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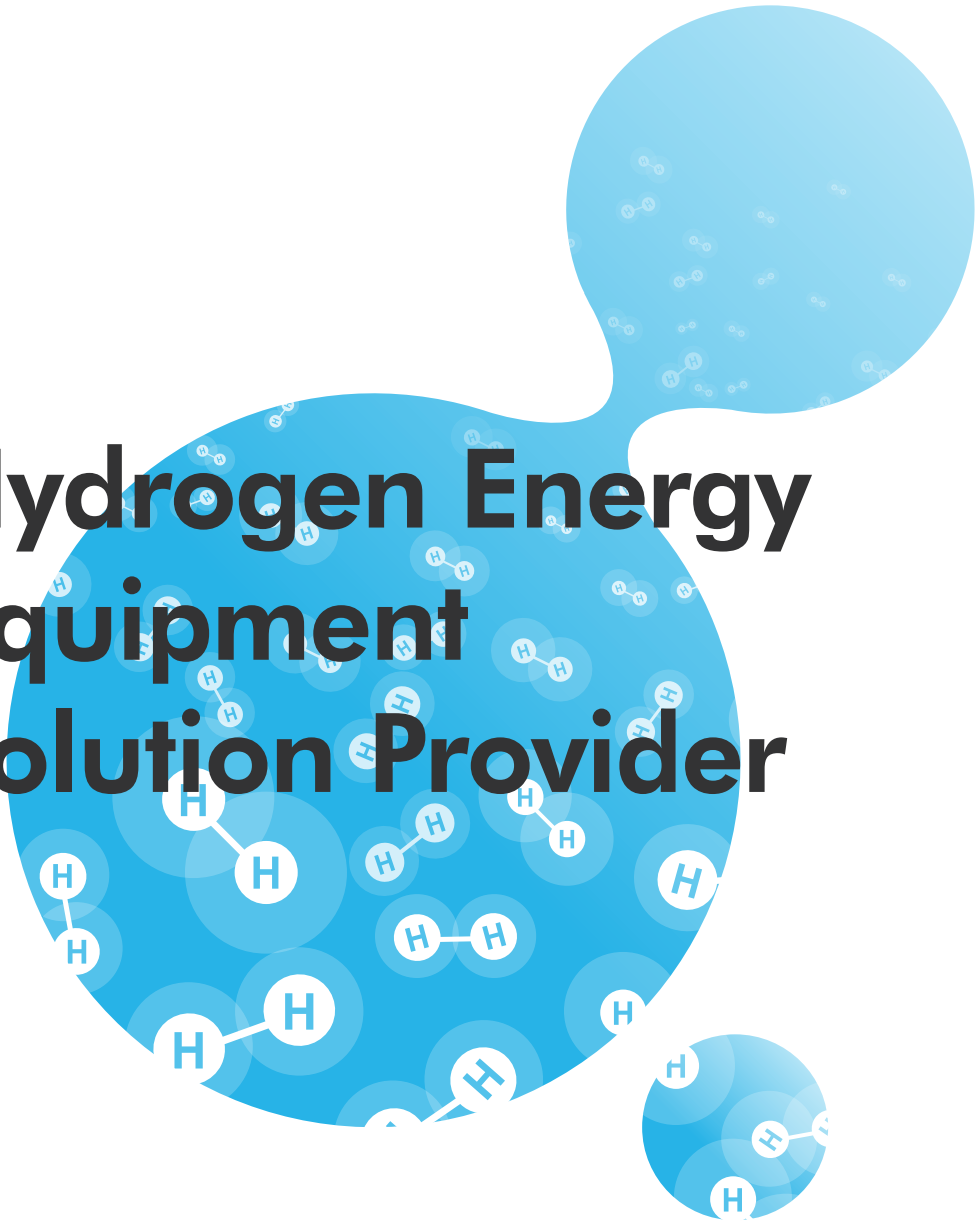
Hydrogen Energy Equipment Solution Provider



PRESSURIZED ALKLINE ELECTROLYZER

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Advantages

- **Low energy consumption**

  Higher current density and lower electrolysis energy consumption in a more efficient process of electrolysis with high activity electrodes and low resistance membranes.

