德国品质
German Quality

固体氧化物燃料电池与电解池一体化系统

SOLID OXIDE FUEL CELL AND ELECTROLYSIS CELL SYSTEM

LEANITIATIVE
科尼弗

赫杰姆机电科技（西安）有限责任公司
HAJOMECH Mechanical & Electrical Technology(Xi'an)Co.,Ltd

CATALOG
目 录

前言 FOREWORD

双碳战略全面纵深推进，全球能源体系正向高效、低碳、可逆、分布式方向转型。固体氧化物燃料电池（SOFC）与可逆固体氧化物电解池（SOEC）一体化系统，凭借全固态结构、双向可逆转换、广谱燃料适配、无贵金属依赖等核心优势，打破传统设备瓶颈，实现电-气互通与多能耦合。

该系统基于先进高温电化学机理，能源转换效率远高于传统设备，可高效完成发电、热电联供及绿氢/合成气制备。金属支撑或全固态陶瓷结构杜绝泄漏腐蚀，运行稳定、寿命长，无需贵金属催化剂，显著降低产业化成本。支持快速双向工况切换，适配多种燃料，技术通用性强。

应用场景广泛：为园区、商业体及偏远区域提供分布式热电联产与独立供能；消纳风光富余电力制氢，实现长效储能；助力化工、冶金等高耗能产业低碳转型；支撑电网调峰调频。全面契合能源转型与产业脱碳趋势。

SOFC/SOEC一体化系统以前沿技术突破能源转换瓶颈，可为分布式供能、绿氢制备、工业低碳、电网储能等领域提供高效、可靠、绿色的解决方案，助力全球能源革新与双碳目标落地。

As the "Dual Carbon" strategy advances comprehensively and deeply, the global energy system is transitioning toward high efficiency, low carbon emissions, reversibility, and distributed architecture. Integrated Solid Oxide Fuel Cell (SOFC) and Reversible Solid Oxide Electrolysis Cell (SOEC) systems overcome the bottlenecks of traditional equipment by leveraging core advantages such as an all-solid-state structure, bidirectional reversible conversion, broad fuel compatibility, and independence from precious metals, thereby enabling electricity-gas interoperability and multi-energy coupling.

Based on advanced high-temperature electrochemical principles, this system offers energy conversion efficiency far superior to conventional equipment, enabling efficient power generation, combined heat and power (CHP) production, and the generation of green hydrogen or syngas. Its metal-supported or all-solid-state ceramic structure eliminates leakage and corrosion, ensuring stable operation and a long service life; furthermore, the absence of precious metal catalysts significantly reduces industrialization costs. The system supports rapid, bidirectional operational switching and is compatible with a wide range of fuels, demonstrating strong technological versatility.

It offers a wide range of application scenarios: providing distributed CHP and independent energy supply for industrial parks, commercial complexes, and remote areas; utilizing surplus wind and solar power for hydrogen production to achieve long-duration energy storage; facilitating the low-carbon transition of energy-intensive industries such as chemicals and metallurgy; and supporting grid peak shaving and frequency regulation. It aligns perfectly with trends in energy transition and industrial decarbonization.

By breaking through energy conversion bottlenecks with cutting-edge technology, the integrated SOFC/SOEC system provides efficient, reliable, and green solutions for distributed energy supply, green hydrogen production, industrial decarbonization, and grid energy storage, thereby driving global energy innovation and the realization of "Dual Carbon" goals.

固体氧化物燃料电池与电解池一体化系统

INTEGRATED SOLID OXIDE FUEL CELL AND ELECTROLYSIS CELL SYSTEM

科尼弗品牌在全球固体氧化物电池、电堆及解决方案领域占据核心地位，年产能分别达到20MW固体氧化物燃料电池（SOFC）与70MW固体氧化物电解池（SOEC）。公司固体氧化物技术具备成熟的实地应用经验，在燃料电池与电解两种模式下均展现出行业顶尖的高性能与耐久性。其高效能固体氧化物电堆可灵活集成于数千瓦至兆瓦级系统。

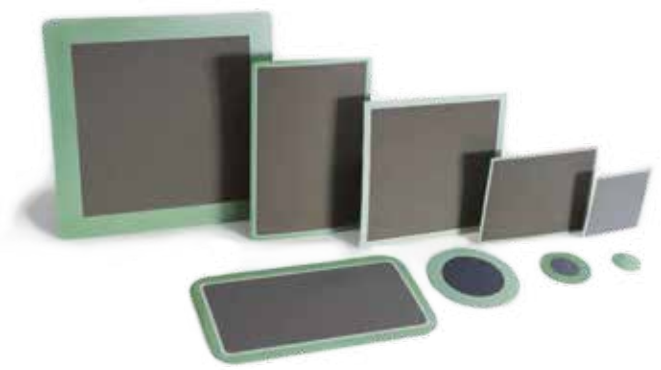
The CLEANITIATIVE brand holds a pivotal position in the global solid oxide cell, stack, and solutions sector, boasting an annual production capacity of 20 MW for solid oxide fuel cells (SOFC) and 70 MW for solid oxide electrolysis cells (SOEC). The company's solid oxide technology is backed by extensive field application experience, demonstrating industry-leading performance and durability in both fuel cell and electrolysis modes. Its high-efficiency solid oxide stacks can be flexibly integrated into systems ranging from the kilowatt to the megawatt scale.

科尼弗品牌单体电池

CLEANITIATIVE Brand Single Battery Cell

单体电池是固体氧化物电堆的核心组成部件，由致密电解质层与多孔阳极、阴极构成。作为电化学反应的基本单元，单体电池直接决定了电堆的能量转换效率与运行寿命。科尼弗品牌的高性能单体电池，依托先进的金属支撑或陶瓷支撑与界面调控技术，在燃料电池(SOFC)与电解池(SOEC)模式下均具备出色的功率密度与热循环稳定性。多个单体电池通过连接体堆叠集成电堆，为大规模制氢与高效发电提供可靠的基础单元。

The single battery cell is the core component of a solid oxide stack, consisting of a dense electrolyte layer sandwiched between a porous anode and cathode. As the fundamental unit for electrochemical reactions, the single battery cell directly determines the stack's energy conversion efficiency and operational lifespan. Leveraging advanced metal- or ceramic-supported architectures and interface engineering technologies, CLEANITINTIVE's high-performance single battery cells deliver exceptional power density and thermal cycling stability in both fuel cell (SOFC) and electrolysis (SOEC) modes. Multiple single battery cells are stacked and integrated via interconnects to form the stack, providing a reliable foundation for large-scale hydrogen production and high-efficiency power generation.



