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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 26N1050-S

型式试验报告 Type Test Report

委托单位: 四川众信通用电能股份有限公司

Client: Sichuan Zhongxin General Electric Energy Co., Ltd.

产品名称: 干式电力变压器

Name of Product: Dry-type power transformer

产品型号:

Product Type: SC18-12500/35/10.5-NX1

检验类别: 型式试验

Test Category: Type test

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Suzhou Electrical Apparatus Science Research Institute Co., Ltd.

Test Report

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Client	Sichuan Zhongxin General Electric Energy Co., Ltd.	Test category	Type test
Manufacturer	Sichuan Zhongxin General Electric Energy Co., Ltd.	Date of sample receiving	Jun. 05, 2026
Name of sample	Dry-type power transformer	Type of sample	SC18-12500/35/10.5-NX1
Address of manufacturer	No.998 Xinghua 5th Road, Xinjin District, Chengdu City (Industrial Park)	Original number or date of production	B260023
Date of test	From Jun. 05, 2026 to Jun. 08, 2026	Number of sample	1 set
Test items	Routine test Type test Measurement of no-load loss and current at 90% and 110% of rated voltage Power evaluation on transformer Measurement of zero-sequence impedances on three-phase transformers Measurement of the harmonics of the no-load current Short-circuit withstand test	Test standards	GB/T1094.1—2013 GB/T1094.3—2017 GB/T1094.5—2008 GB/T1094.10—2022 GB/T1094.11—2022 GB/T10228—2023 JB/T10088—2016 JB/T501—2021 IEC60076-1:2011 IEC60076-3:2013+AMD1:2018 IEC60076-5:2006 IEC60076-10:2016 IEC60076-11:2018 Commission requirements
Test conclusion	The test results of routine test, type test, measurement of no-load loss and current at 90% and 110% of rated voltage, power evaluation on transformer, measurement of zero-sequence impedances on three-phase transformers, measurement of the harmonics of the no-load current and short-circuit withstand test of the dry-type transformer (type: SC18-12500/35/10.5-NX1) are in accordance with test standards and commission requirements. The sample has passed the above tests.		
Remarks	/		

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1. Sample parameters

Rated power: 12500kVA

Rated voltage: 35/10.5kV

Rated current: 206.2/687.3A

Rated frequency: 50Hz

Number of phases: 3

Tapping ranges: $\pm 2 \times 2.5\%$

Connection symbol: Dyn11

Cooling method: AN/AF

Thermal class of insulation: H

Insulation level: HV Um/LI/LIC/AC 40.5/200/220/80kV

 LV Um/LI/AC 12/75/35kV

2. Test standards

GB/T 1094.1—2013 *Power transformers—Part 1: General*

GB/T 1094.3—2017 *Power transformers—Part 3: Insulation levels, dielectric tests and external clearances in air*

GB/T 1094.5—2008 *Power transformers—Part 5: Ability to withstand short circuit*

GB/T 1094.10—2022 *Power transformers—Part 10: Determination of sound levels*

GB/T 1094.11—2022 *Power transformers—Part 11: Dry-type transformers*

GB/T 10228—2023 *Technical parameters and requirements for dry-type power transformers*

JB/T 10088—2016 *Sound level for 6kV~1000kV power transformers*

JB/T 501—2021 *Test guide for power transformers*

IEC60076-1:2011 *Power transformers—Part 1: General*

IEC60076-3:2013+AMD1:2018 *Power transformers—Part 3: Insulation levels, dielectric tests and external clearances in air*

IEC60076-5:2006 *Power transformers—Part 5: Ability to withstand short circuit*

IEC60076-10:2016 *Power transformers—Part 10: Determination of sound levels*

IEC60076-11:2018 *Power transformers—Part 11: Dry-type transformers*

Commission requirements

3. Sample description

The dry-type power transformer meets the requirements of GB/T 1094.11—2022, and it is for indoor use. The LV winding which is made of copper foil is circular concentric type. External photos of the sample have been attached.

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Photos of the sample



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Summary of test results					
No	Test items	Specified values	Measured values		Conc- clusion
		Standards (commission requirements)	Before short-circuit test	After short-circuit test	
1	Measurement of d.c. insulation resistance between each winding to earth and between windings (routine test)	Providing value of insulation resistance (GΩ)	H-L-E: 48.1 L-H-E: 38.6 H.L-E: 34.1 Core-earth: 15.4	H-L-E: 30.9 L-H-E: 27.6 H.L-E: 25.3 Core-earth: 10.1	/
2	Measurement of voltage ratio and check of phase displacement (routine test)	Voltage ratio tolerance of principal tapping: obtaining the lower of the following values between ±0.5% of declared ratio and ±1/10 of the actual percentage impedance Connection symbol: Dyn11	0.00%~0.12% Dyn11	-0.09%~0.09% Dyn11	PASS
3	Measurement of winding resistance (routine test)	Maximum resistance unbalance rate Line resistance: ≤2% Phase resistance: ≤2%	HV(line): 0.64% LV(line): 1.43% LV(phase): 1.20%	HV(line): 0.69% LV(line): 1.38% LV(phase): 1.13%	PASS
4	Applied voltage test (routine test)	HV: 80kV 60s LV: 35kV 60s	80kV 60s 35kV 60s	80kV 60s 35kV 60s	PASS
5	Induced voltage withstand test (routine test)	Applied voltage (kV): 2Ur Induced voltage (kV): 70 Duration (s): 120(f _r /f) Frequency (Hz): >50	21.0 70 30 200	21.0 70 30 200	PASS
6	Measurement of no-load loss and current (routine test)	I ₀ (%): 0.35 +0% P ₀ (kW): 10.550 +0%	0.24 9.988	0.23 10.046	PASS
7	Measurement of no-load loss and current at 90% and 110% of rated voltage (commission test)	I ₀ (%) : measured P ₀ (kW) : measured	90% 110% 0.22 0.26 8.979 10.926		/
8	Measurement of short-circuit impedance and load loss (routine test)	t: 145°C Z (%): 9.0 ±10% P _k (kW): 62.200 +0% P _{total} (kW): 72.750 +0%	9.17 59.418 69.406	9.14 59.068 69.114	PASS
9	Partial discharge measurement (routine test)	Three-phase measurement Applied voltage (kV): 1.3Ur Duration (min): 3 Discharge magnitude (pC): ≤5	45.5 3 A: <3, B: <4, C: <4 a: <2, b: <2, c: <1	45.5 3 A: <4, B: <3, C: <4 a: <1, b: <2, c: <2	PASS

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Summary of test results					
No	Test items	Specified values	Measured values	Conclusion	
		Standards (commission requirements)			
10	Temperature-rise test (type test)	In the condition of AN: Winding temperature-rise limit (K): 125	HV winding temperature-rise: 114.4 LV winding temperature-rise: 109.4	PASS	
11	Power evaluation on transformer (commission test)	Nominal rated power (kVA): 12500	See 4.11	Meet the requirements	
12	Determination of sound levels (type test)	In the condition of AN: Sound pressure level L_{PA} dB(A): ≤ 55 Sound power level L_{WA} dB(A): ≤ 78	53 71	PASS	
13	Measurement of zero-sequence impedances on three-phase transformers (commission test)	Providing zero-sequence impedance value (Ω)	0.014	/	
14	Measurement of the harmonics of the no-load current (commission test)	Providing harmonics of the no-load current of each phase	Harmonics of the no-load current of I_1 - I_{19}	/	
15	Short-circuit withstand test (special test)	Test times of each phase: 3 times Duration (s): $0.25 \pm 10\%$ The test oscillogram shall be normal. The reactance variation in phase before and after the test is not more than 2%. The inspection on transformer does not reveal any obvious defects. Routine retests shall be passed after short-circuit test.	3 times $0.256 \sim 0.256$ Without abnormality The maximum reactance variation in phase is 0.67%. Without any obvious defects Routine retests are passed.	PASS	
16	Lightning impulse test (type test, commission test)	35kV winding: Full wave (kV): 200 $\pm 3\%$ Chopped wave (kV): 220 $\pm 3\%$	199.28~201.03 219.72~220.76	PASS	
		10.5kV winding: Full wave (kV): 75 $\pm 3\%$	74.36~76.33		
Blank below					

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4. Test items and results								
4.1 Measurement of d.c. insulation resistance between each winding to earth and between windings (routine test)								
Test date: Jun. 05, 2026 Relative humidity: 65%; Ambient temperature: 23.4℃								
Measured part		Measured voltage (kV)			Measured insulation resistance (GΩ)			
HV—LV and earth		5.0			48.1			
LV—HV and earth		5.0			38.6			
HV and LV—earth		5.0			34.1			
Core—earth		2.5			15.4			
4.2 Measurement of voltage ratio and check of phase displacement (routine test)								
Test date: Jun. 05, 2026								
HV winding		LV winding		Transformation ratio by calculation	Measured voltage ratio tolerance (%)			Connection symbol
Tapping position	Voltage (kV)	Tapping position	Voltage (kV)		AB/ab	BC/bc	CA/ca	
1	36.750	/	10.5	3.500	0.03	0.03	0.06	Dyn11
2	35.875			3.417	0.00	0.03	0.00	
3	35.000			3.333	0.09	0.03	0.03	
4	34.125			3.250	0.03	0.12	0.03	
5	33.250			3.167	0.03	0.06	0.06	
4.3 Measurement of winding resistance (routine test)								
Test date: Jun. 05, 2026 Ambient temperature: 23.4℃; Winding temperature: 23.6℃								
Winding	Tapping position	Measured resistance value (Ω)			Resistance unbalance rate (%)			
		A~B a~b	B~C b~c	C~A c~a				
HV	1	0.3523	0.3514	0.3533	0.54			
	2	0.3438	0.3428	0.3447	0.55			
	3	0.3353	0.3341	0.3362	0.63			
	4	0.3289	0.3276	0.3297	0.64			
	5	0.3225	0.3211	0.3231	0.62			
LV	/	24.445×10^{-3}	24.103×10^{-3}	24.451×10^{-3}	1.43			
		ao: 14.667×10^{-3}	bo: 14.495×10^{-3}	co: 14.671×10^{-3}	1.20			

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4.4 Applied voltage test (routine test)						Test date: Jun. 05, 2026			
Relative humidity: 65%; Ambient temperature: 23.4°C; Air pressure: 101.8kPa									
Part of applied voltage		Test voltage (kV)		Test duration (s)		Result			
HV—LV and earth		80		60		PASS			
LV—HV and earth		35		60					
4.5 Induced voltage withstand test (routine test)						Test date: Jun. 05, 2026			
Relative humidity: 65%; Ambient temperature: 23.4°C; Air pressure: 101.8kPa									
Tapping position	Applied voltage (kV)	Induced voltage (kV)	Induced multiple	Frequency (Hz)	Test duration (s)	Result			
	LV	HV							
3	21.0	70.0	2	200	30	PASS			
4.6 Measurement of no-load loss and current (routine test)						Test date: Jun. 05, 2026			
Voltage multiple	Applied voltage (kV)		No-load current		No-load loss (kW)				
	Average value	r.m.s. value	(A)	(%)	Measured value	Corrected value			
90%Ur	5.453	5.455	1.48	0.22	8.982	8.979			
100%Ur	6.060	6.059	1.64	0.24	9.986	9.988			
110%Ur	6.664	6.665	1.78	0.26	10.925	10.926			
Remark: at 100%Ur, the difference between r.m.s. voltage and average voltage is within 3%.									
4.7 Measurement of no-load loss and current at 90% and 110% of rated voltage (commission test)									
See 4.6.									
4.8 Measurement of short-circuit impedance and load loss (routine test)						Test date: Jun. 05, 2026			
Ambient temperature: 23.4°C; Winding temperature: 23.6°C									
Winding	Tapping position	Applied current I		Measured voltage (kV)	Measured load loss (kW)	Short-circuit impedance (for each phase)		Load loss (kW)	Total loss (kW)
		(A)	I/Ir (%)			HV impedance (Ω)	(%)	Corrected value	Corrected value
						t=145°C I=Ir	t=145°C I=Ir	t=145°C I=Ir	t=145°C I=Ir
HV LV	1	115.14	58.63	2.045	14.086	10.26	9.49	57.573	67.561
	3	122.61	59.46	1.908	15.040	8.99	9.17	59.418	69.406
	5	122.41	56.40	1.661	13.944	7.84	8.86	61.405	71.393

