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XINTC Electrolyzer System — Technical Specification Sheet

Version: July 2025
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SYSTEM OVERVIEW

XINTC develops and supplies high-efficiency, modular electrolyzer systems optimized for the global mid-scale hydrogen market. Built on next-generation alkaline technology, our systems are designed for maximum cost-effectiveness, environmental sustainability, and operational flexibility. XINTC enables decentralized hydrogen production at the lowest achievable cost for any location and application.

Our modular architecture ensures fast configuration and scalability. Each system is composed of standardized building blocks, configurable for various energy sources, pressures, and purities, resulting in reduced total cost of ownership (TCO) and simplified deployment.

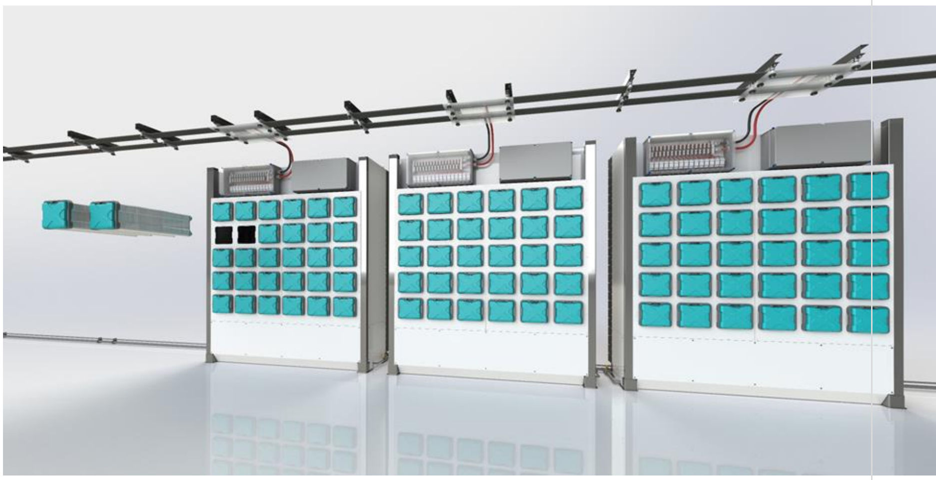
CORE TECHNOLOGY

XINTC designs, manufactures, and delivers high-efficiency, multi-core electrolyzer systems engineered for the global mid-scale hydrogen market. Leveraging next-generation alkaline technology, our systems combine environmental sustainability with exceptional cost-efficiency. XINTC's core objective is to enable decentralized hydrogen production, at any location, for any application, at the lowest achievable cost. We prioritize minimizing total cost of ownership across the full operational lifespan of the system.

Our electrolyzers are engineered for robustness, reliability, and operational simplicity. Rather than relying on complex, custom-built designs, XINTC employs a fully modular architecture. Standardized modules can be rapidly configured to meet varying requirements for energy source, hydrogen purity, production rate, and outlet pressure. This approach allows for seamless scalability and system flexibility.

At the heart of our technology are XINTC's patented gas modules, an entirely new concept compared to traditional electrolyzer stacks. These modules are constructed using engineered polymers instead of metal, offering superior chemical resistance, durability, and recyclability. The design eliminates the need for membranes, gaskets, or critical raw materials. Each module contains 105 reaction cells in a sealed, monolithic block, ensuring complete liquid and gas tightness.

Each electrolyzer system includes two gas modules operating in parallel, managed by intelligent switching electronics and embedded control software. This design delivers a maintenance-free module with a proven operational lifetime **exceeding 100,000 switching cycles** and > **87,500 operating hours**, without measurable degradation in performance.



XINTC systems are built from sections, each comprising 15 pairs of gas modules. These modular sections form the primary building blocks of the overall platform. Each section is designed to convert 150 kW of nominal electrical input, up to 200 kW peak, into hydrogen in a highly efficient and controlled manner. Within each section, the gas modules operate under distributed intelligence: every module communicates continuously with the others to coordinate workload, balance performance, and assign functions dynamically in real time.

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DIRECT COUPLING TO SOLAR PV – THE XINTC WAY

XINTC electrolyzer systems are uniquely engineered for direct DC coupling to photovoltaic (PV) power sources, eliminating the need for conventional power electronics such as inverters, MPPT optimizers, and battery storage systems.

