



中国认可
国际互认
检测
TESTING
CNAS L1020



实验室名称: 苏州电器科学研究院股份有限公司
国家电器产品质量检验检测中心

Lab Name: Suzhou Electrical Apparatus Science Research Institute Co., Ltd.
China National Center for Quality Inspection and Test of Electrical Apparatus Products

No 21XJ1161-S

检验 (试验) 报告 Test Report

委托单位: CTC POWER EQUIPMENT CO., LTD.
Client:

产品名称: 170kV Composite Station Post Insulator
Name of Product:

产品型号: C12.5-650/3625
Product Type:

检验类别: Type test
Test Category:

本实验室对出具的检验 (试验) 结果负责, 未经实验室书面同意, 不得部分地复制本报告。

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Suzhou Electrical Apparatus Science Research Institute Co., Ltd.		Test Report		C12.5-650/3625 170kV Composite Station Post Insulator	
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Suzhou Electrical Apparatus Science Research Institute Co., Ltd.		Test Report		C12.5-650/3625 170kV Composite Station Post Insulator	
General					
Test category		Type test			
Type and name of specimens		C12.5-650/3625 170kV Composite Station Post Insulator			
Client		CTC POWER EQUIPMENT CO., LTD.			
Address		Room 10-1-701, Gangjing Gardon, Zhongshan District, Dalian City, Liaoning Province, China			
Manufacturer		DALIAN CTC INSULATOR COMPANY LIMITED.			
Address		No. 32 Guangyuan Street, Lvshun Economic Development Zone, Dalian City, Liaoning Province, China			
Manufacturing date and serial number		/			
Main technical parameters of specimens	Rated voltage kV		170		
	Dry lightning-impulse withstand voltage kV peak		650		
	Wet power-frequency withstand voltage kV		275		
	Specified cantilever load (SCL) kN		12.5		
	Specified tensile load (STL) kN		100		
	Maximum design cantilever load (MDCL) kN		5		
	Maximum design torsion load (MDToL) kN·m		0.4		
	Technical data from client	C12.5-650/3625 170kV Composite Station Post Insulator		Test commission form	
215301 C12.5-650/3625 Composite Station Post Insulator		Assembly			
Description		/			
Representative of client: Li Chuanqu					
Date of specimens receiving: Aug. 27 th , 2021					
Test period: from Sept. 25 th , 2021 to Jan. 14 th , 2022					

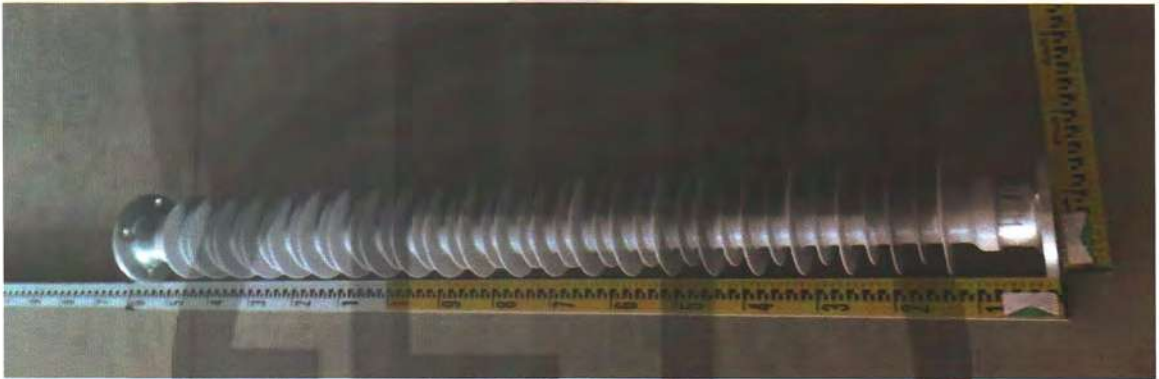
Suzhou Electrical Apparatus
Science Research Institute
Co., Ltd.

Test Report

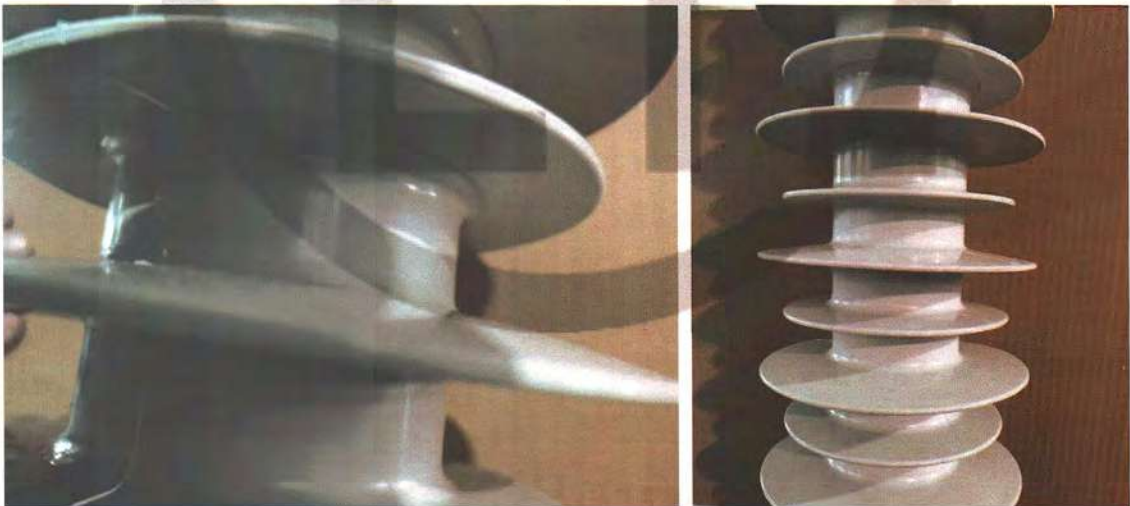
C12.5-650/3625
170kV Composite Station Post
Insulator

Photos of the specimens

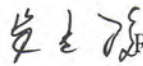



Whole picture




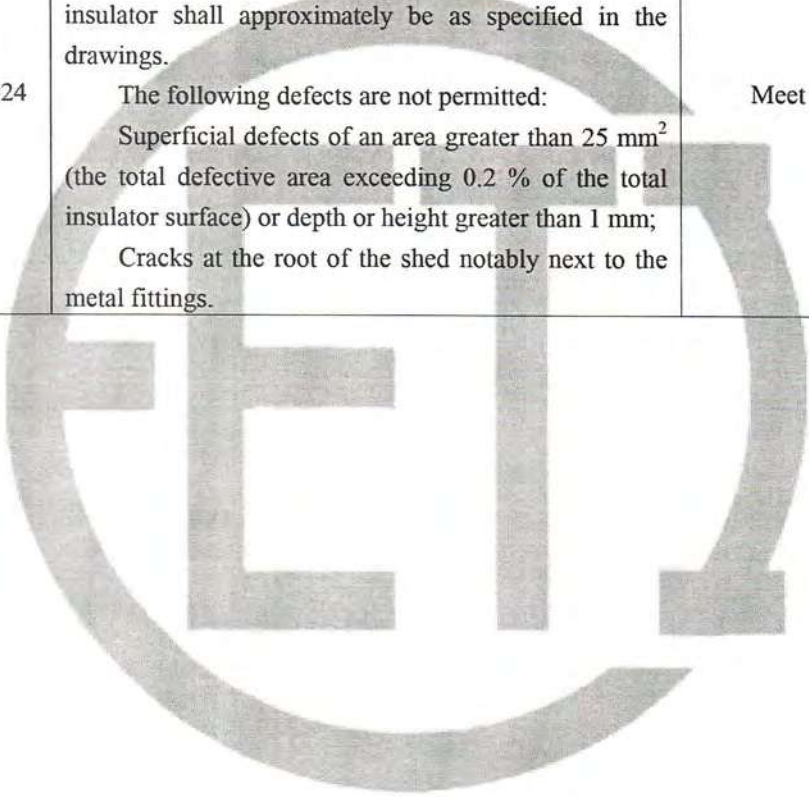
Partial pictures




Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator
Test conclusion		
Client	CTC POWER EQUIPMENT CO., LTD.	
Type of specimens	C12.5-650/3625	
Name of specimens	170kV Composite Station Post Insulator	
Manufacturer	DALIAN CTC INSULATOR COMPANY LIMITED.	
Test items and results	Identification of the station post insulator	PASS
	Visual examination	PASS
	Tensile load test [STL:100kN]	PASS
	Tests on interfaces and connections of end fittings (Reference dry power frequency test)	PASS
	Tests on interfaces and connections of end fittings (Thermal-mechanical pre-stressing) [MDCL:5kN]	
	Tests on interfaces and connections of end fittings (Water immersion pre-stressing) [42h]	
	Tests on interfaces and connections of end fittings (Visual inspection)	
	Tests on interfaces and connections of end fittings (Steep-front impulse voltage test)	
	Tests on interfaces and connections of end fittings (Dry power-frequency voltage test)	PASS
	Tests on shed and housing material (Hardness test)	
	Tests on shed and housing material (Accelerated weathering test) [1000h]	
	Tests on shed and housing material (Tracking and erosion test) [1000h]	
	Tests on shed and housing material (Flammability test) [Class V-0]	PASS
	Tests on the core material	
	Assembled core load tests (Verification of the specified tension load) [STL:100kN]	PASS
	Assembled core load tests (Verification of the maximum design cantilever load (MDCL)) [MDCL:5kN]	PASS
	Assembled core load tests (Verification of the maximum design torsion load) (MDToL) [MDToL: 0.4kN·m]	PASS
	Verification of dimensions[According to technical deta]	PASS
	Dry lightning impulse withstand voltage test [Between upper and lower end surfaces:650kV peak]	PASS
	Wet power-frequency withstand voltage test [Between upper and lower end surfaces: 275kV 1min]	PASS
	Cantilever failing load test [SCL:12.5kN]	PASS
	Specified tension load test [STL:100kN]	PASS
	Verification of dimensions[According to technical deta]	PASS

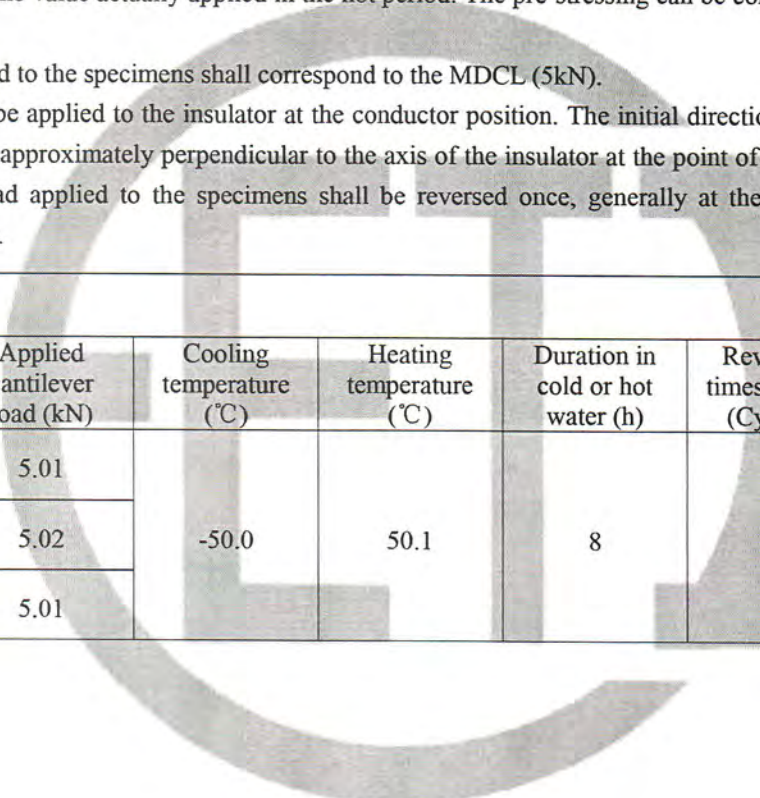
Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator
Test conclusion		
Test items and results	Galvanizing test	PASS
	Verification of the SCL [SCL:12.5kN]	PASS
	Verification of the STL [STL:100kN]	PASS
	Test standards	GB/T 25096-2010 Composite station post insulators for substations with AC voltages greater than 1000V – Definitions, test methods and acceptance criteria Clauses 11.1, 11.2, 11.3, 8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.4, 8.5, 8.3.1, 8.3.2, 8.3.3, 9.1, 9.2.1, 9.2.2, 9.3.1, 9.3.2, 10.2, 10.3, 10.4.1, 10.4.2
IEC 62231:2006 Composite station post insulators for substations with a.c. voltages greater than 1000V up to 245kV – Definitions, test methods and acceptance criteria Clauses 11.1, 11.2, 11.3, 8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.4, 8.5, 8.3.1, 8.3.2, 8.3.3, 9.1, 9.2.1, 9.2.2, 9.3.1, 9.3.2, 10.2, 10.3, 10.4.1, 10.4.2		
Test conclusion	<p style="text-align: center;"> The tests are carried out on C12.5-650/3625 170kV Composite Station Post Insulator by CTC POWER EQUIPMENT CO., LTD. and manufactured by DALIAN CTC INSULATOR COMPANY LIMITED., and the test items meet the relevant clauses of above test standard and technical specification, and the specimens have passed the test. </p> <p style="text-align: center;"> Note: the conclusion is valid only for the inspected and tested sample. </p>	
<p> Compiled by:  Proofread by:  Checked by:  Approved by:  </p> <p> Date: 2022-01-26 Date: 2022-01-26 Date: 2022-01-26 Date: 2022-01-26 </p>		

