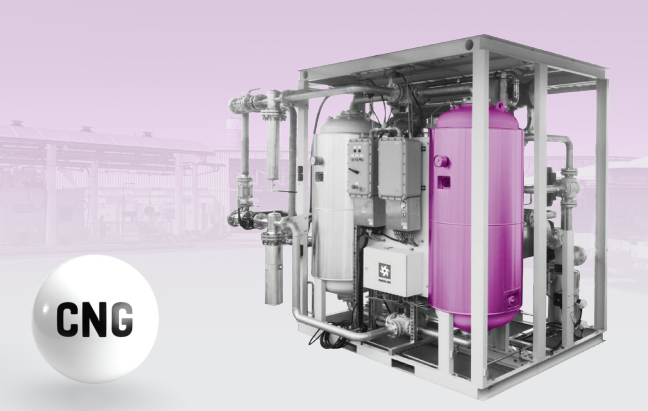
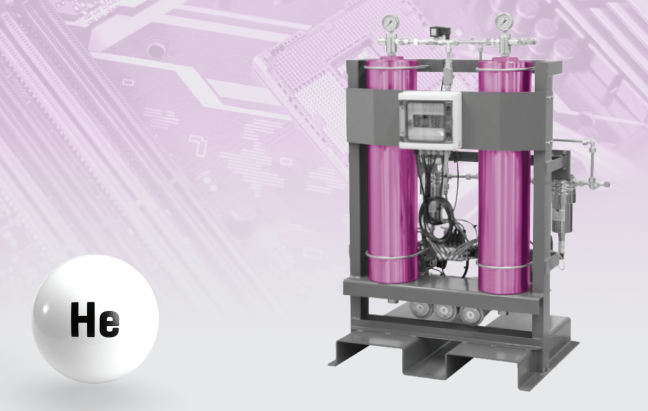
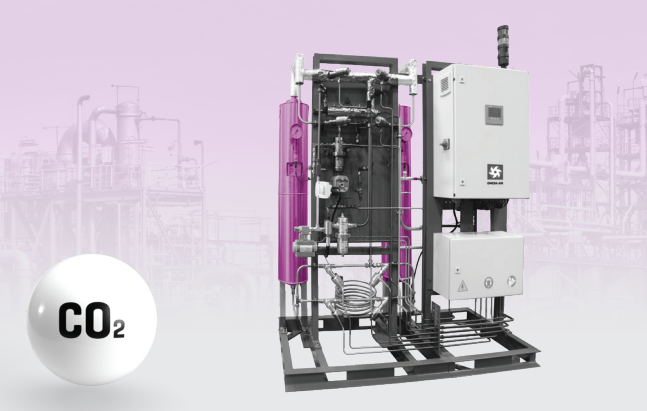
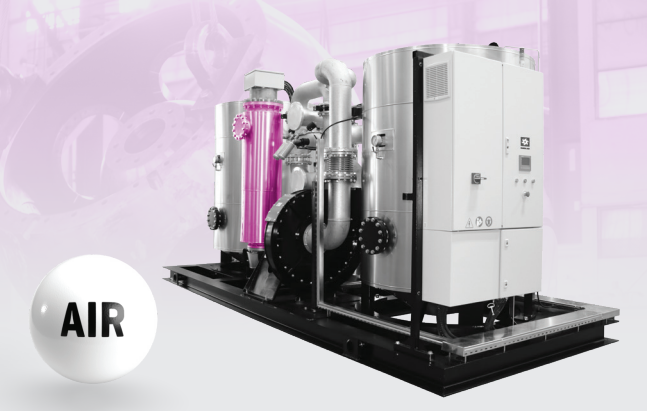


PRODUCTION

Hydrogen is produced by the separation of chemical elements of which the H atom is a component and by the mobilization of an energy source. Today, a major part of the hydrogen production is from natural gas and more generally, approximately 95 % of hydrogen production still comes from fossil fuels (natural gas, oil, coal). The production of hydrogen thanks to a renewable or nuclear energy source (or by steam reforming of natural gas if the process is associated with a CO₂ capture, storage and recovery unit) is called "low-carbon hydrogen" and quickly became an environmental and political priority, especially around Electrolysis.

