



Company Address: CITIC Investment Building, Yuhuatai District, Nanjing City, Jiangsu Province, China
Tel: +86-025-52095601 +86 18061616729
Unified National Customer Service Hotline: info@ceeelectric.com
Welcome to our website: www.ceeelectric.com



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Hydrogen-Production Specialty Rectifier Transformer

Green power | Green product | Smart manufacturing | Intelligent service

Delivering Premium Power to the World

A photograph of the CEEG factory entrance. In the foreground, a large black sign with the CEEG logo and the Chinese characters '中电电气' is visible. Behind the sign, three tall flagpoles hold the Chinese national flag, the CEEG corporate flag, and another flag. The background shows a modern industrial building with a red roof and a clear blue sky.

**GREEN POWER, GREEN PRODUCTS,
SMART MANUFACTURING, INTELLIGENT SERVICE**

Founded in 1990, CEEG has been focusing on manufacturing for more than 30 years and exporting quality power equipment to the world with the core values of "Vision, Innovation and Responsibility". So far, CEEG has three major industries: power transmission and distribution, new energy and system solutions. CEEG guides by the green concept of "safety, energy conservation, and environmental protection". CEEG is a modern enterprise integrating manufacturing, sales and scientific research. CEEG was successively awarded the honorary titles of National High and New Tech Enterprises, National Innovative Enterprise, and has established industrial, academic and research bases such as Jiangsu Graduate Workstation and Jiangsu Engineering Research Center of Power Transformation Equipment.

CEEG's products include 220kV and below oil-immersed power transformer, traction transformer, mobile transformer, 35kV and below cast resin dry type transformers, VPI transformer, amorphous alloy dry type transformer, mining explosion-proof transformer, frequency conversion transformer, amorphous alloy transformer, anti-harmonic transformer, marine transformer, Pad-mounted transformer and European type substation, wind power and PV substation, energy storage substation, hydrogen-production specialty transformer, high and low voltage switchgear, etc. Its sales cover many industries such as railway, electric power, electronics, transportation, marine, coal mines, communications, construction, petroleum, chemical industry, aviation, etc.

Walking with giants and keeping pace with the world. CEEG has established long-term strategic partnerships with world-class companies such as DuPont, Siemens, ABB, ChinaBaowu, etc. Its transformers have been exported to more than 100 countries and regions in the world. The strategic layout of brand internationalization and service globalization has been formed, and is transitioning towards "manufacturing globalization + terminal solutions + services"!

CEEG has actively implemented the "double carbon" goal, focusing on the development of specialized transformers for the new energy industry (wind energy, PV, and hydroenergy storage). We can quickly provide customers with overall product design solutions and specialized, customized, and integrated services. By optimizing the configuration of batteries, inverters, bidirectional converters, wind energy and PV equipment. We can provide full lifecycle services and operations for energy storage systems, wind and solar storage systems, energy storage microgrid systems, and other projects, including engineering consulting, design, system integration, and station level monitoring.

Make CEEG to be the world's first choice!



Historical Background: Carbon peak Carbon neutrality

In the face of global Climate warming caused by carbon emissions, General secretary XiJinPing In September 2020, on the seventy-fifth session of the United Nations General Assembly put forward the vision of "China striving to achieve the peak of carbon emissions by 2030 and striving to achieve carbon neutrality by 2060." Subsequently, the "3060 target" was included in the 14th Five-Year Plan, and the Central Economic Work Conference for the first time listed carbon peak and carbon neutrality as one of the annual key tasks. In March 2021, the relevant targets were also written into the government work report for the first time.

“Carbon peak”

It means that the annual carbon emissions of a certain region or industry reach the highest value in history, which is the historical inflection point of carbon emissions from increasing to decreasing, and marks the transition of economic development from high energy consumption and high emissions to clean and low energy consumption mode.

“Carbon neutrality”

It refers to the total amount of carbon directly and indirectly emitted by human activities in a certain area within a certain period of time, and the total amount of carbon absorbed by afforestation and industrial carbon sequestration offset each other to achieve "net zero emissions" of carbon.