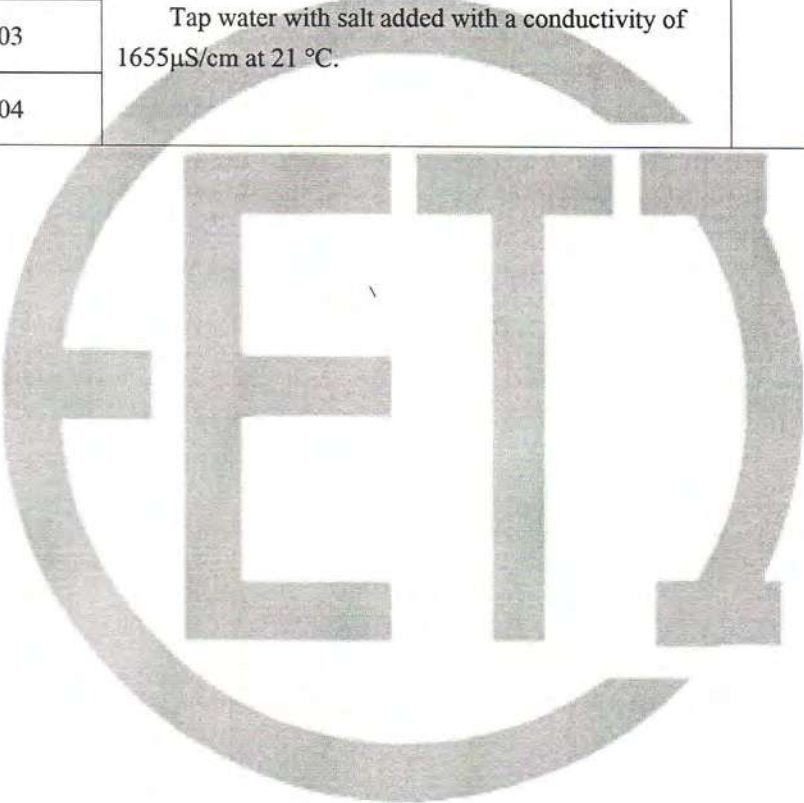
Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator
Identification of the station post insulator		
Test date: 2021-09-25		
I. Test results		
No. of the specimens	Appearance inspection standard of test specimen	Test result
21XJ1161-S-#01~#24	Each insulator shall be marked with manufacturer's name or trademark, the year of manufacture, and the maximum design cantilever load (MDCL) or corresponding standard type as specified. These markings should be legible and indelible.	Meet the requirements
		
Note: /		

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator
Visual examination		
Test date: 2021-09-25		
1. Test results		
No. of the specimens	Appearance inspection standard of test specimen	Test result
21XJ1161-S-#01~#24	<p>Each insulator shall be examined. The mounting of metal fittings on the insulator assembly shall be in accordance with the drawings. The colour of the insulator shall approximately be as specified in the drawings.</p> <p>The following defects are not permitted:</p> <p>Superficial defects of an area greater than 25 mm² (the total defective area exceeding 0.2 % of the total insulator surface) or depth or height greater than 1 mm;</p> <p>Cracks at the root of the shed notably next to the metal fittings.</p>	Meet the requirements
		
Note: /		

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator	
Tensile load test			
Test date: 2021-09-25			
1. Test result			
No. of the specimens	Test load (kN)	Duration (s)	Whether damaged
21XJ1161-S-#01	50.01	10	No
21XJ1161-S-#02	50.04		
21XJ1161-S-#03	50.01		
21XJ1161-S-#04	50.03		
21XJ1161-S-#05	50.03		
21XJ1161-S-#06	50.02		
21XJ1161-S-#07	50.04		
21XJ1161-S-#08	50.03		
21XJ1161-S-#09	50.02		
21XJ1161-S-#10	50.02		
21XJ1161-S-#11	50.04		
21XJ1161-S-#12	50.06		
21XJ1161-S-#13	50.05		
21XJ1161-S-#14	50.05		
21XJ1161-S-#15	50.06		
21XJ1161-S-#16	50.03		
21XJ1161-S-#17	50.03		
21XJ1161-S-#18	50.04		
21XJ1161-S-#19	50.02		
21XJ1161-S-#20	50.02		
21XJ1161-S-#21	50.03		
21XJ1161-S-#22	50.04		
21XJ1161-S-#23	50.02		
21XJ1161-S-#24	50.02		
Note: /			

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.		Test Report					C12.5-650/3625 170kV Composite Station Post Insulator		
Tests on interfaces and connections of end fittings (Reference dry power frequency test)									
Test date: 2021-10-08									
1. Test results:									
No. of the specimens	Status of the specimen or test part	Dry power-frequency flashover withstand voltage (kV)					Average value (kV)	Corrected value (kV)	Puncture times
		1	2	3	4	5			
21XJ1161-S -#01	Between upper and lower end surfaces	478.3	480.6	483.1	479.9	480.7	480.5	480.5	0
									
Note: the data in the table has been corrected in the standard atmosphere condition.									
Atmosphere condition of test zone		P=102.0kPa; Environmental temperature t=22.0°C; Relative humidity: 47% Atmosphere correction factor Kt=1.0 Height correction factor Ka= /							

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator				
Tests on interfaces and connections of end fittings (Thermal-mechanical pre-stressing)						
Test date: 2021-09-26~2021-09-28						
1. Test requirement:						
<p>The three specimens shall be submitted to a mechanical load in two opposite directions and to temperature cycles. The 24h temperature cycle shall be performed twice. Each 24h temperature cycle has two temperature levels with a duration of at least 8h, one at $(+50 \pm 5)$ °C, the other at (-50 ± 5) °C. The cold period shall be at a temperature at least 85 K below the value actually applied in the hot period. The pre-stressing can be conducted in air or any other suitable medium.</p> <p>The load applied to the specimens shall correspond to the MDCL (5kN).</p> <p>The load shall be applied to the insulator at the conductor position. The initial direction shall be appropriate for the end fittings, and approximately perpendicular to the axis of the insulator at the point of application. The direction of the cantilever load applied to the specimens shall be reversed once, generally at the cooling passage through ambient temperature.</p>						
2. Test results:						
No. of the specimens	Applied cantilever load (kN)	Cooling temperature (°C)	Heating temperature (°C)	Duration in cold or hot water (h)	Reversed times in 24h (Cycles)	Whether cracks or falling off occur
21XJ1161-S-#02	5.01					No
21XJ1161-S-#03	5.02	-50.0	50.1	8	2	No
21XJ1161-S-#04	5.01					No
						
Note: /						

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator
Tests on interfaces and connections of end fittings (Water immersion pre-stressing)		
Test date: 2021-10-04~2021-10-06		
1. Test results:		
No. of the specimens	Test liquor	Boiling time (h)
21XJ1161-S-#02	Tap water with salt added with a conductivity of 1655 μ S/cm at 21 °C.	42
21XJ1161-S-#03		
21XJ1161-S-#04		
		
Note: /		

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Test Report

C12.5-650/3625
170kV Composite Station Post
Insulator

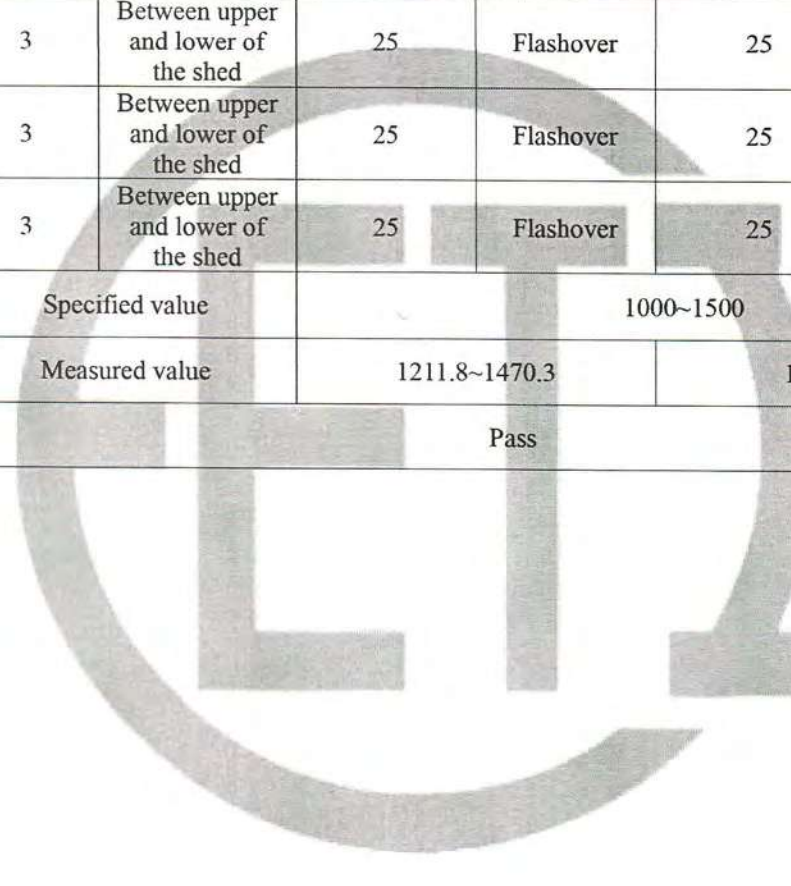
Tests on interfaces and connections of end fittings (Visual inspection)

Test date: 2021-10-06

I. Test results:

No. of the specimens	Appearance inspection standard of test specimen	Test result
21XJ1161-S-#02~#04	After water immersion pre-stressing the housing of each specimen is inspected visually. No cracks are permissible.	Meet the requirements

Note: /

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report		C12.5-650/3625 170kV Composite Station Post Insulator			
Tests on interfaces and connections of end fittings (Steep-front impulse voltage test)						
Test date: 2021-10-07						
1. Test results:						
No. of the specimens	Specimen section	Status of the specimen or test part	Positive polarity		Negative polarity	
			Impulses in each section	Flashover or puncture	Impulses in each section	Flashover or puncture
21XJ1161-S-#02	3	Between upper and lower of the shed	25	Flashover	25	Flashover
21XJ1161-S-#03	3	Between upper and lower of the shed	25	Flashover	25	Flashover
21XJ1161-S-#04	3	Between upper and lower of the shed	25	Flashover	25	Flashover
Steepness kV/ μ s	Specified value		1000~1500			
	Measured value		1211.8~1470.3		1193.3~1493.4	
Test conclusion	Pass					
						
Atmosphere condition of test zone	P=102.4kPa; Environmental temperature t=23.3℃; Relative humidity: 60% Atmosphere correction factor Kt= / Height correction factor Ka= /					

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.		Test Report					C12.5-650/3625 170kV Composite Station Post Insulator		
Tests on interfaces and connections of end fittings (Dry power-frequency voltage test)									
Test date: 2021-10-08									
1. Test results:									
No. of the specimens	Status of the specimen or test part	Dry power-frequency flashover withstand voltage (kV)					Average value (kV)	Corrected value (kV)	
		1	2	3	4	5			
21XJ1161-S-#02	Between upper and lower end surfaces	491.5	486.7	487.5	486.3	488.2	488.0	488.0	
21XJ1161-S-#03		483.8	483.3	485.1	484.0	481.5	483.5	483.5	
21XJ1161-S-#04		470.9	473.1	475.0	474.4	473.4	473.4	473.4	
2. Test conclusion: The values of flashover voltage of Specimens 21XJ1161-S-#02~#04 exceed 90% of based flashover voltage and the test is passed.									
No. of the specimens	80% based flashover voltage (kV)	Duration (min)	Measuring points of temperature					Temperature rise (<10K)	Test results
			Measured points	1	2	3	Average value		
21XJ1161-S-#02	384.4	30	Refer to bar temperature (°C)	24.7	25.0	24.8	24.8	0.2	Pass
			Temperature after raising voltage (°C)	25.0	24.9	25.2	25.0		
21XJ1161-S-#03	384.4	30	Refer to bar temperature (°C)	24.7	25.0	24.8	24.8	0.3	Pass
			Temperature after raising voltage (°C)	24.9	25.3	25.1	25.1		
21XJ1161-S-#04	384.4	30	Refer to bar temperature (°C)	24.7	25.0	24.8	24.8	0.3	Pass
			Temperature after raising voltage (°C)	25.2	25.2	25.0	25.1		
Note: based flashover voltage refers to dry power-frequency flashover withstand voltage of specimen 21XJ1161-S-#01. See page 9.									
Note: the data in the table has been corrected in the standard atmosphere condition.									
Atmosphere condition of test zone		P=102.0kPa; Environmental temperature t=22.0°C; Relative humidity: 47% Atmosphere correction factor Kt=1.0 Height correction factor Ka= /							

Suzhou Electrical Apparatus
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Co., Ltd.