The different ways of producing hydrogen are classified by colors:

	Natural state
	Electrolysis with electricity coming from Renewable Energy Sources (RES)
	Thermal splitting of methane pyrolysis (CO ₂ produced is solid and not gaseous)
	Hydrogen produced from different processes including natural gas, with Carbon Capture Utilization and Storage (CCUS) techniques involved
	Electrolysis with electricity from nuclear power plant
	High temperature catalytic splitting of water using nuclear heat
	Chemo-thermal electrolysis through direct nuclear power and heat
	Production from fossil fuels in general (often Steam Methane Reforming - SMR)
	Hydrogen produced from coal (bituminous or lignite - brown). CO ₂ released into the atmosphere.



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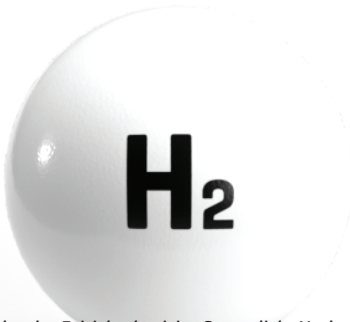
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OMEGA AIR
more than air

H₂
Purification units

H₂
Hydrogen



CHARACTERISTICS

The dihydrogen H₂ molecule, made up of two hydrogen atoms, is commonly called "hydrogen" and was discovered in 1766 by the British physicist Cavendish. Under normal conditions of temperature and pressure, hydrogen is a colorless and odorless gas but also the lightest element of the periodic table. It is soluble in water up to 1.6 mg/L at 21 °C. It is the simplest member of the family of chemical elements and the most abundant one in the universe (main element of the Sun and stars). However, it is rarely found alone on and in the Earth, and is very often an integral part of various organic materials and, more importantly, water (H₂O). Depending on its temperature and pressure, it can be found in different states: gaseous, liquid, solid, metallic and triatomic. Here, we will only concentrate on hydrogen in its gaseous state.

APPLICATIONS

The earliest known important chemical property of hydrogen is that it burns with oxygen to form water (H₂O), it was therefore made famous for its usage in the process of nuclear fusion. But it is now even more famous for its extremely low density, allowing it to be an energy vector to answer the problematic of electricity storage. Therefore Hydrogen is today widely considered as one of the key features that will play a major role in the world's energy transition.

- Hydrogen can be used for a variety of Industrial, Residential and Mobility applications:
- **Chemical industry** | Production of ammonia and other fertilizers (50 % of global consumption)
 - **Petrochemical industry** | Sulfur removal | Creation of gasoline and diesel (hydrocracking) | Methanol production (synthesis of amines and alkanes by hydrogenation)
 - **Food industry** | Production of margarine and butter (fat hydrogenation)
 - **Welding** | Atomic Hydrogen Welding (also called Plasma)
 - **Glass production** | As antioxidant or shielding gas when coupled with nitrogen
 - **Electronics manufacturing** | Production of semiconductors, LEDs, displays, etc
 - **Aerospace** | Rocket's engines (liquid form)
 - **Housing** | Lighting, Heating
 - **Hydrogen Refueling Stations (HRS) for "Green Mobility"** | Fuel Cells Electric Vehicles, FCEVs

