



POWER TRANSFORMER

ANSI, IEEE, CSA, AS and IEC

GENERAL

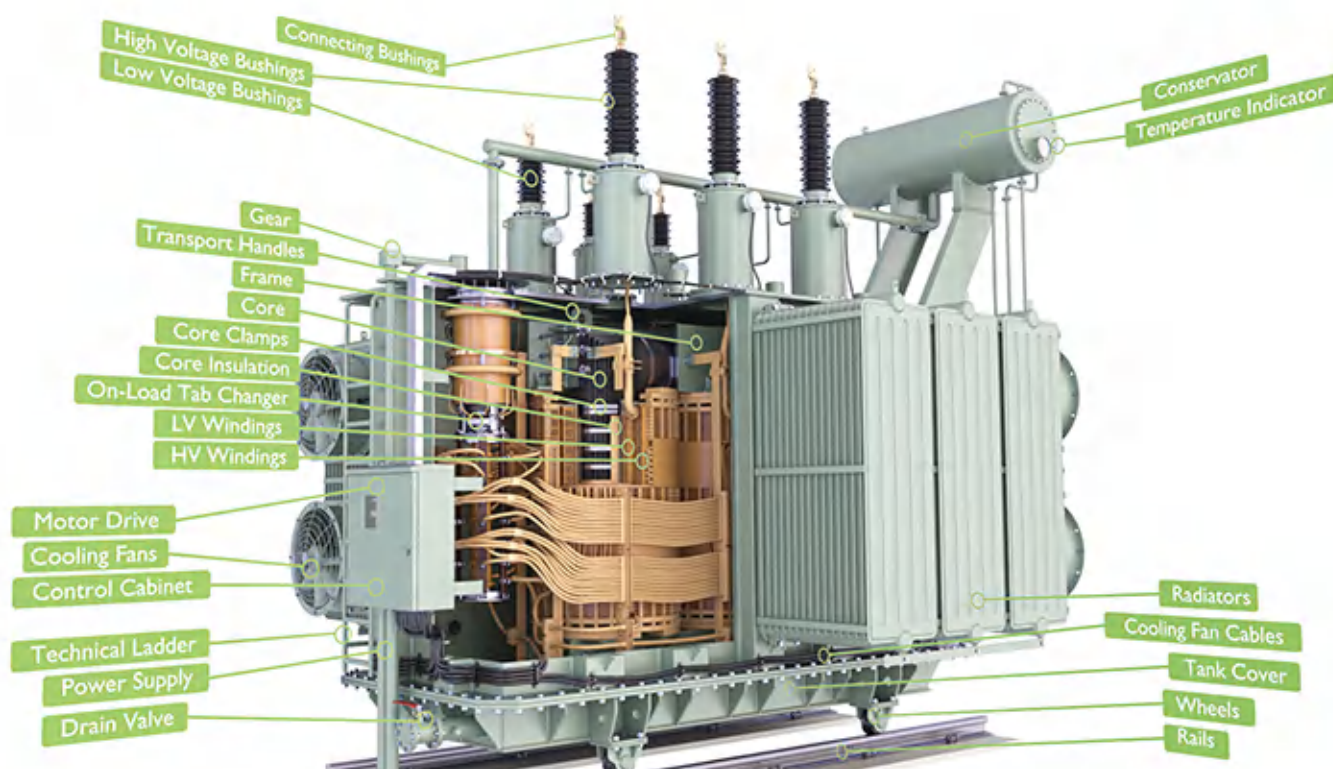
Power transformers are a core component of power transmission system. Daelim Belefic builds power transformers that deliver power to the consumer efficiently and reliably.

Our single-phase and three-phase multi-winding or autotransformers are according to international standards such as ANSI/IEEE /IEC/CSA/AS as well as NEMA standards, etc, the power ratings are up to 270 MVA and for voltages up to the highest insulation class of 900 kV.

