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检测
TESTING
CNAS L1184

检 验 报 告

TEST REPORT

产品名称 Product Description	Oil-immersed Power Transformer
型号 Model/Specification	S20-M-800-0.4/11-NX2
委托单位 Client	HENAN TENGYI ELECTRIC CO.,LTD
检验类别 Test Type	Type Test

青岛市产品质量检验研究院
Qingdao Product Quality Testing Research Institute
国家电子电器安全质量检验检测中心
National Electronics and Electric Appliance Safety Quality Inspection and Testing Center

Qingdao Product Quality Testing Research Institute
(National Electronics and Electric Appliance Safety Quality Inspection and Testing Center)

Test Report

*Name of sample	Oil-immersed Power Transformer	Test Type	Type test
*Type of sample	S20-M-800-0.4/11-NX2	Original number	202609357
Number of sample	1 set	Date of sample received	2026-10-21
Sample condition	Intact	Date of test completed	2026-10-26
*Client:	HENAN TENGYI ELECTRIC CO.,LTD		
*Address of client:	Room 1306, 13th Floor, Unit 1, Building 15, China Resources Beilonghu Ruifu East of Longyuan West 1st Street, South of Longhu Outer North Road Zhengdong District, Zhengzhou Area, Henan Pilot Free Trade Zone Henan Province, P.R.China		
*Manufacturer:	HENAN TENGYI ELECTRIC CO.,LTD		
*Address of Manufacturer:	No. 12 Shanhai Road, Qinghu Subdistrict, Jiangshan City, Quzhou City, Zhejiang Province, China		

Test items:Routine Test,Type Test, Leak testing with pressure for liquid-immersed transformers,Presssure deflection test,Measurement of zero-sequence impedances on three-phase transformer,Measurement of the harmonics of the no-load current,Short-circuit withstand test.

Test standards:
IEC 60076-1:2011 *Power transformers-Part 1: General*
IEC 60076-2:2011 *Power transformers-Part 2: Temperature rise for liquid-immersed transformers*
IEC 60076-3:2018 *Power transformers-Part 3: Insulation levels, dielectric tests and external clearances in air*
IEC 60076-5:2006 *Power transformers-Part 5:Ability to withstand short circuit*
IEC 60076-10:2016 *Power transformers-Part 10:Determination of sound levels*
GB/T 1094.2-2013 *Power transformers-Part 2:Temperature rise for liquid-immersed transformers*
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 6451-2023 *Specification and technical requirements for oil-immersed power transformers*
GB/T 7595-2017 *Quality of transformers oils in service*
GB 20052-2024*Minimum allowable values of energy efficiency and the energy efficiency grades for power transformers*

Test conclusion: The sample was tested and the tested items met IEC 60076-1:2011,IEC 60076-2:2011,IEC 60076-3:2018,IEC 60076-5:2006,IEC 60076-10:2016,GB/T 1094.2-2013,GB/T 1094.3-2017,GB/T 1094.5-2008,GB/T 1094.10-2022,GB/T 6451-2023,GB/T 7595-2017,GB 20052-2024.

Complied by: 陈 剑 Signature: 陈剑 Date: 2026-10-27

Checked by : 侯成志 Signature: 侯成志 Date: 2026-10-28

Appreved by: 徐 峰 Signature: 徐峰 Date: 2026-10-28

Qingdao Product Quality Testing Research Institute
(National Electronics and Electric Appliance Safety Quality Inspection and Testing Center)
2026-10-28

Note	The information marked with * is provided by the client.The conclusion is valid only for the tested sample. All tested items of the sample comply with the inspection basis, with Energy Efficiency Class 2.

Sample Description and Explanation

1.Sample parameters

Type of sample:	S20-M-800-0.4/11-NX2	
Rated power:	800kVA	
Rated voltage:	11kV/0.4kV	
Rated current:	42.0A/1154.7A	
Rated frequency:	50Hz	
Number of phases:	3	
Tapping ranges:	(11±2×2.5%)kV /0.4kV	
connecting symbol:	Dyn11	
Cooling method:	ONAN	
Thermal class of insulation:	A	
Insulation level:	h.v	LI/AC 75/35 kV
	l.v.	AC 5 kV

2.Test standards

IEC 60076-1:2011 *Power transformers-Part 1: General*

IEC 60076-2:2011 *Power transformers-Part 2: Temperature rise for liquid-immersed transformers*

IEC 60076-3:2018 *Power transformers-Part 3: Insulation levels, dielectric tests and external clearances in air*

IEC 60076-5:2006 *Power transformers-Part 5:Ability to withstand short circuit*

IEC 60076-10:2016 *Power transformers-Part 10:Determination of sound levels*

GB/T 1094.2-2013 *Power transformers-Temperature rise for liquid-immersed transformers*

GB/T 1094.3-2017 *Power transformers-Insulation levels, dielectric tests and external clearances in air*

GB/T 1094.5-2008 *Power transformers-Ability to withstand short circuit*

GB/T 1094.10-2022 *Power transformers-Determination of sound levels*

GB/T 6451-2023 *Specification and technical requirements for oil-immersed power transformers*

GB/T 7595-2017 *Quality of transformers oils in service*

GB 20052-2024 *Minimum allowable values of energy efficiency and the energy efficiency grades for power transformers*

3.Sample description

The power transformer is for outdoor use,the structure of the coil is non-circular concentric type coil.

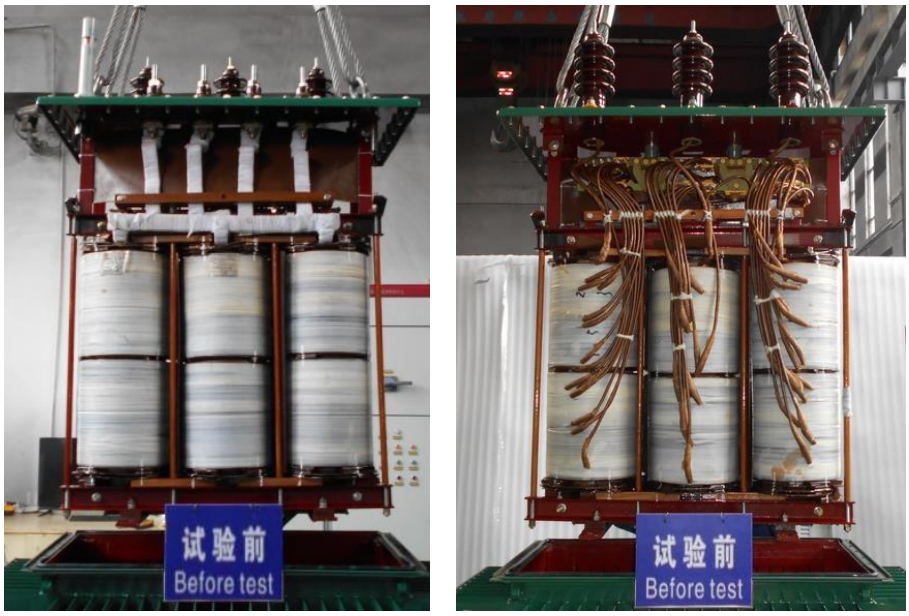
Photos of the sample

Photos of the sample:



Photos of the sample

Photos of the sample:

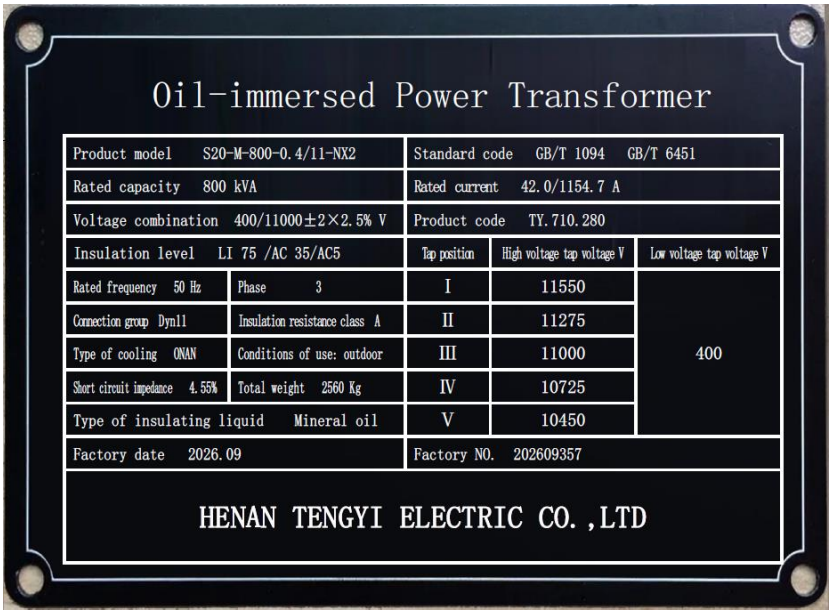


Before short-circuit test



After short-circuit test

Photos of the nameplate



Nameplate

Summary Table of Test Items

NO.	Test items	Specified values	Measured value		Results
		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	Providing insulation resistance value（GΩ）	H—L.E: 48.6 L—H.E: 21.4 H.L—E: 24.6	H—L.E: 38.5 L—H.E: 14.8 H.L—E: 16.0	Data only
2	Measurement of voltage ratio and check of phase displacement	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	-0.075%～+0.071% Dyn11	-0.084%～+0.068% Dyn11	Pass
3	Measurement of winding resistance	Maximum resistance unbalance rate Line resistance：≤2%	HV(line)：0.33% LV(line)：0.89%	HV(line)：0.37% LV(line)：0.92%	Pass
4	Applied voltage test	HV： 35kV 60s LV： 5kV 60s	35kV 60s 5kV 60s	35kV 60s 5kV 60s	Pass
5	Induced voltage test	Applied voltage（kV）： 2Ur Duration（s）： 120(f_n/f) Frequency（Hz）： ＞50	0.8 40 150	0.8 40 150	Pass
6	Measurement of no-load loss and current	I_0(%)： ≤0.48（1+30%） P_0(kW)： ≤0.630	0.171 0.613	0.179 0.625	Pass
7	Measurement of short-circuit impedance and load loss	t: 75℃ Z(%) 4.5（1±10%） P_k(kW) ≤6.000 P_{Total}(kW) ≤6.630	4.55 5.842 6.455	4.58 5.928 6.553	Pass
8	Insulating liquid test	Breakdown voltage(kV)： ≥40kV Dielectric loss factor tanδ（90℃）≤1.0%	48.8 0.14%		Pass
9	Leak testing with pressure for liquid-immersed transformers	Applied pressure（kPa）：15 Duration（h）：12 No oil leakage or damage	15.0 12 Pass		Pass
10	Pressure deflection test	Applied pressure（kPa）：20 Duration（min）：5 No damage	20.0 5 Pass		Pass
11	Measurement of zero-sequence impedances on three-phase transformers	Providing zero-sequence impedances values（mΩ）	9.11		Data only

NO.	Test items	Specified values Standards (commission requirements)	Measured value	Results
12	Temperature-rise test	Top oil temperature-rise limits（K）≤60 Winding temperature-rise limits（K）≤65	Top oil temperature-rise: 42.1 HV winding temperature-rise: 57.2 LV winding temperature-rise: 59.0	Pass
13	Determination of sound levels	Sound pressure level $\overline{L_{PA}}$dB(A): Sound power level L_{WA}dB(A):≤60	39.9 52.6	Pass
14	Lightning impulse test	Full wave（kV）:75(1±3%) Chopped wave（kV）:85(1±3%)	-75.82～-74.45 -86.15～-85.76	Pass
15	Measurement of no-load loss and current at 90% and 110% of rated voltage	90%Ur No-load Current(%):Actual measured value 90%Ur No-load loss(kw): Correction value 110%Ur No-load Current (%):Actual measured value 110%Ur No-load loss (kw): Correction value	0.149 0.478 0.209 0.778	Data only
16	Measurement of the harmonics of the no-load current	Providing harmonics of the no-load current of each phase	Harmonics of the no-load current of I_1～I_{19}	Data only
17	Short duration overload capacity test	Test current（A）：1.5Ir Duration（h）：2 Pressure protective device was not operated. Without leakage phenomenon. Permitted transformation range of the radiator（mm）：≤6 Tank enclosure（K）：≤85 Bushing（K）：≤85	63.0 2 Without leakage ＜1 61.4 47.5	Pass
18	Short-circuit withstand test	Test times of each phase: 3 times Duration (s): 0.5±10% The test wave shall be normal. The reactance tolerance of phase before and after the test is less than 7.5% The outside and out-of-tank inspection does not reveal any obvious defects. Routine retests shall be passed after short-circuit test.	3 times 0.507～0.510 Without abnormity The maximum reactance tolerance of phase is 2.71% Without any obvious defects Routine retests are passed.	Pass

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Test instructions:
Measurement of d.c. insulation resistance between each winding to earth and between windings according to IEC 60076-1:2011；
Measurement of voltage ratio and check of phase displacement according to IEC 60076-1:2011；
Measurement of winding resistance according to IEC 60076-1:2011；
Applied voltage test according to GB/T 1094.3-2017,The test item was completed at the inspection address : Hongdong Community, Wangzhuang Sub-district, Laoshan District, Qingdao City;
Induced voltage test according to GB/T 1094.3-2017,The test item was completed at the inspection address : Hongdong Community, Wangzhuang Sub-district, Laoshan District, Qingdao City;
Measurement of no-load loss and current according to IEC 60076-1:2011;
Measurement of short-circuit impedance and load loss according to IEC 60076-1:2011;
Insulating liquid test according to GB/T6451-2023,The test item was completed at the inspection address : Hongdong Community, Wangzhuang Sub-district, Laoshan District, Qingdao City;
Leak testing with pressure for liquid-immersed transformers according to GB/T6451-2023,The test item was completed at the inspection address (4): No. 6 Hongxiang Second Road, Chengyang District, Qingdao;
Pressure deflection test according to GB/T6451-2023,The test item was completed at the inspection address : Hongdong Community, Wangzhuang Sub-district, Laoshan District, Qingdao City;
Measurement of zero-sequence impedances on three-phase transformers according to IEC 60076-1:2011；
Temperature-rise test according to GB/T 1094.2-2013；
Determination of sound levels according to GB/T 1094.10-2022,The test item was completed at the inspection address (4): No. 6 Hongxiang Second Road, Chengyang District, Qingdao;
Lightning impulse test according to GB/T 1094.3-2017,The test item was completed at the inspection address : Hongdong Community, Wangzhuang Sub-district, Laoshan District, Qingdao City;
Measurement of no-load loss and current at 90% and 110% of rated voltage according to IEC 60076-1:2011;
Measurement of the harmonics of the no-load current according to GB 17625.1-2017;
Short duration overload capacity test according to GB/T 6451-2023;
Short-circuit withstand test according to GB/T 1094.5-2008.