Instead of converting solar energy through intermediate stages, PV panel strings are connected directly to the DC busbar within the Power & Control Module (PCM). This simplified architecture significantly reduces both capital and operational expenditures related to power conversion equipment and minimizes energy losses associated with traditional AC systems.

Each gas module pair is equipped with a custom-designed printed circuit board (PCB) and embedded control software that enables real-time switching in response to fluctuations in solar input. As a result, the gas modules themselves perform the role of a **Maximum Gas Production Tracker (MGPT)**, an innovative alternative to conventional MPPT systems.

Key advantages

- No need for inverters, DC/DC converters, or batteries
- Ultra-fast response to intermittent power from PV
- Higher hydrogen output through real-time optimization
- Lower system complexity and cost
- No curtailment losses—use every photon productively

This direct-coupled configuration is ideally suited for off-grid or grid-constrained environments and enables hydrogen production wherever solar power is available, efficiently, reliably, and with maximum yield.

SYSTEM COMPOSITION

COMPONENT	DESCRIPTION
PCM (Power & Control Module)	Contains power electronics and control systems
GPM (Gas Production Module)	Houses gas modules, water treatment, electrolyte, and post-treatment units
HSM (Hydrogen Storage Module)	Integrated low-pressure storage up to 20.000 m³
CPM (Compression & Purification Module)	Optional module for grade 5.0 hydrogen at 13 bar(g)

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POWER & CONTROL MODULE (PCM) + GAS PRODUCTION MODULES (GPM)

A complete XINTC electrolyzer system consists of two integrated components: the **Power & Control Module** (PCM) and the **Gas Production Module** (GPM). The PCM contains the power electronics and system control infrastructure, while the GPM houses the gas modules, water treatment unit, electrolyte system, and gas post-treatment equipment. These two modules are interconnected and function as a single, inseparable unit. The GPM produces hydrogen at grade 2.5 purity (99.5 %) with an outlet pressure of 0.5 bar(g).

SPECIFICATIONS PCM			
Power supply	**DC power**	Nominal 380 – 480 VDC Solar string MMPT target to busbar 430 – 440 VDC Open circuit voltage 190 VDC (minimum) – 550 VDC (maximum)	**A**
	AC power	Three-phase 400 VAC (+/- 10%), 50/60 Hz	
Compartments	**Power electronics**	**DC power only**: No DC/DC rectifiers required. Solar panel strings directly connected to the DC busbar. Blocking diodes required on each solar panel string.	
		AC power only or **AC + DC power**: AC/DC rectifiers (300/400 kW each) based on adjustable IGBT technology with galvanic isolation, designed for the conversion of external AC voltage to internal DC voltage, with THDi below 5%. Includes power distribution station and MCCB.	
	System control	Equipped with HMI touchscreen, 4G gateway for 24/7 remote monitoring, UPS, safety control systems, and comprehensive data logging. In the event of a critical incident, all safety systems remain active for a minimum of 24 hours.	
Enclosure	**Shipping container**	Customized and compartmentalized 20 ft high cube container, finished in RAL 7035 with C3 corrosion protection and external signage. Optional C5 coating.	
	Gross weight	< 10.500 kg (including 4x AC/DC rectifiers).	
Accessibility	**Power electronics**	Accessible via 2x hinged doors at the end.	
	System control	Accessible via a hinged door with panic opener on the longitudinal side (front).	
Power consumption	**Connection**	Via existing cable entry on the longitudinal side (back).	
	Standby	Hot/Cold standby ~ 0,5 kW.	
Safety	Shielding, emergency switches, warning lights, circuit breakers, temperature control, fuses, voltage control, air-tight cable entries, 24/7 remote monitoring.		
Ambient temperature and heat control	**Standard**	5 °C to 35 °C. Forced air cooling by means of redundant mechanical ventilation.	
	Optional	Up to 55 °C. Additional internal heat exchangers and external cooling medium.	

A **DC POWER SUPPLY**

Photovoltaic (PV) panels are directly connected to the Power Control Module (PCM) of the XINTC electrolyzer system, eliminating the need for MPPT optimizers, DC/AC or DC/DC converters, and battery storage systems. Each gas module pair features a custom-designed PCB and integrated control software, enabling real-time on/off switching in response to solar input fluctuations. As a result, the gas modules function as a Maximum Gas Production Tracker (MGPT), effectively replacing traditional MPPT systems. This innovative setup delivers a simpler, more efficient, and cost-effective system architecture.