01 技术参数
TECHNICAL PARAMETERS

燃料/蒸汽电极：
镍/氧化钇稳定氧化锆（Ni/YSZ）
Fuel/Steam Electrode:
Nickel/Yttria-Stabilized Zirconia (Ni/YSZ)

电解质：
8mol%氧化钇稳定氧化锆（8YSZ）
Electrolyte:
8 mol% Yttria-Stabilized Zirconia (8YSZ)

空气电极：
镧锶钴铁氧体/钆掺杂氧化铈（LSCF/GDC）
Air Electrode:
Lanthanum Strontium Cobalt Ferrite / Gadolinium-Doped Ceria (LSCF/GDC)

总厚度/Total thickness: 305±25μm
标准尺寸/Standard Size: 120×80mm
机械强度/MS: σ_0＞500MPa（ASTM C-1499）
威布尔模数/Weibull Modulus: m＞8

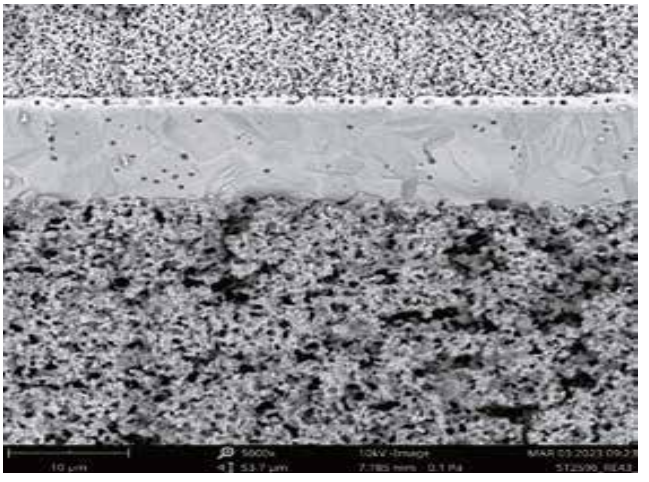
02 核心优势
CORE ADVANTAGES

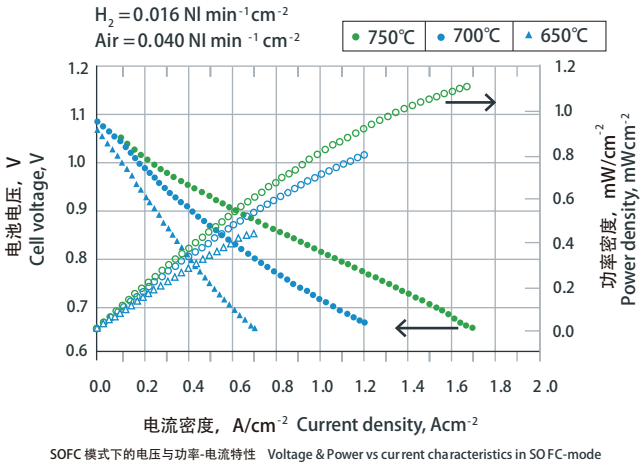
可按需定制形状尺寸：(最大180×180mm)；
空气电极可定制、机械强度高、可靠性好；
燃料电池与电解模式长期稳定性经电堆验证。

Customizable shapes and dimensions available upon request (maximum 180 × 180 mm);
Customizable air electrodes, featuring high mechanical strength and excellent reliability;
Long-term stability in both fuel cell and electrolysis modes has been validated through stack testing.

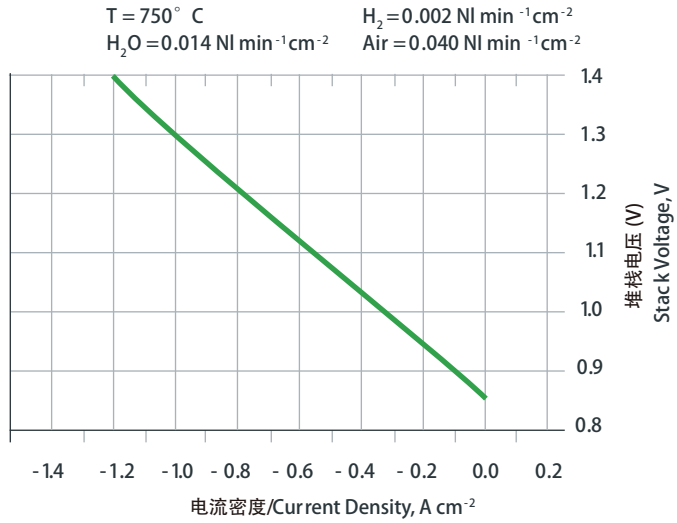
03 工作条件
WORKING CONDITIONS

工作温度/Operating Temperature: 650-800℃

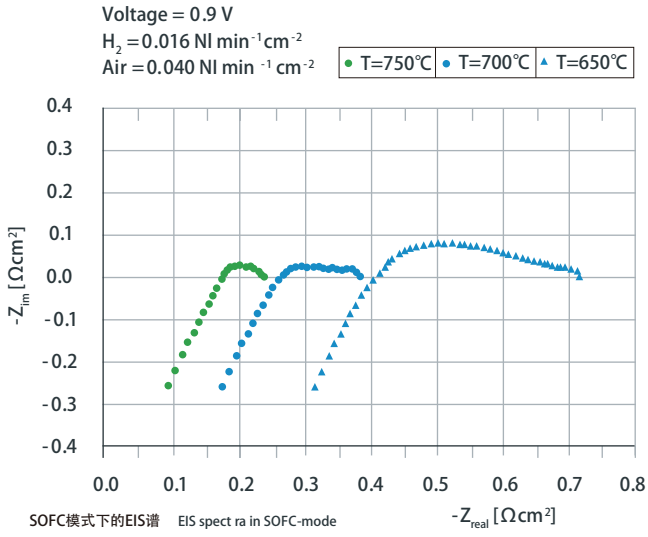




SOFC 模式下的电压与功率-电流特性　Voltage & Power vs current characteristics in SOFC-mode



SOE模式下的电压-电流特性 / Voltage vs current characteristics in SOE-mode



SOFC模式下的EIS谱　EIS spect ra in SOFC-mode

04 应用领域 APPLICATION AREAS

用于氢气/氢载体、天然气、沼气、蒸汽电解、二氧化碳/水共电解的固体氧化物电池电堆集成。

Solid Oxide Cell Stack Integration for Hydrogen/ Hydrogen Carriers, Natural Gas, Biogas, Steam Electrolysis, and CO_2/H_2O Co-electrolysis.