- **High adability**

  Wide range and fast speed of power adjustment for a higher accommodation proportion of renewable energy and better adaptability to hydrogen production applications from wind and solar energy.

- **High reliability**

  Selected electrodes passing the 5,000 hours stress test for an annual attenuation rate of less than 1%;

  Simulation for improved structure and uniformity of flow/temperature fields of electrolyzers to tackle the risk of local overheating;

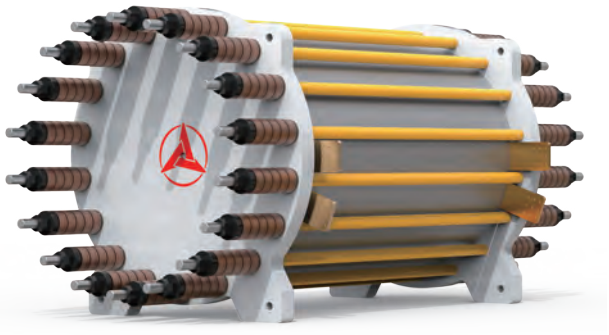
  New sealing waterline design of the bipolar plate to address the leakage risk caused by local creep and thinning of gaskets;

  High-precision assembly process of the electrolyzers for better consistency, namely less differences among various equipment in the hydrogen production cluster, and more precise control over the cluster.

5000 HOURS
Accelerated stress test

4.3kWh/Nm³
DC power consumption

20% ~ 110%
Working load range



Technical specifications >>>

NAME	E–200	E–500	E–1000	E–1200	E–1500	E–2000
Hydrogen production capacity (Nm³/h)	200	500	1000	2000	1500	2000
DC power consumption (kWh/Nm³)	⩽4.3	⩽4.3	⩽4.3	⩽4.3	⩽4.4	⩽4.4
Maximum operating pressure (MPa)	3.2	3.2	1.8	1.8	1.8	1.8
Operating temperature (°C)	90±5	90±5	85±5	85±5	85±5	85±5
Crude hydrogen purity	⩾99.8%	⩾99.8%	⩾99.8%	⩾99.8%	⩾99.8%	⩾99.8%
Hydrogen purity after purification	⩾99.999%	⩾99.999%	⩾99.999%	⩾99.999%	⩾99.999%	⩾99.999%
Dew point of hydrogen after purification (°C)	-70	-70	-70	-70	-70	-70
Working load range	20-110%	20-110%	20-110%	20-110%	20-110%	20-110%
Cold start time (min)	⩽20	⩽20	⩽20	⩽20	⩽30	⩽30
Hot start time (min)	⩽3	⩽3	⩽3	⩽3	⩽5	⩽5

(Cold start: the period from starting at the environment temperature to when the hydrogen and oxygen purity is qualified;
hot start: the period from starting at 50±5°C to when the hydrogen and oxygen purity is qualified.)

SKID–MOUNTED HYDROGEN EQUIPMENT

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Advantages

- **Module–based**

  Skid-mounted module-based standard container design for a compact structure of electrolyzers that are convenient to deliver and install.

- **High efficiency**

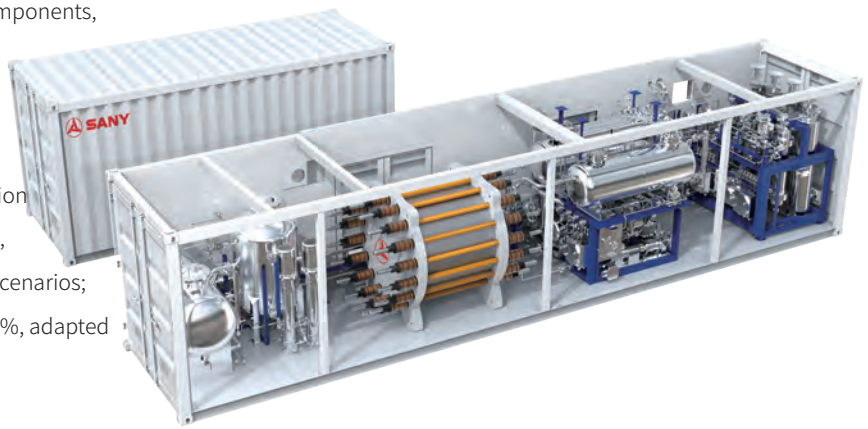
  Core materials such as high-performance electrodes and membranes and a new design of the flow field for operation under low energy consumption.

