



Power Industry Quality Inspection and Testing Center for
Electric Equipment and Instruments

EETC2017HG009J



Test Report

Address: NO. 143, Luoyu Road, Hongshan District, Wuhan,
Hubei Province.

Postcode: 430074

Tel: 400-656-5689

Fax: 86-27-5937-8488

Website: <http://www.epri.sgcc.com.cn>

NOTICE

- 1 This test report will enter into effect with exclusive test seals, a steel seal and anti-fake labels of EETC.
- 2 This report is legally made available accompany with tested, checked, verified and approved signatures.
- 3 Any objections in the report should be posed within 30 days once the report is received.
- 4 This report only takes responsibility to the test sample.
- 5 Report's authenticity can be confirmed via website or tel on the cover.

Power Industry Quality Inspection and Testing Center for Electric
Equipment and Instruments
Test Report

EETC2017HG009J

1 Client

Guangdong Sihui Instrument Transformer Works Co., Ltd.

2 Sample Description

Name: Current transformer

Type : LVQB-220

Manufacturer: Guangdong Sihui Instrument Transformer Works Co., Ltd.

Manufacture Date: Nov,2016

Sample No./Details: C1610220001

3 Standards/Specifications

GB20840.1-2010 Instrument transformers-Part1: General requirements

GB20840.2-2014 Instrument transformers-Part2: Additional requirements for current transformers

IEC61869-1:2007 Instrument transformers-Part1: General requirements

IEC61869-2:2012 Instrument transformers-Part2: Additional requirements for current transformers

4 Test Category

Routine Test /Type Test / Special Test

5 Test Date

03 Jan. 2017 to 03 Mar. 2017

6 Conclusion

The current transformer with the type of LVQB-220 offered by Guangdong Sihui Instrument Transformer Works Co., Ltd. meets the requirements of the corresponding items of the standards GB20840.1-2010, GB20840.2-2014, IEC61869-1:2007, IEC61869-2:2012.

Note 1: In the event of any difference in meanings of the text, the Chinese report shall take priority over the English version.

Note 2: (Period of validity: 5 years.)

Tested by: 黄永志 万德峰

Checked by: 刘翔

Verified by: 李华

Approved by: 王明华

Date of issue: 2017-03-15

7 Inspection Items and Results

No.	Item	Requirements	Results	Evaluation
1	Verification of markings	The nameplate, sign, earthing terminal, terminal marking shall meet the requirements. The valve and the bursting plate shall be in good condition.	Meet the requirements	Pass
2	Power-frequency voltage withstand tests on secondary terminals	Applied voltage on winding-to-winding and winding-to-earth shall be 3kV/50Hz/60s.	Test voltage: 3kV/50Hz/60s No flashover and breakdown occurred.	Pass
3	Power-frequency withstand test between sections	Applied voltage between sections of the primary winding shall be 3kV/50Hz/60s.	Test voltage: 3kV/50Hz/60s No flashover and breakdown occurred.	Pass
4	Power-frequency voltage withstand test on primary terminals	Applied voltage between primary winding and earth shall be 460kV/50Hz/60s.	Test voltage: 460kV/50Hz/60s No flashover and breakdown occurred.	Pass
5	Partial discharge measurement	Test frequency : 50 Hz Pre-stress voltage: 460 kV Test voltage: 252 kV Maximum permissible PD level : 10 pC Test voltage: 175 kV Maximum permissible PD level : 5 pC	Test frequency : 50 Hz Pre-stress voltage: 460 kV Test voltage: 252 kV PD level: 6 pC Test voltage: 175 kV PD level: 3 pC	Pass
6	Inter-turn overvoltage test	With the secondary windings open-circuited, the rated primary current (or rated primary current (or rated) shall be applied for 60s to the primary winding at rated frequency. The peak voltage of the open-circuited secondary windings shall not exceed 4.5kV.	Primary winding in series Test current: 720A 1S ₁ S ₂ : 858V 60s 2S ₁ S ₂ : 850V 60s 3S ₁ S ₂ : 862V 60s 4S ₁ S ₂ : 809V 60s 5S ₁ S ₂ : 355V 60s 6S ₁ S ₂ : 308V 60s	Pass
7	Tests for accuracy	Basic error tests The errors of the secondary windings shall meet the requirements of accuracy classes 0.2S/0.5S/SP/5P/5P/SP.	Meet the requirements	Pass
	Test for composite errors	1S ₁ 50VA 5P20 primary current ≥ 12kA 1S ₂ 50VA 5P20 primary current ≤ 5 % 2S ₁ 50VA 5P20 primary current ≥ 12kA 2S ₂ 50VA 5P20 primary current ≤ 5 %	1S ₁ 50VA 5P20 primary current 12.05 kA composite error 2.0 % 2S ₁ 50VA 5P20 primary current 12.05 kA composite error 3.0 %	Pass

No.	Item	Requirements	Results	Evaluation																								
7	Tests for accuracy	<table border="1"> <tr> <td>Test for composite errors</td> <td>50VA SP20 3S₁ primary current ≥ 12KA composite error ≤ 5%</td> <td>50VA SP20 3S₂ primary current ≥ 12KA composite error ≤ 5%</td> <td>50VA SP20 3S₁ primary current 12.02 KA composite error 3.2 %</td> <td>Pass</td> </tr> <tr> <td>Determination of the instrument security factor(FS)</td> <td>50VA SP20 4S₁ primary current ≥ 12KA composite error ≤ 5%</td> <td>50VA SP20 4S₂ primary current ≥ 12KA composite error ≤ 5%</td> <td>50VA SP20 4S₁ primary current 12.02 KA composite error 3.0 %</td> <td>Pass</td> </tr> <tr> <td rowspan="4">30VA FSS</td> <td>30VA FSS 5S₁ primary current ≤ 3 KA composite error ≥ 10%</td> <td>30VA FSS 5S₂ primary current ≤ 3 KA composite error ≥ 10%</td> <td>30VA FSS 5S₁ primary current 1.42 KA composite error 22 %</td> <td rowspan="4">Pass</td> </tr> <tr> <td>30VA FSS 6S₁ primary current ≤ 3KA composite error ≥ 10%</td> <td>30VA FSS 6S₂ primary current ≤ 3KA composite error ≥ 10%</td> <td>30VA FSS 6S₃ primary current 1.43 KA composite error 24 %</td> </tr> <tr> <td>15VA FSS 5S₁ primary current ≤ 1.5 KA composite error ≥ 10%</td> <td>15VA FSS 5S₂ primary current ≤ 1.5 KA composite error ≥ 10%</td> <td>15VA FSS 5S₁ primary current 0.82 KA composite error 28 %</td> </tr> <tr> <td>15VA FSS 6S₁ primary current ≤ 1.5 KA composite error ≥ 10%</td> <td>15VA FSS 6S₂ primary current ≤ 1.5 KA composite error ≥ 10%</td> <td>15VA FSS 6S₁ primary current 0.82 KA composite error 29 %</td> </tr> </table>	Test for composite errors	50VA SP20 3S ₁ primary current ≥ 12KA composite error ≤ 5%	50VA SP20 3S ₂ primary current ≥ 12KA composite error ≤ 5%	50VA SP20 3S ₁ primary current 12.02 KA composite error 3.2 %	Pass	Determination of the instrument security factor(FS)	50VA SP20 4S ₁ primary current ≥ 12KA composite error ≤ 5%	50VA SP20 4S ₂ primary current ≥ 12KA composite error ≤ 5%	50VA SP20 4S ₁ primary current 12.02 KA composite error 3.0 %	Pass	30VA FSS	30VA FSS 5S ₁ primary current ≤ 3 KA composite error ≥ 10%	30VA FSS 5S ₂ primary current ≤ 3 KA composite error ≥ 10%	30VA FSS 5S ₁ primary current 1.42 KA composite error 22 %	Pass	30VA FSS 6S ₁ primary current ≤ 3KA composite error ≥ 10%	30VA FSS 6S ₂ primary current ≤ 3KA composite error ≥ 10%	30VA FSS 6S ₃ primary current 1.43 KA composite error 24 %	15VA FSS 5S ₁ primary current ≤ 1.5 KA composite error ≥ 10%	15VA FSS 5S ₂ primary current ≤ 1.5 KA composite error ≥ 10%	15VA FSS 5S ₁ primary current 0.82 KA composite error 28 %	15VA FSS 6S ₁ primary current ≤ 1.5 KA composite error ≥ 10%	15VA FSS 6S ₂ primary current ≤ 1.5 KA composite error ≥ 10%	15VA FSS 6S ₁ primary current 0.82 KA composite error 29 %		
Test for composite errors	50VA SP20 3S ₁ primary current ≥ 12KA composite error ≤ 5%	50VA SP20 3S ₂ primary current ≥ 12KA composite error ≤ 5%	50VA SP20 3S ₁ primary current 12.02 KA composite error 3.2 %	Pass																								
Determination of the instrument security factor(FS)	50VA SP20 4S ₁ primary current ≥ 12KA composite error ≤ 5%	50VA SP20 4S ₂ primary current ≥ 12KA composite error ≤ 5%	50VA SP20 4S ₁ primary current 12.02 KA composite error 3.0 %	Pass																								
30VA FSS	30VA FSS 5S ₁ primary current ≤ 3 KA composite error ≥ 10%	30VA FSS 5S ₂ primary current ≤ 3 KA composite error ≥ 10%	30VA FSS 5S ₁ primary current 1.42 KA composite error 22 %	Pass																								
	30VA FSS 6S ₁ primary current ≤ 3KA composite error ≥ 10%	30VA FSS 6S ₂ primary current ≤ 3KA composite error ≥ 10%	30VA FSS 6S ₃ primary current 1.43 KA composite error 24 %																									
	15VA FSS 5S ₁ primary current ≤ 1.5 KA composite error ≥ 10%	15VA FSS 5S ₂ primary current ≤ 1.5 KA composite error ≥ 10%	15VA FSS 5S ₁ primary current 0.82 KA composite error 28 %																									
	15VA FSS 6S ₁ primary current ≤ 1.5 KA composite error ≥ 10%	15VA FSS 6S ₂ primary current ≤ 1.5 KA composite error ≥ 10%	15VA FSS 6S ₁ primary current 0.82 KA composite error 29 %																									
8	Temperature rise test	<p>The rated continuous thermal current is applied on the primary winding. The limited value of temperature rise are shown as follows:</p> <p>Secondary windings ≤ 75 K Connection, bolted or the equivalent ≤ 50K</p>	<p>Primary winding in parallel Test current: 1.44 KA</p> <p>1S₁S₂: 12 K 2S₁S₂: 12 K 3S₁S₂: 12 K 4S₁S₂: 12 K 5S₁S₂: 15 K 6S₁S₂: 15 K</p> <p>Connection of primary terminal: 27K</p>	Pass																								
9	Impulse voltage test on primary terminals (Lightning and chopped impulse voltage test on primary terminals)	<p>Standard LI: 1050KV/±15 Waveform: 1.2/50µs Standard LI-chopped: 1208KV/-2 Waveform: (2~5)µs</p>	<p>1041KV~1056KV ±15 1200KV, 1201KV -2 No flashover and breakdown occurred.</p>	Pass																								
10	Wet test for outdoor type transformers (Switching impulse voltage test)	<p>The test shall be performed in wet condition. Applied voltage between primary winding and earth shall be 460KV/50HZ/60s.</p>	<p>Test voltage: 460KV/50HZ/60s No flashover and breakdown occurred.</p> <p>Atmosphere correction factor: K=1.006 Water conductivity: 102 µS/cm Vertical precipitation: 1.5 mm/min Horizontal precipitation: 1.2 mm/min</p>	Pass																								

No.	Item	Requirements	Results	Evaluation
11	Short-time current tests	Rated dynamic current: $125^{+10\%}$ kA Rated short-time thermal current: 50kA, 3s Stable heat quantity: $7500^{+20\%} \times 10^6 A^2s$ Note: The primary winding is of aluminum, and the calculated current density is $9.2 A/mm^2$	Primary winding in series with secondary windings short-circuited Dynamic current (peak value): 127.0kA Short-time thermal current(r.m.s.): 50.39kA, 3.02s Stable heat quantity: $7664 \times 10^6 A^2s$ Note: The primary winding is of aluminum, and the calculated current density is $9.2 A/mm^2$	Pass
12	Power-frequency voltage withstand tests on secondary terminals (retail)	Applied voltage on winding-to-winding and winding-to-earth shall be 2.7kV/50Hz/60s.	Test voltage: 2.7kV/50Hz/60s No flashover and breakdown occurred.	Pass
13	Power-frequency voltage withstand tests between sections of the primary winding shall be (retail)	Applied voltage between sections of the primary winding shall be 2.7kV/50Hz/60s.	Test voltage: 2.7kV/50Hz/60s No flashover and breakdown occurred.	Pass
14	Power-frequency voltage withstand tests on primary terminals (retail)	Applied voltage between primary winding and earth shall be 41kV/50Hz/60s.	Test voltage: 41kV/50Hz/60s No flashover and breakdown occurred.	Pass
15	Partial discharge measurement (retail)	Pre-stress voltage: 414 kV Test voltage: 252 kV Maximum permissible PD level: 10 pC Test voltage: 175 kV Maximum permissible PD level: 5 pC	Pre-stress voltage: 415 kV Test voltage: 252 kV PD level: 5 pC Test voltage: 175 kV PD level: 3 pC	Pass
16	Inter-turn overvoltage test (retail)	With the secondary windings open-circuited, the rated primary current (or rated extended primary current) shall be applied for 60s to the primary winding at rated frequency. The peak voltage of the open-circuited secondary windings shall not exceed 4.5kV.	Primary winding in series Test current: 720A 1S1S ₂ : 960V 60s 2S2S ₂ : 950V 60s 3S3S ₂ : 960V 60s 4S4S ₂ : 960V 60s 5S5S ₂ : 450V 60s 6S6S ₂ : 431V 60s	Pass
17	Tests for accuracy (retail)	The errors of the secondary windings shall meet the requirement of accuracy classes 0.2S/0.5S/5P/5P/5P.	Meet the requirements	Pass
18	Electromagnetic Compatibility (EMC) tests (RIV test)	The radio interference voltage shall not exceed 2500 μ V at 160kV.	Test voltage: 160kV/50Hz Radio interference voltage (0.5MHz): <860 μ V	Pass

No.	Item	Requirements	Results	Evaluation
19	Transmitted overvoltage test	A low-voltage impulse (UI) (T1=0.5μs±20%, T2≥50μs) shall be applied between one of the primary terminals and earth. The transmitted overvoltage shall not exceed 1.6kV.	Transmitted overvoltage: 393V~521V	Pass
20	Mechanical tests	The test load shall be applied on primary terminal for at least 60s. There shall be no evidence of damage (deformation, rupture or leakage).	Horizontal load: 2.5kN 60s Vertical load: 2.5 kN 60s No evidence of damage (deformation, rupture or leakage).	Pass
21	Enclosure tightness test	The relative leakage rate (F _{rel}) shall not exceed 0.5% per year at ambient temperature.	F _{rel} : 0.1%	Pass
22	Gas dew point test	The dew-point is not higher than -38.6℃ for a measurement at 20℃. The water content of gas shall be less than 150μL/L.	The dew-point: -46.7℃ The water content of gas: 58μL/L	Pass
23	Verification of the degree of protection auxiliary enclosures for outdoor instrument transformers is IP54.	The degree of protection of low-voltage control and/or auxiliary enclosures for outdoor instrument transformers is IP54. The level of protection against effects of mechanical impacts is impact level IK07.	Meet the requirements Note: The test was performed on another secondary terminal box of the same type offered by the client.	Pass
24	Pressure test for the enclosure	Welded aluminum enclosure shall be withstand (2.5/√σ _d) × σ _d "the design pressure" for 1 min. no broken or permanent deformation. Insulator shall be withstand 1.25 × MSP for 5min. No visible damage.	Welded aluminum enclosure: Test Pressure: 2.15MPa Duration: 1min No broken or no permanent deformation. Porcelain insulator: Test Pressure: 2.98MPa Duration: 5min No visible damage. Note: The design pressure/the maximum service pressure (MSP) is 0.7MPa. The test was performed on another welded aluminum enclosure and porcelain insulator of the same type offered by the client.	Pass

Note: 1. The tests of 1~10, 12~19 items were performed in the minimum functional pressure of 0.35MPa. The tests of 11, 20~22 items were performed in the rated filling pressure of 0.40MPa.

2. According to the client's request, The test voltage of 190 kV (50Hz) was applied between primary winding and the earth for 5min in the pressure of 0 MPa. No flashover and breakdown occurred.

1 Identification of the tested object

1.1 Parameters

Name: Current transformer

Type: LVQB-220

Sample No: C1610220001

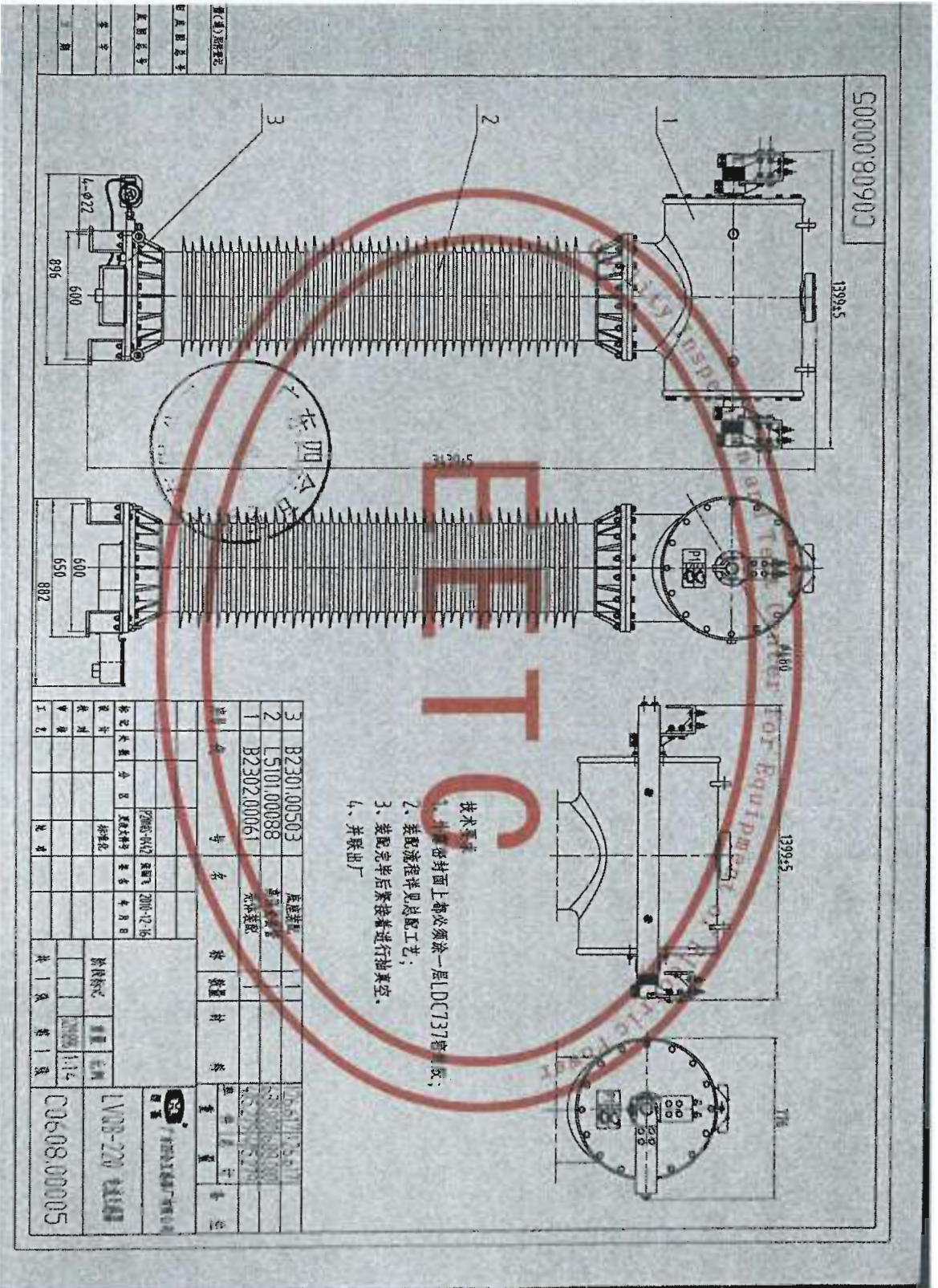
Manufacturer: Guangdong Sihui Instrument Transformer Works Co., Ltd.

Date of Manufacture: Nov, 2016

Sampling way: Offer by client

Main parameters provided by the manufacturer:

Highest voltage for equipment (U _n)	252kV	Rated primary current (I _{pr})	2×600 A
Equipment category	Outdoor	Rated frequency	50Hz
Minimum functional pressure	0.35MPa	Rated filling pressure	0.40MPa
Temperature categories	-25℃/+40℃	Altitude	≤1000m
Rated current ratio	2×500/5 A, 2×300/5 A(tapping)		
Rated insulation level	252/460/1050 kV		
Rated continuous thermal current	120%I _{pr}		
Rated dynamic current (peak value)	125kA		
Rated short-time thermal current(I _{th})	50kA, 3s		
Secondary winding/Accuracy class	1S,1S ₂ /5P	2S,2S ₂ /5P	3S,3S ₂ /5P
Rated burden (VA) /Power factor	50/0.8	50/0.8	50/0.8
Safety factor/Accuracy limit factor	20	20	20
Secondary winding/Accuracy class	6S,6S ₂ /0.5S	5S,5S ₂ /0.2S	6S,6S ₂ /0.5S
Rated burden (VA) /Power factor	30/0.8	15/0.8	15/0.8
Safety factor/Accuracy limit factor			FSS



1.3 Statement

1.3.1 The testing laboratory has checked that the drawings and other data submitted by the manufacturer can adequately represent the essential details and parts of the equipment to be tested, but isn't responsible for the accuracy of the detailed information.

1.3.2 Before all the tests, the test object provided by the client is a new, clean current transformer, including frame and all the other parts as in normal operation.

图样和资料目录真实代表所送试品的声明

本公司向电力工业电气设备质量监督检验中心提交的型号为 LVQB-220 互感器的图样、资料目录与所送试样机一致，能真实代表所送试样机。

序号	目录	名称	图号/代码
1	总装	总装	C0608.00005
2	端子图	瓷套图	L1100.00003
1	二次端子详图	接线板	L1100.00813
	产品铭牌图	铭牌	L6100.01010
	使用说明书	使用说明书	C0608.00005SY
	产品技术条件/企标	技术条件	C0608.00005T
	工厂明示的关键材料/件清单		
	制作工艺文件及设计/件目录		
8.1	一、二次绕组控制包扎工艺文件	高压电流互感器差工序的生产作业指导书目录	C8209.00001ML
8.2	主绝缘制作/树脂浇注工艺文件	高压电压互感器绕组制作工艺指导书	GY-015-2013
8.3	油液体/气体处理工艺文件	绝缘油净化作业指导书	GY-007-2013
8.4	器身干燥工艺文件	互感器器身装配作业指导书	GY-009-2014
8.5	产品密封工艺文件	充油/漏油作业指导书	GY-002-2013
8.6	产品装配工艺文件	互感器装配作业指导书	GY-011-2014

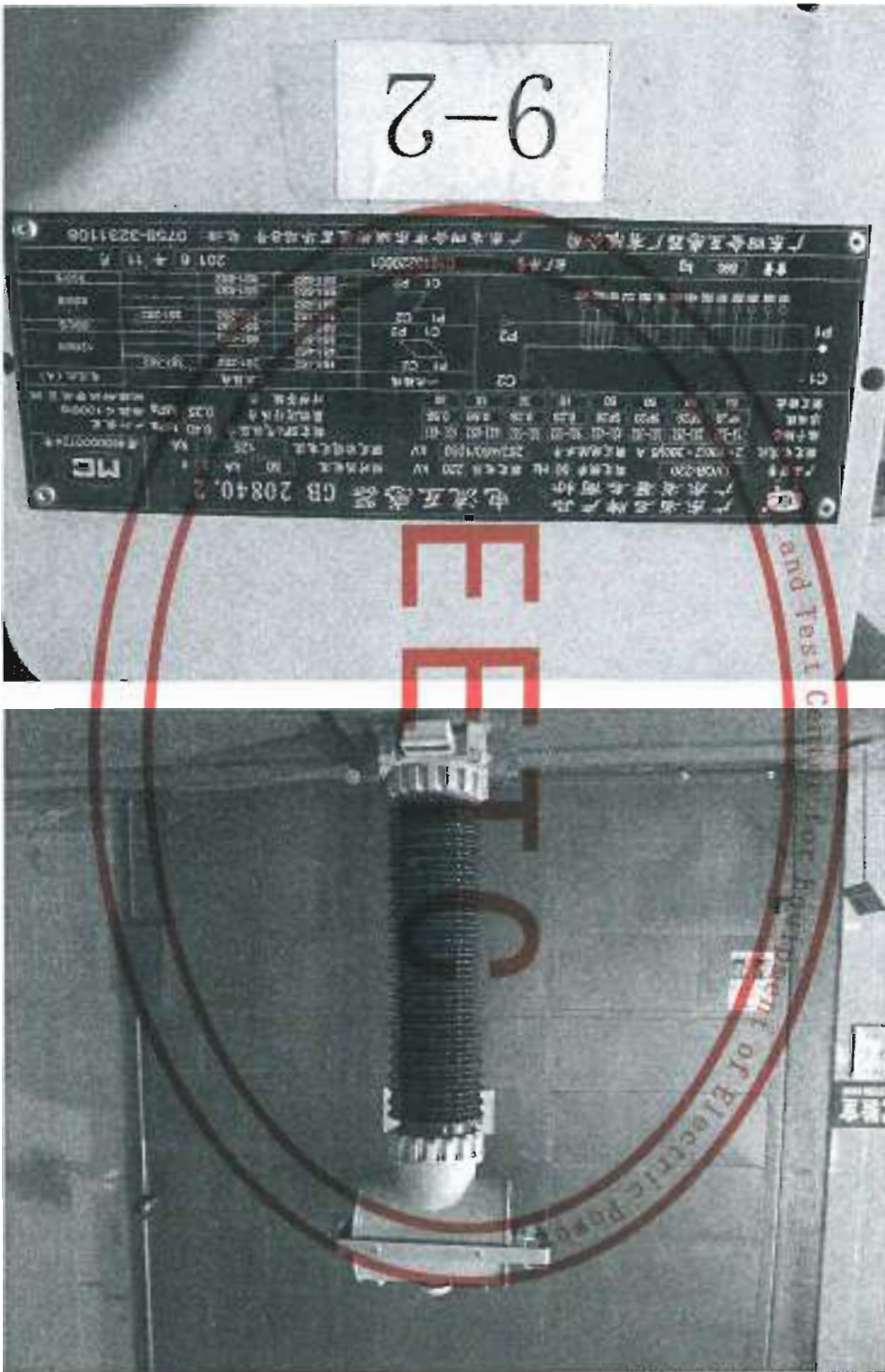
1.3.3 The test object is a current transformer with outer insulation of porcelain insulator. The crepage

distance is 4.73m and the arcing distance is 2.05m.

1.3.4 Confirmed date of test object: 03 Jan. 2017

1.3.5 Client representative: Lu Jianyi

1.4 Photographs of test object



2 Test items and results

2.1 Verification of markings

2.1.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Transformer calibrator	HEF-H	#K1020 (YQ320)	2	2017.11.07

2.1.2 Reference standard requirement

The nameplate and the mark of terminals shall meet the requirements. The nameplate and the mark of terminals shall meet the requirements. The valve and the bursting plate shall be in good condition.

2.1.3 Data

The nameplate, wiring, earthing terminal, terminal marking meet the requirements. The valve and the bursting plate are in good condition.

2.1.4 Test result

The test object passed the tests.

2.2 Power-frequency voltage withstand tests on secondary terminals

2.2.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Equipment for secondary voltage withstand tests	HZSY-S	#6120611 (SB210)	3	2017.10.07

2.2.2 Reference standard requirement

The test voltage of 3kV shall be applied for 60s between the short-circuited terminals of each winding and earth in turn. No flashover and breakdown occur.

2.2.3 Data

The test voltage of 3kV was applied for 60s between the short-circuited terminals of each winding and earth in turn. No flashover and breakdown occurred.

2.2.4 Test result

The test object passed the tests.

2.3 Power-frequency withstand tests between sections

2.3.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Equipment for secondary voltage withstand tests	HZSY-S	#6120611 (SB210)	3	2017.10.07

2.3.2 Reference standard requirement

The test voltage of 3kV shall be applied for 60s between the sections of the primary winding in turn. No flashover and breakdown occur.

2.3.3 Data

The test voltage of 3kV was applied for 60s between the sections of the primary winding in turn. No flashover and breakdown occurred.

2.3.4 Test result

The test object passed the tests.

2.4 Power-frequency voltage withstand tests on primary terminals

2.4.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Series resonance measuring system	TRF1200-	#111030 (YQ220)	3	2017.12.17
2	Series resonance testing device	YDGK- 1200/3×400	#111023 (SB220)		2018.01.25

2.4.2 Reference standard requirement

The test voltage of 460 kV (50Hz) shall be applied between primary winding and the earth for 60s. The short-circuited secondary winding(s) shall be connected to earth. No flashover and breakdown occur.

2.4.3 Data

Ambient temperature: 8 °C Relative humidity: 60%
Ambient air pressure: 102.6 kPa Atmosphere correction factor: $K_t=0.9953$

The test voltage of 460 kV (50Hz) was applied between primary winding and the earth for 60s. No flashover and breakdown occurred.

2.4.4 Test result

The test object passed the tests.

2.5 Partial discharge measurement

2.5.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty/ Accuracy class/ Maximum Permissible Error	Valid date
1	Partial discharge detector	JFD-251	#N1002 (YQ380)	10	2017.11.25
2	Series resonance measuring system	TRF1200-	#111030 (YQ220)	3	2017.12.17
3	Series resonance testing device	YDGR- 1200/3×400	#111033 (SB220)	/	2018.01.25

2.5.2 Reference standard requirement

Test frequency: 50Hz, Pre-stress voltage: 460 kV

Test voltage: 252kV, Maximum permissible PD level: 10 pC

Test voltage: 175kV, Maximum permissible PD level: 5 pC

2.5.3 Data

Ambient temperature: °C		Relative humidity: %	
Test frequency (Hz)	50	Pre-stress voltage (kV)	460
Test voltage (kV)	252	Test voltage (kV)	175
PD level (pC)	6		3

2.5.4 Test result

The test object passed the tests.

2.6 Inter-turn overvoltage test

2.6.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty/ Accuracy class/ Maximum Permissible Error	Valid date
1	Standard current transformer	HL23/8	#4613 (YQ341)	0.02	2017.10.19
2	Current generator	YL30	#910 (SB306)	/	2018.05.05
3	Open-circuited voltage tester	CT106	#102394 (YQ350)	2	2018.02.04

2.6.2 Reference standard requirement

With the secondary windings open-circuited, the rated primary current (or rated extended primary current) shall be applied for 60s to the primary winding at rated frequency. The peak voltage of the open-circuited secondary windings shall not exceed 4.5kV. The applied current shall be limited if the test voltage of 4.5kV (peak) is obtained before reaching the rated current (or extended rated current).

2.6.3 Data

Ambient temperature: 8 °C Relative humidity: 60%

Primary winding in series

Secondary winding	Primary current (A)	Peak voltage (V)	Duration(s)
1S ₁ S ₂	720	858	60
2S ₁ 2S ₂	720	850	60
3S ₁ 3S ₂	720	862	60
4S ₁ 4S ₂	720	809	60
5S ₁ 5S ₂	720	356	60
6S ₁ 6S ₂	720	308	60

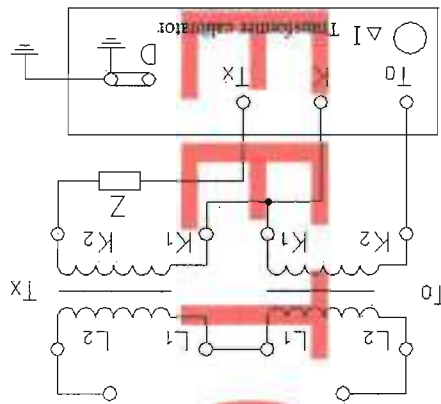
2.6.4 Test result

The test object passed the tests.

2.7 Tests for accuracy

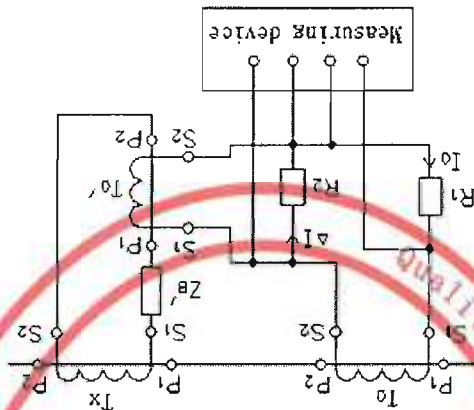
2.7.1 Test circuit diagram

1. Basic error tests



T₀: Standard current transformer
 T_x: Test object
 Z: Burden

2. Determination of composite errors and instrument security factor



T_x: Test object
 T₀, T_{0'}: Standard current transformer
 R₁, R₂: Sampling resistance
 Z_{B'}: Burden

Secondary windings	Ratio	Accuracy class	I_{pr} (%)	Ratio error (%)	Phase displacement (°)	Burden (VA)	Ratio error (%)	Phase displacement (°)	Burden (VA)
5S ₁ 5S ₂	300/5A	0.2S	120	0	+1	15	+0.06	+1	3.75
				100	0		+0.06	+2	
				20	-0.04		+0.06	+3	
				5	-0.04		+0.06	+4	
				1	-0.04		+0.06	+1	
6S ₁ 6S ₂	300/5A	0.5S	120	0	0	15	+0.05	0	3.75
				100	-0.05		+0.05	0	
				20	-0.25		-0.05	+6	
				5	-0.45		-0.05	+12	
				1	-0.55		0	+16	
Secondary windings	Ratio	Accuracy class	I_{pr} (%)	Ratio error (%)	Phase displacement (°)	Burden (VA)	Ratio error (%)	Phase displacement (°)	Burden (VA)
						$\cos\phi=0.8$			$\cos\phi=0.8$

Primary winding in series (tapping):

Secondary windings	Ratio	Accuracy class	I_{pr} (%)	Ratio error (%)	Phase displacement (°)	Burden (VA)	Ratio error (%)	Phase displacement (°)	Burden (VA)
5S ₁ 5S ₂ 5S ₃	600/5A	0.2S	120	0	0	30	+0.02	+1	7.5
				100	0		-0.02	+1	
				20	-0.02		+0.02	+1	
				5	-0.04		+0.02	+2	
				1	-0.04		+0.02	+2	
4S ₁ 4S ₂	600/5A	5P	100	-0.20	+2	50	/	/	/
				-0.20	+2		/	/	
				-0.15	+2		/	/	
				-0.20	+2		/	/	
				-0.15	+2		/	/	
1S ₁ 1S ₂	600/5A	5P	100	-0.15	+2	50	/	/	/
				-0.15	+2		/	/	
				-0.20	+2		/	/	
				-0.15	+2		/	/	
				-0.15	+2		/	/	
Secondary windings	Ratio	Accuracy class	I_{pr} (%)	Ratio error (%)	Phase displacement (°)	Burden (VA)	Ratio error (%)	Phase displacement (°)	Burden (VA)
						$\cos\phi=0.8$			$\cos\phi=0.8$

Primary winding in parallel

Secondary windings	Ratio	Accuracy class	I_{pr} (%)	Ratio error (%)	Phase displacement(°)	Burden (VA)	Ratio error (%)	Phase displacement(°)	Burden (VA)	$\cos\phi=0.8$				
6S ₁	1200/5A	0.5S	1	-0.30	+16	30	0	+6	7.5	0				
			5	-0.25	+8		-0.05	+6						
			20	-0.15	+2		0	+2						
			100	-0.05	0		0	0						
			120	-0.05	0		0	0						
	1200/5A	0.2S	1	0.04	+4	30	+0.02	+2	7.5	+0.02				
			5	-0.04	+4		+0.02	+1						
			20	-0.02	+1		+0.02	+1						
			100	0	+1		+0.02	+1						
			120	0	0		-0.02	+1						
1200/5A	5P	100	-0.20	+2	50	/	/	/	/	/				
											4S ₁	4S ₂	3S ₁	3S ₂
											2S ₁	2S ₂	1S ₁	1S ₂
											1200/5A	1200/5A	1200/5A	1200/5A

Determination of composite errors and instrument security factor

Ambient temperature: 9°C

Relative humidity: 75%

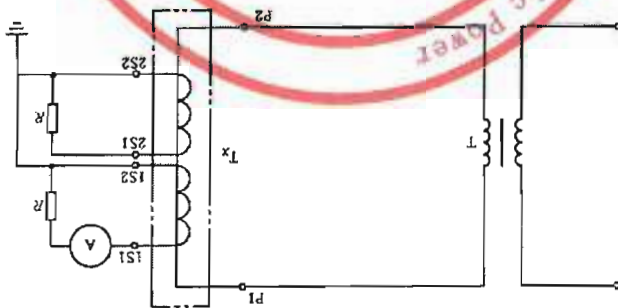
Secondary windings	Burden (VA)	Instrument security factor / Accuracy limit factor	Primary current (KA)	Composite errors
1S ₁ 2 ₂	50	20	12.05	2.0%
2S ₁ 2 ₂	50	20	12.05	3.0%
3S ₁ 3 ₂	50	20	12.02	3.2%
4S ₁ 4 ₂	50	20	12.02	3.0%
5S ₁ 5 ₃	30	FSS	1.42	22%
6S ₁ 6 ₃	30	FSS	1.43	24%
5S ₁ 5 ₂	15	FSS	0.82	28%
6S ₁ 6 ₂	15	FSS	0.82	29%

2.7.5 Test result

The test object passed the tests.

2.8 Temperature-rise test

2.8.1 Test circuit diagram



T: Current generator A: Ammeter R: Burden Tx: Test object
 P1, P2: Primary terminals 1S1, 1S2, 2S1, 2S2: Secondary terminals

2.8.2 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	DC bridge	JY44B #01124972 (YQ210)		0.5	2017.01.19
2	Multi-channel thermometer	TP1048 #TPV91986 (YQ383)		±1℃	2018.01.23
3	Ammeter	D26-A #6504.73 (BJ311)		0.5	2018.01.23

2.8.3 Reference standard requirement

The rated continuous thermal current is applied on the primary winding. The limited values of temperature rise are shown as follows: secondary windings: ≤75 K; Connection, bolted or the equivalent ≤50 K.

2.8.4 Data

Winding	Resistance at ambient temperature	Ambient temperature
1S1S ₁	265.7	10
2S1S ₂	261.7	10
3S1S ₂	261.9	10
4S1S ₃	260.9	10
5S1S ₃	227.8	10
6S1S ₃	172.9	10

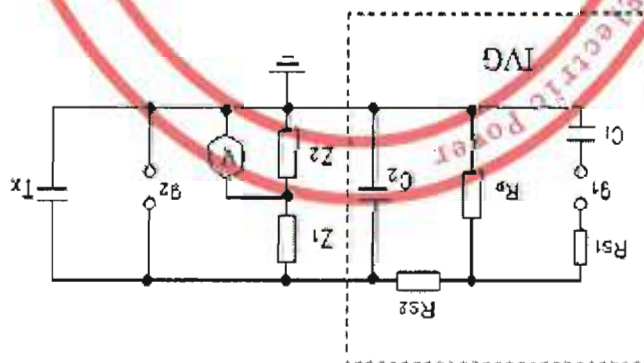
Test of primary current	120%I _{pr} (1440A)
Connection of primary terminal (K)	27
1S1S ₂ (K)	12
2S1S ₂ (K)	12
3S1S ₂ (K)	12
4S1S ₃ (K)	12
5S1S ₃ (K)	15
6S1S ₃ (K)	15
Ambient temperature (℃)	10

2.8.5 Test result

The test object passed the tests.

2.9 Impulse voltage test on primary terminals

2.9.1 Test circuit diagram



IVG: Impulse voltage generator Z₁, Z₂: High voltage divider g₂: Chopped device Tx: Test object

2.9.2 The main test device

No.	Name	Type/ Specification	Serial No.	Accuracy class / Uncertainty / Maximum Permissible Error	Valid date
1	Impulse voltage generator	4000kV, 300kJ	#17020001003 (SB202)	/	2018.05.05
2	Impulse voltage measuring system	3000kV	#550264 (YQ212)	3	2017.08.05

2.9.3 Reference standard requirement

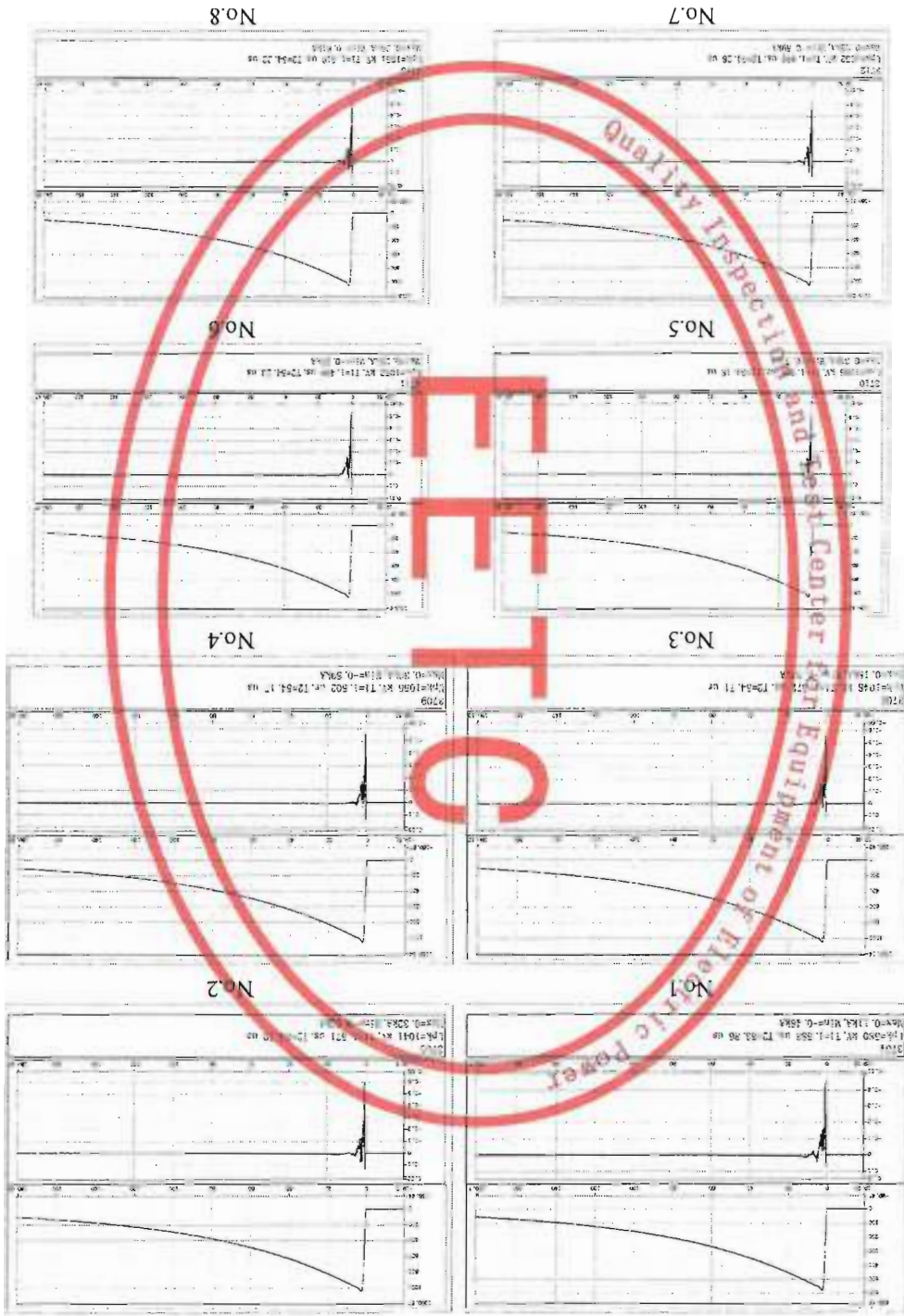
The test object shall be subject to 15 full lightning impulses of positive and negative polarity at 1050kV (peak value), 2 chopped lightning impulses of negative polarity at 1208kV (peak value).
No disruptive discharge on non-self restoring insulation shall occur and the number of disruptive discharge shall not exceed two for each series. No evidence of insulation failure shall be detected.

2.9.4 Date

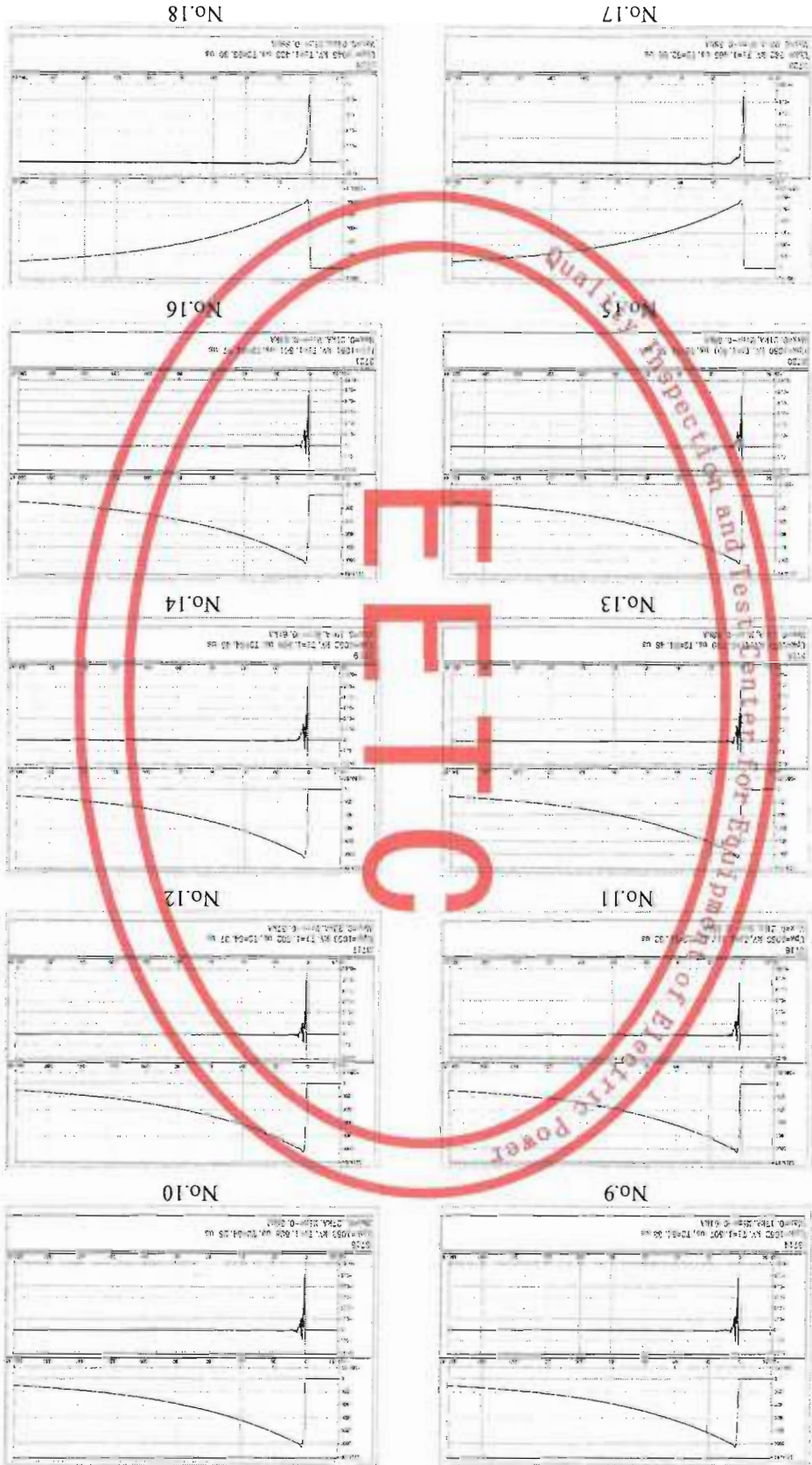
Ambient temperature: 10°C Relative humidity: 59%

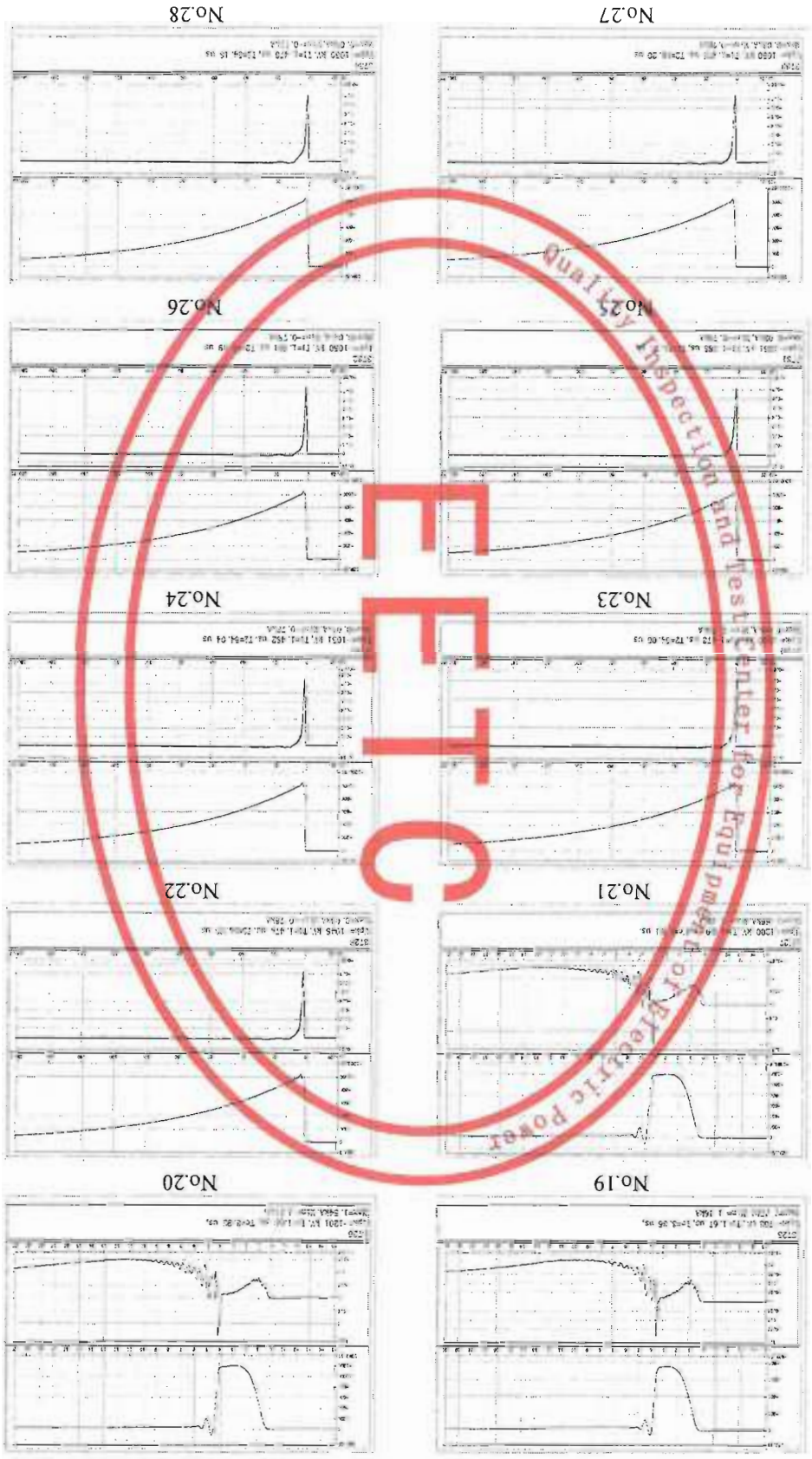
No.	Voltage polarity	Test voltage (peak,kV)	Chopped time (μs)	Waveform No.	Result
1	Pos.LI	580	/	1	Pass
2	Pos.LI	1041	/	2	Pass
3	Pos.LI	1048	/	3	Pass
4	Pos.LI	1056	/	4	Pass
5	Pos.LI	1056	/	5	Pass

No.	Voltage polarity	Test voltage (peak)(kV)	Chopped time (µs)	Waveform No.	Result
6	Pos.LI	1052	/	/	Pass
7	Pos.LI	1052	/	/	Pass
8	Pos.LI	1051	/	/	Pass
9	Pos.LI	1052	/	/	Pass
10	Pos.LI	1053	/	/	Pass
11	Pos.LI	1053	/	/	Pass
12	Pos.LI	1053	/	/	Pass
13	Pos.LI	1053	/	/	Pass
14	Pos.LI	1052	/	/	Pass
15	Pos.LI	1050	/	/	Pass
16	Pos.LI	1051	/	/	Pass
17	Neg.LI	582	/	/	Pass
18	Neg.LI	1045	/	/	Pass
19	Neg.LI-chopped	763	3.4	/	Pass
20	Neg.LI-chopped	1201	3.9	/	Pass
21	Neg.LI-chopped	1200	3.9	/	Pass
22	Neg.LI	1045	/	/	Pass
23	Neg.LI	1050	/	/	Pass
24	Neg.LI	1051	/	/	Pass
25	Neg.LI	1051	/	/	Pass
26	Neg.LI	1050	/	/	Pass
27	Neg.LI	1050	/	/	Pass
28	Neg.LI	1050	/	/	Pass
29	Neg.LI	1051	/	/	Pass
30	Neg.LI	1048	/	/	Pass
31	Neg.LI	1053	/	/	Pass
32	Neg.LI	1053	/	/	Pass
33	Neg.LI	1053	/	/	Pass
34	Neg.LI	1052	/	/	Pass
35	Neg.LI	1054	/	/	Pass



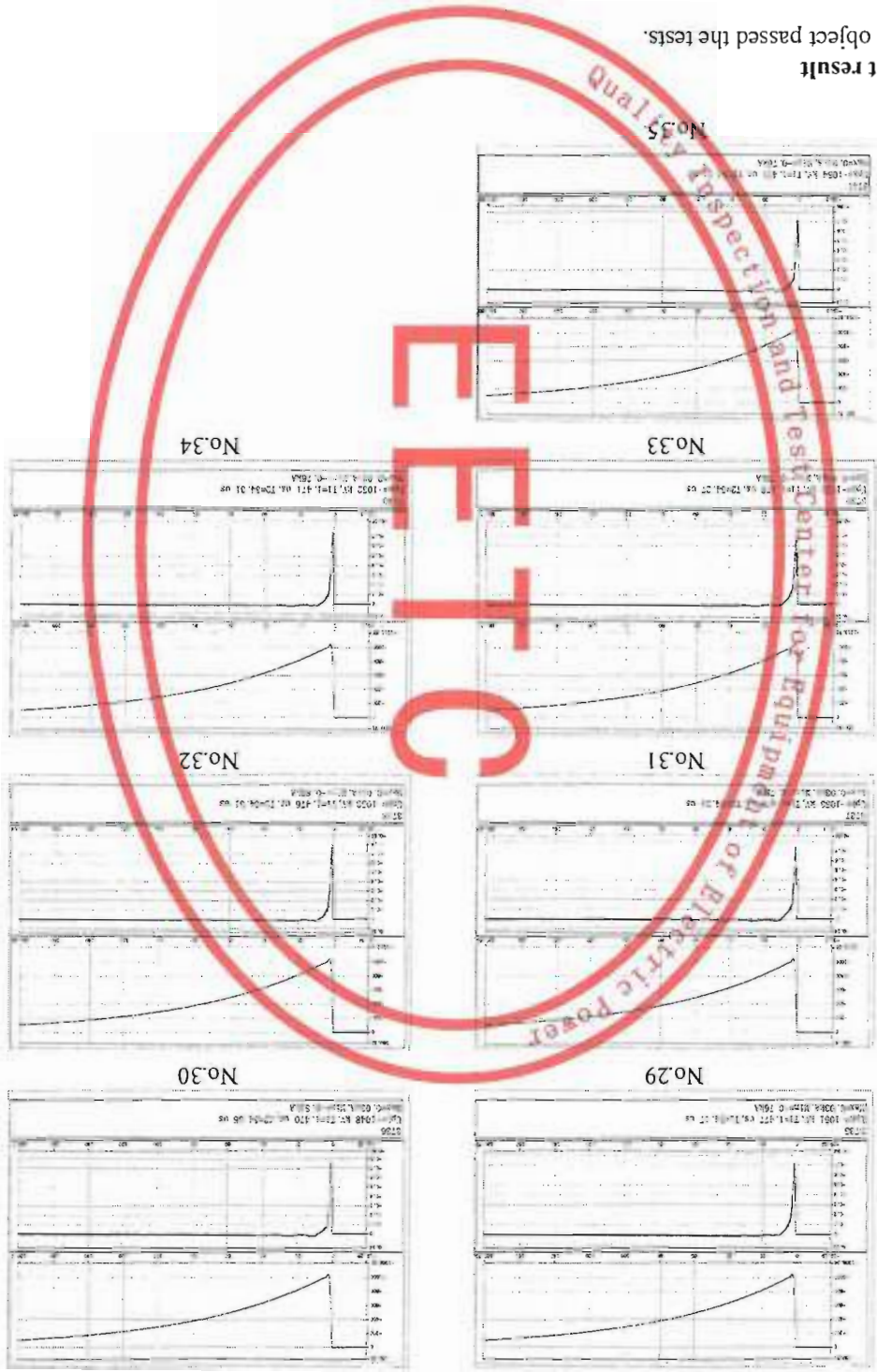
waveform:





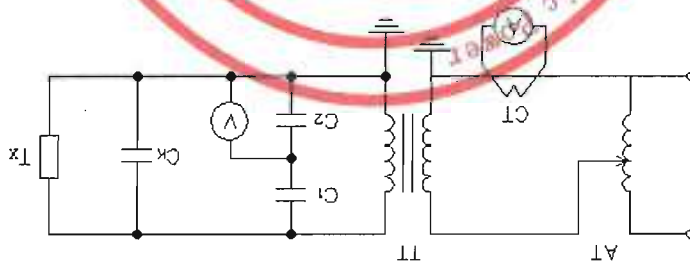
2.9.5 Test result

The test object passed the tests.



2.10 Wet test for outdoor type transformers

2.10.1 Test circuit diagram



TT: Testing transformer C₁, C₂, V: High voltage measurement system Tx: Test object

2.10.2 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Permissible Error	Valid date
1	Power frequency voltage measurement system	TJF1200-1000	#1105415 (YQ209)	3	2018.02.03
2	Testing transformer	TMZ17	#S3-9-36 (SB201)	/	2018.05.05
3	Conductivity Meter	DDS-307	#722014072 713 (YQ307)	1.0	2018.01.23

2.10.3 Reference standard requirement

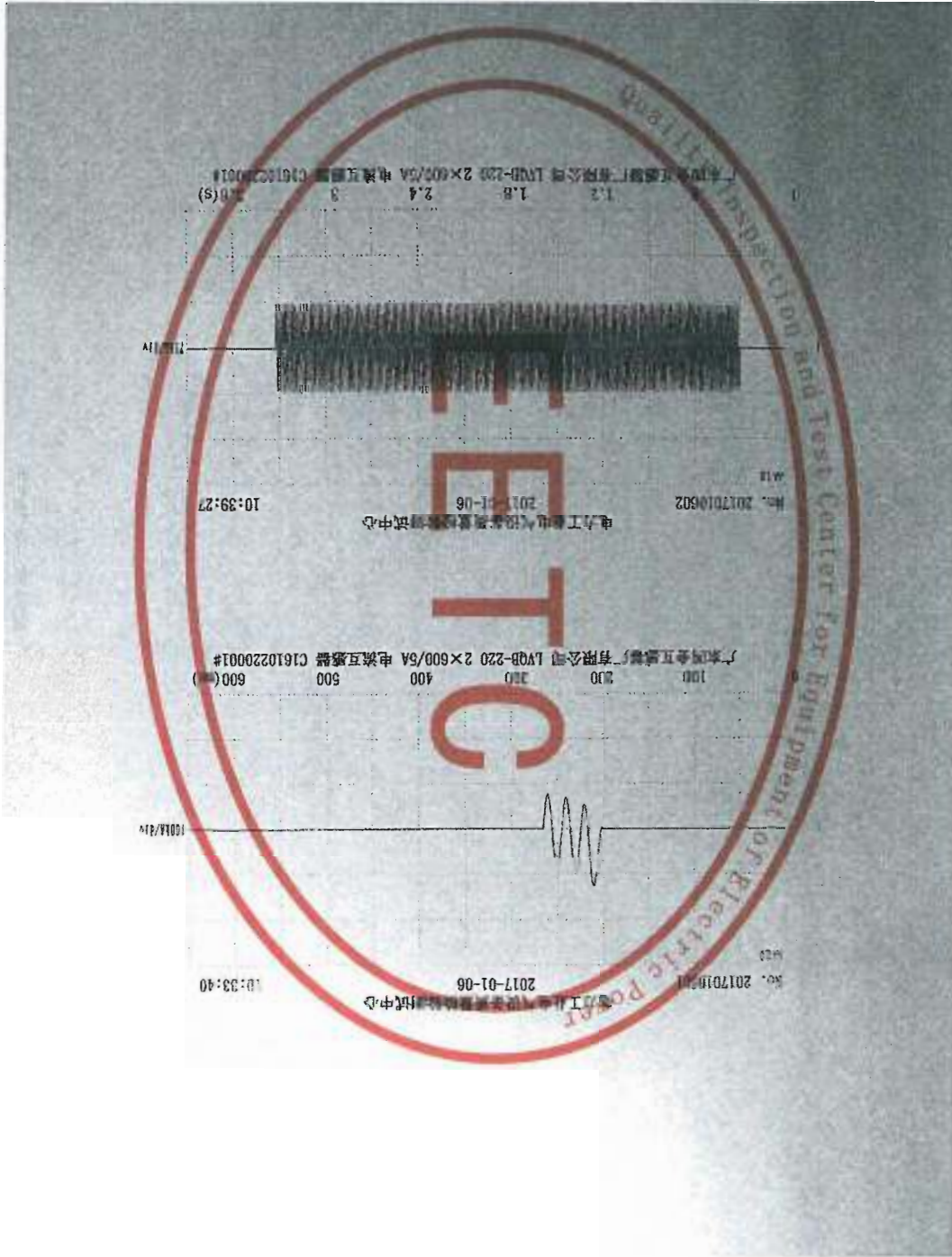
In wet condition, the test voltage of 460kV (50Hz) shall be applied between primary winding and the earth for 60s. No flashover and breakdown occur.

2.10.4 Data

Atmosphere correction factor: K_p=1.006 Water conductivity: 102/S/cm
 Vertical precipitation: 1.2mm/min Horizontal precipitation: 1.2mm/min
 Ambient temperature: 9°C Relative humidity: 77% Ambient air pressure: 101.0 kPa
 The test voltage of 460 kV (50Hz) was applied between primary winding and the earth for 60s. No flashover and breakdown occurred.
 The test object passed the tests.

2.10.5 Test result

Waveform of short-time current test:



2.11.5 Test result

The test object was in good conditions before and after this test. The test object passed the tests.

2.12 Power-frequency voltage withstand tests on secondary terminals (retrial)

2.12.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Equipment for secondary voltage withstand tests	HZSY-S	#6120611 (SB210)	3	2017.10.07

2.12.2 Reference standard requirement

The test voltage of 2.7kV shall be applied for 60s between the short-circuited terminals of each winding and earth in turn. No flashover and breakdown occur.

2.12.3 Data

The test voltage of 2.7kV was applied for 60s between the short-circuited terminals of each winding and earth in turn. No flashover and breakdown occurred.

2.12.4 Test result

The test object passed the tests.

2.13 Power-frequency withstand tests between sections (retrial)

2.13.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Equipment for secondary voltage withstand tests	HZSY-S	#6120611 (SB210)	3	2017.10.07

2.13.2 Reference standard requirement

The test voltage of 2.7kV shall be applied for 60s between the sections of the primary winding in turn. No flashover and breakdown occur.

2.13.3 Data

The test voltage of 2.7kV was applied for 60s between the sections of the primary winding in turn. No flashover and breakdown occurred.

2.13.4 Test result

The test object passed the tests.

2.14 Power-frequency voltage withstand tests on primary terminals (retial)

2.14.1 The main test device

No.	Name	Type/ Specification	Serial No.	Accuracy class / Uncertainty / Maximum Permissible Error	Valid date
1	Series resonance measuring system	TRF1200- 0.002	#1111030 (YQ220)	3	2017.12.17
2	Series resonance testing device	YDGK- 1200/3×400	#1111023 (SB220)	/	2018.01.25

2.14.2 Reference standard requirement

The test voltage of 41 kV (50Hz) shall be applied between primary winding and the earth for 60s. The short-circuited secondary winding(s) shall be connected to earth. No flashover and breakdown occur.

2.14.3 Data

Ambient temperature: 15 °C Relative humidity: 5% %

The test voltage of 41.5 kV (50Hz) was applied between primary winding and the earth for 60s. No

flashover and breakdown occurred.

2.14.4 Test result

The test object passed the tests.

2.15 Partial discharge measurement (retial)

2.15.1 The main test device

No.	Name	Type/ Specification	Serial No.	Accuracy class / Uncertainty / Maximum Permissible Error	Valid date
1	Partial discharge detector	JFD-251 #N1002 (YQ380)	#1111030 (YQ220)	10	2017.11.15
2	Series resonance measuring system	TRF1200- 0.002	#1111023 (SB220)	3	2017.12.17
3	Series resonance testing device	YDGK- 1200/3×400	#1111023 (SB220)	/	2018.01.25

2.15.2 Reference standard requirement

Pre-stress voltage: 41 kV, Test frequency: 50Hz

Test voltage: 252kV, Maximum permissible PD level: 10 pC

Test voltage: 175kV, Maximum permissible PD level: 5 pC

2.15.3 Data

Ambient temperature:19 °C Relative humidity:56 %

Test frequency (Hz)	50	415
Pre-stress voltage (kV)		
Test voltage (kV)	252	175
PD level (pC)	5	3

2.15.4 Test result

The test object passed the tests.

2.16 Inter-turn overvoltage test (retial)

2.16.1 The main test device

No.	Name	Type/Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Standard current transformer	HL23/8	#4613 (YQ341)	0.02	2017.10.19
2	Current generator	YL30	#910 (SB306)	/	2018.05.05
3	Open circuit test instrument	CT106	#102394 (YQ330)	2	2018.02.04

2.16.2 Reference standard requirement

With the secondary windings open-circuited, the rated primary current (or rated extended primary current) shall be applied for 60s to the primary winding at rated frequency. The peak voltage of the open-circuited secondary windings shall not exceed 4.5kV. The applied current shall be limited if the test voltage of 4.5kV (peak) is obtained before reaching the rated current (or extended rated current).

2.16.3 Data

Ambient temperature:19 °C Relative humidity: 56 %

Primary winding in series

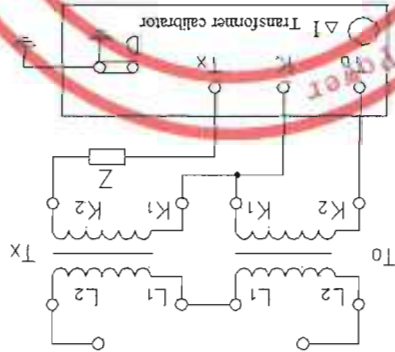
Secondary winding	Primary current (A)	Peak voltage (V)	Duration(s)
1S,1S ₂	720	960	60
2S,2S ₂	720	950	60
3S,3S ₂	720	960	60
4S,4S ₂	720	960	60
5S,5S ₃	720	450	60
6S,6S ₃	720	431	60

2.16.4 Test result

The test object passed the tests.

2.17 Tests for accuracy (retail)

2.17.1 Test circuit diagram



T₀: Standard current transformer
 Tx: Test object
 Z: Burden

2.17.2 The main test device

No.	Name	Type/ Specification	Serial No.	Accuracy class / Maximum Permissible Error	Valid date
1	Standard current transformer	HL23/8	#4613 (YQ341)	0.02	2017.10.19
2	Current generator	YL30	#910 (SB306)		2018.05.05
3	Transformer calibrator	HET 11	#K1020 (YQ320)	2	2017.11.07

2.17.3 Reference standard requirement

The errors of the secondary windings shall meet the requirements of the accuracy classes 0.2S/0.5S/SP/5P/5P/SP.

2.17.4 Data

Ambient temperature: 19°C
 Relative humidity: 56%
 Primary winding in series

Secondary windings	Ratio	Accuracy class	I _{pr} (%)	Ratio error (%)	Phase displacement (ent)	Burden (VA)	Ratio error (%)	Phase displacement (ent)	Burden (VA)
6S ₁	600/5A	0.5S	1	-0.35	+14	30	-0.10	+6	7.5
			5	-0.25	+6		-0.05	+6	
			20	-0.10	+2		0	+2	
			100	0	0		+0.05	0	
			120	0	0		+0.05	0	
5S ₁	600/5A	0.2S	1	-0.08	+3	30	-0.02	+1	7.5
			5	-0.04	+4		+0.02	+1	
			20	-0.02	+3		+0.04	+1	
			100	0	0		+0.04	+1	
			120	0	0		+0.04	+1	

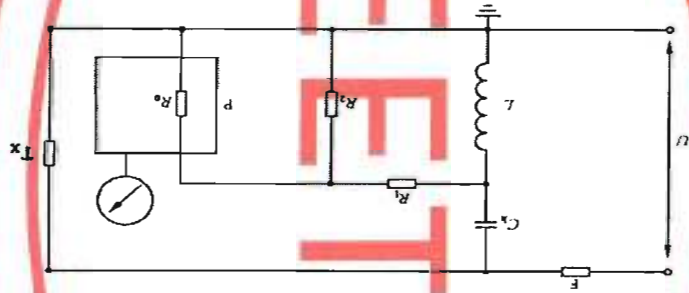
A pre-stress voltage of $1.5U_m/\sqrt{3}$ shall be applied and maintained for 30s. The voltage shall then be decreased to $1.1U_m/\sqrt{3}$ in about 10s and maintained to this value for 30s before measuring the radio interference voltage. The radio interference voltage shall not exceed $2500\mu V$ at $1.1U_m/\sqrt{3}$.

2.18.3 Reference standard requirement

No.	Name	Type/ Specification	Serial No.	Accuracy class / Uncertainty / Permissible Error	Valid date
1	Radio interference tester	ZN3950	#051205 (YQ592)	±2dB	2018.02.15
2	Series resonance measuring system	TRF1200-0.002	#111030 (YQ220)		2017.12.17

2.18.2 The main device used during the test

F: Filter C: Coupling capacitor L: Inductance
 P: Radio interference tester with input resistance R_0
 R_1, R_2 : Resistance T_x : Test object



2.18.1 Test circuit diagram

2.18 Electromagnetic Compatibility (EMC) tests (RIV test)

The test object passed the tests.

2.17.5 Test result

Secondary windings	Ratio	Accuracy class	I_p (%)	Ratio error (%)	Phase displacement (°)	Burden (VA) $\cos\phi=0.8$	Ratio error (%)	Phase displacement (°)	Burden (VA) $\cos\phi=0.8$
1S ₁	600/5A	5P	100	-0.15	+2	50	/	/	/
2S ₁	600/5A	5P	100	-0.15	+2	50	/	/	/
3S ₁	600/5A	5P	100	-0.15	+2	50	/	/	/
4S ₁	600/5A	5P	100	-0.15	+2	50			

2.18.4 Data

Ambient temperature: 9 °C Relative humidity: 77 %

Test voltage (KV)	160
Tuning frequency of measuring circuit (MHZ)	0.5
Radio interference voltage (μ V)	< 860

2.18.5 Test result

The test object passed the tests.

2.19 Transmitted overvoltage test

2.19.1 The main test device

No.	Name	Type/Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Type A impulse generator	CDF-800	#001 (SB315)	3	2019.02.14
2	Type A impulse measuring system	TZF600-800	#BHT20130 5001 (YQ368)	3	2017.08.05

2.19.2 Reference standard requirement

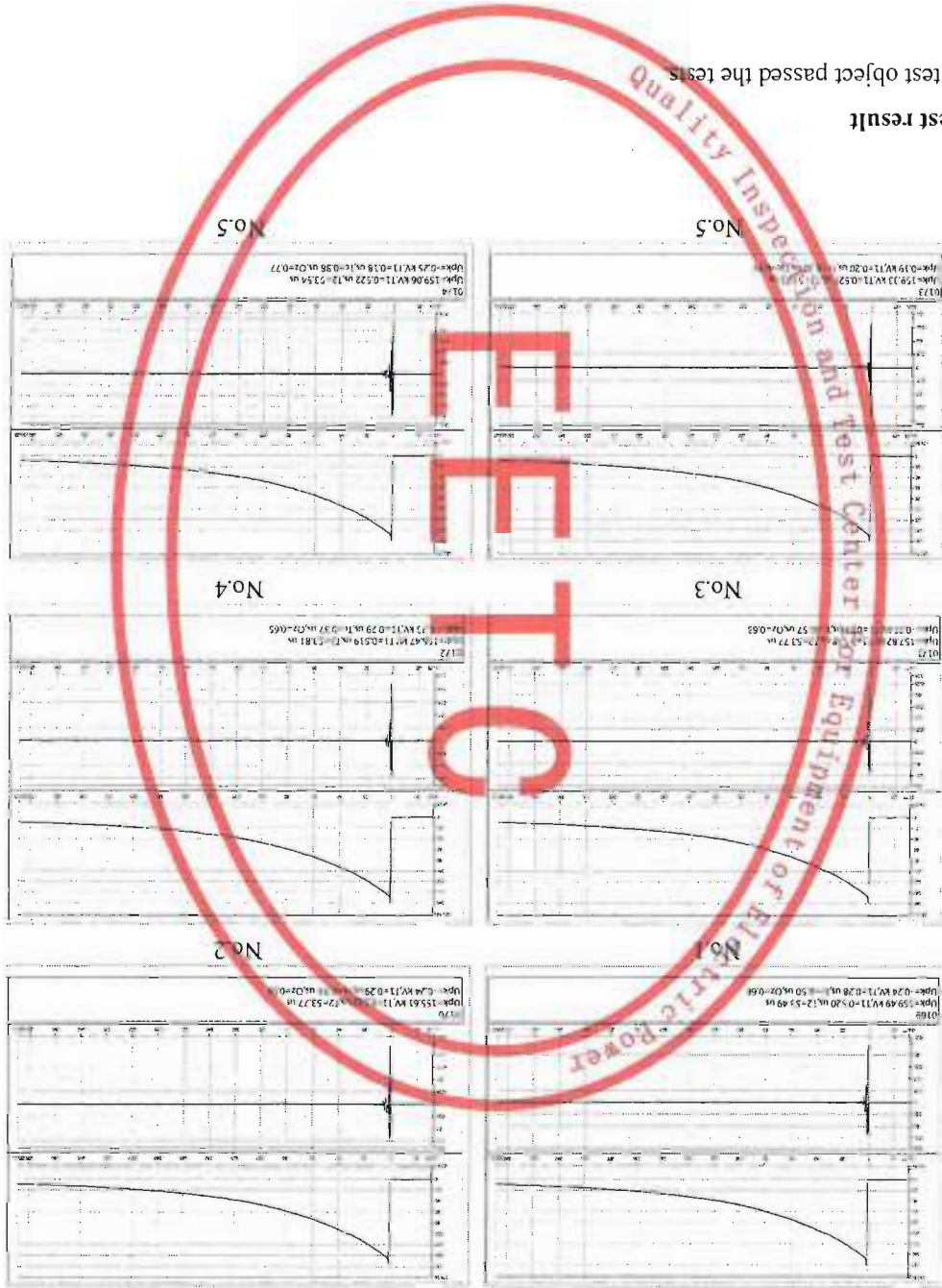
A low-voltage impulse (U_1) ($T_1=50 \mu s \pm 20\%$, $T_2 \geq 50 \mu s$) shall be applied between one of the primary terminals and earth. The transmitted overvoltage shall not exceed 1.6kV.

2.19.3 Data

Secondary winding	Type of impulse	Peak voltage of primary winding (U_1) (KV)	Peak voltage of secondary winding (U_2) (V)	Calculated transmitted overvoltage (U_s) (V)	Wave No.
1S ₁ S ₂	Type A impulse	159	240	497	1
2S ₁ 2S ₂	Type A impulse	156	240	506	2
3S ₁ 3S ₂	Type A impulse	158	250	521	3
4S ₁ 4S ₂	Type A impulse	158	250	479	4
5S ₁ 5S ₂	Type A impulse	159	190	393	5
6S ₁ 6S ₂	Type A impulse	159	250	517	6

Note: $U_s = \frac{U_2}{U_1} \times U_p$, $U_p = 1.6 \frac{\sqrt{2} U_m}{\sqrt{3}}$

Waveform



2.19.4 Test result

The test object passed the tests

2.20 Mechanical tests

2.20.1 The main test device

No.	Name	Type/ Specification	Serial No.	Accuracy class / Uncertainty / Permissible Error	Valid date
1	Ergometer	XK3100-B1	#9119/C004 (YQ371)	1	2017.07.06

2.20.2 Reference standard requirement

The test load (2.5kN) shall be applied on primary terminal for at least 60s. There shall be no evidence of damage (deformation, rupture or leakage).

2.20.3 Data

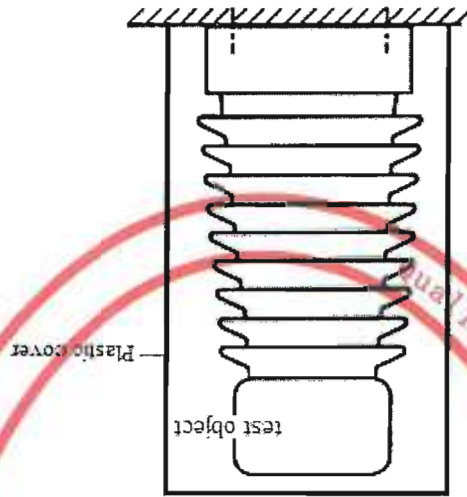
Modality of application (N)	Duration (s)	Test results
Horizontal (landscape orientation)	2500	No evidence of damage (deformation, rupture or leakage).
Horizontal (longitudinal orientation)	2500	
Vertical	2500	

2.20.4 Test result

The test object passed the tests

2.21 Enclosure tightness test at ambient temperature

2.21.1 Test circuit diagram



2.21.2 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	SF6 gas detector	COP58	#CZP1605237 (YQ334)	10%	2017.08.18

2.21.3 Reference standard requirement

The relative leakage rate (F_{rl}) shall not exceed 0.5% per year at rated filling pressure.

2.21.4 Data

Measuring Volume V_m (m^3)	Gas chamber Volume V_{ch} (m^3)	Rated filling pressure P_r (MPa)	Incer gas concentration $C_p C_0$ (cm^3/m^3)	F_{rl} /year (%)
0.30	0.5	0.40	8	<0.1

2.21.5 Test result

The test object passed the tests.

2.22 Gas dew point test

2.22.1 The main test device

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Dew-point meter	DP9mini	#190171110 (YQ213)	$\pm 1^\circ C$	2017.07.18

2.22.2 Reference standard requirement

The dew-point is not higher than $-38.6^\circ C$ for a measurement at $20^\circ C$. The water content of gas shall be less than 150 $\mu L/L$.

2.22.3 Data

Dew-point at ambient temperature ($^\circ C$)	Dew-point at $20^\circ C$ ($^\circ C$)	The water content of SF ₆ ($20^\circ C$) $\mu L/L$
-47.1	-46.7	58

2.22.4 Test result

The test object passed the tests.

2.23.2 The main device used during the test

No.	Name	Type/ Specification	Serial No.	Uncertainty / Accuracy class / Permissible Error	Valid date
1	Object probe	GR-F4D	#GR15091204 (YQ231-5)	1.0 ^{+0.05} mm	2017.09.11
2	Raining control system	JL-1-2	#200912088 (SB326)	/	2018.05.05
3	Spring impact hammer	ZLT-SZ1	#SZ11403 (YQ421)	1	2018.12.15
4	Dust chamber	SC-080	#1506060 (SB221)	/	2018.10.21

2.23.3 Reference standard requirement

Verification of the IP coding: The degree of protection of low-voltage control and/or auxiliary enclosures for outdoor instrument transformers is IP54.

Mechanical impact test: The level of protection against effects of mechanical impacts is impact level IK07.

2.23.4 Data

Verification of the IP coding: First characteristic Number of IP code: 5	The test for protection against access to hazardous parts.	The test for protection against access to hazardous parts.
Duration:8h	Ingress of dust was not totally prevented, but the dust did not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety.	The test wire of 1.0mm Φ did not penetrate and kept adequate clearance

Verification of the IP coding: Second characteristic Number of IK code: 4		
The test for protection against water		
Water flow (L/min)	Test pressure (kPa)	Duration (min)
10-1	100	5

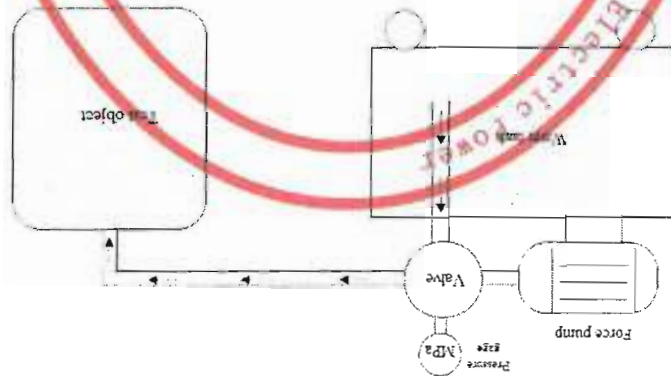
Mechanical impact test (IK07):		
Standard kinetic energy (J)	Test kinetic energy (J)	Test times
2.0±0.10	20	3

2.23.5 Test result

The test object passed the tests.

2.24 Pressure test for the enclosure

2.24.1 Test circuit diagram



2.24.2 The main test device

No.	Name	Type/Specification	Serial No.	Uncertainty / Accuracy class / Maximum Permissible Error	Valid date
1	Water pump for the test	4DSY-100/10	#201505012 (SB388)	/	2017.05.25
2	Pressure gage	YB-150A	#08.03.788 (BJ326)	0.4	2017.07.13

2.2.4.3 Reference standard requirement

Welded aluminum enclosure shall be withstand $(2.3 \times v) \times \sigma_d / \sigma_a \times$ "the design pressure" for 1min. no broken or permanent deformation.

Gas insulated, porcelain or glass insulator shall be withstand $4.25 \times MSP$ for 5min. No visible damage occurred.

2.2.4.4 Data

Ambient temperature: 19 °C, Relative humidity : 54%

Welding coefficient η	Permissible design stress at test temperature σ_t (MPa)	Permissible design stress at design temperature σ_d (MPa)	Design pressure (MPa)
0.75	65	65	0.70

Texture	Test pressure (MPa)	Duration (min)
Welded aluminum enclosure	2.15	1
Porcelain insulator	2.98	5

2.2.4.5 Test result

The test object passed the tests.