<table>
<tr><td colspan="10">4.Test items and requirements</td><td>Measurement or observation results</td><td>Results</td></tr>
<tr><td>4.1</td><td colspan="10">Measurement of d.c. insulation resistance between each winding to earth and between windings:
Ambient temperature（℃）:
Relative humidity（%）:
HV—LV and earth（H—L.E）(GΩ)
LV—HV and earth（L—H.E）(GΩ)
HV and LV—earth（H.L—E）(GΩ)</td><td>

22.6℃
56.1%
48.6
21.4
24.6</td><td>Data only</td></tr>
<tr><td rowspan="8">4.2</td><td colspan="10">Measurement of voltage ratio and check of phase displacement:</td><td></td><td rowspan="8">Pass</td></tr>
<tr><td colspan="2">HV winding</td><td colspan="2">LV winding</td><td rowspan="2">Transformer ratio by calculation</td><td colspan="4">Measured voltage ratio tolerance(%)</td></tr>
<tr><td>Tapping position</td><td>Voltage (V)</td><td>Tapping position</td><td>Voltage (V)</td><td>AB/ab</td><td colspan="2">BC/bc</td><td>CA/ca</td></tr>
<tr><td>1</td><td>11550</td><td rowspan="5">/</td><td rowspan="5">400</td><td>28.88</td><td>-0.071</td><td colspan="2">-0.071</td><td>-0.075</td></tr>
<tr><td>2</td><td>11275</td><td>28.19</td><td>+0.067</td><td colspan="2">+0.071</td><td>+0.066</td></tr>
<tr><td>3</td><td>11000</td><td>27.50</td><td>+0.061</td><td colspan="2">+0.054</td><td>+0.062</td></tr>
<tr><td>4</td><td>10725</td><td>26.81</td><td>-0.064</td><td colspan="2">-0.068</td><td>-0.071</td></tr>
<tr><td>5</td><td>10450</td><td>26.13</td><td>-0.045</td><td colspan="2">-0.048</td><td>-0.049</td></tr>
<tr><td colspan="5">Connection symbol</td><td colspan="4">Dyn11</td></tr>
<tr><td rowspan="9">4.3</td><td colspan="10">Measurement of winding resistance:</td><td></td><td rowspan="9">Pass</td></tr>
<tr><td colspan="10">Ambient temperature（℃）:</td><td>22.6℃</td></tr>
<tr><td rowspan="2">Winding</td><td rowspan="2">Tapping position</td><td colspan="3">Measured resistance values</td><td colspan="4" rowspan="2">Resistance unbalance rate（%）</td></tr>
<tr><td>AB(mΩ)
ab(mΩ)</td><td>BC(mΩ)
bc(mΩ)</td><td>CA(mΩ)
ca(mΩ)</td></tr>
<tr><td rowspan="5">HV</td><td>1</td><td>943.42</td><td>943.45</td><td>945.95</td><td colspan="4">0.27</td></tr>
<tr><td>2</td><td>920.76</td><td>920.78</td><td>923.55</td><td colspan="4">0.30</td></tr>
<tr><td>3</td><td>885.07</td><td>885.36</td><td>887.98</td><td colspan="4">0.33</td></tr>
<tr><td>4</td><td>860.89</td><td>861.35</td><td>863.37</td><td colspan="4">0.29</td></tr>
<tr><td>5</td><td>830.28</td><td>830.40</td><td>832.58</td><td colspan="4">0.28</td></tr>
<tr><td>LV</td><td>/</td><td>1.0507</td><td>1.0437</td><td>1.0530</td><td colspan="4">0.89</td></tr>
<tr><td>4.4</td><td colspan="10">Applied voltage test:
Ambient temperature（℃）:
Relative humidity（%）:
Air pressure（kPa）:
Altitude（m）:
Test duration（s）: 60
Applied voltage parts:
1）HV—LV and earth: 35kV
2）LV—HV and earth: 5kV
No sudden drop of test voltage shall occur.</td><td>
22.6℃
56.1%
101.6kPa
15m
60s

35kV
5kV
Pass</td><td>Pass</td></tr>
<tr><td>4.5</td><td colspan="10">Induced voltage withstand test
Ambient temperature（℃）:
Relative humidity（%）:
Air pressure（kPa）:
Tapping position
Applied voltage（V）
Test duration（s）: 40
Frequency（Hz）: 150
No sudden drop of test voltage shall occur.</td><td>
22.6℃
56.1%
101.6kPa
3
800
40
150
Pass</td><td>Pass</td></tr>
</table>

4.Test items and requirements		Measurement or observation results	Results
4.6	Measurement of no-load loss and current:		Pass
	Applied voltage（V） Average value:	399.8	
	r.m.s. value:	399.5	
	No-load current （A）:	1.98	
	（%）:	0.171	
	No-load loss（kW） Measured value:	0.613	
	Corrected value:	0.613	
4.7	Measurement of short-circuit impedance and load loss:		Pass
	Ambient temperature: （℃）	22.6℃	
	Tapping position	1 3 5	
	Applied current I （A）	24.02 25.05 26.62	
	I/Ir（%）	60.1 59.7 60.2	
	Measured voltage（V）:	319.8 297.2 280.7	
	Short-circuit impedance(%)(t=75℃):	4.63 4.55 4.48	
	Load loss Corrected value(t=75℃ I=Ir)(kW):	5.644 5.842 6.074	
	Total loss Corrected value(t=75℃ I=Ir)(kW):	6.257 6.455 6.687	
	The load loss and total loss values of the ultimate split connection are the measured data and shall not be subject to any judgment.		
4.8	Insulating liquid test:		Pass
	Ambient temperature（℃）	22.6℃	
	Relative humidity（%）	56.1%	
	Air pressure（kPa）	101.6kPa	
	Breakdown voltage（kV）: ≥40	Times / Breakdown voltage（kV） 1 48.1 2 49.6 3 48.3 4 47.0 5 48.6 6 51.5	
	Average breakdown voltage（kV）	48.8	
	tanδ（90℃）≤1.0%	0.14%	
4.9	Leak testing with pressure for liquid-immersed transformers:		Pass
	Ambient temperature（℃）	16.3℃	
	Relative humidity（%）	47.0%	
	Air pressure（kPa）	102.2kPa	
	Applied pressure（kPa）:	15.0	
	Duration（h）:	12	
	No oil leakage or damage	No oil leakage or damage	
4.10	Pressure deflection test:		Pass
	Ambient temperature（℃）	16.3℃	
	Relative humidity（%）	47.0%	
	Air pressure（kPa）	102.2kPa	
	Applied pressure（kPa）:	20.0	
	Duration（min）:	5	
	No damage	No damage	

4.Test items and requirements			Measurement or observation results	Results
4.11	Measurement of zero-sequence impedances on three-phase transformers:			Data only
	Ambient temperature（℃）		22.6℃	
	Relative humidity（%）		56.1%	
	Air pressure（kPa）		101.6kPa	
	Connection symbol:		Dyn11	
	Power supply terminal:		abc-n	
	Open-circuit terminal:		ABC	
	Applied voltage（V）:		1.0300	
	Applied current（A）:		339.2	
	impedance（mΩ/phase）		9.11	
4.12	Temperature-rise test:			Pass
	Tapping position:		3	
	Ambient temperature of Total loss（℃）:		24.2	
	Ambient temperature of Measurement of cold resistance（℃）:		22.6	
	Total loss injection（kW）:		6.468	
	Applied current（A）:		42.0	
	Cold resistance（mΩ）:	HV	885.07	
		LV	1.0507	
	Hot resistance（mΩ）:	HV	1070.7	
		LV	1.2783	
	Average winding temperature（℃）:	HV	76.6	
		LV	78.4	
	Top oil temperature-rise（K）: ≤60		42.1	
	HV Winding temperature-rise（K）: ≤65		57.2	
	LV Winding temperature-rise（K）: ≤65		59.0	
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4.Test items and requirements		Measurement or observation results	Results
4.13	Determination of sound levels:		Pass
	Rough estimation of the load current sound power level:		
	$L_{WA.IN} \approx 39 + 18\lg\frac{Sr}{S_p}$	37.3dB(A)	
	$L_{WA.IN}$——The A-weighted sound power level of a transformer at rated current, rated frequency, and short-circuit impedance; Unit in dB (A)		
	Sr——Rated capacity	0.8MVA	
	Sp——Benchmark capacity，1MVA		
	Measurement of sound pressure level and calculation of sound power level		
	Voltage of LV winding（V）:	400	
	Frequency（Hz）:	50	
	Tapping position:	3	
	The number of measured points:	8	
	The height of measured point（m）:	0.62	
	The distance between measured points（m）:	1.0	
	The total area of the surface of the test room Sv（m^2）:	880	
	The average acoustic absorption coefficient α:	0.2	
	The amount of acoustic A（m^2）:	176	
	Distance from the principal radiating surface（m）:	1.0	
	The area of the measurement surface（m^2）:	18.74	
	Environmental correction K（dB）:	1.54	
	Device cooling status:	ONAN	
	Average noise value of transformer$\overline{L_{PAO}}$	42.1	
	A weighted sound pressure level $\overline{L_{PA}}$（dB(A)）:	39.9	
	A weighted sound power level L_{WA}(dB(A)):	52.6	
	Average of background noise Before the test（dB(A)）:	33.4	
	Average of background noise After the test（dB(A)）:	33.1	
	$\overline{L_{bgA}}$: the lower of the two calculated average A weighted background noise pressure level	33.1	

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4.Test items and requirements			Measurement or observation results			Results
4.14	Lightning impulse test					Pass
	Ambient temperature（℃）：		22.6℃			
	Relative humidity（%）：		56.1%			
	Air pressure（kPa）：		101.6kPa			
	Altitude（m）：		15			
	Tapping position：		3			
	Withstand terminals：		ABC			
	Full wave（kV）：75（1±3%）	A	-75.82	-74.45	-75.20	
		B	-74.60	-75.47	-75.27	
		C	-74.54	-75.41	-75.28	
	Chopped wave（kV）：85（1±3%）	A	-86.15		-85.90	
		B	-85.76		-85.98	
		C	-85.87		-86.00	
	Test sequence： One 50% to 70% full voltage negative full wave reference impulse One negative full wave impulse with 100% full voltage One negative polarity chopped wave impulse of 50% to 70% full voltage Two negative polarity chopped wave at 100% full voltage Two negative full wave surges at 100% full voltage					
4.15	Measurement of no-load loss and current at 90% and 110% of rated voltage					Data only
	Voltage：		90%Ur		110% Ur	
	Applied voltage（V）	Average value：	359.3		438.1	
		r.m.s. value：	359.3		438.6	
	No-load current	（A）：	1.72		2.41	
		（%）：	0.149		0.209	
	No-load loss（kW）	Measured value：	0.478		0.779	
		Corrected value：	0.478		0.778	

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4.Test items and requirements					Measurement or observation results		Results
4.16	Measurement of the harmonics of the no-load current						Data only
	NO.	CH-A THD(%)=22.22		CH-BTHD(%)=21.01		CH-C THD(%)=21.07	
		In(A)	In/Il(%)	In(A)	In/Il(%)	In(A)	In/Il(%)
	01	2.08	100.00	1.60	100.00	1.98	100.00
	02	0.02	0.73	0.01	0.91	0.02	0.95
	03	0.29	14.05	0.20	12.76	0.16	8.00
	04	0.01	0.32	0.00	0.24	0.00	0.23
	05	0.26	12.67	0.24	15.21	0.33	16.81
	06	0.00	0.17	0.00	0.18	0.01	0.27
	07	0.24	11.42	0.10	6.20	0.19	9.41
	08	0.00	0.21	0.00	0.24	0.01	0.26
	09	0.03	1.56	0.03	1.68	0.04	2.14
	10	0.00	0.13	0.01	0.35	0.01	0.42
	11	0.02	1.10	0.02	1.07	0.02	0.86
	12	0.00	0.10	0.00	0.30	0.01	0.33
	13	0.02	0.87	0.03	1.71	0.03	1.32
	14	0.00	0.20	0.00	0.30	0.00	0.22
	15	0.01	0.37	0.01	0.52	0.01	0.31
	16	0.01	0.26	0.00	0.16	0.00	0.19
	17	0.01	0.35	0.01	0.47	0.01	0.41
	18	0.00	0.18	0.00	0.23	0.00	0.12
	19	0.00	0.16	0.00	0.28	0.00	0.21
4.17	Short-duration overload capacity test: Applied current（A）：1.5Ir Duration（h）：2 Pressure protective device was not operated and Without leakage The deformation of the tank corrugation and the corrugated radiator was in specified scope（mm）：≤6 The temperature-rise of the tank enclosure and the bushing（K）：≤85				 63.0 2 Pass ＜1 Tank enclosure：61.4 Bushing：47.5		Pass