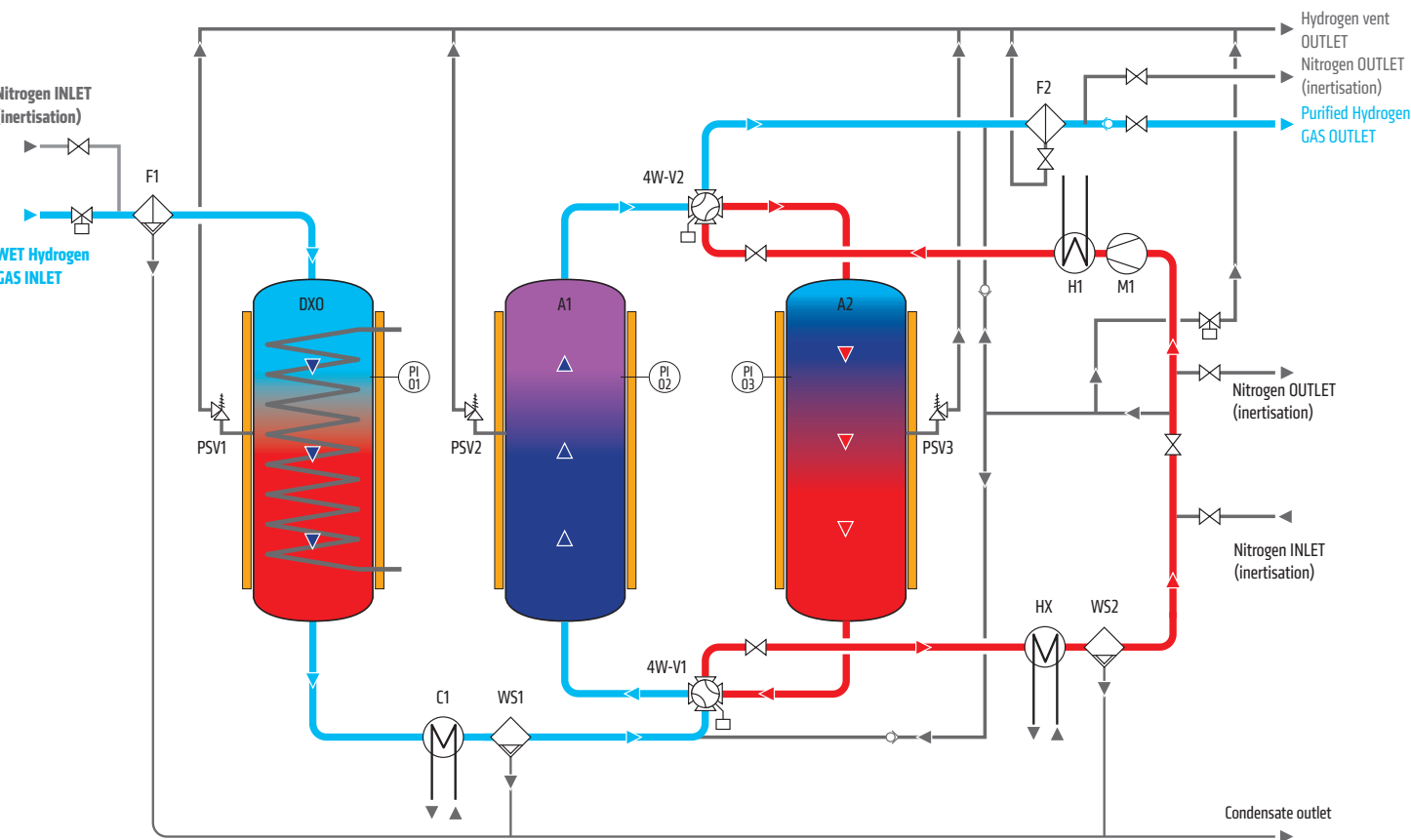


H₂ PURIFICATION UNITS

SPECIFICATIONS

The H₂-DRY X/XD purification units are specifically designed for continuous removal of water vapor, oxygen, and solid particles from hydrogen gas, making them suitable for a wide range of applications, including Fuel Cells (ISO 14687:2019). These purification units are easily integrated into electrolyzer hydrogen systems. With a proven and durable design, the units provide efficient, reliable operation, quick installation, and easy maintenance. They can handle fluctuating loads with ease.

