Ningbo Tianan Group Co., Ltd is a famous leading enterprise of the power transmission equipment manufacturing in China. It was founded in 1969. Currently under the group, we have 2 provincial-level R&D centers, 16 professional companies, 70 sales offices, and its total asset is RMB 4.2 billion and over 3500 employees, one of the most influential leading enterprises in the industry.

Ningbo Tianan Transformer Co., Ltd is the holding company of Ningbo Tianan Group Co., Ltd. Located in Nanhai economic development zone science-technology industrial park, it collects research and development, production, sales and service, has the abundant technical strength, excellent production equipment and modern office facilities. Ningbo Tianan Transformer Co., Ltd is the company specialized in producing mobile substation, medium and large power transformer and special purpose transformer. Transformer voltage grade is from 28kv~275kv, the capacity ranges from 315kVA~300000kVA. Products mainly include: various types of power transformer and autotransformer, rectifier transformer, electric furnace transformer, traction transformer, reactor, etc., the vehicle mobile substation is a new concept of power transmission and transformation equipment that combined with the technology and products of whole group. As for mobile substation produced by Ningbo Tianan Transformer Co., Ltd, except the trailer, all other devices are Tianan Group’s internal R&D, design and production, reliable performance, security and stability.

As an outstanding representative of Chinese-made, our enterprise is in the steady development and growth in the tide of reform and opening up. In 1978, our mode of production transforms from labor products processing to the manufacturing of component electrical equipment. In1992, the local state-owned Xiangshan High-voltage Electric Factory was founded, we start the professional development of electrical products; In 1994, we reorganize and established joint-stock company, enquirer to be an international group. In 2005, our group listed on the regional title, the group ranked the No. 225 in competitiveness of China’s top 500. In 2011, according to the development project arrangement for "the 12th five year”, we plan to expand toward five major industries, such as the high voltage equipment, renewable energy equipment, intelligent grid equipment, rail transit appliance and magnetic drive complex motor, and achieve the business objectives of RMB 7 billion production value in the next three or five years.

Over these years, our company adheres to independent innovation, and to build low-carbon economic development model. Annual R & D expenses accounted for more than 5% of corporate sales. We have mastered the core technology of transformation and distribution equipment, and core self-supporting ability long since. Our self-developed prefabricated substation, ring main unit, load switch, wind power switchgear, intelligent grid systems and many other products achieved the international advanced level, and we are the major player in the drafting of national standard for several power transformation and distribution products in China.

Our company boasts the full endorsement of honor and certificates, such as China famous brand, China top brand, National inspection-free products and ISO9001 quality system, ISO14001 environmental management system, OHSAS18001 occupational health and safety management system, the system of inspection measurement and test and “CCC”, “PCCC”, etc. Business efficient and flexible management mechanism, large number of outstanding professionals, first-class production and testing equipment, high starting point of research and development strategy, “Quality is the character” concept, perfect quality management system and quality assurance, sales and marketing network all over the country, form to provide customers with excellent support system of resources.

Whether in the Shenzhou spacecraft launch base, the Three Gorges Hydropower Station, Qinghai-Tibet railway, Qinghai nuclear power station, or domestic subway, Olympic venues, international airport, wind farm——as well as in more than 30 countries and regions all over the world, there are Tianan products being used. Our main products include 126kV SF6 circuit breaker, GIS combined apparatus, 126kV, 252kV power transformer, 252kV and below outdoor HV disconnector, instrument transformer, box type substation below 40.5kV, Ring Main Unit, Mid-mounted switchgear, fixed type switchgear, gas insulated type switchgear, LV switchgear, HV frequency changer, HV load switch, HV & LV circuit breaker, cable branch box, fuse, current transformer, voltage transformer, intelligent apparatus and dry type & oil type transformer, active power filter, HV variable frequency speed governor, HV static reactive power generation, intelligent devices and system etc.

