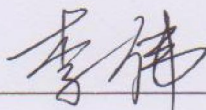


Power of Attorney

We, Electrical Accessory Subsidiary of TBEA Shenyang Transformer Group Co., Ltd, a corporation duly organized and existing pursuant to the laws of China with its office at: NO.32 Kaifa Dalu, Economic and Technological Development Zone, Shenyang City, Liaoning Province, China, hereby confirm that the company PT.VALINDO TEKNIK PRATAMA, legal person Jonny Ma, is authorized to be an agency of Electrical Accessory Subsidiary of TBEA Shenyang Transformer Group Co., Ltd in Indonesia. This letter as a certification is special for them to engage in the marketing activities.

We hereby confirm that this Power of Attorney shall remain in full force from the date of signature and/or seal. The validity of this Power of Attorney is six months.

IN WITNESS WHEREOF we cause this Power of Attorney to be duly signed and/or sealed.



(seal)

Date: 23th May, 2016



TBEA 特变电工

The Global Reliable

Electric Service Provider

**ELECTRICAL ACCESSORY SUBSIDIARY OF
TBEA SHENYANG TRANSFORMER GROUP CO., LTD.**

TBEA 特变电工

Foundation

Strong production capability
Ensure high quality products



Enterprise synopsis

Electrical Accessory Subsidiary of TBEA Shenyang Transformer Group Co., Ltd. is a secondary entity of TBEA Shenyang Transformer Group Co., Ltd. and a core member of TBEA electric transmission and transformation industry group. The company has mainly devoted itself to researching, developing and manufacturing high voltage and ultra-high voltage AC/DC transformer bushing products and various voltage level's AC/DC insulation outlet devices. Now the company is capable of manufacturing AC bushings up to 1700kV, DC bushings up to $\pm 800\text{kV}$, and accordingly has become the first domestic manufacturer which has successfully put independently researched and developed DC bushings into operations. In the Meanwhile, the company is also capable of assembling and manufacturing insulation outlet devices up to DC $\pm 800\text{kV}$, AC 1000kV.

With reliable and qualified products, excellent after-sale services, brand new management concepts and continuously improving supporting facilities, Electrical Accessory Subsidiary of TBEA Shenyang Transformer Group Co., Ltd. is willing to serve the construction of global transformer companies and domestic and overseas electric transmission & transformation industries all the time.



The product type



Up to $\pm 800\text{kV}$

Oil-gas DC bushing



Up to $\pm 400\text{kV}$

Resin-impregnated
paper condenser DC bushing





○ fully automatic winding machine for OIP&RIP bushing

Equipment introduction

The company is well equipped with advanced testing and manufacturing facilities: an imported fully automatic rewinding center, an imported kerosene vapor phase drying equipment, an imported RIP bushing vacuum drying & casting equipment, the world only 1000kV OIP&RIP bushing fully automatic rewinding machine, and a 1200kV series resonance reactor and a 3600kV impulse voltage generator in the testing hall which has high quality shielding materials that guarantee the background Partial Discharge in the test hall is less than 2pC.

The first class hardware facilities, perfect testing method, good testing environment and powerful production capacity have guaranteed the stability and excellence of our products.

