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检测
TESTING
CNAS L0681

CHPTL

TEST REPORT

№ : CTQC/ZJ-23. 0585

Test object name: Adhesive paper capacitive transformer bushing

Test object type: QXBRPW-550/4000-4

Entrusted by: Shandong Qixing High Voltage Electric CO.,Ltd.

Manufacturer: Shandong Qixing High Voltage Electric CO.,Ltd.

Kind of testing: Type Tests

沈阳变压器研究院有限公司 变压器实验室

沈阳变压器研究院有限公司 检验专用章

SHENYANG TRANSFORMER RESEARCH INSTITUTE CO., LTD.

CHINA NATIONAL TRANSFORMER QUALITY DETECTION AND TESTING CENTER

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Address: Hushitai South Avenue No.18, Shenbei New District, Shenyang Postal code: 110122 Tel:(024)23785225
E-mail: ctqc@vip.sina.com http: //www.ctn.cn Tel:(024)23787022

CTQC

Shenyang Transformer Research Institute Co., Ltd.

China National Transformer Quality Detection And Testing Center

Test Report

№: CTQC/ZJ-23.0585

Test object name	Adhesive paper capacitive transformer bushing	Test object type	QXBRPW-550/4000-4
		Brand	/
Entrusted by	Shandong Qixing High Voltage Electric CO.,Ltd.	Kind of testing	Type test
Manufactu-rer	Shandong Qixing High Voltage Electric CO.,Ltd.	Sampling date	/
		Test date	Jul.18, 2023 ~Jul.22, 2023
Address	No.1228,Pengcheng Industrial Park, Pingli Road, Xiazhuang Town, Gaomi City, Weifang City, Shandong Province	Serial №	2307PB001
Standards	IEC60137：2017 GB/T4109-2022 Technical contract	Test items	Routine test Type test
Results	The test results of routine tests, type tests of QXBRPW-550/4000-4 are in accordance with standards and technical contract. The sample passed the above tests. Signing and issuing date: 2023.08.01		
Note			

Approved by: Lv Xiangpeng Checked by:Du Jiansong Compiled by: Song Jialin

Statement : 1. Testing report is invalid without test special seal.
2. Testing report is invalid without compiler, checker and approver's signature.
3. Please inform CTQC in time after received the testing report if you have some disagreement to the testing report..
4. Testing or witnessing only apply to sample.
5. Copying testing certificate or testing report is forbidden without written permission from CTQC(except for copying all the testing report).

Address: Hushitai South Avenue No. 18, Shenbei New District, Shenyang Postal code: 110122 Tel: (024) 23785225
E-mail: ctqc@vip.sina.com http: //www.ctn.cn Tel: (024) 23787022

Test Report

Test results

№	Test items	Specified values Standards(Technical contract)	Measured values	Conclu-sions
1	Measurement of dielectric dissipation factor（tanδ）and capacitances at ambient temperature (Before type test)	Applied voltage(kV):2~20 tanδ：≤0.007 Providing capacitance of the sample（pF）	10 0.00335 754.8	Passed
		Applied voltage(kV):1.05$U_m/\sqrt{3}$ tanδ：≤0.007 Providing capacitance of the sample（pF）	333.4 0.00337 755.4	
		Applied voltage(kV):U_m tanδ：≤0.007 Providing capacitance of the sample（pF）	550 0.00340 755.5	
2	Measurement of partial discharge quantity (Before type test)	Applied voltage(kV):U_m Partial discharge level(pC):≤10	550 <4	Passed
		Applied voltage(kV):1.5$U_m/\sqrt{3}$ Partial discharge level(pC):≤10	476.3 <4	
		Applied voltage(kV):1.05$U_m/\sqrt{3}$ Partial discharge level(pC):≤5	333.4 <4	
3	Dry lightning impulse voltage withstand test (Type test)	Full wave voltage: Positive polarity(kV): 1686(Corrected value) ±3% Negative polarity(kV): 1855.5(Corrected value) ±3% 15 positive and 15 negative polarity full wave impulses Chopped wave voltage(kV): 2040.8(Corrected value) ±3% 5 negative polarity chopped wave impulses	 1657.41~1729.63 1848.05~1887.09 Each 15 times 2032.79~2099.35 5 times	Passed
4	Dry switch impulse voltage withstand test (Type test)	Full wave voltage: Negative polarity(kV): 1432.3(Corrected value) ±3% 15 negative polarity	 1399.64~1445.34 15 times	Passed
5	Wet switch impulse voltage withstand test (Type test)	Full wave voltage: Positive polarity(kV): 1281.8(Corrected value) ±3% Negative polarity(kV): 1300 ±3% 15 positive and 15 negative polarity	 1298.07~1307.18 1268.28~1278.41 Each 15 times	Passed
6	Dry power-frequency voltage withstand test (Type test)	Applied voltage(kV): 752.1(Corrected value) Duration(s): 60	752.1 60	Passed

Test Report

№	Test items	Specified values Standards(Technical contract)	Measured values	Conclu-sions
7	Long-duration power-frequency voltage withstand test（ACLD）（Type test）	U_1=Um（kV） Duration(s)：60	550 60	Passed
		U_2=1.5Um/$\sqrt{3}$ （kV） Duration(min)：60 Partial discharge level (pC):≤10	476.3 60 <4	
		1.1Um/$\sqrt{3}$ （kV） Duration(min)：5 Partial discharge level (pC):≤5	349.3 5 <4	
8	Radio interfenence voltage test（Type test）	Applied voltage（kV）：1.1Um/$\sqrt{3}$ Duration（min）：5 Radio interfenence level(μV)：≤500	349.3 5 282	Passed
9	Thermal stability test（Type test）	Oil temperature（℃）：90±2 Applied voltage(kV): 0.8 Um	90 440	Passed
10	Temperature-rise test (Type test)	Temperature limit(℃):120 Temperature-rise limit(K): 75	68.1～93.9 38.7～64.5	Passed
11	Verification of thermal short-time current withstand (Type test)	Thermal short-time current（kA）：$25I_r$ Duration(s):2 Final temperature (℃):≤180	100 2 118.4	Passed
12	Cantilever load withstand test（Type test）	Applied load(N)：5000 Duration(s)：60 Successfully repeat check items	5046 60 Passed	Passed
13	Visual inspection and dimensions check (Type test)	According to standard	See 4.13	Passed
14	Measurement of partial discharge quantity（After type test）	Applied voltage(kV):U_m Partial discharge level(pC):≤10	550 <4	Passed
		Applied voltage(kV):1.5U_m/$\sqrt{3}$ Partial discharge level(pC):≤10	476.3 <4	
		Applied voltage(kV):1.05U_m/$\sqrt{3}$ Partial discharge level(pC):≤5	333.4 <4	

Test Report

№	Test items	Specified values Standards(Technical contract)	Measured values	Conclu-sions
15	Measurement of dielectric dissipation factor（tanδ）and capacitances at ambient temperature (After type test)	Applied voltage(kV):2~20 tanδ：≤0.007 Providing capacitance of the sample（pF）	10.0 0.00334 754.6	Passed
		Applied voltage(kV):1.05$U_m/\sqrt{3}$ tanδ：≤0.007 Providing capacitance of the sample(pF)	333.4 0.00335 755.2	
		Applied voltage(kV):U_m tanδ：≤0.007 Providing capacitance of the sample(pF)	550 0.00335 755.2	
16	Test of tap insulation (Routine test)	Dry power-frequency voltage withstand test on the tap: Applied voltage(kV): ≥2 Duration(s): 60	 2 60	Passed
		Measurement of dielectric dissipation factor (tanδ) and capacitances at ambient temperature on the tap: Applied voltage(kV): ≥1 tanδ: ≤0.05 Capacitance(pF): ≤10000	 2 0.00618 1198	
17	Dry lightning impulse voltage withstand test (Routine test)	Negative polarity(kV):1758.8 ±3% 3 negative polarity Chopped wave voltage(kV): 1926.3 ±3% 2 negative polarity	1773.33~1806.00 3 times 1902.48~1922.71 2 times	Passed
18	Dry power-frequency voltage withstand test (Routine test)	Applied voltage(kV):750 Duration（s）：60	750 60	Passed
19	Measurement of partial discharge quantity (Routine test)	Applied voltage(kV): U_m Partial discharge level(pC): ≤10	252 <3	Passed
		Applied voltage(kV): 1.5$U_m/\sqrt{3}$ Partial discharge level(pC):≤10	476.3 <3	
		Applied voltage(kV):1.05$U_m/\sqrt{3}$ Partial discharge level(pC):≤5	333.4 <2	

Test Report

№	Test items	Specified values Standards(Technical contract)	Measured values	Conclu-sions
20	Measurement of dielectric dissipation factor (tanδ) and capacitances at ambient temperature (Routine test)	Applied voltage(kV):2~20 tanδ: ≤0.007 Providing capacitance of the sample(pF)	10.0 0.00335 754.8	Passed
		Applied voltage(kV):1.05$U_m/\sqrt{3}$ tanδ: ≤0.007 Providing capacitance of the sample(pF)	333.4 0.00336 755.4	
		Applied voltage(kV):U_m tanδ: ≤0.007 Providing capacitance of the sample(pF)	550 0.00336 755.5	
21	Tightness test at the flange (Routine test)	Applied medium Applied pressure(MPa): 0.40 ±0.01 Durations(min): 15 No oil leakage and damage	SF_6 0.4 15 No oil leakage and damage	Passed
22	Visual inspection and dimensions check (Routine test)	According to standard	See 4.13	Passed

Note: 1. All the tests were field tests;

2. Tested in Shandong Qixing High Voltage Electric Co., Ltd. laboratory.

Test Report

1. Test object parameters

Highest voltage for equipment(kV): 550

Rated phase-to-earth voltage(kV): $550/\sqrt{3}$

Rated current(A): 4000

Rated frequency(Hz): 50

Altitude(m):≤1000

Temperature class of insulation: E

Test tap(measured tap, tanδ): With

Insulation type of bushing: Adhesive paper

Rated voltage of tap(Tap of electric potential, tap of capactitance) (kV): /

2. Sample condition description

Sample exterior construction and major dimensions(length, diameter) are in compliance with outline drawings.

Measured values: Length is 7672 mm, external diameter is Φ800 mm.

Rating plate	Outline dimensions
PCBT55-1228	8QX.860.009G

Rating plate and outline drawings are in testing report annex, other drawings should be conserved by enterprise after affirming by CTQC.

The form, performance data, specifications of sample ra

3. Standards

IEC60137: 2017, GB/T4109-2022 Insulated bushings for alternating voltage above 1000V

Technical contract

Test Report

4. Test items and conclusions

4.1Measurement of dielectric dissipation factor(tanδ) and capacitances at ambient temperature (Before type test)

Test date:Jul.18,2023

Humidity: 46.0%; Ambient temperature: 31.1℃

Applied voltage (kV)	Dielectric dissipation factor (tanδ)	Capacitance(pF)	Result
10.0	0.00335	754.8	Passed
333.4	0.00337	755.4	
550	0.00340	755.5	

Note: tanδ(550kV)- tanδ(333.4kV)= 0.00003＜0.001 (Standard value), passed.

4.2 Measurement of partial discharge quantity (Before type test)

Test date:Jul.18,2023

Humidity: 46.0%; Ambient temperature: 31.1℃; Atmospheric pressure: 101.2kPa

Prestress voltage (kV)	Duration (s)	Measured voltage (kV)	Partial discharge level(pC)	Result
750	60	550	<4	Passed
		476.3	<4	
		333.4	<4	

Note: Background level is <4pC before and after test.