Test Report

C12.5-650/3625
170kV Composite Station Post
Insulator

Tests on shed and housing material (Hardness test)

Test date: 2021-12-03~2021-12-05

1. Test results:

No. of the specimens	Temperature before boiling (°C)	Hardness before boiling				Boiling time (h)	Temperature after boiling (°C)	Hardness after boiling				Hardness variation before and after boiling $\leq \pm 20\%$
		1	2	3	The mid-value			1	2	3	The mid-value	
21XJ1161-S-C21	13.5	51.6	57.2	52.8	52.8	42	14.2	43.9	51.4	46.5	46.5	13.5
21XJ1161-S-C22	13.5	53.2	54.8	52.8	53.2	42	14.2	48.2	48.8	49.0	48.8	9.02

2. Test conclusion: Pass.

Note: /

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report		C12.5-650/3625 170kV Composite Station Post Insulator	
Tests on shed and housing material (Accelerated weathering test)				
Test date: 2021-09-23~2021-11-03				
1. Test requirement:				
<p>Select three specimens of shed and housing materials for this test (with markings included, if applicable). The insulator housing material shall be subjected to a 1000h UV light test using the following test method. Markings on the housing, if any, shall be directly exposed to UV light. Xenon-arc methods according to ISO 4892-2, using cycle 1 with a dark period of 8h</p> <p>--- Xenon-arc methods: ISO 4892-2:</p> <ul style="list-style-type: none"> ● Test method A, ● Standard injection cycle, ● Temperature of blackboard: 65°C±3K, ● Radiancy: 550 W/m². <p>Acceptance criteria:</p> <p>After the test markings on shed or housing material shall be legible; surface degradations such as cracks and raised areas are not permitted.</p> <p>In case of doubt concerning such degradation, two surface roughness measurements shall be made on each of the three specimens. The roughness, R_z as defined in ISO 4287, shall be measured along a sampling length of at least 2,5 mm. R_z shall not exceed 0,1 mm.</p>				
2. Test results:				
No. of the specimens	Test method	Duration (h)	After the test markings on shed or housing material shall be legible	After the test surface degradations such as cracks and raised areas are not permitted.
21XJ1161-S-C2 3~C25	Xenon-arc methods	1000	Meet the requirements	Meet the requirements
3. Test conclusion: Pass.				
Note: /				

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.		Test Report			C12.5-650/3625 170kV Composite Station Post Insulator			
Tests on shed and housing material (Tracking and erosion test)								
Test date: 2021-12-03~2022-01-14								
1. Test result:								
No. of the specimens	Applied voltage (kV)	Creepage distance (mm)		Duration (h)	Times of flashover	Times of interruption	Depth of erosion (mm)	
		Required value	Measured value				Required value	Measured value
21XJ1161-S-#05	21.54	500~800	745	1000	0	0	<3	<0.5
21XJ1161-S-#06	21.54	500~800	745	1000	0	0	<3	<0.5
2. Test conclusion: After test there are no tracking on the specimens. The erosion depth is less than 3mm and does not reach the core (the core cannot be visible). No shed, housing or interface is punctured. The test is passed.								
Note: Fog house temperature: 20.0°C; Concentration of NaCl in water: 4.0 kg/m ³ ; Sedimentation volume: 1.7mL/(80cm ² ·h); Specimen 21XJ1161-S-#05 is tested mounted horizontally and specimen 21XJ1161-S-#06 is tested mounted vertically.								

Suzhou Electrical Apparatus
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Test Report

C12.5-650/3625
170kV Composite Station Post
Insulator

Tests on shed and housing material (Flammability test)

Test date: 2021-10-20~2021-10-27

1. Test results:

No. of the specimens	The first ignition time (s)	t1 (s)	The second ignition time (s)	t2 (s)	t3 (s)	Individual test specimen afterflame time plus afterglow time after the second flame application (t2+t3) (s)	Total afterflame time tf (s)
21XJ1161-S-C01	10	0	10	0	0	0	0
21XJ1161-S-C02	10	0	10	0	0	0	
21XJ1161-S-C03	10	0	10	0	0	0	
21XJ1161-S-C04	10	0	10	0	0	0	
21XJ1161-S-C05	10	0	10	0	0	0	
21XJ1161-S-C11	10	0	10	0	0	0	0
21XJ1161-S-C12	10	0	10	0	0	0	
21XJ1161-S-C13	10	0	10	0	0	0	
21XJ1161-S-C14	10	0	10	0	0	0	
21XJ1161-S-C15	10	0	10	0	0	0	

Afterflame and/or afterglow of any specimens does not burned to the holding clamp and cotton indicator pad does not ignited by flaming particles or drops.

2. Test conclusion: Materials passing class V-0.

Note: Specimens 21XJ1161-S-C01~C10 have preprocessed under temperature of 23.0°C and humidity of 50% for 48h; Specimen 21XJ1161-S-C11~C20 have preprocessed under temperature of 75°C for 168h.

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Test Report

C12.5-650/3625
170kV Composite Station Post
Insulator

Tests on the core material (Dye penetration test)

Test date: 2021-12-03

1. Test results:

No. of the specimens	Test solution	Diameter of steel ball (mm)	The level which is higher than the level of the balls (mm)	Length of specimens (mm)	Time which dye rises through the specimens Required value (min)	Whether dye penetrated
21XJ1161-S-B01	1% magenta alcohol solution	2.0	2	10.1	> 15	No
21XJ1161-S-B02		2.0	2	10.1	> 15	No
21XJ1161-S-B03		2.0	2	10.1	> 15	No
21XJ1161-S-B04		2.0	2	10.0	> 15	No
21XJ1161-S-B05		2.0	2	10.1	> 15	No
21XJ1161-S-B06		2.0	2	10.0	> 15	No
21XJ1161-S-B07		2.0	2	10.1	> 15	No
21XJ1161-S-B08		2.0	2	10.1	> 15	No
21XJ1161-S-B09		2.0	2	10.1	> 15	No
21XJ1161-S-B10		2.0	2	10.0	> 15	No

2. Test conclusion: Pass.

Note: /

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report		C12.5-650/3625 170kV Composite Station Post Insulator				
Tests on the core material (Water diffusion test)							
Test date: 2021-12-03~2021-12-07							
1. Test requirements:							
<p>Six specimens shall be cut from a production line insulator making the cut approximately 90° to the long axis of the insulator with a diamond-coated circular saw blade under running cold water. The length of the specimens shall be 30 mm±0,5 mm. The cut surfaces shall be smoothed by means of fine abrasive cloth (grain size 180). The cut ends shall be clean and parallel.</p> <p>The surfaces of the specimens shall be cleaned with isopropyl-alcohol and filter-paper immediately before boiling. The specimens shall be boiled in a glass container for 100 h±0.5 h in deionised water with 0.1 % by weight of NaCl.</p> <p>Specimens of only one core material shall be boiled together in the same container. After boiling, the specimens shall be removed from the boiling container and placed in another glass container filled with tap water at ambient temperature for at least 15 min. The voltage test shall be carried out within the next 3h after the removal of the specimens from the boiling container.</p> <p>Immediately before the voltage test, the specimens shall be removed from the container and their surfaces dried with filter paper. Each specimen shall then be put between the electrodes. The test voltage shall be increased at approximately 1kV per second up to 12kV. The voltage shall be kept constant at 12kV for 1 min and then decreased to zero.</p> <p>During the test no puncture or surface flashover shall occur. The current during the whole test shall not exceed 1mA (r.m.s.).</p>							
2. Test results:							
No. of the specimens	The length of the specimens (mm)	Boiling time (h)	Whether damaged	Applied voltage (kV)	Duration (min)	Leakage current (mA)	Results
21XJ1161-S-B11	30.5	100	No	12.0	1	0.056	No puncture and surface flashover occurs
21XJ1161-S-B12	30.4	100	No	12.0	1	0.053	No puncture and surface flashover occurs
21XJ1161-S-B13	30.4	100	No	12.1	1	0.055	No puncture and surface flashover occurs
21XJ1161-S-B14	30.3	100	No	12.0	1	0.057	No puncture and surface flashover occurs
21XJ1161-S-B15	30.5	100	No	12.0	1	0.054	No puncture and surface flashover occurs
21XJ1161-S-B16	30.3	100	No	12.0	1	0.050	No puncture and surface flashover occurs
3. Test conclusion: Pass.							
Note: /							

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator
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Assembled core load tests (Verification of the specified tension load)

Test date: 2021-10-06

1. Test requirements:

The tensile load shall be applied to the insulator at the conductor position, in the direction foreseen in service. The load shall be increased rapidly but smoothly from zero to approximately 75 % of the specified tension failing load (STL) and then shall be gradually increased in a time between 30 s and 90 s until the STL is reached. If the 100% STL is reached in less than 90 s, the load shall be maintained for the remainder of the 90 s.

The insulator shall be regarded as passed if the pull-out or slip of the core from end fittings or breakage of end fitting not occurs.

STL: 100kN

2. Test results:

No. of the specimens	75% of STL (kN)	Time from 75% of STL to STL (s)	STL (kN)	Duration (s)	Broken or not
21XJ1161-S- #07	75.02	50	100.04	40	No
21XJ1161-S- #08	75.03	50	100.01	40	No
21XJ1161-S- #09	75.02	50	100.06	40	No

3. Test conclusion: Pass.

Note: /

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report		C12.5-650/3625 170kV Composite Station Post Insulator	
Assembled core load tests (Verification of the maximum design cantilever load (MDCL))				
Test date: 2021-10-06~2021-10-10				
1. Test results:				
<p>The insulators shall be gradually loaded to 1.1 times the MDCL rating at a temperature of 20°C±10K and held for 96 h. The load shall be applied to the insulator at the conductor position, perpendicular to the direction of the conductor, and perpendicular to the core of the insulators.</p>				
<p>At 24h, 48h, 72h and 96h, the deflection of the insulators at the point of application of the load shall be recorded, as additional information.</p>				
<p>After removal of the load, the steps below shall be followed:</p>				
<ul style="list-style-type: none"> — visually inspect the base end fitting for cracks or permanent deformation, — check that threads of the end fitting are re-usable, 				
<p>Cut each insulator 90° to the axis of the core and about 50mm from the base of the end fitting, and then cut the base end fitting part of the insulator longitudinally into two halves in the place of the previously applied cantilever load. The cut surfaces shall be smoothed by means of fine abrasive cloth (grain size 180).</p>				
<ul style="list-style-type: none"> — visually inspect the cut halves for cracks and delaminations, — perform a dye penetration test according to ISO 3452 to the cut surfaces to reveal cracks. 				
<p>Acceptance criteria:</p>				
<p>The insulators shall be regarded as passed if there is no crack, permanent deformation or delaminations occur.</p>				
MDCL=5kN				
1.1 times the MDCL: 5.5kN				
No. of the specimens	1.1 times the MDCL (kN)	Duration (h)	Whether any cracks or permanent deformation on the bottom of end fitting	Perform a dye penetration test to the cut surfaces to reveal cracks or delaminations
21XJ1161-S-#07	5.51	96	No	No
21XJ1161-S-#08	5.52	96	No	No
21XJ1161-S-#09	5.51	96	No	No
2. Test conclusion: Pass.				
Note: /				

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator
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Assembled core load tests (Verification of the maximum design torsion load (MDToL))

Test date: 2021-12-04

1. Test results:

The insulators shall be gradually loaded to 1.1 times the MDToL rating at a temperature of $20^{\circ}\text{C}\pm 10\text{K}$ and held for 30 min. The torsion load shall be applied to the insulators perpendicularly with the axis of the core of the insulator. No bending moment should be applied.

Acceptance criteria:

After removal of the load, the steps below shall be followed:

- visually inspect the base end fitting for cracks or permanent deformation,
- check that threads of the end fitting are re-usable,

Cut each insulator 90° to the axis of the core and about 50mm from the base of the end fitting, and in the middle part of this cut section, polish the cut surfaces by means of fine abrasive cloth (grain size 180).

- visually inspect the cut surfaces for cracks and delaminations,
- perform a dye penetration test according to ISO 3452 to the cut surfaces to reveal cracks.

Acceptance criteria:

The insulators shall be regarded as passed if there is no crack, permanent deformation or delaminations occur.

MDToL=0.4kN·m

1.1 times the MDToL: 0.44kN·m

No. of the specimens	1.1 times the MDToL (kN·m)	Duration (min)	Whether any cracks or permanent deformation on the bottom of end fitting	Perform a dye penetration test to the cut surfaces to reveal cracks or delaminations
21XJ1161-S-#10	0.45	30	No	No
21XJ1161-S-#11	0.44	30	No	No
21XJ1161-S-#12	0.45	30	No	No

2. Test conclusion: Pass.

Note: /

Suzhou Electrical Apparatus
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Test Report

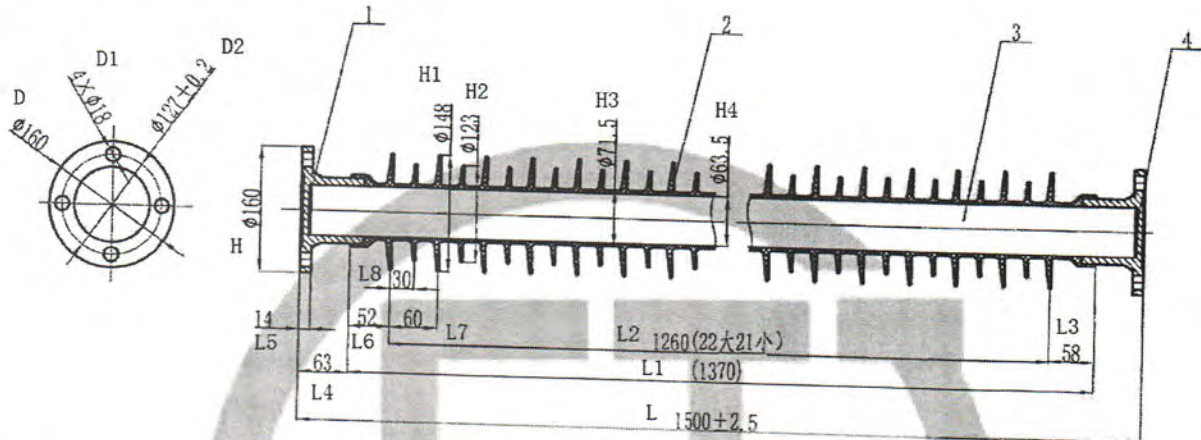
C12.5-650/3625
170kV Composite Station Post
Insulator

Verification of dimensions

Test date: 2021-09-25

170kV Composite Station Post Insulator should meet the standards provided by drawing.

