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检测
TESTING
CNAS L0223

CHPTL

XIHARI

No. 230963G

检 验 报 告

TEST REPORT

试 品 型 号: **TYPE**	LW36A-170
试 品 名 称: **DESIGNATION**	户外高压交流六氟化硫断路器 OUTDOOR HIGH-VOLTAGE ALTERNATING-CURRENT SF6 CIRCUIT-BREAKER
委 托 单 位: **APPLICANT**	江苏省如高高压电器有限公司 JIANGSU RUGAO HIGH VOLTAGE ELECTRIC APPARATUS CO.,LTD.
制 造 单 位: **MANUFACTURER**	江苏省如高高压电器有限公司 JIANGSU RUGAO HIGH VOLTAGE ELECTRIC APPARATUS CO.,LTD.
检 验 类 别: **CLASSIFICATION**	型式试验 （绝缘性能） TYPE TEST（DIELECTRIC PERFORMANCE）

西安高压电器研究院股份有限公司

XI'AN HIGH VOLTAGE APPARATUS RESEARCH INSTITUTE CO.,LTD.

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1）型式试验报告：报告包含了一个或多个型式试验系列，试验依据公认的标准实施并验证了制造商给出的额定值。Type Test Report: a report contains records of one or more series of type tests carried out strictly in accordance with a recognized standard, and the relevant ratings assigned by the manufacturer are verified;

注：对高压开关类型式试验报告包含 6 种基本形式：

note: The six basic type test reports for high-voltage switchgear and controlgear are as follows:

——完整型式试验报告 Type Test Report of Complete Type Test

——绝缘性能型式试验报告 Type Test Report of Dielectric Performance

——温升性能型式试验报告 Type Test Report of Temperature Rise Performance

——短路/开断和关合性能型式试验报告 Type Test Report of Short-Circuit / Making and Breaking Performance

——开合性能型式试验报告 Type Test Report of Switching Performance

——内部电弧性能型式试验报告 Type Test Report of Internal Arc Performance

2）性能试验报告：报告包含了一项或多项试验，试验依照相关的标准实施，仅验证试品所做试验项目的性能。Performance Test Report: a report contains records of one or more tests carried out according to a related standards, only the performance conducted to the tests are verified.

3）研究性试验报告：报告包含了一项或多项试验，试验依照客户要求或参照相关标准实施。Researching Test Report: a report contains records of one or more tests carried out based on a recognized standard, or according to the client’ s instruction.

4）其它试验报告（委托试验报告、定型试验报告等）。Other (e.g. entrusted test report, prototype test report).

8 中国大容量试验联盟（简称 CHPTL）是中国同类试验机构的唯一协作组织，隶属于中国电工技术学会。其主要目标是规范国家标准、行业标准及 IEC 标准在电力设备(交流 1000V 以上，直流 1200V 以上)型式试验中的协调应用。

China High Power Testing liaison (CHPTL) is the only organization in China which is formed to promote and coordinate the application of IEC/GB standard as well as industry standards in power electrical equipment type test (AC above 1000V, DC above 1200V). CHPTL is under the leadership and management of China Electro-technical Society.

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The members of CHPTL are as follows:

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Xi’an High Voltage Apparatus Research Institute Co., Ltd. (XIHARI)

中国电力科学研究院(CEPRI)

China Electrical Power Research Institute (CEPRI)

辽宁高压电器产品质量检测有限公司(AQTC)

Liaoning High Voltage Apparatus Quality Test Co., Ltd. (AQTC)

沈阳变压器研究院股份有限公司变压器实验室(STRI)

Shenyang Transformer Institute Co., Ltd Transformer Laboratory (STRI)

上海电气输配电试验中心有限公司(SETC)

Shanghai Electric Power Transmission & Distribution Testing Center Co., Ltd. (SETC)

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Power Industry Reactive Compensation Equipment Quality Inspection & Test Center(PRCIQTC)

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试品基本信息
Description of the test object