SPECIFICATIONS GPM		
Gas production	**Hydrogen**	Purity 99.5 %. H_2O < 5.000 ppm, O_2 < 5.000 ppm. Outlet pressure 0.5 bar(g)
	Oxygen	Internally diluted to safe concentrations before released to the atmosphere
Gas module	**Input power**	Nominal 5 kW. Peak power 6.5 kW
	Weight	~ 18 kg
	Working temperature	~ 45 °C (55 °C maximum)
	Life expectancy	Designed for a service life of over 10 years (>87,500 operating hours), after which replacement of the gas modules may be required.
	Degradation	Degradation is less than 5% over 87,500 production hours at 100% load and 100,000 on/off cycles. With a full-service package, degradation remains below 2.5% under the same conditions.

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Section	Deploying 30 collaborating gas modules | 15 pair	
	Input power	Nominal 150 kW. Peak power 200 kW, with solar or solar + DC.
	Production	Nominal 61,9 kg/24h. Peak power 78,1 kg/24h, with solar or solar + DC.
		Nominal 28,6 Nm^3/h. Peak power 36,2 Nm^3/h, with solar or solar + DC.
System | full container	Deploying 240 collaborating gas modules | 120 pair	
	Power installed	Nominal 1.200 kW. Peak power 1.600 kW, with solar or solar + DC.
	Power factor solar DC	> 0,99. With solar DC coupling: no power thresholds, no curtailment losses. Installed system peak power MMPT equals installed power solar field.
	Production	Nominal 495 kg/24h. Peak power 625 kg/24h, with solar or solar + DC.
		Nominal 229,2 Nm^3/h. Peak power 289,1 Nm^3/h, with solar or solar + DC.
	Operational dynamics	1 – 100% dependent on system configuration
	Water supply	Specific water consumption ~ 10 l/kg, ~ 0,9 l/Nm^3
		Nominal potable water intake ~ 12 l/kg depending on water quality.
		Potable water inlet pressure 2 – 6 bar(g) without softener, 3 - 6 bar(g) with softener.
		Inlet conductivity <1,500 µS/cm[1], TDS < 1,000 mg/l, acidity < 0,1 meq/l **B**
		Inlet temperature 5 – 30^0C
	Power consumption	Depending on system configuration, power source, load profile, ambient conditions, and operational dynamics, energy consumption ranges from 52.0 to 60.2 kWh/kg.
	Average specific power consumption	AC power at nominal load 57,75 kWh/kg at full system level. DC power at peak load 60,2 kWh/kg at full system level.
	Startup time	Hot startup time 0-100%: ~ 60 sec (electrolyte >35 ^{0}C)
		Cold startup time 0-100%: ~ 360 sec (ambient >5 ^{0}C)
	Shutdown	100-0%: ~ 10 sec.
	Turndown ratio	120:1 maximum flow/minimum flow.
	Operational flexibility	0-140 % with solar DC only or solar DC + AC, 0-100 % with AC-power only
Enclosure	**Shipping container**	Customized 40 ft high cube container with liquid-tight floor, finished in RAL 7035 with C3 corrosion protection and external signage. Optional: C5 coating.
	Gross weight	< 19.000 kg (with 8 sections installed)
Compartment	**Production compartment**	Open interior layout with gas modules positioned on either side of a central walkway. Configurable from a minimum of 2 sections to a maximum of 8. Power is supplied via an axially hinged DC busbar. Auxiliary equipment, such as the RO unit, buffer tank, electrolyte unit, interchangeable filters, and gas treatment unit, is located at the accessible end of the container.
Accessibility	Accessible through two hinged doors at the end.	
Power consumption	**Standby**	Hot standby ~ 26–36 kW, including 16 kW for forced ventilation.
		Cold standby ~ 26 kW.
Safety	Shielding, emergency switches, warning lights, circuit breakers, overpressure protection, temperature control, level control, fuses, voltage control, air-tight cable entries, hydrogen detection sensors, 24/7 remote monitoring.	
Noice level	< 85 dB(A) at 10 meters distance under full load conditions.	
Ambient temperature and heat control	**Standard**	5 ^{0}C to 35 ^{0}C. Forced air cooling by means of redundant mechanical ventilation.
	Optional	Up to 55 °C. Additional internal heat exchangers and external cooling medium.