The results see the following diagram:



No. of the specimens	21XJ1161-S-#13	21XJ1161-S-#14	21XJ1161-S-#15
L(mm)1500±2.5	1501	1502	1501
L1(mm)1370±40.25	1372	1371	1371
L2(mm)1260±37.5	1261	1260	1263
L3(mm)58±3.82	58.1	58.1	58.0
L4(mm)63±4.02	63.2	63.1	63.3
L5(mm)14±2.06	14.1	14.3	14.2
L6(mm)52±3.58	52.6	52.2	52.2
L7(mm)60±3.9	60.0	60.0	60.1
L8(mm)30±2.7	30.2	30.2	30.1
D(mm)160±7.9	160	160	160
D1(mm)18±2.22	17.9	18.0	17.9
D2(mm)127±0.2	127	127	127
H(mm)160±7.9	160	160	160
H1(mm)148±7.42	148	148	148
H2(mm)123±6.42	123	123	123
H3(mm)71.5±4.36	71.3	71.4	71.2
Dry arcing distance (mm)≥1370	1375	1376	1375
Creepage distance (mm)≥3625	3815	3802	3810

Note: A tolerance of $\pm(0.04d+1.5)$ mm when $d \leq 300$ mm and $\pm(0.025d+6)$ mm when $d > 300$ mm with a maximum tolerance of ± 50 mm shall be allowed on all dimensions for which specific tolerances are not requested or given.

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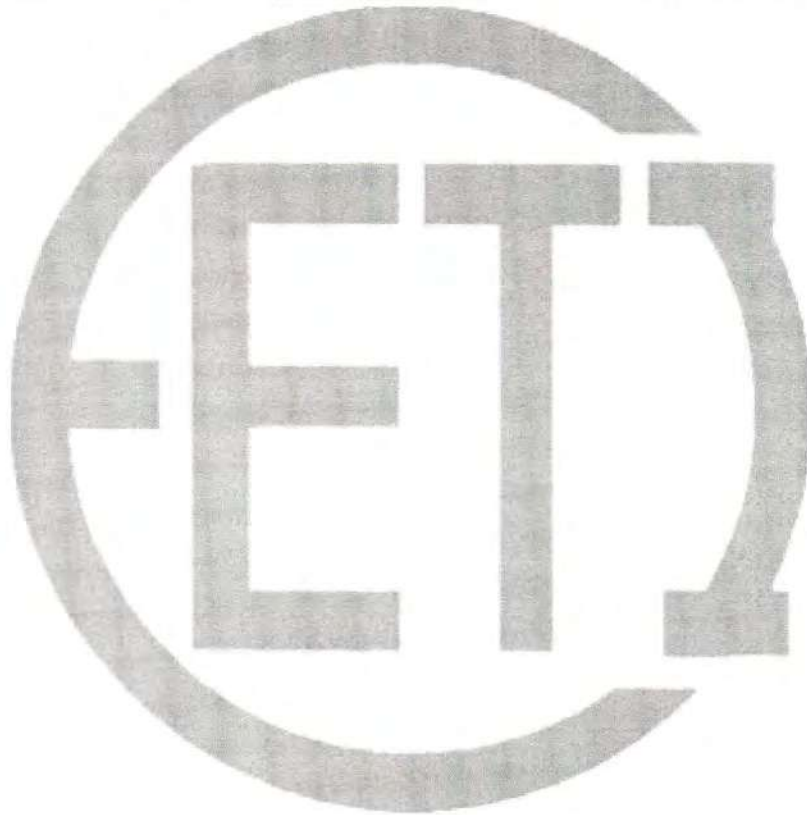
Test Report

C12.5-650/3625
170kV Composite Station Post
Insulator

Dry lightning impulse withstand voltage test

Test date: 2021-09-27


No. of the specimens	Status of the specimen or test part	Positive polarity			Negative polarity		
		Voltage (kV)	Applied times	Puncture times	Voltage (kV)	Applied times	Puncture times
21XJ1161-S-#13	Between upper and lower end surfaces	657.2	15	0	657.2	15	0



Note: the data in the table has been corrected in the standard atmosphere condition.

Atmosphere condition
of test zone

P=101.9kPa; Environmental temperature t=28.3°C; Relative humidity: 51%
Atmosphere correction factor Kt=1.0111 Height correction factor Ka= /

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report		C12.5-650/3625 170kV Composite Station Post Insulator	
Wet power-frequency withstand voltage test				
Test date: 2021-09-27				
Average sprinkling rate	Horizontal component: 1.36mm/min Vertical component: 1.45mm/min	Conductance ratio: 102.0 μ S/cm	Water temperature: 27.7 $^{\circ}$ C	
No. of the specimens	Status of the specimen or test part	Power-frequency withstand voltage (Wet)		
		Voltage (kV)	Duration (s)	Puncture times
21XJ1161-S-#13	Between upper and lower end surfaces	274.3	60	0
				
Note: the data in the table has been corrected in the standard atmosphere condition.				
Atmosphere condition of test zone	P=101.9kPa; Environmental temperature t=28.3 $^{\circ}$ C; Relative humidity: 51% Atmosphere correction factor Kt=0.9973 Height correction factor Ka= /			

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator	
Cantilever failing load test			
Test date: 2021-11-07			
1. Test requirement:			
<p>The load shall be applied gradually, starting from 0 to 75% of the specified cantilever load (SCL), and then gradually increased to the SML in a time between 30 s to 300 s until the core or accessory of the fitting damaged. The load shall be applied so that the direction of loading passes through the axis of the post insulator, and is perpendicular to it. The cantilever failing load tested during the test shall be the maximum load.</p> <p>Each cantilever load should be equal or more than SCL (12.5kN).</p>			
No. of the specimens	75% of the SCL (kN)	Time from 75% of the SCL to failing load (s)	Failing load (kN)
21XJ1161-S-#13	9.375	43	13.66
21XJ1161-S-#14	9.375	38	13.15
21XJ1161-S-#15	9.375	89	14.22
2. Test conclusion: Pass.			
Note: /			

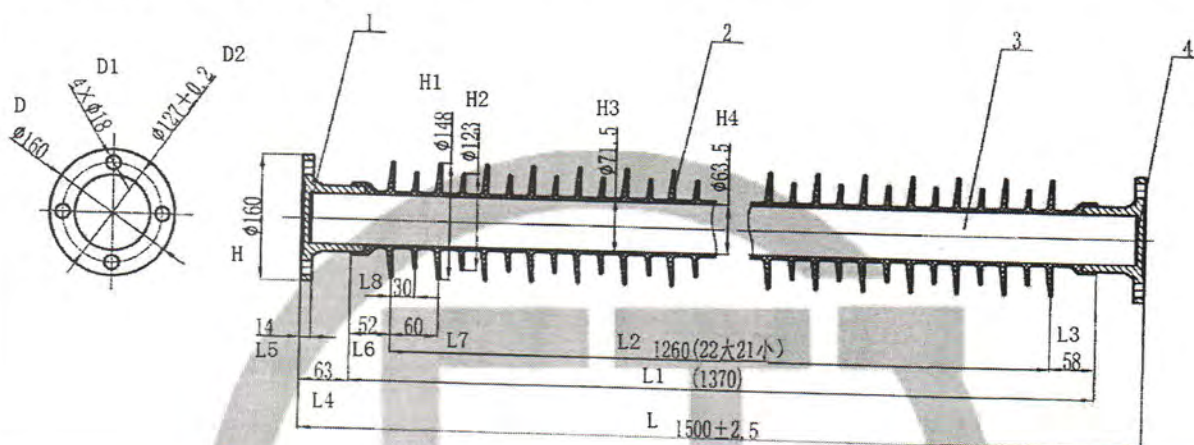
Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report			C12.5-650/3625 170kV Composite Station Post Insulator	
Specified tension load test					
Test date: 2021-09-25					
1. Test requirements:					
<p>The tensile load shall be applied to the insulator in line with the axis of insulator. The load shall be increased rapidly but smoothly from zero to approximately 75 % of the specified tension failing load (STL) and then shall be gradually increased in a time between 30 s and 90 s until the STL is reached. If the 100% STL is reached in less than 90 s, the load shall be maintained for the remainder of the 90 s.</p> <p>The insulator shall be regarded as passed if the pull-out or slip of the core from end fittings or breakage of end fitting not occurs.</p> <p>STL: 100kN</p>					
2. Test results:					
No. of the specimens	75%of STL (kN)	Time from 75% of STL to STL (s)	STL (kN)	Duration (s)	Broken or not
21XJ1161-S- #16	75.04	50	100.07	40	No
21XJ1161-S- #17	75.02	50	100.08	40	No
21XJ1161-S- #18	75.05	50	100.11	40	No
3. Test conclusion: Pass.					
Note: /					

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report	C12.5-650/3625 170kV Composite Station Post Insulator
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Verification of dimensions

Test date: 2021-09-25

170kV Composite Station Post Insulator should meet the standards provided by drawing.
The results see the following diagram:



No. of the specimens	21XJ1161-S-#19	21XJ1161-S-#20	21XJ1161-S-#21
L(mm)1500±2.5	1502	1501	1502
L1(mm)1370±40.25	1371	1372	1372
L2(mm)1260±37.5	1261	1260	1262
L3(mm)58±3.82	58.0	58.1	58.1
L4(mm)63±4.02	63.2	63.1	63.2
L5(mm)14±2.06	14.1	14.2	14.2
L6(mm)52±3.58	52.8	52.1	52.3
L7(mm)60±3.9	60.1	60.0	59.8
L8(mm)30±2.7	30.1	30.2	30.1
D(mm)160±7.9	160	160	160
D1(mm)18±2.22	17.9	18.0	18.0
D2(mm)127±0.2	127	127	127
H(mm)160±7.9	160	160	160
H1(mm)148±7.42	148	148	148
H2(mm)123±6.42	123	123	123
H3(mm)71.5±4.36	71.4	71.4	71.4
Dry arcing distance (mm)≥1370	1374	1375	1375
Creepage distance (mm)≥3625	3815	3810	3820

Note: A tolerance of $\pm(0.04d+1.5)$ mm when $d \leq 300$ mm and $\pm(0.025d+6)$ mm when $d > 300$ mm with a maximum tolerance of ± 50 mm shall be allowed on all dimensions for which specific tolerances are not requested or given.

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.		Test Report										C12.5-650/3625 170kV Composite Station Post Insulator	
Galvanizing test													
Test date: 2021-09-25													
1. Test results:													
		10 times measurements for each specimen										Unit: μm	
Times/Thickness		1	2	3	4	5	6	7	8	9	10	Local coating thickness	Required value
No. of the specimens													
Upper end	21XJ1161-S-#19	118.7	123.2	102.0	117.0	128.8	123.7	121.6	119.8	122.9	140.8	121.9	≥ 70
	21XJ1161-S-#20	141.1	132.6	126.0	129.2	121.2	114.5	108.2	114.0	127.3	128.3	124.2	
	21XJ1161-S-#21	133.5	131.5	133.1	119.0	114.4	107.6	138.9	127.7	120.2	128.3	125.4	
Mean coating thickness		123.8										≥ 85	
Lower end	21XJ1161-S-#19	118.7	109.8	105.9	110.7	114.5	134.8	111.7	121.8	123.5	130.4	118.2	≥ 70
	21XJ1161-S-#20	114.0	125.3	126.3	103.2	121.9	115.4	111.3	127.5	121.0	119.2	118.5	
	21XJ1161-S-#21	123.1	105.8	103.4	117.6	119.8	124.6	111.0	119.8	122.3	127.9	117.5	
Mean coating thickness		118.1										≥ 85	
2. Test conclusion: The coating is continuous, uniform and smooth. The coating is sufficiently adherent to withstand handling consistent with the normal use of the article, without peeling or flaking. It meets the requirements and the test is passed.													
Note: /													

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report			C12.5-650/3625 170kV Composite Station Post Insulator	
Verification of the SCL					
Test date: 2021-12-03					
1. Test requirement:					
<p>The cantilever load shall be applied to the insulator at the conductor position, in the direction foreseen in service. The load shall be increased rapidly but smoothly from zero to approximately 75 % of the SCL and then shall be gradually increased in a time between 30 s and 90 s until the SCL is reached. If the SCL is reached in less than 90 s, the load shall be maintained for the remainder of the 90 s.</p> <p>The insulator shall be regarded as passed if the SCL can be maintained for the required time.</p> <p>SCL: 12.5kN</p>					
2. Test results:					
No. of the specimens	75% of SCL (kN)	Time from 75% of the SCL to SCL (s)	SCL (kN)	Duration (s)	Broken or not
21XJ1161-S-#19	9.375	50	12.56	40	No
3. Test conclusion: Pass.					
Note: /					

Suzhou Electrical Apparatus Science Research Institute Co., Ltd.	Test Report			C12.5-650/3625 170kV Composite Station Post Insulator	
Verification of the STL					
Test date: 2021-09-25					
1. Test requirement:					
<p>The tensile load shall be applied to the insulator at the conductor position, in the direction foreseen in service. The load shall be increased rapidly but smoothly from zero to approximately 75 % of the specified tension failing load (STL) and then shall be gradually increased in a time between 30 s and 90 s until the STL is reached. If the 100% STL is reached in less than 90 s, the load shall be maintained for the remainder of the 90 s.</p> <p>The insulator shall be regarded as passed if the pull-out or slip of the core from end fittings or breakage of end fitting not occurs.</p> <p>STL: 100kN</p>					
2. Test results:					
No. of the specimens	75% of STL (kN)	Time from 75% of STL to STL (s)	STL (kN)	Duration (s)	Broken or not
21XJ1161-S- #20	75.07	50	100.09	40	No
3. Test conclusion: Pass.					
Note: /					

Assembly

C12.5-650/3625
170kV Composite Station Post Insulator

No.: 215301

Janu Agula JIPU Isolator AB

2021-05-27

NO.	DRAWING NUMBER	DESCRIPTION	QTY	MATERIAL	SINGLE TOTAL WEIGHT	REMARK
3		Core Housing	1	FRP		
2		End fitting	2	Silicone Rubber cast iron		H.D.G

NOTES: THE SPECIFICATIONS, DESIGN AND DRAWINGS ARE PROTECTED BY COPYRIGHT. ALL RIGHTS RESERVED.