TSA dryers Flow Diagram H₂-DRY XD (Full Closed Loop version)



- F1** Filter (Removal of solid particles)

DXO DEOXO (Traces of O₂ are converted to H₂O)

4W-V 4-way valves

PI Pressure indicators

C1 Cooler

A1 Drying column 1

A2 Drying column 2
- HX** Water cooled heat exchanger

WS Water separator with automatic drain

PSV Pressure safety valve

M1 Blower

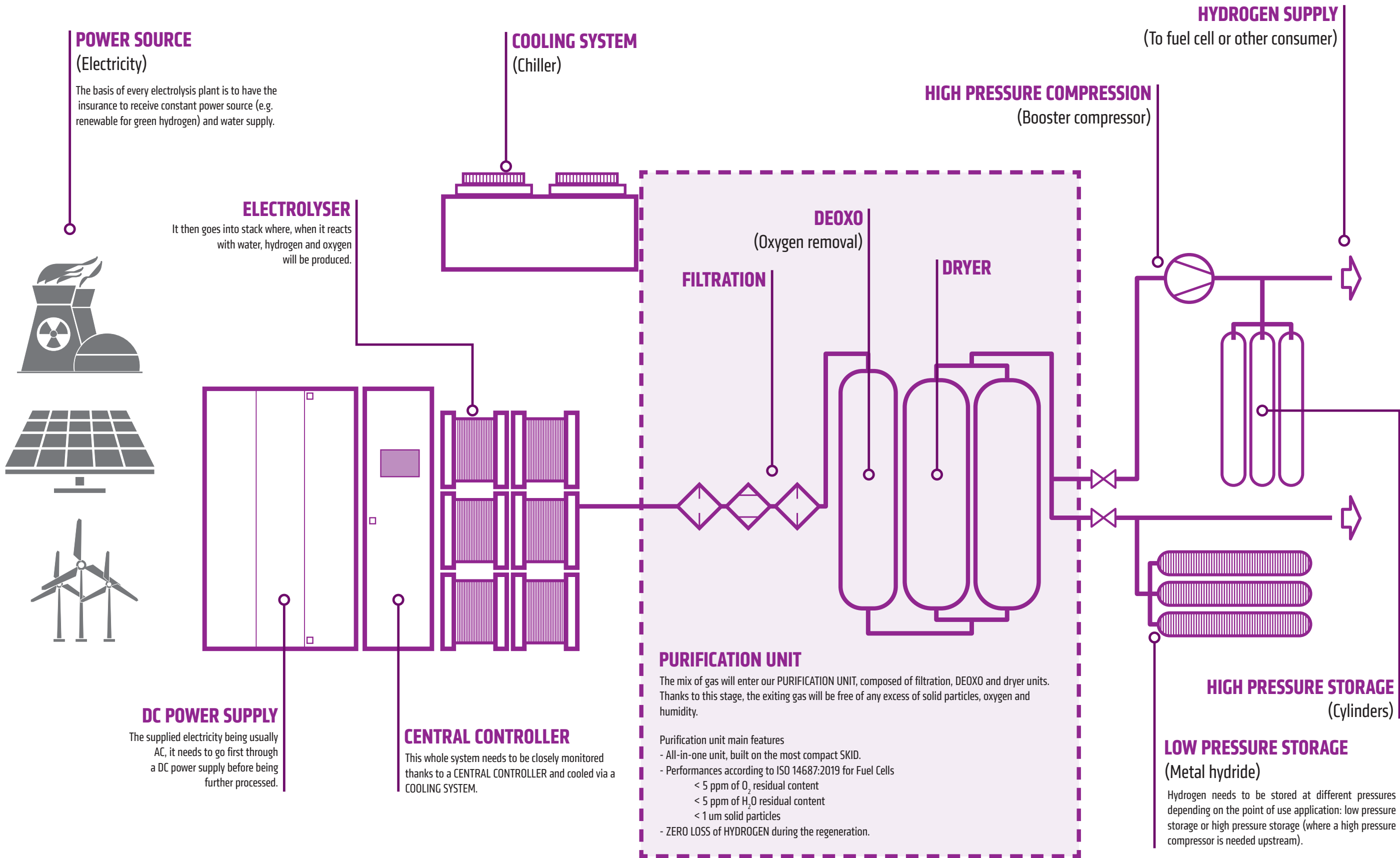
H1 Heater

F Filter

The purification unit includes filtration, a dryer, and an optional deoxo tower.

The dryer operates in a closed-loop regeneration process, ensuring that no hydrogen is wasted during regeneration. Additionally, the optional deoxo unit can reduce oxygen content to less than 5 ppm.