科尼弗品牌电堆
CLEANITIATIVE Brand Stack

CT8X

电堆是固体氧化物燃料电池（SOFC）与电解池（SOEC）系统的核心组件，由多个单体电池通过连接体串联堆叠而成，承担 着化学能与电能相互转化的关键任务。科尼弗品牌的高效能固体氧化物电堆，基于其自主研发的高性能单体电池与精密密封技术，在发电模式下可实现行业领先的功率密度与热电联供效率，在电解模式下则展现出卓越的制氢速率与长期运行稳定性。科尼弗品牌电堆通过灵活集成，为全球清洁能源转型提供坚实的技术载体。

The stack is the core component of Solid Oxide Fuel Cell (SOFC) and Solid Oxide Electrolysis Cell (SOEC) systems; formed by stacking multiple individual cells in series via interconnects, it performs the critical function of interconverting chemical and electrical energy. Leveraging proprietary high-performance cells and precision

sealing technology, CLEANITIATIVE's high-efficiency solid oxide stacks achieve industry-leading power density and combined heat and power (CHP) efficiency in power generation mode, while demonstrating exceptional hydrogen production rates and long-term operational stability in electrolysis mode. Through flexible integration, CLEANITIATIVE stacks serve as a robust technological foundation for the global clean energy transition.

01 技术参数 TECHNICAL PARAMETERS

电堆型号/Stack Model: CT8X

单体电池数/Number of Individual Cells:
70片重复单元/70 Repeating Units

尺寸（宽×高×深，不含压紧系统）：
184mm×299mm×250mm
Dimensions (W×H×D, excluding compression system):
184mm×299mm×250mm

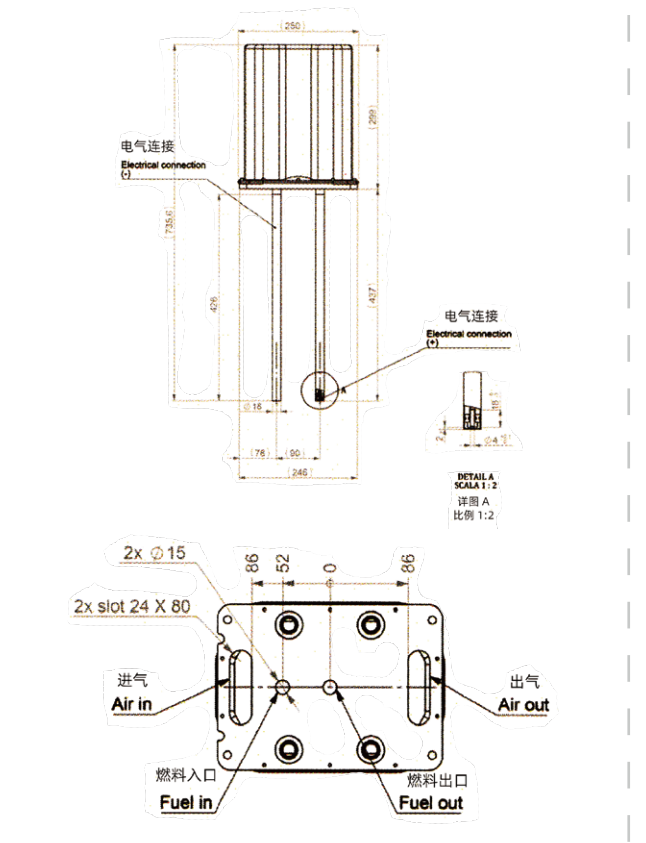
适配燃料：
氢气,天然气重整气,沼气,液化石油气重整气,氨气
Compatible Fuels:
H_2, Reformed Natural Gas, Biogas, Reformed LPG, NH_3

重量/Weight: 31.5kg

02 核心优势 CORE ADVANTAGES

- 自主设计，集成压紧系统与集流器；
- 性能优异：高效率、实地验证长寿命；
- 结构稳固：可承受热循环；
- 低压降

- Independently designed, integrating the clamping system and current collector.
- Superior Performance: High efficiency and field-proven longevity.
- Robust Structure: Capable of withstanding thermal cycling.
- Low Dropout