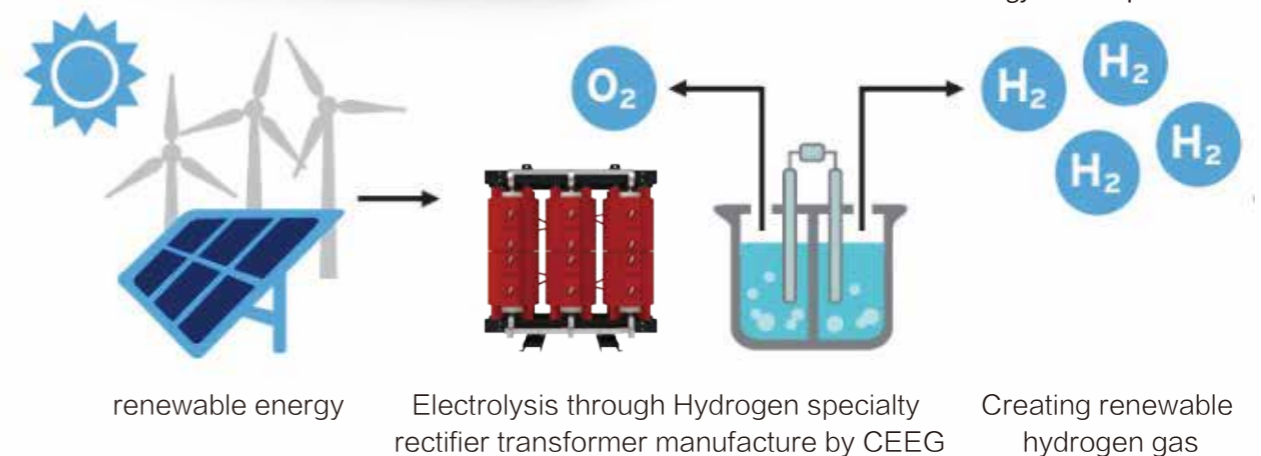


Assist in accelerating the implementation of hydrogen production projects

The Medium and Long Term Plan for the Development of the Hydrogen Energy Industry (2021-2035) points out that the proportion of renewable energy hydrogen production in terminal energy consumption will significantly increase, playing an important supporting role in the green transformation and development of energy. At present, China's hydrogen energy industry has gradually established a relatively complete industrial chain with key links such as production, storage, transportation, and utilization, and has preliminarily laid the foundation for large-scale development. The implementation of renewable energy hydrogen production projects is accelerating.



Under the 2030 carbon peak vision, the annual demand for hydrogen in China is expected to reach 37.15 million tons, accounting for about 5% of terminal energy consumption. The production of renewable hydrogen is about 5 million tons, and the installed capacity of electrolytic cells is about 80GW. Under the carbon neutrality vision of 2060, the annual demand for hydrogen in China will increase to around 130 million tons, accounting for about 20% of terminal energy consumption.



The hydrogen by electrolytic water technology which has a high purity level, low impurity gases, and is easy to combine with renewable energy is considered as the most promising green hydrogen energy supply method in the future. With the large-scale development of hydrogen production projects, breakthroughs in the localization of key core technologies, and a decrease in energy consumption and investment costs, the proportion of electrolytic water hydrogen production will continue to increase, driving a significant demand for electrolytic water hydrogen production equipment.



Hydrogen–Production Specialty Rectifier Transformer



Hydrogen–Production Specialty Rectifier Transformer

Converter is a general term for the three working modes of rectification, inversion, and frequency conversion. Rectification is one of the most widely used. Most industrial rectified DC power supplies are generated by rectifier equipment composed of rectifier transformers and rectifiers. The most commonly used rectifier transformers are in the electrochemical industry, where non-ferrous metal compounds are electrolyzed to produce aluminum, magnesium, copper, and other metals; With the depletion of fossil fuels, deterioration of the ecological environment, and frequent occurrence of extreme weather, the hydrogen energy industry has experienced explosive growth. Hydrogen energy is a rich, green, and low-carbon secondary energy source, gradually becoming one of the important carriers of global energy transformation. Under the requirements of carbon peaking and carbon neutrality, renewable energy such as photovoltaic, wind energy, or hydropower can be combined with hydrogen production rectifier equipment and electrolytic water technology to produce high-purity hydrogen and oxygen, which will be more widely used in the global economy.

Hydrogen–Production Specialty Rectifier Transformer



Green Power | Green Products | Smart Manufacturing | Intelligent Service

The hydrogen–production rectifier transformer produced by CEEG can improve the efficiency of electrolytic water, reduces comprehensive power consumption, and improves operational reliability. All performance indicators meet and exceed the latest national standards.