4.3 Dry lightning impulse voltage withstand test (Type test)

Test date:Jul.18,2023

Test atmospheric conditions:

Ambient temperature: 31.2℃; Humidity: 46.0%; Atmospheric pressure: 101.2kPa

Full wave rated withstand voltage: positive polarity: 1686.6kV(Corrected value) 15 positive polarity impulses;

Negative polarity: 1855.5kV(Corrected value) 15 negative polarity impulses;

Chopped wave rated withstand voltage: 2040.8 kV(Corrected value) 5 negative polarity impulses.

Test sequence:

One positive polarity reference voltage full wave impulse;

Fifteen positive polarity rated voltage full wave impulse;

One negative polarity reference voltage full wave impulse;

One negative polarity rated voltage full wave impulse;

Five negative polarity rated chopped wave impulse;

Fourteen negative polarity rated voltage full wave impulse.

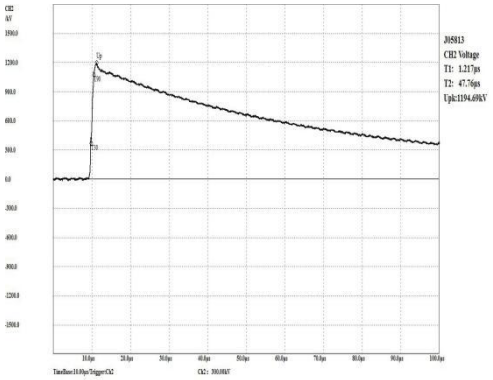
Test oscillogram records:

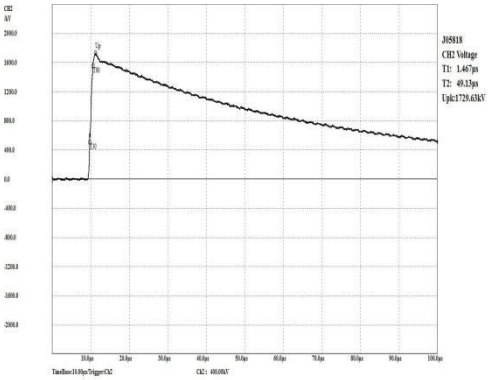
T_1:Front time; T_2:Time to half value; Upk: Peak voltage;

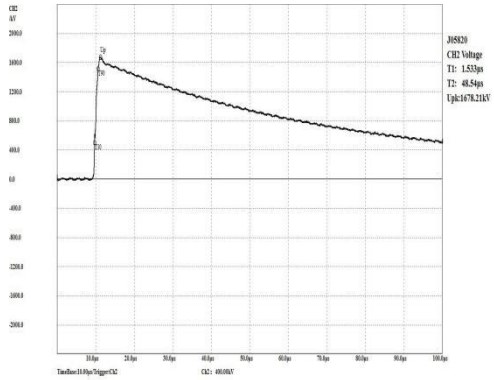
Tc: Time to chopping; Q_z: Factor of over crossing

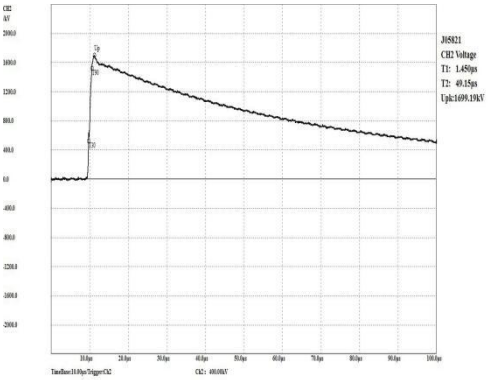
Result: Passed.

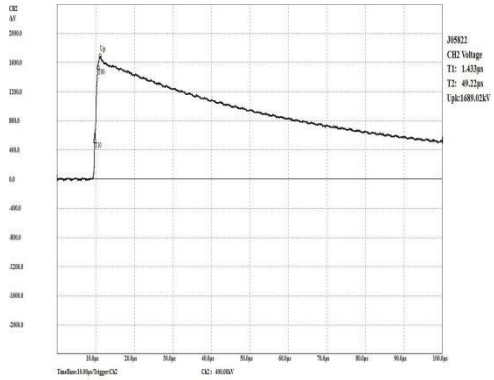
Tested terminal: To earth Test polarity: Positive CH1:Voltage records

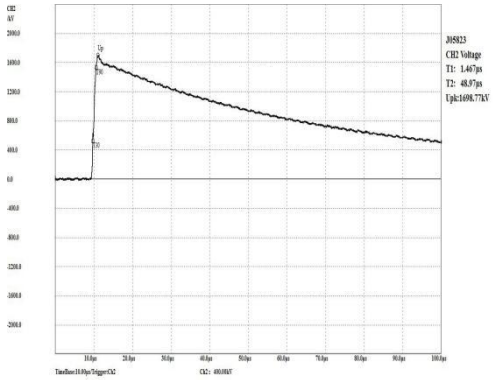


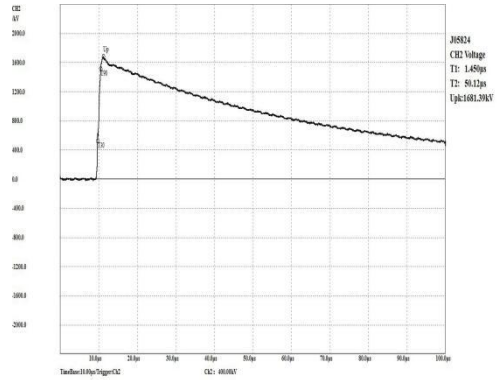


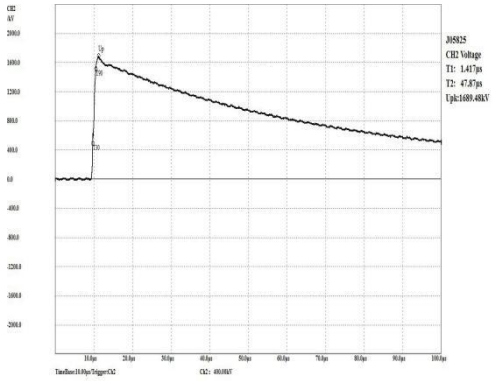






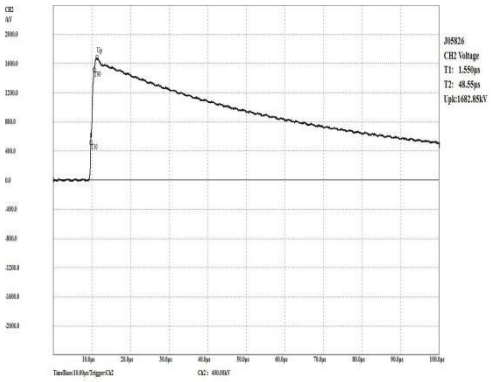


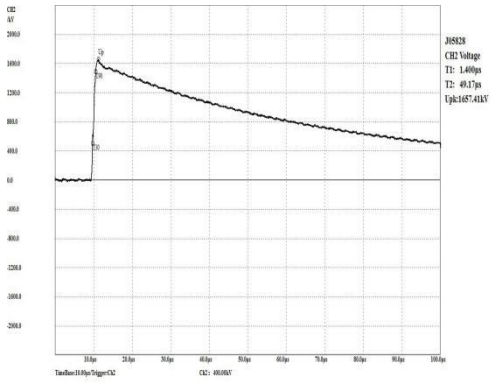


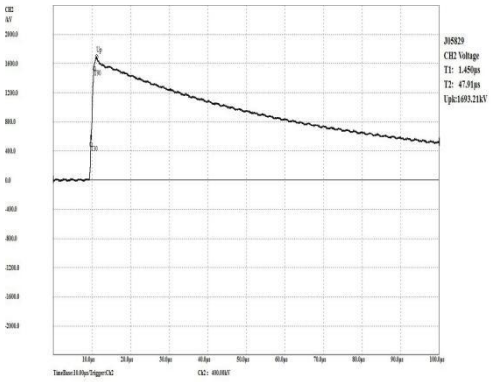


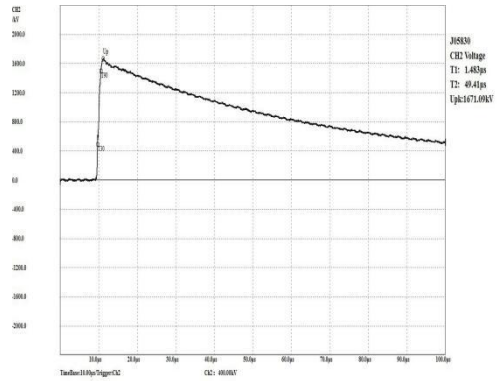
Test Report

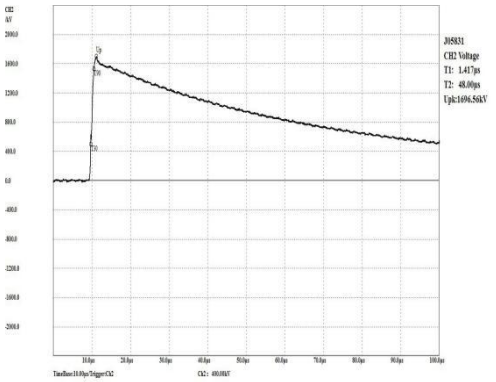
Tested terminal: To earth Test polarity: Positive CH1:Voltage records