DESIGN UNIT: liu min
CHECKED: Luo SCALE: NTS
APPR: Yu WEIGHT
DATE: 28.08-4-29

CTC Power Equipment Co., Ltd.
MODEL NUMBER: C12.5-650/3625
DRAWING NUMBER: 215301
REV: 3

Specifications

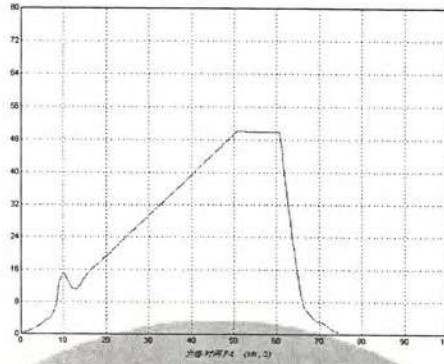
1. Rated voltage: 170kV
2. Min. Creepage distance: 3625mm
3. Min. Dry arcing distance: 1370mm
4. Lightning impulse withstand (p): 650kV
5. Power frequency withstand (wet): 275kV
6. Specified cantilever load (SCL): 12.5kN
7. Max. Design cantilever load (MDCL): 5kN
8. Applied standard: IEC 62231

Oscillograms of tensile load test

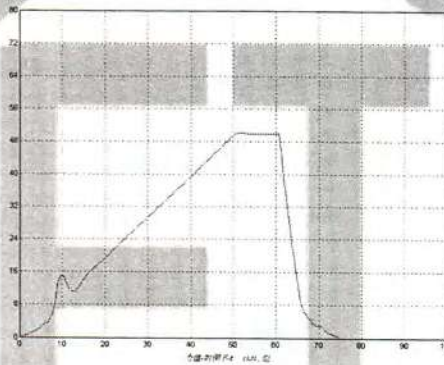
C12.5-650/3625
170kV Composite Station Post Insulator

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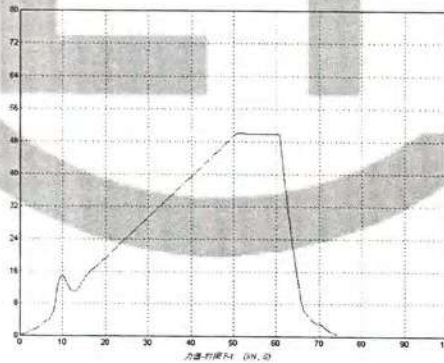
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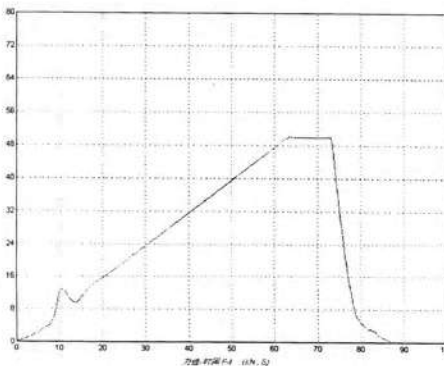
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21XJ1161-S-#03



21XJ1161-S-#04

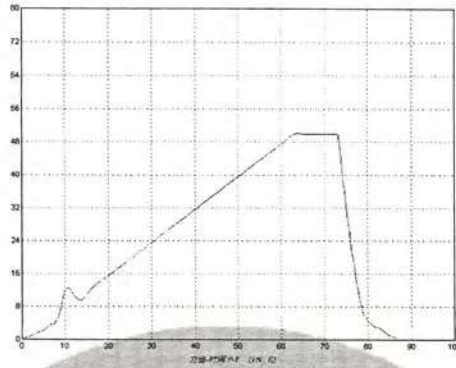


Oscillograms of tensile load test

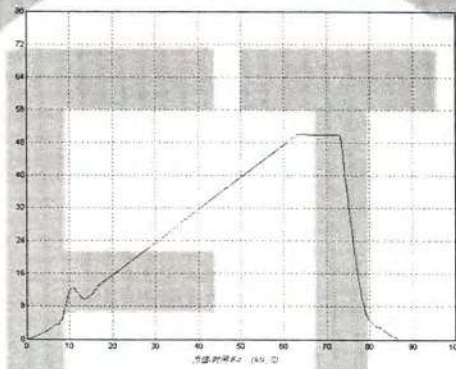
C12.5-650/3625
170kV Composite Station Post Insulator

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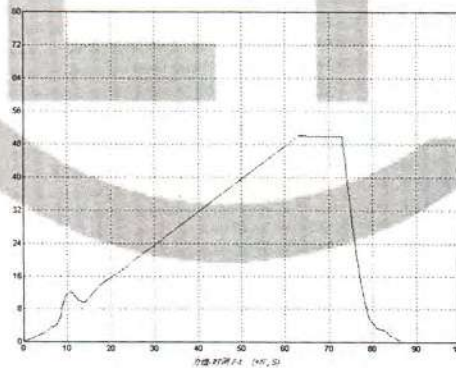
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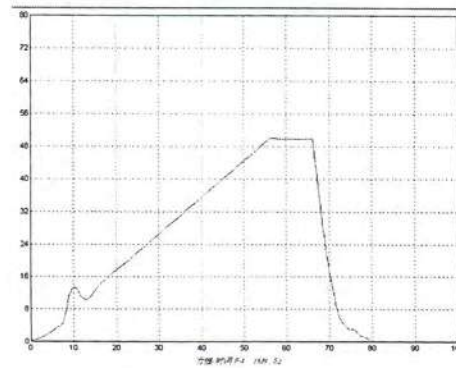
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21XJ1161-S-#07



21XJ1161-S-#08

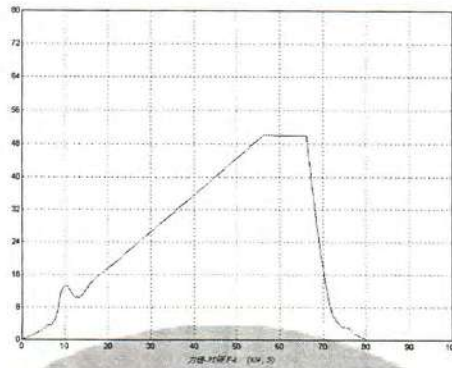


Oscillograms of tensile load test

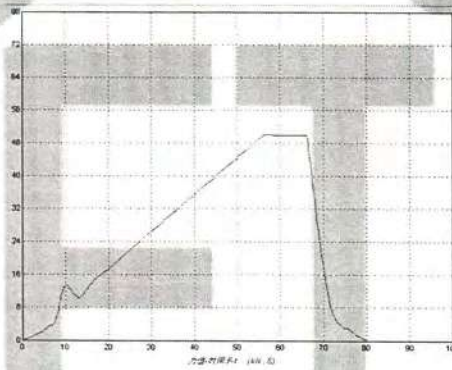
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170kV Composite Station Post Insulator

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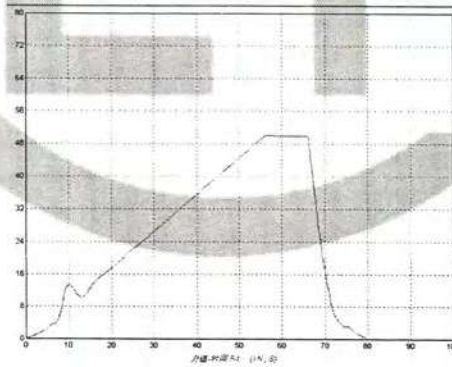
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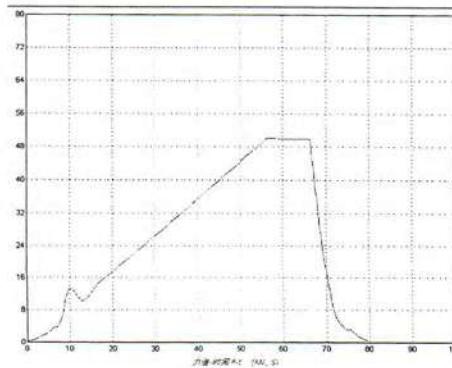
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21XJ1161-S-#11



21XJ1161-S-#12

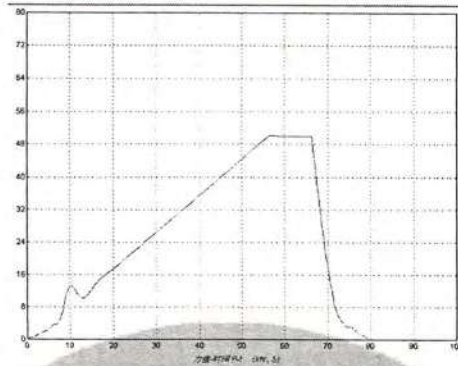


Oscillograms of tensile load test

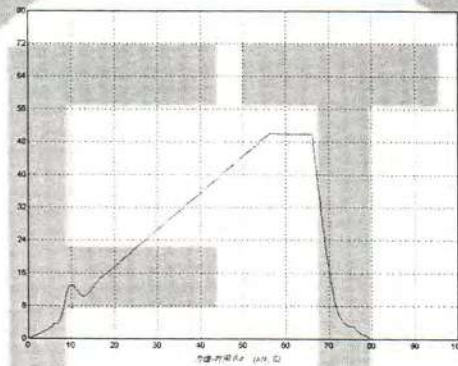
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170kV Composite Station Post Insulator

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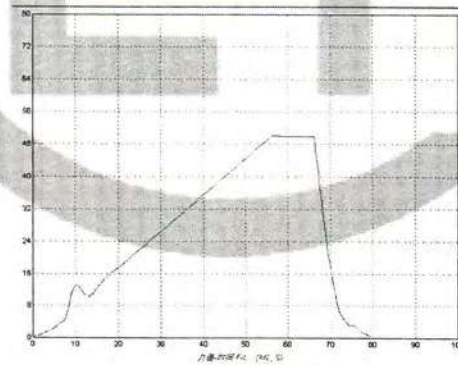
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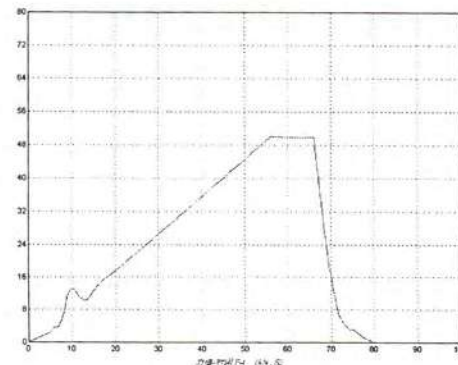
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21XJ1161-S-#15



21XJ1161-S-#16

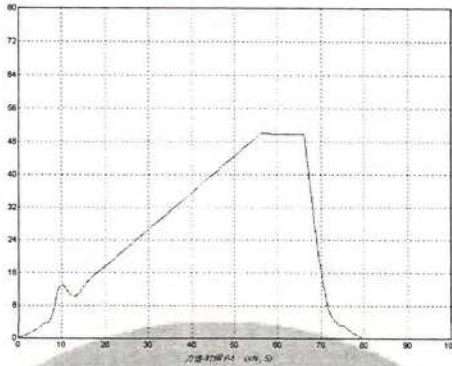


Oscillograms of tensile load test

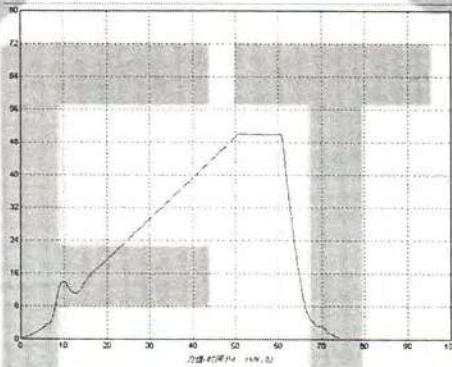
C12.5-650/3625
170kV Composite Station Post Insulator

No.: /

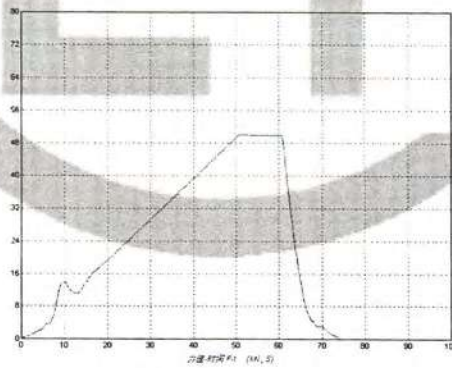
21XJ1161-S-#17



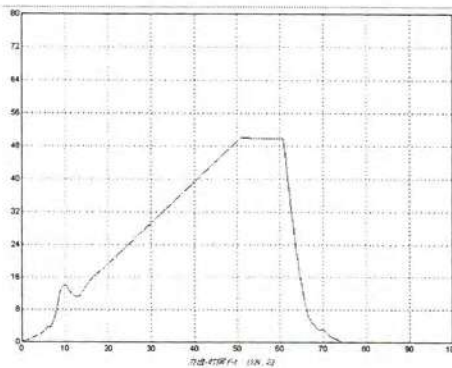
21XJ1161-S-#18



21XJ1161-S-#19



21XJ1161-S-#20



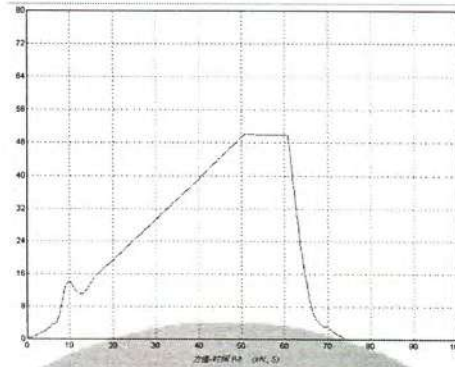
Oscillograms of tensile load

C12.5-650/3625
170kV Composite Station Post Insulator

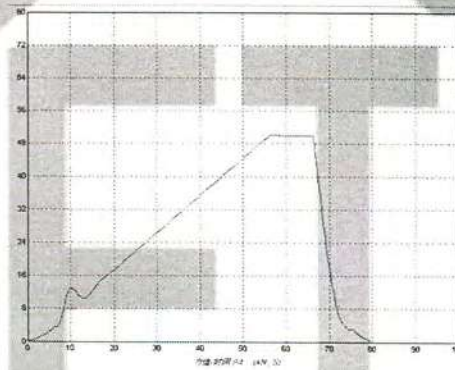
test

No.: /

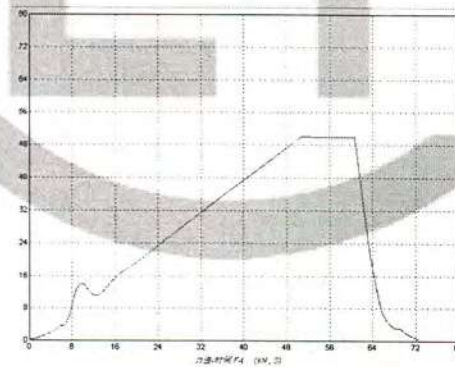
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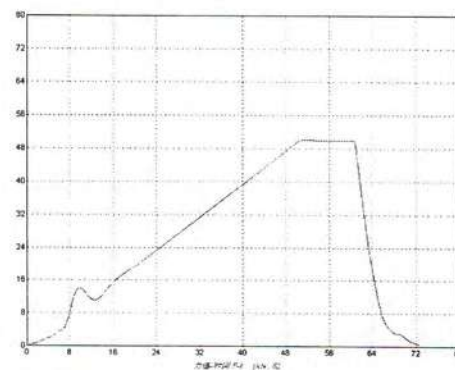
21XJ1161-S-#22