B WATER TREATMENT

The output of the RO-water treatment unit is 5µS/cm. With a 2-stage RO-unit we accept up to 1.000 TDS of input quality. The water installation is also equipped with an ion-exchange filter (softener) to remove Ca_2^+, Mg_2^+ (hardness ions) and also Cr_2^+ from the input. The drinking water may not contain dissolved chlorine gas Cl_2 (but may contain chloride ions Cl^-). It should therefore not be swimming pool quality because the Cl_2 is an oxidizer (kills bacteria) but also damages the RO membranes. If this is the case, an additional active chlorine filter must be placed in the supply line to adsorb the chlorine gas.

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HYDROGEN STORAGE MODULE (HSM)

For safe and efficient on-site hydrogen storage, XINTC offers the **Hydrogen Storage Module** (HSM), a fully integrated component of the XINTC electrolyzer system. The HSM is a semi-spherical, low-pressure storage solution specifically designed to store hydrogen produced at atmospheric pressure. The gas holder features a robust, multi-layer plastic membrane system that securely contains the hydrogen while shielding it from external environmental influences. Dual blowers ensure continuous aeration of the space between the inner membrane, holding the hydrogen, and the outer membrane, which acts as a protective barrier. This design effectively prevents the formation or accumulation of potentially hazardous gas mixtures, ensuring maximum operational safety. The HSM is available in various volume configurations, up to 20.000 m³, to meet diverse storage requirements and provides advanced control, monitoring, and safety features, all fully integrated within the XINTC system architecture.

SPECIFICATIONS HSM		
Membrane		Three-layer, double-sided PVC-coated polyester fabric with antistatic properties, low permeability, and resistance to UV, microbial growth, abrasion, and biogas. Flame retardant rated B1 in accordance with DIN 4102.
Capacity		Various volumes: 150 m^3, 400 m^3, 1.000 m^3 … 10.000 m^3
Power supply	**AC power**	Three-phase 400 – 440 VAC, 50/60 Hz
Pressure	**Inlet**	200 mbar maximum
	Outlet	200 mbar maximum
Anchoring		Mechanical seal anchoring system, installed on concrete foundation using stainless steel flanges
Power	**Connection**	Via control cabinet
System control & safety	H2 Gas Detector, weight sensor, volume level sensor, hydraulic gas safety valve, air overpressure valve, inspection window, air pressure transmitter, forced air cooling by means of redundant mechanical ATEX air vans.	
Ambient temperature	-20 ^{0}C to 55 ^{0}C	

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COMPRESSION & PURIFICATION MODULE (CPM)

For applications requiring higher hydrogen purity and increased outlet pressure, the grade 2.5 hydrogen (99.5%) produced at 0.5 bar(g) can be upgraded to the internationally recognized standards for hydrogen purity for fuel cell applications, such as SAE J2719 or ISO 14687:2019 (minimum purity level of 99.97% H_2) at 13 bar(g) by integrating the **Compression & Purification Module** (CPM). This module carries out three essential post-treatment steps: (1) compression, (2) trace oxygen removal, and (3) drying.

The CPM is a standardized component of the XINTC electrolyzer system and is configured for a nominal system capacity of 1 to 1.2 MW. Its design ensures zero hydrogen loss—hydrogen used for regenerating the PSA/TSA drying vessels is fully recovered and recycled within the system.