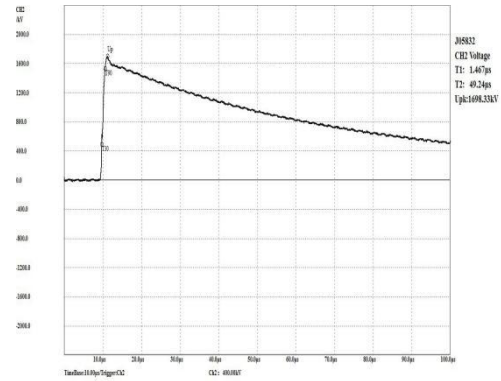


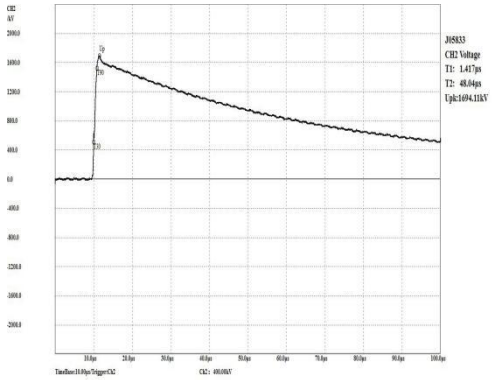


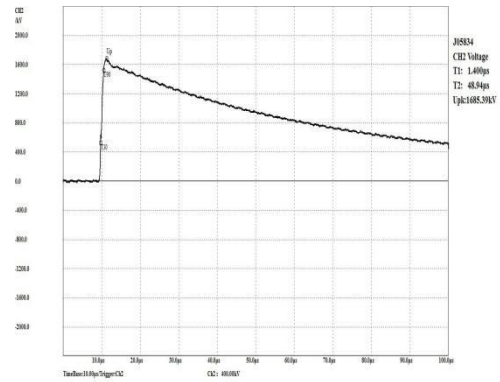








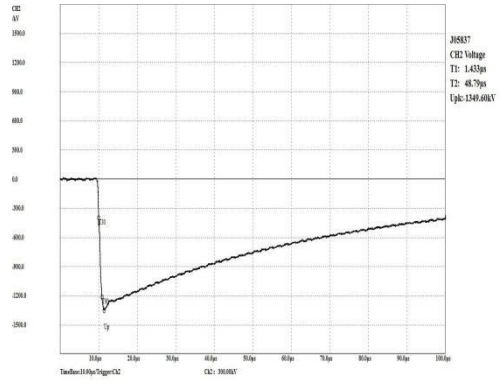


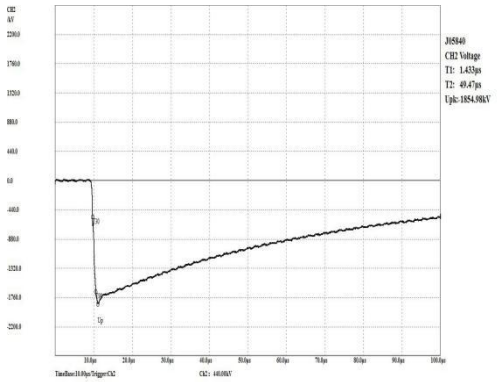


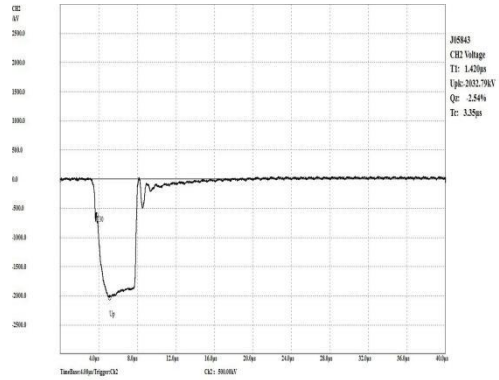
Tested terminal: To earth

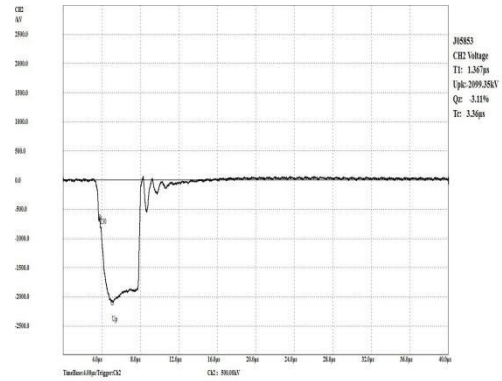
CH1.Voltage records

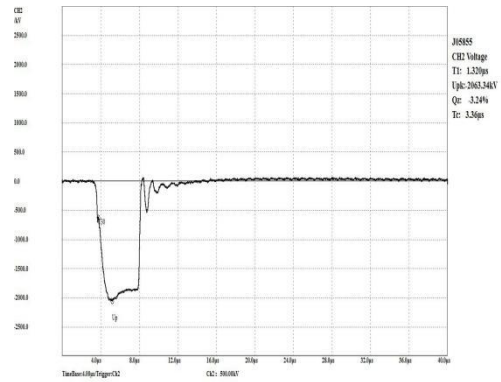
Test polarity: Negative

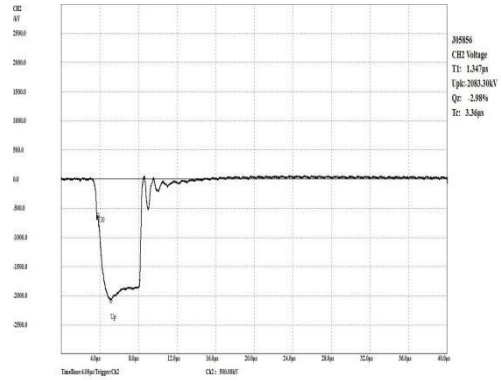


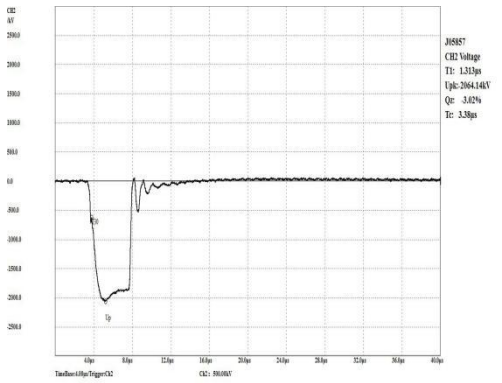




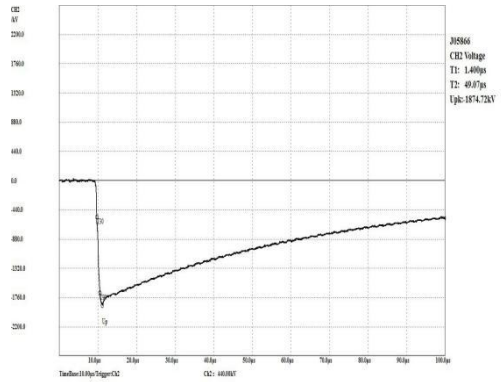


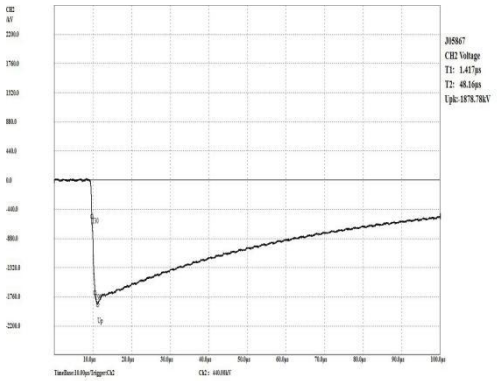


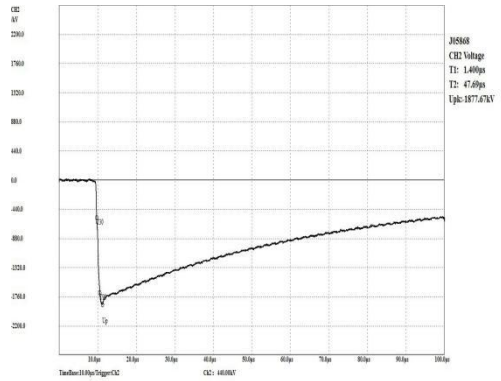


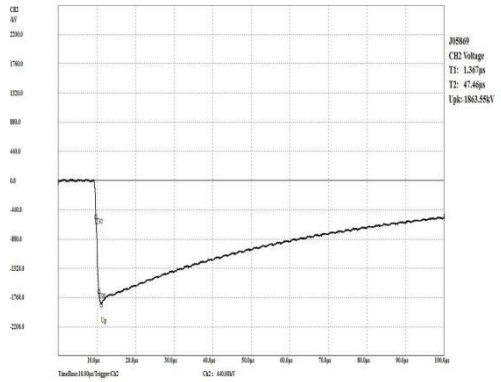


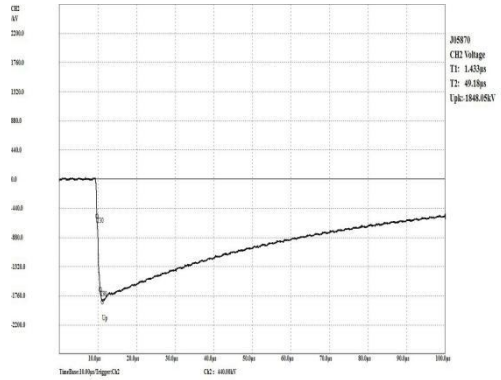
Tested terminal: To earth Test polarity: Negative CH1:Voltage records

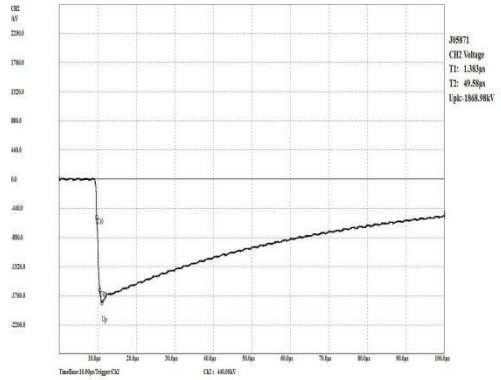


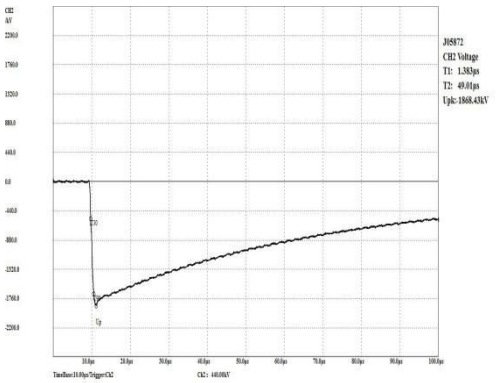


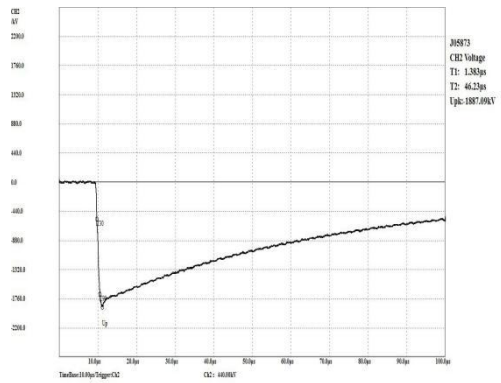




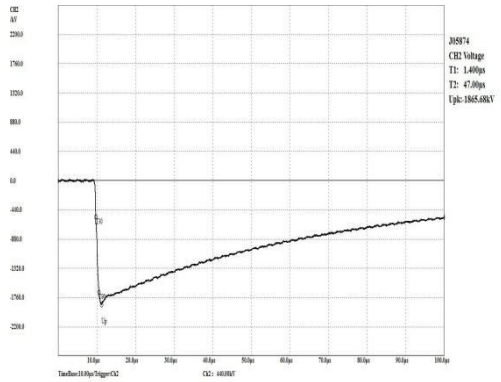


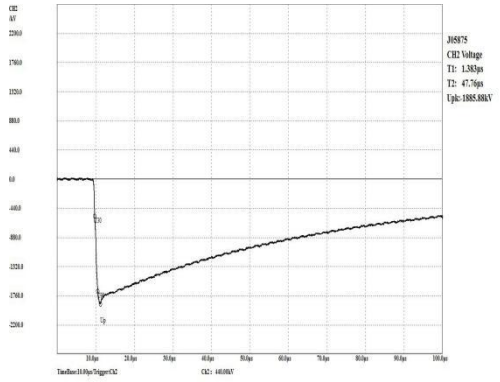


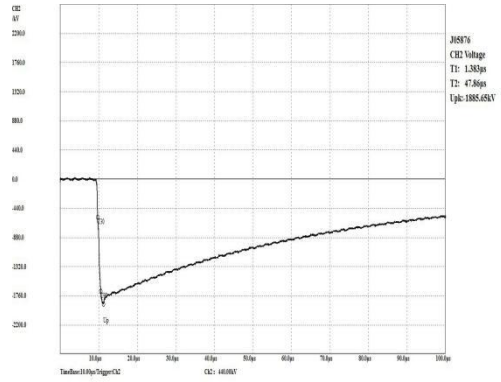


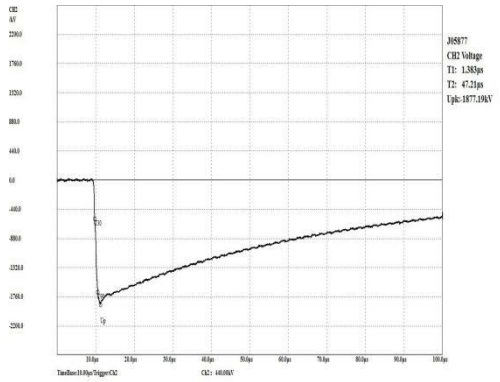


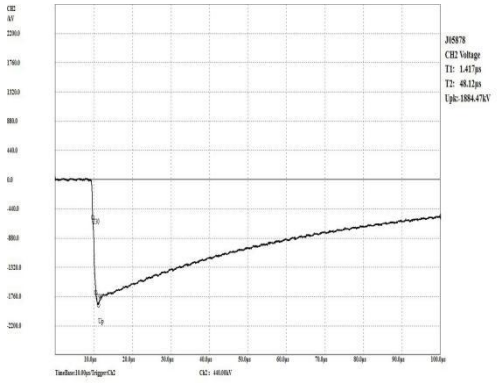
Tested terminal: To earth Test polarity: Negative CH1:Voltage records