21XJ1161-S-#23



21XJ1161-S-#24

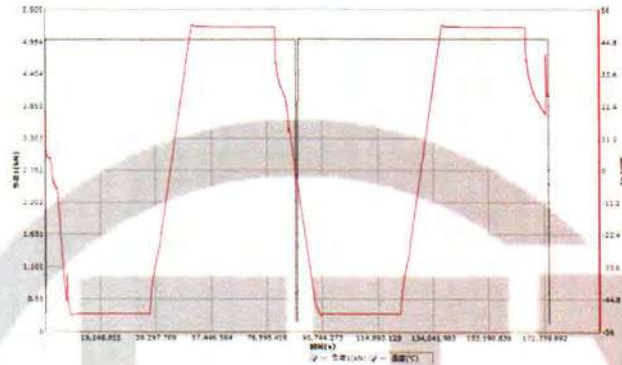


Oscillograms of tests on interfaces and connections of end fittings (Thermal-mechanical pre-stressing)

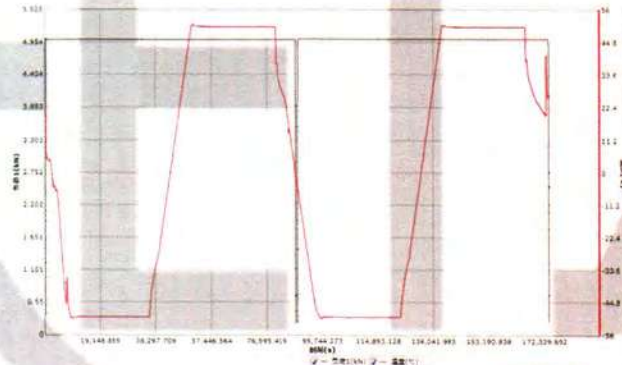
C12.5-650/3625
170kV Composite Station Post Insulator

No.: /

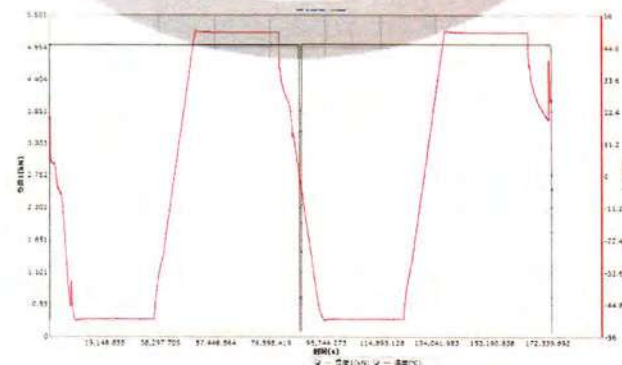
21XJ1161-S-#02



21XJ1161-S-#03



21XJ1161-S-#04



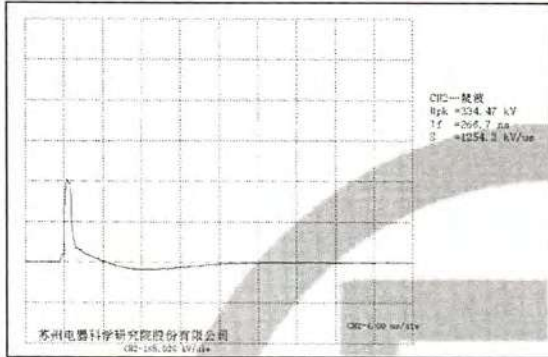
Oscillograms of tests on interfaces and connections of end fittings (Steep-front impulse voltage test)

C12.5-650/3625
170kV Composite Station Post Insulator

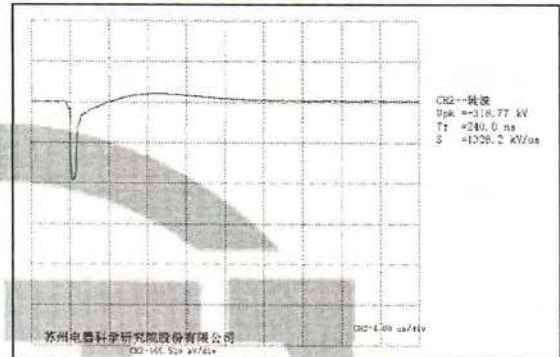
No.: /

21XJ1161-S-#02 (01)

Positive polarity

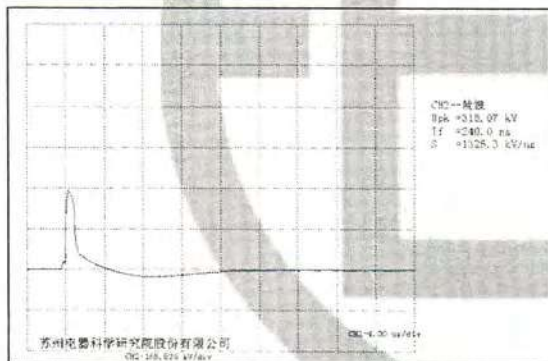


Negative polarity

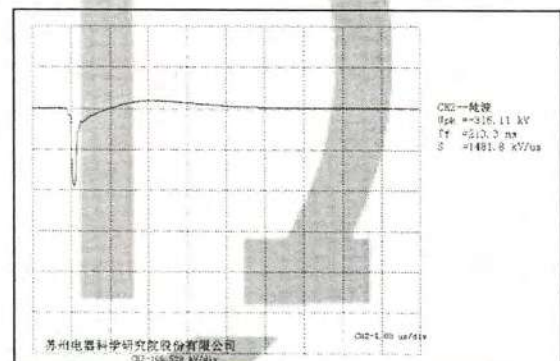


21XJ1161-S-#02 (02)

Positive polarity

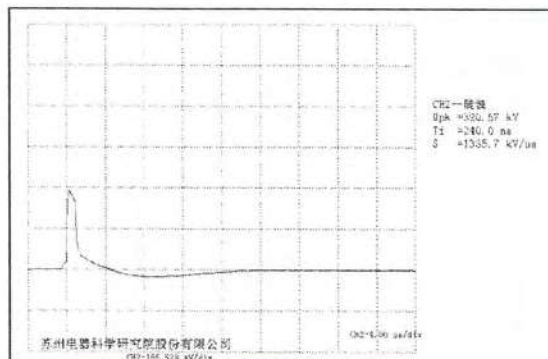


Negative polarity

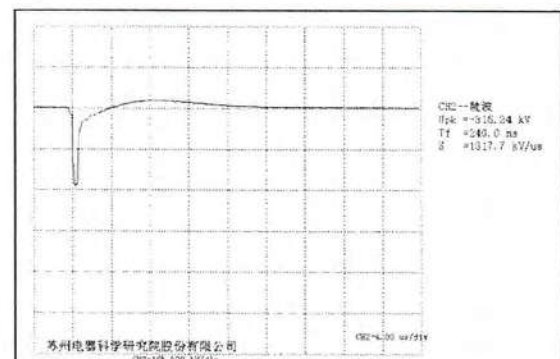


21XJ1161-S-#02 (03)

Positive polarity



Negative polarity



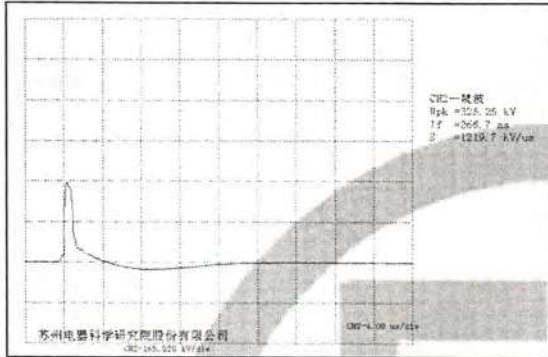
Oscillograms of tests on interfaces and connections of end fittings (Steep-front impulse voltage test)

C12.5-650/3625
170kV Composite Station Post Insulator

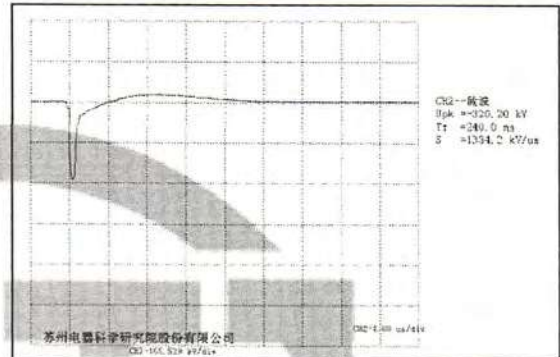
No.: /

21XJ1161-S-#03 (01)

Positive polarity

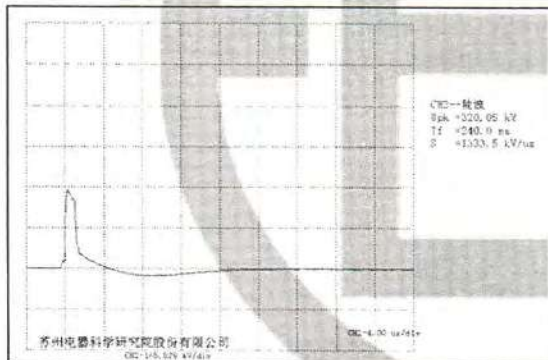


Negative polarity

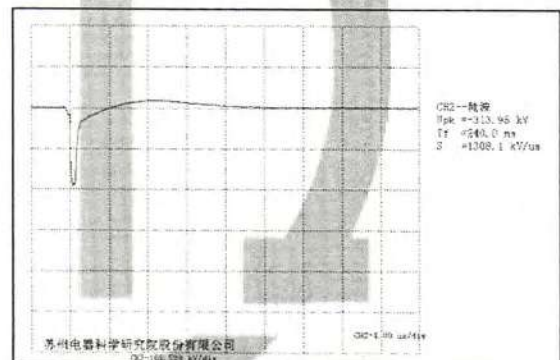


21XJ1161-S-#03 (02)

Positive polarity

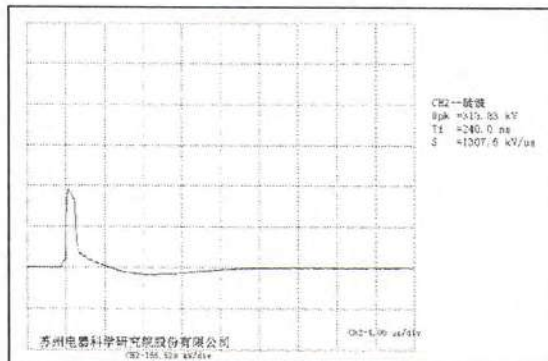


Negative polarity

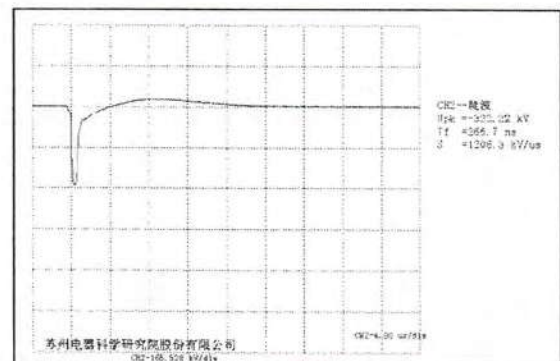


21XJ1161-S-#03 (03)

Positive polarity



Negative polarity



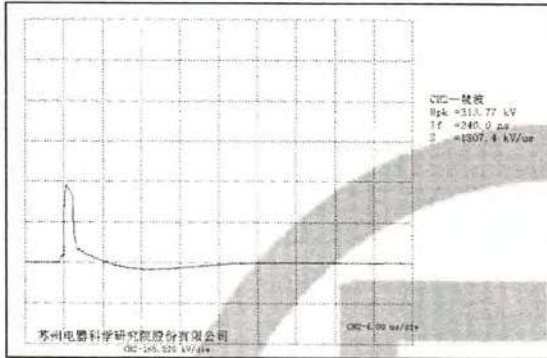
Oscillograms of tests on interfaces and connections of end fittings (Steep-front impulse voltage test)