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4.Test items and requirements						Measurement or observation results			Results
4.18	Short-circuit withstand test								Pass
4.18.1	Current calculation of short-circuit test								
	Tapping position	The value of phase symmetrical short-circuit current（kA）	The first peak value of phase asymmetrical current（kA）	Peak coefficient（K$\sqrt{2}$）					
	1	24.18$^{\pm 10\%}$	55.45$^{\pm 5\%}$	2.29					
	3	24.52$^{\pm 10\%}$	55.71$^{\pm 5\%}$	2.27					
	5	24.74$^{\pm 10\%}$	55.71$^{\pm 5\%}$	2.25					
4.18.2	Short circuit test applied current								
	Tapping position/ phase category					1/a,b,c（The first time）			
	Applied current terminal					a,b,c			
						a	b	c	
	Current measurement	The value of phase symmetrical short-circuit current		kA		24.16	24.17	23.94	
				（%）		-0.10	-0.06	-1.01	
		The first peak value of phase asymmetrical current		kA		53.85	40.24	39.99	
				（%）		-2.90	-27.42	-27.89	
		Duration（s）				0.510			
					Before test	After test			
	Reactance measurement	Phase reactance value（Ω）		A	23.23	23.55			
				B	23.09	23.30			
				C	23.36	23.53			
		Phase reactance deviation（%）		A	/	1.36			
				B	/	0.91			
				C	/	0.72			
	Waveform number:					26A3140-S-T24			
	Maximum phase reactance difference:					1.36%			

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4.Test items and requirements				Measurement or observation results			Results
Tapping position/ phase category				1/a,b,c（The second time）			
Applied current terminal				a,b,c			
				a	b	c	
Current measurement	The value of phase symmetrical short-circuit current		kA	23.76	23.95	24.06	
			（%）	-1.73	-0.96	-0.49	
	The first peak value of phase asymmetrical current		kA	53.70	41.14	41.49	
			（%）	-3.15	-25.80	-25.17	
	Duration（s）			0.508			
			Before test	After test			
Reactance measurement	Phase reactance value（Ω）	A	23.23	23.68			
		B	23.09	23.32			
		C	23.36	23.53			
	Phase reactance deviation（%）	A	/	1.93			
		B	/	1.00			
		C	/	0.72			
Waveform number： Maximum phase reactance difference：				26A3140-S-T25 1.93%			
Tapping position/ phase category				1/a,b,c（The third time）			
Applied current terminal				a,b,c			
				a	b	c	
Current measurement	The value of phase symmetrical short-circuit current		kA	24.36	23.96	24.19	
			（%）	0.74	-0.92	0.03	
	The first peak value of phase asymmetrical current		kA	54.36	38.94	39.21	
			（%）	-1.96	-29.78	-29.28	
	Duration（s）			0.510			
			Before test	After test			
Reactance measurement	Phase reactance value（Ω）	A	23.23	23.73			
		B	23.09	23.33			
		C	23.36	23.53			
	Phase reactance deviation（%）	A	/	2.15			
		B	/	1.05			
		C	/	0.70			
Waveform number：				26A3140-S-T26			
Maximum phase reactance difference：				2.15%			
Tapping position/ phase category				3/a,b,c（The first time）			
Applied current terminal				a,b,c			
				a	b	c	
Current measurement	The value of phase symmetrical short-circuit current		kA	24.22	24.38	24.46	
			（%）	-1.22	-0.54	-0.22	
	The first peak value of phase asymmetrical current		kA	39.57	54.60	40.98	
			（%）	-28.97	-2.00	-26.45	
	Duration（s）			0.508			

4.Test items and requirements				Measurement or observation results			Results
			Before test	After test			
Reactance measurement	Phase reactance value（Ω）	A	20.86	21.31			
		B	20.64	20.97			
		C	20.52	20.68			
	Phase reactance deviation（%）	A	/	2.17			
		B	/	1.59			
		C	/	0.76			
Waveform number：				26A3140-S-T27			
Maximum phase reactance difference：				2.17%			
Tapping position/ phase category				3/a,b,c（The second time）			
Applied current terminal				a,b,c			
				a	b	c	
Current measurement	The value of phase symmetrical short-circuit current		kA	24.23	24.34	24.51	
			（%）	-1.16	-0.70	-0.02	
	The first peak value of phase asymmetrical current		kA	39.79	54.84	42.24	
			（%）	-28.59	-1.55	-24.18	
	Duration（s）			0.510			
			Before test	After test			
Reactance measurement	Phase reactance value（Ω）	A	20.86	21.31			
		B	20.64	21.06			
		C	20.52	20.70			
Reactance measurement	Phase reactance deviation（%）	A	/	2.15			
		B	/	2.01			
		C	/	0.85			
Waveform number：				26A3140-S-T28			
Maximum phase reactance difference：				2.15%			
Tapping position/ phase category				3/a,b,c（The third time）			
Applied current terminal				a,b,c			
				a	b	c	
Current measurement	The value of phase symmetrical short-circuit current		kA	24.13	24.06	24.07	
			（%）	-1.59	-1.85	-1.84	
	The first peak value of phase asymmetrical current		kA	41.02	54.81	40.80	
			（%）	-26.37	-1.62	-26.76	
	Duration（s）			0.508			
			Before test	After test			
Reactance measurement	Phase reactance value（Ω）	A	20.86	21.31			
		B	20.64	21.18			
		C	20.52	20.69			
	Phase reactance deviation（%）	A	/	2.16			
		B	/	2.58			
		C	/	0.84			
Waveform number：				26A3140-S-T29			
Maximum phase reactance difference：				2.58%			

4.Test items and requirements				Measurement or observation results			Results
Tapping position/ phase category				5/a,b,c（The first time）			
Applied current terminal				a,b,c			
				a	b	c	
Current measurement	The value of phase symmetrical short-circuit current		kA	24.79	24.66	24.56	
			（%）	0.22	-0.31	-0.74	
	The first peak value of phase asymmetrical current		kA	41.26	40.39	54.63	
			（%）	-25.92	-27.50	-1.93	
	Duration（s）			0.507			
			Before test	After test			
Reactance measurement	Phase reactance value（Ω）	A	18.04	18.42			
		B	18.12	18.59			
		C	18.23	18.45			
	Phase reactance deviation（%）	A	/	2.15			
		B	/	2.58			
		C	/	1.20			
Waveform number:				26A3140-S-T30			
Maximum phase reactance difference:				2.58%			
Tapping position/ phase category				5/a,b,c（The second time）			
Applied current terminal				a,b,c			
				a	b	c	
Current measurement	The value of phase symmetrical short-circuit current		kA	24.37	24.20	24.25	
			（%）	-1.48	-2.19	-1.99	
	The first peak value of phase asymmetrical current		kA	38.94	39.35	54.51	
			（%）	-30.10	-29.37	-2.15	
	Duration（s）			0.508			
			Before test	After test			
Reactance measurement	Phase reactance value（Ω）	A	18.04	18.43			
		B	18.12	18.60			
		C	18.23	18.52			
	Phase reactance deviation（%）	A	/	2.17			
		B	/	2.62			
		C	/	1.62			
Waveform number:				26A3140-S-T31			
Maximum phase reactance difference:				2.62%			
Tapping position/ phase category				5/a,b,c（The third time）			
Applied current terminal				a,b,c			
				a	b	c	
Current measurement	The value of phase symmetrical short-circuit current		kA	24.21	24.76	24.44	
			（%）	-2.14	0.09	-1.22	
	The first peak value of phase asymmetrical current		kA	41.96	42.28	54.50	
			（%）	-24.67	-24.09	-2.16	
	Duration（s）			0.509			

4.Test items and requirements				Measurement or observation results	Results
			Before test	After test	
	Reactance measurement	Phase reactance value（Ω） A	18.04	18.42	
		Phase reactance value（Ω） B	18.12	18.61	
		Phase reactance value（Ω） C	18.23	18.63	
		Phase reactance deviation（%） A	/	2.15	
		Phase reactance deviation（%） B	/	2.71	
		Phase reactance deviation（%） C	/	2.20	
	Waveform number:			26A3140-S-T32	
	Maximum phase reactance difference:			2.71%	
4.18.3	Physical test The appearance inspection showed no abnormalities, and after the short circuit test, there was no obvious displacement or deformation in the coil, lead wire, and support structure. No discharge marks were found on the surface of the device.			Pass	
4.18.4	Routine retest test:				
4.18.4.1	Measurement of d.c. insulation resistance between each winding to earth and between windings:				Data only
	Ambient temperature（℃）:			19.8℃	
	Relative humidity（%）:			48.4%	
	HV—LV and earth（H—L.E）(GΩ)			38.5	
	LV—HV and earth（L—H.E）(GΩ)			14.8	
	HV and LV—earth（H.L—E）(GΩ)			16.0	

4.18.4.2 Measurement of voltage ratio and check of phase displacement: — Pass

HV winding		LV winding		Transformer ratio by calculation	Measured voltage ratio tolerance(%)		
Tapping position	Voltage (V)	Tapping position	Voltage (V)		AB/ab	BC/bc	CA/ca
1	11550	/	400	28.88	-0.065	-0.069	-0.084
2	11275			28.19	+0.065	+0.068	+0.060
3	11000			27.50	+0.059	+0.048	+0.057
4	10725			26.81	-0.065	-0.072	-0.068
5	10450			26.13	-0.045	-0.043	-0.050

4.18.4.3 Measurement of winding resistance: — Pass

Ambient temperature（℃）: 19.8℃

Winding	Tapping position	Measured resistance values AB(mΩ) ab(mΩ)	BC(mΩ) bc(mΩ)	CA(mΩ) ca(mΩ)	Resistance unbalance rate（%）
HV	1	947.42	944.49	947.55	0.32
	2	917.90	914.88	918.27	0.37
	3	889.96	886.71	889.79	0.37
	4	858.56	856.71	858.74	0.24
	5	830.60	828.00	830.52	0.31
LV	/	1.0537	1.0579	1.0634	0.92

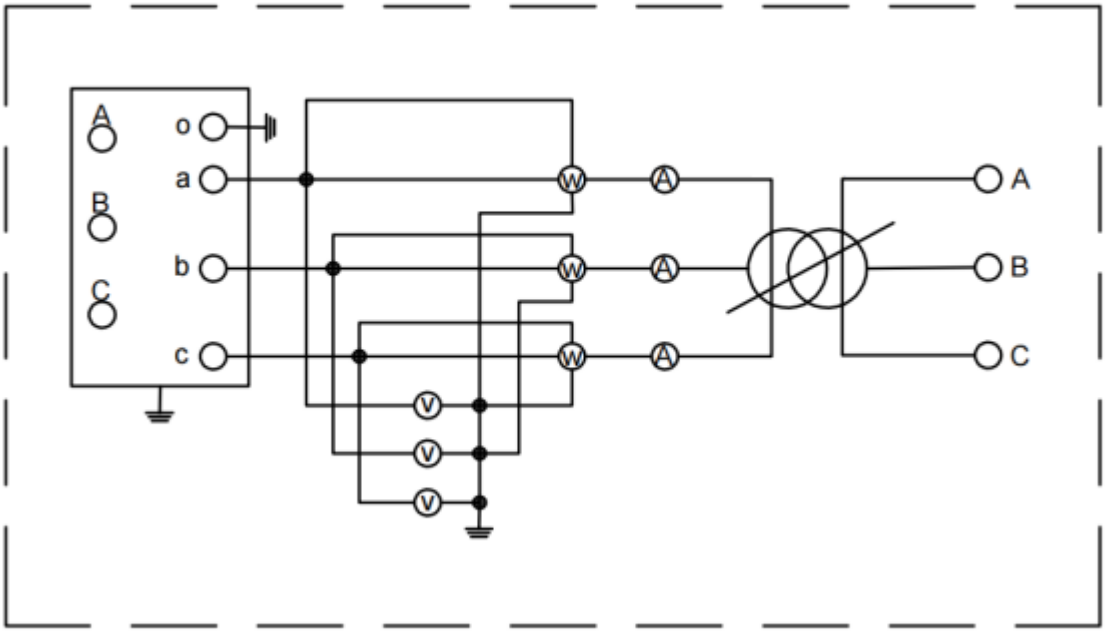
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4.Test items and requirements		Measurement or observation results	Results
4.18.4.4	Applied voltage test:		Pass
	Ambient temperature（℃）：	19.8℃	
	Relative humidity（%）：	48.4%	
	Air pressure（kPa）：	101.6kPa	
	Altitude（m）：	15m	
	Test duration（s）：60	60s	
	Applied voltage parts：		
	1）HV—LV and earth：35kV	35kV	
	2）LV—HV and earth：5kV	5kV	
	No sudden drop of test voltage shall occur.	Pass	
4.18.4.5	Induced voltage withstand test		Pass
	Ambient temperature（℃）：	19.8℃	
	Relative humidity（%）：	48.4%	
	Air pressure（kPa）：	101.6kPa	
	Tapping position	3	
	Applied voltage（V）	800V	
	Test duration（s）：40	40s	
	Frequency（Hz）：150	150Hz	
	No sudden drop of test voltage shall occur.	Pass	
4.18.4.6	Measurement of no-load loss and current：		Pass
	Applied voltage（V） Average value：	405.7	
	Applied voltage（V） r.m.s. value：	405.9	
	No-load current （A）：	2.07	
	No-load current （%）：	0.179	
	No-load loss（kW） Measured value：	0.625	
	No-load loss（kW） Corrected value：	0.625	
4.18.4.7	Measurement of short-circuit impedance and load loss：		Pass
	Ambient temperature：（℃）	19.8℃	
	Tapping position	1 / 3 / 5	
	Applied current I （A）	22.81 / 24.93 / 26.07	
	Applied current I I/Ir（%）	57.0 / 59.4 / 59.0	
	Measured voltage（V）：	305.7 / 297.8 / 276.8	
	Short-circuit impedance(%)(t=75℃)：	4.66 / 4.58 / 4.51	
	Load loss Corrected value(t=75℃ I=Ir)(kW)：	5.729 / 5.928 / 6.134	
	Total loss Corrected value(t=75℃ I=Ir)(kW)：	6.354 / 6.553 / 6.759	
	The load loss and total loss values of the ultimate split connection are the measured data and shall not be subject to any judgment.		
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Test schematic diagram