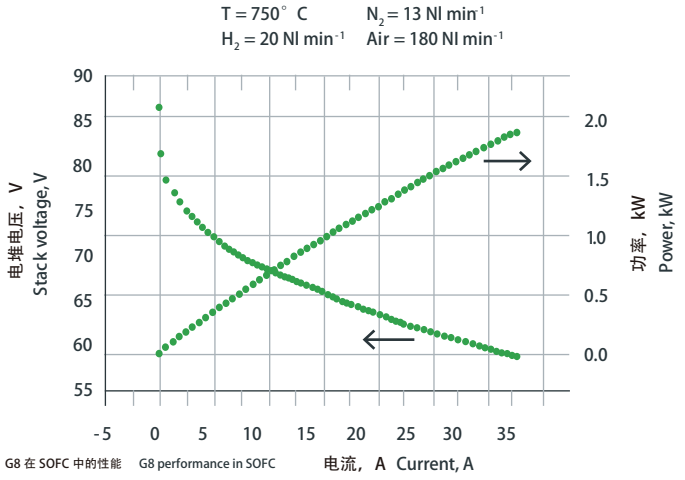
03 性能数据
PERFORMANCE DATA

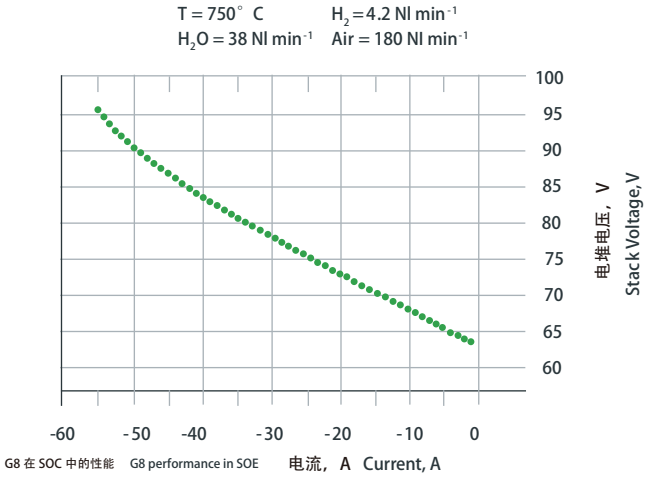
工作模式 Operating Mode	发电（SOFC） Power Generation (SOFC)	制氢（SOE） Hydrogen Production (SOE)
额定功率 Rated Power	1.7kW	4.5kW
最大功率 Maximum power	1.8kW	5kW
SOFC效率 SOFC efficiency	天然气重整>60% Natural gas reforming >60%	-
燃料利用率（SOFC） Fuel Utilization (SOFC)	最高83% Up to 83%	-
蒸汽转化率（SOE） Steam Conversion Rate (SOE)	-	最高90% Up to 90%
额定电流（SOFC） Rated current (SOFC)	32A	-
额定电流（SOE） Rated current (SOE)	-	48A
开路电压 Open-circuit voltage	干燥氢气中>84V >84 V in dry hydrogen	-
极化工作电压 Polarization operating voltage	>55V	91V（额定工况） 91V (rated operating condition)
工作温度 Operating Temperature	600 - 800℃	650 - 800℃
设计寿命 Design life	60000 H	-
衰减率 Attenuation rate	恒功率下每1000H效率衰减0.2% Efficiency degrades by 0.2% per 1,000 hours at constant power.	-

04 应用领域
APPLICATION AREAS

发电机组、热电联产（CHP）、电解槽、可逆系统。

Generator sets, combined heat and power (CHP), electrolyzers, reversible systems.





科尼弗品牌电堆
CLEANITIATIVE Brand Stack

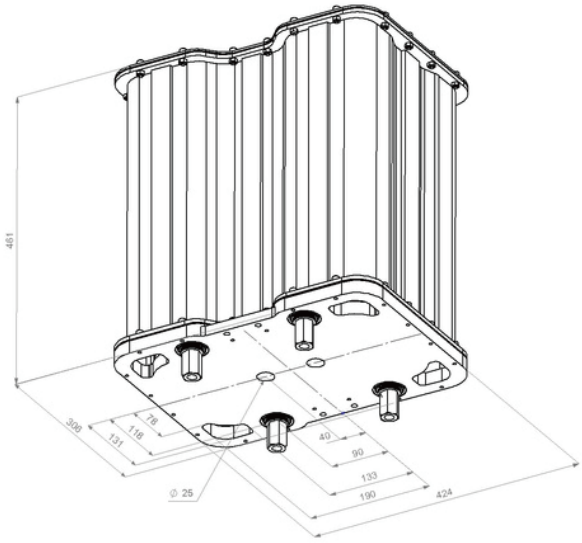
CT8X-10

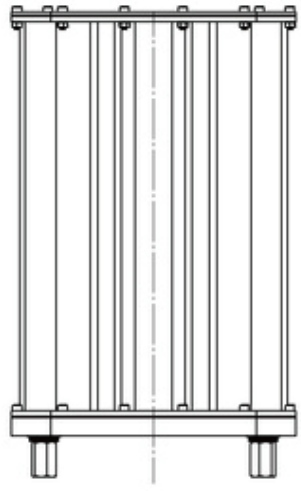
01 技术参数
TECHNICAL PARAMETERS

电堆型号/Stack Model: CT8X-10
电池数量/Number of batteries: 400片，100层/400 pieces, 100 layers
尺寸（宽×高×深，不含压紧系统）： 306mm×461mm×424mm Dim. (W × H × D, excluding clamping system) 306mm×461mm×424mm
重量/Weight: 150kg

适配燃料：氢气,天然气重整气,沼气,液化石油气重整气,氨气

Compatible Fuels: H_2, Reformed Natural Gas, Biogas, Reformed LPG, NH_3



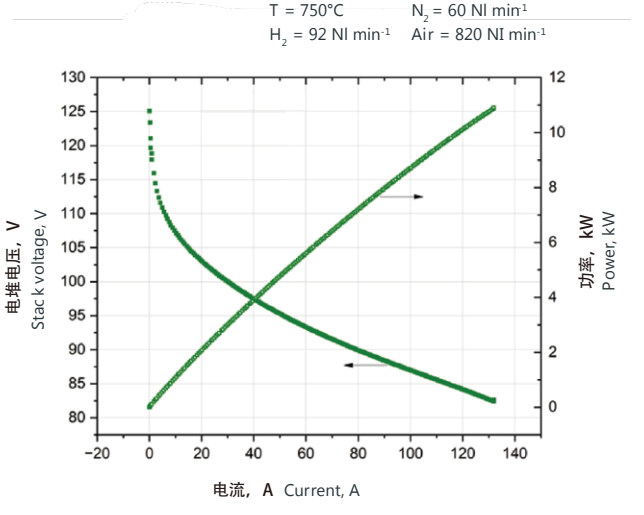


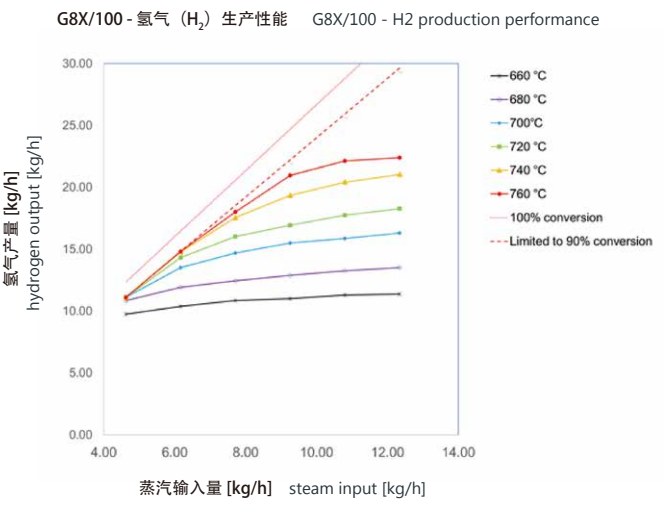
02 性能数据 PERFORMANCE DATA

工作模式 Operating Mode	发电（SOFC） Power Generation (SOFC)	制氢（SOE） Hydrogen Production (SOE)
额定功率 Rated Power	10kW	25kW
最大功率 Maximum power	10.3kW	30kW
SOFC效率 SOFC efficiency	天然气重整>63% Natural gas reforming >63%	-
燃料利用率 Fuel Utilization	最高83% Up to 83%	-
蒸汽转化率 Steam Conversion Rate	-	最高90% Up to 90%