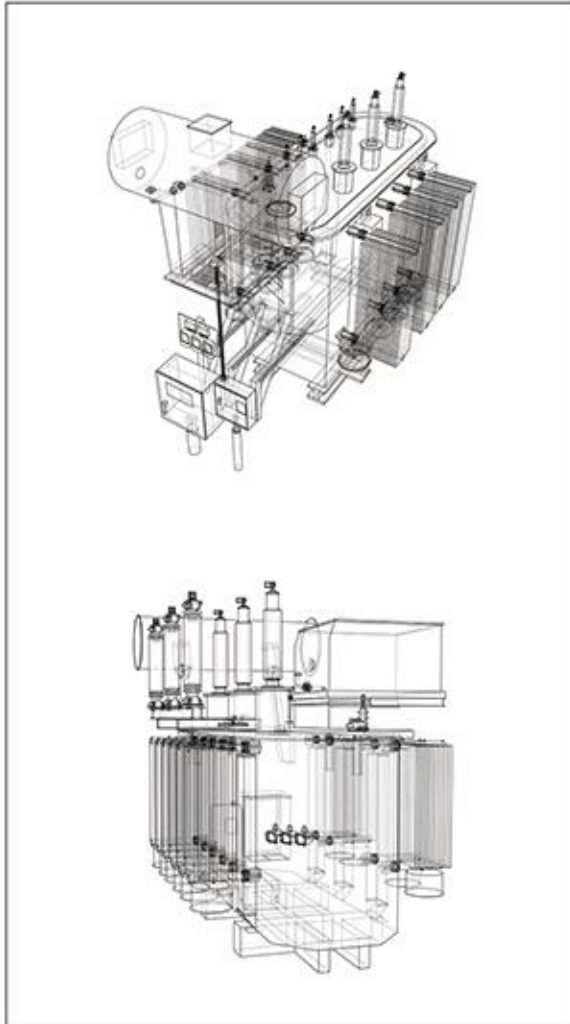
At Daelim Belefic we work relentlessly to exceed the new demands by innovating solutions for a more sustainable and safer work environment with a wide array of electrical transformer solutions for our customers while meeting the most stringent standards. Every single transformer is unique, designed according to individual factors such as voltage, power rating, climate, network topography, noise level, and many other criteria. We offer solutions such as high efficiency, environmentally friendly, maximum short-circuit strength, overload capability, high temperature operation, reliable start-up after a power outage, and low maintenance costs solutions, applied in renewable projects, urban substations, utilities, industrial applications, etc.

In an ever-changing world, every day, Industry faces new challenges to satisfy their customers, be competitive, provide a safe work place and meet stringent regulations. At Daelim Belefic, we:

- Prompt preparation of bids
- Optimized, consistent end-to-end project management
- Noticeably shorter production and delivery times
- Very high delivery reliability
- Fast, standardized documentation
- Just-in-time delivery



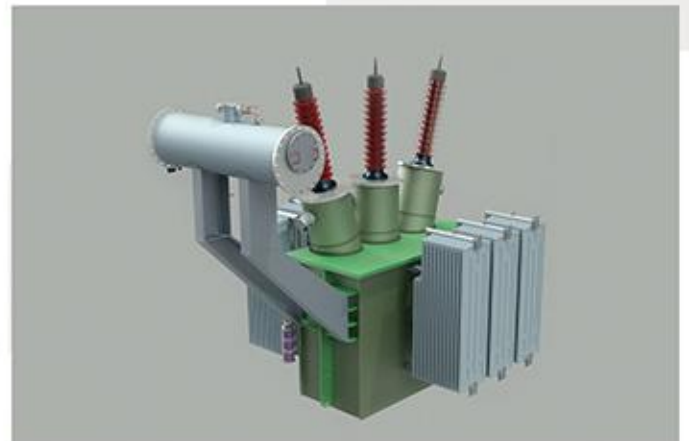
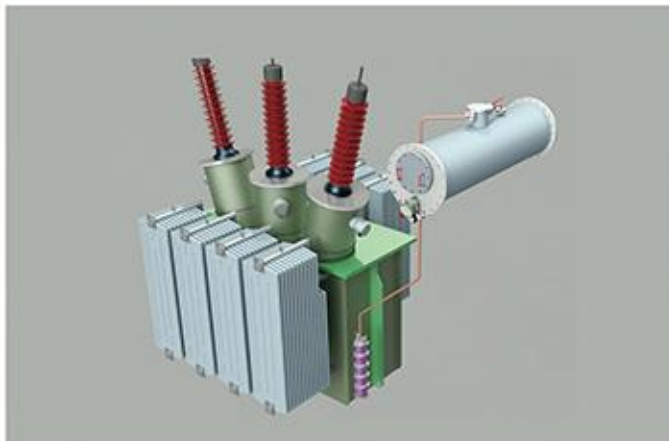
01 DESIGN CAPABILITY