- **High reliability**

  Long-term stability testing of core components, verification of the equipment under extreme operating conditions, and full-process monitoring and early warning of key parameters and indicators;
  All the skid-mounted equipment, pressure-bearing components, and electrical components verified by CE certification to meet the requirements for exports.

- **High flexibility**

  Flexible application scenarios, suitable for hydrogenation integrated stations, small and medium-sized refineries, natural gas hydrogen blending and other application scenarios;
  Flexible operation, allowing operation range of 20~110%, adapted to different hydrogen production conditions.



Technical specifications

NAME	V–200	V–500	V–1000
Hydrogen production capacity (Nm^3/h)	200	500	1000
DC power consumption (kWh/Nm^3)	⩽4.3	⩽4.3	⩽4.3
Maximum operating pressure (MPa)	3.2	1.8	1.8
Operating temperature (°C)	90±5	90±5	85±5
Crude hydrogen purity	⩾99.8%	⩾99.8%	⩾99.8%
Hydrogen purity after purification	⩾99.999%	⩾99.999%	⩾99.999%
Dew point of hydrogen after purification (°C)	-70	-70	-70
Working load range	20-110%	20-110%	20-110%
Cold start time (min)	⩽20	⩽20	⩽30
Hot start time (min)	⩽5	⩽5	⩽3

(Cold start: the period from starting at the environment temperature to when the hydrogen and oxygen purity is qualified;
hot start: the period from starting at 50±5°C to when the hydrogen and oxygen purity is qualified.)

MULTI–IN–ONE HYDROGEN EQUIPMENT

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Advantages

- **Highly adaptable**

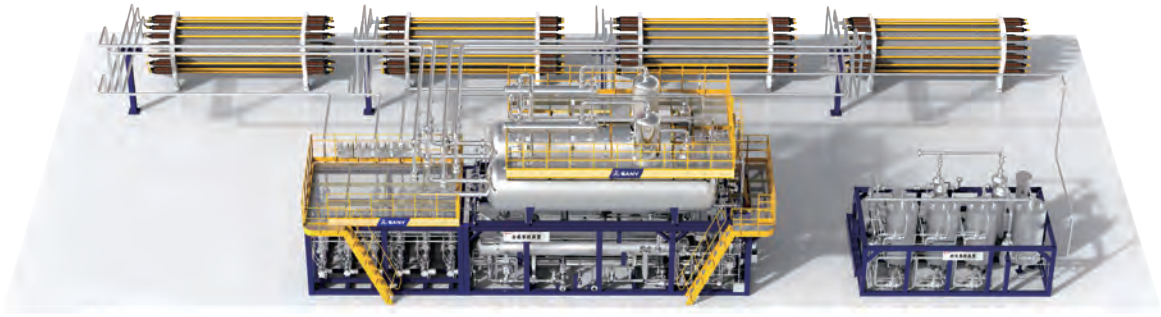
  The electrolyzer supports separate circulation of alkali and control of operating parameters under independent power supply, which can meet the operation scheduling and power allocation of multiple equipment in applications of hydrogen production from wind and solar power.

- **Highly safe**

  The purity of the gas is monitored at the outlet of the electrolyzer to understand the operating status of every electrolyzer and improve the operating safety of the multi-in-one system.
  The five-level safety protection system provides real-time monitoring of operating parameters of all the indicators and factors, and timely warning and interlock shutdown for abnormal conditions to guarantee safe and credible operation.

- **High economic**

  The circulation of hot alkali realizes the recyclable utilization of waste heat in electrolysis, and hot standby and quick start-up of the electrolyzer for better efficiency in the comprehensive utilization of energy;
  The gas preheating process of the purification system realizes the recyclable utilization of heat from deoxygenated and reproduced gas with a decrease in the consumption of electric heating and cooling water.



Technical specifications

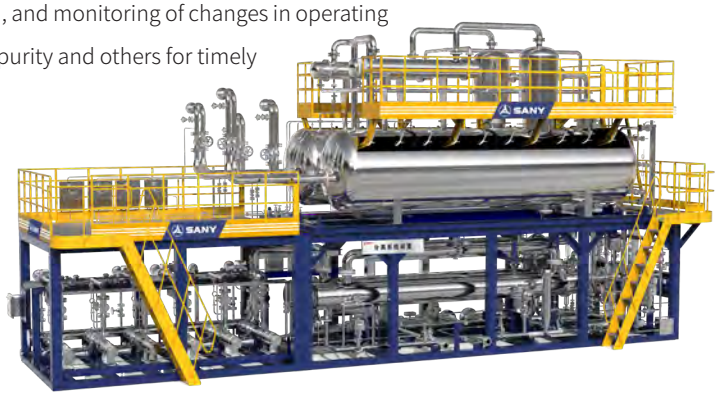
NAME	4*1000	4*1200
Hydrogen production capacity (Nm^3/h)	4000	4800
DC power consumption (kWh/Nm^3)	⩽4.3	⩽4.3
Maximum operating pressure (MPa)	1.8	1.8
Operating temperature (°C)	85±5	85±5
Crude hydrogen purity	⩾99.8%	⩾99.8%
Hydrogen purity after purification	⩾99.999%	⩾99.999%
Dew point of hydrogen after purification (°C)	-70	-70
Working load range	15-120%	15-120%
Cold start time (min)	⩽30	⩽30
Hot start time (min)	⩽3	⩽3

(Cold start: the period from starting at the environment temperature to when the hydrogen and oxygen purity is qualified;
hot start: the period from starting at 50±5°C to when the hydrogen and oxygen purity is qualified.)

Advantages

- **Ultra-safe**

Safety measures for the full-scale and full-element control of the system, and monitoring of changes in operating parameters such as thermal, pressure, liquid level of the separator, gas purity and others for timely response to abnormal conditions.



- **Excellent energy-saving efficiency**

Dynamic dual PID regulation of alkali thermal and dynamic dual PID regulation control methods are introduced to reduce the energy consumption index of auxiliary power equipment by 10%.

- **Exceptional flexibility**

Optimal algorithm utilized for the dynamic balance among alkali flow, thermal and pressure under power fluctuation conditions, better gas purity and lower energy consumption of the whole system under low load, for better adaptability to system load fluctuations.

- **Ultra-intelligent**

Automatic control provided for various equipment, valves and instruments in the skid with multi-level intelligent control, DCS monitoring and PLC control management in the central control room;

Automatic sampling and analysis, automatic water replenishment, intelligent drainage, and intelligent nitrogen replacement.

Technical specifications >>>

NAME	B-500	B-1000	B-1500	B-2000	B-4000	B-6000
Hydrogen processing capacity (Nm^3)	500	1000/1200	1500	2000	4000	6000
Maximum operating pressure (MPa)	3.2	3.2	1.8	1.8	1.8	1.8
Hydrogen purity after purification	⩾99.999%	⩾99.999%	⩾99.999%	⩾99.999%	⩾99.999%	⩾99.999%
Dew point of hydrogen after purification (°C)	-70	-70	-70	-70	-70	-70
Working load range	20-120%	20-120%	20-120%	20-120%	20-120%	20-120%
Purification method	I	I II	I II	I II	I II III	II III
Control method	Fully automatic PLC	Fully automatic PLC	Fully automatic PLC	Fully automatic PLC	Fully automatic DCS	Fully automatic DCS

(Cold start: the period from starting at the environment temperature to when the hydrogen and oxygen purity is qualified; hot start: the period from starting at 50±5°C to when the hydrogen and oxygen purity is qualified.)

MODULAR ALKALINE ELECTROLYZER

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Advantages

- **High efficiency and energy saving**

  Zero-pole distance structure and high activity electrodes for electrolyzers to run under high current density and low energy consumption;

  Stray current tackled in the main pipe for the ultra-high current efficiency and better capacity of electrolyzers.

- **Safe and reliable**

  Wide range of power adjustment, and full-load hydrogen purity≥99.9%, oxygen purity ≥99%, under safe operation conditions;

  Fast warm start with qualified gas purity in the whole process, and real-time start and stop at any time for better adaptability to hydrogen production applications from wind and solar energy.