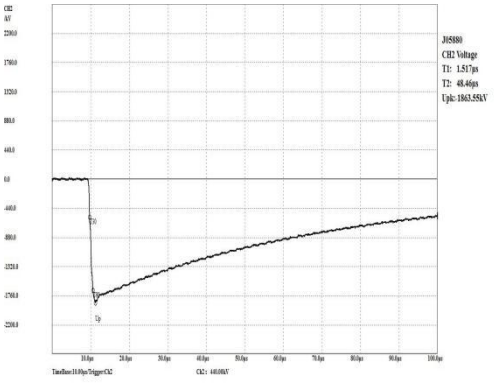












4.4 Dry switch impulsevoltage withstand test(Type test) Test date:Jul.18,2023

Test atmospheric conditions: Humidity: 43.0％; Ambient temperature: 32.3℃; Atmospheric pressure: 101.8kPa.

Rated switch impulse withstand voltage:

Negative: 1432.3kV (Corrected value) Fifteen positive rated full wave switch impulses;

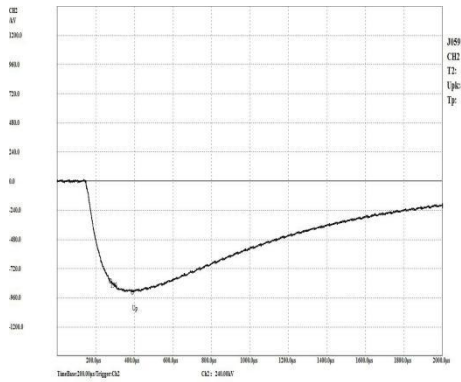
Test sequence:
One negative reference full wave impulse;
Fifteen negative rated full wave impulses;

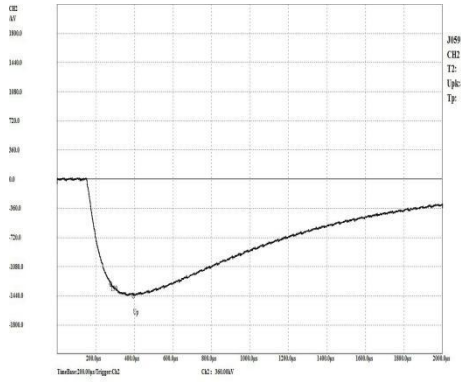
Test oscillogram records:
Tp: Front time; T2: Time to half value; Upk：Peak voltage;

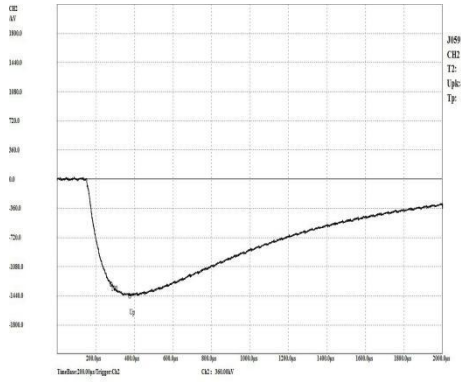
Result: Passed.

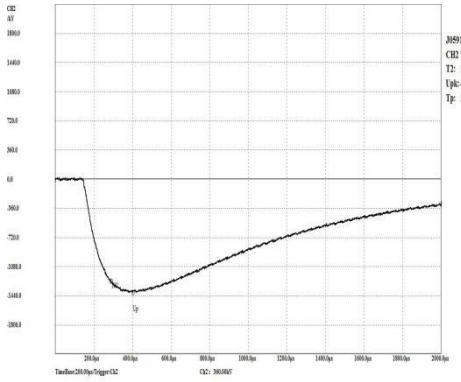
Test Report

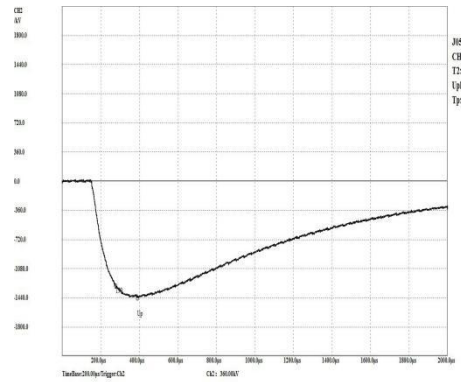
Tested terminal: To earth Test polarity: Negative CH1:Voltage records

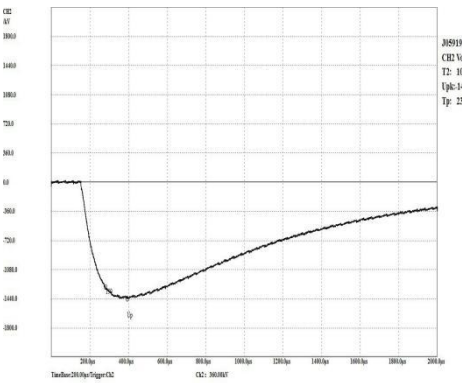


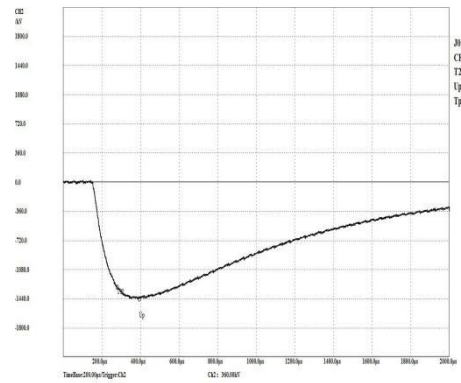


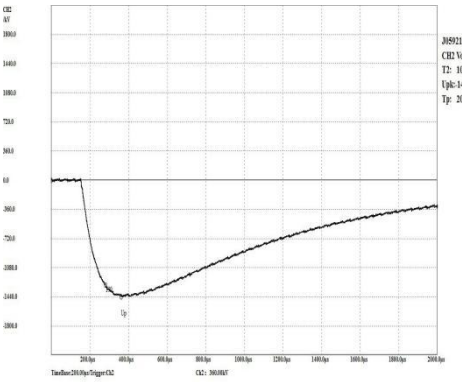






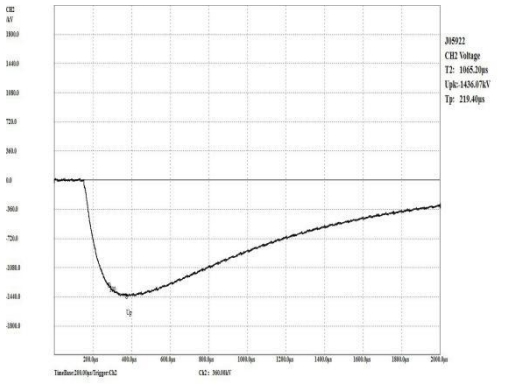


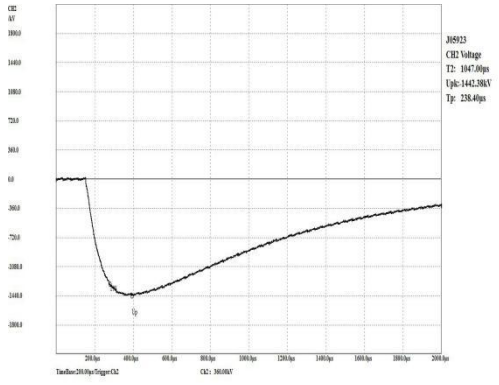


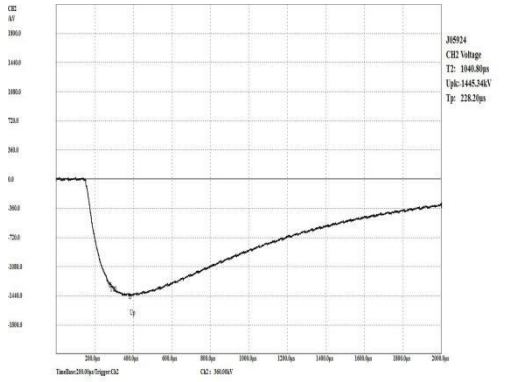


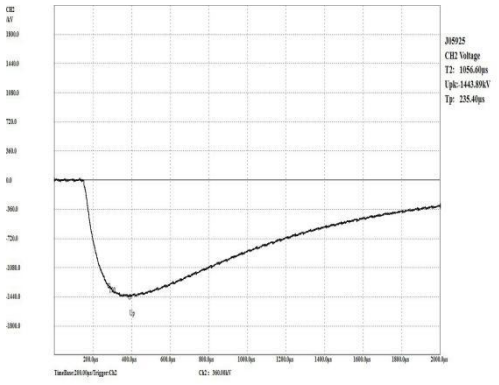
Test Report

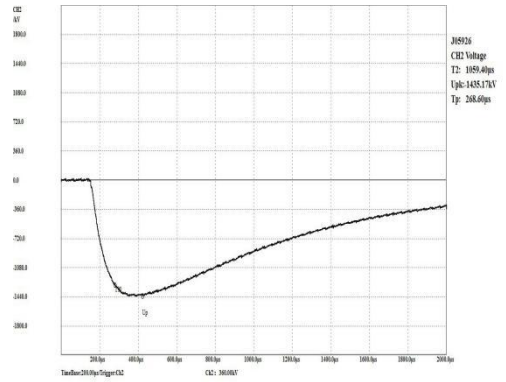
Tested terminal: To earth Test polarity: Negative CH1:Voltage records

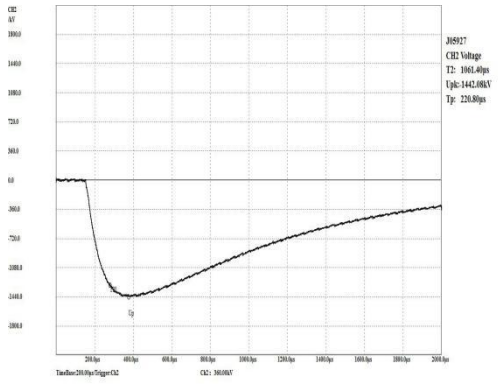


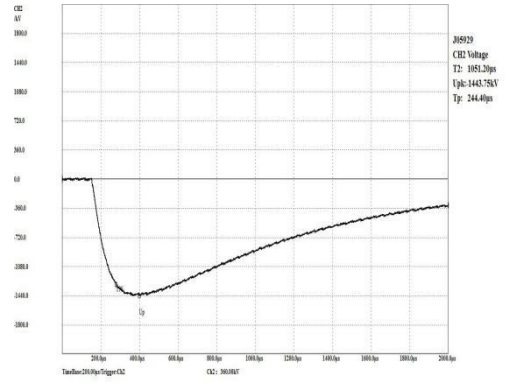


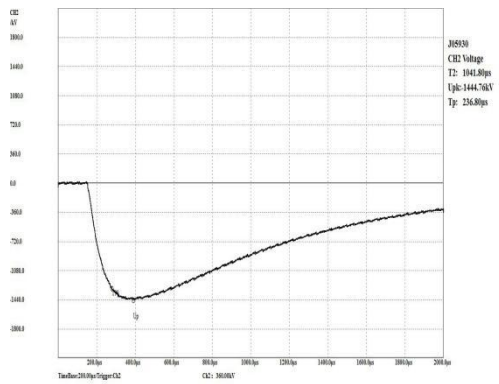












4.5 Wet switch impulsevoltage withstand test(Type test) Test date:Jul.18,2023

Test atmospheric conditions: Humidity: 45.0％; Ambient temperature: 33.4℃; Atmospheric pressure: 100.6kPa.
The conductivity of collected water is 100.3μS/cm at 20℃.
Vertical component 1.4mm/min, horizontal component 1.3mm/min.