Design Tools	SOLIDWORKS(3D) / AUTOCAD
Equipment	3F/2F/1F Multi-winding Transformer / Autotransformer
Design and Manufacture Standard	ANSI-IEEE 57.12/CSA/EN/BS/GOST/AS,IEC 60076 1
Design	Sealed-tank system /Inert-gas pressure system or Conservator-tank system without diaphragm On load or no load voltage tap changer ONAN/ONAF/ODAF/OFAP/OFWF/KNAN/KNAF
Insulation	Mineral Oil Inhibited I Not Inhibited I Vegetable oil
Primary voltage	Up to 230kv, up to 900kv BIL
Capacity	Up to 240MVA
Frequency	50/60 HZ

Operating Condition

- Suitable for indoor and outdoor application.
- Ambient temperature: - 50℃~40℃
- Relative humidity: ambient air relative humidity should be below93%.
- Altitude: ≤ 1000m
- Max wind speed: ≤35 m/s
- Earthquake acceleration: horizontal acceleration ≤0.3g
- vertical acceleration ≤0.15g
- Special conditions: customized products are available.



02

MANUFACTURING

Core	Coiled Type Column Type in Grain Oriented Silicon Steel and High Permeability (low losses) High Purity Electrolytic Copper
Coils	Class E Insulating Paper (120°C)
Steel	ASTM A-36 Low Carbon Steel
Welding	Continuous Double Seam Welding
Active Part Drying	Oven & "Vapourphase" System (Kerosene Steam)
Cleaning Process	Blasting
Painting Process	Electrostatic / Anticorrosive + Epoxy I Immersion
Tests	Routine test(included), Type Tests (upon request), Special Tests(upon request) Tests Accessories (Not included, Except Typical Information Available)
Packaging	Wooden Cages / Crates / Drums Included



Core Assembly

The iron core is made of cold rolled, granular-oriented, low-loss and high magnetic conductive silicon steel sheet, which is of multi-step completely tilted structure to reduce the loss and noise.

Iron core with fixed clamps optimizes the design so as to ensure mechanical strength and to reduce leakage losses.

Adoption of PET banding structure ensures the damp force of core column and lowers the noise.



Coil Winding

HV winding adopts entanglement or inner screened continuous type with phase insulation structure to ensure insulating strength.

MV/LV windings adopt high strength or adhibit- transposition conductor, forced cooling to reduce the temperature rise and enhance capability of short circuit withstand.

Interleaved, shielded disc, helical, disc or layer construction (depending on voltage and impulse rating)



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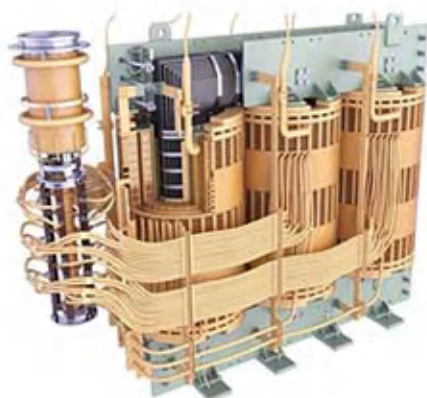


Active- parts Assembly

Cold pressing ensures cleanness of the body active parts and the reliability of leads.