额定电流 Rated current	128A	192A
最大功率电流 Current at maximum power	132A	240A
开路电压 Open-circuit voltage	干燥氢气中>120V >120 V in dry hydrogen	-
极化工作电压 Polarization operating voltage	>78V	130V（额定工况） 130V (rated operating condition)
电解电耗 Electrolytic power consumption	-	34.6kWh/kg H_2
最大产氢速率 Max hydrogen production rate	-	21kg/d
工作温度 Operating Temperature	650 - 800℃	650 - 800℃
设计寿命 Design life	60000 H	-
衰减率 Attenuation rate	恒功率下每1000H效率衰减0.2% Efficiency degrades by 0.2% per 1,000 hours at constant power.	-

天然气重整气工况，支持高达 90% 的内部重整
Supports up to 90% internal reforming under natural gas reforming operating conditions.





03 核心优势
CORE ADVANTAGES

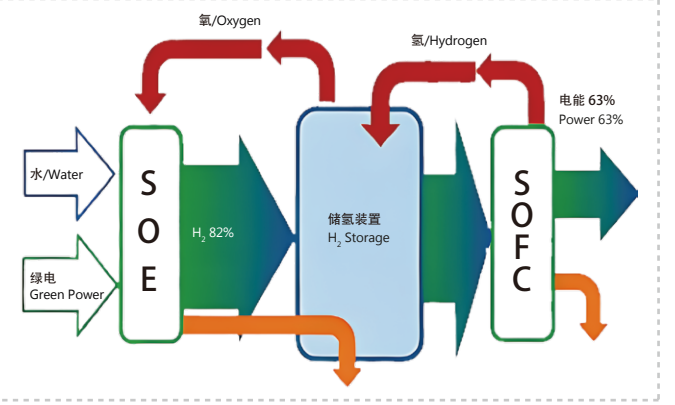
- 自主设计，集成压紧系统与集流器；
- 性能优异：高效率、实地验证长寿命；
- 结构稳固：可承受热循环；
- 低压降

- Independently designed, integrating clamping system and current collector.
- Superior Performance: High efficiency and field-proven longevity.
- Robust Structure: Capable of withstanding thermal cycling.
- Low Dropout

04 应用领域
APPLICATION AREAS

同CT8X电堆，适配发电机组、热电联产、电解槽、可逆系统。

Like the CT8X stack, it is compatible with generator sets, combined heat and power (CHP) systems, electr-olyzers, and reversible systems.



燃料电池模块（FCM）
Fuel Cell Module

燃料电池模块（FCM）由CT8X电堆、集成重整、换热、燃烧等热区功能集成的标准化发电或电解单元，属于“热区核心模块”，提供基本的热化学反应与发电功能。适用微分布式场景（CHP）及二次开发。

The Fuel Cell Module (FCM) is a standardized power generation or electrolysis unit—classified as a "core hot-zone module"—that integrates the CT8X stack with hot-zone functions such as reforming, heat exchange, and combustion. It provides the fundamental thermochemical reaction and power generation capabilities and is suitable for micro-distributed applications (such as CHP) and secondary development.

01 技术参数
TECHNICAL PARAMETERS

电堆型号/Stack Model: CT8X

电池数量/Number of batteries:
70片/70 pieces

尺寸（宽×高×深，不含压紧系统）：
399mm×878mm×456mm
Dim. (W × H × D, excluding clamping system)
399mm×878mm×456mm

重量/Weight: 83.8kg

适配燃料：脱硫天然气（EN437）、天然气混合气、氢气、沼气
Compatible fuels: Desulfurized natural gas (EN437), natural gas mixtures, hydrogen, biogas.

02 性能参数（天然气）
PERFORMANCE PARAMETERS (NATURAL GAS)

最大功率/Max power: 1.7kW (DC)