TBEA

Up to 1700kV

Oil-impregnated
capacitor type bushing



Up to 800kV

Oil-impregnated capacitor type
bushing with composite external
insulation



Up to 252kV

Resin-impregnated
paper condenser AC bushing



Up to 252kV

ETG bushing



Technical advantage

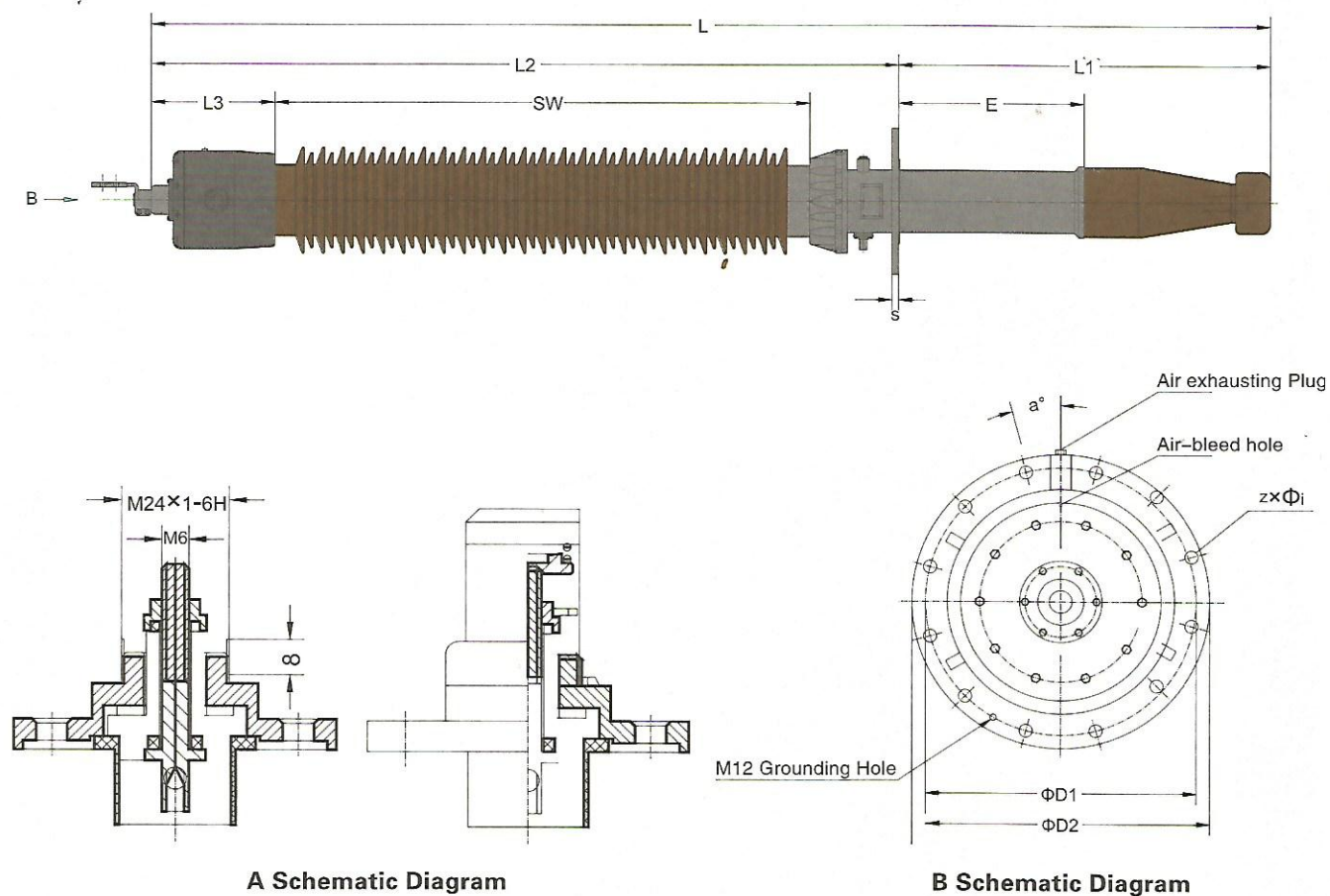
01. Oil-impregnated Paper Capacitor Type Bushing

- A** Computer is used to carry out optimal design for bushings, and the internationally advanced INFOLYTICA computing software is adopted to carry out the calculation analysis of electricity distribution inside and outside the bushing and choose appropriate technical parameters to ensure small partial discharge, high electrical insulation level, and long term function reliability.
- B** As for 252kV to 1700kV bushings, advanced wholly automatic imported rewinding machine is used for insulation rewinding process, during which drying process is also finished at the same time.
As for 72.5kV and 126kV bushings, internationally leading coal oil-vacuum phase drying system is adopted to the drying of capacitance core to ensure excellent drying performance and low dielectric loss factor.

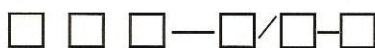
02. Resin-impregnated Paper Condenser Bushing

- A** Reliable electrical insulating performance, lower risk of pollution or wet flashover.
- B** Strong ultraviolet ray and ageing resistance, high reliability of long-time running.
- C** Reliable explosion-proof performance and mechanical properties.
- D** Internal non-oil structure prevents the bushing from leakage, and contamination, and provides good performance of maintenance-free.

Oil-impregnated Paper Capacitor Type Bushings



Model meaning



- External insulation antipollution grade
- Rated current (A)
- Rated voltage(kV)
- External insulation type
- Whether current transformer could be installed
- Main insulation structure

- Main insulation structure
BR—Long tail oil-impregnated paper capacitor type transformer bushings
BRD—Short tail oil-impregnated paper capacitor type transformer bushings
- Whether the current transformer could be installed
L—Current transformer could be installed
No indication—Current transformer could not be installed
- External insulation type
W—Antipollution type
- External insulation grade
3—Minimum nominal creepage distance 25mm/kV
4—Minimum nominal creepage distance 31mm/kV

Oil-impregnated Paper Capacitor Type Bushing Product Specification

Highest voltage for equipment	Um	kv	24	40.5	72.5	126	252	363	420	550	800	1100
Maximum line voltage		kv	14	23	42	73	145	210	242	318	462	635
Partial discharge		pC	≤10	≤10	≤10	≤10	≤10	≤10	≤10	≤10	≤10	≤10
Power frequency withstand voltage test		kv	55	95	155	255	505	625	695	750	970	1200
Lighting impulse voltage (full wave)		kv	125	200	325	550	1050	1175	1425	1675	2100	2400
Lighting impulse voltage (chopped wave)		kv	—	—	—	—	850	950	1050	1175	1550	1950
Switching impulse voltage		kv	138	220	358	605	1155	1293	1568	1843	2310	2760
Minimum flashover (dry arc) distance	SW	mm	335	450	720	1150	2330	3720	3850	4925	6435	9585
Creepage distance		mm	840	1418	2550	3906	8595	13800	14000	18755	22850	35600
Creepage coefficient		l/s	2.5	3.2	3.5	3.4	3.7	3.7	3.6	3.8	3.6	3.7
Bending withstand load		N	3150	4000	1000	1250	4000	4000	5000	4000	5000	5000
Relative voltage creepage distance (nominal)		mm/kv	35	35	35.2	31	34.1	38	33.3	34.1	28.6	32.4
Size specification	D1	mm	325	550	280	350	500	600	430	660	711	930
	D2	mm	360	600	310	400	550	650	480	710	780	1000
	s	mm	15	25	18	18	25	30	25	25	35	35
	i	mm	20	20	18	24	24	24	20	24	32	32
	z		8	12	6	6	12	16	8	16	12	20
	a	°	22.5	15	30	30	15	11.25	22.5	11.25	15	9
	E	mm			425	410	760	500	500	550	600	505
	L1	mm	386	415	685	810	1880	1670	1335	2070	1955	2735
	L2	mm	420	602	1170	1600	3110	4680	4770	5945	7556	11155
	L3	mm	15	32	315	315	450	580	540	585	661	970
	L	m	806	1017	1855	2410	4990	6350	6105	8015	9511	13890

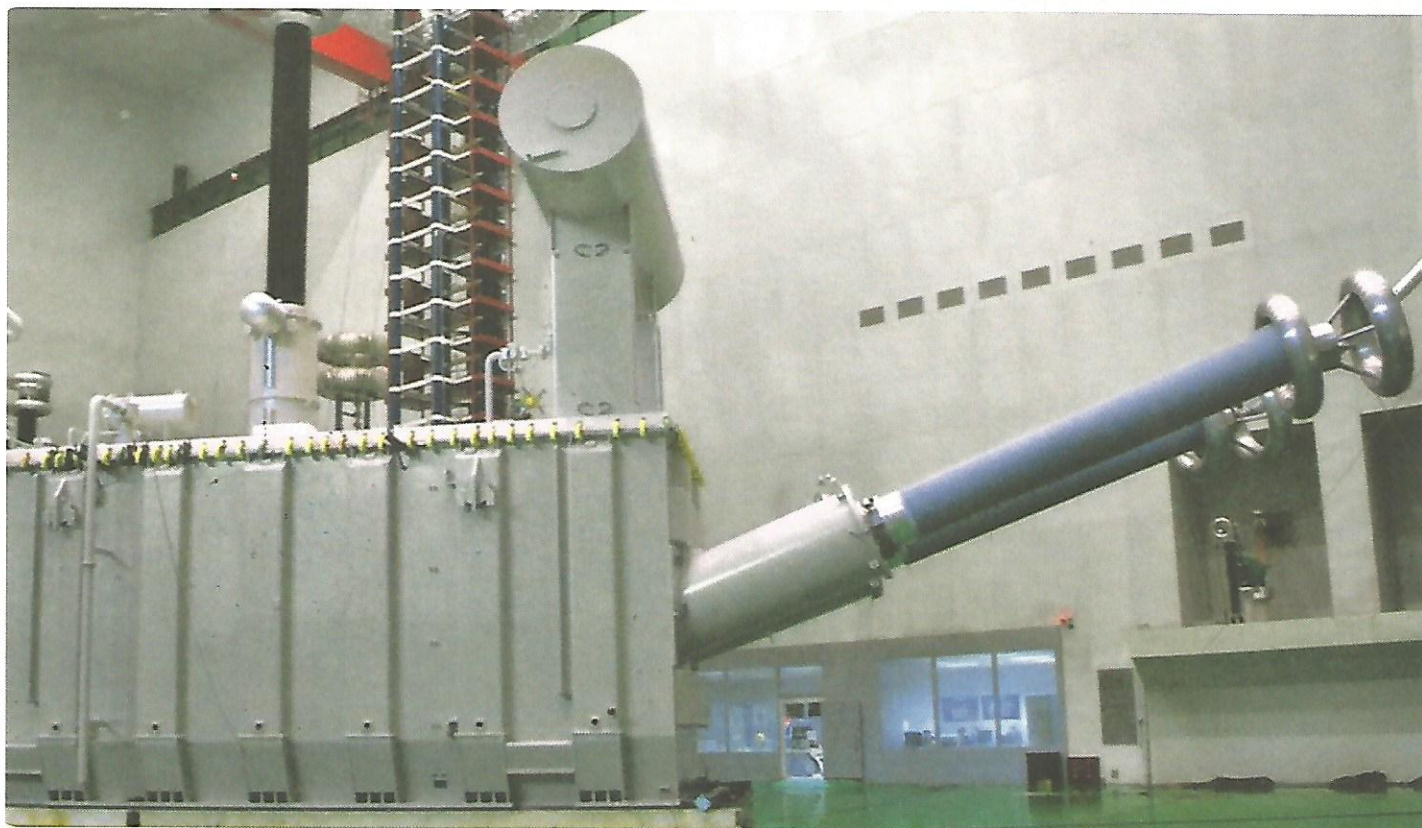
Oil-SF6 DC Bushing

± 800kV performance parameters

DC voltage to earth	± 800kV
Rated current	4722A
1 min power frequency withstand voltage	1200kV
1h power frequency withstand voltage and measure partial discharge	1005kV
2h DC withstand voltage and measure partial discharge pulses number	+1447kV
Polarity reversal test and measure partial discharge pulses number	± 1116kV
Lighting withstand voltage	2145kV/2360kV
Switching impulse withstand voltage	1705kV
Dielectric loss tan δ	≤ 0.4%
Bending withstand load	5000N

± 400kV performance parameters

DC voltage to earth	± 400kV
Rated current	3850A
1 min power frequency withstand voltage	740kV
1h power frequency withstand voltage and measure partial discharge	527kV
2h DC withstand voltage and measure partial discharge pulses number	+743kV
Polarity reversal test and measure partial discharge pulses number	± 530kV
Lighting withstand voltage	1550kV/1783 kV
Switching impulse withstand voltage	1235kV
Dielectric loss tan δ	≤ 0.4%
Bending withstand load	5000 N



Resin-impregnated Paper DC Bushing

± 400kV performance parameters

DC voltage to earth	± 336kV
AC voltage to earth	95.6kV
Composite voltage peak value	471kV
Rated current	3600kV
1 min power frequency withstand voltage	680kV
1h power frequency withstand voltage and measure partial discharge	550kV
2h DC withstand voltage and measure partial discharge pulses number	± 744 kV
Polarity reversal test and measure partial discharge pulses number	± 532kV
Lighting withstand voltage	1430kV/1645kV
Switching impulse withstand voltage	1155kV
Bending withstand load	5000kV

± 186kV performance parameters

Rated voltage	186kV
Rated current	5400A
1 min power frequency withstand voltage	330kV
1h power frequency withstand voltage and measure partial discharge	231kV
2h DC withstand voltage and measure partial discharge pulses number	± 339kV
Polarity reversal test and measure partial discharge pulses number	± 208kV
Lighting withstand voltage	715kV/882 kV
Switching impulse withstand voltage	605kV
Bending withstand load	5000 N





○ Numerically Controlled Lathe

TBEA

03. Oil-SF6 DC Bushings

- Ⓐ Reasonable cooperation of internal and external insulation.
Fine electric field uniformity.
- Ⓑ High electrical insulation margin.
- Ⓒ Excellent insulation self-restoring and ageing-resistance ability.
- Ⓓ Sealing technology with national patent adopted, higher operation reliability.

04. Resin-impregnated Paper DC Bushings

- Ⓐ No partial discharge under double operating voltage.
- Ⓑ Capacitor core has fine oil and gas sealing performance.
- Ⓒ High heat resistance (E grade 120°C).
- Ⓓ Maintenance free, light weight, easy to install.
- Ⓔ No oil, environment friendly and fire proof.
- Ⓕ Flexible installation angle, could be installed vertically and horizontally.



○ Product Testing Hall



Projects

TBEA



±800kV Oil-SF₆ DC Bushings
Hami-Zhengzhou DC Hami Substation Project



±400kV Oil-SF₆ DC Bushings
Jinsu Project, Yulong Converter Station Project



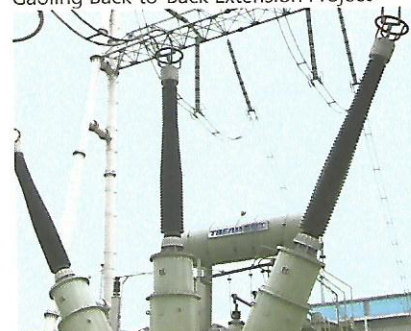
±186kV Resin-Impregnated Paper
DC Bushings
Gaoling Back-to-Back Extension Project



±1700kV Oil-Impregnated Paper
Capacitor Type Bushings
India Energy Company Test Transformer Project



800kV Oil-Impregnated Paper
Capacitor Type Bushings
India UPPTCL Project



550kV Oil-Impregnated
Paper Capacitor Type Bushings
Shanghai Fengjing Power Plant Project



330kV Oil-Impregnated
Paper Capacitor Type Bushings
Yulin Power Plant Project



220kV Oil-Impregnated
Paper Capacitor Type Bushings
Huaneng Tongjiang Wind Power Generation Project



TBEA

Escorts for the product quality

Overview of Insulation Outlet Device and Insulation Parts

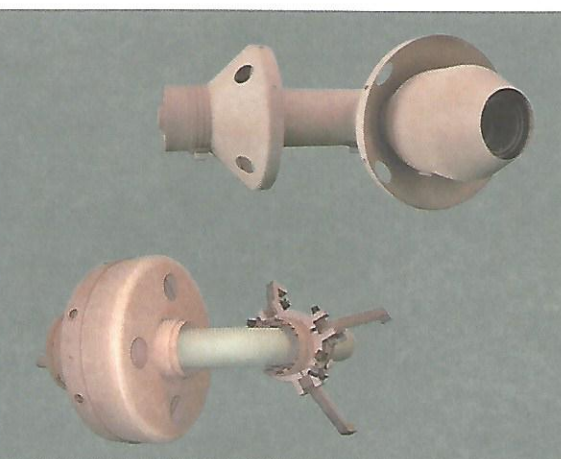
TBEA

Electrical Accessory Subsidiary has a strong ability of scientific research, development and manufacturing based on TBEA's strong scientific research and technology capacity. Our company has long been supplying insulation outlet device for AC and DC transformer, zinc oxide lightning arrester and a variety of insulation parts used in the transformers to TBEA. Currently, our company has the ability of assembling and manufacturing AC 1000kV & below and DC ± 800 kV & below insulation outlet device. Meanwhile, we are also capable of repairing foreign and domestic insulation outlet device.

Our company can use high quality insulation materials produced by designated foreign or domestic manufacturers as per our customers' requirements and process various insulation parts adopting advanced technics and equipments.



The insulation outlet device for converter transformer



Insulation parts