Adoption of whole assembled phase insulation so as to reduce the assembly time and effectively guarantee the dimension and shape of the insulation structure.

HV lead adopts specially molded insulation parts for protection which effectively guarantees its insulating strength and reduces partial discharge.



Vapor phase

DAELIM's modern vapor phase system is the quickest and most effective way to dry transformers.

This process ensures perfect dryness which leads to a longer transformer life. Vapor phase drying also reduces drying time by over 50% when compared to a non-vapor phase oven.

Passing this time savings along the production schedule results in quicker delivery.



OIL TANK

Three- dimension finite element strength analysis and Pro-E mold is adopted, which have reinforced the mechanical strength.

Adopting of welding automatic submerged arc-welding and ultrasonic of fuorescence leakage test to guarantee leakage free.

The surface coating is strictly controlled.



Laboratory Test

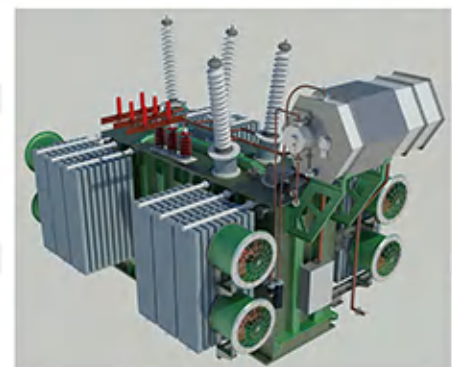
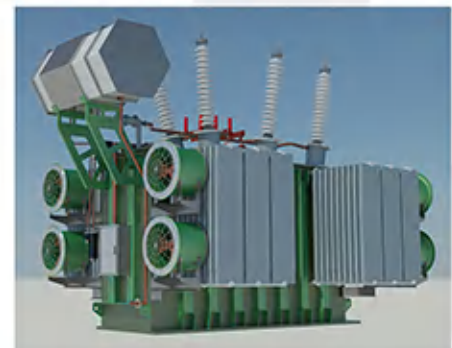
ANSI / IEEE C57.12 | IEC 60076 standards
Test Capacity up to 230kV - 240MVA

Oil Laboratory
Standards ASTM D-3487/2002 / IEC 60296 /
IEEE C57.106-2002 / IEC 60422
Physical - Chemical Analysis
Chromatographic Analysis

03

STANDARD FEATURES

- Capacity range: Through 60 MVA (ONAN), with high-voltage ratings through 230 kV (900 kV BIL)
- Service Location: Outdoor
- Core: Regular grain-oriented; mitered cruciform with step-lap construction
- Coils: Cylindrical construction; all copper windings, custom tempered per design requirements; circular windings with rectangular or continuously-transposed conductor; helical low-voltage windings; continuous disc medium-voltage windings; shielded disc high-voltage windings
- Radiators: Detachable panel type with shut-off valves; mild steel
- Insulating oil: mineral oil type I & type II
- Tank Cover: Welded, Bolted
- Manholes: On cover or tank
- Tank Base: Flat bottom or Skid under base
- Tank Material: Mid Steel
- Frequency: 60 Hertz
- Winding Tem rise: 55°C
- HV Taps: DETC, ETC in tank or out
 - Above rated volts: 2 x 2-1/2% off load taps of full capacity
 - Below rated volts: 2 x 2-1/2% off load taps of full capacity
- Valve: Drain and Filter Valves, w/Sampler
- Lifting, Moving, and Jacking Facilities
- Pressure relief valve
- Magnetic oil-level indicator
- Dial-type oil temperature indicator
- Dial-type winding temperature indicator
- Dial-type sudden pressure relay
- Vacuum pressure gauge
- Paint: Exterior polyurethane enamel, ANSI 70 gray color; interior polyurethane enamel, white color
- HV bushing: IEEE segment 1-4, on top cover or in Air Terminal Chamber. Porcelain Condenser, Solid Bulk, Solid Dielectric, Quick link
- LV bushing: IEEE segment 1-4, Cover mounted or in Air Terminal Chamber Porcelain Condenser, Solid Bulk, Solid Dielectric, Quick link
- Diagrammatic nameplate, engraved stainless steel
- Transformer lifting lugs
- Tank grounding pads