效率/efficiency: 最大58%/Up to 58%

额定功率电压/Rated power voltage:
56V

额定功率电流/Rated power current:
30A

功率调节范围/Power adjustment range:
30% - 100%

电堆工作温度/Stack operating temperature:
750℃ - 780℃

衰减率/Attenuation rate: <0.3%/kh

蒸汽碳比/Steam-to-carbon ratio: >1.8

排气温度/Exhaust temperature: 120-140℃

排气质量流量/Exhaust mass flow rate:
3-5g/s

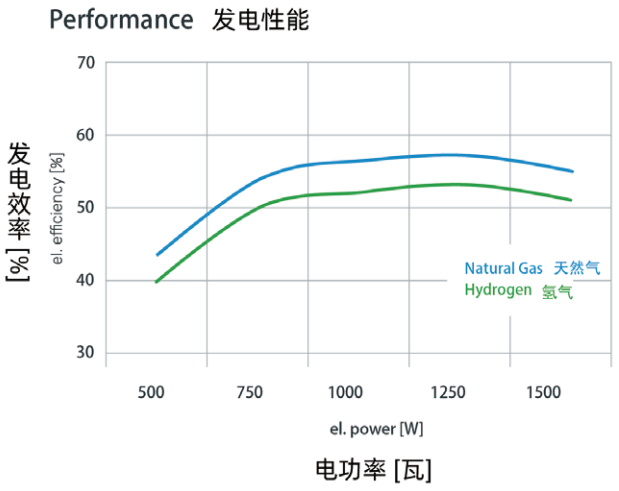
使用寿命/Service life: 5-7年

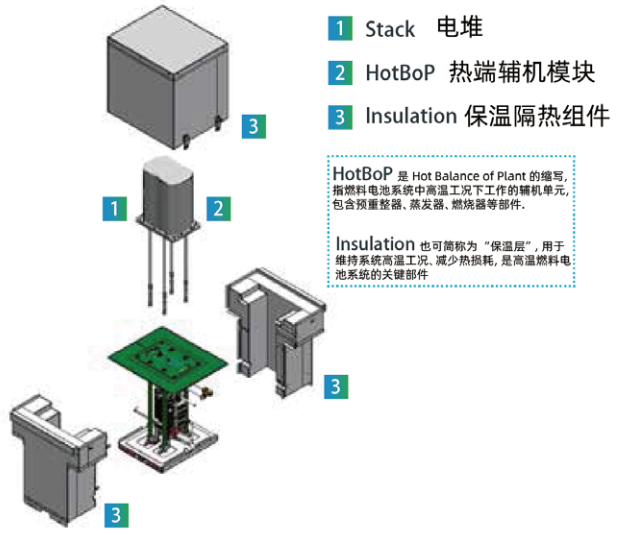
03 核心优势
CORE ADVANTAGES

- 易集成、部分负载性能好、结构稳固、压降低；
- 集成点火器、重整器、补燃器、换热器、集流器；
- 技术成熟: 运行超6800万小时，发电86GWh；
- 规模化电堆生产、高性能、高燃料利用率、高功率密度；
- 内部介质/蒸汽处理、无贵金属催化剂；
- 欧洲供应链、欧洲制造。
- Easy to integrate, excellent part-load performance, robust structure, low pressure drop;
- Integrated igniter, reformer, afterburner, heat exchanger, and current collector;
- Proven technology: over 68 million hours of operation and 86 GWh of power generation;
- Scalable stack production; high performance, high fuel utilization, and high power density;
- Internal media/steam processing; no precious metal catalysts;
- European supply chain and manufacturing.

04 应用领域
APPLICATION AREAS

微型热电联产（1kW-60kW）
Micro-Combined Heat and Power (1 kW–60 kW)





集成单元（CTPM-X）
Integrated Unit (CTPM-X)

科尼弗品牌集成单元CTPM-X是一款集成的标准化、预工程化能量模块，该模块分为两部分，顶部由额定电功率10 kW的CT8X-10电堆，以及预重整器、蒸发器、启动及尾气燃烧用的燃烧器、阴极换热器和保温层等热模块（HU-X）构成。底部由安全电子、流体控制及DC/DC升压器和水热回收装置（可选）等集成了连接箱（C&C）BOP组件，成为热模块与外部系统的接口。CTPM-X具备“即接即用”的现场部署能力，系统可用性高达99%以上、便于维护和占地面积小等优势，适用于数据中心、热电联供（CHP）及主电源解决方案等场景。

The CLEANITIATIVE CTPM-X is an integrated, standardized, and pre-engineered energy module. It consists of two sections: the upper part comprises a thermal module (HU-X) featuring a CT8X-10 stack with a rated electrical output of 10 kW, alongside a prereformer, evaporator, burner (for startup and tailgas combustion), cathode heat exchanger, and thermal insulation. The lower part houses the Balance of Plant (BOP) components—integrated into a Connection & Control (C&C) unit—which include safety electronics, fluid controls, a DC/DC boost converter, and an optional water/heat recovery system, serving as the interface between the thermal module and external systems. Offering "plug-and-play" on-site deployment, system availability exceeding 99%, ease of maintenance, and a compact footprint, the CTPM-X is suitable for applications such as data centers, combined heat and power (CHP) systems, and primary power solutions.

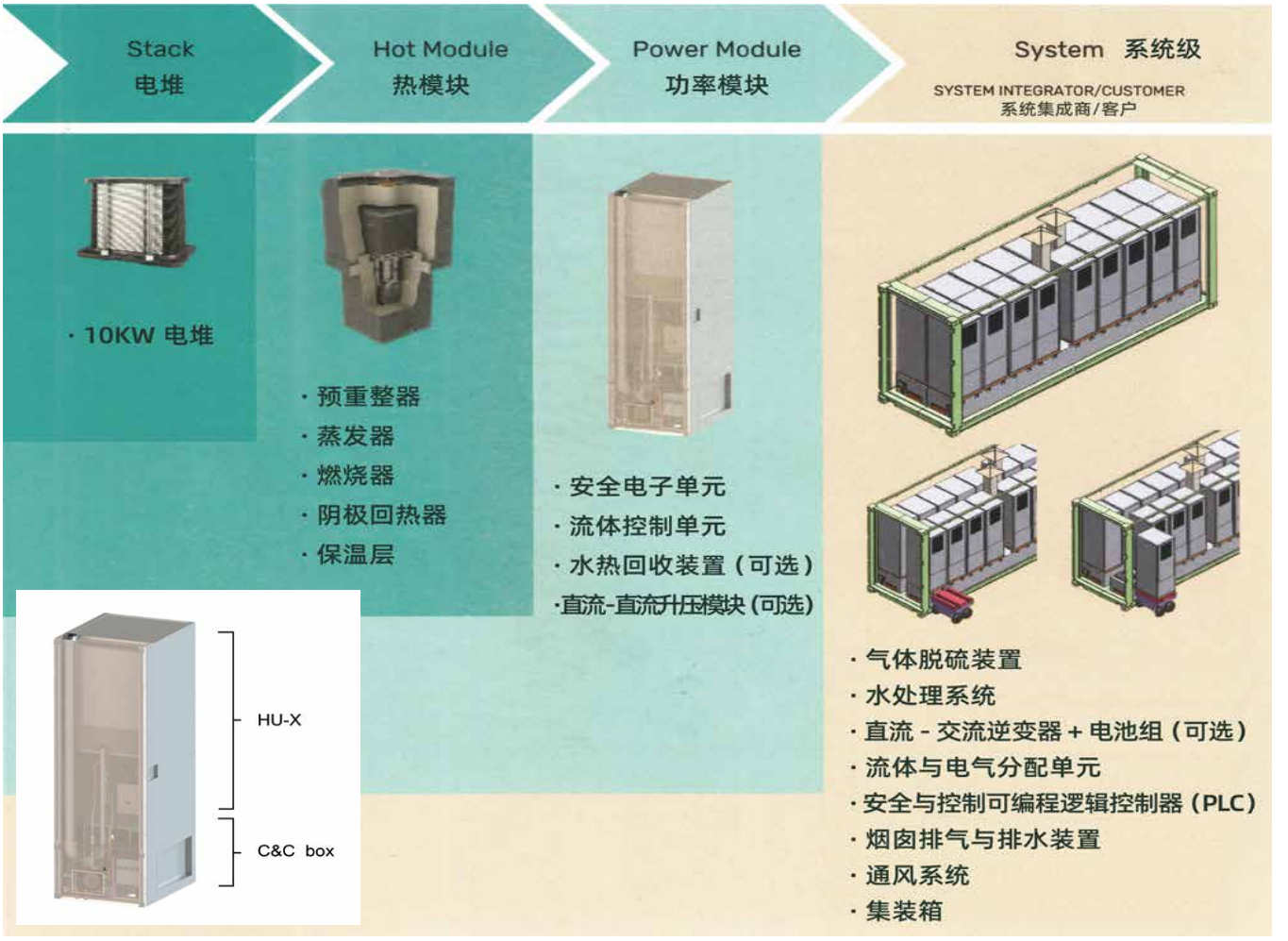
01 CTPM-X结构分为两部分
THE CTPM-X STRUCTURE IS DIVIDED INTO TWO PARTS