型号名称: LW36A-170 户外高压交流六氟化硫断路器
Type and Designation: Outdoor High-voltage alternating-current SF6 circuit-breaker
委托单位: 江苏省如高高压电器有限公司
Applicant: Jiangsu Rugao High Voltage Electric Apparatus Co.,Ltd.
地址: 江苏省如皋市经济开发区惠民西路 1 号 (226572)
Address: No.1,West Huimin Road,Economic Development Zone,Rugao,Jiangsu Province,China (226572)
电话 Tel: 18017518121 传真 Fax: 0513-87309581
制造单位: 江苏省如高高压电器有限公司
Manufacturer: Jiangsu Rugao High Voltage Electric Apparatus Co.,Ltd.
地址: 江苏省如皋市经济开发区惠民西路 1 号 (226572)
Address: No.1,West Huimin Road,Economic Development Zone,Rugao,Jiangsu Province,China (226572)
电话 Tel: 18017518121 传真 Fax: 0513-87309581

制造单位规定的试品主要技术数据 Main technical data assigned by the manufacturer:

额定电压 Rated voltage kV	170	
额定电流 Rated current A	3150	
额定频率 Rated frequency Hz	50	
额定短路开断电流 Rated short-circuit breaking current kA	40	
额定短路关合电流 Rated short-circuit making current kA	100	
额定短时耐受电流 Rated short-time withstand current kA	40	
额定峰值耐受电流 Rated peak withstand current kA	100	
额定短路持续时间 Rated duration of short-circuit s	4	
额定短时工频耐受电压 Rated short-duration power-frequency withstand voltage kV	325	✓
额定短时工频耐受电压(断口) Rated short-duration power-frequency withstand voltage (Across the open switching device) kV	375	✓
额定雷电冲击耐受电压 Rated lightning impulse withstand voltage kV	750	✓
额定雷电冲击耐受电压(断口) Rated lightning impulse withstand voltage (Across the open switching device) kV	860	✓
断路器等级 Breaking class	S2	
首开极系数 First-pole-to-clear factor	1.3/1.5	
额定操作顺序 Rated operating sequence	O-0.3s-CO-180s-CO	

容性电流开合时重击穿等级 Restrike performance during capacitive current switching	C2	
机械寿命等级 Class for mechanical endurance	M2	
SF6气体的额定压力(20℃表压) Rated pressure of gas(meter pressure at 20℃) MPa	0.6	
SF6 气体的最低功能压力(20℃表压) Min. function pressure of gas(meter pressure at 20℃) MPa	0.5	
出厂日期及编号 Manufacture date and serial number	2023-09、DI230910	

注 1：以上信息和数据由委托单位/制造单位提供，本实验室不对其准确性负责。

Note1: The above information and data are provided by Applicant/Manufacturer and the laboratory is not responsible for its accuracy.

注 2："✓"表示该额定值在本检验报告中已得到验证。

Note2: "✓" This rating has been proved by the tests in this report.

检验结论
Conclusions

型号名称: LW36A-170 户外高压交流六氟化硫断路器
Type and Designation: Outdoor High-voltage alternating-current SF6 circuit-breaker

委托单位: 江苏省如高高压电器有限公司
Applicant: Jiangsu Rugao High Voltage Electric Apparatus Co.,Ltd.

地址: 江苏省如皋市经济开发区惠民西路 1 号 (226572)
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依据标准 Standards for Test Performance: IEC 62271-100:2021

实施的项目 Test have been performed:

序号 Serial	项目 Items	参数 Parameters	判定标准 Standards for Verdict	结果 Result
1	雷电冲击耐受电压试验 Lightning impulse withstand voltage tests	相间及对地 Phase to earth & between phases: 750kV 断口 Across the open switching device: 860kV	IEC 62271-100:2021 7.2	符合 Satisfied
2	工频耐受电压试验 Power frequency withstand voltage tests	相间及对地(干试及湿试)Phase to earth & between phases(dry & wet): 325kV 1min 断口 Across the open switching device: 325kV +50kV 1min	IEC 62271-100:2021 7.2	符合 Satisfied
3	控制和辅助回路的绝缘试验 Dielectric tests on auxiliary and control circuits	2 kV 1min	IEC 62271-100:2021 7.2	符合 Satisfied

编写 Edited: 校核 Checked: 王春杰 批准 Approved:

日期 Date: 2024-06-26 日期 Date: 2024-06-26 日期 Date: 2024-06-26

试品确认
Identification of the test object

1、试品总体描述 General description of test object:

LW36A-170 户外高压交流六氟化硫断路器 Outdoor High-voltage alternating-current SF6 circuit-breaker