SPECIFICATIONS CPM		
Gas production	**Hydrogen**	At 210 Nm^3/h, ISO 14687:2019 (99.97-99.99% H_2) at 13 bar(g) outlet pressure[2]. Impurities: <5 ppm O_2, < 5 ppm H_2O, < 300 ppm N_2
Power supply	**AC power**	Three-phase 400 V – 440 VAC, 50/60 Hz. 160 kW installed (peak) power
Compartments	**Compression and purification compartment**	Low maintenance two-stage Liquid Ring Compressor (LRC) skid, de-oxer unit (DEO) with water knock-out, proprietary PSA/TSA drying unit, output gas flow rate measurement, output gas purity measurement.
	System control compartment	Touch screen HMI, 4G gateway for remote monitoring, UPS, security monitoring, signaling and data logging. In case of a critical event the overall safety systems remain activated for at least 24 hours.
Enclosure	**Shipping container**	Customized and compartmentalized 20 ft high cube container, finished in RAL 7035 with C3 corrosion protection and external signage. Optional: C5 coating.
	Gross Weight	< 9.000 kg
Accessibility	**Compression and purification**	Accessible through two hinged doors at both ends.
	System control	Accessible via a hinged door with panic opener on the longitudinal (front) side.
Power	**Connection**	Via existing cable entry on the longitudinal (rear) side.
	Standby	Hot/cold standby (frost protection), ~ 3 kW in recycle mode.
	Consumption	~ 4 kWh/kg at nominal load.
Heat control	Forced air cooling by means of a speed-controlled mechanical ventilation system.	
Safety	Shielding, emergency switches, warning lights, circuit breakers, temperature control, fuses, voltage control, air-tight cable entries, 24/7 remote monitoring.	
Ambient temperature and heat control	**Standard**	-10 ^{0}C to 45 ^{0}C. Active chiller.
	Optional	Up to 55 °C. Adjustment of the active chiller.

[2] The CPM can accommodate a higher flow rate if reduced outlet pressure and/or purity are acceptable. The relationship between outlet pressure, PSA/TSA residence time, and flow rate can be determined based on actual project-specific data.

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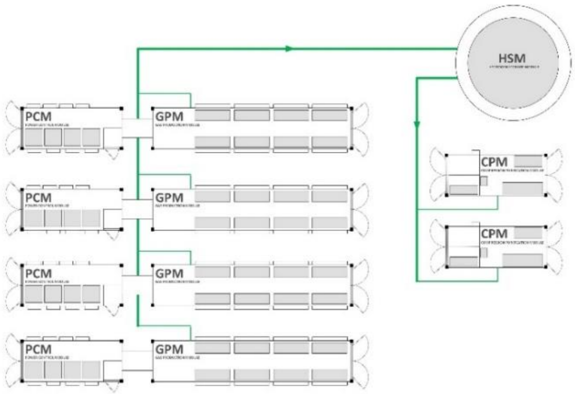
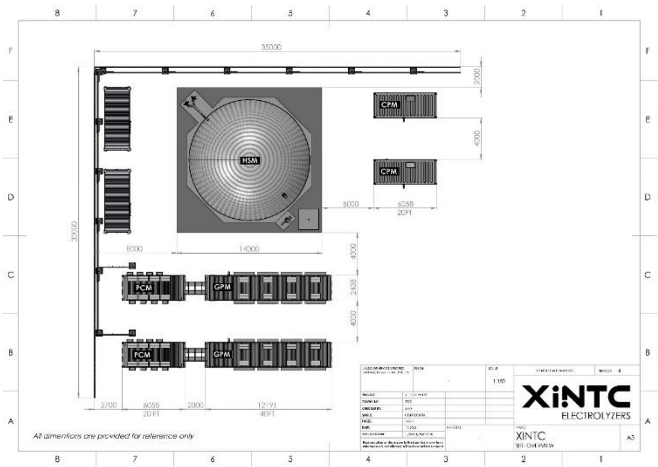
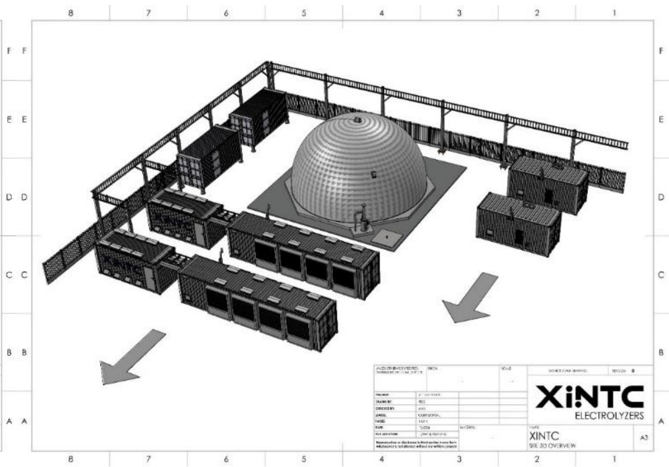
FREE CONFIGURATION & SCALABLE CAPACITY

The system modules are engineered for flexible deployment, enabling reconfiguration or expansion at any stage to meet changing business requirements. Scaling is accomplished by adding modules, with the optimal setup defined through a technical and economic analysis tailored to the customer's operational goals. The integrated software embedded in each system module is built to support future scalability and the seamless integration of additional features. The optimal configuration is determined through a technical and economic assessment, based on the customer's requirements, energy profile, and operational goals.