Committee to enterprise development, the true feeling shall be return society. Tianan has own national May 1st Labor Prize, National Innovation-based Pilot Enterprise, Management Demonstration Enterprise, Industry Civilized Company, Zhejiang Industry Leading Enterprise, Provincial Quality Control Prize, Provincial Famous Brand, Municipal Outstanding Enterprise Headquarters, Ten decent learning enterprises and so on. Over the past 10 years, our company donated money and materials for a variety of public welfare cumulative total value of 20 million yuan, establish some charitable funds, and we get Ningbo Ten charity enterprise.

"Think of danger in times of safety, combat progressive”. Investing for 1.2 billion in an area of 1.298 acres, for the “Tianan City” is basically completed, it will function as an integrated, intelligent and modern “Carrier” of the power transmission industry, combining scientific research, production, management and culture, to achieve our strategic objective of being larger, stronger, better and long-lasting.
1. Product introduction

The Mobile Substation, manufactured by Ningbo Tianan Transformers Co., Ltd., is mainly used as a quick substation to the conventional substation to resume power supply in emergency. It is used in the high-load season to alleviate the shortage of power supply capacity and as a temporary substation put into operation. It can be put into immediate service with just a simple layout, connecting to the incoming and outgoing cables upon arrival at the site.

The mobile substation has the advantages of compact structure, reliable operation, complete functions, high intelligence, quick site operation, less maintenance, etc. Prefabricated semi-work hanging car mobile substation can be designed according to user requirements, can be configured as twin car or bicycle or car based on user conditions.

2. Function & features

- It has all the function of ordinary substation.
- (1) It includes control, protection, lighting protection and step-down and other functions.
- (2) It can be assigned to several power users of branches.
- It is easy to install and put into operation quickly.
- Just connect the cable to put into operation.
- It has shock absorption, temporary rod, circuit components soft connection and other shock measures.

3. Structural composition

- It is divided into HV part, main transformer, LV switchgear room.
- High pressure switches use HGIS or open type isolating switch and magnetic pole breaker as the main switch, mounted on a trailer.
- LV switchgear room include: Low voltage side switch cabinet, control power supply, DC screen and measuring equipment control protection.

4. LV inner switchgear features

- Use three-layer insulation shell;
- Air-conditioned, open on demand;
- Shell protection grade up to IP43 substation;
- Indoor DC power supply battery of low-voltage switchgear is fully sealed products.
5. Semi-trailer Mobile Substation General Technical Parameters

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Unit</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main transformer capacity</td>
<td>MVA</td>
<td>5, 7.5, 10, 15, 20, 25, 31.5, 40, 50</td>
</tr>
<tr>
<td>2</td>
<td>Rated voltage of the switch on HV side</td>
<td>kV</td>
<td>33, 35, 66, 110, 132, 145, 220</td>
</tr>
<tr>
<td>3</td>
<td>Rated current on HV side</td>
<td>A</td>
<td>630, 1250, 2000</td>
</tr>
<tr>
<td>4</td>
<td>Rated short circuit breaking current</td>
<td>kA</td>
<td>25, 31.5, 40</td>
</tr>
<tr>
<td>5</td>
<td>Rated voltage of the switch on LV side</td>
<td>kV</td>
<td>6.6, 11, 13.8, 22, 33, 35</td>
</tr>
<tr>
<td>6</td>
<td>Rated current on LV side</td>
<td>A</td>
<td>1250, 2000, 2500, 3150</td>
</tr>
<tr>
<td>7</td>
<td>Rated short circuit breaking current</td>
<td>kA</td>
<td>25, 31.5, 40</td>
</tr>
<tr>
<td>8</td>
<td>Rated frequency</td>
<td>Hz</td>
<td>50/60</td>
</tr>
</tbody>
</table>

**Ambient Environment**

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Unit</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Ambient temperature</td>
<td>°C</td>
<td>-40 – +60</td>
</tr>
<tr>
<td>10</td>
<td>Solar radiation</td>
<td>W/m²</td>
<td>1000</td>
</tr>
<tr>
<td>11</td>
<td>Humidity</td>
<td>%</td>
<td>&lt;95</td>
</tr>
<tr>
<td>12</td>
<td>Height above sea level</td>
<td>m</td>
<td>&lt;2000</td>
</tr>
<tr>
<td>13</td>
<td>Wind Speed</td>
<td>m/s</td>
<td>40</td>
</tr>
</tbody>
</table>