Three main application scenarios of hydrogen production rectifier transformer:

1. Multi-pulse three-phase bridge thyristor rectifier system
2. Three-phase bridge diode rectifier+IGBT chopping system
3. Three-phase bridge PWM rectifier+DC/DC chopping system

The product models alphabetical order and meaning

Number	Classification	Meaning	Alphabet
1	Use	General industry	ZB
		Charging	ZC
		Galvanization	ZD
		Electrochemical industry	ZH
		Traction	ZQ
		Transmission	ZS
		Field excitation	ZL
		DC transmission	ZZ
		Frequency control	ZT
		Frequency converter	ZP
	Polysilicon	ZG	
2	Number of phases on the line side	Single phase	D
		Three phases	S
3	Insulation dielectric	Non encapsulated	G
		Casting	C
		Wrapped type	CR
4	Method of voltage regulation	Non-excitation volatge regulation	-
		On load voltage regulation	Z

Product features



1.Safe and reliable	Transformer is made of non-toxic, flame-retardant epoxy resin, with high mechanical strength, flame retardant, fireproof, and pollution-free;
2.Convenient installation	The dry type rectifier transformer is a complete machine. It can be put into operation once, which is convenient and efficient;
3.High overload	The insulation and heat resistance level of the transformer is level H, and the heat resistance temperature reaches 180°C. The maximum overload capacity reaches 200%;
4.Low noise	The noise is 3-10 dB lower than the GB standard;
5.Save investment	The dry type rectifier transformer can be installed together with electrical equipment such as rectifiers, eliminating the need for separate distribution rooms, saving space and reducing one-time investment;
6.Variety	The product portfolio is complete, fully covering the design and production of all types of transformers in the hydrogen production field
7.Customized	Can be designed according to customer specific requirements;
8.Authoritative certification	Achieved the authoritative certification of the National Electrical Product Quality Supervision and Inspection Center;

Procurement Guidelines



1. Product application (electrochemical industrial, transmission, traction, etc.)
2. Work load characteristics (resistive, capacitive, inductive) and their working conditions
3. External operating conditions (environmental temperature, altitude, pollution level, relative humidity, earthquake resistance, etc.)
4. Pulse numbers in one unit
5. Rectifier transformer efficiency (or provide specific no-load loss and load loss values)
6. Impedance voltage fraction (and specify the corresponding valve side voltage)
7. Winding vector group
8. Rated voltage and fluctuation range on the line side (primary side)
9. Rated no-load DC voltage, voltage regulation range, and DC current on valve side (secondary side)
10. Frequency of use (50Hz in normal if no specified)
11. Installation location (indoor or outdoor)
12. Voltage regulation methods (non excitation voltage regulation, on load voltage regulation, and voltage regulation range & taps)
13. Selection Requirements for On-load tap-changers
14. Valve side (secondary side) outlet method
15. Other special requirements (overload times, whether with casting, weight and size requirements, valve side outlet distance and height, etc.)



Executive standards

GB/T 1094.1–2013 Power Transformers Part 1 General

GB/T 1094.2–2013 Power Transformers Part 2 Temperature Rise

GB/T 1094.3–2017 Power Transformers Part 3 Dielectric test and External Clearance in air

GB/T 1094.5–2008 Power Transformers Part 5 Ability to withstand short circuits

GB/T 6451–2015 Specification and technical requirements for oil-immersed power transformers

GB/T 10228–2015 Specification and technical requirements for dry-type power transformers

GB/T 18494.1–2014 Converter transformers Part 1: Transformers for industrial applications

GB/T 18494.3–2012 Converter transformers Part 3: Application guide

JB/T 3837–2016 Identification method of transformer's product type

Technical research and development strength

Our company has absorbed and digested advanced technologies both domestically and internationally, such as France Alstom technology, Swiss ABB technology, Hitachi technology from Japan, and Xi'an Xidian transformer technology. Based on this, we have comprehensively developed a complete set of unique technologies from China Electric Corporation.

1. Reliability of insulation technology

From the initial 2D electric field simulation, 3D electric field measurement, and impulse characteristic measurement to the later theoretical analysis and simulation tests of the main insulation, longitudinal insulation, end insulation, lead insulation, and coil withstand lightning impulse voltage characteristics of transformers. Though several years and multiple methods of verification, the reliability of transformer insulation has been ensured.

2. Calculation of Leakage Magnetic Field and Reduction of Stray Loss

Specialized in the calculation and measurement of transformer leakage magnetic field. Calculation of shielding structure of leakage magnetic field, transformer dynamic and thermal stability. Research on improving the dynamic and thermal stability of transformers. Ensure the calculation of leakage magnetic field, reduce stray losses, and improve the dynamic stability of transformers.