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BATTERY LIMITS

	IN FROM	OUT TO	SPECIFICATIONS
PCM			
DC (solar) power cables	SITE		4x Entry Boxes, each: 16x N DC cables/Entry Box - Single core aluminum cable; 25 mm^2, YMvK erx 16x P DC cables/Entry Box - Single core aluminum cable; 25 mm^2, YMvK erx Each cable: ~550 Voc/~425 Vmp[3]/ ~62,5 Imp
AC power cables	SITE		4x Entry Boxes, each: 3x AC cable, each 2x 3 Phase 400 VAC, 50 Hz, ~420 Imp, single core copper cables YMvK Flex 1x 120 mm², Dca-s2/d2/a3, no shielding required, earth of Neutral required
AC auxiliary power cable[4]	SITE		3-phase 400 VAC; 50 Hz; ~160 Imp; copper cable, PE, VG-YMvKas 4x 95 mm² 0,6/1 kV Dca-s2/d2/a3
Communication cable		SITE	Modbus RTU (RS485)
Safety line	SITE		24 VDC (yellow), multi core cable, n x 1,5 mm^2
Safety line		SITE	24 VDC (yellow), multi core cable, n x 1,5 mm^2
Earthing	SITE		2x at container corners, positioned diagonally opposite, connected to site grid, tinned solid copper rod, 50 mm^2/OD8 mm
GPM			
Water	SITE		OD16 mm - HDPE water pipe coupling with external 230 VAC, 50 Hz, 16 Amp power socket for water pipe heat tracing
Drainage		SITE	Discharge to sewer (open sump) near the system module
Process water	SITE	SITE	1inch BSP thread
Earthing	SITE		Two grounding points located at diagonally opposite container corners, each connected to the site grid using a tinned solid copper rod (50 mm² / Ø8 mm).
Hydrogen gas		HSM	DN75 PN16 DIN-flange
Nitrogen gas	SITE		15 mm tube clamp fitting
HSM			
Power cable	SITE		3-phase 400 VAC; 50 Hz; ~16 Imp, copper cable, PE, VG-YMvKas 4X95 mm² 0,6/1kV Dca-s2/d2/a3
Safety line	SITE		24 VDC (yellow), multi core cable, n x 1,5 mm^2
Safety line		SITE	24 VDC (yellow), multi core cable, n x 1,5 mm^2
Communication cable		SITE	Modbus RTU (RS485)
Hydrogen gas	GPM		DN100 PN16 DIN-flange
Hydrogen gas		SITE/CPM	DN100 PN16 DIN-flange
Earthing			Protecting earth
CPM			
Power cable	SITE		3-phase 400 VAC, 50 Hz; ~350 Imp; copper cable shielded + armored, VG-YMvKas 4X95 mm^2 0,6/1 kV Dca-s2/d2/a3
Safety line	SITE		24 VDC (yellow), multi core cable, n x 1,5 mm^2
Safety line		SITE	24 VDC (yellow), multi core cable, n x 1,5 mm^2
Communication cable		SITE	Modbus RTU (RS485)
Earthing	SITE		Two grounding points located at diagonally opposite container corners, each connected to the site grid using a tinned solid copper rod (50 mm² / Ø8 mm).
Hydrogen gas	HSM		DN100 PN16 DIN-flange
Hydrogen gas		SITE	DN50 PN25 DIN-flange
Nitrogen gas	SITE		15 mm tube clamp fitting
Drainage		SITE	Discharge to sewer (open sump) near the system module

[3] Optimized for every solar system, depending on the type of PV panels with a targeted 425 Vmp. Open circuit voltage not to be exceeded.
[4] If only dedicated DC power is available, the option of a DC/AC inverter is selected. Alternative: external battery.