2、制造单位声明的试品主要构成元件如下 The main parts of test object assigned by manufacturer as follows:

1）操动机构 Operating device

型号 Type: 操动机构专用弹簧机构 Special spring device

分闸线圈额定电压 Rated supply voltage of opening coil: DC220V/DC110V

分闸线圈额定电流 Rated current of opening coil: DC220V≤2.5A、DC110V≤5.0A

合闸线圈额定电压 Rated supply voltage of closing coil: DC220V/DC110V

合闸线圈额定电流 Rated current of closing coil: DC220V≤2.5A、DC110V≤5.0A

出厂日期 Manufacture date: 2023-09

出厂编号 Serial number: DI230910

制造单位 Manufacturer: 江苏省如高高压电器有限公司 Jiangsu Rugao High Voltage Electric Apparatus Co.,Ltd.

3、制造单位保证试品符合的技术文件 The test object is guaranteed by the manufacturer to comply with the following technical documents:

D100001319 LW36A-170 技术规范 Technical specification

4、制造单位提供并由实验室确认的图纸 Drawings submitted by the manufacturer and identified by the laboratory:

1)、以下图纸编入本报告 The following drawings were attached in the report:

2S012389 户外高压交流六氟化硫断路器总装图 Outdoor high voltage AC SF6 circuit-breaker assembly drawing(版本 Rev: A00)

本实验室已确认制造单位提供的资料和图纸充分代表了试品的部件和零件，但不对这些资料和图纸细节的准确性负责。The laboratory is responsible for checking that the drawings and data schedules submitted adequately represent essential details of the equipment tested, but is not responsible for the accuracy of detailed drawings.

5、试品来源 Source of test object: 委托方送样 Provided by the applicant

6、样品确认日期 Date of identification of the test object: 2023-10-20

7、委托方代表 Tests witnessed by:

郑志祥 江苏省如高高压电器有限公司

Zheng Zhixiang Jiangsu Rugao High Voltage Electric Apparatus Co.,Ltd.

8、检验日期 Date of tests: 起 from 2023-11-27 止 to 2023-11-29

试品照片 Photographs:

照片 Photo1

绝缘试验总则

General of dielectric test

1.试验样机的编号为 Serial No. of test object: DI230910;

2.依据标准 Applied standard: IEC 62271-100:2021;

3.试品是新的、干净的高压交流六氟化硫断路器，包括支柱绝缘子、灭弧室套管、操动机构和所有正常运行时的其它部件;

Test object is new, clean high voltage AC SF_6 CB, including post insulator, interrupter bushing, operating device and all the other parts as in service;

4.试验过程中,未更换或整修零部件;

No part is renewed or reconditioned during the tests;

5.A、B、C 为动触头端，a、b、c 为静触头端，F 为底架和地;

A, B, C are terminals at moving contacts side, a, b, c are terminals at fixed contacts side, F is the frame and the earth;

6.试品支柱绝缘子干弧距离为 1507mm，灭弧室套管干弧距离为 1610mm，相间最短绝缘距离为 1651mm;

The dry arcing distance of the post insulator of the test object is 1507mm, the dry arcing distance of the interrupter bushing is 1610mm, the minimum insulating distance of phase to phase is 1651mm;

7.断路器气室压力为 0.50MPa(20℃时相对表压) 。

The inflation pressure of CB is 0.50MPa(relative gauge pressure at 20℃).

8.试品布置关于中间相对称，仅对 A、B 相进行试验;

The arrangement of the test object is symmetrical with respect to the centre phase，the tests are only performed on phase A and phase B.