3. Accurate analysis of coil temperature field

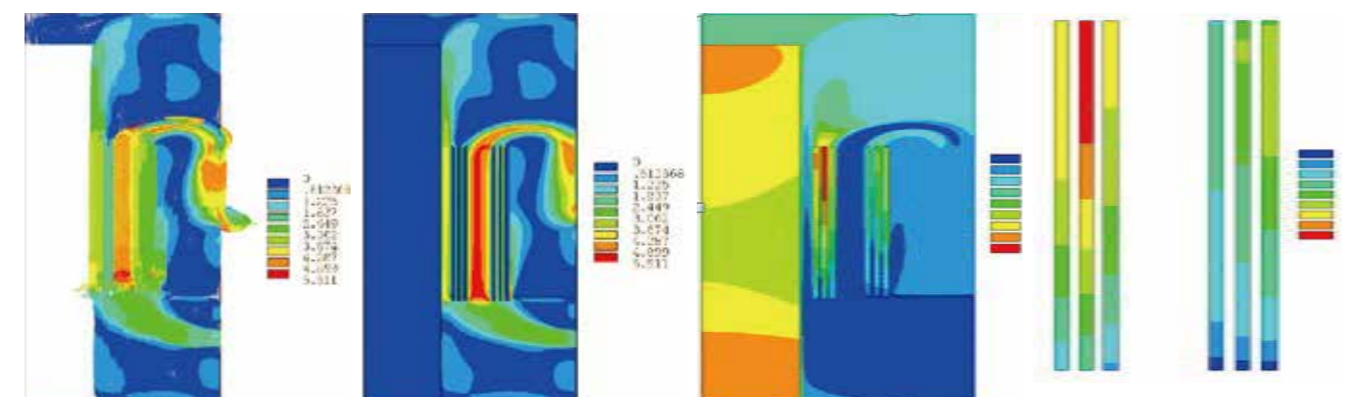
Our company collaborates with Southeast University, University of Science and Technology Beijing, Huazhong University of Science and Technology, and other universities to develop a calculation program for the temperature field of the coil. By calculating the loss distribution of the coil (including resistance loss, eddy current loss in different directions, and circulating current loss between parallel wires) and the cooling status of the flow field, we can accurately calculate the temperature distribution of the coil and the temperature rise of the hot spot, in order to take measures. Effectively control the temperature rise of hot spots that affect the lifespan of transformers

4. Reduce partial discharge of transformers

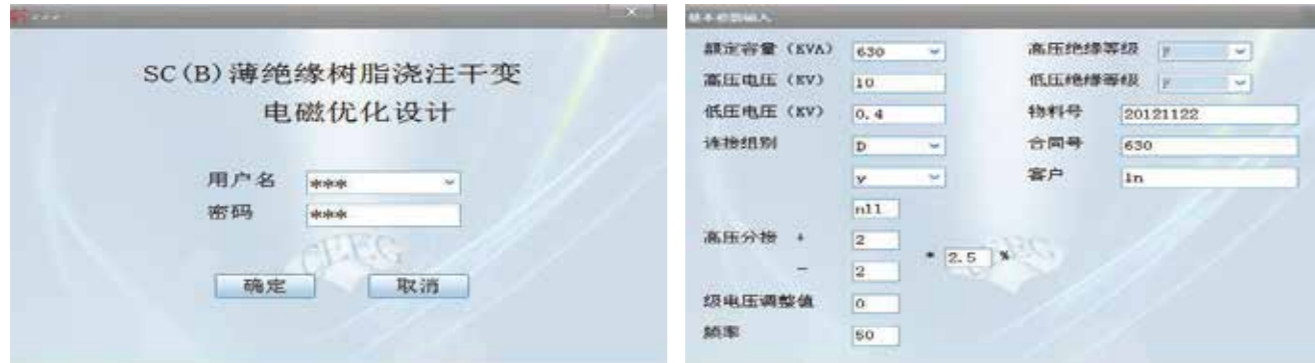
The electric field strength of each part has been numerically analyzed during the design phase and strictly controlled. The compliance of manufacturing quality, the reliability of processing methods, and the rationality of operation technology also effectively control the local discharge of transformers.

Cloud R&D Platform

It integrates the functions of transformer electromagnetic optimization design, parametric drawing, performance analysis and structure optimization, automatic drawing, etc. to realize the sharing of transformer design resources, search, modification and version control of various data information, etc.



Design, Equipments and Manufacturing process



+ Low Voltage Coil Semi-product

Low voltage winding selects high quality foil as conductor, and be wound automatically. The foil machine uses the patent technology named by "Foil-rolling & Tension equipment by hydraulic energy-saving system". Its accuracy can be $\pm 0.5\text{mm}$, with argon arc welding technology to guaranty of winding's quality.