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INSTALLATION REQUIREMENTS

Placement	The PCM and GPM units are installed in line with each other, maintaining a minimum clearance of 2 meters. All containerized units, PCM, GPM, and CPM, must be placed on a level concrete surface compliant with DIN 18202:2005, with sufficient load-bearing capacity. The installation site must be freely accessible for both a low-loader and a crane.
Utilities	Required utilities include a potable water supply with an inlet pressure of 2–6 bar(g), a sewage connection, and a 2 kW AC grid connection to power essential system components when the electrolyzer is not in operation.
Extra requirements	Based on the outcome of a formal risk assessment, the Environmental Service may mandate additional safety measures. These could include fencing around the electrolyzer installation, CCTV surveillance, or the construction of a concrete block partition wall.

TECHNICAL STANDARDS

2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/68/EU	Pressure Equipment Directive
114/2014 + 153/99/92/EC	ATEX Directive
2014/35/EC	Low Voltage Equipment
2009/105/EC	Simple Pressure Vessels

CONSIDERATIONS

Electrochemical Efficiency	Electrochemical conversion within the gas modules is more efficient at lower power loads (i.e., lower current densities). Although higher loads result in greater hydrogen output, they are accompanied by a slight decrease in efficiency. Therefore, where operationally feasible, installing additional capacity and operating at reduced power levels may enhance overall system efficiency.
System Configuration	Configuring the system with an even number of sections, rather than an odd number, can lead to cost savings, reduced material consumption, and improved energy conversion efficiency under standard operating conditions. Scenario-based calculations are recommended to support well-informed decisions and accurately evaluate the total cost of ownership.

LCOH CALCULATION, A FLEXIBLE TECHNO-ECONOMIC ANALYSIS TOOL

XINTC has developed a techno-economic model to calculate the Levelized Cost of Hydrogen (LCOH) across a wide range of system configurations. The model enables a transparent and detailed analysis of both technical and financial parameters, resulting in a realistic cost estimate per kilogram or normal cubic meter of hydrogen over the full system lifetime.

The model simulates system performance on an hourly basis using historical solar and wind data for the selected location. It incorporates key factors such as energy consumption, system efficiency, standby power, degradation, maintenance requirements, and technical lifespan. Financial indicators such as Net Present Value (NPV) and Debt Service Coverage Ratio (DSCR) are also included to assess economic viability.

Multiple variables can be defined or adjusted, including usage profiles, energy source mix, energy costs, financing structure, and organizational factors. This allows for scenario-based sensitivity analyses to explore the impact of different design and investment choices on the LCOH.

The model supports all common configurations, as shown below:

CONFIGURATIE	SOLAR	WIND	GRID
ONLY SOLAR	✓		
ONLY WIND		✓	
SOLAR WITH GRID	✓		✓
WIND WITH GRID		✓	✓
COMBINED SOLAR AND WIND	✓	✓	
COMBINED SOLAR, WIND, AND GRID	✓	✓	✓
GRID-ONLY			✓

Insights from the Sensitivity Analysis
The model provides graphical outputs that offer insight into the relationship between system design choices and hydrogen production costs, including:

- The impact of increasing or decreasing the installed capacity or power input from wind and solar on the LCOH
- The influence of grid supplementation—whether limited or flexible—on hydrogen cost
- The trade-offs between energy mix, system sizing, and overall cost efficiency
- The Total Cost of Ownership (TCO), covering the complete electrolyzer lifecycle

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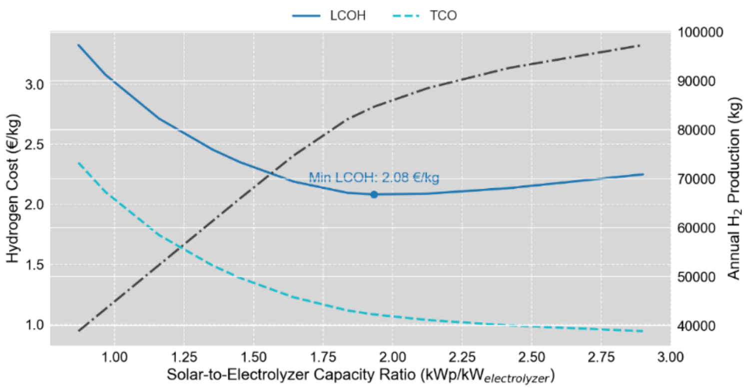
Example outcomes from the Sensitivity Analysis



This flexible configuration matrix allows the model to reflect project-specific conditions and objectives, supporting the optimization of system sizing and energy mix to minimize hydrogen production costs.