C12.5-650/3625
170kV Composite Station Post Insulator

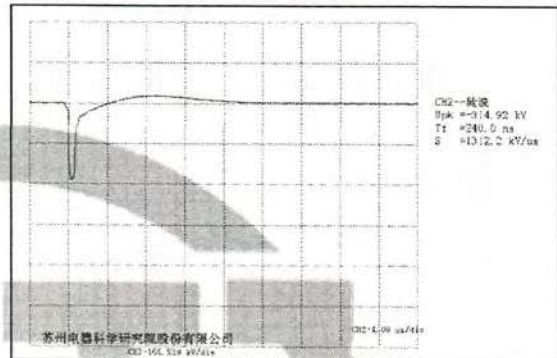
No.: /

21XJ1161-S-#04 (01)

Positive polarity

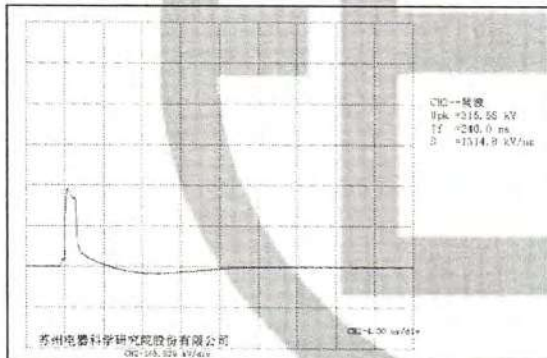


Negative polarity

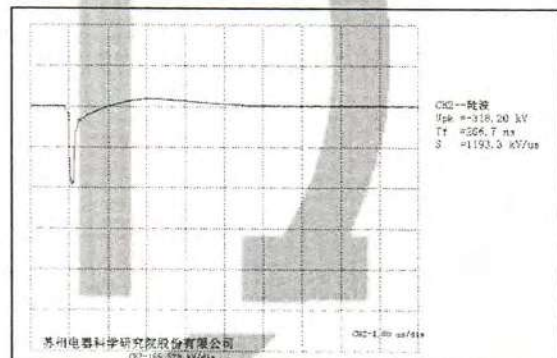


21XJ1161-S-#04 (02)

Positive polarity

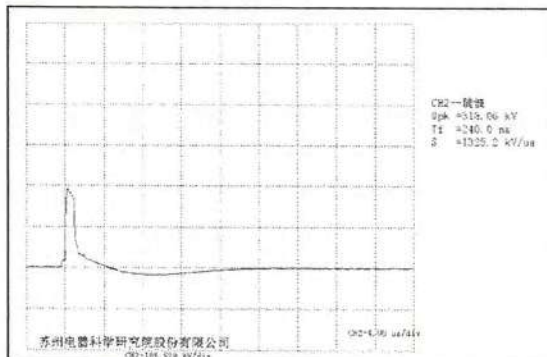


Negative polarity

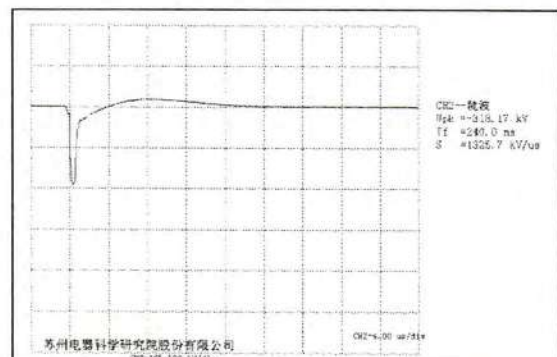


21XJ1161-S-#04 (03)

Positive polarity



Negative polarity

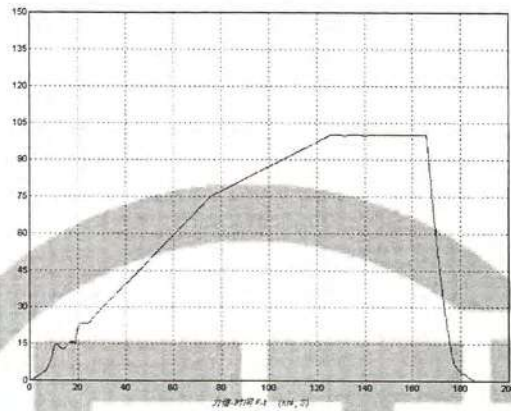


Oscillograms of assembled core load tests (Verification of the specified tension load)

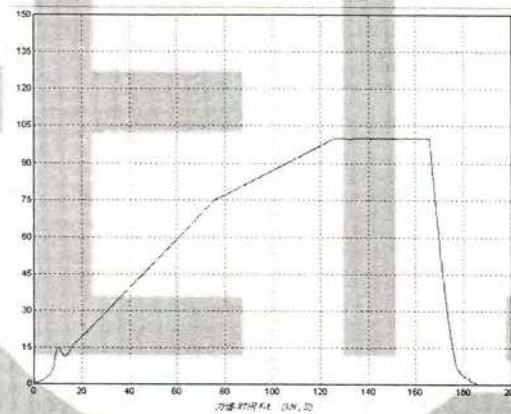
C12.5-650/3625
170kV Composite Station Post Insulator

No.: /

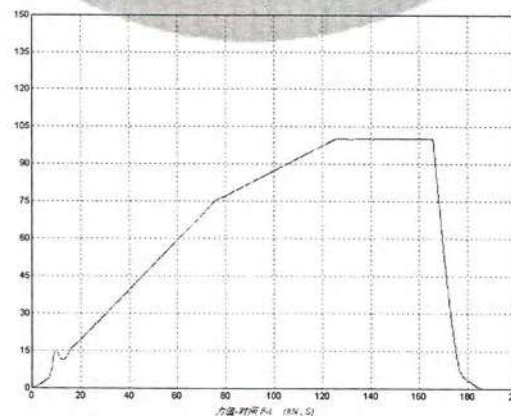
21XJ1161-S-#07



21XJ1161-S-#08



21XJ1161-S-#09

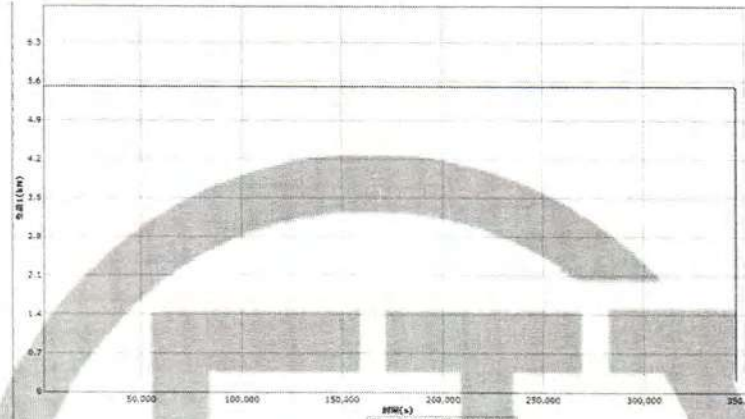


Oscillograms of assembled core load tests (Verification of the maximum design cantilever load (MDCL))

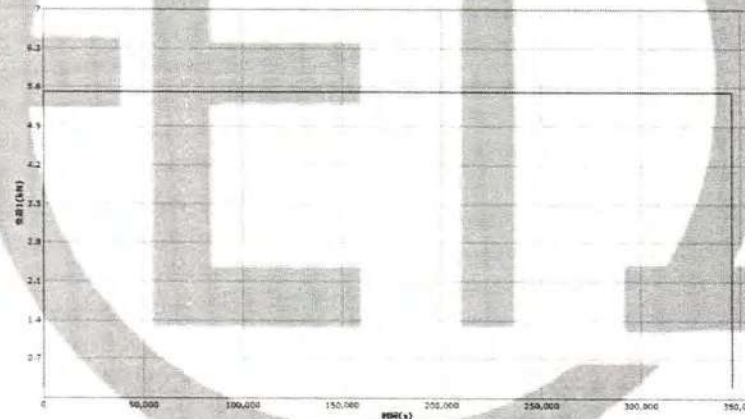
C12.5-650/3625
170kV Composite Station Post Insulator

No.: /

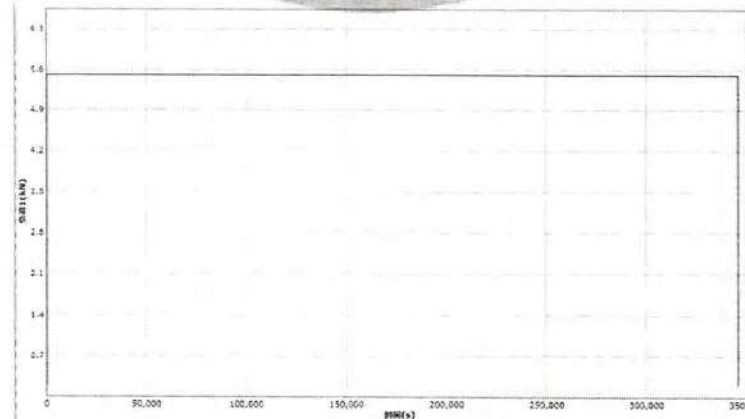
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21XJ1161-S-#08



21XJ1161-S-#09

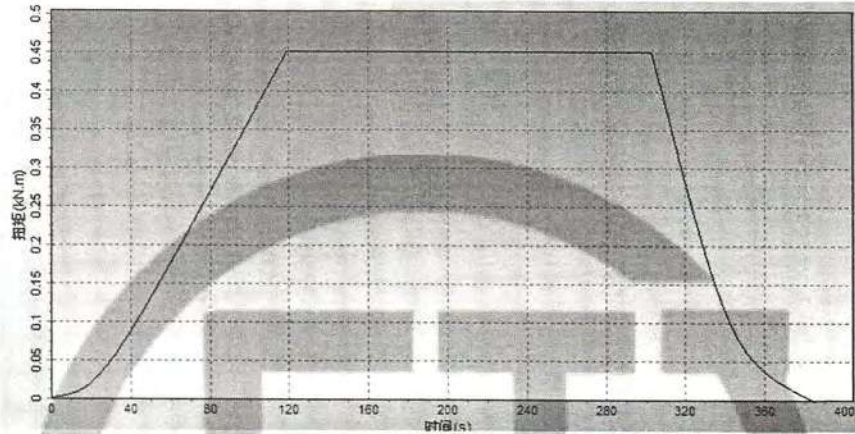


Oscillograms of assembled core load tests (Verification of the maximum design torsion load (MDToL))

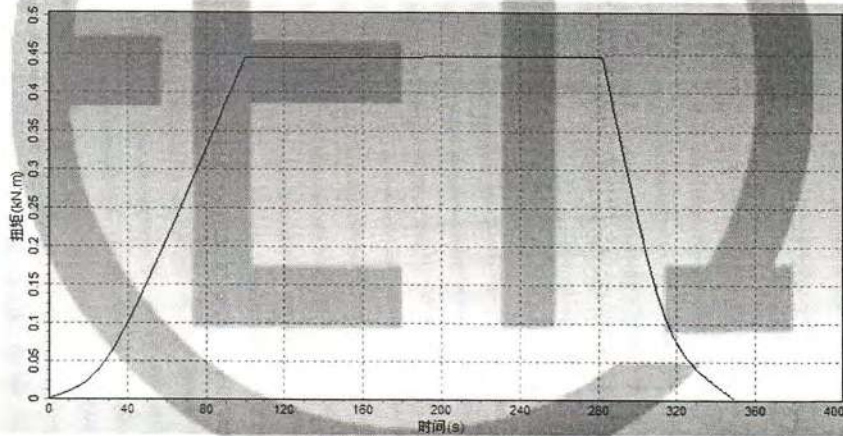
C12.5-650/3625
170kV Composite Station Post Insulator

No.: /

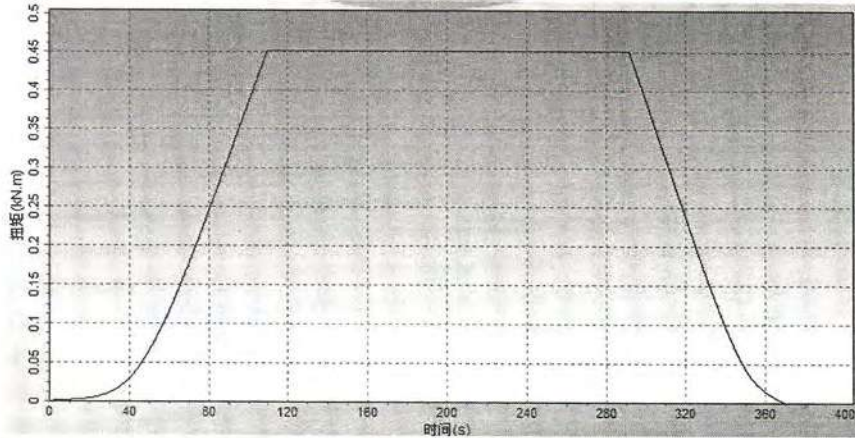
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21XJ1161-S-#11



21XJ1161-S-#12



Oscillograms of dry lightning impulse withstand voltage test

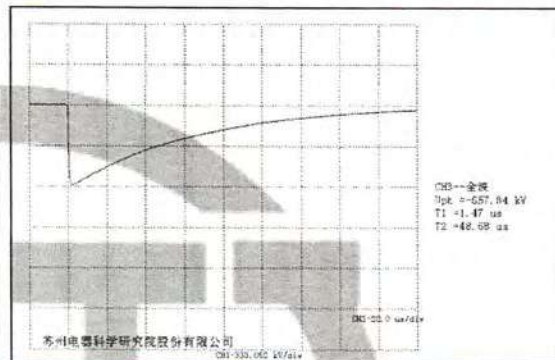
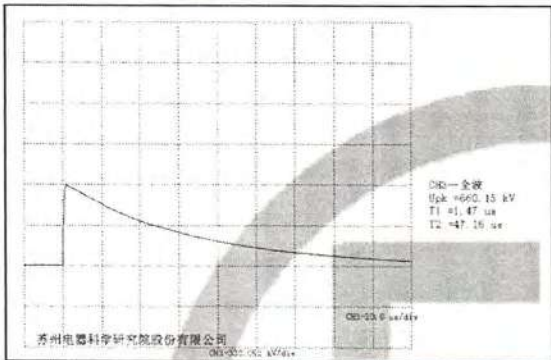
C12.5-650/3625
170kV Composite Station Post Insulator