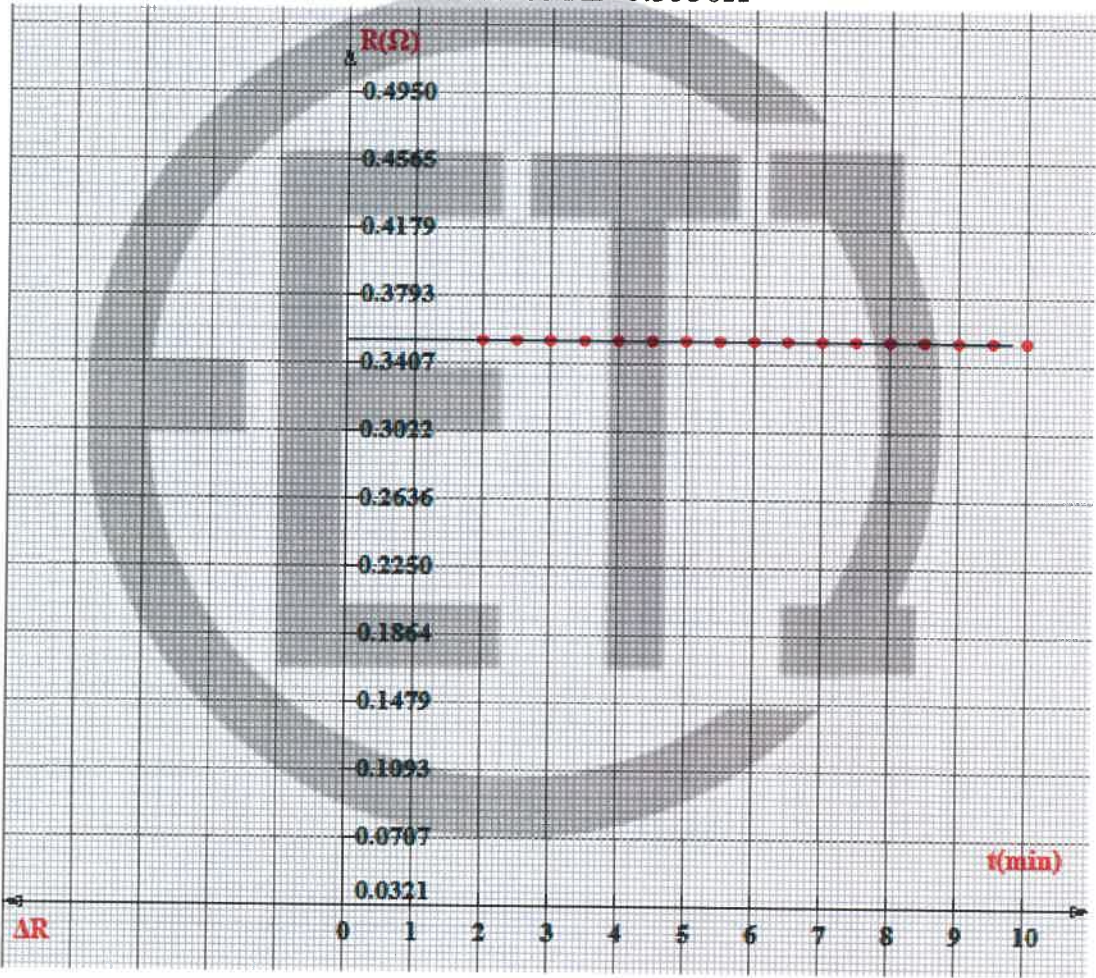
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4.9 Partial discharge measurement									
Three-phase measurement (routine test)							Test date: Jun. 05, 2026		
Frequency (Hz)	Applied voltage		Duration	Partial discharge magnitude (pC)					
	(kV)	Multiple		A	B	C	a	b	c
200	63.0	1.8Ur	30s	/	/	/	/	/	/
	45.5	1.3Ur	3min	<3	<4	<4	<2	<2	<1
Remark: the background noise levels are less than 1pC before and after the test.									
4.10 Temperature-rise test (type test)				Test date: from Jun. 05, 2026 to Jun. 06, 2026					
In the condition of AN: Simulated load method is adopted at the test with tapping position V tapped. The test duration is 20h. 6.060kV voltage is applied at no-load test. 217.06A current is required and 217.08A current is actually applied at short-circuit test.									
Measured results at the no-load test									
Winding	Measurement of resistance (Ω)		Winding temperature (°C)		Ambient temperature (°C)		Winding temperature-rise (K)		
	Cold resistance	Hot resistance	Measurement of cold resistance		Measurement of hot resistance				
HV	0.3427	0.3536	23.6		24.7		7.0		
LV	24.103×10 ⁻³	25.346×10 ⁻³					12.2		
Measured results at the short-circuit test									
Winding	Measurement of resistance (Ω)		Winding temperature (°C)		Ambient temperature (°C)		Winding temperature-rise (K)		
	Cold resistance	Hot resistance	Measurement of cold resistance		Measurement of hot resistance				
HV	0.3427	0.4928	23.6		25.2		111.5		
LV	24.103×10 ⁻³	33.9147×10 ⁻³					103.6		
Calculations of temperature-rise									
Winding temperature-rise (K)			HV		114.4				
			LV		109.4				

Hot resistance curve

HV hot resistance data

HV hot resistance	0.3536Ω
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HV winding hot resistance temperature-rise curve at no-load test
hot resistance $R_2=0.3536\Omega$

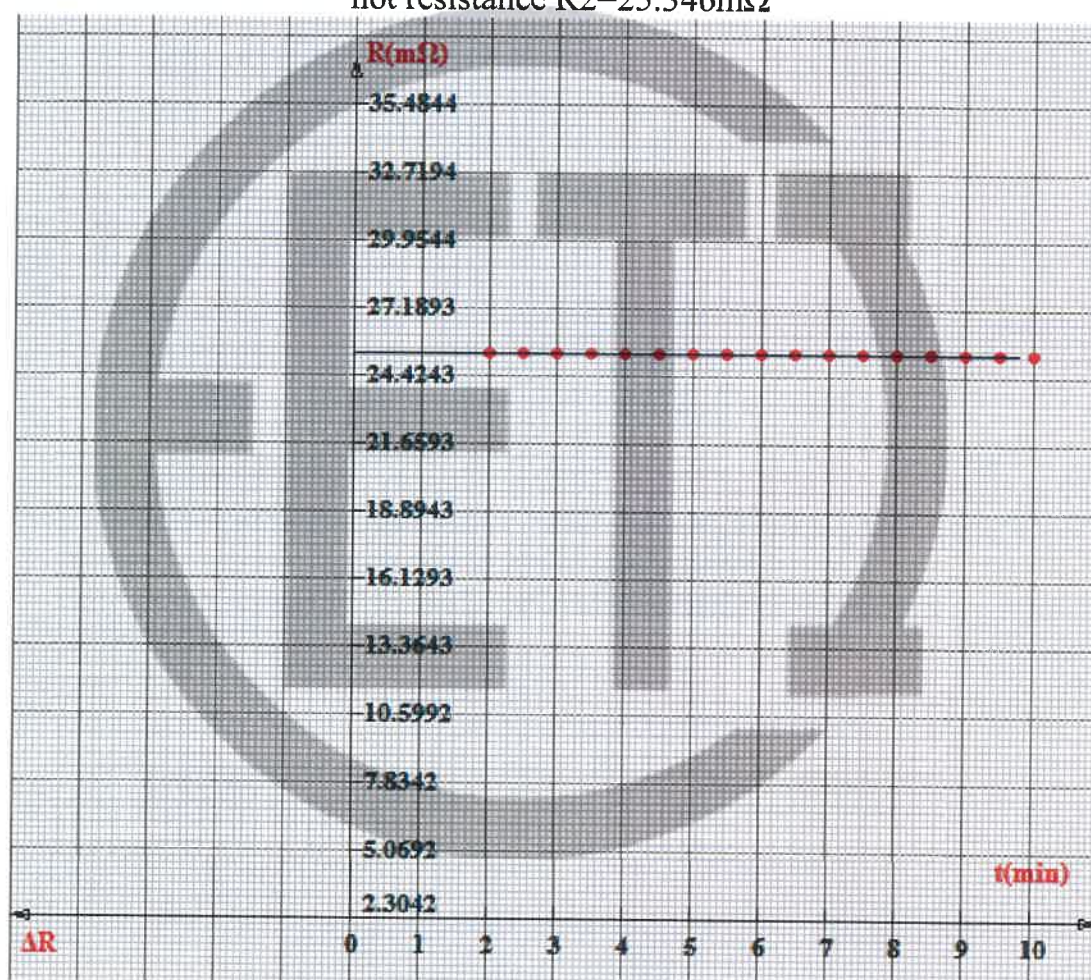


Hot resistance curve

LV hot resistance data

LV hot resistance	$25.346 \times 10^{-3} \Omega$
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LV winding hot resistance temperature-rise curve at no-load test
hot resistance $R_2 = 25.346 \text{ m}\Omega$

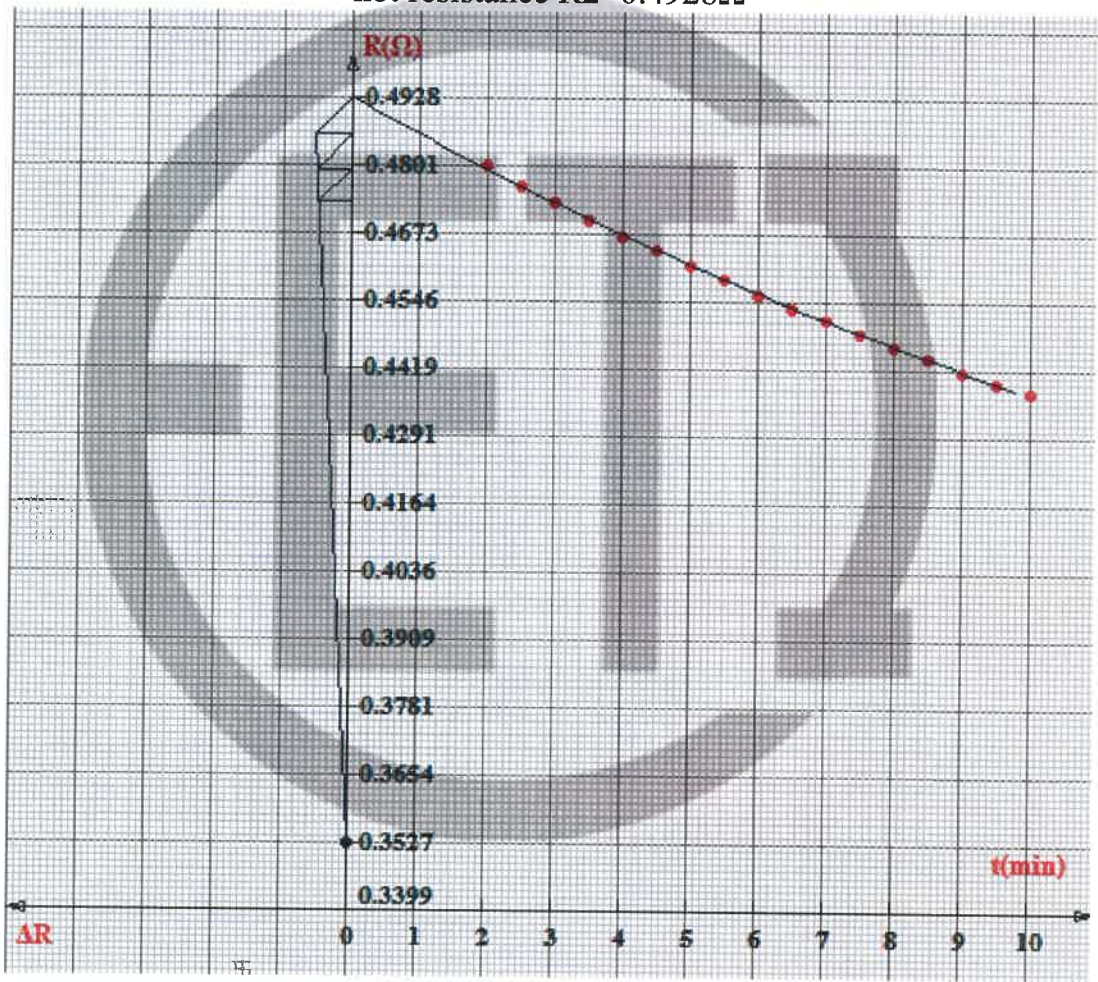


Hot resistance curve

HV hot resistance data

HV hot resistance	0.4928Ω
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HV winding hot resistance temperature-rise curve at short-circuit test
hot resistance $R_2=0.4928\Omega$



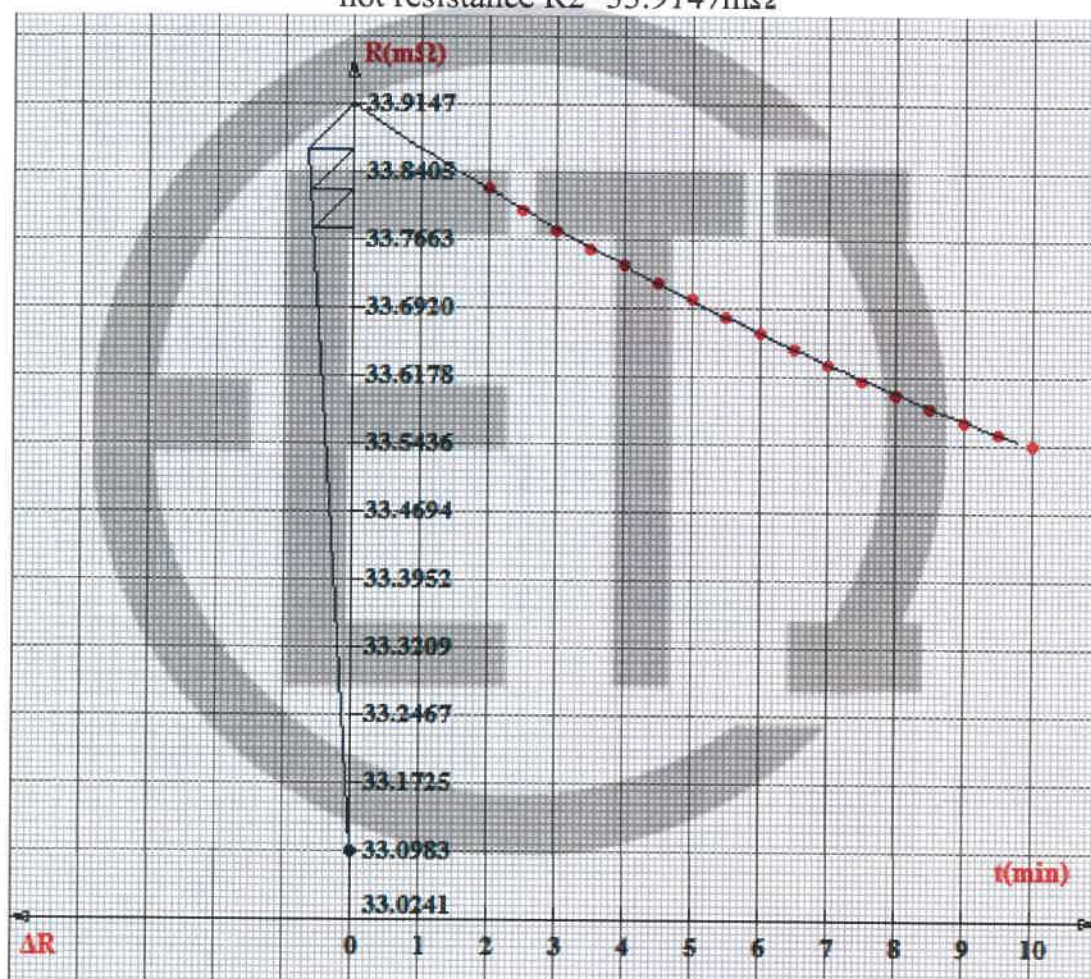
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Hot resistance curve

LV hot resistance data

LV hot resistance	$33.9147 \times 10^{-3} \Omega$
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LV winding hot resistance temperature-rise curve at short-circuit test
hot resistance $R_2 = 33.9147 \text{ m}\Omega$



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4.11 Power evaluation on transformer (commission test)						Test date: Jun. 06, 2026		
4.11.1 Measurement of no-load loss and current								
Applied voltage (kV)		No-load current			No-load loss			
		Specified value	Measured value		Specified value	Corrected value		
Average value	r.m.s. value	(%)	(A)	(%)	(kW)	(kW)		
6.060	6.059	0.35 ^{+0%}	1.64	0.24	10.550 ^{+0%}	9.988		
4.11.2 Measurement of short-circuit impedance and load loss								
Winding	Tapping position	Applied current I		Measured voltage (kV)	Short-circuit impedance (%)		Load loss (kW)	
		(A)	I/I _r (%)		Specified value	Corrected value	Specified value	Corrected value
					t=145℃ I=I _r		t=145℃ I=I _r	
HV LV	3	122.61	59.46	1.908	9.0±10%	9.17	62.200 ^{+0%}	59.418
4.11.3 Temperature-rise test								
Measured content				Measured part	Specified value (K)		Measured value (K)	
Winding temperature-rise				HV	125		114.4	
				LV			109.4	
4.11.4 Evaluation results:								
No	Test item				Nominal rated power (kVA)		Measured power (kVA)	Conclusion
1	Measurement of no-load loss and current				12500		12500	Meet the requirements
2	Measurement of short-circuit impedance and load loss				12500		12500	Meet the requirements
3	Temperature-rise test				12500		12500	Meet the requirements
The test results meet the parameter requirements of a dry-type power transformer of which the rated power is 12500kVA.								