+ Iron Core

The iron core is made of high quality, highly magnetically conductive, oriented silicon steel sheet with 45° full oblique step lapping process. The surface is coated with a special moisture and rust resistant coating, which effectively reduces the no-load loss, no-load current and noise level.

+ Design

CEEG has integrated more than 20 years of design, manufacturing and experiment experience in various transformer factories of the group and developed a series of advanced "three-dimensional + parametric" design software, which can realize automatic design and cost optimization and simulation. The requirements of national and industrial standards are fully considered to ensure advanced design of products.



+ High Voltage Coil Semi-product

The HV winding will select high quality conductor, with long & short fiberglass mat as the enhance filler. Casting equipment are global advanced Hedrich vacuum-casting system, to effectively reduce the partial discharge which is less than 5PC.



+ Advanced Testing Equipments

Before delivery, rigorous testing and inspection are carried out in accordance with the requirements of national standards GB6450-1986 and JB / t501-xxxx. Partial discharge test, impulse withstand test and sounds level test are the necessary tests. Advanced testing equipments and perfect testing system ensure the high quality and high quality standard of products.

General-industry type of Hydrogen-production Rectifier Transformer

Type	Capacity kVA	Rated Voltage (kV)		Tap	Vector Group	Short Circuit Impedance	Efficiency	Weight (kg)	Gauge Dimensions (mm)	Enclosure Dimensions (mm)
		Line Side	Valve Side							
ZBSCB10	200					4.0	≥0.97	1250	550 × 550	1400 × 1250 × 2200
ZBSCB10	250					4.0	≥0.97	1430	550 × 550	1500 × 1250 × 2200
ZBSCB10	315					4.0	≥0.97	1570	660 × 660	1500 × 1250 × 2200
ZBSCB10	400					4.0	≥0.98	1750	660 × 660	1500 × 1300 × 2200
ZBSCB10	500					4.0	≥0.98	1970	660 × 660	1600 × 1300 × 2200
ZBSCB10	630	10				6.0	≥0.98	2250	820 × 820	1700 × 1400 × 2200
ZBSCB10	800	6.3				6.0	≥0.98	2590	820 × 820	1750 × 1400 × 2200
ZBSCB10	1000					6.0	≥0.98	2940	820 × 820	1850 × 1400 × 2200
ZBSCB10	1250					6.0	≥0.98	3420	820 × 820	1900 × 1400 × 2200
ZBSCB10	1600		0.4		Dyn11 Yyn0 Dd0	6.0	≥0.98	3830	820 × 820	1950 × 1500 × 2200
ZBSCB10	2000		0.66			6.0	≥0.99	4500	820 × 820	2000 × 1500 × 2200
ZBSCB10	2500		0.69			6.0	≥0.99	5350	820 × 820	2100 × 1600 × 2200
ZBSCB10	500			2*2.5%		6.0	≥0.98	2680	820 × 820	2420 × 1800 × 2300
ZBSCB10	630					6.0	≥0.98	3300	820 × 820	2520 × 1900 × 2350
ZBSCB10	800	35				6.0	≥0.98	3810	820 × 820	2650 × 1900 × 2350
ZBSCB10	1000	36				6.0	≥0.98	4650	1070 × 820	2870 × 1900 × 2350
ZBSCB10	1250	37				6.0	≥0.98	5250	1070 × 1070	2980 × 2000 × 2450
ZBSCB10	1600	38.5				6.0	≥0.98	5750	1070 × 1070	2800 × 2000 × 2650
ZBSCB10	2000					6.0	≥0.98	6380	1070 × 1070	3200 × 2200 × 2700
ZBSCB10	2500					6.0	≥0.98	7390	1070 × 1070	3000 × 2000 × 2700

Dry type of Hydrogen–production Rectifier Transformer

Rated Capacity	Type	Voltage			Vector Group	Short Circuit Impedance %	P0 kW	Pk kW (75°C)	l × b × h (mm)	Weight kg	Gauge Dimensions (mm)
		High Voltage kV	Tap %	Low Voltage kV							
630	ZHST/ZHSS/ZHS	35、10、6	±2*2.5%	0.75×2	Dd0y11/ Dy11d0/ Dy11	6~8	0.84	7.85	1680 × 1220 × 1480	2050	820 × 820
800							1.15	13.35	1760 × 1240 × 1630	3020	820 × 820
1000							1.38	15.24	1890 × 1430 × 1960	3405	820 × 820
1250							1.5	17.65	2040 × 1490 × 2010	3860	1070 × 1070
1600							1.8	19.0	2100 × 1630 × 2200	4865	1070 × 1070
2000							2.2	26.2	2200 × 2440 × 2390	5370	1070 × 1070
2500							2.48	27.5	2240 × 2820 × 2660	6690	1070 × 1070
3150							3.28	31.73	2400 × 3020 × 2920	8020	1070 × 1070
4000							4.66	46.82	2420 × 3400 × 3100	9265	1070 × 1070
5000							5.40	51.72	2600 × 4010 × 3260	11600	1070 × 1070
6300							6.20	59.5	2770 × 4040 × 3500	13440	1475 × 1475
8000							6.50	70.0	3430 × 4260 × 3530	15600	1475 × 1475
10000							7.80	87.0	3450 × 4490 × 3800	19580	1475 × 1475
12500							21.0	100.0	5100 × 4200 × 4500	24000	2040 × 1475