**Earthquake**

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Unit</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Horizontal acceleration</td>
<td>g</td>
<td>General area: 0.15g</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stricken area: 0.3g</td>
</tr>
<tr>
<td></td>
<td>Vertical acceleration</td>
<td>g</td>
<td>General area: 0.075g</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stricken area: 0.15g</td>
</tr>
</tbody>
</table>

For the higher condition, please feel free contact with us for further discussion.

comercial@colprolec.com

6. Structural composition

- HV Isolate Switch
- LV side
- LV inner switchgear picture 1
- LV inner switchgear picture 2
- LV inner switchgear picture 3
- Main Power Transformer
The design and production technology of our main transformer is researched and redeveloped on the basis of a variety of advanced technologies. With the assist of our many-year design and manufacture experiences, the reliability and performance of the product have reached international advanced level. Through continuous improvement and alteration, a series of the product has been formed, with characteristics of low loss, low noise, low partial discharge, high short circuit withstand capability, high impedance, and fully-enclosed. The series covers 16000 ~ 63000kVA double-winding non-excitation voltage regulating transformer, 16000 ~ 63000kVA double-winding power transformer load tap. Its main features are as follows:

1. **Features**

   1.1 **Product standards**
   
   IEC60076

   1.2 **Low loss**
   
   - Optimization of electromagnetic calculations, using combined technology of electrical shielding and magnetic circuit, effectively controlled leakage, so as to reduce the load loss and to avoid partial overheating.
   - Use high quality cold-rolled lattice orientation high permeability silicon steel, to reduce the load loss, no-load current.
   - Core all-helical stacking with STEP joints, and advanced stacking process, reduced the load loss, load current and electromagnetic noise.

   1.3 **Low partial discharge**

   To ensure the safe and steady operation of the transformer under continuous rated voltage, our Electric Power Research Institute conducted a lot of research to develop a more reasonable insulation structure, plus the strict technology specifications and technical staff experience, ensured the low partial discharge of our products.

   1.4 **High strength**

   - Adoption of six-side method positioning for the body, meets the transportation requirements of, horizontal acceleration not more than 0.3g, vertical direction not greater than 0.15g.
   - Upper and Lower Clamps and the formation of tight fixed side beam frame.
   - The tank can withstand the vacuum test and required positive pressure test.

   1.5 **Low Noise**

   - Use of high-quality core silicon steel;
   - Core STEP by STEP stepping joints;
   - Reduction of the flux density, despite of the increase of cost;
   - Use low-noise fan as the air cooling equipment;
   - Increase the shock absorbing measures;
   - Well interior-protection, to avoid direct rigid contact of the body and tank.

   1.6 **Maintenance-free**

   Our company adopts the domestic leading technology, use fully enclosed structure for the transformer tank, ensuring product life of 30 years, and maintenance-free operation.

7. **Introduction of mobile substation main device**

   - **Main power transformer**

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      1.6 **Maintenance-free**

      Our company adopts the domestic leading technology, use fully enclosed structure for the transformer tank, ensuring product life of 30 years, and maintenance-free operation.
2.1 Transformer Tank sealed structure adopted Tianan general structural design, with strict control of sealing material and the compression coefficient of the sealing rings; a formal leak test would be carried out after the completion of assembly process, so as to ensure the tank is leakage-free.

2.2 For the core fabrication, we use high quality and superior performance Hi-B silicon steel sheet, using the CNC controlled CEORG core cutting line, ensure the silicon steel burrs and angle error, so that after the cutting, it can be moved to the stacking process right away.

For the core stack, we adopted 45 degrees with full reclining, multi-joint core type. Core columns are pre-compressed; use synthetic material or steel ribbon, together with the corresponding fixture and process condition, to ensure the clamping force in a reasonable condition, for the assurance of core quality.

Use spherical measures to eliminate the possibility of interior line deformation under the short circuit status.