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4.12 Determination of sound levels (type test)						Test date: Jun. 06, 2026					
4.12.1 Rough estimation of the load current sound power level											
Equation:											
$L_{WA,lr} \approx 39 + 18 \lg \frac{Sr}{Sp} = 58.7 \text{dB(A)}$											
where: Sr—the rated power is 12.5MVA;											
Sp—the reference power is 1MVA.											
Because $L_{WA,IN}$ is less 19.3dB(A) than limit value 78dB(A) of assured sound power level, according to standard requirement, measurement of load current sound power level is not needed.											
4.12.2 Measurement of sound pressure level and calculation of sound power level											
The transformer is excited at rated conditions. The prescribed contour shall be spaced 1.0m away from the principal radiating surface. Walk-around measurement is adopted in the test, with 1/3 octave band. The height of measured point 1 is 1.01m and the height of measured point 2 is 2.02m.											
Test environment											
The total area of the surface of the test room $S_v \text{ (m}^2\text{)}$		The average acoustic absorption coefficient α		The amount of acoustic absorption A $\text{(m}^2\text{)}$		Distance from the principal radiating surface (m)		The area of the measurement surface S $\text{(m}^2\text{)}$		Environmental correction K (dB)	
3293.2		0.2		658.6		1.0		61.1		1.4	
Measured value								(dB)			
Status of cooling device	Average of background noise		Measured height	Average noise value of transformer $\overline{L_{pA0}}$	A weighted sound pressure level $\overline{L_{pA}} = 10 \lg(10^{0.1\overline{L_{pA0}}} - 10^{0.1\overline{L_{bgA}}}) - K$				A weighted sound power level $L_{WA} = \overline{L_{pA}} + 10 \lg(S/S_0)$		
	Before the test	After the test									
AN	30.6	30.2	1/3h	54.3	53				71		
			2/3h	54.5							
			Average	54.4							
Remarks: $\overline{L_{pA0}}$: the uncorrected average A-weighted sound pressure level; $\overline{L_{pA0}} = 10 \lg(\frac{1}{N} \sum_{i=1}^N 10^{0.1L_{pAi}})$											
$\overline{L_{bgA}}$: the lower of the two calculated average A weighted background noise pressure level.											

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4.12.3 Values of frequency spectrum during testing				
Octave band (Hz)	Initial $\overline{L_{bgA}}$ (dB)	Final $\overline{L_{bgA}}$ (dB)	$\frac{1}{3} \overline{L_{pA0}}$ (dB)	$\frac{2}{3} \overline{L_{pA0}}$ (dB)
50	8.9	7.9	20.1	19.8
63	9.2	8.7	20.5	20.7
80	12.7	12.8	30.5	30.3
100	21.4	20.9	46.7	46.5
125	12.8	11.8	30.4	30.1
160	14.2	13.1	33.6	33.8
200	12.7	13.6	44.5	44.3
250	14.4	14.1	40.8	40.6
315	14.9	13.9	46.2	46.4
400	15.8	15.1	43.2	43.6
500	17.2	16.9	44.2	44.8
630	18.1	17.8	48.6	49.2
800	18.6	18.2	38.2	37.6
1000	19.2	18.7	35.1	34.3
1250	19.7	19.6	23.8	23.1
1600	18.7	19.4	22.1	21.8
2000	19.2	17.9	30.5	29.6
2500	18.4	16.9	32.8	33.4
3150	17.9	16.8	26.8	27.3
4000	17.3	16.4	20.1	20.9
5000	16.4	16.2	15.6	16.2
6300	15.8	15.8	13.2	12.7
8000	13.9	14.1	10.4	11.6
10000	11.1	12.9	6.9	7.8
Remark: for the diagram of pressure spectrum, see P ₁₆ .				

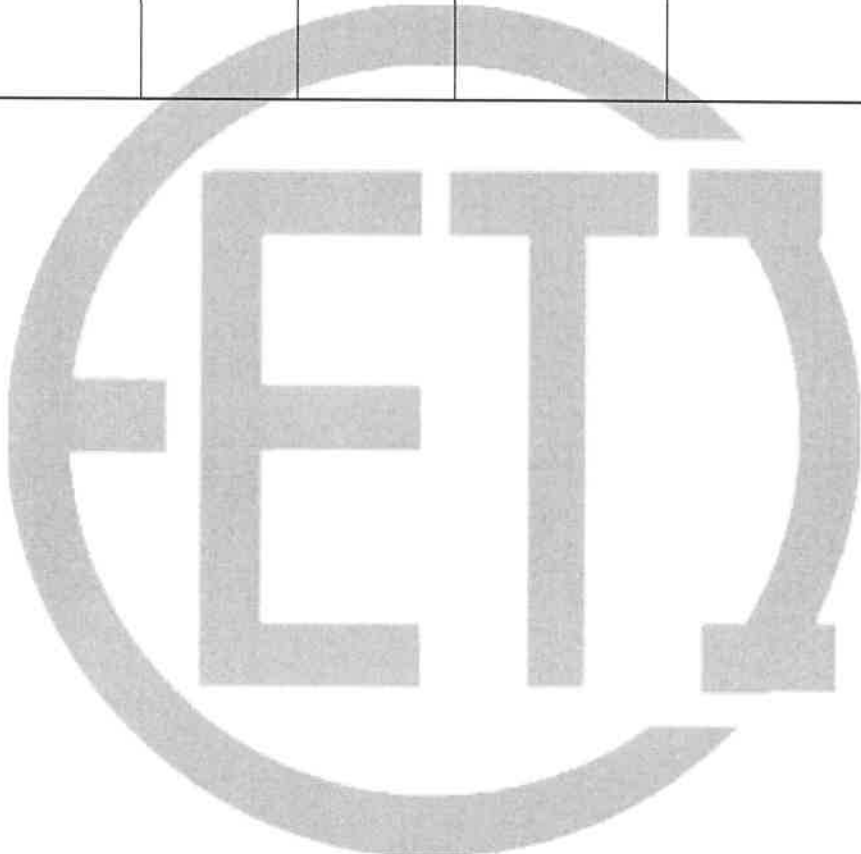
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Mean pressure spectrum at 1/3 height

Frequency/Hz	Averaged sound pressure level /dB(A)/20μPa
50	20
63	20
80	30
100	45
125	30
160	33
200	43
250	40
315	45
400	42
500	43
630	48
800	38
1000	34
1250	23
1600	21
2000	30
2500	32
3150	26
4000	19
5000	15
6300	12
8000	9
10000	6

Mean pressure spectrum at 2/3 height

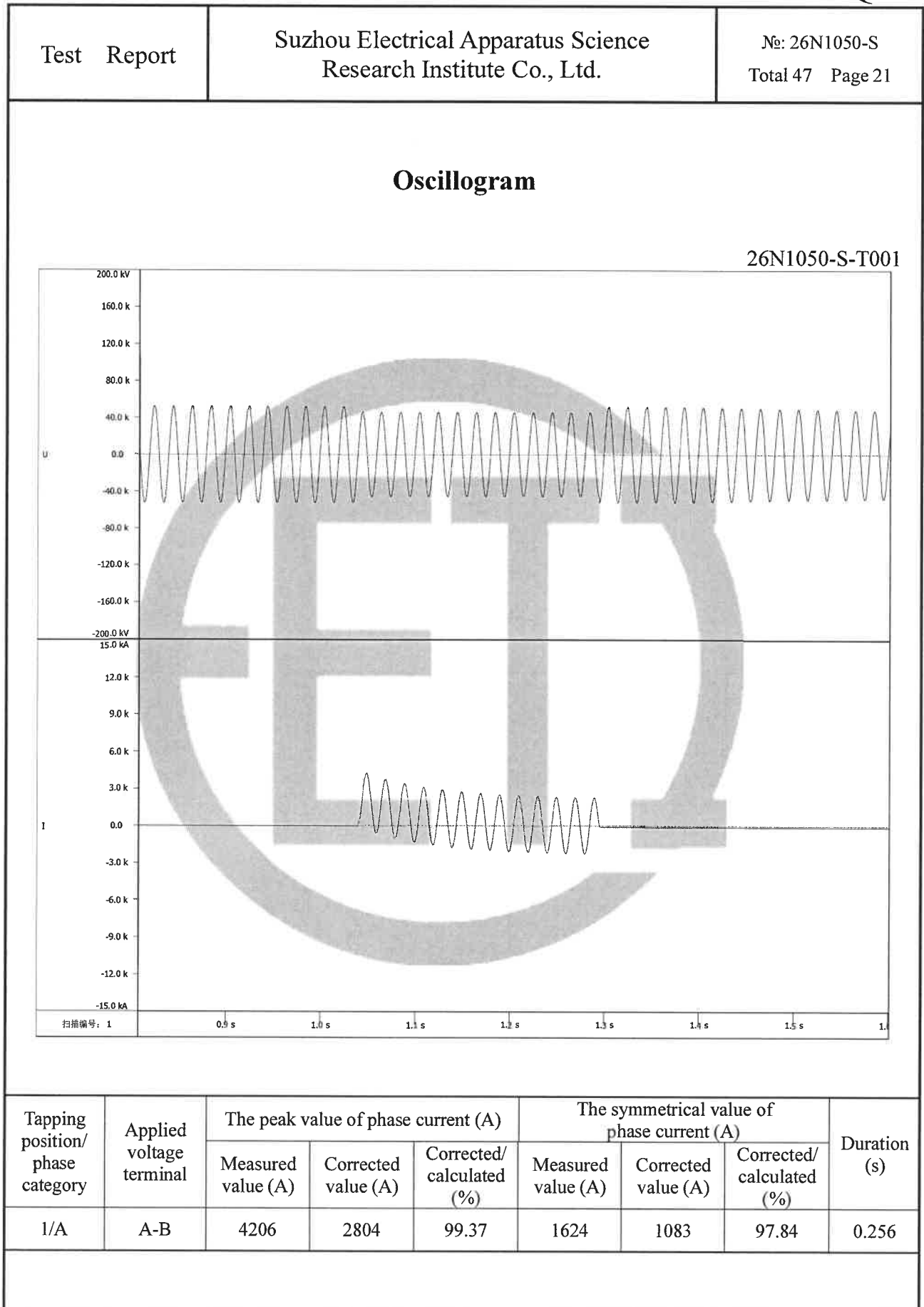
Frequency/Hz	Averaged sound pressure level /dB(A)/20μPa
50	20
63	20
80	30
100	46
125	30
160	33
200	44
250	40
315	46
400	43
500	44
630	48
800	37
1000	33
1250	22
1600	21
2000	29
2500	32
3150	26
4000	20
5000	15
6300	12
8000	10
10000	6