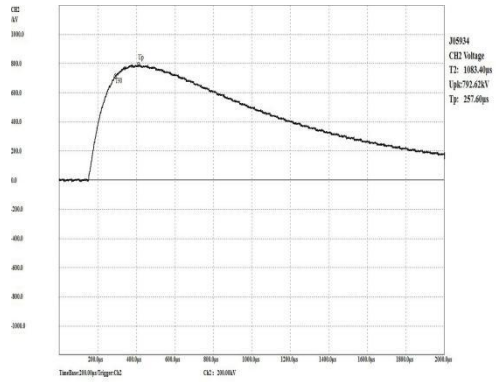
Rated switch impulse withstand voltage:
Positive: 1281.8kV (Corrected value)
Negative： 1300kV Fifteen positive and negative rated full wave switch impulses;

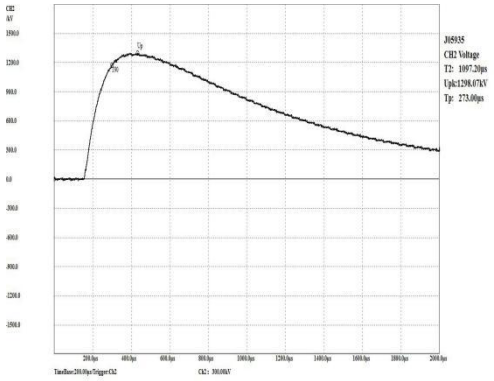
Test sequence:
One positive polarity reference voltage full wave impulse；
Fifteen positive polarity rated voltage full wave impulses；
One negative polarity reference voltage full wave impulse；
Fifteen negative polarity rated voltage full wave impulses；

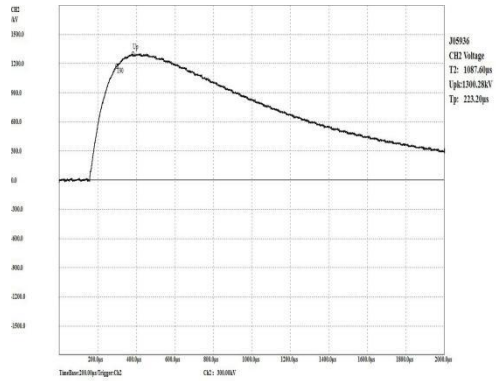
Test oscillogram records:
Tp: Front time; T2: Time to half value; U_{pk}: Peak voltage;

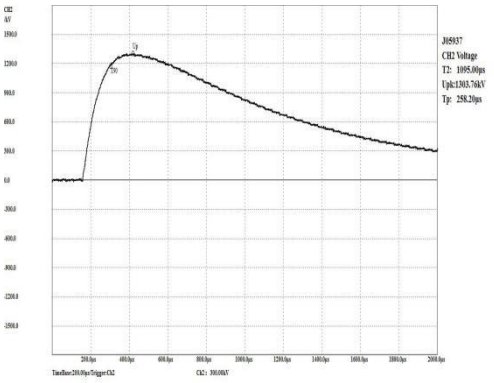
Result: Passed.

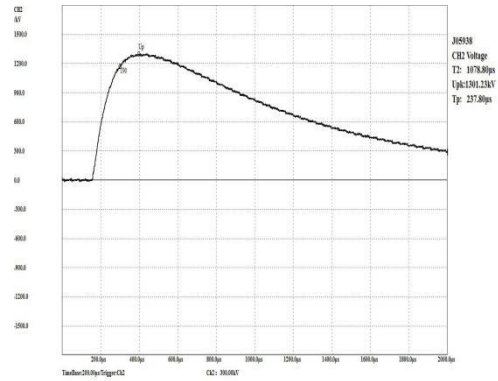
Tested terminal: To earth Test polarity: Positive CH1: Voltage records

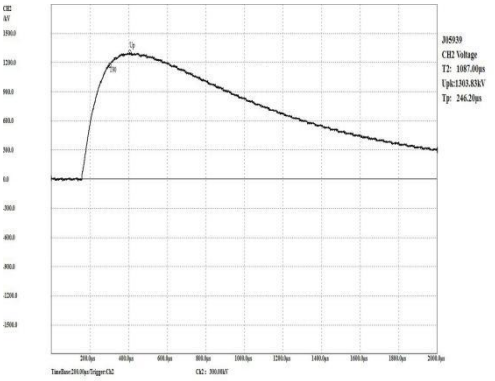


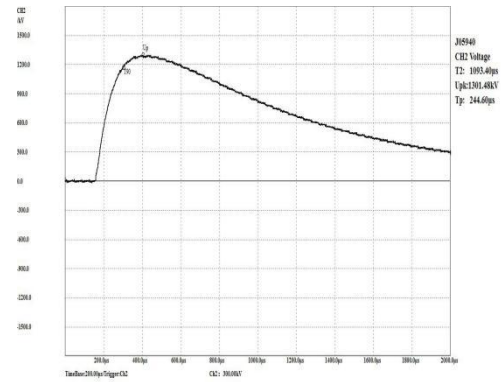


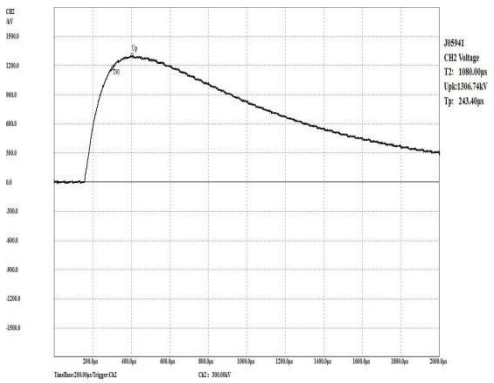






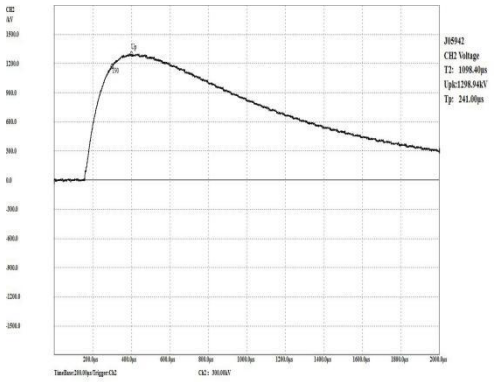


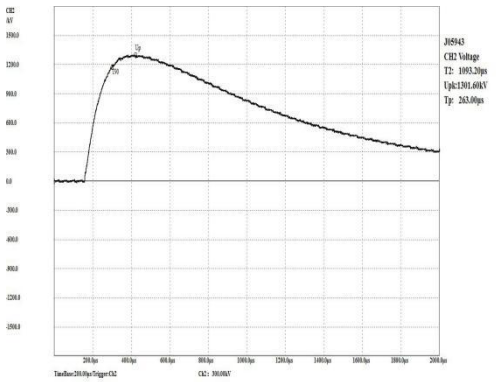


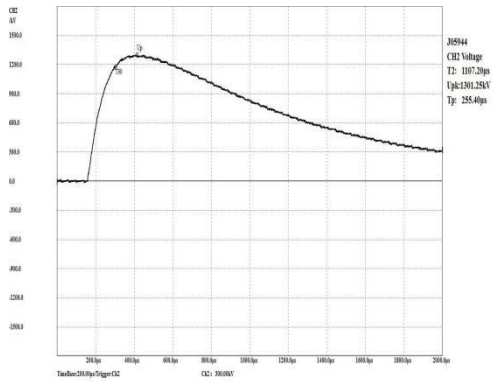


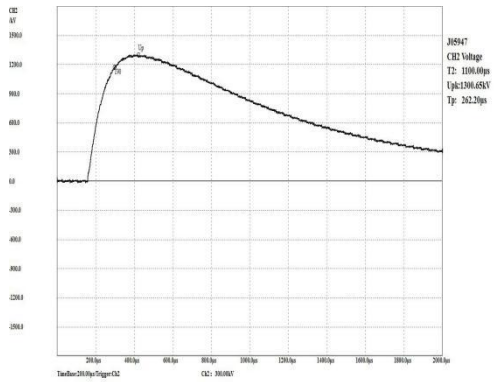
Test Report

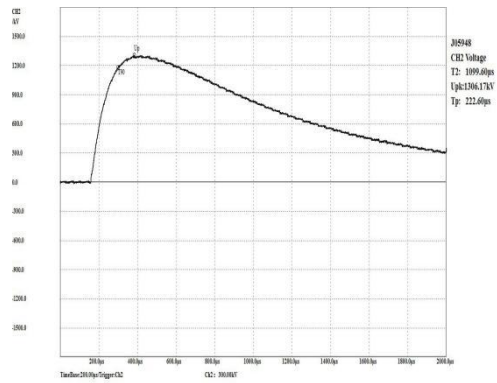
Tested terminal: To earth Test polarity: Positive CH1: Voltage records