报告中使用的符号和缩写

Symbols and abbreviation used in test report

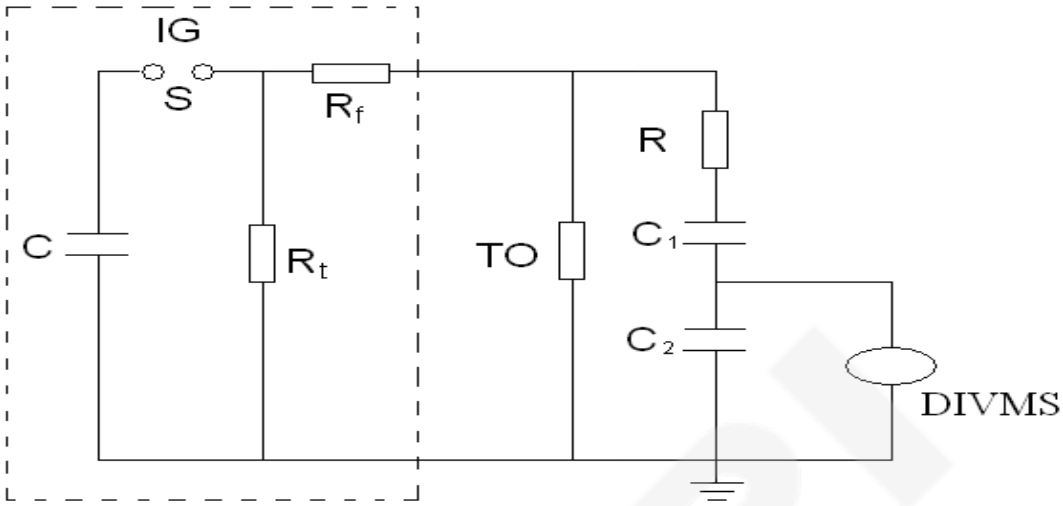
符号和缩写 Symbols and abbreviation	说明	Description
LI	雷电冲击	Lightning impulse
SI	操作冲击	Switching impulse
LIC	雷电冲击截波	Chopped lightning impulse
IG	冲击电压发生器	Impulse voltage generator
DCG	直流电压发生器	Direct current voltage generator
HV	高压	High voltage
LV	低压	Low voltage
PF	工频	Power-frequency
P-to-P & P-to-E	相间及对地	Phase to phase and phase to earth
SN	编号	Serial number
No.A	施加次数	Application number
No.D	击穿次数	Discharge number
T-OSC	典型示波图	Typical oscillogram
kV_p	电压峰值	Voltage peak value
r.m.s.	有效值	Root mean square
U_c	应施电压值	Expected voltage value
U_t	实测电压值	Measured voltage
K_{t1}	相间、相对地修正系数	Correction factor for P-to-P and/or P-to-E
K_{t2}	断口修正系数	Correction factor for across open switching device/isolating distance
K_{t3}	接地开关最不利位置修正系数	Correction factor for the most unfavorable position of earthing switch
K_{t4}	相间联合电压修正系数	Combined voltage correction factor for P-to-P
K_1	空气密度修正系数	Air density correction factor
K_a	海拔修正系数	Altitude correction factor
U_e	额定耐受电压值	Rated withstand voltage
U_p	相电压	Phase voltage
U_{cx}	试验抽头电压	Test tap voltage
C_x	实测电容量	Measured capacitance
C_{x0}	要求电容量	Required capacitance
U_r	额定电压值	Rated voltage
U_m	设备最高电压	Highest voltage for equipment

测量不确定度
Measurement uncertainty

序号 NO	测量系统 Measuring system	扩展不确定度 Expanded uncertainty
1	电压测量系统 Voltage measurement system	U<2%　(k=2)
2	无线电干扰电压试验测量系统 RIV measuring system	U=2dB　(k=2)
3	电容及损耗因数测量系统 tanδ&C measuring system	电容量 capacitance (C):　U<0.15%　(k=2) tanδ:　U<2.5%　(k=2)
4	大气压力 Air pressure DYM3 空盒气压表 DYM3 air pressure meter	U<0.2kPa　(k=2)
5	雨水电导率 Rain conductivity CON510 电导率仪 CON510conductivity meter	U=1.2%　(k=2)
6	冲击电压波形时间测量系统 Time measurement system for impulse voltage waveform	U<5%　(k=2)
7	温度 Temperature testo 数字式温湿度大气压力表 testo digital temperature and humidity atmospheric pressure gauge	U<1.0℃　(k=2)
8	绝对湿度 Absolute humidity testo 数字式温湿度大气压力表 testo digital temperature and humidity atmospheric pressure gauge	U<1g/m^3　(k=2)
9	局部放电测量系统 PD measuring system	<20pC:U=2.4pC　(k=2) 20pC ~ 50pC:U=5.3pC　(k=2) >50pC:U=12%　(k=2)