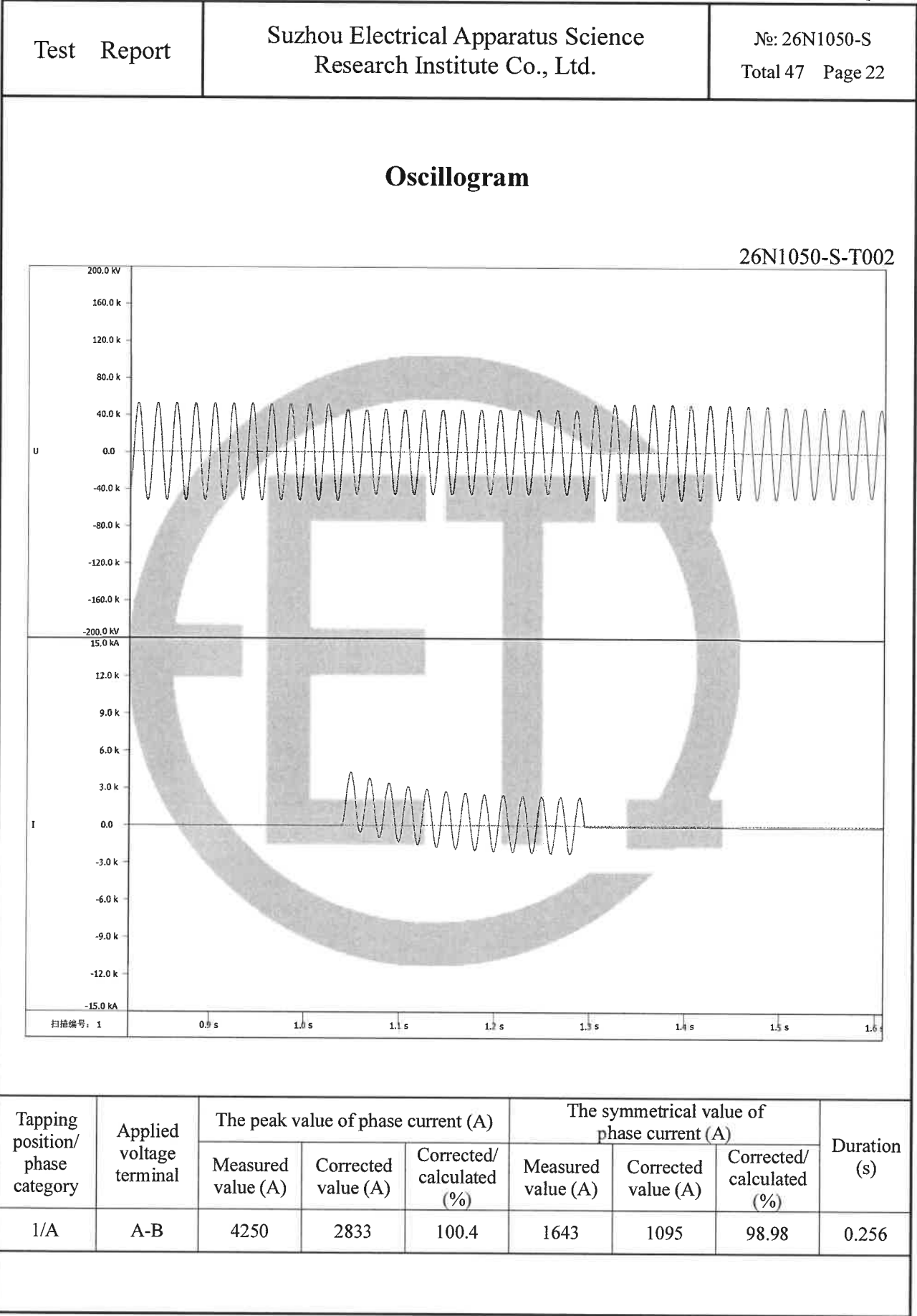
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4.13 Measurement of zero-sequence impedances on three-phase transformers (commission test)						
Test date: Jun. 06, 2026						
Connection symbol	Power supply terminal	Open-circuit terminal	Short-circuit terminal	Applied current (A)	Measured voltage (V)	Impedance (Ω)
Dyn11	abc—o	A, B, C	/	229.1	3.2074	0.014
						

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4.14 Measurement of the harmonics of the no-load current (commission test)					Test date: Jun. 06, 2026		
No	CH-A THD (%) =5.513		CH-B THD (%) =5.962		CH-C THD (%) =5.895		
	In (A)	In/I1 (%)	In (A)	In/I2 (%)	In (A)	In/I3 (%)	
01	1.765	100.000	1.892	100.000	1.269	100.000	
02	0.000	0.000	0.000	0.000	0.000	0.000	
03	0.076	4.289	0.079	4.189	0.054	4.289	
04	0.000	0.000	0.000	0.000	0.000	0.000	
05	0.049	2.763	0.066	3.482	0.043	3.416	
06	0.000	0.000	0.000	0.000	0.000	0.000	
07	0.024	1.364	0.033	1.752	0.017	1.359	
08	0.000	0.000	0.000	0.000	0.000	0.000	
09	0.013	0.746	0.014	0.726	0.009	0.716	
10	0.000	0.000	0.000	0.000	0.000	0.000	
11	0.024	1.368	0.028	1.481	0.019	1.492	
12	0.000	0.000	0.000	0.000	0.000	0.000	
13	0.003	0.149	0.004	0.189	0.002	0.148	
14	0.000	0.000	0.000	0.000	0.000	0.000	
15	0.003	0.163	0.002	0.132	0.003	0.248	
16	0.000	0.000	0.000	0.000	0.000	0.000	
17	0.003	0.148	0.003	0.172	0.002	0.138	
18	0.000	0.000	0.000	0.000	0.000	0.000	
19	0.000	0.000	0.000	0.000	0.000	0.000	

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4.15 Short-circuit withstand test (special test) Single-phase supply is used, and test voltage is supplied to two corners of the delta. The test waveform is normal. For the test oscillograms, see P₂₁₋₂₉. The percentage of peak current and symmetrical current is the ratio of measured current to calculated current. Remark: corrected value=measured value/1.5 Test date: Jun. 07, 2026												
4.15.1 Current calculation of short-circuit test (reference temperature 145°C)												
Tapping position		The symmetrical value of phase current (A)			The peak value of phase current (A)			Peak factor ($K\sqrt{2}$)				
1		1107			2822			2.550				
3		1190			3035			2.550				
5		1281			3266			2.550				
4.15.2 Current injection of short-circuit test												
Tapping position/ phase category	Applied voltage terminal	Times	Measurement of current						Duration (s)	Oscillogram No		
			The peak value of phase current			The symmetrical value of phase current						
			Measured value (A)	Corrected value (A)	Corrected / calculated (%)	Measured value (A)	Corrected value (A)	Corrected / calculated (%)				
1/A	A-B	The first time	4206	2804	99.37	1624	1083	97.84	0.256	26N1050-S-T001		
		The second time	4250	2833	100.4	1643	1095	98.98	0.256	26N1050-S-T002		
		The third time	4229	2819	99.91	1633	1089	98.38	0.256	26N1050-S-T003		
		Times	Measurement of reactance									
			Reactance value of phase (Ω)			Reactance variation in phase (%)						
				A	B		C	A	B	C		
				Before tests	29.243	30.025		29.376	/	/	/	
				The first time	29.340	30.058		29.405	0.33	0.11	0.10	
				The second time	29.377	30.061		29.407	0.46	0.12	0.11	
				The third time	29.403	30.066		29.413	0.55	0.14	0.13	
The maximum reactance variation in phase when the test is performed at phase A is 0.55%.												

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Tapping position/ phase category	Applied voltage terminal	Times	Measurement of current							Duration (s)	Oscillogram No
			The peak value of phase current			The symmetrical value of phase current					
			Measured value (A)	Corrected value (A)	Corrected / calculated (%)	Measured value (A)	Corrected value (A)	Corrected / calculated (%)			
3/B	B-C	The first time	4566	3044	100.3	1766	1177	98.92	0.256	26N1050-S-T004	
		The second time	4562	3041	100.2	1763	1175	98.76	0.256	26N1050-S-T005	
		The third time	4543	3029	99.80	1757	1171	98.42	0.256	26N1050-S-T006	
		Times	Measurement of reactance								
			Reactance value of phase (Ω)			Reactance variation in phase (%)					
			A	B	C	A	B	C			
		Before tests	25.662	26.203	25.654	/	/	/			
		The first time	25.806	26.277	25.689	0.56	0.28	0.14			
		The second time	25.811	26.319	25.695	0.58	0.44	0.16			
The third time	25.813	26.347	25.698	0.59	0.55	0.17					
Tapping position/ phase category	Applied voltage terminal	Times	Measurement of current							Duration (s)	Oscillogram No
			The peak value of phase current			The symmetrical value of phase current					
			Measured value (A)	Corrected value (A)	Corrected / calculated (%)	Measured value (A)	Corrected value (A)	Corrected / calculated (%)			
5/C	C-A	The first time	4860	3240	99.19	1882	1255	97.95	0.256	26N1050-S-T007	
		The second time	4954	3303	101.1	1918	1279	99.83	0.256	26N1050-S-T008	
		The third time	4865	3243	99.30	1884	1256	98.06	0.256	26N1050-S-T009	
		Times	Measurement of reactance								
			Reactance value of phase (Ω)			Reactance variation in phase (%)					
			A	B	C	A	B	C			
		Before tests	22.089	23.055	22.256	/	/	/			
		The first time	22.224	23.185	22.339	0.61	0.56	0.37			
		The second time	22.226	23.190	22.368	0.62	0.59	0.50			
The third time	22.230	23.192	22.405	0.64	0.59	0.67					
The maximum reactance variation in phase when the test is performed at phase B is 0.59% and at phase C is 0.67%.											
4.15.3 Inspection on transformer											
The inspection does not reveal any obvious distortion and displacement of coil, lead and supporting structures after the short-circuit test and no traces of discharge are found. For the pictures before and after the short-circuit test, see P ₃₉₋₄₀ .											

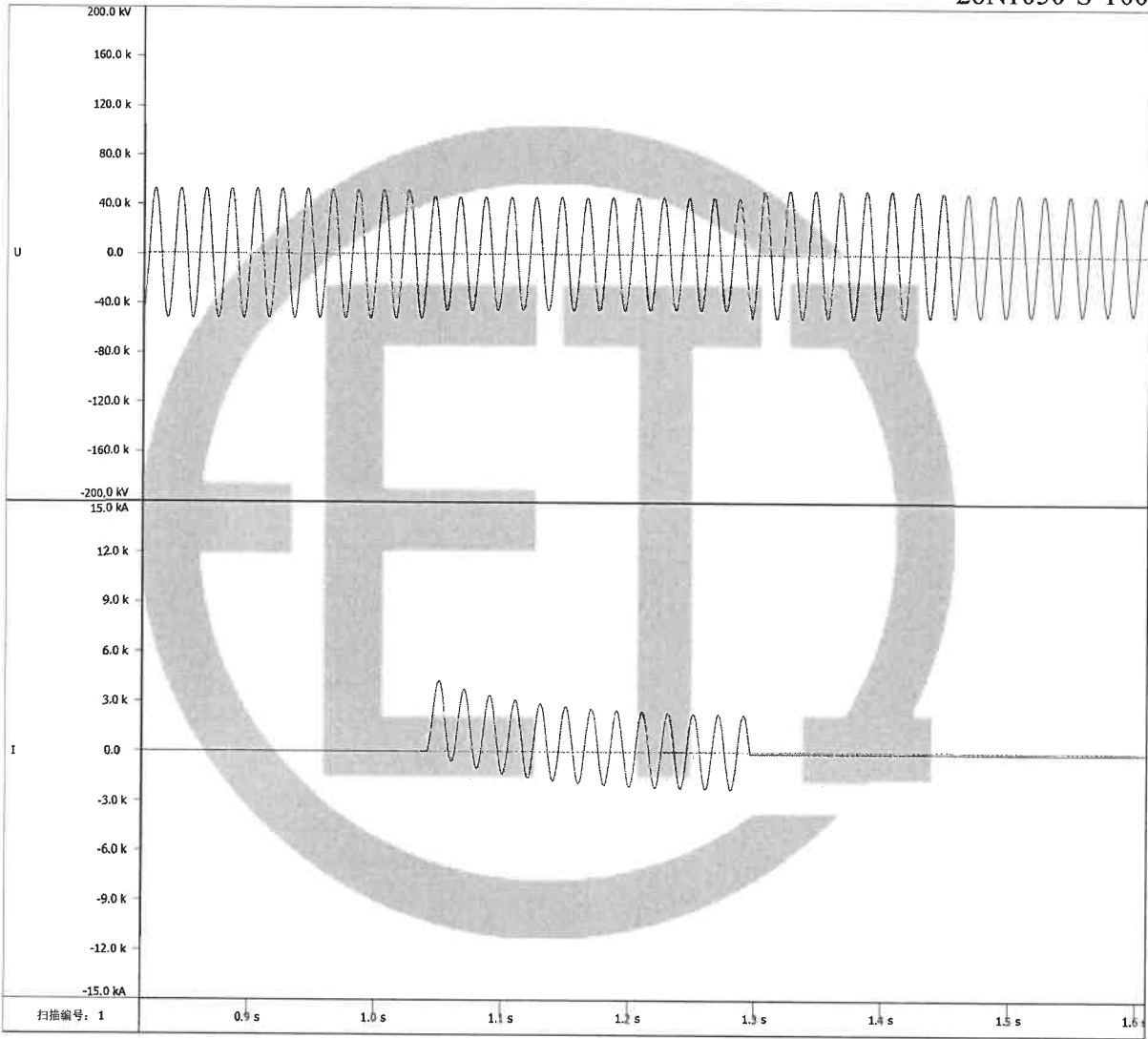




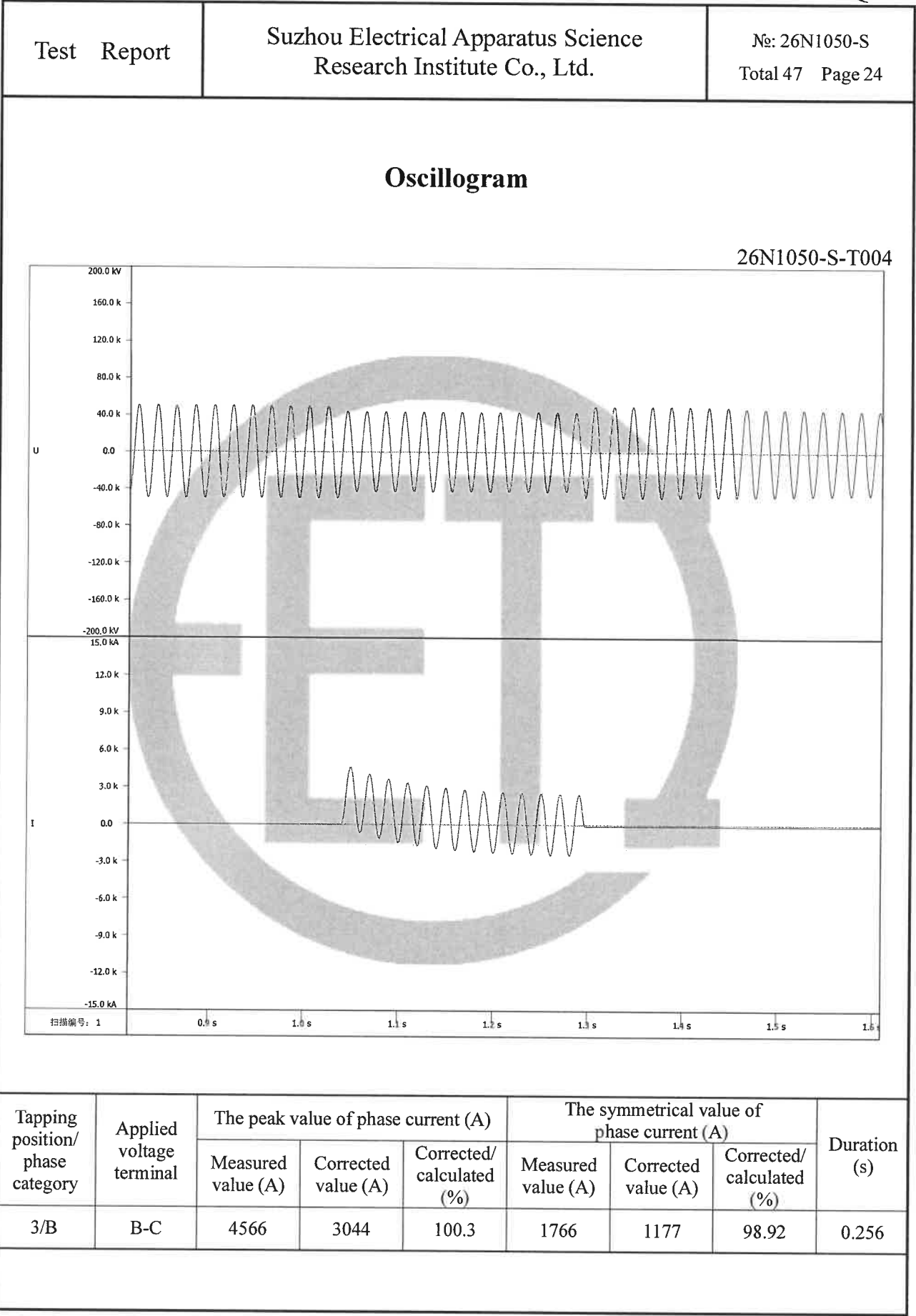
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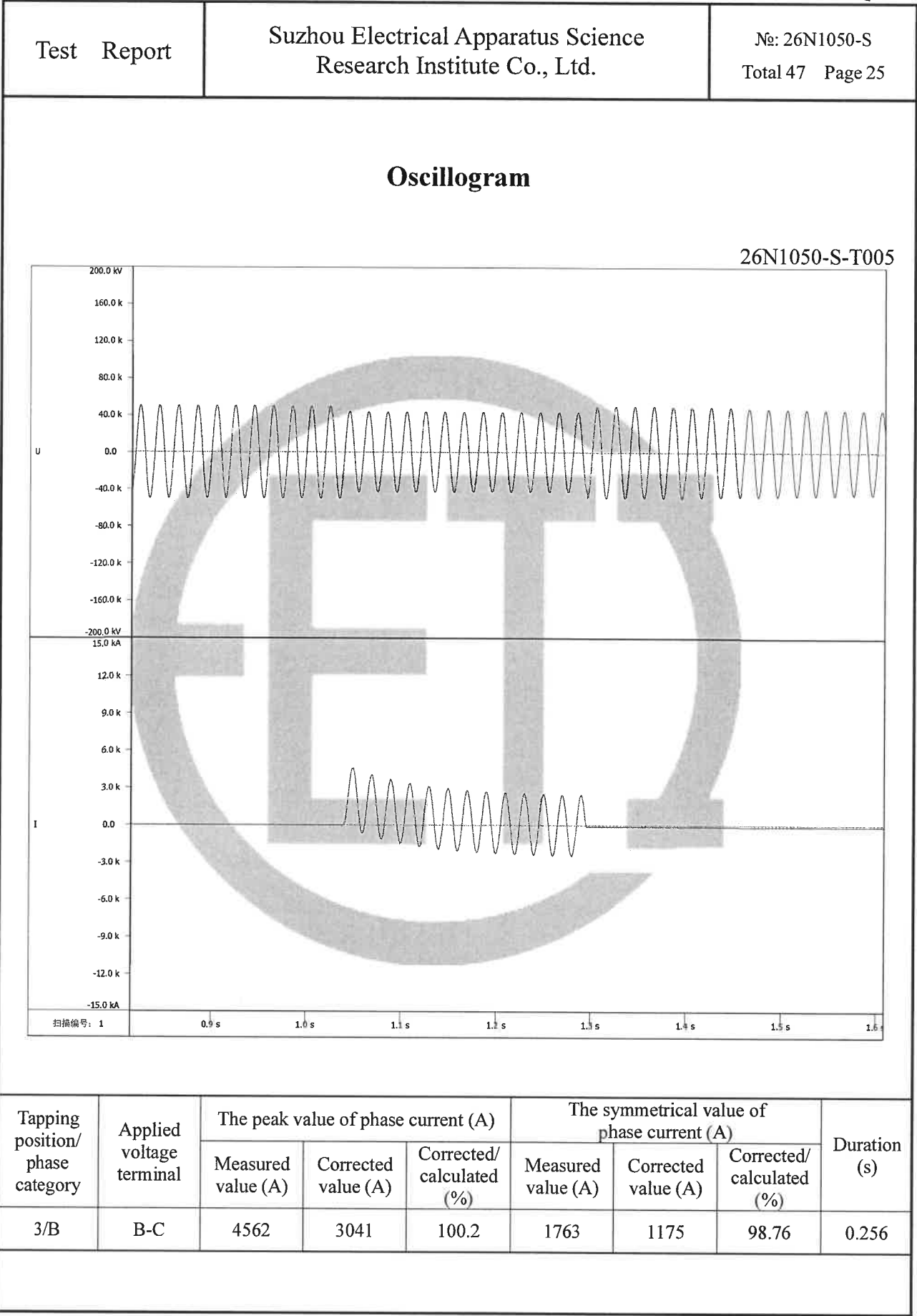
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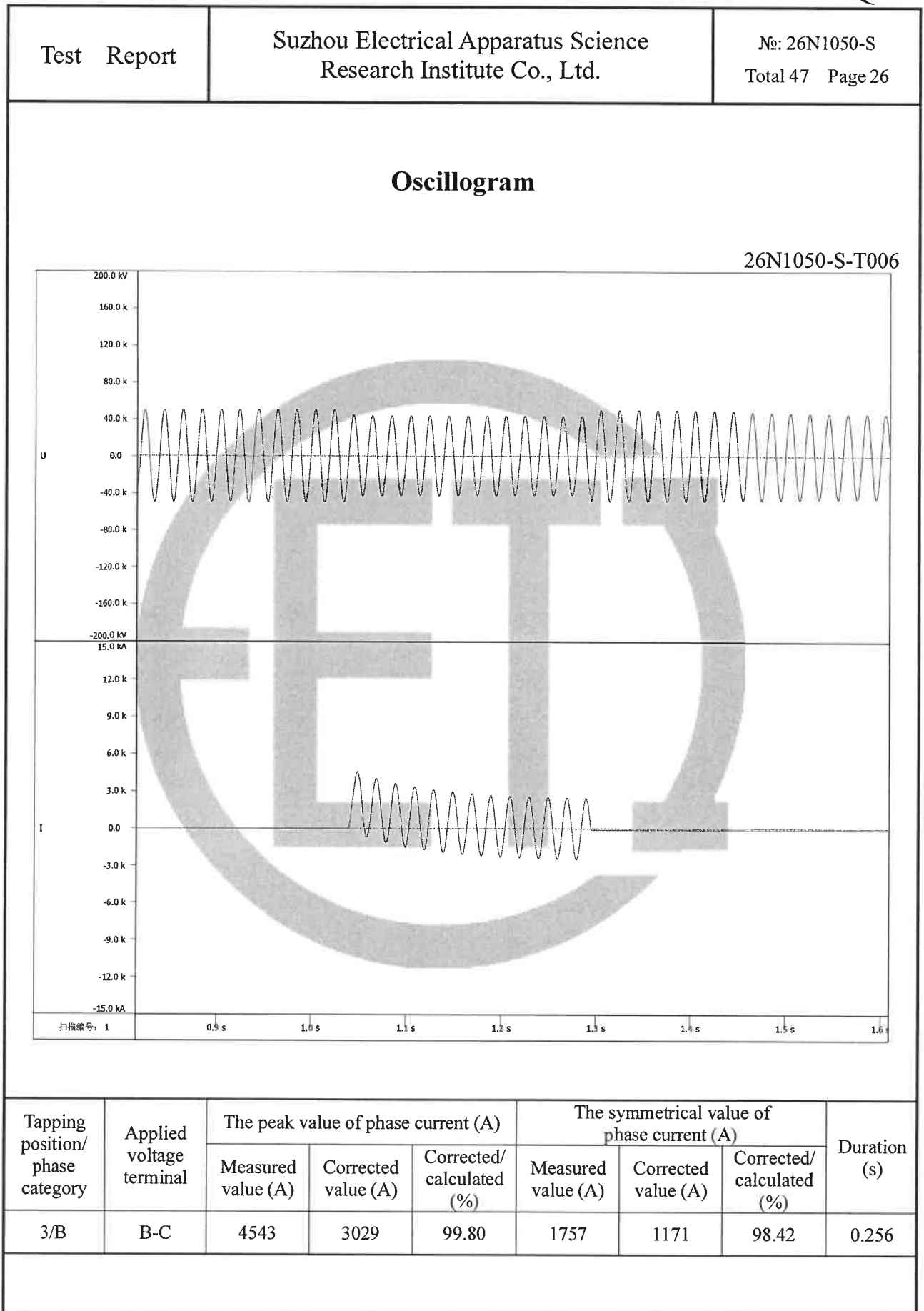
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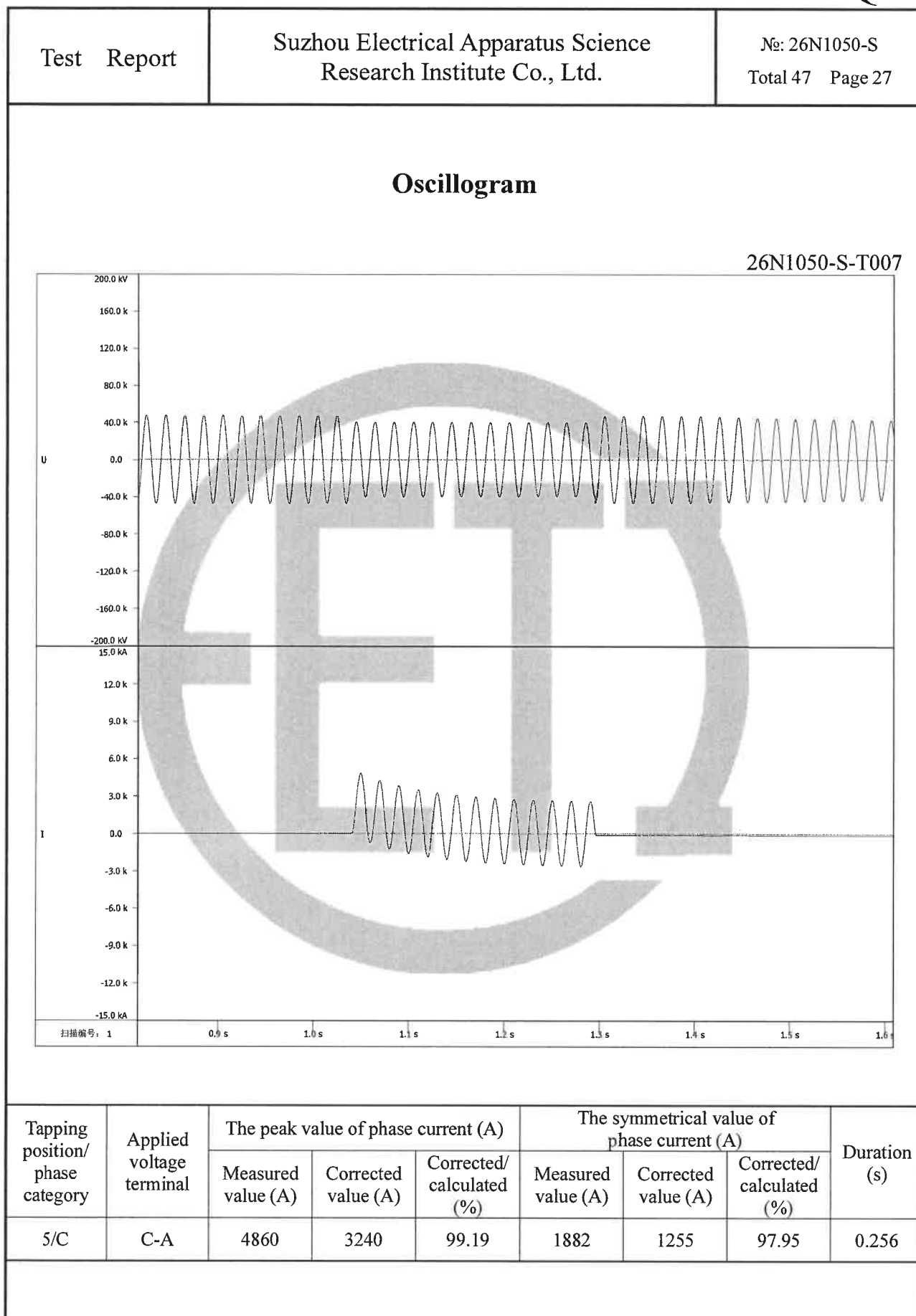


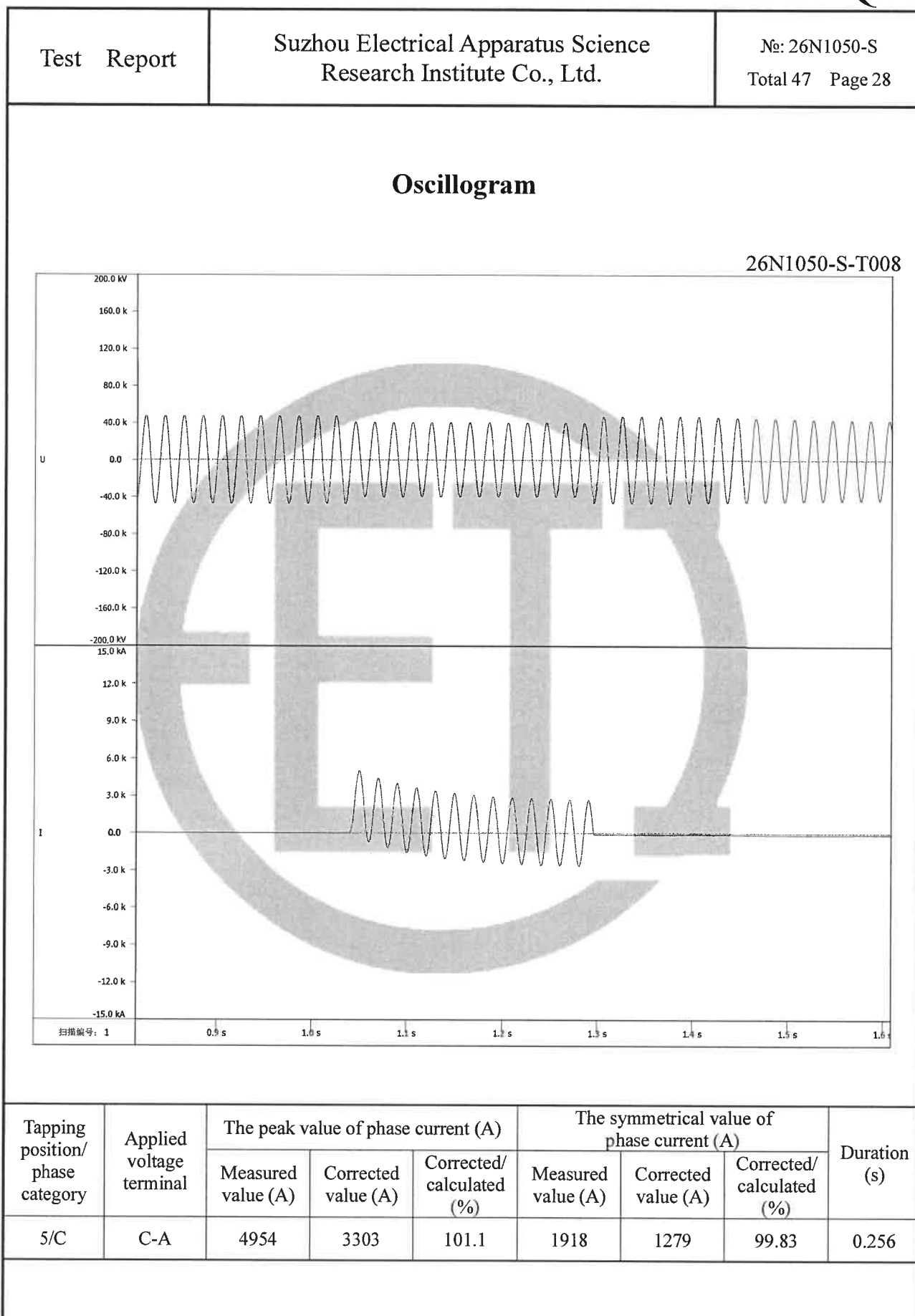
Tapping position/ phase category	Applied voltage terminal	The peak value of phase current (A)			The symmetrical value of phase current (A)			Duration (s)
		Measured value (A)	Corrected value (A)	Corrected/calculated (%)	Measured value (A)	Corrected value (A)	Corrected/calculated (%)	
1/A	A-B	4229	2819	99.91	1633	1089	98.38	0.256

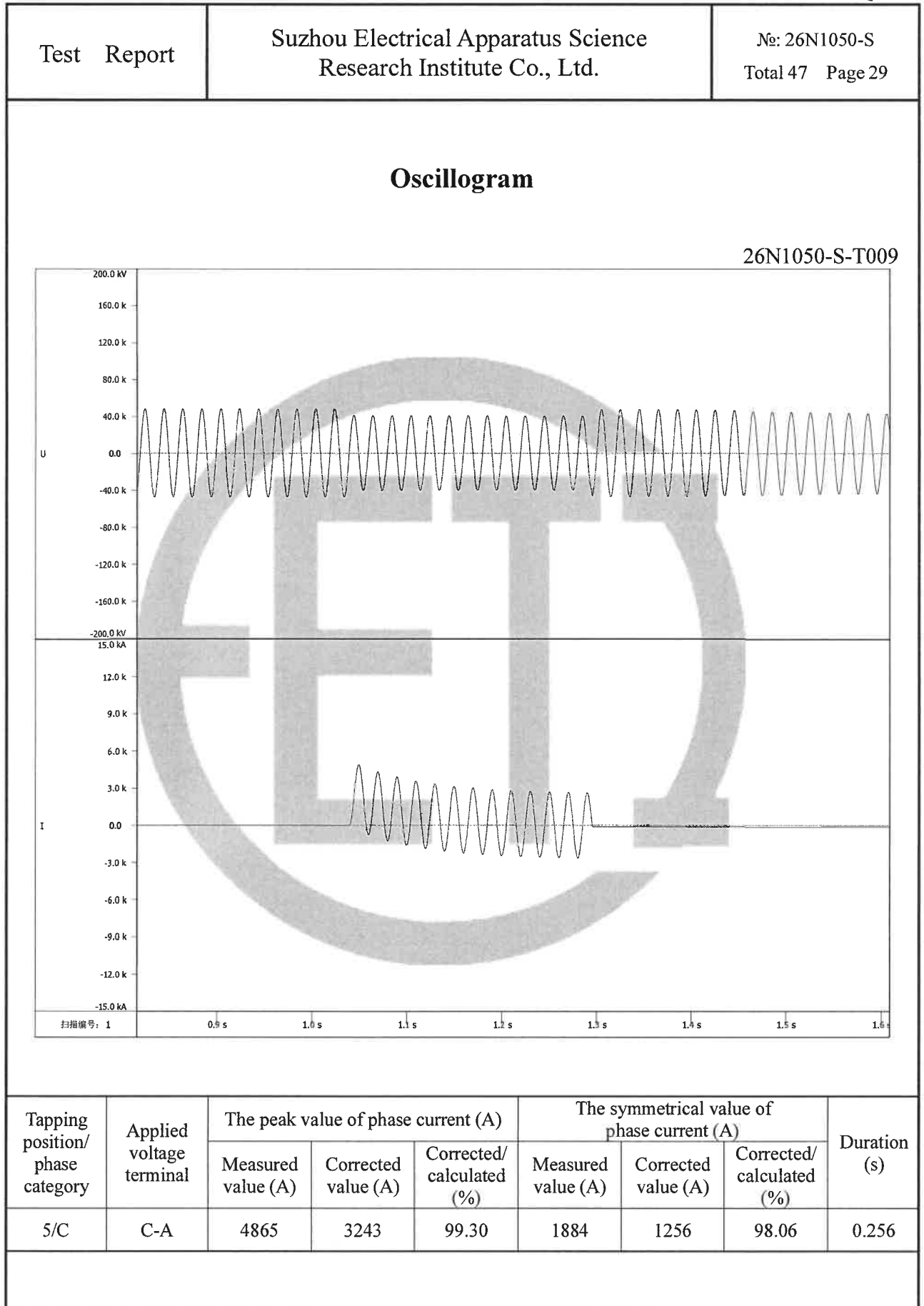












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4.15.4 Routine retests								
4.15.4.1 Measurement of d.c. insulation resistance between each winding to earth and between windings (routine test) Test date: Jun. 08, 2026 Relative humidity: 57%; Ambient temperature: 22.6°C								
Measured part		Measured voltage (kV)			Measured insulation resistance (GΩ)			
HV—LV and earth		5.0			30.9			
LV—HV and earth		5.0			27.6			
HV and LV—earth		5.0			25.3			
Core—earth		2.5			10.1			
4.15.4.2 Measurement of voltage ratio and check of phase displacement (routine test) Test date: Jun. 08, 2026								
HV winding		LV winding		Transformation ratio by calculation	Measured voltage ratio tolerance (%)			Connection symbol
Tapping position	Voltage (kV)	Tapping position	Voltage (kV)		AB/ab	BC/bc	CA/ca	
1	36.750	/	10.5	3.500	0.09	0.06	0.09	Dyn11
2	35.875			3.417	0.03	0.06	0.09	
3	35.000			3.333	-0.06	-0.03	-0.03	
4	34.125			3.250	-0.09	-0.06	-0.09	
5	33.250			3.167	0.06	0.09	0.03	
4.15.4.3 Measurement of winding resistance (routine test) Test date: Jun. 08, 2026 Ambient temperature: 22.6°C; Winding temperature: 22.4°C								
Winding	Tapping position	Measured resistance value (Ω)			Resistance unbalance rate (%)			
		A~B a~b	B~C b~c	C~A c~a				
HV	1	0.3507	0.3501	0.3517	0.46			
	2	0.3422	0.3418	0.3431	0.38			
	3	0.3337	0.3327	0.3346	0.57			
	4	0.3274	0.3265	0.3282	0.52			
	5	0.3210	0.3196	0.3218	0.69			
LV	/	24.332×10^{-3}	24.002×10^{-3}	24.337×10^{-3}	1.38			
		ao: 14.599×10^{-3}	bo: 14.439×10^{-3}	co: 14.603×10^{-3}	1.13			

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4.15.4.4 Applied voltage test (routine test)						Test date: Jun. 08, 2026			
Relative humidity: 57%; Ambient temperature: 22.6°C; Air pressure: 102.1kPa									
Part of applied voltage		Test voltage (kV)		Test duration (s)		Result			
HV—LV and earth		80		60		PASS			
LV—HV and earth		35		60					
4.15.4.5 Induced voltage withstand test (routine test)						Test date: Jun. 08, 2026			
Relative humidity: 57%; Ambient temperature: 22.6°C; Air pressure: 102.1kPa									
Tapping position	Applied voltage (kV)		Induced voltage (kV)		Induced multiple	Frequency (Hz)	Test duration (s)	Result	
	LV		HV						
3	21.0		70.0		2	200	30	PASS	
4.15.4.6 Measurement of no-load loss and current (routine test)						Test date: Jun. 08, 2026			
Applied voltage (kV)			No-load current		No-load loss (kW)				
Average value		r.m.s. value		(A)	(%)	Measured value	Corrected value		
6.061		6.062		1.56	0.23	10.048	10.046		
Remark: the difference between r.m.s. voltage and average voltage is within 3%.									
4.15.4.7 Measurement of short-circuit impedance and load loss (routine test)						Test date: Jun. 08, 2026 Ambient temperature: 22.6°C			
Winding	Tapping position	Applied current I		Measured voltage (kV)	Measured load loss (kW)	Short-circuit impedance (for each phase)		Load loss (kW)	Total loss (kW)
		(A)	I/I _r (%)			HV impedance (Ω)	(%)	Corrected value	Corrected value
						t=145°C I=I _r	t=145°C I=I _r	t=145°C I=I _r	t=145°C I=I _r
HV LV	1	115.04	58.73	2.040	14.005	10.21	9.45	57.430	67.476
	3	123.16	59.73	1.911	14.931	8.96	9.14	59.068	69.114
	5	120.16	55.36	1.622	13.340	7.80	8.81	61.312	71.358
4.15.4.8 Partial discharge measurement						Test date: Jun. 08, 2026			
Three-phase measurement (routine test)									
Frequency (Hz)	Applied voltage		Duration	Partial discharge magnitude (pC)					
	(kV)	Multiple		A	B	C	a	b	c
200	63.00	1.8Ur	30s	/	/	/	/	/	/
	45.50	1.3Ur	3min	<4	<3	<4	<1	<2	<2
Remark: the background noise levels are less than 1pC before and after the test.									

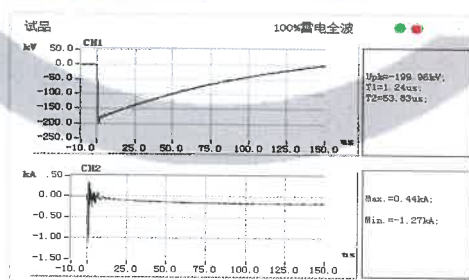
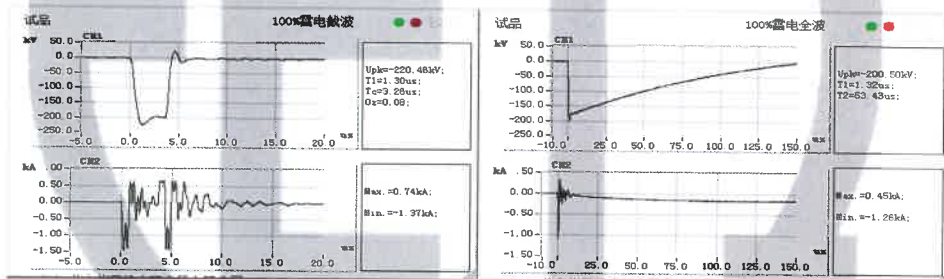
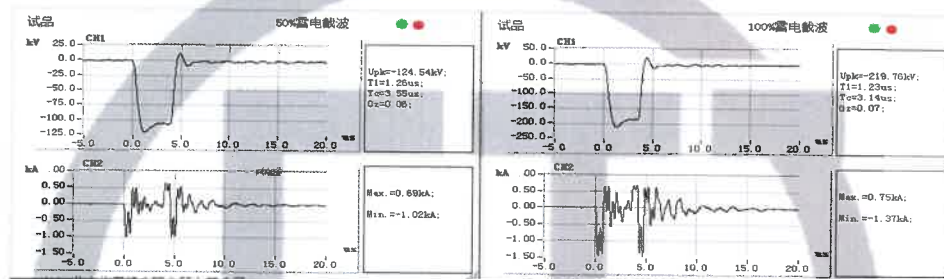
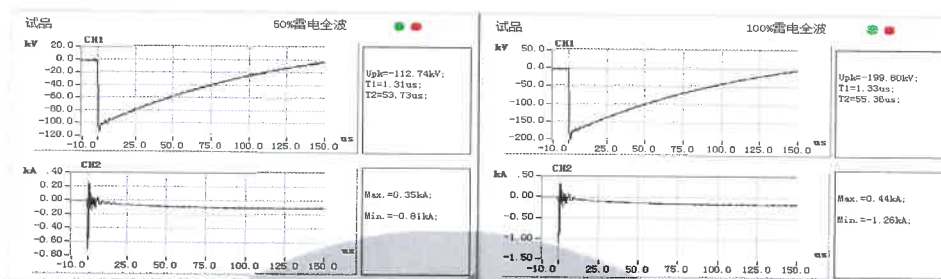
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4.16 Lightning impulse test (type test, commission test)			Test date: Jun. 08, 2026
Atmospheric conditions of test: Relative humidity: 65%; Ambient temperature: 23.4°C; Air pressure: 101.8kPa.			
Test items and voltage			
Withstand terminal	Rated withstand voltage (kV)		Tapping position
	Lightning full wave	Lightning chopped wave	
A, B, C	200	220	1, 3, 5
a, b, c	75	/	/
Test sequence: 35kV winding: One negative reduced level full wave impulse; One negative full level full wave impulse; One negative reduced level chopped wave impulse; Two negative full level chopped wave impulses; Two negative full level full wave impulses. 10kV winding: One negative reduced level full wave impulse; Three negative full level full wave impulses.			
Test records: T1: front time; T2: time to half-value; Tc: time to chopping; Upk: peak voltage. For oscillograms, see P ₃₃₋₃₈ . Voltage ranges of oscillograms are as below:			
Withstand terminal	Full wave (kV)	Chopped wave (kV)	
A, B, C	199.28~201.03	219.72~220.76	
a, b, c	74.36~76.33	/	

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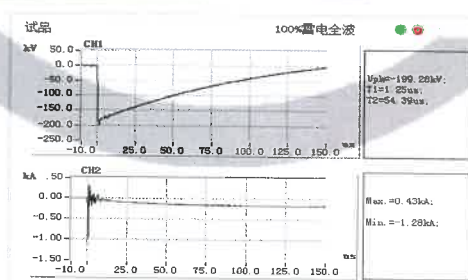
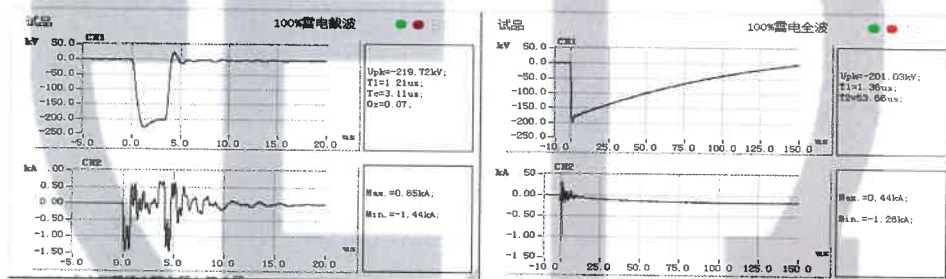
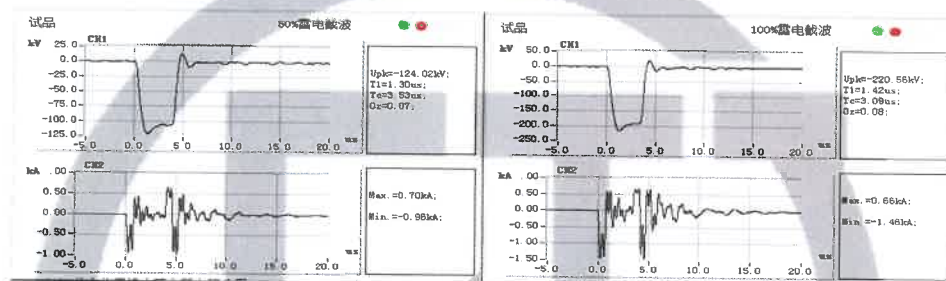
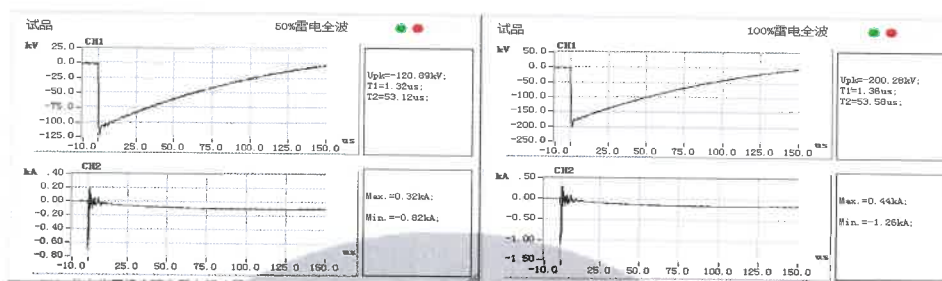
Tested terminal: A Test polarity: negative Channel 1: voltage wave Channel 2: current wave



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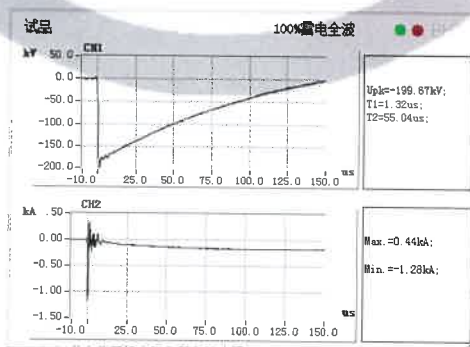
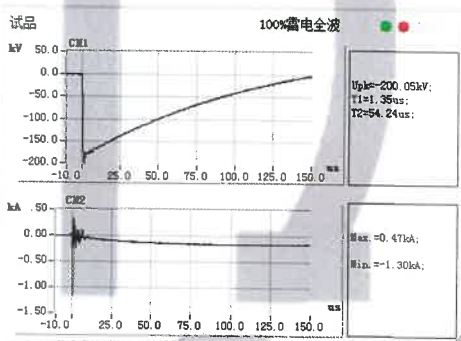
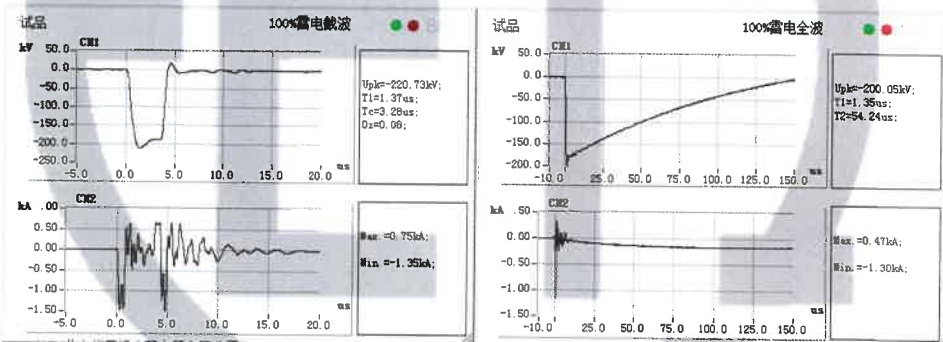
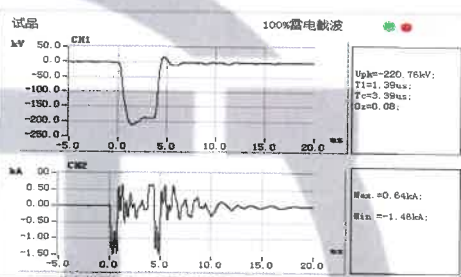
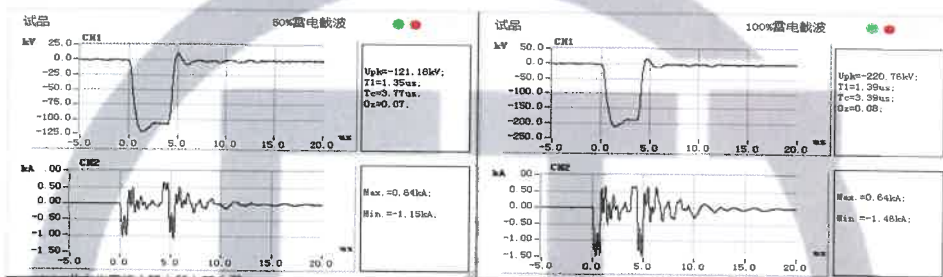
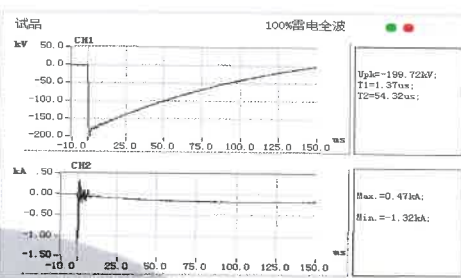
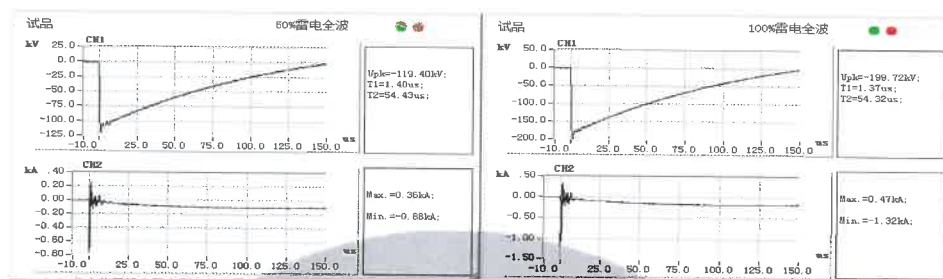
Tested terminal: B Test polarity: negative Channel 1: voltage wave Channel 2: current wave



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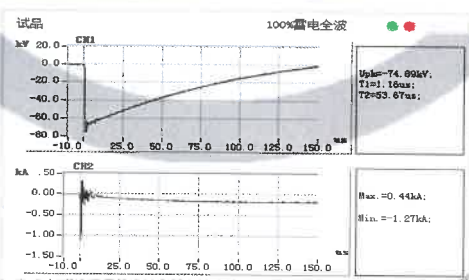
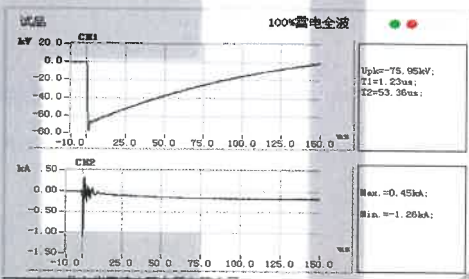
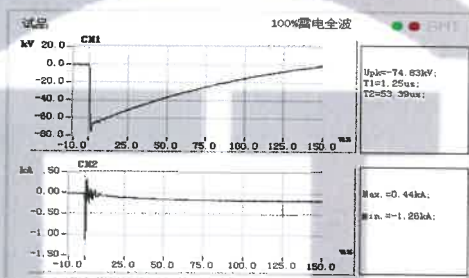
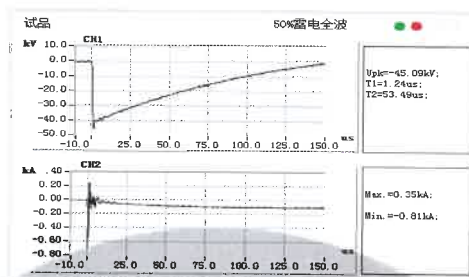
Tested terminal: C Test polarity: negative Channel 1: voltage wave Channel 2: current wave



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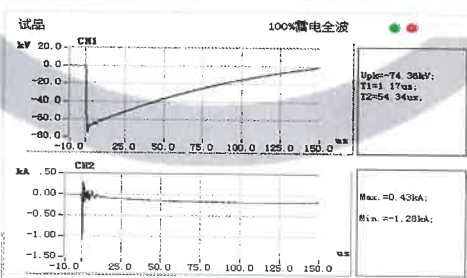
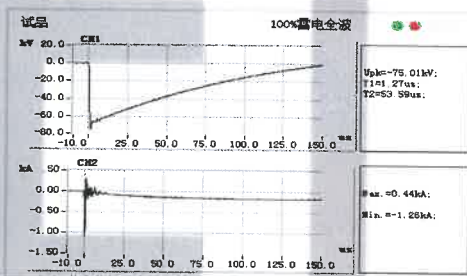
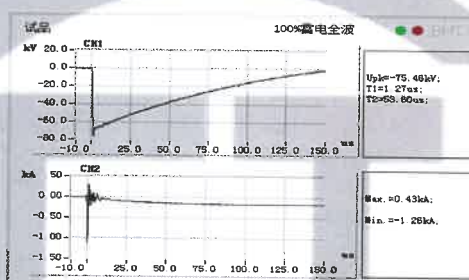
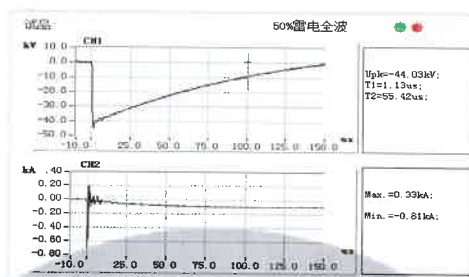
Tested terminal: a Test polarity: negative Channel 1: voltage wave Channel 2: current wave

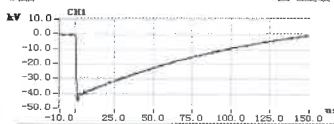
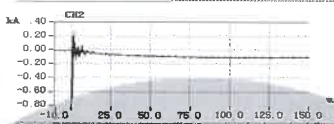
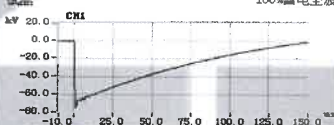
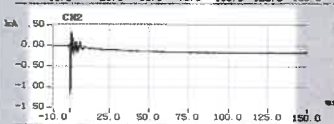
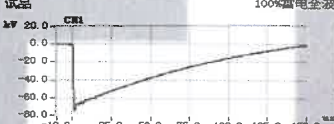
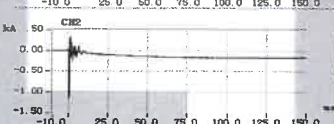
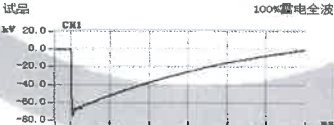
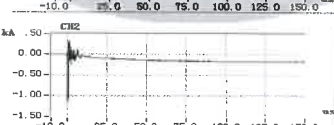