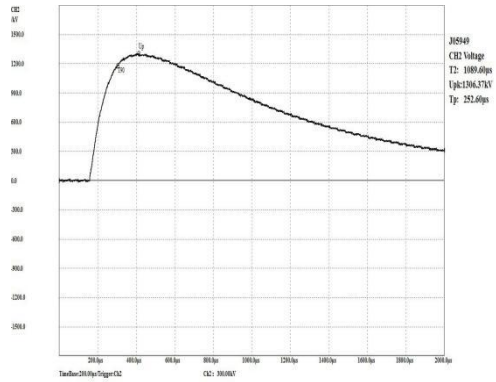


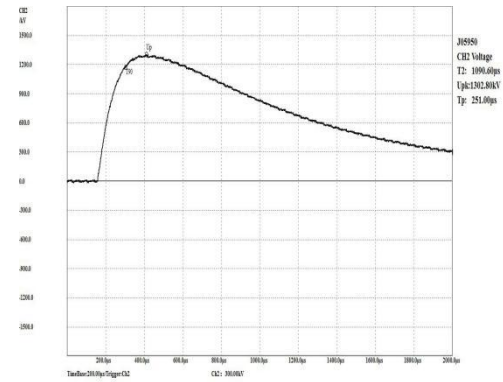


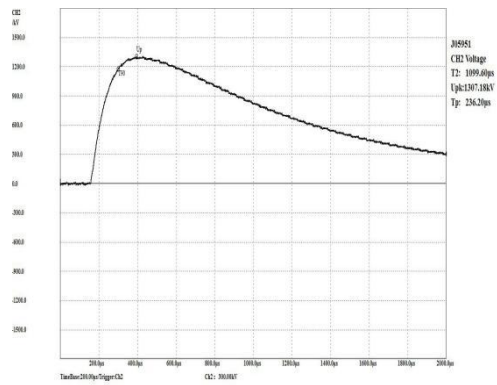




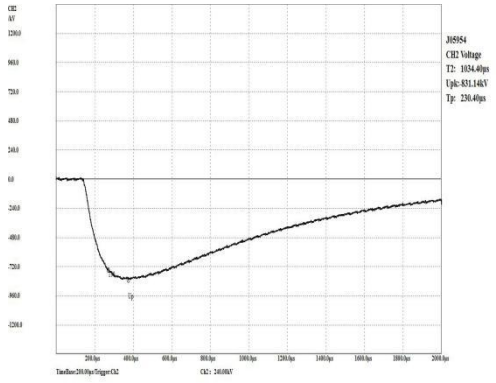


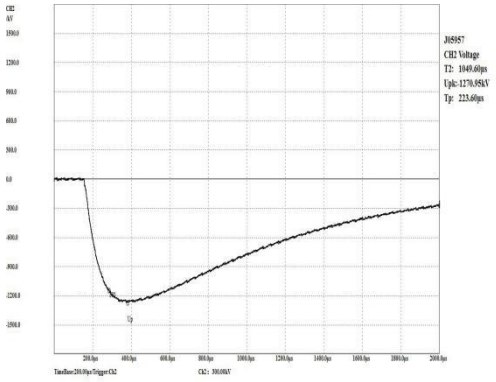


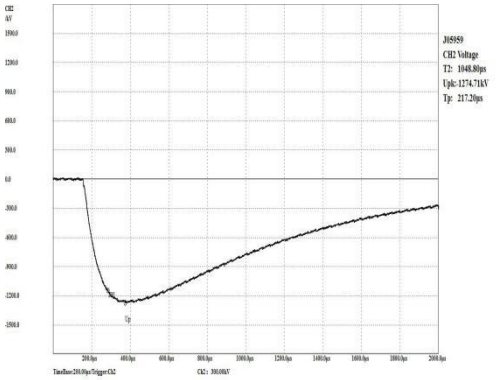


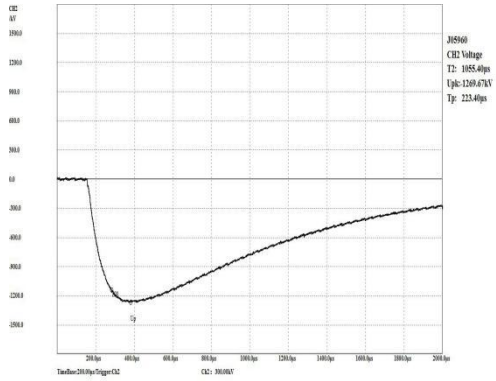


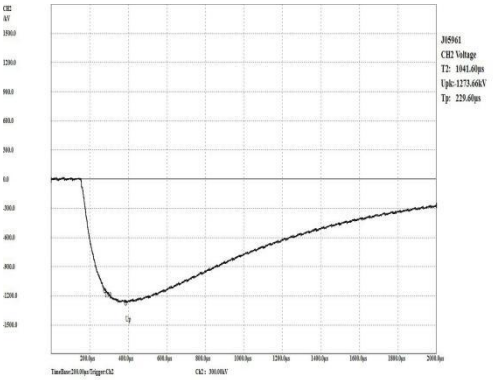
Tested terminal: To earth Test polarity: Negative CH1: Voltage records

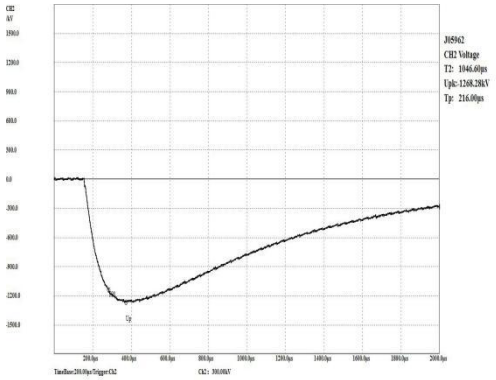


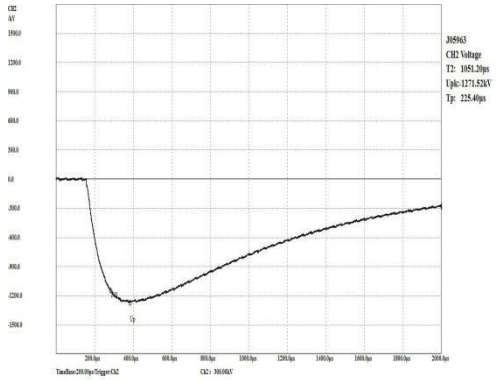


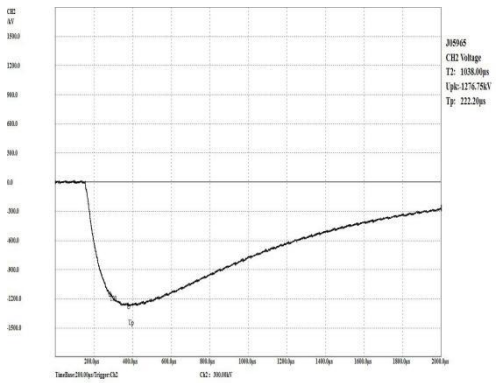




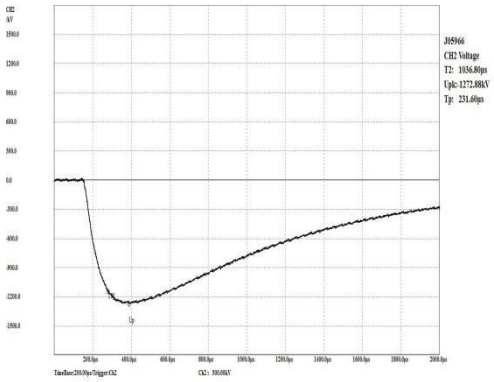


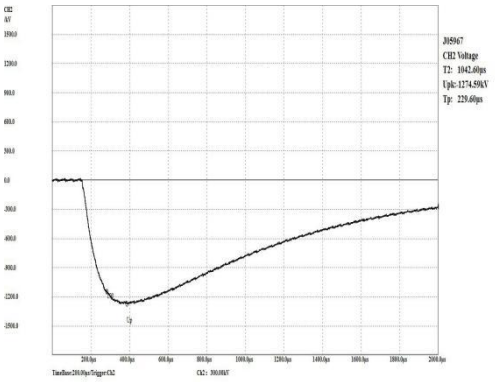


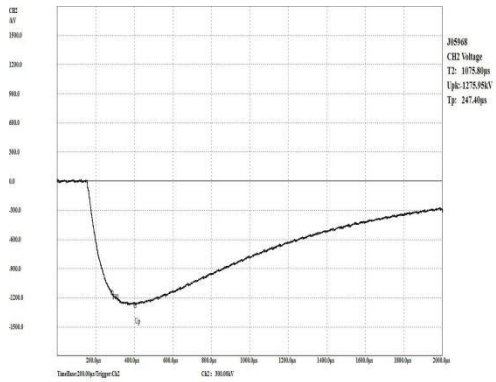


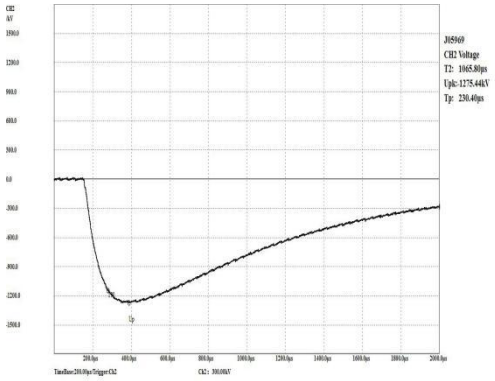


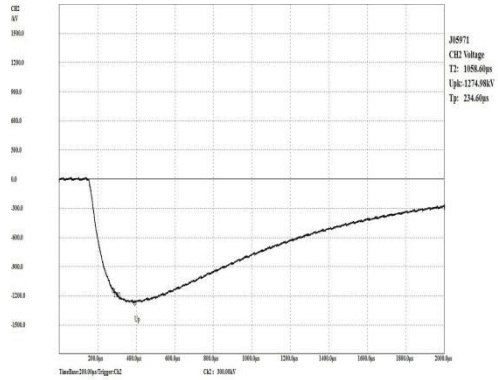
Tested terminal: To earth Test polarity: Negative CH1: Voltage records

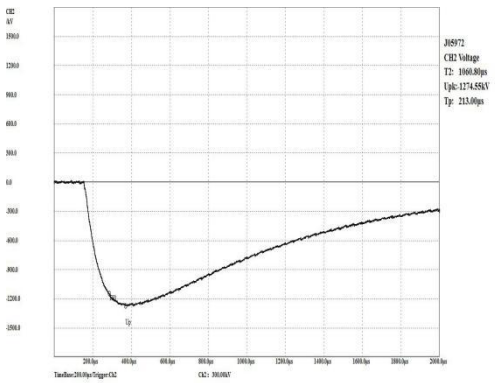


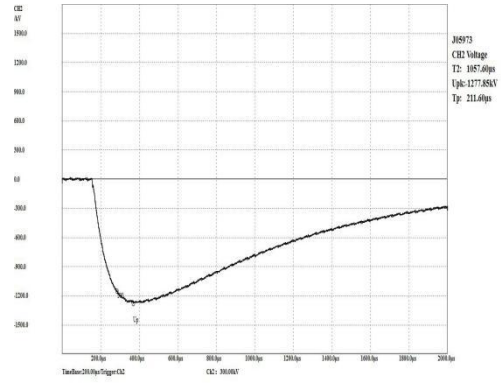


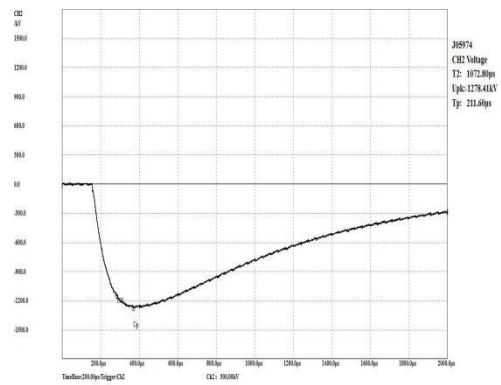












Test Report

4.6 Dry power-frequency voltage withstand test(Type test) Test date:Jul.19,2023

Humidity:60.0%; Ambient temperature: 29.7℃; Atmospheric pressure: 101.0kPa

Position	Applied voltage(kV)			Frequency (Hz)	Duration (s)	Result
	Standard value	Atmospheric corrected value	Applied value			
Terminal-earth	750	752.1	752.1	50	60	Passed

4.7 Long-duration power-frequency withstand voltage test(ACLD)(Type test)

Test date:Jul.19,2023

Ambient temperature: 29.7℃

Applied voltage		Duration(min)	Partial discharge level(pC)
Multiple	Phase-earth(kV)		
1.1Um/$\sqrt{3}$	349.3	5	＜4
U_2=1.5Um/$\sqrt{3}$	476.3	5	＜4
U_1=Um	550	1	/
U_2=1.5Um/$\sqrt{3}$	476.3	5	＜4
		10	＜4
		15	＜4
		20	＜4
		25	＜4
		32	＜4
		35	＜4
		40	＜4
		45	＜4
		50	＜4
		55	＜4
		60	＜4
1.1Um/$\sqrt{3}$	349.3	5	＜4

Note: U_m=550kV;

Background level is＜4pC before and after test.