雷电冲击耐受电压试验回路图

Lightning impulse withstand voltage test circuit



C	冲击发生器主电容	IG capacitance	R_f	波头电阻	Front resistance
R_t	波尾电阻	Tail resistance	S	冲击点火球隙	Sphere gap
R	阻尼电阻	Damping resistance	C_1	高压臂电容	H.V arm capacitance
TO	试品	Test object	C_2	低压臂电容	L.V arm capacitance
DIVMS	数字冲击电压测量系统 Impulse voltage measuring system 型号 Type: MIRA25　　编号 SN: 15422020				
2400kV/240kJ 冲击电压测量系统 2400kV/240kJ impulse voltage measuring system					

冲击系统主要参数 Parameters of IG system

U(kV)	C(μF)	R_f(Ω)	R_t(Ω)	C_1(pF)	C_2(μF)
2400	0.083	380	740	300	0.9

雷电冲击耐受电压试验

Lightning impulse withstand voltage test

试验日期 Date: 2023-11-27

试区大气条件 Atmospheric conditions: P=97.5kPa t=16.3℃ RH=33.9%

大气/海拔修正因数 Atmospheric/Altitude correction factor: K_{t1}=0.914K_a=/

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c (kV_p)		实测电压值 U_t(kV_p) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	加压次数 No.A	击穿次数 No.D	典型示波图 T-OSC
相间及对地 P-to-P & P-to-E	Aa	BCbcF	712.5	+	705.7	712.1	712.4	713.3	712.1	712.5	714.3	713.0	712.5	713.0	712.9	712.8	712.7	712.5	712.1	15	0	001
				-	703.4	710.7	710.0	712.1	711.8	713.2	713.1	713.6	712.9	713.1	712.8	712.5	713.4	712.6	714.1	15	0	002
相间及对地 P-to-P & P-to-E	Bb	ACacF	712.5	+	699.8	708.0	711.9	712.0	711.7	714.1	712.1	713.6	712.5	714.1	712.2	714.1	712.3	712.5	712.8	15	0	003
				-	713.5	714.5	715.0	713.4	714.9	713.1	714.4	713.7	713.8	713.7	714.5	714.7	713.9	714.1	713.6	15	0	004

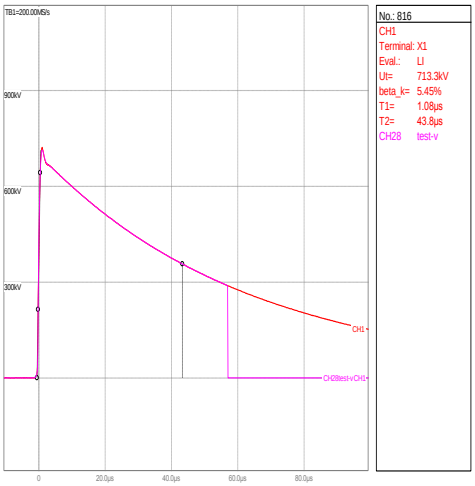
试验结果 Result: 通过 Passed。

注 Notes:

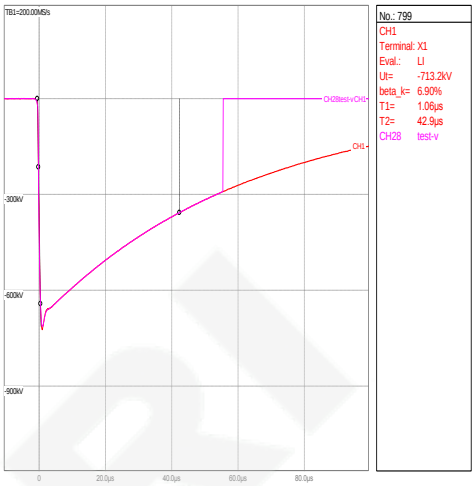
a)U_c=U_e×K_{t1}，实际试验时取 K_{t1}=0.950; Choosing K_{t1}=0.950 during test;

b)施加了一次 50%的 U_c 进行调波，分别施加 65%和 80%的 U_c 对波形进行校验。50%, 65%, 80%U_c are applied in sequence to verify parameters.