Technical data of oil-immersed Hydrogen–production rectifier transformer & alkaline water electrolyzer hydrogen production equipment

Hydrogen Production (Nm ³ /h)	200	500	800	1000	1200	
Rated Power DC (MW)	1	2.5	4*2	5*2	6*2	
DC Current (A)	4900	6300	6300	7300	9200	
DC Voltage (V)	196	380	608	722	722	
Capacity (kVA)	1250	2500	8000	12500	15000	
Pulse	12	12	24	48	48	
Line Side Voltage (kV)	10/35	10/35	10/35	35	35	
Vector	Line Side	D/Y	D/Y	Δ/Z (one unit with two active parts)	Δ/Z (Two units with two active parts)	Δ/Z (Two units with two active parts)
	Valve Side	d,y	d,y	d,y	d,y	d,y

Parameters of Hydrogen–Production Specialty Rectifier Transformer

Rated Capacity kVA	Primary Voltage kV	Secondary Voltage V	Rated Secondary Voltage V	Vector Group	Cooling Type	PO kW	PK kW	Pulse	Short Circuit Impedance %	l × b × h (mm)	Weight kg	Gauge Dimensions (mm)
1250	10、35	160~136	160	Z, y0d11	ONAN	1.6	19.4	12	6~8	2230 × 1860 × 2260	4500	1070 × 1070
2500	10、35	310~260	310		OFWF	2.6	29.5	12		3100 × 2480 × 3000	7800	1070 × 1070
8000	10、35	495~420	495	Ya0, Z, y0d11	ONAF	10	80	24	8~12	5500 × 4200 × 4000	32000	1475 × 1475
12500	35	592~500	592	Ya0, Δ, y0d11	OFAF	20	160	24、48		5800 × 4600 × 4200	40000	2040 × 1475
15000	35	592~500	592			24	220	24、48		6400 × 5100 × 4600	45000	2040 × 1475

Note1: The values of PO, Pk and short circuit impedance are measured at the highest secondary voltage. The values of load loss are measured at the rated secondary voltage.

Note2: The voltage regulation level is 19 taps (with constant current outputs). In addition, other capacities or secondary voltage and no-load losses can be determined through negotiation with users.

Intelligent Transformer Product Solutions

In order to solve the problems and risks in the traditional operation and maintenance management of transformers, CEEG launched an intelligent transformer product solution based on the Zhonghan IoT cloud platform, which includes intelligent acquisition hardware, edge computing, information transmission equipment, cloud platform data storage, analysis model and a variety of application modules, so as to achieve digital measurement, networked control, status visualization, functional integration Information interaction, etc.