Result: Passed.

Test Report

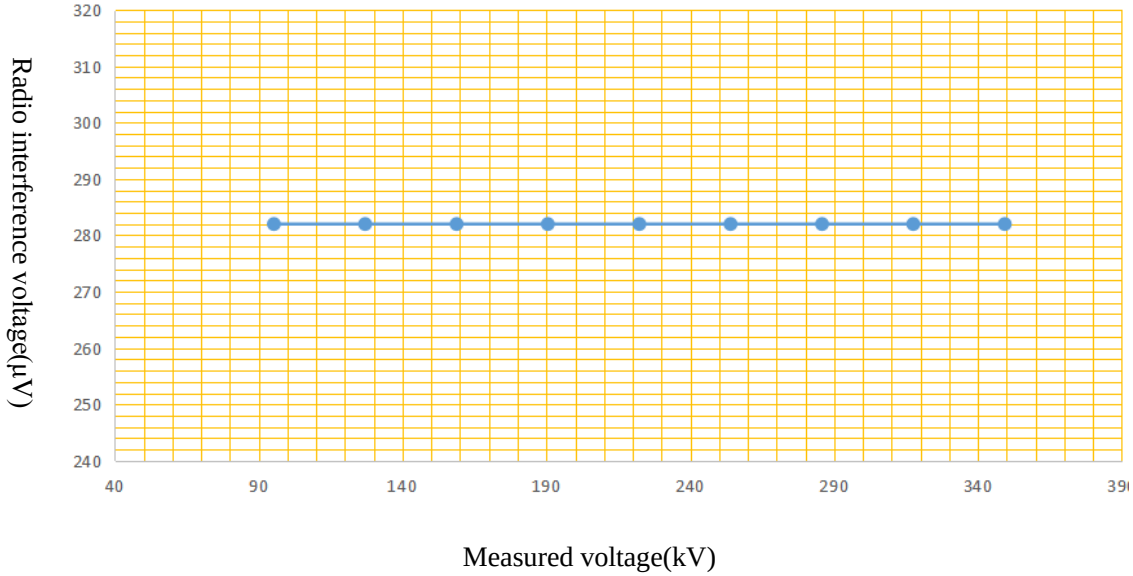
4.8 Radio interference voltage test(Type test) Test date:Jul.19,2023

Humidity:60.0%; Ambient temperature: 29.7℃; Atmospheric pressure: 101.0kPa

Measured frequency (MHz)	Attenuation factor of measurement circuit (dB)	Attenuation factor of resistance network (dB)	Measured voltage (kV)	Measured voltage (kV)	Radio interference reading B_m (dB)	Radio interference level (μV)
1.0	11	22	349.3	5	16	282
			317.5	/	16	282
			285.8		16	282
			254.0		16	282
			222.3		16	282
			190.5		16	282
			158.8		16	282
			127.0		16	282
			95.3		16	282

Result: Passed.

Radio interference curve



Test Report

4.9 Thermal stability test (Type test) Test date:Jul.21,2023

Duration(h)	Applied voltage (kV)	tanδ	Cx (pF)	Oil temperature (℃)	Ambient temperature(℃)
0	440	0.00336	755.5	89.1	30.5
0.5	440	0.00336	755.5	89.4	30.5
1.0	440	0.00336	755.6	90.2	31.5
1.5	440	0.00337	755.6	90.2	31.8
2.0	440	0.00337	755.7	90.4	32.4
2.5	440	0.00337	755.7	90.4	32.8
3.0	440	0.00338	755.7	90.4	33.4
3.5	440	0.00338	755.8	90.5	33.8
4.0	440	0.00339	755.8	90.5	34.0
4.5	440	0.00339	755.8	90.5	34.0
5.0	440	0.00339	755.8	90.5	34.1

Result: Passed.

4.10 Temperature-rise test(Type test) Test date:Jul.21,2023

Specified current was 4000A, injected current was 4000A during test, the test duration was 8h, stability duration was 1h.

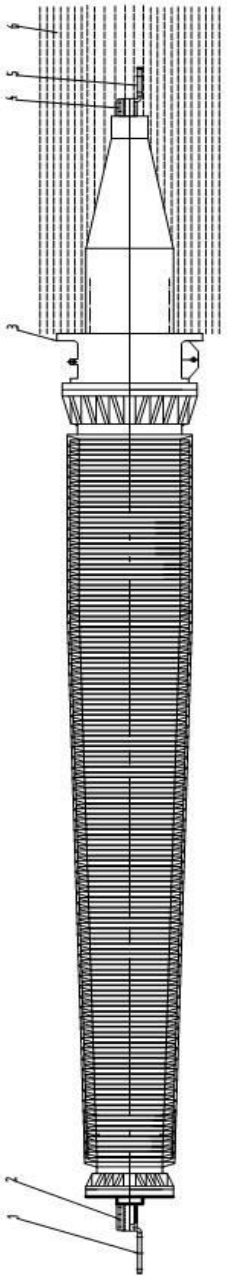
Temperature-rise calculated value

No.	Measurement position	Temperature (℃)	Temperatur-rise(K)	Oil temperature (℃)	Ambient temperature (℃)	Result
1	Terminal in the air	81.2	51.8	29.4	91.2	Passed
2	Firmness of terminal in the air	78.6	49.2			
3	Flange	68.1	38.7			
4	Firmness of terminal in the oil	91.9	62.5			
5	Terminal in the oil	93.9	64.5			

The measurement position drawing is shown in Page 27.

Test Report

Schematic diagram of measured point of temperature rise



1. Terminal in the air 2. Firmness of terminal in the air 3. Conducting rod top part 4. Conducting rod middle part
5. Flange 6. Transformer oil

4.11Verification of thermal short-time current withstand(Verify by the calculation)(Type test)

Test date:Jul.21,2023

The standard value of thermal short-time current of bushing I_{th}=100kA, duration t_{th}=2s. According to calculation final temperature of the conductor θ_f =118.4℃. If $\theta_f \leqslant$180℃, it was considered that the bushing could withstand the standard value I_{th} of thermal short-time current.

Sample parameters

Conductor material of sample	Aluminium
Conductor resistivityρ(μΩ·cm)	2.83
Total cross section area S_t(cm^2)	78.50
Measured temperature rise of the bushing (K)	64.5
Rated current I_r(A)	4000
Standard value of rated thermal short-time current I_{th}(kA)	100
Rated duration t_{th}(s)	2
θ_0(℃)	104.5
Current penetration depth d(cm)	1.198
Diameter of the conductor D(cm)	10.0
α[(K/s)/(kA/cm^2)^2]	1.8
Equivalent cross section area considering the skin effect S_e(cm^2)	33.11

Verify by the calculation:

$$\theta_f = \theta_0 + \alpha \frac{I_{th}^2}{S_t \times S_e} \times t_{th} = 118.4℃$$

Result: Passed.

4.12 Cantilever load withstand test(Type test)

Test date:Jul.22,2023

Load direction	Applied position	Standard value		Applied value		Result
		Load (N)	Duration(s)	Load (N)	Duration(s)	
Vertical	Terminal	5000	60	5046	60	No damage, distortion,passed

4.13 Visual inspection and dimensions check (Type test)

Test date:Jul.18,2023

It has smooth surface, no cracks. Dimensional check is accordance with the drawing requirement.

Drawing values (mm):7680±30 1800±20 4700±20 Ø800

Measured values (mm):7672 1795 4696 Ø800

Arcing distance (mm):4750

Creepage(mm): 20680

Result: Passed.

4.14 Measurement of partial discharge quantity(After type test)

Test date:Jul.22,2023

Humidity: 72.0%; Ambient temperature: 27.7℃; Atmospheric pressure: 100.5kPa

Prestress voltage (kV)	Duration(s)	Measured voltage(kV)	Partial discharge level(pC)	Result
750	60	550	＜4	Passed
		476.3	＜4	
		333.4	＜4	

Note: Background level is <4pC before and after test.

4.15 Measurement of dielectric dissipation factor(tanδ) and capacitances at ambient temperature(After type test)

Test date:Jul.22,2023

Humidity: 72.0%; Ambient temperature: 27.7℃

Applied voltage (kV)	Dielectric dissipation factor (tanδ)	Capacitance(pF)	Result
10	0.00334	754.6	Passed
333.4	0.00335	755.2	
550	0.00335	755.2	

Note: tanδ(550kV)- tanδ(333.4kV)= 0.00003＜0.001 (Standard value), passed.

4.16 Tests of tap insulation(Routine test) Test date:Jul.22,2023

Power-frequency voltage withstand test on the tap

Humidity: 72.0%; Ambient temperature: 27.7℃; Atmospheric pressure: 100.5kPa

Applied position	Applied voltage(kV)	Frequency(Hz)	Duration(s)	Result
Tap－earth	2	50	60	Passed

Measurement of dielectric dissipation factor (tanδ) and capacitances at ambient temperature on the tap

Humidity: 72.0%; Ambient temperature: 27.7℃

Applied voltage(kV)	Dielectric dissipation factor(tanδ)	Capacitance(pF)	Result
2	0.00618	1198	Passed

4.17 Dry lightning impulse voltage withstand test(Routine test) Test date:Jul.22,2023

Test atmospheric conditions

Humidity: 72.0%; Ambient temperature: 27.7℃; Atmospheric pressure: 100.5kPa

Full wave rated withstand voltage: negative polarity:1758.8kV; 3 negative polarity

Chopped wave rated withstand voltage: negative polarity:1926.3kV; 2 negative polarity

Test sequence

One negative reference full wave impulse;

One negative rated full wave impulses;

Two negative rated chopped wave impulses;

Two negative rated full wave impulses.

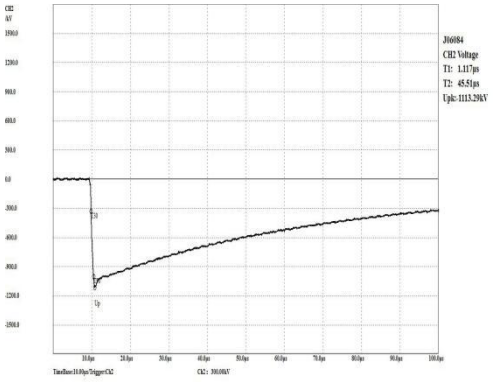
Test records:

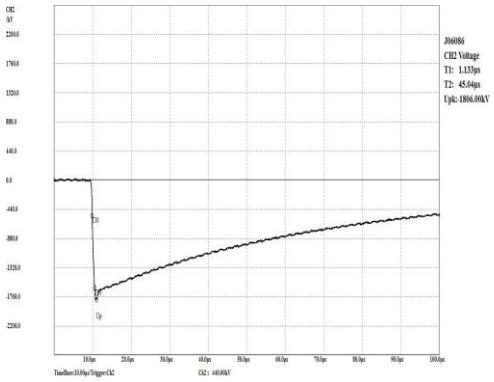
T1: Front time; T2: Time to half value; Upk: Peak voltage;

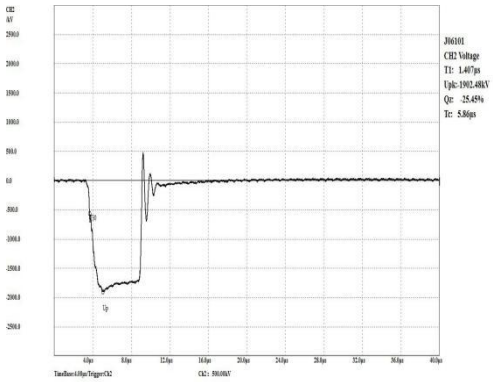
Tc: Time to chopping; Qz: Factor of over crossing.