PURIFICATION MODULE IN ELECTROLYSIS PLANT



POWER SOURCE
(Electricity)

The basis of every electrolysis plant is to have the insurance to receive constant power source (e.g. renewable for green hydrogen) and water supply.

COOLING SYSTEM
(Chiller)

ELECTROLYSER

It then goes into stack where, when it reacts with water, hydrogen and oxygen will be produced.

PURIFICATION UNIT

PURIFICATION UNIT

The mix of gas will enter our PURIFICATION UNIT, composed of filtration, DEOXO and dryer units. Thanks to this stage, the exiting gas will be free of any excess of solid particles, oxygen and humidity.

- Purification unit main features
- All-in-one unit, built on the most compact SKID.
 - Performances according to ISO 14687:2019 for Fuel Cells
 - < 5 ppm of O₂ residual content
 - < 5 ppm of H₂O residual content
 - < 1 µm solid particles
 - ZERO LOSS of HYDROGEN during the regeneration.

DEOXO
(Oxygen removal)

FILTRATION

DRYER

HYDROGEN SUPPLY
(To fuel cell or other consumer)

HIGH PRESSURE COMPRESSION
(Booster compressor)

HIGH PRESSURE STORAGE
(Cylinders)

LOW PRESSURE STORAGE
(Metal hydride)

Hydrogen needs to be stored at different pressures depending on the point of use application: low pressure storage or high pressure storage (where a high pressure compressor is needed upstream).

ADDITIONAL FEATURES OF H₂-DRY PURIFICATION UNITS

DEOXO UNIT

An additional tower, packed with a specialized palladium-based catalyst, plays a crucial role in facilitating the hydrogen-oxygen reaction, helping to reduce the oxygen content in the gas stream.

ELECTRIC ACTUATORS

In contrast to pneumatic actuators that depend on an external air supply, electrical actuators operate directly on electricity, removing the need for an air compressor.

REMOTE CONTROL CABINET

Enable operators to control and oversee machinery or systems remotely, from a control room located in a safe area. An option for the remote control cabinet is the I/O module, which converts all signals into digital format, enabling transmission through a single UTP cable.

CONDENSATE COLLECTOR WITH LEVEL SWITCHES

All condensate lines are routed to a centralized condensate vessel, which is designed to collect and store the condensate. The vessel is equipped with level switches that continuously monitor the condensate level. When the level reaches a predetermined threshold, the system automatically discharges the condensate to maintain optimal levels within the vessel.

OXYGEN SENSOR PANEL

Independent monitoring, system designed to measure oxygen content on the outlet of purification unit.

COOLING SYSTEM

A cooling system is needed to prepare cold industrial water, which is used to cool the system. You can choose from a wide range of industrial water coolers from our product range.

TECHNICAL DATA

Operating pressure	Up to 37 (45) bar
Inlet temperature	Up to +80 °C
Ambient temperature	1,5 to 50 °C (check also blower suction conditions)
Pressure dew point	-40 °C (lower PDP on request)
Voltage, Frequency	400 V, 50 Hz
Protection class (controller)	IP 65
Communication	Modbus TCP/IP, Profinet TCP/IP (other on request)
Certification	CE/ATEX (IECEx on request)

MODEL	Capacity		Electrolyser MW
	m ³ /h	kg/h	
H ₂ -DRY 30	105	8,7	0,5
H ₂ -DRY 60	210	17,4	1
H ₂ -DRY 180	630	52,3	3
H ₂ -DRY 300	1050	86,8	5
H ₂ -DRY 600	2100	173,7	10
H ₂ -DRY 1200	4200	347,3	20
H ₂ -DRY 2500	8400	694,7	40
H ₂ -DRY 3600	12600	1.042,0	60
H ₂ -DRY 5000	16800	1.389,4	80
H ₂ -DRY 6500	21000	1.736,7	100

CONTAINER UNITS

BOX UNITS

The elements of the H₂ purification unit are integrated into a compact container BOX unit. The unit is suitable for outdoor installation and is weatherproof and easy to transport. Individual components are determined by OMEGA AIR based on the input parameters, functionally connected to each other, the system is wired, tested and ready for connection and operation.