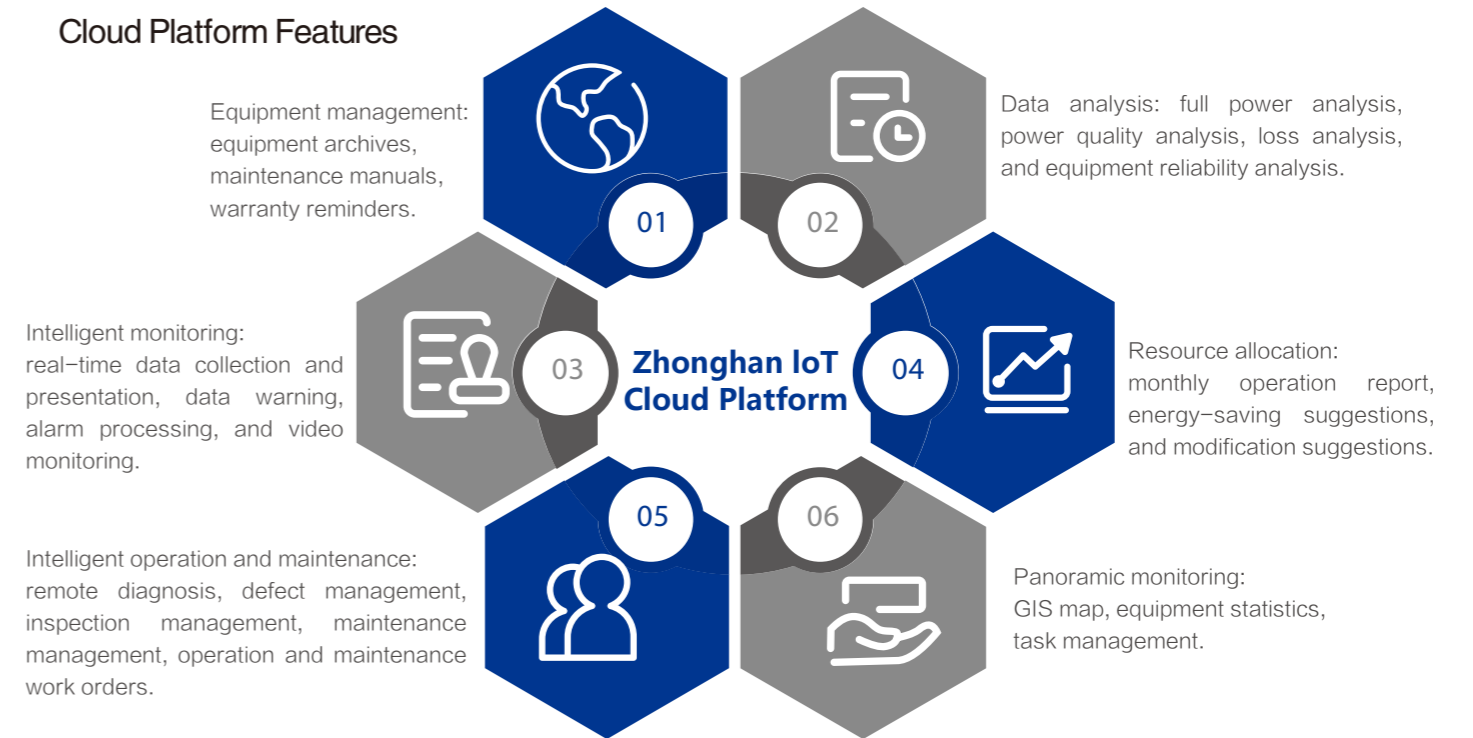
Smart operation and maintenance platform

By collecting the key data of temperature, current, voltage vibration and harmonic of power grid, online power quality analysis and fault alarm can be realized, and can be installed on the mobile terminal.