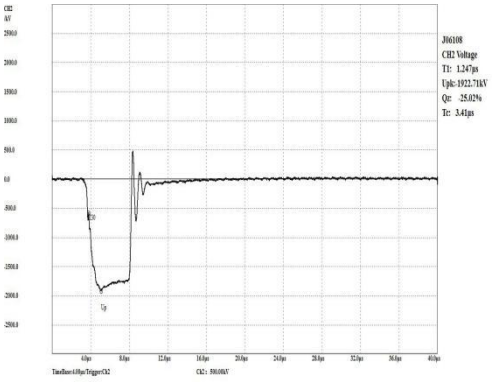
Result: Passed.

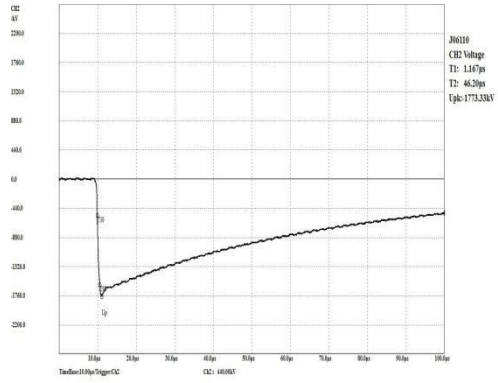
Tested terminal: To earth Test polarity: Negative CH1: Voltage wave

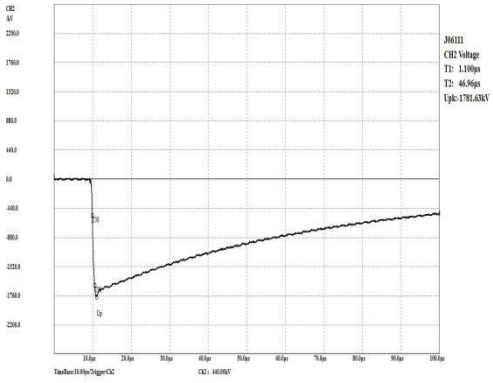












4.18 Dry power-frequency voltage withstand test (Routine test)

Test date:Jul.22,2023

Humidity: 72.0%; Ambient temperature: 27.7℃; Atmospheric pressure: 100.5kPa

Position	Applied voltage(kV)			Frequency (Hz)	Duration (s)	Result
	Standard value	Atmospheric corrected	Applied value			
Terminal－earth	750	/	750	50	60	Passed

4.19 Measurement of partial discharge quantity(Routine test) Test date:Jul.22,2023

Humidity: 72.0%; Ambient temperature: 27.7℃; Atmospheric pressure: 100.5kPa

Prestress voltage (kV)	Duration(s)	Measured voltage(kV)	Partial discharge level(pC)	Result
750	60	550	＜4	Passed
		476.3	＜4	
		333.4	＜4	

Note: Background level is <4pC before and after test.

4.20 Measurement of dielectric dissipation factor(tanδ) and capacitances at ambient temperature(Routine test)

Test date:Jul.22,2023

Humidity: 72.0%; Ambient temperature: 27.7℃; Atmospheric pressure: 100.5kPa

Applied voltage (kV)	Dielectric dissipation factor (tanδ)	Capacitance(pF)	Result
10	0.00335	754.8	Passed
333.4	0.00336	755.4	
550	0.00336	755.5	

Note: Background level is <4pC before and after test.

4.21 Tightness test at the flange (Routine test) Test date:Jul.22,2023

Applied medium	Applied pressure(MPa)	Duration(h)	Residual pressure(MPa)	Result
SF6	0.4	15	0.4	No leakage or damage, passed

4.22 Visual inspection and dimensions check (Routine test) Test date:Jul.22,2023

It has smooth surface, no cracks. Dimensional check is accordance with the drawing requirement. Dimensional inspection see 4.2.

Result: Passed.

Annex 1

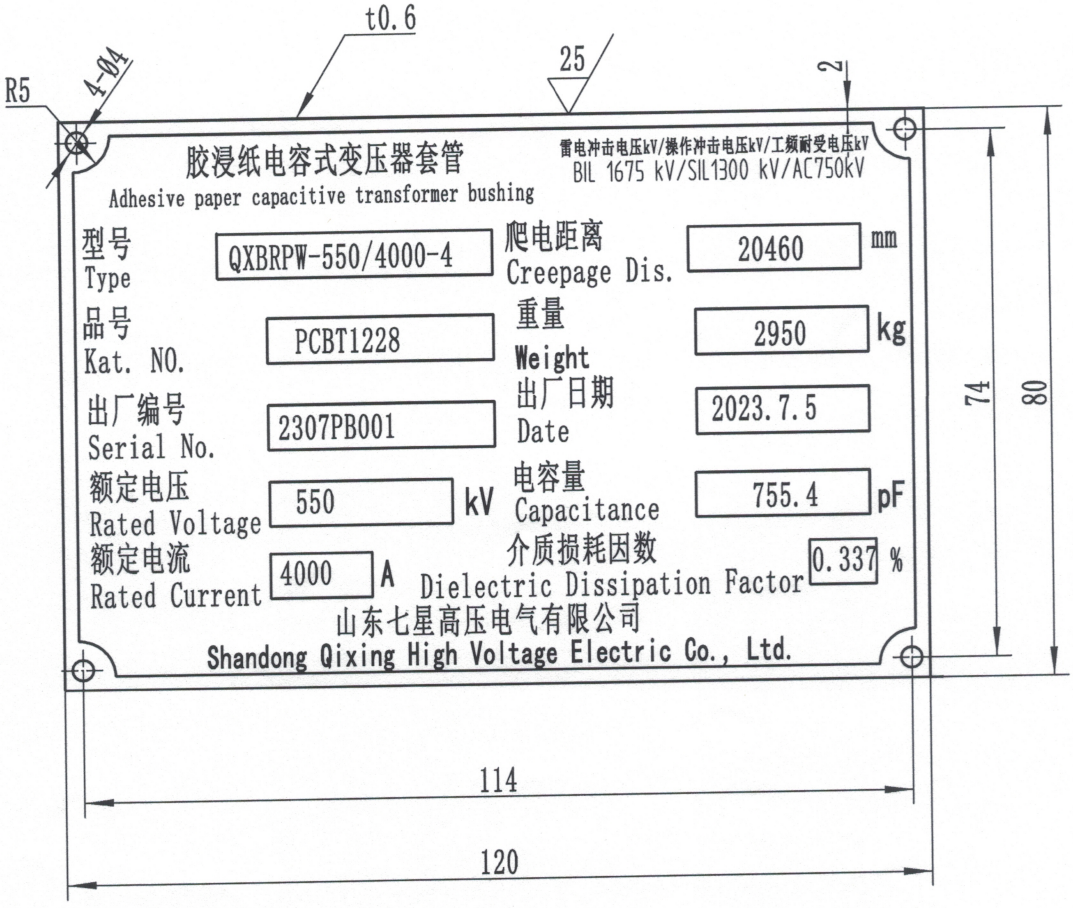
RATING PLATE AND OUTLINE PHOTOS

Rating plate:

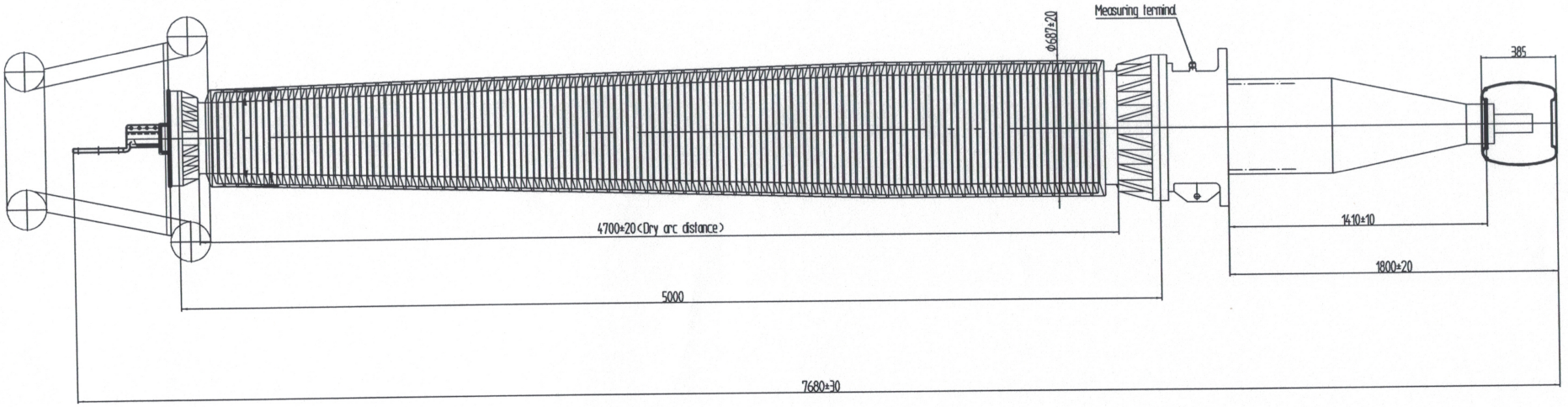
Outline:

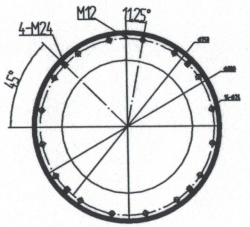
Annex 2

BUSHING DRAWINGS



借（通）用件登记											
旧底图总号								产品型号		装配图代号	序号
底图总号								铭牌nameplate		8QX.860.009G	
签字										图样标记 / 重量 / 比例	0.030 / 1:1
日期	标记	处数	分区	更改文件号	签字	日期		316L		共 张 / 第 张	
档案员 日期	设计	张学明	2023.7.5	标准化						Shandong Qixing High Voltage Electric Co. LTD山东七星高压电气有限公司	
	校核	石孝刚	2023.7.5	审定							
	会签			批准	曹明波	2023.7.5					





Lightning strikes at 1675kV

Power frequency withstand voltage 750kV/1min

Partial discharge Umk V<10pC

Dielectric loss factor <0.4%

Pollution Grade Ⅳ /31mm/kV(creepage distance ≥20460mm)

Altitude: ≤1000m

Bending load: ≥5kN

Other requirements comply with the latest GB/T4109 and IEC60137

标记	处数	分区	更改文件号	签名	年、月、日
设计	Zhang Mingmin	2023.5.10	标准化		
审核	Shi Xiaogang	2023.5.10			
工艺			批准	Cao Mingbo	2023.5.10

QXBRPW-550/4000-4		
阶段标记	重量	比例
		1:10
共 张	第 张	

Shandong Qixing High Voltage Electric Co. LTD

Adhesive paper capacitive transformer bushing

PPicture No. : PCBT55-1228

Product number: PCBT1228

会签 Confirm

0KA.605.103

CHPTL

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