Technical Data for 69KV Class Three Phase Two Winding OLTC Power Transformer

(KVA) Rated Power	(KV) High Voltage	(KV) Low Voltage	Connection Symbol	Short Circuit Impedence (%)	Loss(W)		No load Current (%)
					No-load Loss (KW)	On-load Loss (KW)	
10 000	69	6.3	YNd11	9	11.6	47.6	0.75
12 000					13.6	56.5	0.53
15 000					16.3	69.5	0.49
20 000					19.2	84.2	0.49
25 000					22.6	99.5	0.42
30 000					26.8	120	0.42
37 500					31.9	140.3	0.39
50 000					38.6	174.3	0.39
60 000					44.4	210	0.39

Technical Data for 69KV Class Three Phase Two Winding NLTC Power Transformer

(KVA) Rated Power	(KV) High Voltage	(KV) Low Voltage	Connection Symbol	Short Circuit Impedence (%)	Loss(W)		No load Current (%)
					No-load Loss (KW)	On-load Loss (KW)	
10 000	69	6.3	YNd11	9	12.1	47.6	0.75
12 000					12.6	56.5	0.53
15 000					15.1	69.5	0.49
20 000					17.9	84.2	0.49
25 000					21.1	99.5	0.42
30 000					25.1	120	0.42
37 500					30	140.3	0.39
50 000					35.4	174.3	0.39
60 000					42.1	210	0.39

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Technical Data for 115KV Class Three Phase Two Winding OLTC Power Transformer

(KVA) Rated Power	(KV) High Voltage	(KV) Low Voltage	Connection Symbol	Short Circuit Impedence (%)	Loss(W)		No load Current (%)
					No-load Loss (KW)	On-load Loss (KW)	
10 000	115 138 161	6.3 6.6 10.5 11	YNd11	10.5	11.8	51.2	0.82
12 000					13.7	59.5	0.82
15 000					16.3	73.1	0.76
20 000					19.5	88.4	0.76
25 000					22.7	105	0.69
30 000					27.4	126	0.69
37 500					32.9	148	0.63
50 000					38.9	184	0.63
60 000					46.4	221	0.57

Technical Data for 115KV Class Three Phase Two Winding NLTC Power Transformer

(KVA) Rated Power	(KV) High Voltage	(KV) Low Voltage	Connection Symbol	Short Circuit Impedence (%)	Loss(W)		No load Current (%)
					No-load Loss (KW)	On-load Loss (KW)	
10 000	115 138 161	6.3 6.6 10.5 11	YNd11	10.5	10.5	50.2	0.64
12 000					12.4	59.5	0.64
15 000					15	73.1	0.59
20 000					17.8	88.4	0.59
25 000					21	105	0.54
30 000					25	126	0.54
37 500					29.9	148	0.56
50 000					35.3	178.5	0.52
60 000					41.9	221	0.48

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Technical Data for 230KV Class Three Phase Two Winding OLTC Power Transformer

(KVA) Rated Power	(KV) High Voltage	(KV) Low Voltage	Connection Symbol	Short Circuit Impedence (%)	Loss(W)		No load Current (%)
					No-load Loss (KW)	On-load Loss (KW)	
30 000	230	6.3	YNd11	12	30	128	0.69
37 500		6.6			36	149	0.63
50 000		10.5			43	180	0.63
60 000		11			50	209	0.57
		34.5					
		66					