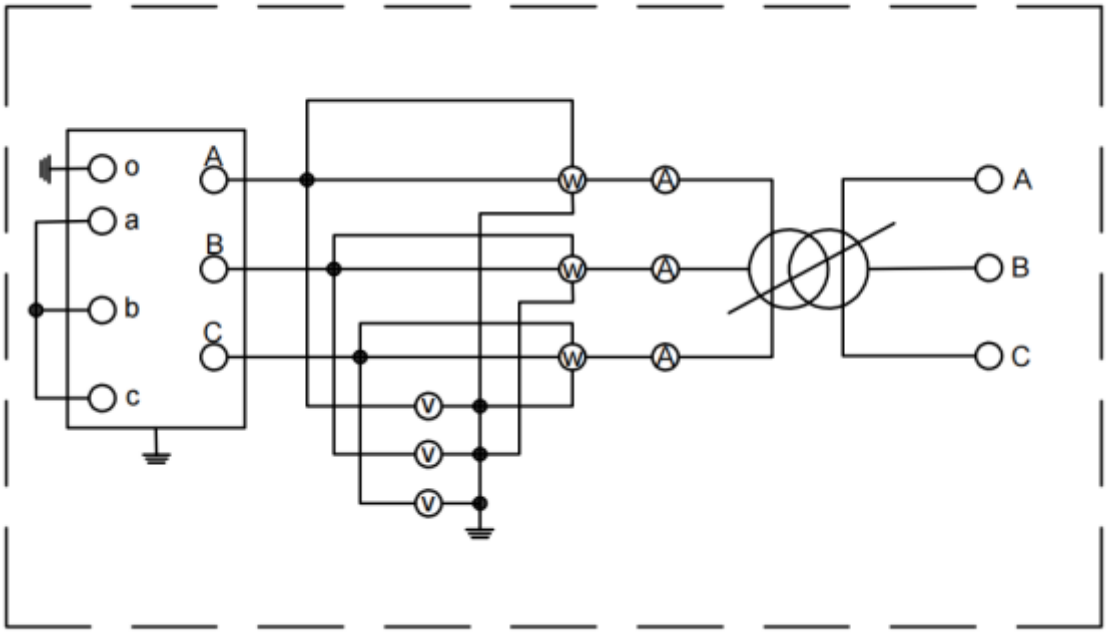
Test schematic diagram 1

Schematic diagram of no-load loss and no-load current measurement



Test schematic diagram 2

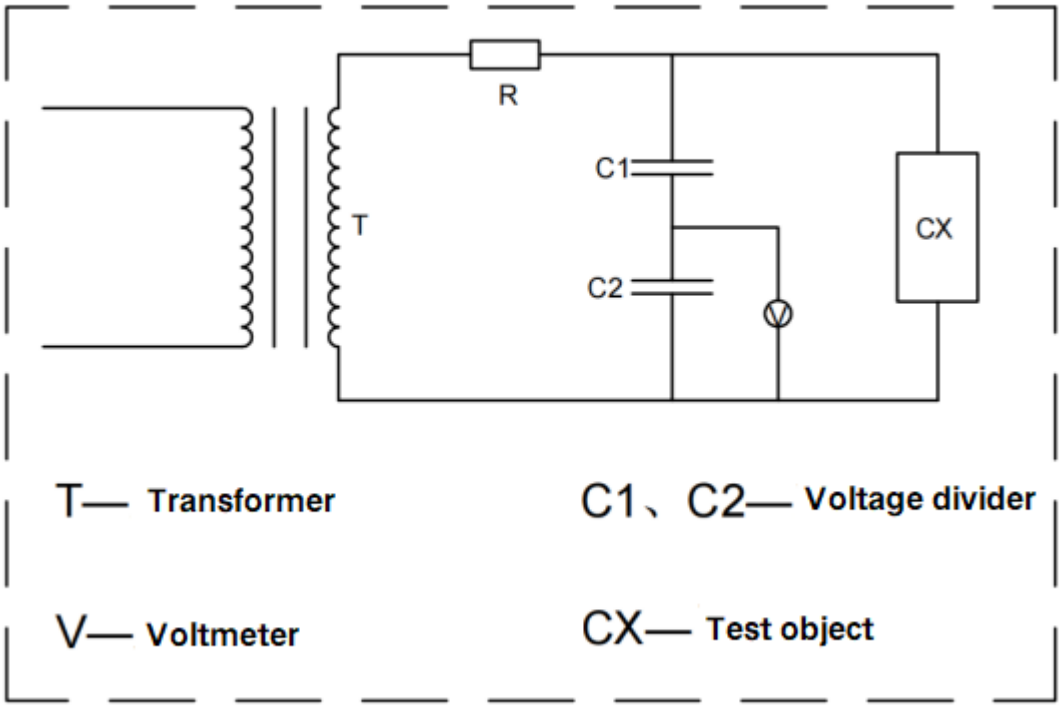
Short-circuit impedance and load loss measurement schematic diagram



Test schematic diagram

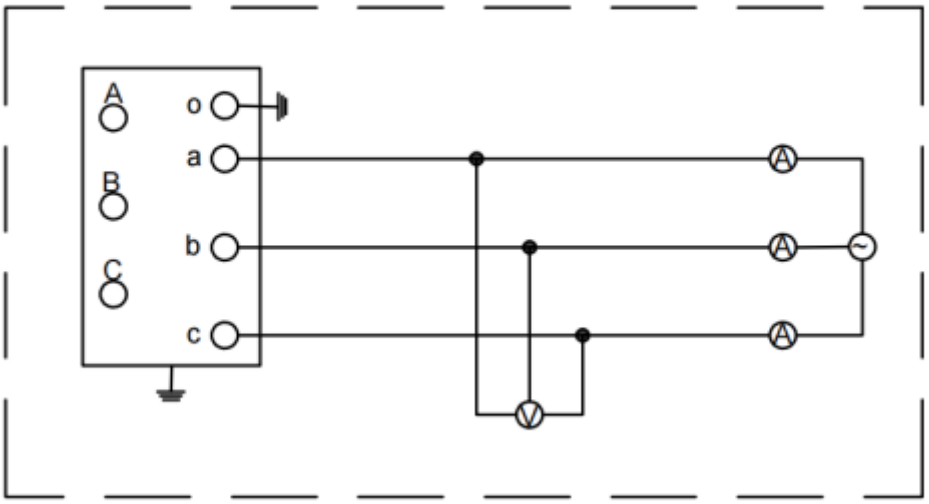
Test schematic diagram 3

Schematic diagram for applied voltage test



Test schematic diagram 4

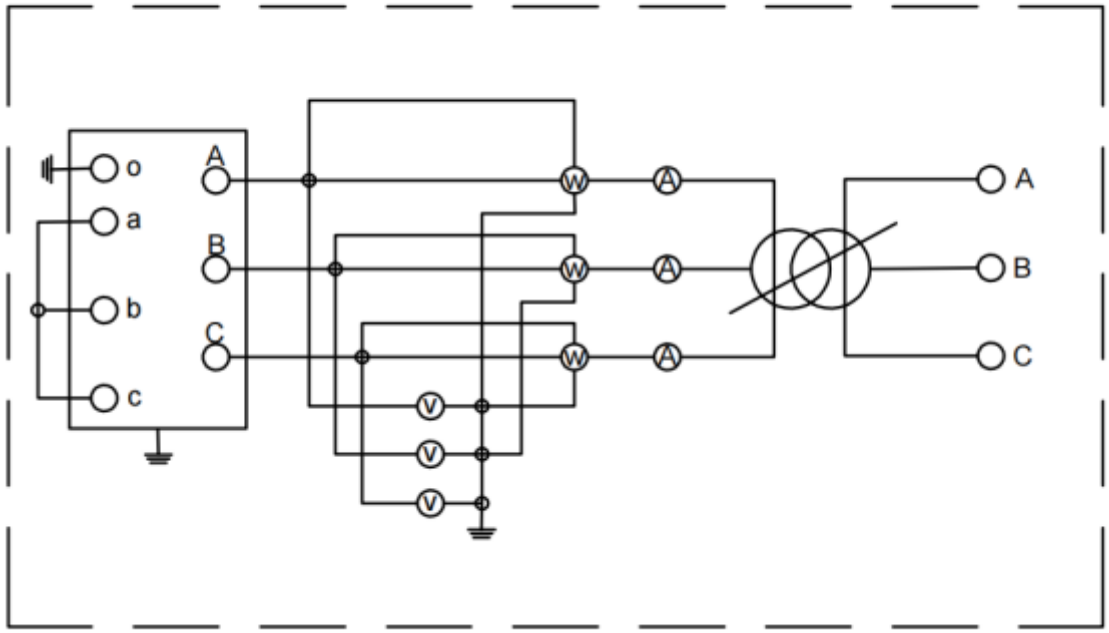
Schematic diagram for induced voltage withstand test



Test schematic diagram

Test schematic diagram 5

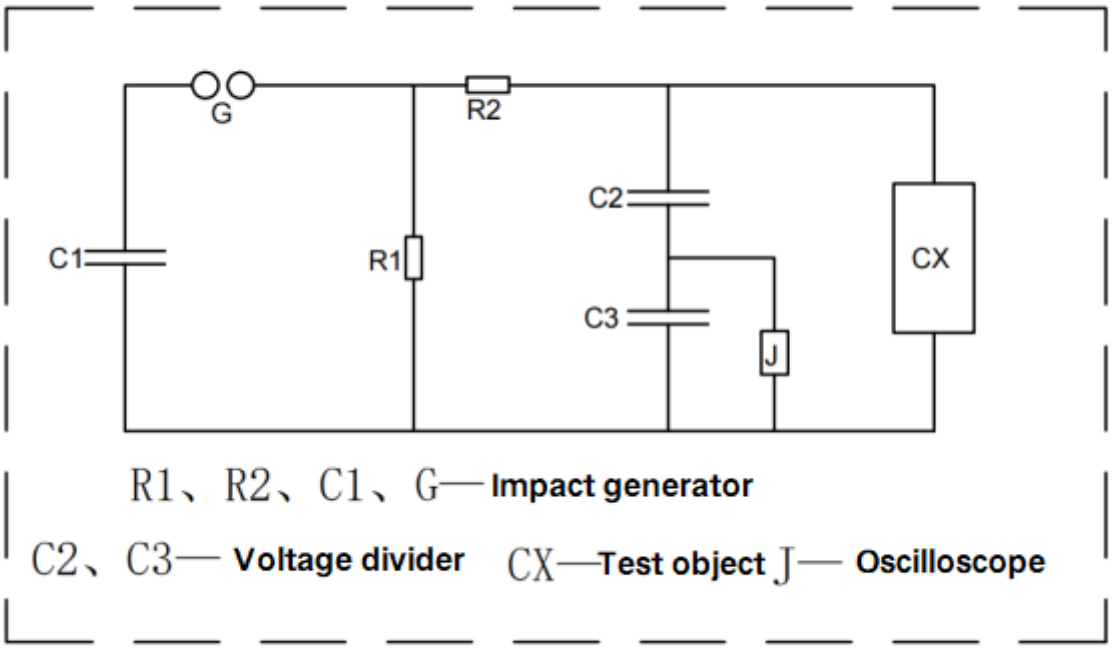
Schematic diagram of temperature-rise test



Test schematic diagram

Test schematic diagram 6

Schematic diagram of lightingimpulse test



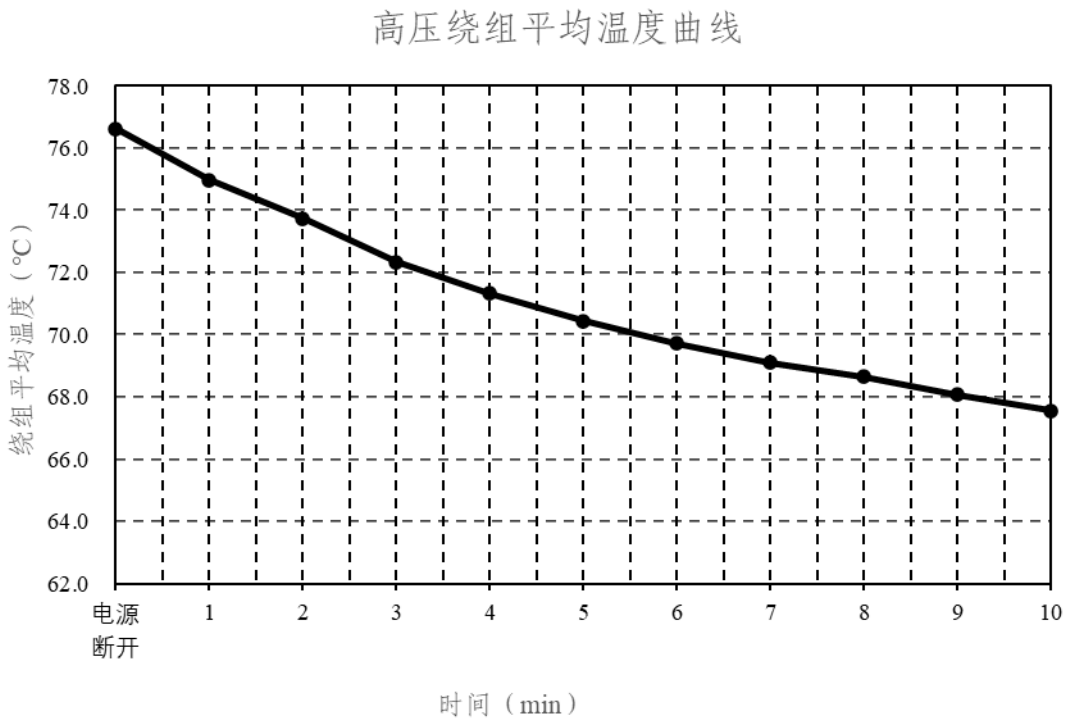
R1、R2、C1、G— **Impact generator**

C2、C3— **Voltage divider** CX—**Test object** J— **Oscilloscope**

Winding temperature curve

Diagram number of high-voltage winding：26A3140-S-T01

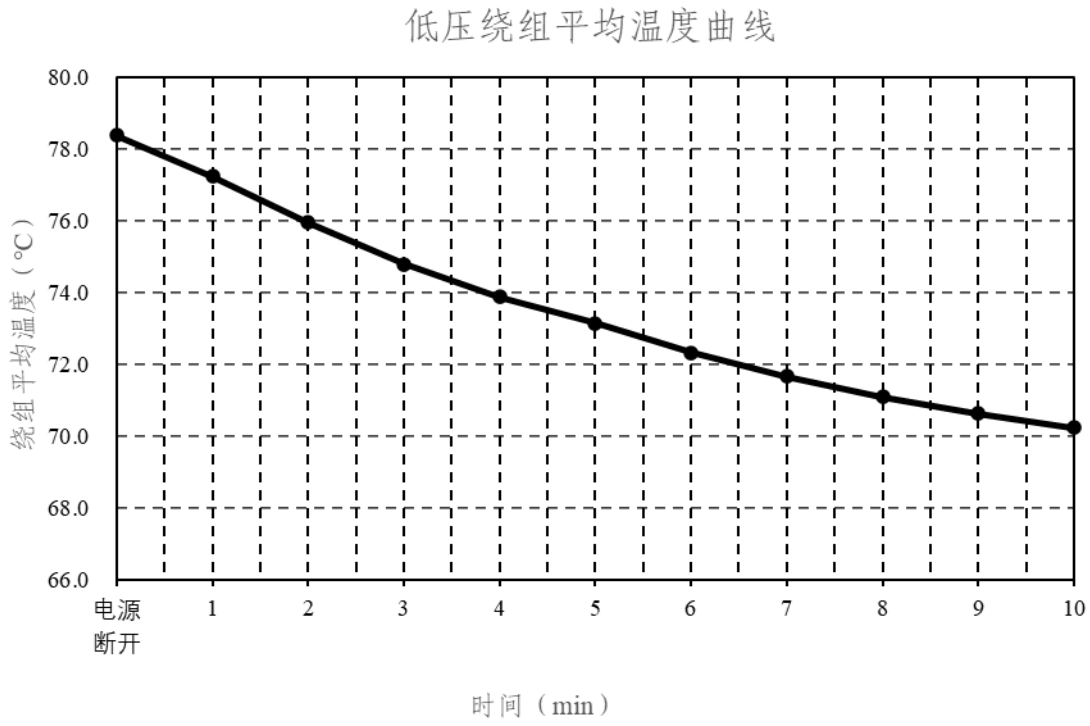
Unit：℃



Winding temperature curve

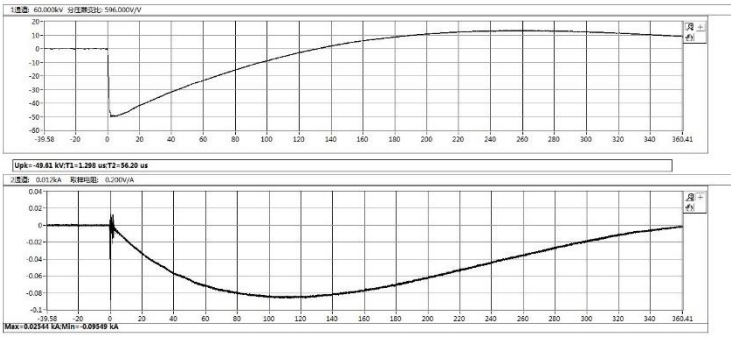
Diagram number of low-voltage winding：26A3140-S-T02

Unit：℃

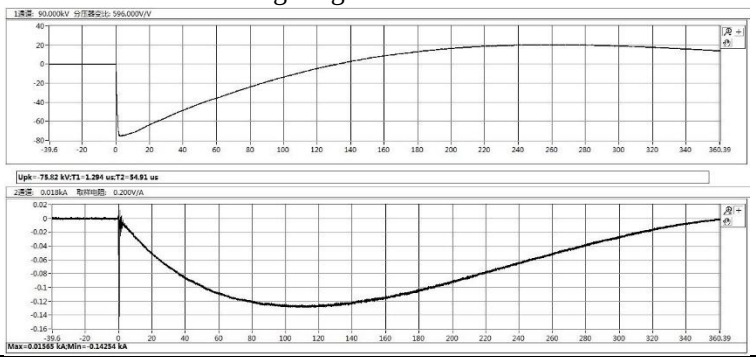


Waveform of lightning impulse voltage
Test terminal：A
Test polarity: negative

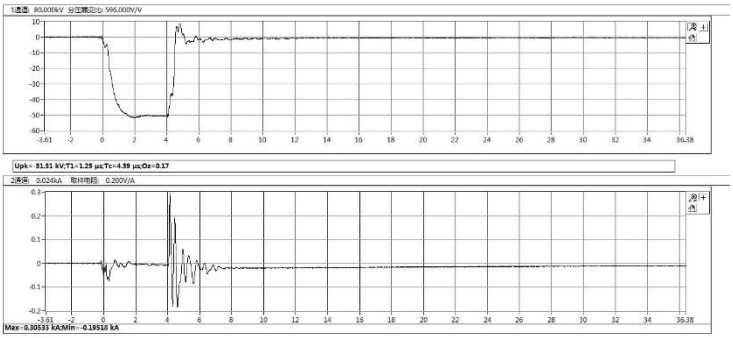
Test terminalA：50%～70%Lighting full wave 26A3140-S-T03



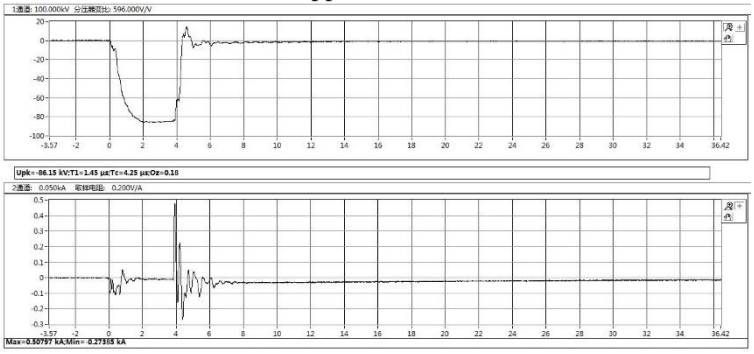
Test terminalA：100%Lighting full wave 26A3140-S-T04



Test terminalA：50%～70%chopped wave 26A3140-S-T05

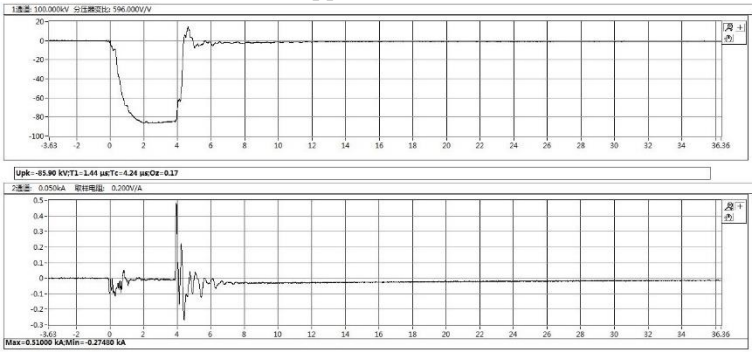


Test terminalA：100%chopped wave 26A3140-S-T06

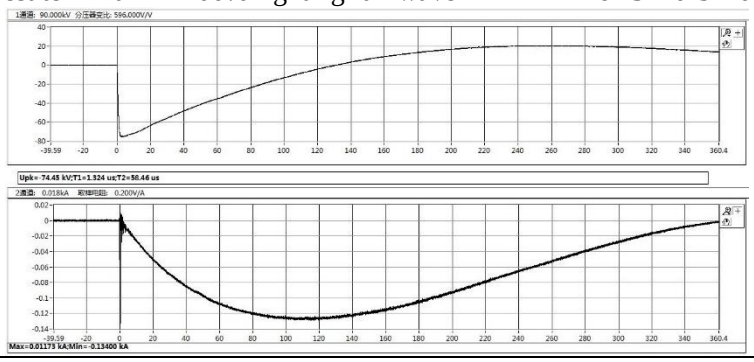


Waveform of lightning impulse voltage
Test terminal：A
Test polarity: negative

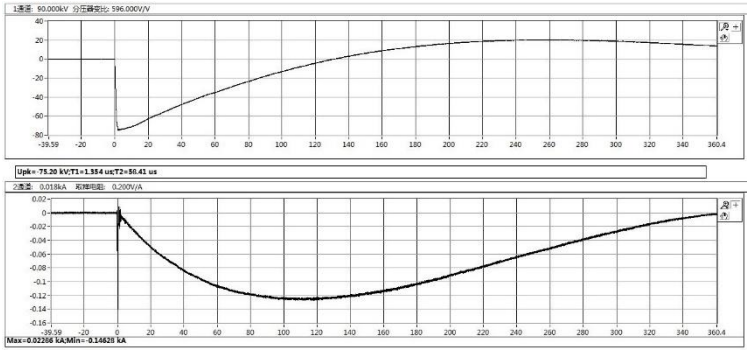
Test terminalA：100%chopped wave 26A3140-S-T07



Test terminalA：100%Lighting full wave 26A3140-S-T08

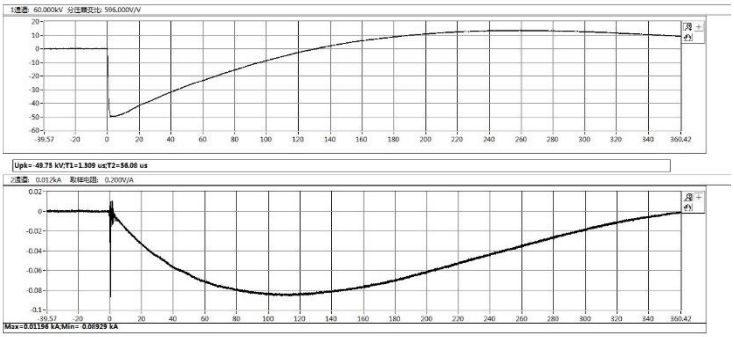


Test terminalA：100%Lighting full wave 26A3140-S-T09

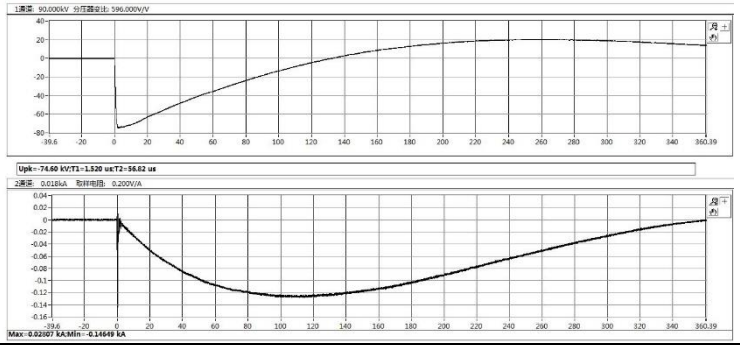


Waveform of lightning impulse voltage
Test terminal：B
Test polarity: negative

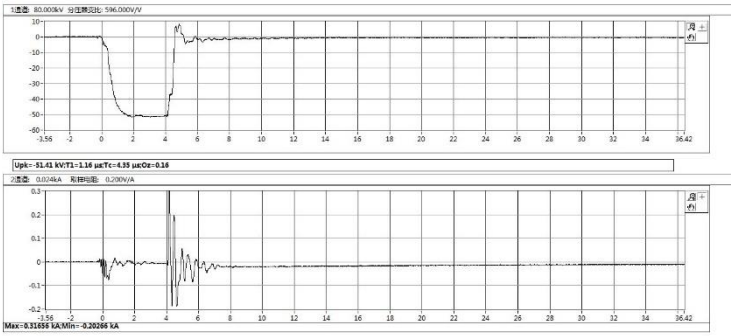
Test terminalB：50%～70%Lighting full wave 26A3140-S-T10



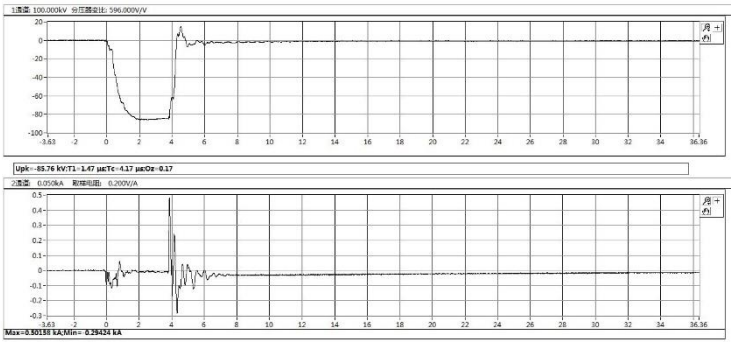
Test terminalB：100%Lighting full wave 26A3140-S-T11



Test terminalB：50%～70%chopped wave 26A3140-S-T12

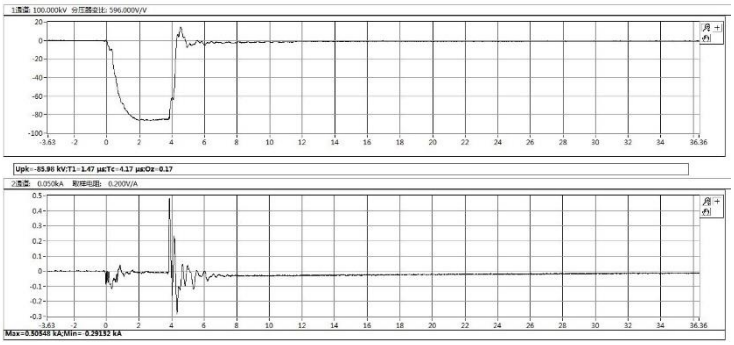


Test terminalB：100%chopped wave 26A3140-S-T13

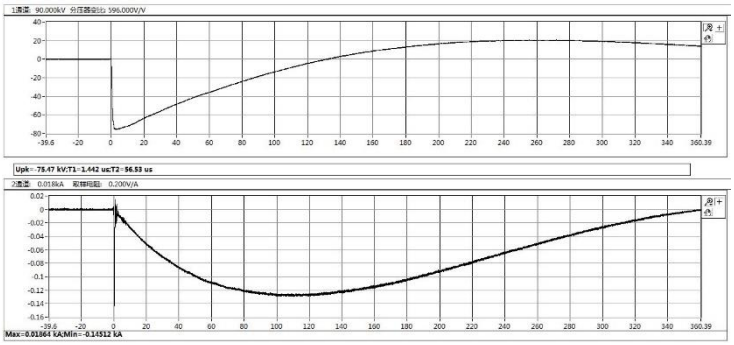


Waveform of lightning impulse voltage
Test terminal：B
Test polarity: negative

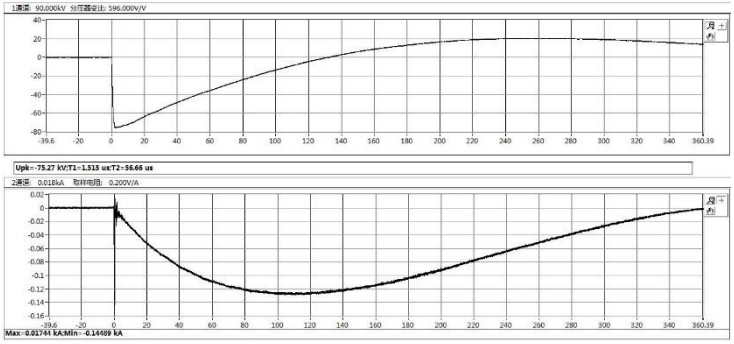
Test terminalB：100%chopped wave 26A3140-S-T14



Test terminalB：100%Lighting full wave 26A3140-S-T15

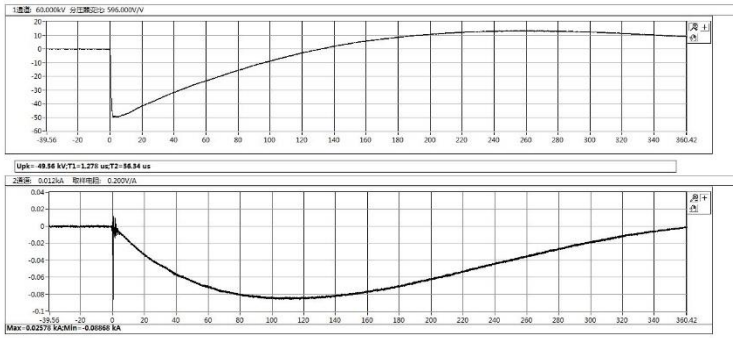


Test terminalB：100%Lighting full wave 26A3140-S-T16

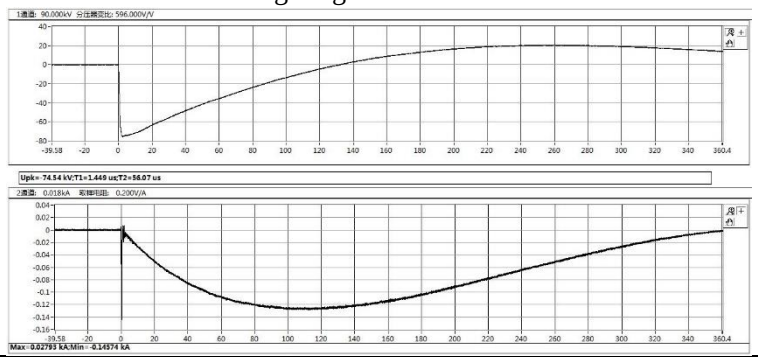


Waveform of lightning impulse voltage
Test terminal：C
Test polarity: negative

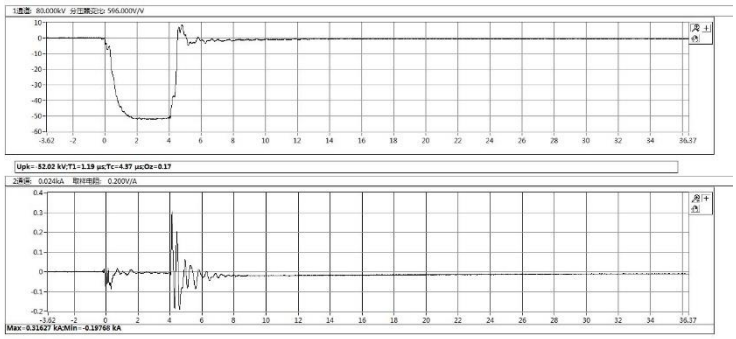
Test terminalC：50%～70%Lighting full wave 26A3140-S-T17



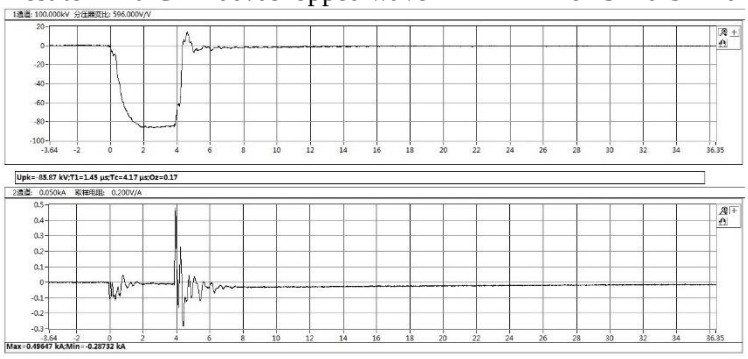
Test terminalC：100%Lighting full wave 26A3140-S-T18



Test terminalC：50%～70%chopped wave 26A3140-S-T19

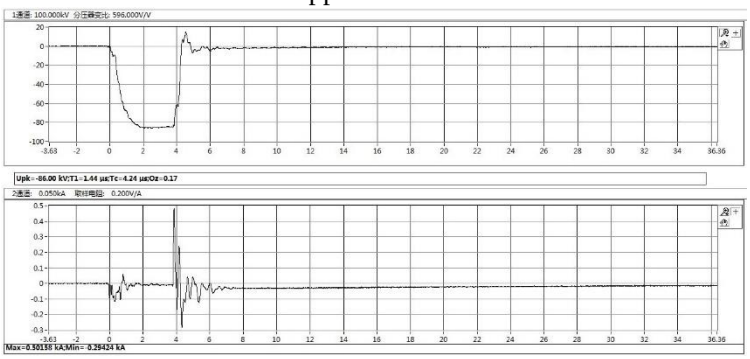


Test terminalC：100%chopped wave 26A3140-S-T20

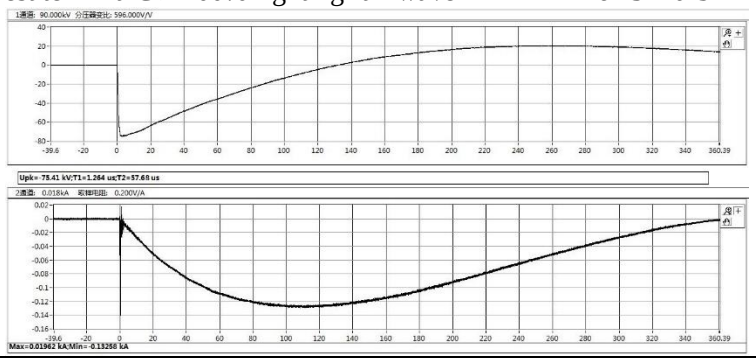


Waveform of lightning impulse voltage
Test terminal：C
Test polarity: negative

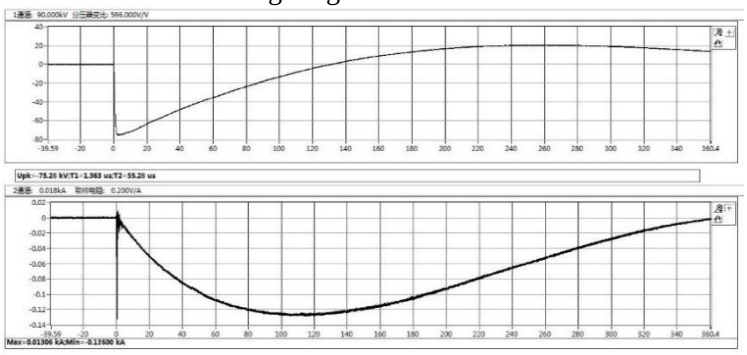
Test terminalC：100%chopped wave 26A3140-S-T21



Test terminalC：100%Lighting full wave 26A3140-S-T22



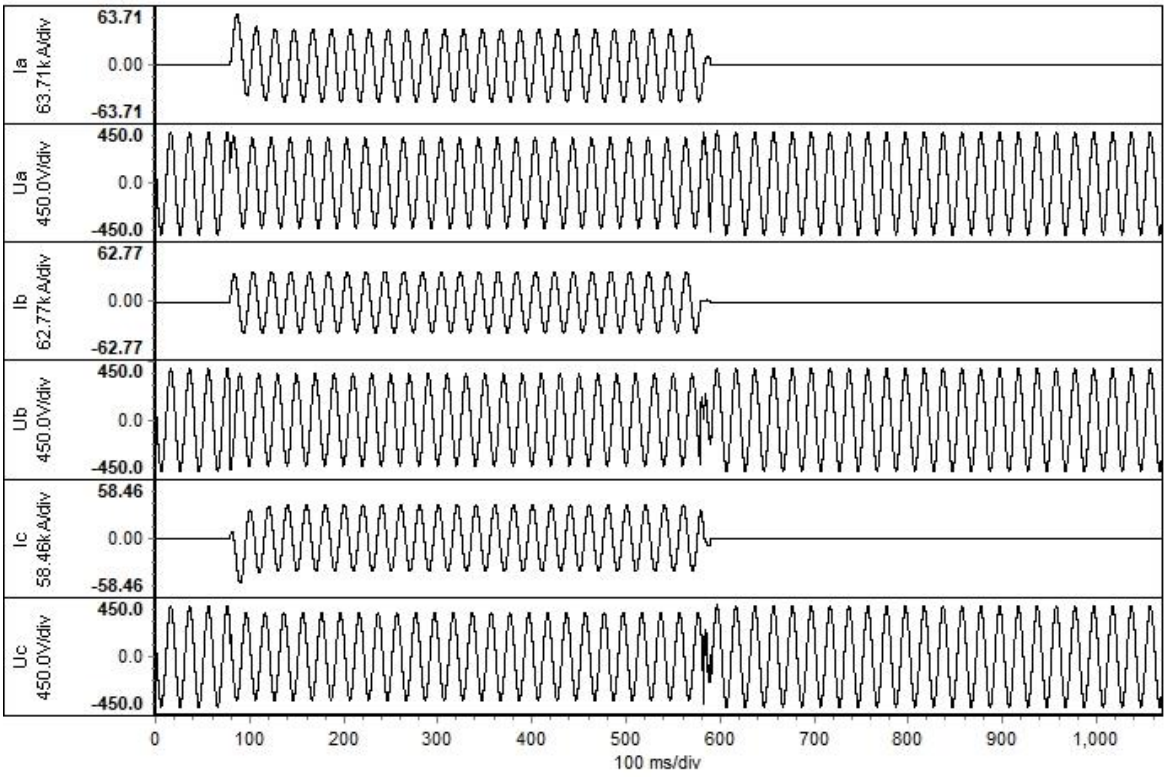
Test terminalC：100%Lighting full wave 26A3140-S-T23



Waveform

Waveform number 26A3140-S-T24

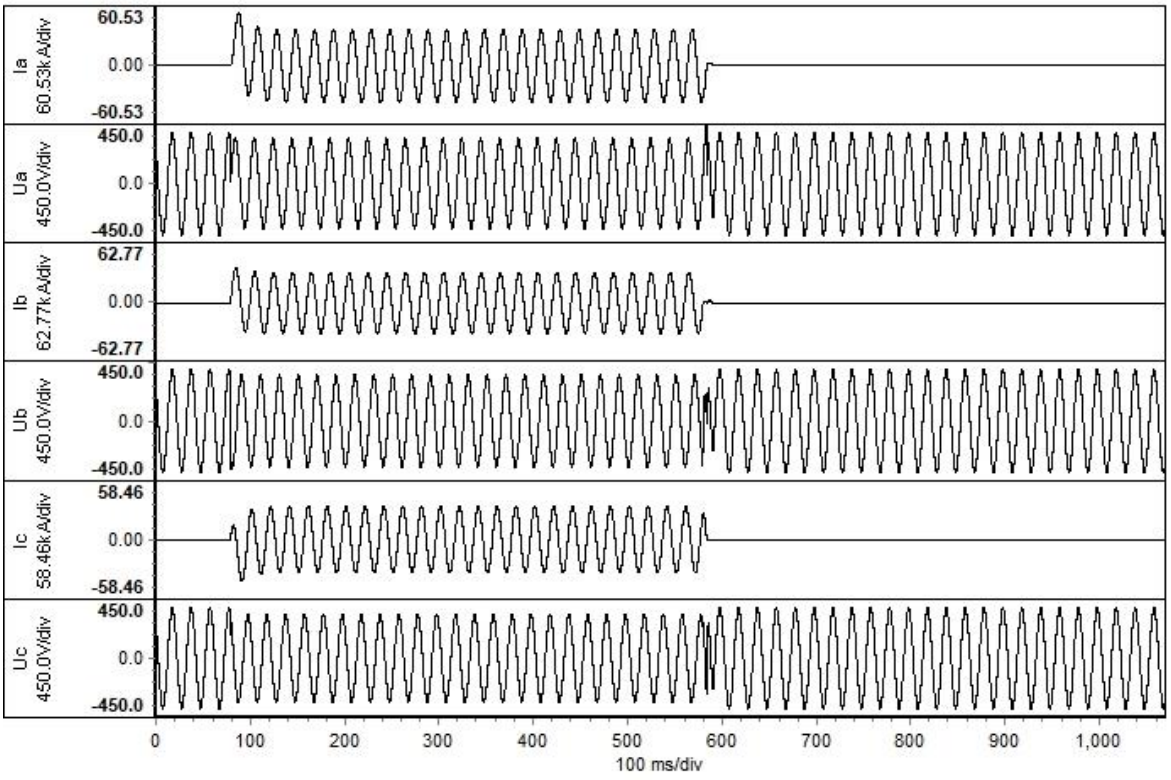
Short-circuit withstand test：Tapping position/ phase category：1/abc Applied current terminal：abc



Waveform

Waveform number 26A3140-S-T25

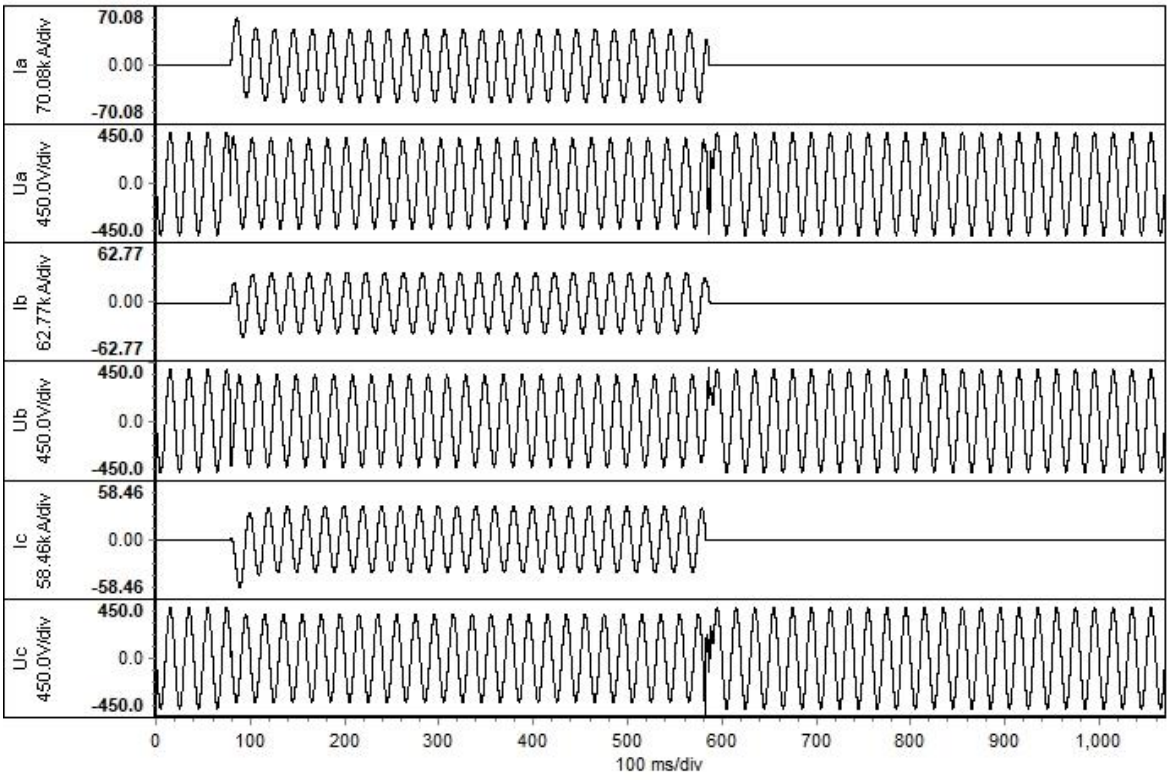
Short-circuit withstand test：Tapping position/ phase category：1/abc Applied current terminal：abc



Waveform

Waveform number 26A3140-S-T26

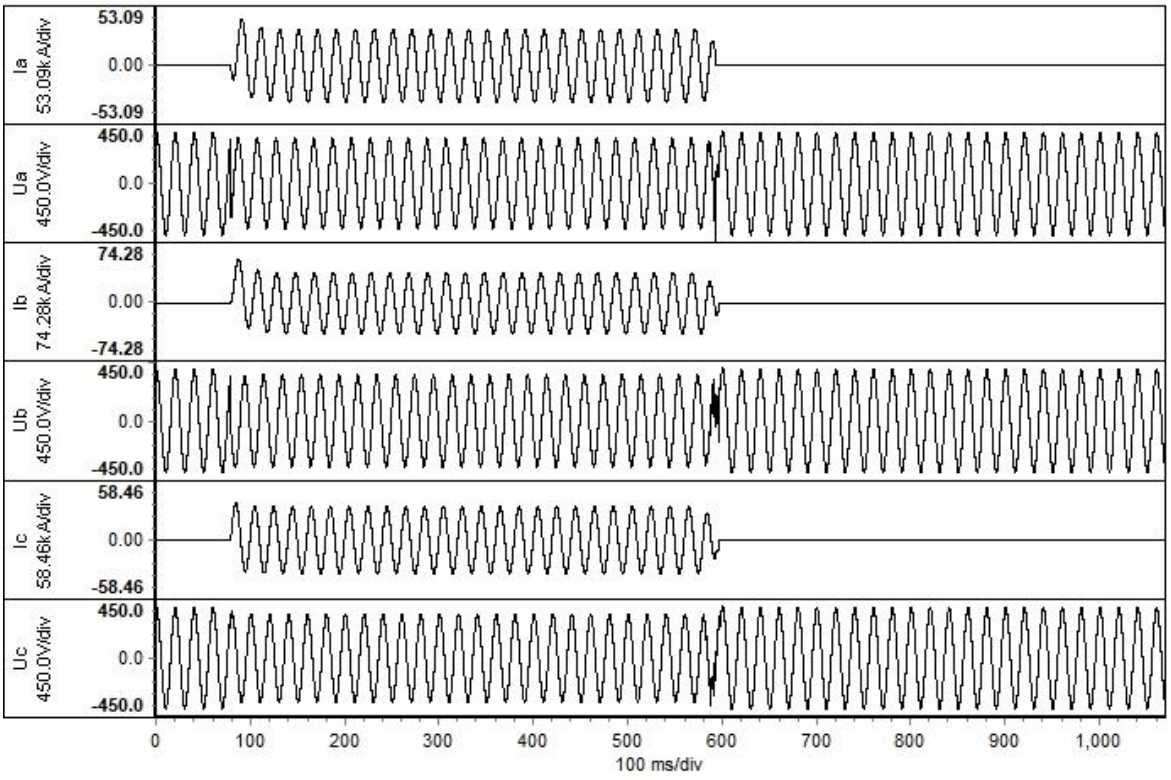
Short-circuit withstand test：Tapping position/ phase category：1/abc Applied current terminal：abc



Waveform

Waveform number 26A3140-S-T27

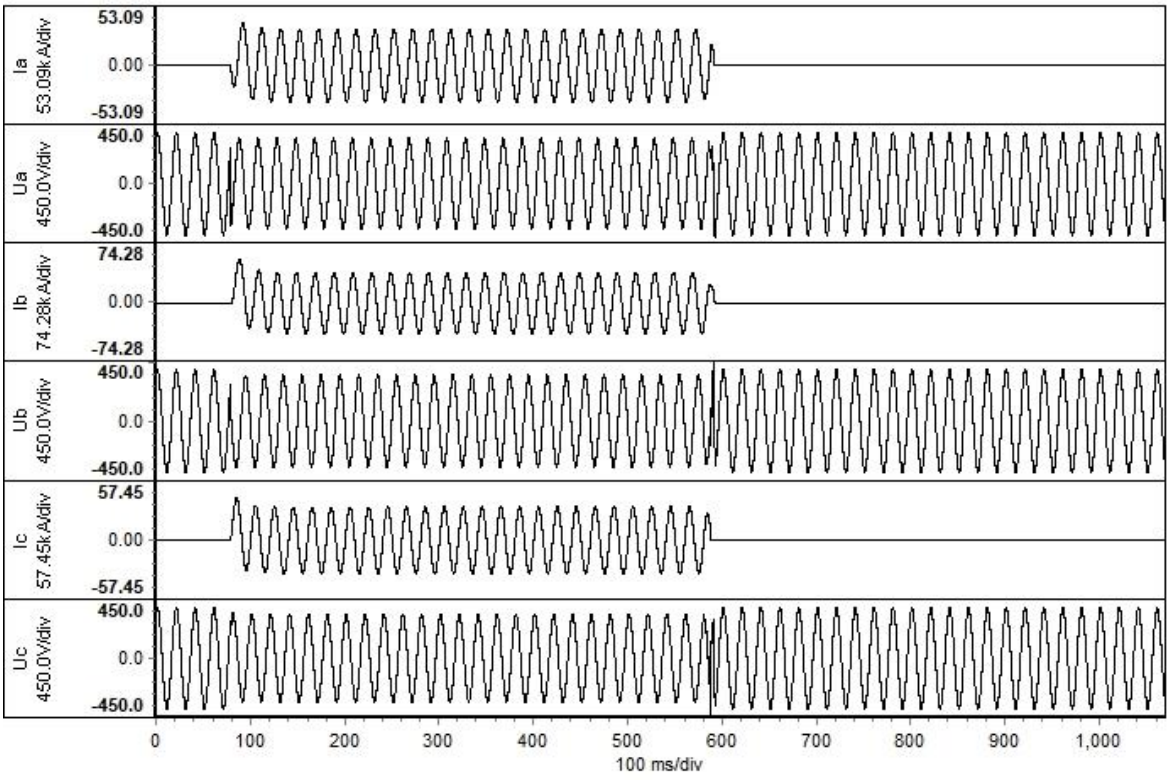
Short-circuit withstand test：Tapping position/ phase category：3/abc Applied current terminal：abc



Waveform

Waveform number 26A3140-S-T28

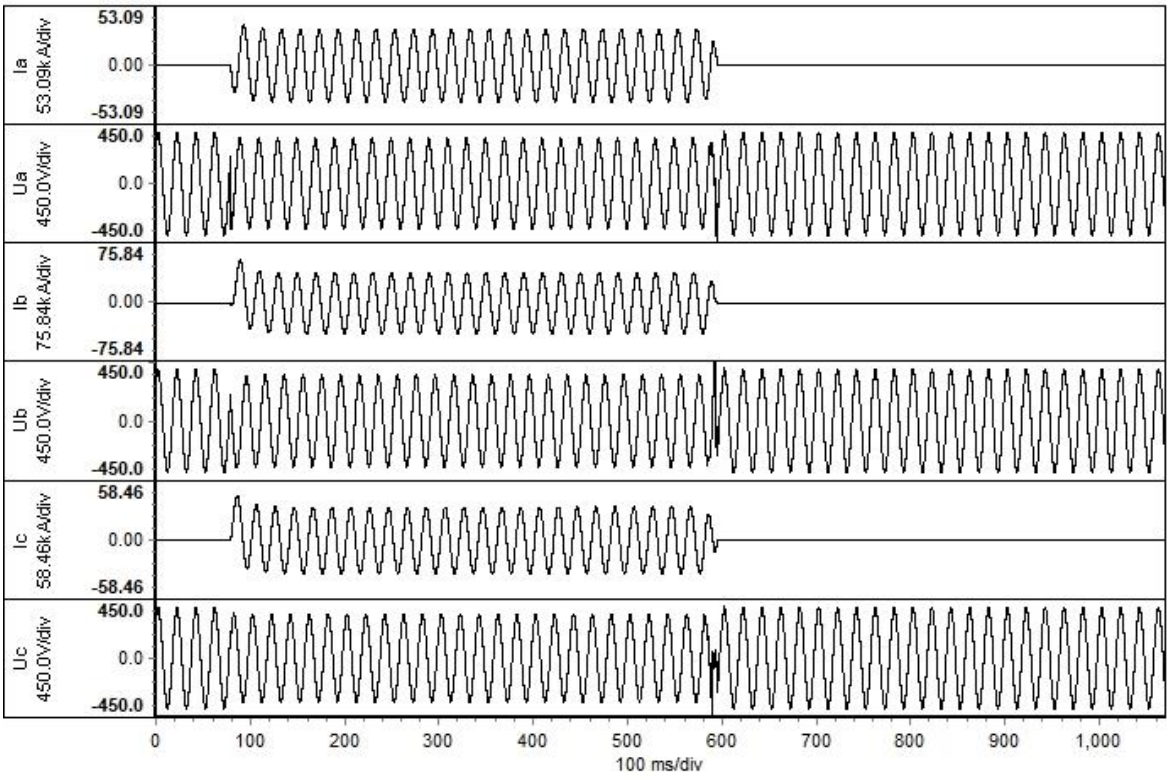
Short-circuit withstand test：Tapping position/ phase category：3/abc Applied current terminal：abc



Waveform

Waveform number 26A3140-S-T29

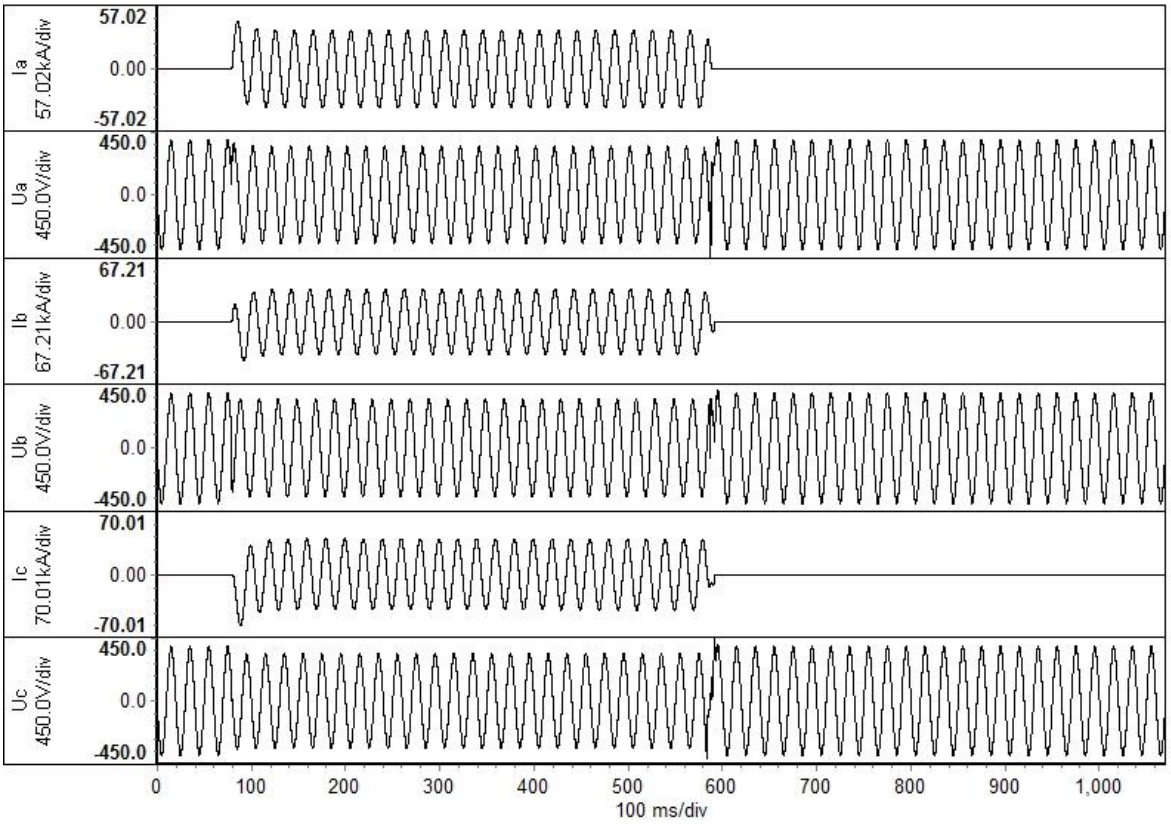
Short-circuit withstand test：Tapping position/ phase category：3/abc Applied current terminal：abc



Waveform

Waveform number 26A3140-S-T30

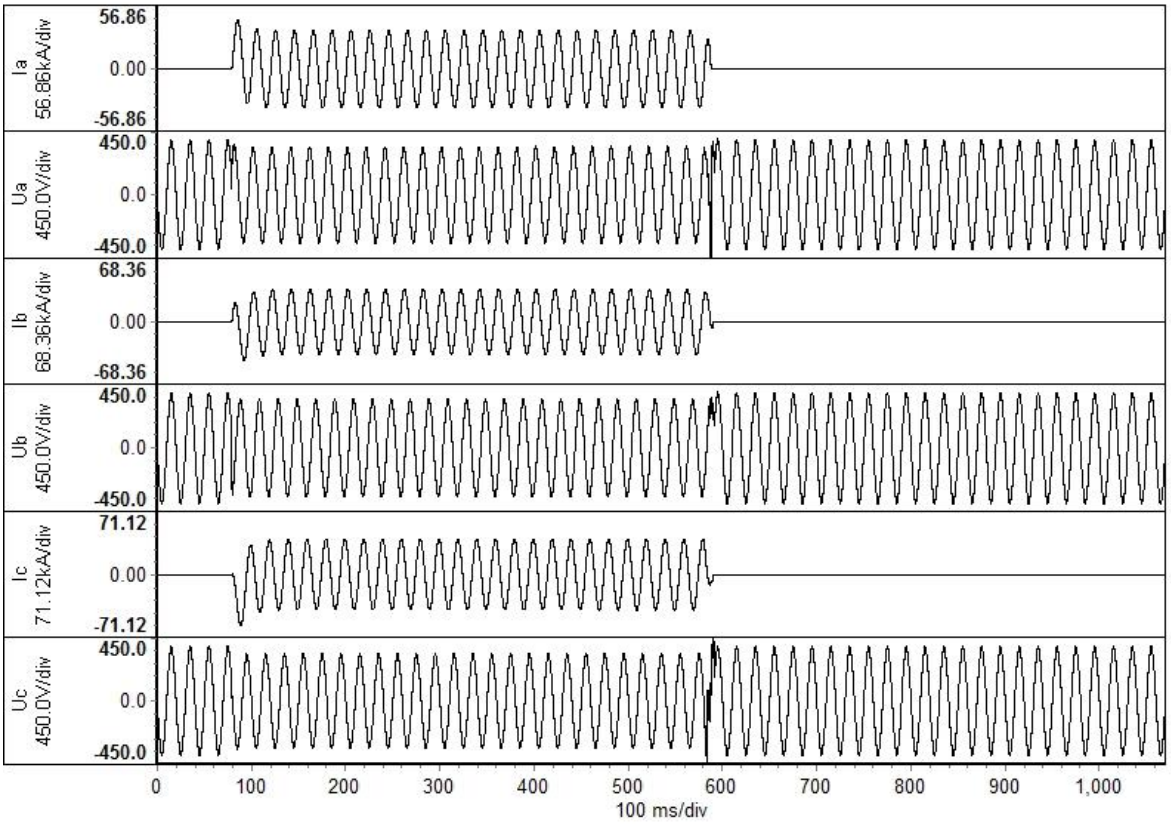
Short-circuit withstand test：Tapping position/ phase category：5/abc Applied current terminal：abc



Waveform

Waveform number 26A3140-S-T31

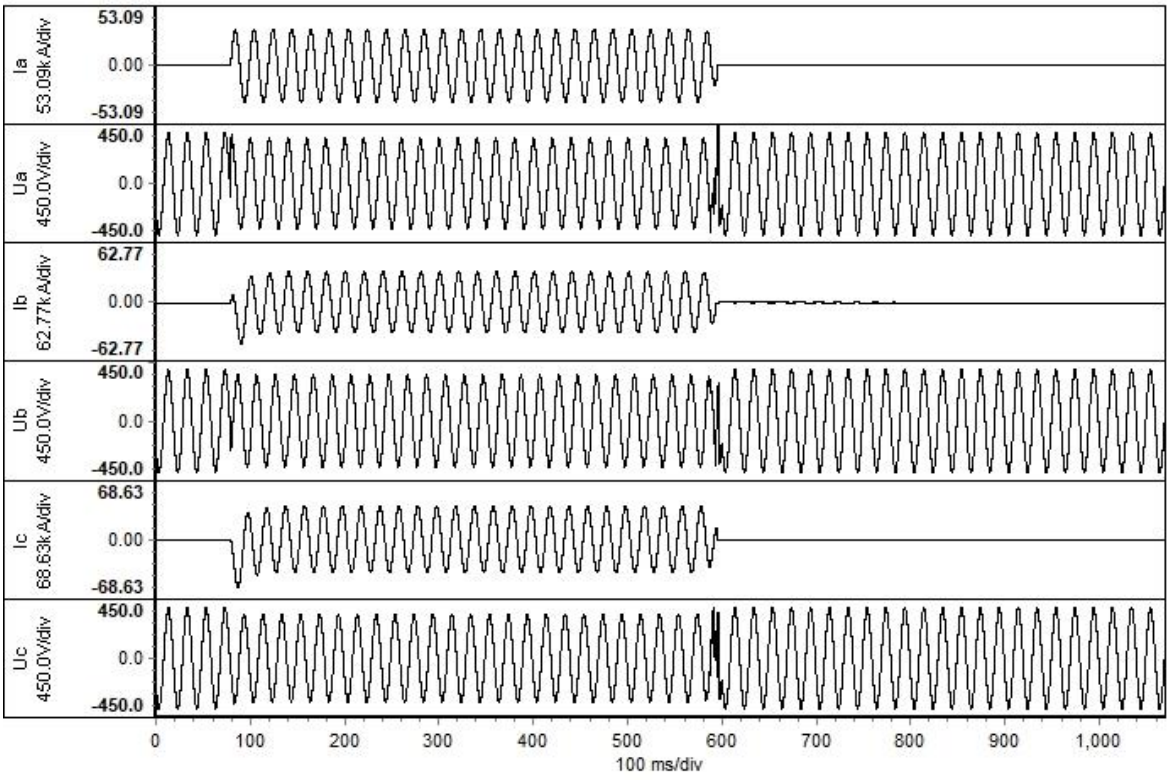
Short-circuit withstand test：Tapping position/ phase category：5/abc Applied current terminal：abc



Waveform

Waveform number 26A3140-S-T32

Short-circuit withstand test：Tapping position/ phase category：5/abc Applied current terminal：abc



List of Test Instruments and Equipment

NO.	Name	Model	identifier	Calibration validity period	Use（√）
1	Temperature Recorder	MW100-E-1H	05-764	2027-03-31	√
2	Mobile No-load and Load Loss Tester	HWGL-2500	05-1042	2027-06-22	√
3	Insulation Resistance Tester	XYDZ-5000V	05-1010	2027-06-22	√
4	Transformer Turns Ratio Tester	XYBT	05-1014	2027-06-22	√
5	DC Resistance Tester	KRI9310	05-1005	2027-06-22	√
6	Impulse Voltage Generator	JDY	05-1064	2027-06-22	√
7	Mobile Power Frequency Withstand Voltage Tester	XYNY-20KVA/100KV	05-1012	2027-06-22	√
8	Induced Withstand Voltage Tester	HWBYQ-B-2500	05-1041	2027-06-22	√
9	Induction Voltage Regulator	TYSA-630	05-946	/	√
10	AC/DC Voltmeter	T51-V	J05-055	2027-04-07	√
11	Ammeter	T51	J05-752 J05-753 J05-754	2027-03-10	√
12	Data Acquisition System	CY-2004	ZD-119	2027-06-09	√
13	Sound Level Meter	AWA5636	05-1092	2027-07-08	√
14	Current Transformer	HL1	05-264	2027-10-23	√
			05-267	2027-06-07	
			J05-071	2027-06-07	
15	Oil Dielectric Loss Tester	XYY-B	05-1008	2027-07-14	√
16	Oil Breakdown Voltage Tester	XYY-A	05-1009	2027-06-09	√
17	Electric Power Test Unit	WT5000	05-987-1	2027-10-29	√
18	Intelligent Digital Pressure Gauge	HC-YS100	J05-805	2027-06-04	√
19	Intelligent Digital Pressure Gauge	HC-YS100	J05-806	2027-06-04	√

Statement

The test results of this report are only valid for the tested samples;
This report may not be partially copied without permission;
If you have any objections to this report, please raise them within fifteen days from the date of receipt.

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