上部高温模块（HU-X）：集成电堆与高温BOP部件；

Upper High-Temperature Module (HU-X): Integrates the stack and high-temperature BOP components.

下部控制与连接箱（C&C）：高温模块与系统其他部分的接口。

Lower Control & Connection Box (C&C): Interface between the high-temperature module and the rest of the system.



02 核心优势 CORE ADVANTAGES

- 模块化设计，系统可用率＞99%；
- 维护性优；
- 占地面积小

- Modular design, system availability rate >99%;
- Excellent maintainability;
- Small footprint

03 应用领域 APPLICATION AREAS

- 数据中心；
- 热电联产（CHP）解决方案；
- 主电源解决方案

- Data Centers;
- Combined Heat and Power (CHP) Solutions;
- Prime Power Solutions

02 性能数据
PERFORMANCE DATA

参数 Parameter	数值 Numerical value
额定功率（直流，起始状态） Rated power (DC, initial state)	9.6kW
峰值功率（直流，起始状态） Peak power (DC, initial state)	10kW
额定功率发电效率（直流，低热值） Rated power generation efficiency (DC, net calorific value)	最高/Up to 63%
总效率（进水 30℃/ 出水 40℃） Overall efficiency (inlet 30°C / outlet 40°C)	＞100%
总效率（进水 50℃/ 出水 60℃） Overall efficiency (Inlet 50°C / Outlet 60°C)	＞90%
功率调节范围/Power adjustment range	30%–100%
输出电压/Output voltage	710–810VDC
升温时间/Warm-up time	<24h
排气温度/Exhaust temperature	<200℃
蒸汽碳比/Steam-to-carbon ratio	＞1.8
去离子水消耗/Deionized water consumption	2.3L/h
70℃冷凝水量/Condensate volume at 70°C	＞2.3L/h
输入电压/Input voltage	230V–50Hz
最大输入功率/Maximum input power	350W
宽x深x高/Width x Depth x Height	600x750x1900mm

比功率（净直流） Specific power (net flow)	21kW/m²
重量 weight	＜520kg
适配燃料 Compatible fuel	脱硫天然气、氢气 Desulfurized natural gas, hydrogen
热插拔能力 Hot-swappability	支持（系统级电气保护到位） Supported (system-level electrical protection is fully implemented)
维护通道 Maintenance accessway	正面单侧 Front single-sided

注：温度≤70℃时，冷凝水量超耗水量，无需外部补水；氢气工况功率最高降额20%。

Note: At temperatures ≤70°C, the amount of condensate generated exceeds water consumption, eliminating the need for external water makeup; under hydrogen operating conditions, power derating of up to 20% applies.

可逆电解系统（RES）
Reversible Electrolysis System

RES可逆电解系统是一款兼具高效制氢与清洁发电双重功能的固体氧化物能源系统。由成熟的 CT8X-8 电堆和CTPM-125 模块集成，RES 系统可在电解模式（SOEC）与燃料电池模式（SOFC）之间灵活切换，为用户提供真正的“电-氢-电”双向能量管理能力。

The RES reversible electrolysis system is a solid-oxide energy system that combines high-efficiency hydrogen production with clean power generation. Integrating the proven CT8X-8 stack and CTPM-125 module, the RES system flexibly switches between electrolysis mode (SOEC) and fuel cell mode (SOFC), providing users with true bidirectional "electricity-to-hydrogen-to-electricity" energy management capabilities.

01 技术参数
TECHNICAL PARAMETERS

电堆型号/Stack Model:　CT8X-8
模块型号/Module Model: CTPM-125
工作模式：电解+发电 Operating mode: Electrolysis+Power generation

控制方式：
独立 CTPM 模块控制 + 阵列主控

Control Method:
Independent CTPM module control + array master control

安装方式：室内/遮蔽环境

Installation method:
Indoor/sheltered environment

占地面积/Footprint area: ＜90m²/MW

安全系统：
安全可编程控制器（PLC）

Safety Systems:
Safety Programmable Logic Controller (PLC)

布局：
模块化，16模块构成2MW系统

Layout:
Modular design; 16 modules constitute a 2 MW system.

02 性能数据
PERFORMANCE DATA

项目 Parameter	RES -1（基础版） RES-1 (Basic Version)	RES -2（扩容版） RES-2 (Expanded version)
电解工况/Electrolysis operating conditions		
额定直流功率/Rated DC power	0.8MW	1.6MW
最大直流功率 * /Maximum DC power	1.00MW	2.00MW
二代电堆兼容功率 ** Second-generation stack power compatibility	1.25MW	2.5MW
系统能效/System energy efficiency		
系统单位能耗*** (AC) Specific consumption System*** (AC)	37~39 kWh/kg	
电堆单位能耗*** (DC) Specific consumption Stack*** (DC)	34.6 kWh/kg	
额定蒸汽转化率 Rated steam conversion rate	80%~90%	

产出介质/Produced medium		
额定产氢量 Rated hydrogen production capacity	23 kg/h	46 kg/h
最大产氢量 Maximum hydrogen production capacity	28.6 kg/h	57.2 kg/h
输出压力（表压） Outlet pressure (gauge pressure)	< 25 mbar(g)	
输出温度 Output temperature	＜200℃	
蒸汽参数/Steam parameters		
蒸汽压力（表压） Steam pressure (gauge pressure)	2.6 bar(g)	
蒸汽温度 Steam temperature	150~200℃	
蒸汽消耗量 Steam consumption	10-11 kg_{H_2O}/kg_{H_2}	
运行动态特性/Operational dynamic characteristics		
负荷调节范围 Load adjustment range	2.5%~100%	
升降负荷时间 **** Load ramp-up and ramp-down time	< 1 min	
运行温度 Operating temperature	650~800℃	
发电工况/Power generation mode		

项目 Parameter	RES -1（基础版） RES-1 (Basic Version)	RES -2（扩容版） RES-2 (Expanded version)
最大直流功率 Maximum DC power	240kW	480kW
适用燃料 Suitable fuels	富氢气体（氢含量＞50%） > 50% H_2	
燃料压力 Fuel pressure	6 bar	
发电系统效率 Power generation system efficiency	＞50% LHV	

注解/NOTE

* 可根据需求定制其他配置。

** 兼容第二代电堆产品。

*** 不含蒸汽制备能耗

**** 额定温度下，0~100% 全负荷升降时间（上下游设备无限制前提下）。

* Other configurations can be customized upon request.

** Compatible with second-generation stack products.

*** Excludes energy consumption for steam generation.

**** Ramp-up/ramp-down time from 0% to 100% full load at rated temperature (assuming no limitations from upstream or downstream equipment).

03 核心优势 CORE ADVANTAGES

- 高性能：系统综合效率高、蒸汽转化率优异；
- 高稳健性：调节速度快、CTPM模块支持热插拔更换；
- 高适配性：灵活对接用户工艺、可选配可逆运行；
- 多阵列机组可共用辅助系统；
- 支持个性化定制开发。

- High performance: high overall system efficiency and excellent steam conversion rate;;
- High robustness: fast adjustment speed; CTPM module supports hot-swapping.
- High adaptability: flexibly integrates with user processes; reversible operation available as an option.
- Multi-array units can share auxiliary systems;
- Supports personalized custom development.

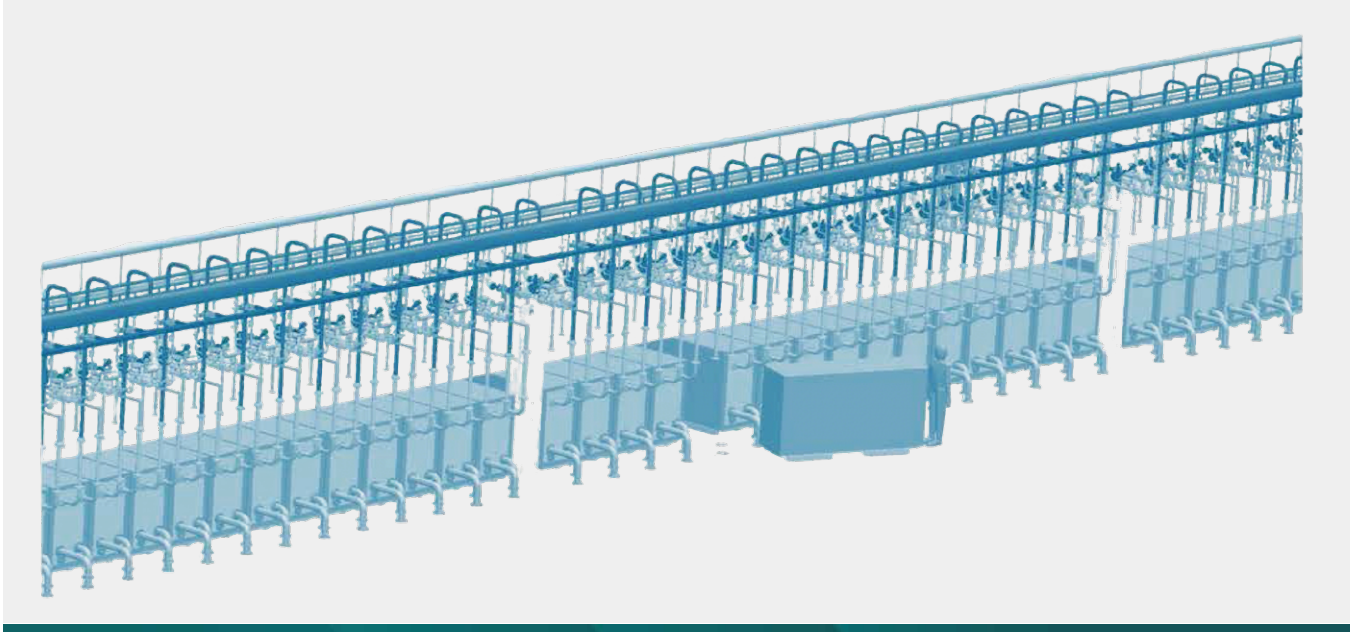
04 应用领域
APPLICATION AREAS

- 制氢制备、合成氨生产、合成燃料制备；
- 共电解反应；
- 电网配套服务。

- Hydrogen production, synthetic ammonia production, and synthetic fuel production;
- co-electrolysis reaction;
- Power grid support services.

注：可按需提供其他配置，也可提供纯电解系统（PES）；正向兼容第二代电堆；不含蒸汽发生；额定温度下0-100%负载升降载，不受上下游系统限制时。

Note: Other configurations are available upon request, including a pure electrolysis system (PES); forward-compatible with second-generation stacks; steam generation not included; applies to 0–100% load ramping at rated temperature, assuming no constraints from upstream or downstream systems.



应用情况
Application Status

目前，全球已投运科尼弗品牌热电系统超 2800 套。设备累计运行时长突破6800万小时，总发电量超86GWh。依托海量实际运行案例与实测数据，企业积累了深厚工程经验，持续赋能技术创新与市场拓展。

Over 2,800 CLEANITIATIVE cogeneration systems are operational worldwide, with 68 million+ operating hours and over 86 GWh of electricity generated. Leveraging extensive field cases and operational data, the company has built deep engineering expertise to drive technological innovation and market expansion.

LEANITIATIVE
科尼弗

地址：西安市经济技术开发区凤城二路天心大厦12层
Address：12 / F, Tianxin Building, Fengcheng 2nd Road,
Xi'an Economic and Technological Development Zone
电话 / Tel：+86（029）86184112　86184113
邮箱 / E-mail：webmaster@hajomech.com