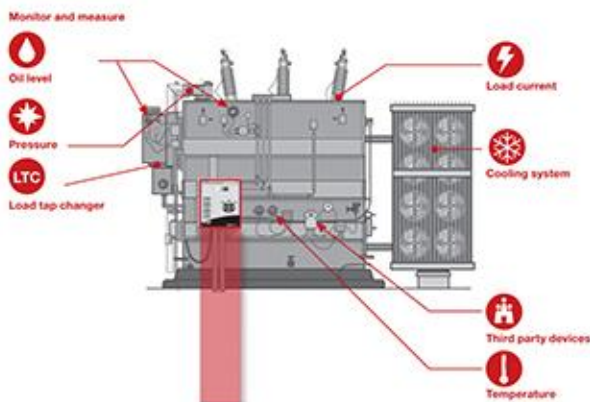
Technical Data for 230KV Class Three Phase Two Winding NLTC Power Transformer

(KVA) Rated Power	(KV) High Voltage	(KV) Low Voltage	Connection Symbol	Short Circuit Impedence (%)	Loss(W)		No load Current (%)
					No-load Loss (KW)	On-load Loss (KW)	
30 000	230	6.3	YNd11	12	28	128	0.7
37 500		6.6			33	149	0.7
50 000		10.5			39	180	0.65
60 000		11			46	209	0.65
		34.5					
		66					

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04 OPTIONAL ACCESSORIES

- Cooling: ONAN/ONAF, KNAN, KNAN/KNAF
- Insulating oil: Natural ester(FR3 Enviro Temp, RAPO etc)
- Frequency: 50 Hertz
- Average winding rise: 55°C or 55/65°C
- Future fan wiring and control
 - Automatic pressure relief device
 - Galvanized or stainless-steel radiators
 - Fans
 - Accessories with additional contacts
- Controls Cabinet: NEMA 3R, 4, 4X
 - Customizable Colors
- HV lightning arresters :Distribution Class, Intermediate Class, Station Class
 - Harmonic allowances up to k-20
- Seismic designs: Zones 1-4
 - High ambient designs available
 - High elevation designs available
- Rapid Rise Relay
 - Neutral Terminations
 - Other Moving Facilities (Wheels)
 - Nitrogen gas fluid preservation system
 - Gas Test Valve
 - Schrader Valve
 - Junction Box
 - Fiber-optic temperature measurements
 - Line Dissolved Gas Monitor
 - Bushing Mounted Current Transformers
 - Fire Prevention System (SERGI)
 - On-line monitoring system
 - Electrostatic shield
 - Special / low sound level
 - Special environment (i.e: classified areas)
 - Special paint for marine ambient



05

QUALITY & CERTIFICATION SYSTEM

DAELIM BELEFIC transformer manufacturing processes is standardized under the norm of ISO 9001:2015 quality, allowing us to have greater control over the production

We offer a full range of testing compliant with ANSI C57.12 and CSA C88-M90 standards, as well as, specialty testing such as lightning impulse, sound, heat run, partial discharge and SFRA.



CESI SGS



06 TESTS

Tests	Transformer Class			
	Class I (≤ 69 kV)		Class II (115-765 kV)	
	Standard	Optional	Standard	Optional
Winding resistance	•		•	
Winding insulation resistance		•	•	
Core insulation resistance		•	•	
Ratio	•		•	
Polarity and phase relation	•		•	
Insulation power factor		•	•	
Control (auxiliary) cooling losses				•
Single-phase excitation tests		•		•
Noload losses and excitation current	•		•	
Impedance voltage and load losses	•		•	
Zero-phase sequence impedance voltage		•		•
Temperature rise		•		•
Low frequency dielectric tests	•		•	
Low frequency dielectric tests on auxiliary devices, control, and current transformer circuits	•		•	
Lightning impulse		•		•
Front of wave impulse		•		•
Switching impulse		•	•	
Partial discharge		•		•
Audible sound level	•		•	
Operational tests (all devices)		•	•	
Dissolved gases in oil	•		•	
Leak test				

07

SERVICE & SUPPORT

DAELIM BELEFIC will work with you to identify your transformer needs and customize the solution. Once we know your exact requirements, our engineers will quickly recommend the right solution based on your specific needs.