No.: /

21XJ1161-S-#13

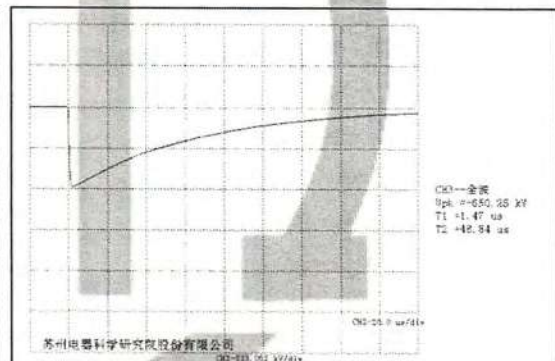
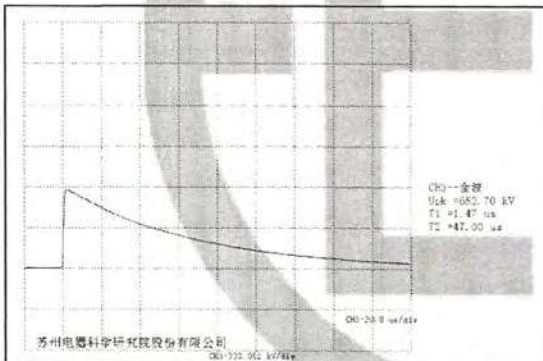
Positive polarity

Negative polarity



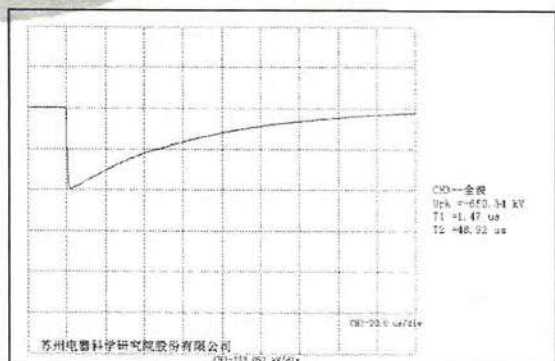
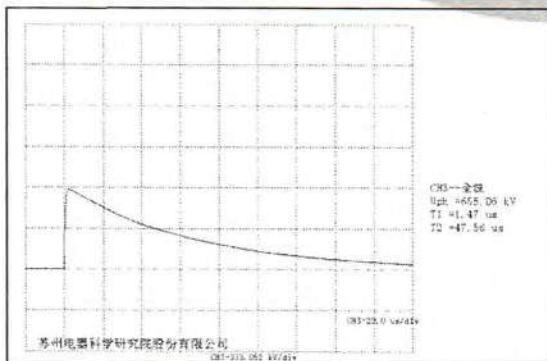
Positive polarity

Negative polarity



Positive polarity

Negative polarity

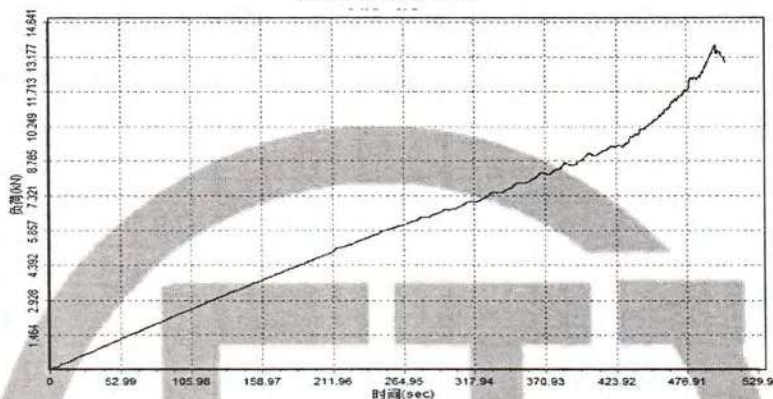


Oscillograms of cantilever failing load test

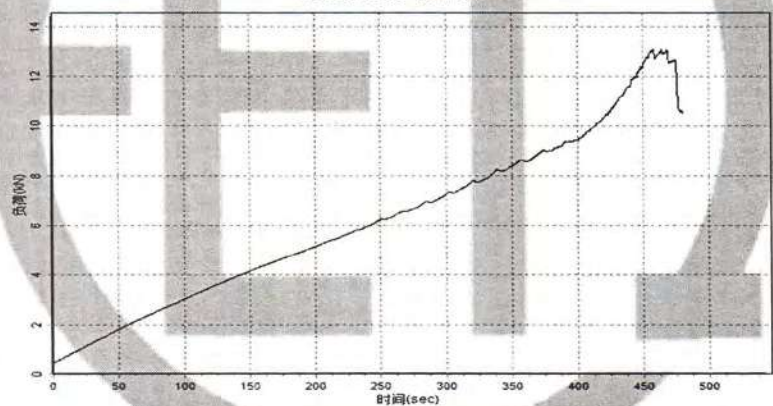
C12.5-650/3625
170kV Composite Station Post Insulator

No.: /

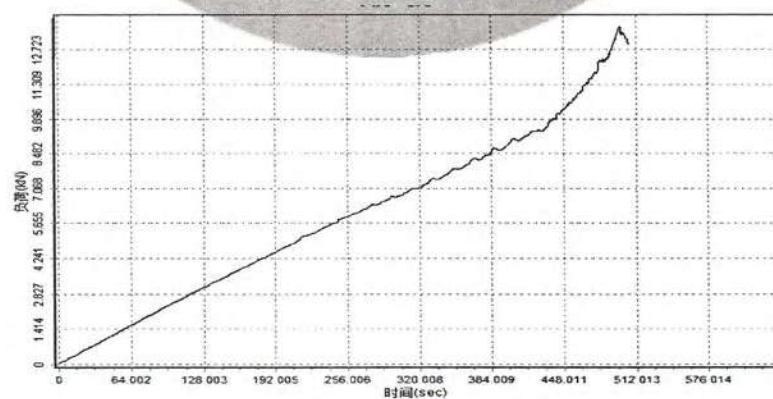
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21XJ1161-S-#14



21XJ1161-S-#15

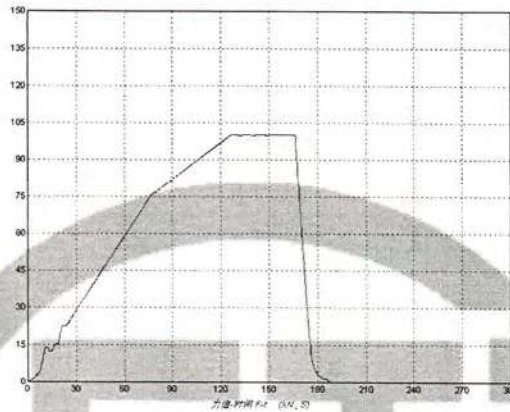


Oscillograms of specified
tension load test

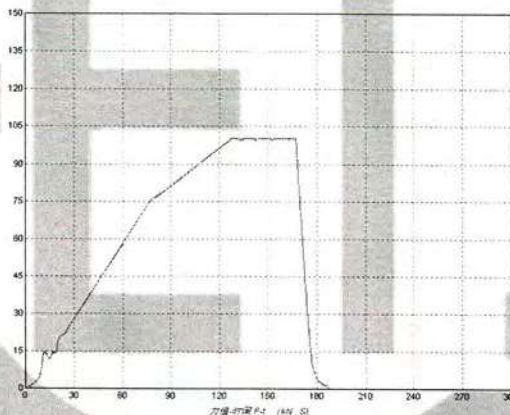
C12.5-650/3625
170kV Composite Station Post Insulator

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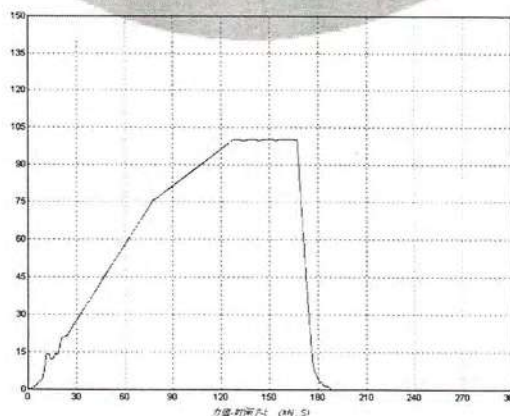
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21XJ1161-S-#17



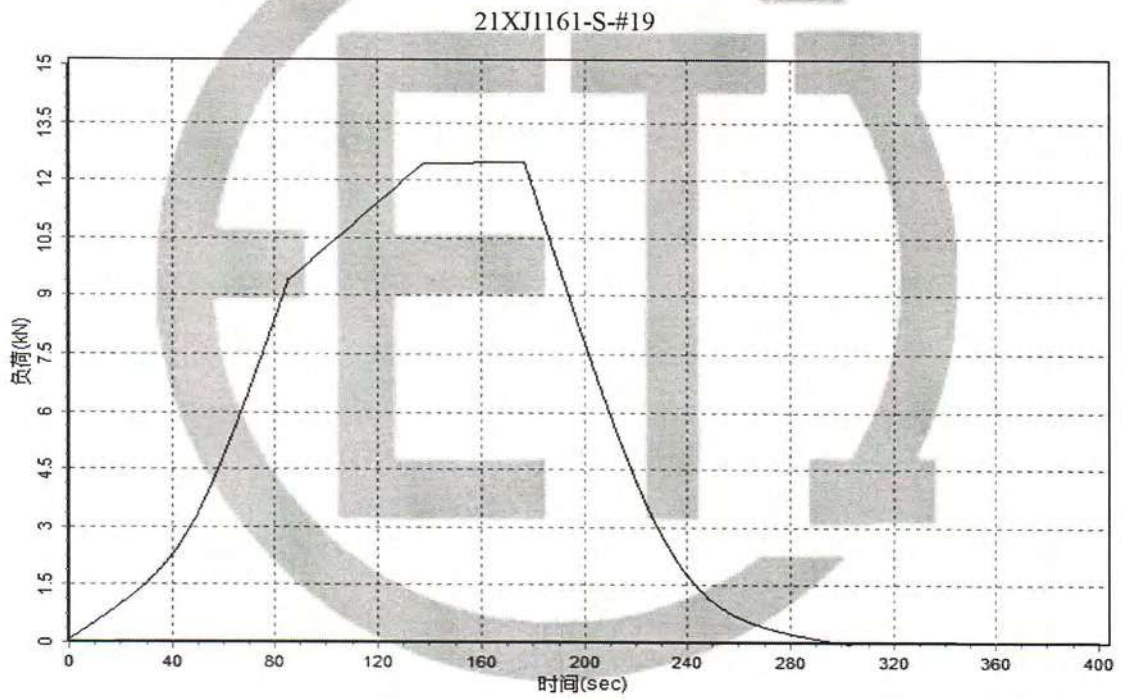
21XJ1161-S-#18



Oscillogram of verification of the SCL

C12.5-650/3625
170kV Composite Station Post Insulator

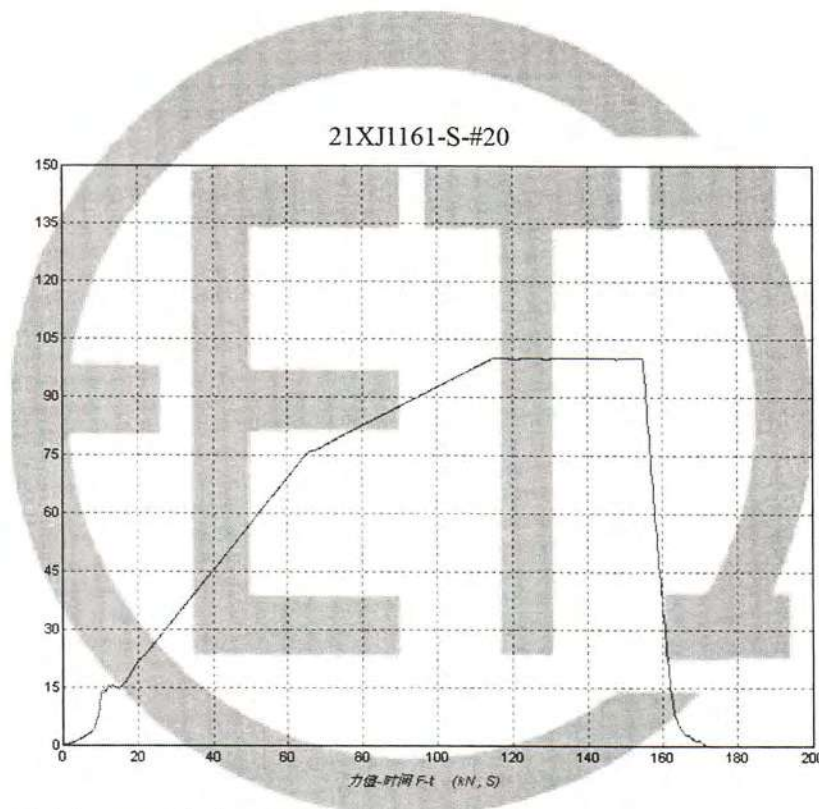
No.: /



Oscillogram of verification of the STL

C12.5-650/3625
170kV Composite Station Post Insulator

No.: /



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