- **Easy to operate and maintain**

  Module-based design and assembly for exceptionally easy maintenance, downtime＜1 day, electrolyzer replacement period ＜2 hours, and annual run-time: over 8000 hours.

< 2 HOURS
Replacement time per electrolytic chamber

4.5kWh/Nm³
DC power consumption

5% ~ 120%
Working load range

Technical specifications >>>

NAME	S–1000	S–2000	S–3000
Hydrogen production capacity (Nm^3/h)	1000	2000	3000
DC power consumption (kWh/Nm^3)	≤4.5	≤4.5	≤4.5
Current density (A/m^2)	≥10000	≥10000	≥10000
Maximum operating pressure (MPa)	0.5	0.5	0.5
Operating temperature (°C)	85±5	85±5	85±5
Crude hydrogen purity	≥99.9%	≥99.9%	≥99.9%
Crude oxygen purity	≥99.2%	≥99.2%	≥99.2%
Hydrogen purity after purification	≥99.999%	≥99.999%	≥99.999%
Dew point of hydrogen after purification (°C)	-70	-70	-70
Working load range	5-120%	5-120%	5-120%
Cold start time (min)	≤20	≤20	≤20
Hot start time (min)	≤3	≤3	≤3
Annual working hours (h)	≥8000	≥8000	≥8000

(Cold start: the period from starting at the environment temperature to when the hydrogen and oxygen purity is qualified;
hot start: the period from starting at 50±5°C to when the hydrogen and oxygen purity is qualified.)

PEM ELECTROLYZER

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Advantages

- **High energy density**

  Proton membrane materials with high ion conductivity and unique design of electrolyzers with high energy density for the industry-leading rated current density, and smaller volume and footprint of electrolyzers.

- **Quick response to fluctuations**

  Electrolyzers are able to withstand a pressure difference of more than 3.5MPa, produce hydrogen purity≥99.9%, oxygen purity≥99%, under low load conditions, ensuring the safety of electrolyzers and systems under rapid fluctuations and changes of load conditions;

  Electrolyzers with a smaller mass and better isolation of gas offers a shorter period of cold and hot starts to meet the customer' s demand for applications with a need for fast start and stop.stop at any time for better adaptability to hydrogen production applications from wind and solar energy.

- **Easy to operate and maintain**

  Only pure water needed for the operation process where long-term unattended operation is possible with no chemical treatment involved.

2.5 ~ 3A/m²
Current density

4.3kWh/Nm³
DC power consumption

5% ~ 120%
Working load range

Technical specifications

NAME	P–200
Hydrogen production capacity (Nm^3/h)	200
DC power consumption (kWh/Nm^3)	⩽4.3
Current density (A/m^2)	⩾25000
Maximum operating pressure (MPa)	3.0
Operating temperature (°C)	70±5
Working load range	5-120%
Cold start time (min)	⩽5
Hot start time (min)	0

(Cold start: the period from starting at the environment temperature to when the hydrogen and oxygen purity is qualified;
hot start: the period from starting at 50±5°C to when the hydrogen and oxygen purity is qualified.)

DEMONSTRATION PROJECTS

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DA'AN WIND AND SOLAR GREEN HYDROGEN SYNTHESIS AMMONIA INTEGRATION DEMONSTRATION PROJECT

No.	Name	Scale	Remark
1	Air separation unit (Including air compression station, oxygen liquefaction unit)	20000Nm³/h Nitrogen	
2	Electrolysis hydrogen producing unit	46000Nm³/h Hydrogen	36 sets of 1000 Nm³/h alkaline electrolyzers, and 50 sets of 200 Nm³/h PEM electrolyzers
3	Synthesis ammonia unit	30*10⁴ t/a	
4	Solid hydrogen storage unit	60000Nm³/h Hydrogen	

- The largest integrated electrolysis hydrogen producing and refueling station in China.
- Hydrogen producing: 2000 Nm³/h, hydrogen refueling: 2000 kg/day.
- A demonstration case of the comprehensive application of hydrogen energy integrating "producing, refueling and use".

2000kg
INTEGRATED HYDROGEN PRODUCING AND REFUELING STATION DEMONSTRATION PROJECT

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