Intelligent Transformer Product Solutions

Cloud Platform Features



PC terminal: real-time monitoring and data visualization



Mobile terminal: remote monitoring, instant alarm, and fault location



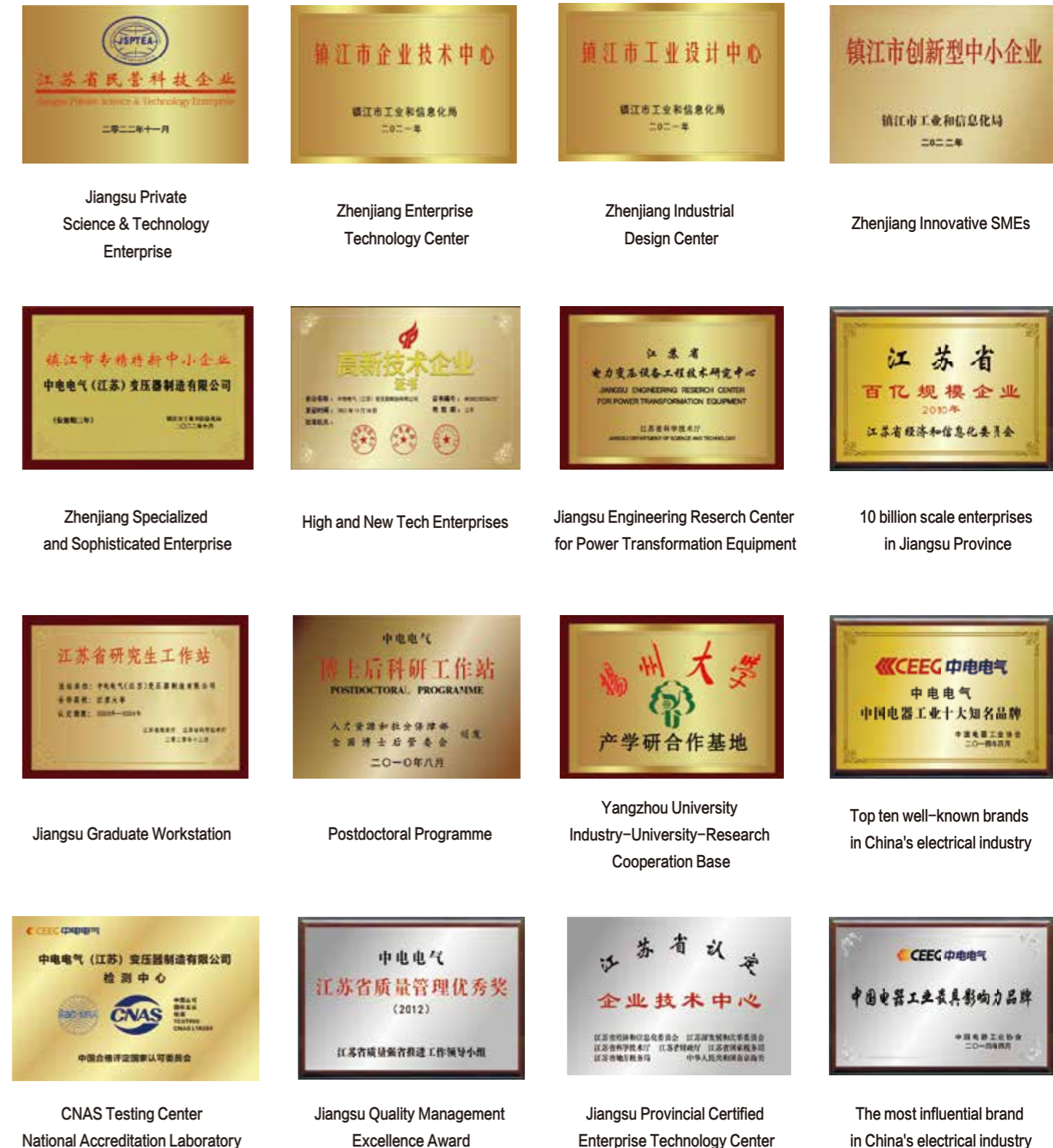
Inspection Equipment



Testing

All products strictly control the production process and quality links, and conduct strict test and inspection according to national standards and customers' customized requirements before leaving the factory, including partial discharge inspection, impulse withstand test and sounds level test are the necessary tests. Advanced test and detection equipment and perfect inspection and detection system ensure the high quality and high quality of products.

Honorary Qualifications



Jiangsu Private Science & Technology Enterprise

Zhenjiang Enterprise Technology Center

Zhenjiang Industrial Design Center

Zhenjiang Innovative SMEs

Zhenjiang Specialized and Sophisticated Enterprise

High and New Tech Enterprises

Jiangsu Engineering Reserch Center for Power Transformation Equipment

10 billion scale enterprises in Jiangsu Province

Jiangsu Graduate Workstation

Postdoctoral Programme

Yangzhou University Industry-University-Research Cooperation Base

Top ten well-known brands in China's electrical industry

CNAS Testing Center National Accreditation Laboratory

Jiangsu Quality Management Excellence Award

Jiangsu Provincial Certified Enterprise Technology Center

The most influential brand in China's electrical industry

Authority Certificates



Authority Test Reports



Product Family



Amorphous Alloy Dry Type Transformer

SG(B) Ventilated Dry Type Transformer

SC(B) Cast Resin Dry Type Transformer

Harmonic Mitigating Dry Type Transformer



Mining Explosion-proof Transformer

Variable Frequency Transformer

35kV Cast Resin Dry Type Transformer

Rectifier Dry Type Transformer



220kV Oil-immersed Power Transformer

220kV Oil-immersed Traction Transformer

110kV Oil-immersed Traction Transformer

SRN High Temperature Resistant Oil-immersed Transformer



Mobile Transformer on vehicles

35kV Power Transformer

Amorphous Alloy Oil-immersed Transformer

Oil-immersed Type Converter Transformer

Product Family



Auto Transformer

S series Oil-immersed Transformer

Energy Storage Dedicated Epoxy Dry Type Transformer

Energy Storage Dedicated Oil-Immersed Type Transformer



Energy Storage Step-up Substation integrated with Converter

European Prefabricated Substation

YBF series Wind Power Substation

ZGS series Prefabricated Substation



Water cooled transformer

Ocean Platform Transformer

Marine Transformer

Prefabricated Containerized Intelligent Substation



KYN28A series Armored Movable AC Metal-enclosed Switchgear

GGD, MNSZ, GCK and GCS series AC low voltage switchgear

PBG/KBG High-voltage Vacuum Switch BBD Low-voltage Protection Box

Generatrix