	Expertise&consulting	
	Factory-to-jobsite logistics support	
	On Site Technical Assistance	
	Training	
	Repair	



Expertise&consulting& To meet performance requirements we are able to incorporate short circuit strength improvements, kVA upgrades, voltage changes, reduced losses, LTC modernization, sound level reduction and tank modification.

Our engineering team respond fast to answer technical questions from our customers.











- 2** Factory-to-jobsite logistics support: Delivery by ship and truck, the impact recorders measure and store three-axis impact data, identifying any abnormally severe impacts that might have caused damage to the transformer during transportation.
- 3** On Site Technical Assistance: In Assembly, Oil Treatment, Testing and Commissioning (Energization) by an Engineer
- 4** Training: by a Factory Specialist, about the operation and maintenance
- 5** Repair: Our technicians replace gaskets, broken bushings and accessories, purify or replace the oil, sand, prime and repaint the unit. When complete, the unit is fully tested.



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08

OVERSEAS PROJECT CASES

<p>Plant: Haian, China Operating location: Ecuador</p>	<p>This is mobile substation type 6MVA 3 phase power transformer operated in Ecuador with 20KV.</p>	
<p>Plant: Haian, China Operating location: Mexico</p>	<p>This 26/30MVA ONAN/ONAF furnace transformer with 69KV high voltage was manufactured for a chemical factory in Mexico.</p>	
<p>Plant: Haian, China Operating location: Mexico</p>	<p>This 35/40MVA ONAN/ONAF power transformer with 110KV high voltage was manufactured comply with IEC standards. Did FAT testing before shipping out.</p>	
<p>Plant: Haian, China Operating location: Kazakhstan</p>	<p>This 20MVA power transformer with 115KV was manufactured for power station in Kazakhstan.</p>	
<p>Plant: Haian, China Operating location: Ecuador</p>	<p>This 20/30MVA ONAN/ONAF power transformer with 69KV high voltage was manufactured for power station in Ecuador.</p>	
<p>Plant: Haian, China Operating location: Ecuador</p>	<p>This 10/12.5MVA 69KV ONAN/ONAF power transformer was operated in Ecuador.</p>	
<p>Plant: Haian, China Operating location: The US</p>	<p>This 10MVA Power transformer with 230KV for bitcoin mining in Houston. It was manufacturer in our factory in Jiangsu Province and it comply with IEEE standards.</p>	
<p>Plant: Haian, China Operating location: Australia</p>	<p>This 12.5/15MVA Power transformer with 66KV/33KV does its duty in Australia. It was manufactured at our factory in Haian, China, and is equipped with the cooling ONAN/ONAF.</p>	

DB Transformer, with an Edge



DAELIM BELEFIC

CONTACT US

TEL: +86-10-65002471/65001715

FAX: +86-10-65001719

CELL: +86-17600626876 +86-13051965423

EMAIL: SERVICE@DAELIM-ELECTRIC.COM

WEBSITE: WWW.DAELIM-ELECTRIC.COM

ADD:

BEIJING OFFICE:

2707, No.4 BUSINESS BUILDING, CHINA CENTRAL PLACE, CHAOYANG DISTRICT, BEIJING, CHINA

JIANGSU FACTORY:

169 XINLOU ROAD, QUTANG TOWN, HAI'AN CITY, NANTONG CITY, JIANGSU PROVINCE



Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise