

Modular Substation

Technical Data

TGOOD
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Part 1:
Common Characteristics

1. Standard compliance

- IEC 62271-1 High-voltage switchgear and controlgear Part 1: Common specifications
- IEC 62271-202 High-voltage/low-voltage prefabricated substation
- IEC 62271-100 High-voltage alternating-current circuit-breakers
- ISO12944 Corrosion protection of steel structures by protective paint systems
- IEC 60529-2004 Degrees of protection provided by enclosures (IP code)
- IEC364-4-41 Protection of grounding, lightning protection and grounding standards
- IEC60071-1:2011 Insulation Co-ordination for high-voltage power transmission and transformation equipment
- IEC 62271-102 Alternating current disconnectors and earthing switches
- IEC 62271-303 Use and handling of sulphur hexafluoride (SF6) in highvoltage switchgear and controlgear
- IEC 60068-2 Environmental testing Part 2: Tests (all parts)
- DIN EN ISO 3834-2 Quality requirements for fusion welding of metallic materials - Part 2: Comprehensive quality requirements
- EN 1090-2:2008+A1:2011 Execution of steel structures and aluminium structures – Part 2: Technical requirements for steel structures
- ISO2768-1:1989 General tolerances for linear and angular dimensions without individual tolerance indications
- GB/T 1231 Specification of high strength bolts with large hexagon head, large hexagon nuts, and plain washers for steel structures.
- ISO 898-1:1999 Mechanical properties of fasteners made of carbon steel and alloy steel-- Part 1: Bolts, screws and studs
- ISO 6789-2003 Assembly Tools for Screws and Nuts - Hand Torque Tools - Requirements and Test Methods
- CSA A660-10 Manufacturers certification of steel building systems
- EN 1090 Assembly of steel structures
- CWB 47.1 Canadian welding standards
- ISO 3834 Welding fabrication certification
- GB/T 9978.1-2008 Fire-resistance tests-elements of building construction-Part1: General requirements
- GB/T 9978.8-2008 Fire-resistance tests-elements of building construction-Part8: Specific requirements for non-loadbearing vertical separating elements.

2 Application condition

No	Items		Option values of project demand standard					
1	Ambient temperature	Max (°C)	+40	+42	+45	—	—	—
		Min (°C)	-25	-30	-35	—	—	—
2	Altitude (≤m)		1000	2000	2500	3000	3500	4000
3	Solar radiation intensity (W/cm^2)		0.11					
4	Maximum icing thickness (mm)		10					
5	The average maximum wind speed (m/s) maintained for 10min at 10m above the ground		35					
6	Ground horizontal acceleration (m/s^2)		2					
7	Safety factors of three periods of sinusoidal resonance (≥)		1.67					

3. Enclosure

- Lifespan: 30 years
- Maintenance passageway: ≥900mm
- Frame structure: welded as a whole, texture of the main rolled steel should be the improved carbon structural steel of high quality, and the yield strength should not be less than 235MPa.
- IP class: IP33D, connecting points-IP54, between compartments-IP2X
- Base of enclosure: welded by high quality of steel, the yield strength should not be less than 235MPa. Thickness of steel: frame≥2.5mm; Door and top roof: 2mm; Base: ≥3mm, Filled by nonflammable materials.
- Sealing: Yes, for whole enclosure
- Top roof: inclining degree not less than 5°,
- Hinge: inner side design
- Door opening angle :> 90°
- Smoke detection system: sensor is located at the top
- Anti-corrosion performance: 30 years
- Temperature control system:
  - Wall: 3 layers, overall thickness≥48mm
  - Heat conduction ratio between inner plate and outer plate: 2%
  - Filled foam density: 37kg/m^3
  - Automatic temperature control system: AC starts T >50°C or T<0°C
- Anti-seismic:
  - Frame welded as a whole
  - Vibration resistance: 0.5g (horizontal and vertical)
- Cable passageway:
  - Made of 2mm metal sheet

  - Fire rating: class A
  - Secondary channel: tunnel made of metal sheet
- Lighting:
  - Passageway
  - Emergency
  - Maintenance
  - Anti-explosion LED
- Earthing:
  - Earthing terminal: >Ø12
  - Earthing point: 4 per house

4. Auxiliary systems

4.1 Standard compliance

- GB16796-2009 Safety Requirements and Test Method for Security Alarm Equipment
- GB10408.1-2000 Detection for Intruder Alarm System – Part 1: Requirements for Detectors – General Requirements
- GB12663-2007 General Technical Conditions for Fire Alarm Control Unit
- GB4798.4-2007 Environmental Conditions Existing in the Application of Electric and Electronic Products – Stationary Use at Non-weather-protected Locations
- GB2423.10-2008 Environmental Testing for Electric and Electronic Products
- IEC364-4-41 Standard for Protective Grounding and Lightning Protection
- GA/T75-94 Engineering Procedure and Requirement of Safety and Alarm System
- GA308-2001 Acceptance Check Criterion of Security and Alarm Systems
- GA/T74-2000 Symbols for Use in Diagram of Security and Alarm System
- GB50115-2009 Design Code of Industrial Television System
- GB/16677-1996Transfer Equipment of Alarm Picture Signal through Cable

4.2 Prefabricated substation environment and fire protection monitoring

Item	Type	Unit	Qty	Note
Indoor intelligent ball	Ball machine and infrared	Set	2	Simulation with power supply support
Point-type photoelectric smoke detector	JTY-GD-G3	Nr.	4	one for 40 squares
Base of detector	DZ-02	Nr.	4	
Manual fire alarm call point	J-SAM-GST9121	Nr.	2	One for each door
Fire audible and visual alarm	HX-100B	Nr.	2	

Temperature & humidity sensor	ST2004	Nr.	6	485 output
Temperature and humidity protocol module	ST-WSD-5130	Nr.	1	485 input and Ethernet input; each cabinet is provided with one
Water sensor	ST2003	Nr.	2	DI output
SF6 detector (if need)	Detection of double chamber gas	Nr.	4	485 output
SF6 protocol module (if need)	ST-SF6-5130	Nr.	1	485 input and Ethernet input; each cabinet is provided with one
SF6 audible visual annunciator (if need)	Horn	Set	2	DO
Indoor lighting controller	ST2007E	Set	1	
Auxiliary system equipment box (purchased by Party A)	Custom-made	Nr.	1	It is of a dimension of 20 (thickness) × 60 (width) × 80 (length) (CM), equipped with guide rail, wiring terminals, and cabin service power supply
8 of 10M/100M Switches	Huawei	Nr.	1	
Micro-positive pressure air conditioner	TGOOD	Set	2	
Ventilating fan	KAKU KA2509HA2-4	Nr.	4	
Environment monitoring module	ST2201E	Set	1	
Note 1: The above configuration is only for reference, and the specific configuration should be subject to relevant national regulations and requirements of the operation unit. Note 2: The manufacturer winning the bidding should take charge of installation and commissioning of the system equipment in the plant.				

Part 2:

HV Gas Insulated Switchgear (GIS) Technical Data

1. Standard compliance

- IEC 62271 High-voltage switchgear and controlgear Part 1: Common specifications
- IEC62271-203 Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV
- IEC 62271-104 Switches for rated voltages of 52 kV and above
- IEC 62271-100 High-voltage alternating-current circuit-breakers
- IEC 62271-102 Alternating current disconnectors and earthing switches
- IEC 61869-1-2007 Instrument transformers-Part1 General requiremnets
- IEC 61869-2 addional requirements for current transformers
- IEC 60270 High-voltage test techniques—Partial discharge measurements
- IEC60071-1:2011 Insulation Co-ordination for High-voltage Power Transmission and Transformation Equipment
- IEC 62271-200 AC Metal-enclosed Switchgear and Control Gear for Rated Voltages above 3.6kV and up to and including 40.5kV
- IEC 62271-303 Use and handling of sulphur hexafluoride (SF6) in highvoltage switchgear and controlgear
- IEC 60265-2 Switches
- IEC 62271-108 Disconnecting circuit-breakers
- IEC 60044-1 Current transformer
- IEC 60044-8 Electronic current transformers
- IEC 60044-2 Voltage transformers
- IEC 60044-5 Capacitor voltage transformers
- IEC 60044-7 Electronic voltage transformers
- IEC60044-3 Combined transformers
- IEC 60099-4 Surge arresters
- IEC 60137 Bushings
- IEC 61462 Insulators
- IEC 62271-209 Cable connections
- IEC 61639 Transformer connections

2. HV GIS technical data

S/N	Items		Unit	Data	Note
I	GIS common parameter				
1	Rated voltage		kV	145	
2	Rated current	Outgoing line	A	2000	
		Incoming line		2000	
		Subsection and buscouple		2000	

S/N	Items			Unit	Data	Note
			Main busbar		2000	
3	Rated power-frequency withstand voltage (1 min) (relatively)			kV	230	
4	Peak value of rated lightning impulse withstand voltage (1.2/50μs) (relatively)			kV	550	
5	Rated short-circuit breaking current			kA	40	
6	Rated short-circuit making current			kA	100	
7	Rated short-time withstand current/duration			kA/s	40/3	
8	Rated peak withstand current			kA	100	
9	Short-time power-frequency withstand voltage of auxiliary and control circuits			kV	2	
10	Radio interference voltage			μV	≤500	
11	Noise level			dB	≤90	
12	SF_6 gas pressure (20°C gauge pressure)		Circuit breaker chamber	MPa	0.6MPa	
			Other compartments		0.5MPa	
13	SF_6 gas leakage rate of each compartment			%/Year	≤0.1	
14	SF_6 gas humidity	Compartments with arc decomposition	Handover acceptance value	μL/L	≤150	
			Allowable value of long-term operation		≤300	
		Compartments without arc decomposition	Handover acceptance value		≤250	
			Allowable value of long-term operation		≤500	
15	Partial discharge		Testing voltage	kV	$1.1\times126/\sqrt{3}$	
			Every compartment	pC	≤5	
			Every single insulating part		≤3	
			Bushing		≤5	
			Current transformer		≤5	

S/N	Items		Unit	Data	Note
		Voltage transformer		≤10	
		Lightning arrester		≤10	
16	Power supply	Control circuit	V	DC 220	
		Auxiliary circuit	V	AC 380/220	
17	Service life		Year	≥30	
18	Overhaul period		Year	≥20	
19	Equipment quality (single space)	SF_6 gas quality	kg	300	
		Total weight	kg	6000	
		Maximum transportation weight	kg	8000	
		Dynamic load moves downwards	kg	2000	
		Dynamic load moves upwards	kg	2000	
20	Equipment dimension	Overall dimension of equipment	m	See drawing	
		Maximum transportation clearance of equipment	m	See drawing	
		Width	m	0.8	
21	Structural Layout	Breaker		Three-phase in one tank	
		Bus		Three-phase in one tank	
II	Parameters of the breaker				
1	Model			(provided by the Bidder)	
2	Layout mode			Vertical type	
3	Number of fractures			1	
4	Rated current	Outgoing line	A	2000	
		Incoming line		2000	
		Subsection and buscouple		2000	
5	Main circuit resistance		μΩ	80	

S/N	Items		Unit	Data	Note
6	Current of temperature-rise test		A	1.0 I_r	
7	Rated power-frequency withstand voltage (1 min)	Across isolating distance	kV	230+70	
		To earth		230	
	Peak value of rated lightning impulse withstand voltage (1.2/50μs)	Across isolating distance	kV	550+100	
		To earth		550	
8	Rated short-circuit breaking current	Effective value of AC component:	kA	40	
		Time constant:	ms	45	
		Breaking times	Times	≥20	
		First-phase breaking factor		1.5	
9	Rated short-circuit making current		kA	100	
10	Rated short-time withstand current/duration		kA/s	40/3	
11	Rated peak withstand current		kA	100	
12	Break time		ms	≤60	
13	Close-open time		ms	≤60	
14	Opening time		ms	≤40	
15	Closing time		ms	≤100	
16	Reclosing dead time		ms	≥300	
17	Average speed of opening and closing	Opening speed	m/s	5±0.5	
		Closing speed		2.5±0.5	
18	Opening non-synchronism		ms	≤3	
19	Closing non-synchronism		ms	≤5	
20	Mechanical endurance		Times	10000	
21	Rated operating sequence			O–0.3s–CO–180s–CO	
22	Switching no-load transformer capacity at site	No-load transformer capacity	MVA	50	
		No-load exciting current	A	0.5~15	
		Testing	kV	126	

S/N	Items		Unit	Data	Note
		voltage			
		Operating Sequence		10×O and 10× (CO)	
23	Charging current test of field switching non-load line	Test current	A	Determined by the actual length of line	
		Testing voltage	kV	126	
		Test condition		In principle, the line should not be equipped with voltage reducing devices, such as electric reactors, lightning arresters, voltage transformers, etc.	
		Operating Sequence		10× (O-0.3s-CO)	
24	Capacitive current switching test (laboratory)	Test current	A	Line: 31.5, cable: 140	
		Testing voltage	kV	$1.4\times126/\sqrt{3}$	
		Class C1: LC1 and CC1: 24×O; LC2 and CC2: 24×CO Class C2: LC1 and CC1: 48×O; LC2 and CC2: 24×O and 24×CO		Class C1	
25	Switching capability under the close-in fault condition	L90	kA	36	
		L75	kA	30	
		L60	kA	24 (the minimum arc time of L75 is 5ms greater than that of L90)	
		Operating Sequence		O-0.3s-CO-180s-CO	
26	Out-of phase making and breaking capacity	breaking current	kA	10	

S/N	Items		Unit	Data	Note
		Testing voltage	kV	$2.5\times126/\sqrt{3}$	
26	Out-of phase making and breaking capacity	Operating Sequence		Mode 1: O-O-O Mode 2: CO-O-O	
27	SF_6 gas pressure (gauge pressure, 20°C)	Rated	MPa	0.6MPa	
		Alarm		0.55MPa	
		Minimum (in block)		0.5MPa	
28	Type or model of operating mechanism			Spring	
	Operating mode			Three-phase mechanical linkage	
	Motor voltage		V	DC220	
	Closing operating power supply	Rated operating voltage	V	DC 220	
		Allowable range of operating voltage		85% - 110% and operation is not allowed below 30%	
		Coil quantity of each phase	Nr.	1	
		Surge of each coil	A	3.3	
		Steady-state current of each coil	A	DC 220V, 2.5A	
	Opening operating power supply	Rated operating voltage	V	DC 220	
		Allowable range of operating voltage		65% - 110% and operation is not allowed below 30%	
		Coil quantity of each phase	Nr.	1	
		Surge of each coil	A	3.3	
		Steady-state current of each coil	A	DC 220V, 2.5A	
	Heater	voltage	V	AC 220	
		Power of each	W	100W	

S/N	Items		Unit	Data	Note
		phase			
	Standby auxiliary contact	Qty.	Pair	10 for normal open and 10 for normal closed	
		Breaking capacity		DC 220V, 2.5A	
	Overhaul period		Year	≥20	
	Spring mechanism	Charging time	s	≤20	
29	Breaker quality	Overall quality of breaker, including the auxiliary equipment	kg	500	
		Quality of operating mechanism of each phase	kg	150	
		SF_6gas quality of each phase	kg	50	
		Overall transportation quality	kg	800	
30	Transportation height		m	3.4	
S/N	Description		Unit	Standard parameter value	
31	Hoisting height		m	5	
III	Parameters for Isolating Switch				
1	Type/model			(provided by the Bidder)	
2	Rated current	Outgoing line	A	2000	
		Incoming line	A	2000	
		Subsection and buscouple	A	2000	
3	Main circuit resistance		μΩ	(provided by the Bidder)	
4	Current of temperature-rise test		A	$1.1I_r$	
5	Rated power-frequency withstand voltage (1 min)	Break	kV	230+70	
		To earth		230	
	Peak value of rated lightning impulse withstand voltage (1.2/50μs)	Break	kV	550+100	
		To earth		550	
6	Rated short-time withstand current/duration		kA/s	40/3	

S/N	Items		Unit	Data	Note
7	Rated peak withstand current		kA	100	
8	Opening and closing time	Opening time	ms	(provided by the Bidder)	
		Closing time		(provided by the Bidder)	
9	Average speed of opening and closing	Opening speed	m/s	(provided by the Bidder)	
		Closing speed		(provided by the Bidder)	
10	Mechanical endurance		Times	≥3000	
11	Current value of switching small capacitance		A	1	
12	Current value of switching small inductance		A	0.5	
13	Electric current transformation capacity of switching bus	Switching current	A	1600	
		Transforming voltage	V	10	
		Breaking times	Times	100	
14	Operating mechanism	Type or model		Electric	
		Motor voltage	V	AC 380/220	
		Control voltage	V	AC 220	
		Allowed variation scope of voltage		85%~110%	
		Operating mode		Three-phase mechanical linkage	
	Standby auxiliary contact	Qty.	Pair	10 for normal open and 10 for normal closed	
		Breaking capacity		DC 220V, 2.5A	
IV	Parameters of fast earthing switch (FES)				
1	Rated short-time withstand current/duration		kA/s	40/3	
2	Rated peak withstand current		kA	100	
S/N	Description		Unit	Standard parameter value	
3	Rated short-circuit making current		kA	100	
4	Closing times of rated short-circuit current		Times	≥2	
5	Opening and closing time	Opening time	ms	(provided by the Bidder)	

S/N	Items			Unit	Data	Note
			Closing time		(provided by the Bidder)	
6	Average speed of opening and closing		Opening speed	m/s	(provided by the Bidder)	
			Closing speed		(provided by the Bidder)	
7	Mechanical endurance			Times	≥3000	
8	Switching induction Current capacity (Type A/B)	Electromagnetic induction	Reactive current	A	50/80	
			Breaking times	Times	10	
			Induced voltage	kV	0.5/2	
		Electrostatic induction	Capacitive current	A	0.4/2	
			Breaking times	Times	10	
			Induced voltage	kV	3/6	
9	Operating mechanism		Type or model		Spring	
			Motor voltage	V	AC 380/220	
			Control voltage	V	AC 220	
			Allowed variation scope of voltage		85%~110%	
	Standby auxiliary contact		Quantity	Pair	8 for normal open and 8 for normal closed	
			Breaking capacity		DC 220V, 2.5A	
V	Parameters of maintenance grounding switch					
1	Rated short-time withstand current/duration			kA/s	40/3	
2	Rated peak withstand current			kA	100	
3	Mechanical endurance			Times	≥3000	
4	Operating mechanism		Type or model		Electric	
			Motor voltage	V	AC 380/220	
			Control voltage	V	AC 220	
			Allowed variation		85%~110%	

S/N	Items		Unit	Data	Note
		scope of voltage			
	Standby auxiliary contact	Qty.	Pair	8 for normal open and 8 for normal closed	
		Breaking capacity		DC 220V, 2.5A	
VI	Parameters for Current Transformer (CT)				
1	Type or model			Electromagnetic type	
2	Layout mode			Internal	
3	Winding 1	Nominal current ratio		400~800~1000/5A	
		Rated burden		20VA	
		Accuracy class		5P30 (line and subsection) 5P20 (main transformer)	
	Winding 2	Nominal current ratio		400~800~1000/5A	
		Rated burden		20VA	
		Accuracy class		5P30 (line and subsection) 5P20 (main transformer)	
	Winding 3	Nominal current ratio		400~800~1000/5A	
		Rated burden		20VA	
		Accuracy class		5P30 (line and subsection) 5P20 (main transformer)	
	Winding 4	Nominal current ratio		400~800~1000/5A	
		Rated burden		20VA	
		Accuracy class		0.5	
	Winding 5	Nominal current ratio		400~800~1000/5A	
		Rated burden		20VA	
		Accuracy		0.2S	

S/N	Items		Unit	Data	Note
		class			
VII	Parameters for voltage transformer (VT)				
1	Type or model			Electromagnetic type	
2	Rated voltage ratio			$\frac{110}{\sqrt{3}}/\frac{0.1}{\sqrt{3}}/\frac{0.1}{\sqrt{3}}/0.1$	
3	Accuracy class			0.2/0.5/3P,	
4	Wiring group			Y/Y/Y/△	
5	Three-phase imbalance		V	1	
6	1min power frequency withstand voltage of low voltage winding		kV	3	
7	Rated voltage factor			1.2×rated continuous, 1.5×rated 30S	
VIII	Lightning arrester parameters				
1	Rated voltage		kV	108	
2	Continuous operating voltage		kV	84	
3	Nominal discharge current (8/20μs)		kA	10	
4	Residual voltage at steep impulse current (1/10μs)		kV	315	
5	Residual voltage under lightning impulse current (8/20μs)		kV	281	
6	Residual voltage at switching impulse current (30/60μs)		kV	239	
7	DC 1mA reference voltage		kV	≥157	
8	Leak current at 75% of DC 1mA reference voltage		μA	≤50	
9	Power-frequency reference current (effective value)		kV	≥108	
10	Power-frequency reference current (peak)		mA	2	
11	Continuous current	Full current	mA	0.85	
		Resistive current	μA	250	
12	Long duration impulse withstand current	Line discharge class		2	
		Impact of rectangular wave current impact	A	800	
13	4/10μs large impulse withstand current		kA	100	

S/N	Items		Unit	Data	Note
14	Operating load			Pass	
15	Characteristics of power frequency voltage withstand duration			$1.2U_r^*$ 0.2 s $1.15U_r^*$ 1.1 s $1.1U_r^*$ 10s 1.0 U_r^* 20 min	
16	Absorption capability of kilovolt nominal voltage		kJ/kV	≥7.25	
17	Pressure release capacity		kA/s	40/0.2	
IX	Bushing parameters (this item is composed of inlet and outlet cables, it is not equipped with bushing)				
1	Umbrella skirt type			Large and small umbrella	
2	Material			Porcelain	Or epoxy
3	Rated current		A	2000	
4	Rated short-time withstand current/duration		kA/s	40/3	
5	Rated peak withstand current		kA	100	
6	Rated power-frequency withstand voltage (1 min) (relatively)		kV	230	
7	Peak value of rated lightning impulse withstand voltage (1.2/50μs) (relatively)		kV	550	
8	Creepage distance		mm	3150 (when the average diameter is between 300mm (included) and 500mm (included), the figure should multiple by 1.1; when the average diameter is greater than 500mm, the figure should multiple by 1.2)	For DL standard
9	Dry acing distance		mm	≥900	
10	S/P			≥0.9	
11	Terminal static load	Longitudinal	N	1250	
		Horizontal		750	
		Vertical		1000	
		Safety coefficient		Static state: 2.75; dynamic state: 1.7	
12	Minimum clearance between phases of		mm	≥1000	

S/N	Items		Unit	Data	Note
	electrified part of metal at bushing top				
X	Parameters of epoxy casting insulator				
1	Safety coefficient			Greater than 3 times of design voltage	
2	Leakage current under 2 times of nominal phase-phase voltage		μA	50	
3	The maximum field density under 1.1 times of nominal phase-voltage		kV/mm	≤1.5	
XI	Bus parameters				
1	Material			Aluminum	
2	Rated current		A	2000	
3	Rated short-time withstand current/duration		kA/s	40/3	
4	Rated peak withstand current		kA	100	
5	Conductor diameter (inner diameter/outer diameter)		mm	(30/60)	
XII	Shell parameters				
1	Material			Aluminum alloy	
2	Breakdown pressure for shell			Cast aluminum and aluminum alloy: 5 times of the design voltage; Welded aluminum shells and steel shells: 3 times of the design voltage	
3	Temperature rise	Test current	A	1.0 I_r	
		Positions contactable	K	≤30	
		Positions may be contactable	K	≤40	
		Positions cannot be contactable	K	65	
4	Resistance of casing to be burn-through	Current	kA	40	
		Time	s	0.3	
5	Erection of explosion-proof membrane			Yes	
XIII	Parameters of expansion joint				
1	Material			Stainless steel	
2	Service life			⩾ 30 years or 10,000 times of expansion	

S/N	Items	Unit	Data	Note
XIV	Parameters for SF_6 Gas			
1	Humidity	μg/g	≤8	
2	Purity	%	≥99.8	

Part 3:

110 kV Neutral Point Complete Equipment for Service Transformer Technical Data

1. Standard compliance

Standard No.	Description of Standard
IEC 60038	Standard Voltage
GB1985-89	AC High-voltage Isolating Switch and Earthing Switches
GB 4585.2	AC system applies high-voltage insulator artificial pollution test, cured layer method
DL/T 620-1997	Overvoltage Protection and Insulation Coordination for AC Electrical Installations
GB 1208	Current transformer
IEC60071-1:2011	Insulation Co-ordination for High-voltage Power Transmission and Transformation Equipment
GB/T 775.3 -1987	Test Method for Insulators
GB5582-1993	External Insulation Pollution Classes of High-voltage Electric Power Equipment
GB/T 7354 -1987	Measurement of Partial Discharge
GB/T 11604 -1989	Radio Interference Test for High-voltage Electrical Equipment
IEC 60060:2011	High-voltage Test Techniques
GB 11032-2000	Metal-oxide Surge Arresters without Gaps for A.C. Systems
GB 50150-2006	Standard for Hand-over Test of Electric Equipment Electric Equipment Installation Engineering
GB763	Heating of AC High-voltage Apparatus under Long Runs
GB 191-1990	Package, Storage and Transportation Identification Marks
GB311.1--1997	Insulation Co-ordination for High-voltage Power Transmission and Transformation Equipment
GB2706	Testing Methods for Dynamic and Thermal Stability Test of AC High-voltage Electrical Apparatus
GB5582	External Insulation Pollution Classes of High-voltage Electric Power Equipment
GB/T13540	Anti-seismic Characteristic Test for High-voltage Switchgear
DL/T620	Overvoltage Protection and Insulation Coordination for AC Electrical Installations

2 Technical data

2.1 Operation overview of system

- Nominal voltage of system: 110kV
- Maximum voltage of system: 126kV
- System frequency: 50Hz, 60Hz
- Neutral point operation mode of system: Grounding through isolating switches

2.2 Technical data

- Equipment name and model: neutral point protection device of transformer, JY-JXC-110
- Rated voltage of transformer: 110 kV
- Insulation level of transformer neutral point:
  - 1.2/50μS Lightning impulse full wave (peak value): 325 kV
  - 1min power-frequency withstand voltage (effective value): 140 kV
- Type of the neutral point lightning arrester: YH1.5W-72/186W
  1. Rated frequency of lightning arrester: 50Hz
  2. Rated voltage of lightning arrester: 72kV
  3. Continuous operating voltage of lightning arrester: 58kV
  4. Nominal discharge current: 1.5kA
  5. Protection characteristic of the lightning arrester
     - Residual voltage under steep current surge (peak value): ⩽ kV
     - Residual voltage at lightning impulse current (peak value): ⩽ 186kV
     - Residual voltage at switching impulse current (peak value): ⩽ 174kV
  6. DC 1mA reference voltage: ⩾103kV
  7. Leak current at 75% of DC 1mA reference voltage: ⩽50 μA
  8. Frequency reference voltage (frequency reference current noted) 72kV (resistive current peak value 1mA)
  9. High current impulse withstand: 10kA (Residual voltage during high current impulse can be provided)
  10. Pressure release capacity
      - Large current: 20kA
      - Small current: 400A
  11. Radio interference voltage is not greater than: 500μV
  12. Partial discharge is not greater than: 10pC
- Technical parameters of electrical equipment required by the discharge gap in main neutral point: (Determined by parameters of neutral point lightning arrester by the Supplier)
  - Gap rated voltage: 83kV±5%
  - Scope of gap electrode distance: 50mm~300mm (adjustable)
  - Electrode configuration mode: sealed
  - Electrode type: Spherical gap material: electroplating steel ball
- Isolating switch: 630A, electrical operating mechanism, auxiliary contacts (6 normally open contacts and 6 normally closed contacts) (silvering)
- Current transformer at neutral points of main transformer: 150/5A double winding 5P30/0, .5 (supply with main transformer, excluded in this supply)
- Integrate isolating switch, discharge gap, lightning arrester and gap current transformer, and supply in complete set.

- Base material: hot galvanized steel; Fixing mode: bolt fixing, with equipment support supplied in complete set by the supplier.
- Insulating articles and supporting pieces have moisture-proof performance, to maintain the dielectric strength unchanged. The equipment, of sound sealing, meets long-term outdoor operation conditions,
- The conductor section and type connecting to the transformer neutral point shall be determined by the Demander.
- Provide factory documents such as inspection report and quality certificate during products supplying
- Install current transformer at gap side: LJW1-10 200/5A0.5/10P15, 15/15VA, type: epoxy resin cast fully-enclosed supporting 10kV

Part 4:

40.5 kV Ehouse Technical Data

1.Standard compliance

Standard No.	Description of Standard
DL/T 404-2007	3.6kV~40.5kV AC Metal-enclosed Switchgear and Control Gear for Rated Voltages
DL/T 486-2000	High-voltage AC Isolating Switch and Grounding Switch
IEC 62271-1	Common Specifications for High-voltage Switchgear and Control Gear Standards
GB 1207—2006	Voltage Transformer
GB 1208—2006	Current transformer
GB 1984—2003	High-voltage AC Circuit Breaker
GB 1985—2004	High-voltage AC Isolating Switch and Grounding Switch
GB 3906—2006	3.6kV~40.5kV AC Metal-enclosed Switchgear and Control Gear for Rated Voltages
GB 6450-1986	Dry-type Power Transformer
GB 11032—2000	Metal-oxide Surge Arresters Without Gaps for A.C. Systems
GB 15166.2—2008	AC High-voltage Fuse Part 2: Current Limiting Fuse
GB 50150—2006	Standard for Hand-over Test of Electric Equipment Electric Equipment Installation Engineering
IEC 62271-1	Common Specifications for High-voltage Switchgear and Control Gear Standards
SD 318-1989	Technical Conditions for Locking Device of High-voltage Switchgear
IEC 62271-100	High-voltage AC Circuit Breaker

2. Technical data

S/N	Items		Unit	Data	Note
I	Switchgear common parameter				
1	Rated current	Cable outgoing line	A	1250	
		Capacitor outgoing line		1250	

S/N	Items		Unit	Data	Note
		Grounding transformer outgoing line		1250	
		Busbar equipment		1250	
2	Power supply	Control circuit	V	DC220 / DC 110	
		Auxiliary circuit	V	AC 380/ AC 220	
3	Arc duration		S	0.3~0.5	
4	Equipment dimension	Overall dimension of single switchgear (Length× Width× Height)	mm	(1600×600×2350)	Consult us for details
II	**Parameters of the breaker**				
1	Switching no-load transformer capacity at site	No-load transformer capacity	MVA	10/20/31.5	
		No-load exciting current	A	0.5~15	
2	Capacitive current switching test (Laboratory)	Class C1: CC1: 24×O, CC2: 24×CO; BC1: 24×O, BC2: 24×CO		Class C1/C2	
		Class C2: CC1: 48×O, CC2: 24×O and 24×CO; BC1: 24×O, BC2: 80×CO			
3	Motor voltage		V	AC 380/220	
	Closing operating power supply	Rated operating voltage	V	DC220/DC110	
		Steady-state current of each coil	A	DC220 V, 2.5A or DC110 V, 5A	
	Opening operating power supply	Rated operating voltage	V	DC220/DC110	
		Steady-state current of each coil	A	DC220V, 2.5A or DC110V, 5A	
	Quantity of protection coil		Nr.	Provided by project company	
	Auxiliary contact	Breaking capacity		DC220 V, 2.5A or DC110 V, 5A	
III	**Parameters of earthing switch**				

S/N	Items		Unit	Data	Note
1	Operating mechanism	Type		Electric and manual	
		Motor voltage	V	AC 380/220	
	Auxiliary contact	Breaking capacity		DC220 V, 2.5A or DC110 V, 5A	
IV	**Parameters for current transformer**				
1	Winding 1	Nominal current ratio		200~1250/1 (5)	
		Rated burden	VA	15/20/30	
		Accuracy class		10P10/10P20	
	Winding 2	Nominal current ratio		200~1250/1 (5)	
		Rated burden	VA	15/20/30	
		Accuracy class		10P10/10P20	
	Winding 3	Nominal current ratio		200~1250/1 (5)	
		Rated burden	VA	15/20/30	
		Accuracy class		0.5	
	Winding 4	Nominal current ratio		200~1250/1 (5)	
		Rated burden	VA	15/20/30	
		Accuracy class		0.2S	
V	**Parameters for voltage transformer**				
1	Rated capacity		VA	20/50/100	
VI	**Fuse parameter**				
1	Fuse type			RNP-0.5	
2	Rate current of fuse		A	0.5A	
3	Rated short-circuit breaking current for fuse		kA	31.5kA	
VIII	**Parameters of busbar**				
1	Rated current		A	2000A	

Part 5:

40.5 kV Arc Suppression Coil Ehouse Technical Data

1. Standard compliance

Standard No.	Description of Standard
IEC60071-1:2011	Insulation Co-ordination for High-voltage Power Transmission and Transformation Equipment
IEC 60060	High-voltage Test Techniques
GB 8287.1	High-voltage Pillar Porcelain Insulator
GB 50150	Standard for Hand-over Test of Electric Equipment Electric Equipment Installation Engineering
IEC 62271-102	Alternating Current Disconnectors and Earthing Switches
GB10230	On-load Tap-changer
GB11032	Metal-oxide Surge Arresters without Gaps for A.C. Systems
IEC 62271-200	Metal-enclosed Switchgear for Alternating Current at Rated Voltages of Between 1 and 52 kV
GB1094.1~5	Power Transformer
GB1094.3	Insulation Levels, Dielectric Tests and External Clearances in Air
GB1094.11	Dry-type Power Transformer
GB10229	Reactor
GB7328	Determination of Power Transformer and Reactor Sound Levels
GB7354	Partial Discharge Measurements
GB7449	Guide to the Lightning Impulse and Switching Impulse Testing of Power Transformers and Reactors
GB/T13540	Anti-seismic Characteristic Test
GB/T14549	Quality of Electric Energy - Harmonics in Public Supply Network
GB/T17626.2~12	Electromagnetic Compatibility Testing and Measurement Techniques
DL/T1057	Technical Specifications of Automatic Tracking and Compensation and Arc Suppression Coil Device
DL/T 620	Overvoltage Protection and Insulation Coordination for AC Electrical Installations
IEC 62271-103:	Switches for Rated Voltages above 1 and Less Than 52 kV
IEC 60255	Measurement Relay and Protection Unit
IEC 60282-2	High Voltage Fuses
IEC 61869-2	Current Transformers
IEC 61869-3	Voltage Transformers
IEC 60529	Defining the Protection Indices Provided by the Enclosures
IEC 62271-206:	Voltage Presence Indicating Systems

Q/GDW168	Regulations of Condition-based Maintenance & Test for Electric Equipment
SGCC	Technical Standard for 10kV~66kV Arc Suppression Coil Devices
GJDWS [2004] No. 61	Anti-accident Measures for 10kV~66kV Arc Suppression Coil Devices
GJDWS [2006] No. 51	Instructions on Technical Transformation of Arc Suppression Coil Devices
SGCC [2005]	Technical Standard for 10kV~66kV Arc Suppression Coil Devices

2. Technical data

S/N	Items		Unit	Value	Note
1	Operating conditions			Indoor	
2	Unit package	Rated voltage	kV	40.5	
		Rated frequency	Hz	50, 60	
		Insulation level	kV	Power frequency (1min) withstand voltage (effective): 85kV Lightning full-wave impulse withstand voltage (peak value): 200kV	
		Rated capacity of arc suppression coil	kVA	1800	
		Rated current of arc suppression coil	A	0~81	
		Measuring error of capacitance current	%	<±2	
		Residual current	A	≤5	

S/N	Items		Unit	Value		Note
		Neutral point displacement voltage of the grid at mounting point		≯15% of nominal phase voltage		
		Arrival time of ground compensation	ms	Less than 10μs		s
		Incoming & outgoing modes		Cable		
3	Extinction coil	Rated capacity	kVA	1800		
		Rated current	A	0~81		
		Adjusting mode		Phase control		
		Regulating range		50~100%		
		Linearity range of volt-ampere characteristics		0~110%UN		
		Type of Insulation		Dry type (Class F)		
		Insulation level	kV	Power frequency (1min) withstand voltage (effective): 85kV Lightning full-wave impulse withstand voltage (peak value): 200kV		
		Temperature-rise limit (Working Condition)	K	Top oil	Not to exceed 95K under rated operation conditions.	
				HV winding		
				Fuel tank, iron core and surface of		

S/N	Items		Unit	Value		Note
				metal structure		
				Winding hot point		
		Continuous operation time of rated current (min.)	hour	2		
		Cooling mode		Self-cooling (equipped with temperature display, control and tele-transmission functions)		
		External insulation creepage distance	mm/kV	≥20 (indoor)	≥20 (indoor)	
		Partial discharge	pC	< 3.6		
		Noise	dB	0.3 m away from the transformer body ≤ 50dB		
		Electrical life of switch contact on tap switch		Not less than 200,000 times of movement		
		Mechanical life switch contact on tap switch		Not less than 800,000 times of movement		
4	Control Device	Type		High reliability, high degree of integration, dedicated computer or programming controller for industrial use with modular structure.		
		Rated voltage	V	DC220V or DC110V, reliable working voltage range 75%~115%		

S/N	Items		Unit	Value	Note
		Measuring error of capacitance current	%	-2 ~ +2	
		Measuring error for neutral point displacement voltage	%	-2 ~ +2	
		Recording times of fault information	Times	500	
		Power frequency withstand voltage	kV	2	
		Times of fault recording	Times	≥50	
		Tuning-off degree	%	≤10	
		Neutral point displacement voltage of the grid at mounting point		≠ 10% of nominal phase voltage	
		Main functions		Functions of man-machine interaction, self-checking, alarming, printing, memory, display, tele-transmission, on-line running, automatic blocking (turn-adjusting type), hibernation, line selection principle, statistics and fault recording.	
5	Damping resistor (Turns-adjusting	Resistance value	Ω	(Filled by the Bidder)	
		Long-time working current	A	(Filled by the Bidder)	

S/N	Items		Unit	Value	Note
	type)	DC resistance allowable error	%	±2	
		Short-time allowable current	kA		
		Earth insulation	MΩ	>100	
6	Line selection device (options)	Type		If turn-adjusting type is applied, Paralleled medium resistance shall be selected.	
7	Box outer cover	Protection grade		Not less than IP20 (indoor)	

Part 6:

17.5 kV Ehouse

Technical Data

1. Standard compliance

- IEC 62271-1: Clauses common to high voltage switchgear
- IEC 62271-100: High voltage alternating current circuit-breakers
- IEC 62271-102: Alternating current disconnectors and earthing switches
- IEC 62271-103: Switches for rated voltages above 1 and less than 52 kV
- IEC 62271-200: Metal-enclosed switchgear for alternating current at rated voltages of between 1 and 52 kV
- IEC 60282-2: High voltage fuses
- IEC 60255: Measurement relay and protection unit
- IEC 61869-2: Current transformers
- IEC 61869-3: Voltage transformers
- IEC 60529: Defining the protection indices provided by the enclosures
- IEC 62271-206: Voltage Presence Indicating Systems (high voltage

2 Technical data

No	Items		Unit	Data	Note
I	**Switchgear common parameter**				
1	Structural Type			Trolley type	
2	Rated voltage		kV	17.5	
3	Rated frequency		Hz	50, 60	
4	Rated current		A	630-3150	
5	Temperature rise test			1.0Ir	
6	Rated power-frequency withstand voltage (1 min)		kV	38	
7	Peak value of rated lightning impulse withstand voltage (1.2/50μs)		kV	95	
8	Rated short-circuit breaking current		kA	31.5	
9	Rated short-circuit making current (50Hz)		kA	80	82 at 60Hz
10	Rated short-time withstand current/duration		kA/s	31.5/3	
11	Rated peak withstand current (50Hz)		kA	80	82 at 60Hz
12	Short-time power-frequency withstand voltage of auxiliary and control circuits		kV	2	
13	Partial discharge	Testing voltage	kV	$1.1\times12/\sqrt{3}$	
		Single insulating part	pC	≤3	

No	Items		Unit	Data	Note
		Voltage transformer and current transformer		≤10	
14	Power supply	Control circuit	V	DC220 / DC 110	
		Auxiliary circuit	V	AC 380/ AC 220	
15	Service life		Year	≥30	
16	Equipment dimension	Overall dimension of single switchgear (Length × Width× Height)	mm	(provided by the Bidder)	
		Maximum transportation dimension (length × width× height)		(provided by the Bidder)	
17	Protection degree	Enclosure		IP4X	
		Compartments		IP2X	
18	Creepage distance	Porcelain materials (To earth)	mm	≥216	DL standard
		Organic materials (To earth)		≥240	DL standard
19	Clear distance between phases and that between phase and ground (air insulation)		mm	≥125	
20	Loss of service continuity category			LSC-2B	
21	Insulating bush or fluidized coating			Heat shrinkable bushing	
22	Minimum clear distance from SMC clapboard to insulating bush of the connector or fluidized coating		mm	≥30	
23	Thickness of SMC clapboard		mm	≥5	
24	Thickness of cabinet wall		mm	≥2	
25	Layout of circuit breaker			Withdrawable/ fixed	
26	Racking truck mechanism			Electric/ manual	
27	Cooling mode			Self-cooling/ air-cooling	
28	Heater power			Supplied by the manufacture	
29	Internal arc classification		kA, s	AFLR,31.5kA, 1s	
II	**Parameters of the breaker**				
1	Type			Vacuum	
2	Rated voltage		kV	17.5	

No	Items		Unit	Data	Note
3	Rated frequency		Hz	50, 60	
4	Rated current		A	630-3150	
5	Main circuit resistance		μΩ	(provided by the Bidder)	
6	Temperature rise test			1.0Ir	
7	Rated power-frequency withstand voltage (1 min)		kV	38	
	Peak value of rated lightning impulse withstand voltage (1.2/50μs)		kV	95	
8	Rated short-circuit breaking current	Effective value of AC component:	kA	31.5	
		Time constant:	ms	45	
		Electric endurance	Times	E2	
		First-phase breaking factor		1.5	
9	Rated short-circuit making current (50Hz)		kA	80	82(60Hz)
10	Rated short-time withstand current/duration		kA/s	31.5/3	
11	Rated peak withstand current (50HZ)		kA	80	82(60Hz)
12	Break time		ms	≤60	
13	Time for contact closing		ms	≤2	
14	Opening time		ms	≤45	
15	Closing time		ms	≤70	
17	Reclosing dead time		ms	300	
18	Average speed of opening and closing	Opening speed	m/s		
		Closing speed			
19	Opening non-synchronism		ms	2	
20	Closing non-synchronism		ms	2	
21	Mechanical endurance			M2	10000 times
22	Rated operating sequence			Feeder: O–0.3s–CO–180s–CO	
				Power receiving and subsection: O–180s–CO–180s–CO	

No	Items		Unit	Data	Note
23	Short-time power frequency withstand voltage of auxiliary and control circuits		kV	2	
24	Breaking test of out-phase grounding fault			$\sqrt{3}$ /Double rated short-circuit breaking current	
25	Capacitive current switching test (Laboratory)	Test current	A	Cable: 25, Capacitor bank: ≥400	
		Testing voltage	kV	$1.4\times12/\sqrt{3}$	
		Class C1: CC1: 24×O, CC2: 24×CO; BC1: 24×O, BC2: 24×CO		Class C2	
		Class C2: CC1: 48×O, CC2: 24×O and 24×CO; BC1: 24×O , BC2: 80×CO			
26	Type or model of operating mechanism			Spring	
	Operating mode			Three-phase mechanical linkage	
	CB charging motor voltage		V	DC 220	
	Closing operating power supply	Rated operating voltage	V	DC220	
		Allowable range of operating voltage		85%~110%, 30% is not allowed to be operated	
		Coil quantity of each phase	Nr.	1	
		Surge of each coil	A		
		Steady-state current of each coil	A	DC220 V, 2.5A	
	Opening operating power supply	Rated operating voltage	V	DC220	
		Allowable range of operating voltage		65%~110%, 30% is not allowed to be operated	
		Coil quantity of each phase	Nr.	1	

No	Items		Unit	Data	Note
		Surge current of each coil	A	(provided by the Bidder)	
		Steady-state current of each coil	A	DC220V, 2.5A	
	Standby auxiliary contact	Quantity	Pair	10 for normal open and 10 for normal closed	
		Breaking capacity		DC220 V, 2.5A	
	Overhaul period		Year	≥15	
	Energy storage time of spring mechanism		s	≤20	
27	Vacuum degree of vacuum arc extinguish chamber		Pa	$\leqslant 1.33\times10^{-3}$	
III	**Parameters of Isolating Switch (if any)**				
1	Type			(provided by the Bidder)	
2	Rated current		A	630-3150	
3	Main circuit resistance		μΩ		
4	Current of temperature-rise test		A	1.0Ir	
5	Rated power-frequency withstand voltage (1 min)	Across isolating distance	kV	48	
		To earth		42	
	Peak value of rated lightning impulse withstand voltage (1.2/50μs)	Across isolating distance	kV	85	
		To earth		75	
6	Rated short-time withstand current/duration		kA/s	40/4(31.5/4)	
7	Rated peak withstand current		kA	100/80	
8	Opening and closing time	Opening time	ms	(provided by the Bidder)	
		Closing time		(provided by the Bidder)	
9	Average speed of opening and closing	Opening speed	m/s	(provided by the Bidder)	
		Closing speed		(provided by the Bidder)	
10	Breaking capacitance current		A	0.5	
11	Breaking inductive current		A	0.5	

No	Items		Unit	Data	Note
12	Mechanical endurance		Times	≥3000	
13	Operating mechanism	Type or model		Manual	
		Motor voltage	V		
		Control voltage	V	DC220	
		Allowed variation scope of voltage		85%~110%	
		Operating mode		Three-phase mechanical linkage	
	Standby auxiliary contact	Quantity	Pair	10 NO 10NC	
		Breaking capacity		DC220 V, 2.5A	
IV	**Parameters for earthing switch**				
1	Rated short-time withstand current/duration		kA/s	31.5/4	
2	Rated peak withstand current		kA	100/80	
3	Rated making current		kA	100/80	
4	Rated on-off frequency		Times	2	
5	Mechanical endurance		Times	≥3000	
6	Operating mechanism	Type		Manual	Motor optional
		Motor voltage	V	AC 380/220	
		Control voltage	V	DC220	
		Allowed variation scope of voltage		85%~110%	
		Operating mode		Three-phase mechanical linkage	
	Standby auxiliary contact	Quantity	Pair	8 for normal open and 8 for normal closed	
		Breaking capacity		DC220 V, 2.5A	
V	**Parameters of Current Transformer (CT)**				
1	Type			Dry type and electromagnetic type	
2	Winding 1	Nominal current ratio		In terms of primary drawings	

No	Items		Unit	Data	Note
		Rated burden	VA	20	
		Accuracy class		0.2S	
	Winding 2	Nominal current ratio		In terms of primary drawings	
		Rated burden	VA	20	
		Accuracy class		0.5	
	Winding 3	Nominal current ratio		In terms of primary drawings	
		Rated burden	VA	30	
		Accuracy class		10P20	
	Winding 4	Nominal current ratio		In terms of primary drawings	
		Rated burden	VA	30	
		Accuracy class		10P20	
VII	**Parameter of voltage transformer (VT) and fuse**				
1	Type			Dry type and electromagnetic type	
2	Rated voltage ratio			10/√3: 0.1/√3: 0.1/√3: 0.1/3	
3	Accuracy class			0.2/0.5/3P	
4	Connection grade			$Y_n/y_n/y_n/\triangle$	
5	Rated capacity		VA	10/20/30	
6	Three-phase imbalance		V	1	
7	1min power frequency withstand voltage of low voltage winding		kV	2	
8	Rated voltage factor			1.2×rated continuous, 1.9×rated 8h	
9	Fuse type			Provided by project company	

No	Items		Unit	Data	Note
10	Rate current of fuse		A	Provided by project company	
11	Rated short-circuit breaking current for fuse		kA	Provided by project company	
VIII	**Lightning arrester parameters**				
1	Type			HY5W-XX	
2	Rated voltage		kV	17.5	
3	Continuous operating voltage		kV	17.5	
4	Nominal discharge current		kA	5	
5	Residual voltage peak at steep impulse current (5kA, 1/3μs)		kV	≤51.8	
6	Residual voltage peak under lightning impulse current (5kA, 8/20μs)		kV	≤45	
7	Residual voltage peak at switching impulse current (250A, 30/60μs)		kV	≤38.3	
8	DC 1mA reference voltage		kV	≥24	
9	Leak current at 75% of DC 1mA reference voltage		μA	(provided by the Bidder)	
10	Power-frequency reference current (effective value)		kV	(provided by the Bidder)	
11	Power-frequency reference current (peak)		mA	(provided by the Bidder)	
12	Continuous current	Full current	mA	(provided by the Bidder)	
		Resistive current	μA	(provided by the Bidder)	
13	Long duration impulse withstand current		A	400 (peak value)	
14	4/10μs large impulse withstand current		kA	65 (peak value)	
15	Operating load			(provided by the Bidder)	
16	Characteristics of power frequency voltage withstand duration			(provided by the Bidder)	
17	Absorption capability of kilovolt nominal voltage		kJ/kV	(provided by the Bidder)	
18	Pressure release capacity		kA/s	25/0.2	
IX	Parameters for busbar				

No	Items	Unit	Data	Note
1	Material		Copper	
2	Rated current	A	4000	
3	Rated short-time withstand current/duration	kA/s	40/3	
4	Rated peak withstand current	kA	100	
5	Section of conductor	mm^2	Provided by supplier	
X	**Service transformer**			
1	Type		Dry type	
2	Capacity		Provided by project company	
3	Rated voltage ratio		Provided by project company	
4	Impedance		Provided by project company	
5	Connection symbol		Provided by project company	
6	Loss		Provided by project company	

Part 7:

17.5 kV Compensation Ehouse Technical Data

1.Standard compliance

- IEC 60071-1:2011 Insulation Co-ordination for High-voltage Power Transmission and Transformation Equipment
- GB 1208 Current Transformer
- GB 1985 AC High-voltage Isolating Switches and Earthing Switches
- GB 7354 Measurement of Partial Discharge
- GB 8287 High-voltage Pillar Porcelain Insulator
- GB 11032 Metal-oxide Surge Arresters without Gaps for A.C. Systems
- GB 50060 Design Code for High-voltage Electrical Installation (3~110kV)
- GB 50227 Standard Design Code for Parallel-connected Capacitor Package shall be applicable to the unit
- GB 50260 Design Code of Seismic of Electrical Installations
- GB 15166.5 AC High-voltage Fuse in Parallel Connection with External Protective Fuse of the Capacitor
- GB/T 5582 External Insulation Pollution Classes of High-voltage Electric Power Equipment
- GB/T 11024 Parallel Capacitor for AC Electric Power System with Nominal Voltage over 1kV
- GB/T 16927.1~16927.2 High-voltage Testing Techniques

3 Technical data

S/N	Items	Unit	Data	Note
I	**Parameter of capacitor**			
1	Device type		TBB10-4800/400-AKW	
2	Rated voltage	kV	10	
3	Rated capacity	kVAR	4800	

S/N	Items	Unit	Data	Note
4	Rated reactance ratio	%	5	
5	Rated phase capacitance	μF	105.5	
6	Rated voltage (phase) of the capacitor bank	kV	11/√3	
7	Deviation of capacitor bank capacitance and rated capacitance	%	0~+5	
8	Ratio of maximum value and minimum value of each phase capacitance of capacitor bank		≤1.01	
9	Ratio of maximum capacitance and minimum capacitance of each series section of capacitor bank		/	
10	Connection method		Single-star structure	
11	Series-parallel number of each phase capacitor		1 for series and 4 for parallel	
12	Protection mode		Differential Protection of Phase	
13	Secondary calculation value of initial unbalanced current (or voltage)		/	
14	Setting value of relay protection		/	
15	Allowable overvoltage times for complete components for setting value calculation of relay protection		1.3	
16	Connection Diagram of Equipment		/	
17	Capacitor bank model		Frame style	
18	Direction and position of the incoming line of capacitor bank		Lower incoming line	
19	Short-circuit current endurance	kA	31,5kA	

S/N	Items	Unit	Data	Note
	capacity of equipment			
II	**Parameter of single capacitor**			
1	Type		BAM 11/√3-400-1W	
2	Rated voltage	kV	11/√3	
3	Rated capacity	kvar	400	
4	Design field intensity (K=1)	kV/mm	≤57	
5	Partial discharge performance	pC	Partial discharge≤ 50	
		UN	Extinguishing voltage of partial discharge is not less than 1.2 at the lower temperature limit	
6	Temperature type	°C	(See part1)	
7	Bushing structure		Bushing of roll-on and roll-off integrated structure	
8	Requirements of the leading-out terminal and bushing	N	≥500 (horizontal pull)	
9	Blasting energy endurance of capacitor	kW·s	≥15	
10	Short-circuit discharge test		Discharging for 5 times in 10 minutes at the DC voltage of 2.5UN with change of capacitance less than ±2%	
11	Attached drawings and series and parallel number of internal components of capacitor		/	
12	Protection mode for single capacitor		External fuse wire	

S/N	Items	Unit	Data	Note
13	Installation position of inner fuse wire		(Effective isolating measures) shall be taken in the middle and end of elements	
14	Test of inner fuse wire		Lower voltage limit ≤0.9 $\sqrt{2}$ UN Upper voltage limit ≥2.2 $\sqrt{2}$ UN	
15	Allowable overvoltage times for complete components of capacitor with inner fuse wire		≤ 1.3times rated voltage of elements	
16	Performance of discharging device	min/V	10min/75V	
17	Installation mode of capacitor		Horizontal configuration	
III	**Parameter of discharge coil**			
1	Rated voltage of primary winding	kV	11/√3	
2	Rated voltage of secondary winding	V	100	
3	Rated capacity of secondary winding	VA	/	
4	Accuracy class		0.5	
5	Power frequency withstand voltage (1 min)/ testing voltage	kV/kV	42	
	Lightning impulse withstand voltage/ testing voltage	kV/kV	75	
	Interaction withstand voltage of primary winding		2.15Un/60s	
	Earthing power frequency withstand voltage of secondary winding	kV/1min	3	
6	Structure mode		(See Part 1)	

S/N	Items	Unit	Data	Note
7	Capacity of accessory capacitor (phase)	kvar	≥1336	
8	Discharge performance		Voltage of capacitor bank decrease from $\sqrt{2}$ UN to less than 50V in 5s after disconnecting the power supply.	
			Discharge is not damaged at allowable maximum capacitance of 1.9UN of capacitor bank	
IV	**Metal Oxide Arrester**			
1	Rated voltage	kV	17	
2	Continuous operating voltage	kV	13.6	
3	Nominal discharge current	kA	5	
4	Residual voltage at nominal discharge current	kV	46	
5	2ms rectangular wave discharge current capacity	A	≥500	
6	Power frequency withstand voltage (power frequency/lightning) modified in terms of external insulation elevation	kV/kV	(See optional technical parameter table of project company)	
V	**Post insulator of busbar**			
1	Rated voltage	kV	10	
2	Rated compressive strength	N·m	/	
3	Creepage distance	mm/kV	(See part 1)	

S/N	Items	Unit	Data	Note
4	Withstand testing voltage (power frequency/lightning) modified in terms of elevation	kV/kV	(See Part 1)	
5	Installation method		Front installation	
VI	**Isolating Switches and earthing switches**			
1	Rated voltage	kV	20	
2	Short-circuit current endurance capacity of equipment	kA (3s)	31.5kA	
3	Short-circuit current endurance capacity of equipment	kA	(See optional technical parameter table of project company)	
4	Rated current (Isolating Switch)	A	≥400	
5	Type		(See optional technical parameter table of project company)	
6	Withstand testing voltage (power frequency/lightning) modified in terms of elevation	kV/kV	See optional technical parameter table of project company)	
VII	**Series reactor**			
1	Type		Dry type	
2	Rated voltage	kV	10	
3	Rated terminal voltage	kV	0.32	
4	Rated capacity	kvar	240	
5	Rated inductance	mH	/	
6	Rated current	A	/	
7	Loss	kW/kvar	Iron core ≤0.015	
8	Temperature rise	K	≤70	

S/N	Items	Unit	Data	Note
9	Reactance ratio	%	5	
10	Insulation level (power frequency/ lightning)	kV/kV	42/75	
11	Noise	dB	≤50	
12	Inductance deviation	%	0~+5	
13	Withstand testing voltage (power frequency/lightning) modified in terms of elevation	kV/kV	(See optional technical parameter table of project company)	
14	Three-phase inductance deviation	%	Deviation of reactance between value of each phase and average value of three-phase is not more than ±2%	
15	Installation layout mode		Three-phase integration, semi-iron core, stack mounting	

Part 8:

12 kV Arc Suppression Coil Ehouse Technical Data

1. Standard compliance

Standrad	Description
IEC60071-1:2011	Insulation Co-ordination for High-voltage Power Transmission and Transformation Equipment
IEC60060	High-voltage Test Techniques
GB 8287.1	High-voltage Pillar Porcelain Insulator
GB 50150	Standard for Hand-over Test of Electric Equipment Electric Equipment Installation Engineering
GB 4208	Enclosure Protection Class (IP Code)
GB10230	On-load Tap-changer
GB11032	Metal-oxide Surge Arresters without Gaps for A.C. Systems
GB 1208	Current Transformer
GB1094.1~5	Power Transformer
GB1094.3	Insulation Levels, Dielectric Tests and External Clearances in Air
GB1094.11	Dry-type Power Transformer
GB10229	Reactor
GB7328	Determination of Power Transformer and Reactor Sound Levels
GB7354	Partial Discharge Measurements
GB7449	Guide to the Lightning Impulse and Switching Impulse Testing of Power Transformers and Reactors
GB/T13540	Anti-seismic Characteristic Test
GB/T14549	Quality of Electric Energy - Harmonics in Public Supply Network
GB/T17626.2~12	Electromagnetic Compatibility Testing and Measurement Techniques
DL/T1057	Technical Specifications of Automatic Tracking and Compensation and Arc Suppression Coil Device
DL/T 620	Overvoltage Protection and Insulation Coordination for AC Electrical Installations
Q/GDW168	Regulations of Condition-based Maintenance & Test for Electric Equipment
SGCC	Technical Standard for 10kV~66kV Arc Suppression Coil Devices
GJDWS [2004] No. 61	Anti-accident Measures for 10kV~66kV Arc Suppression Coil Devices
GJDWS [2006] No. 51	Instructions on Technical Transformation of Arc Suppression Coil Devices
SGCC (2005)	Technical Standard for 10kV~66kV Arc Suppression Coil Devices

2 Technical data

S/N	Items		Unit	Data	Note
1	Operating conditions			Indoor	
2	Unit package	Rated voltage	kV	12	
		Rated frequency	Hz	50	
		Insulation level	kV	Power frequency (1min) withstand voltage (effective): 35kV Lightning full-wave impulse withstand voltage (peak value): 75kV	
		Rated capacity of arc suppression coil	kVA	400	
		Rated current of arc suppression coil	A	50	
		Measuring error of capacitance current	%	-2~+2	
		Residual current	A	≤5	
		Neutral point displacement voltage of the grid at mounting point		≯15% of nominal phase voltage	
		Arrival time of ground compensation	ms	Less than 60	

S/N	Items		Unit	Data	Note
		Incoming & outgoing modes		Cable	
3	Earthing transformer	Rated voltage	kV	10.5 (/0.4 kV) (Equipped with secondary coil)	
		Capacity of grounding transformer	kVA	630	
		Capacity of secondary coil (doubles as house transformer)	kVA	200	
		Zero sequence reactance	Ω/phase	≤9	
		connection group and the grade number of connection group (only for connection with secondary winding)		ZN, yn11	
		Type of Insulation		Dry type (Class F)	
		Insulation level	kV	Power frequency (1min) withstand voltage (effective): 35kV Lightning full-wave impulse withstand voltage (peak value): 75kV	
		Temperature rise	K	Not to exceed 100K under rated operation conditions.	

S/N	Items		Unit	Data		Note
		Cooling mode		Self-cooling (equipped with temperature display, control and tele-transmission functions)		
		External insulation creepage distance	mm/kV	⩾20 (indoor)	⩾30 (outdoor)	
		Partial discharge	pC	< 5		
		Noise	dB	0.3 m away from the transformer body ⩽ 55		
4	Extinction coil	Rated capacity	kVA	400		
		Rated current	A	50		
		Adjusting mode		Phase control type		
		Regulating range		50~100%		
		Type of insulation		Dry type (Class F)		
		Linearity range of volt-ampere characteristics		0~110%Un		
		Insulation level	kV	Power frequency (1min) withstand voltage (effective): 35kV Lightning full-wave impulse withstand voltage (peak value): 75kV		
		Temperature rise	K	Not to exceed 100K under rated operation conditions.		
		Continuous operation time of rated	h	2		

S/N	Items		Unit	Data	Note
		current (min.)			
		Cooling mode		Self-cooling (equipped with temperature display, control and tele-transmission functions)	
		External insulation creepage distance	mm/kV	≥20 (indoor)	
		Partial discharge	pC	< 5	
		Noise	dB	0.3 m away from the transformer body ≤ 55	
		Electrical life of switch contact on tap switch		Not less than 200,000 times of movement	
		Mechanical life switch contact on tap switch		Not less than 800,000 times of movement	
5	Control equipment	Type		High reliability, high degree of integration, dedicated computer or programming controller for industrial use with modular structure.	
		Control voltage	V	DC220V or DC110V , reliable working voltage range 75%~115%	
		Measuring error of capacitance current	%	-2~+2	
		Measuring error for neutral point displacement voltage	%	-2~+2	

S/N	Items		Unit	Data	Note
		Recording times of fault information	Times	500	
		Power frequency withstand voltage	kV	2	
		Times of fault recording	Times	≥50	
		Tuning-off degree	%	≤10	
		Neutral point displacement voltage of the grid at mounting point		≯15% of nominal phase voltage	
		Main functions		Functions of man-machine interaction, self-checking, alarming, printing, memory, display, tele-transmission, on-line running, automatic blocking (turn-adjusting type), hibernation, line selection principle, statistics and fault recording; IEC-61850 protocol interface is required for Intelligent Substation.	
6	Damping resistor (Turns-adjusting type)	Resistance value	Ω		
		Long-time working current	A	10	
		DC resistance allowable error	%	±2	
		Short-time allowable current	kA		

S/N	Items		Unit	Data	Note
		Earth insulation	MΩ	>100	
7	Line selection device (options)	Type		If turn-adjusting type is applied, line selection device of paralleled medium resistance shall be selected.	
8	Box outer cover	Protection grade		Not less than IP20 (Indoor)	

Part 9:

Power Transformer Ehouse Technical Data

1. Standard compliance

Standard	Description
IEC60038	Standard Voltage
IEC 60076	Power Transformers
IEC 62271-102	Alternating Current Disconnectors and Earthing Switches
GB 4585.2	Artificial Pollution Test Methods of Composite Insulator
GB 1208	Current Transformer
IEC60071-1:2011	Insulation Co-ordination for High-voltage Power Transmission and Transformation Equipment
GB/T 775.3-1987	Insulator Test Method
GB5582-1993	External Insulation Pollution Classes of High Voltage Electric Power Equipments
IEC 60270	High-Voltage Test Techniques – Partial Discharge Measurements
GB/T 11604-1989	Test Methods for Measuring Radio Interference for High Voltage Equipment
IEC 60060	High-voltage Test Techniques
IEC 60099	Surge Arresters
GB 50150-2006	Standard for Hand-over Test of Electric Equipment Installation...
ISO780-1985	Packaging-Pictorial Markings for Handling of goods

2. Power transformer technical data

Refer to transformer data from supplier.

Part 10:

Secondary Ehouse Technical Data

Please request TGOOD's dedicated document <Secondary House Technical Data>