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Tested terminal: b Test polarity: negative Channel 1: voltage wave Channel 2: current wave



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Tested terminal: c Test polarity: negative Channel 1: voltage wave Channel 2: current wave		
试品 50%雷电全波 CH1  U_{pk}=-44.55kV; T₁=1.31us; T₂=54.25us; CH2  I_{max}=-0.36kA; I_{min}=-0.66kA; 试品 100%雷电全波 CH1  U_{pk}=-74.99kV; T₁=1.34us; T₂=54.19us; CH2  I_{max}=-0.47kA; I_{min}=-1.32kA; 试品 100%雷电全波 CH1  U_{pk}=-79.11kV; T₁=1.35us; T₂=54.35us; CH2  I_{max}=-0.47kA; I_{min}=-1.30kA; 试品 100%雷电全波 CH1  U_{pk}=-74.97kV; T₁=1.32us; T₂=54.91us; CH2  I_{max}=-0.44kA; I_{min}=-1.26kA;		

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HV side before short-circuit test:  短路前		
LV side before short-circuit test:  短路前		

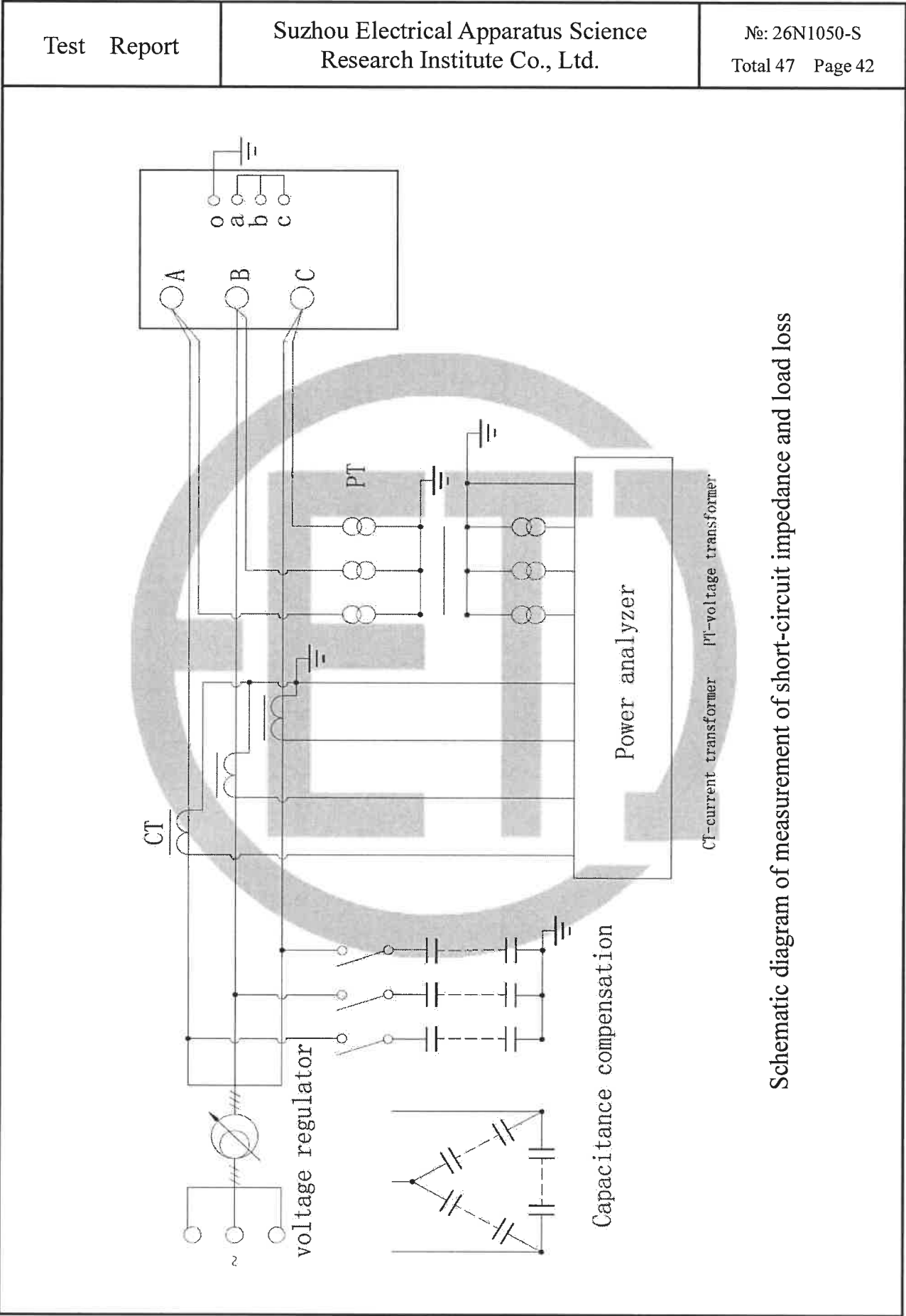
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HV side after short-circuit test:

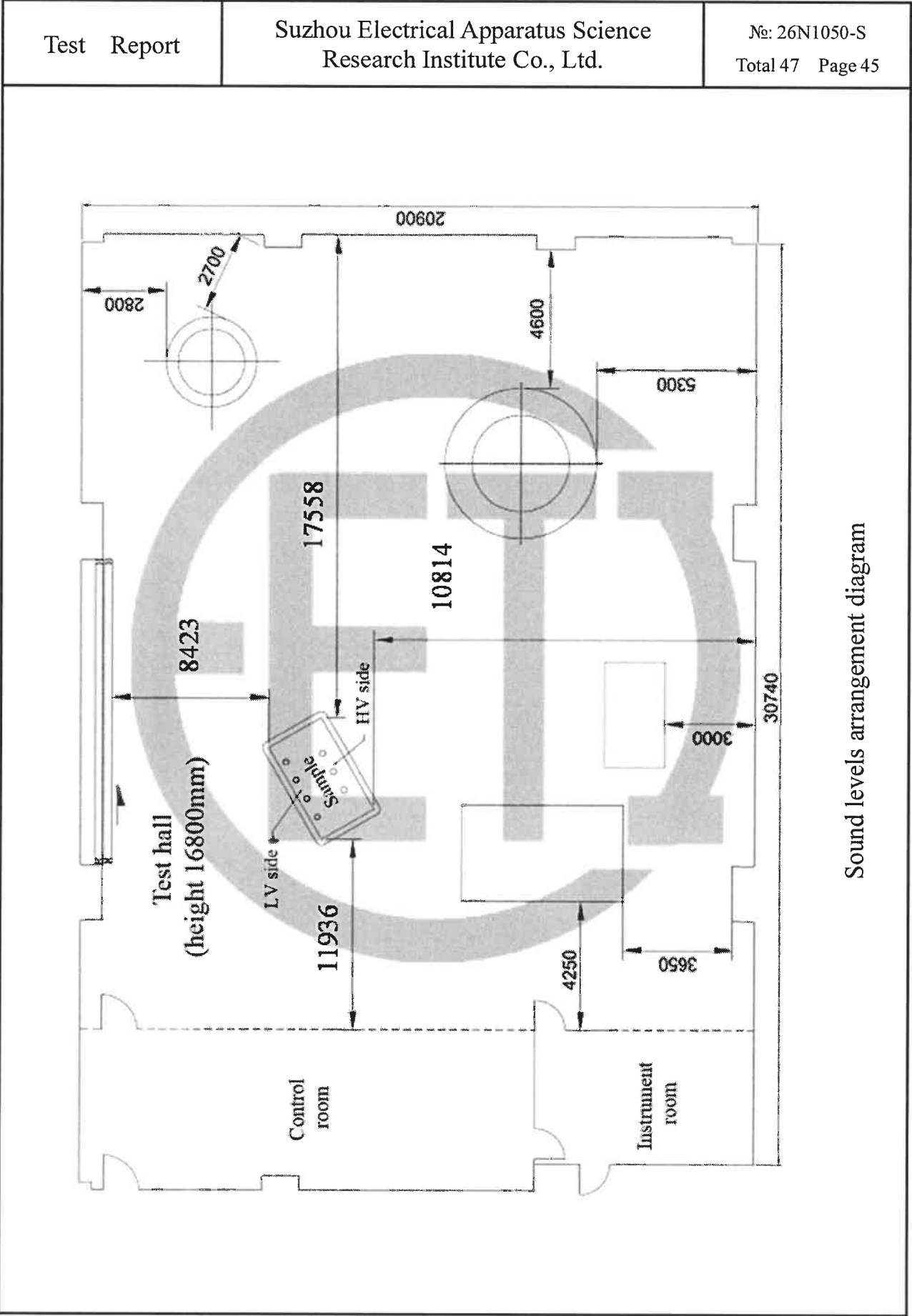


LV side after short-circuit test:





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Legend: - T₁-power supply - V₁-voltmeter - T-testing transformer - R-resistance - A-ammeter - C₂-capacitive divider - V₂-peak value voltmeter Schematic diagram of applied voltage test		



Sound levels arrangement diagram

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Instruments used in the tests						
No	Test item	Name & type of instrument		Number & validity		Accuracy class
1	Measurement of d.c. insulation resistance between each winding to earth and between windings	Digital mega-ohm meter F1550C		ER17-008 2027-01-06		200k~5/10/20/50/ 100GΩ class 5, others class 20
2	Measurement of winding resistance	DC resistance tester JYR(50C)		ER16-101 2026-09-22		0.2%±0.1μΩ
3	Measurement of voltage ratio and check of phase displacement	Transformer ratio tester JYT(A)		R115-042 2027-05-06		AC10V: ≤150±0.1% 150~500±0.3%; AC160V: <2000±0.1% 2000~10000±0.3%; automatic DC supply <1000±0.1% 1000~5000±0.3%
4	Measurement of short-circuit impedance and load loss	Transformer loss test system TMS580		749-1137 2027-03-30		100V~100kV accuracy: 0.12% 1A~2000A accuracy: 0.15%
5	Measurement of no-load loss and current					
6	Measurement of no-load loss and current at 90% and 110% of rated voltage					
7	Applied voltage test	Assemblies equipment of power-frequency pollution YDT-1200/300		745-052 2026-07-21		/
8	Induced voltage withstand test	Transformer loss test system TMS580		749-1137 2027-03-30		100V~100kV accuracy: 0.12% 1A~2000A accuracy: 0.15%
9	Partial discharge measurement	Transformer loss test system TMS580		749-1137 2027-03-30		100V~100kV accuracy: 0.12% 1A~2000A accuracy: 0.15%
		Multi-channel partial discharge tester DDX9121		745-053 2027-03-22		/
10	Temperature-rise test	Transformer loss test system TMS580		749-1137 2027-03-30		100V~100kV accuracy: 0.12% 1A~2000A accuracy: 0.15%
		Data acquisition/switch unit 34970A		TT11-151 2026-07-14		V±5.25%, A±1.5%, T±1°C, Ω±0.81%
		Thermocouple type T		TT33-460/475/476 2026-07-14		/
		DC resistance tester JYR(50C)		ER16-101 2026-09-22		0.2%±0.1μΩ
		DC resistance tester JYR(50C)		ER16-102 2026-09-22		0.2%±0.2μΩ
		Electronic stopwatch PC396		HT15-010 2026-12-23		/

Test Report		Suzhou Electrical Apparatus Science Research Institute Co., Ltd.		№: 26N1050-S Total 47 Page 47	
Instruments used in the tests					
No	Test item	Name & type of instrument	Number & validity		Accuracy class
11	Determination of sound levels	Transformer loss test system TMS580	749-1137	2027-03-30	100V~100kV accuracy: 0.12% 1A~2000A accuracy: 0.15%
		Sound level calibrator 4231	SP01-007	2027-02-03	Class 1
		Sound level meter 2270	SP01-013	2027-04-26	Class 1
		Steel tapeline 10m	LS05-063	2026-06-11	/
12	Measurement of zero-sequence impedances on three-phase transformers	Transformer loss test system TMS580	749-1137	2027-03-30	100V~100kV accuracy: 0.12% 1A~2000A accuracy: 0.15%
13	Measurement of the harmonics of the no-load current				
14	Short-circuit withstand test	Data collector GEN17tA	EI56-025	2026-12-09	Class 1.5
		LCR automatic tester UC2860XD	ER16-076	2027-03-15	±0.05%
		Resistance-capacitance mixed voltage divider TBF-40.5	EV35-011	2027-01-04	Class 0.5
		Resistance-capacitance mixed voltage divider TBF-40.5	EV35-017	2027-01-05	Class 0.5
		Resistance-capacitance mixed voltage divider TBF-40.5	EV35-018	2027-01-06	Class 0.5
		Current transformer LVBT-35	EH166-019	2026-08-07	Class 0.2
		Current transformer LVBT-35	EH166-020	2026-08-07	Class 0.2
		Current transformer LVBT-35	EH166-014	2026-08-07	Class 0.2
		Standard current diverter FL-10/10K	EI31-123	2028-04-24	Class 0.1
		Standard current diverter FL-10/10K	EI31-126	2026-07-12	Class 0.1
		Standard current diverter FL-10/10K	EI31-121	2028-04-24	Class 0.1
15	Lightning impulse test	Assemblies testing equipment of impulse voltage generator CJDY-1050kV/59kJ	750-009	2026-06-24	/
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3. The report is invalid without signatures of persons for drawing up, proof-reading, reviewing and approval;
4. The report is valid only for the inspected and tested samples.
5. The client shall be responsible for the information provided by the client and the authenticity of which cannot be verified by our laboratory.

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2. 如对本报告无异议, 请于收到报告之日起一个月内取回样品, 生产单位取样品时应携带取样凭证, 方可领回样品。逾期不取者, 则由本单位自行处理。

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本试验报告共 47 页	其中图 26 幅	照片 3 张
The test report is in total 47 pages	including 26 figures	and 3 photos

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