2.3 Use high-quality oxygen-free copper wire for the coils; choose adhesive-type transposition wire, to improve the overall strength.

With accordance to design needs, coil (especially low-voltage, voltage regulator) can be wound on hard paper tube, the appropriate increase in the number of stays among the coil, will enhance the mechanical strength of the coil.

For the coil assembly structure, we use the standard structure of Tianan power transformers, with accordance to the design program result, cooling and insulation structure like oil separator can be placed inside the coil, to guarantee its superior reliability.

2.4 Changed the traditional process of coil assembly, use pre-assembly structural design, with the technology and craft, to avoid decrease of mechanical strength caused by the overall contraction during the drying process.

Use imported laminated wood at coil ends, with good mechanical and electrical quality.

Constant pressure device is used during the transformer assembly process, to apply axial pretightening force on the three-phase coil and insulation parts.

2.5 Use advanced kerosene vapor drying equipment to thoroughly dry the transformer, and the oil-pumping is carried out under complete vacuum condition, to ensure the insulation of insulators and oil, therefore greatly improved the safety and reliability of the product.
(3). Hardware facility

We own two large scale assembly workshops, one for 110kV and the other for 220kV. Assembly workshop for 110kV has 169m length, 24m span, 28m inner height, 22.5m height of crane rail. Travelling cranes by remote control are provided in the workshop, the maximum lifting weight is 200 tons.

Modern automatic control systems are adopted in test center, large scale complete set of equipments are controlled by integrate control desk with many functions.

HGIS

Structure Introduction

Overall construction layout: “Three-phase-one-enclosure” construction is employed to the product with characteristic of tiny gap.

Single Bus-bar gap
Control and protection switchgears researched and manufactured by our company.

Advanced and beautiful function switchgears which control and protect the whole test center.

As for mobile substation produced by Ningbo Tianan Transformer Co., Ltd, except the trailer, all other devices are Tianan Group’s internal R&D, design and production, reliable performance, security and stability.
220kV Mobile Substation CZBT1-230/15-50000 Outline drawing

HV side incoming line uses 220kV GIS switch, using oil-SF6 bushing to connect GIS switching and transformer; the project uses two trailers, HV incoming line GIS and transformer are mounted on the trailer 1, and switchgear and control, protection, metering and other equipments are mounted in the container on the trailer 2.
132kV Mobile Substation CZBT1-132/33/15-50000 Outline drawing

132kV Mobile Substation
LAYOUT SKETCH TRAILER 1# (HV & TR.)

132kV Mobile Substation
LAYOUT SKETCH TRAILER 2#

132kV Mobile Substation
LAYOUT SKETCH TRAILER 3#
The first set vehicle mounted mobile substation in China

The first set vehicle mounted mobile substation in China delivered to Iraq, there were not other mobile substations in China at that time, the product is researched, designed and manufactured by Tianan.

Rated voltage: 132kV  
Rated capacity: 16000kVA

<table>
<thead>
<tr>
<th>Type</th>
<th>CZBT1–132/11.5–16000</th>
<th>Vector group</th>
<th>YNd11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated capacity</td>
<td>16000 kVA</td>
<td>Phase</td>
<td>3</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>132 ± 8 x 1.25%/11.5kV</td>
<td>Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>No-load loss</td>
<td>15kW</td>
<td>Cooling type</td>
<td>OFAF</td>
</tr>
<tr>
<td>On-load loss</td>
<td>95kW</td>
<td>Insulation level</td>
<td>LI650AC275/LI75AC35</td>
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</tbody>
</table>
Company Major Qualification and Certifications

Product Application

- Clean energy
  - Qinshan Nuclear Power Plant
  - Huitengxile Wind Power Station
- Water Conservancy Project
  - Three Gorges Project
  - Xiaolangdi Project
- Rail Transportation Project
  - Shanghai Metro
  - Qinghai-Tibet Railway
- Aerospace Project
  - Jiuquan Satellite Launch Centre
  - Shanghai Pudong International Airport
- Other Project
  - National Olympic Stadium
  - Hangzhou Gulf Bridge