示波图
Oscillogram



IPVBT230963G-001



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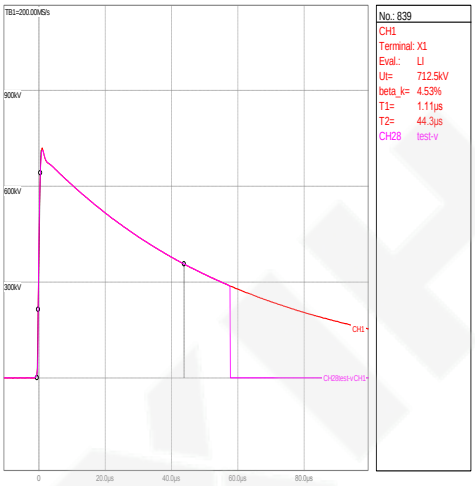
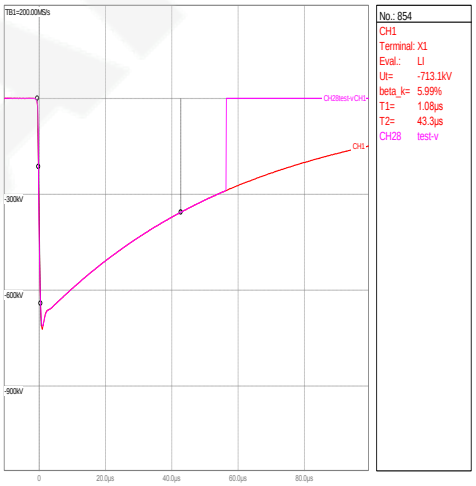


IPVBT230963G-003



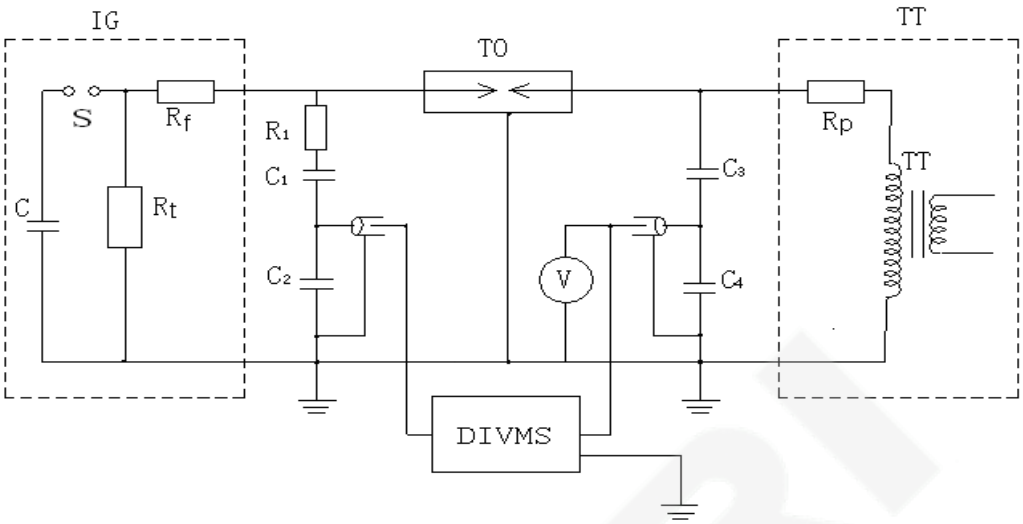
IPVBT230963G-004

试验照片
Photograph

IPVZP230963G-001

雷电+工频联合电压试验回路图

Lightning impulse and power-frequency combined voltage test circuit



C	冲击发生器主电容	IG capacitance	R_f	波头电阻	Front resistance
R_t	波尾电阻	Tail resistance	S	冲击点火球隙	Sphere gap
R_1	阻尼电阻	Damping resistance	C_1	高压臂电容	H.V arm capacitance
TO	试品	Test object	C_2	低压臂电容	L.V arm capacitance
TT	工频试验变压器	PF transformer	R_p	保护电阻	Protection resistance
C_3	高压臂电容	H.V arm capacitance	C_4	低压臂电容	L.V arm capacitance
DIVMS	数字冲击电压测量系统 Impulse voltage measuring system 型号 Type: MIRA25　　编号 SN: 15422020				
V	数字电压表 Voltmeter　　型号 Type: DMI551　　编号 SN: 173760				
2400kV/240kJ 冲击电压测量系统 2400kV/240kJ impulse voltage measuring system					
550kV/2200kVA 工频电压测量系统 550kV/2200kVA power-frequency voltage measuring system					

冲击系统和工频系统主要参数 Parameters of IG and TT system

IG						TT				
U (kV)	C (μF)	R_f (Ω)	R_t (Ω)	C_1 (pF)	C_2 (μF)	U/S (kV/kVA)	f_{TT} (Hz)	R_p (kΩ)	C_3 (pF)	C_4 (μF)
2400	0.083	380	740	300	0.9	550/2200	50	2	500	2.12

雷电冲击耐受电压试验

Lightning impulse withstand voltage test

试验日期 Date: 2023-11-28

试区大气条件 Atmospheric conditions: P=96.9kPa t=16.5℃ RH=24.5%

大气/海拔修正因数 Atmospheric/Altitude correction factor: K_{t2}=0.896K_a=/

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c(kV_p)		实测电压值 U_t(kV_p)															加压次数 No.A	击穿次数 No.D	典型示波图 T-OSC
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
断路器 CB	a + A	BbCcF	817	+	813.5	817.9	817.4	819.2	815.5	816.4	818.3	817.3	817.4	817.7	818.9	816.8	817.6	818.8	817.5	15	0	005
				-	817.0	817.8	817.7	818.1	818.8	818.4	817.5	818.1	818.5	817.6	817.7	820.6	818.4	818.4	818.2	15	0	006
	A + a	BbCcF	817	+	813.1	815.6	818.0	819.4	817.9	818.3	816.4	818.6	817.2	816.9	818.9	817.7	817.2	818.2	818.1	15	0	007
				-	813.1	816.1	816.9	818.5	819.1	818.5	817.8	819.5	815.9	819.2	817.4	818.0	816.1	817.0	816.2	15	0	008
	b + B	AaCcF	817	+	810.0	816.3	815.7	817.0	817.7	818.5	819.5	816.1	818.3	818.9	816.2	817.5	817.4	817.5	816.9	15	0	009
				-	814.3	821.4	817.6	817.4	817.1	818.9	817.9	818.2	817.3	818.4	818.3	817.3	818.2	817.3	817.4	15	0	010

试验结果 Result: 通过 Passed。

注 Notes:

a)$U_c=U_e\times K_{t2}$，实际试验时取 K_{t2}=0.950; Choosing K_{t2}=0.950 during test;

b)施加了一次 50%的 U_c 进行调波，分别施加 65%和 80%的 U_c 对波形进行校验; 50%, 65%, 80%U_c are applied in sequence to verify parameters;

c)“ + ”前为冲击电压施加的峰值或部位，“ + ”后为反极性工频电压施加的峰值或部位。Before “ + ”: applied impulse voltage or position, after “ + ”: applied reverse PF voltage or position.

雷电冲击耐受电压试验

Lightning impulse withstand voltage test

试验日期 Date：2023-11-28

试区大气条件 Atmospheric conditions：P=96.9kPa t=16.5℃ RH=24.5%

大气/海拔修正因数 Atmospheric/Altitude correction factor：K_{t2}=0.896K_a=/

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c(kV_p)		实测电压值 U_t(kV_p)															加压次数 No.A	击穿次数 No.D	典型示波图 T-OSC
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
断路器 CB	B + b	AaCcF	817	+	812.3	815.5	817.3	818.0	817.3	818.3	817.3	816.9	818.7	817.5	817.2	819.4	817.8	817.9	817.9	15	0	011
				-	811.5	813.2	817.3	817.4	816.0	817.2	817.6	815.4	816.7	817.5	815.3	818.0	817.7	817.0	816.2	15	0	012

试验结果 Result：通过 Passed。

注 Notes:

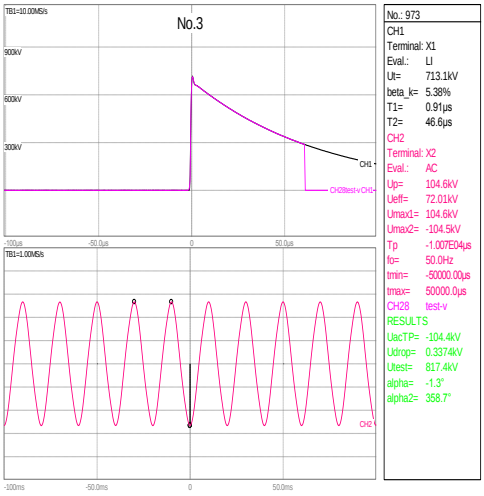
a)U_c=U_e×K_{t2}，实际试验时取 K_{t2}=0.950；Choosing K_{t2}=0.950 during test;

b)施加了一次 50%的 U_c 进行调波，分别施加 65%和 80%的 U_c 对波形进行校验；50%, 65%, 80%U_c are applied in sequence to verify parameters;

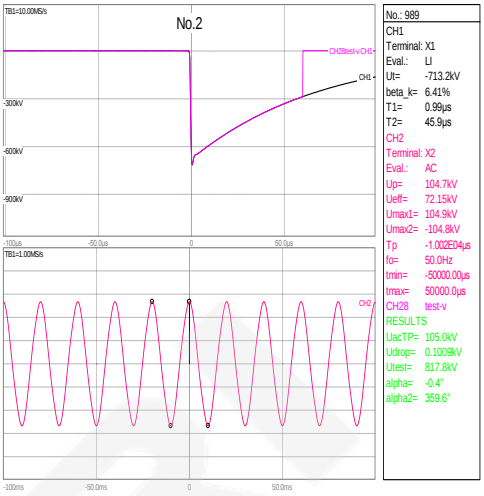
c)“ + ”前为冲击电压施加的峰值或部位，“ + ”后为反极性工频电压施加的峰值或部位。Before “ + ”: applied impulse voltage or position, after “ + ”: applied reverse PF voltage or position.

示波图

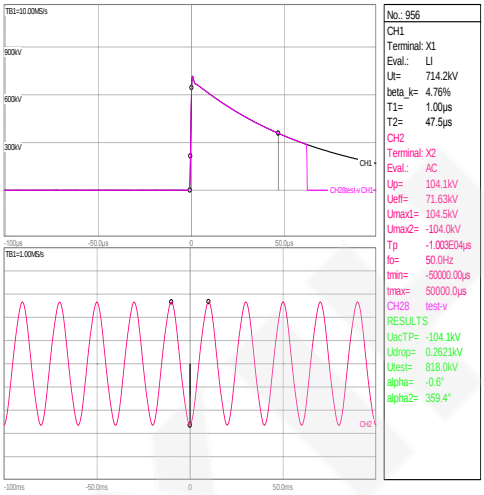
Oscillogram



IPVBT230963G-005



IPVBT230963G-006



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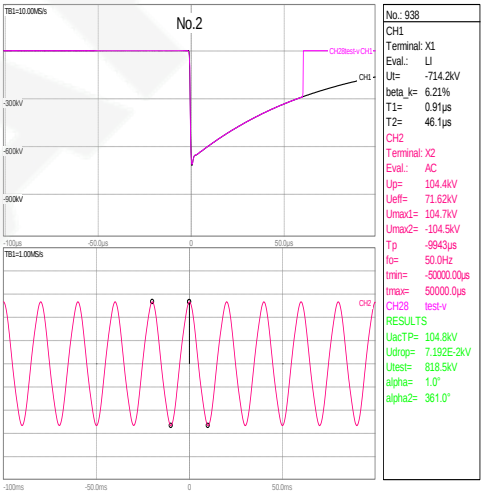

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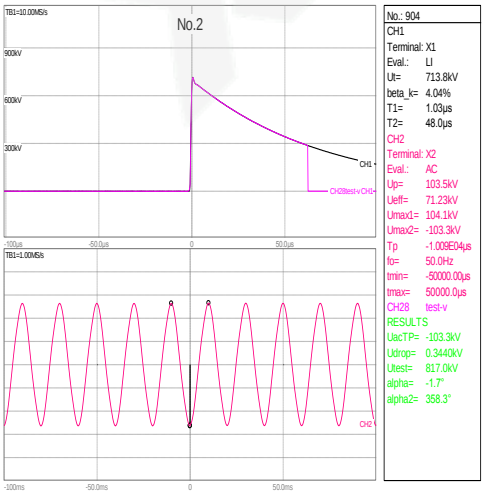

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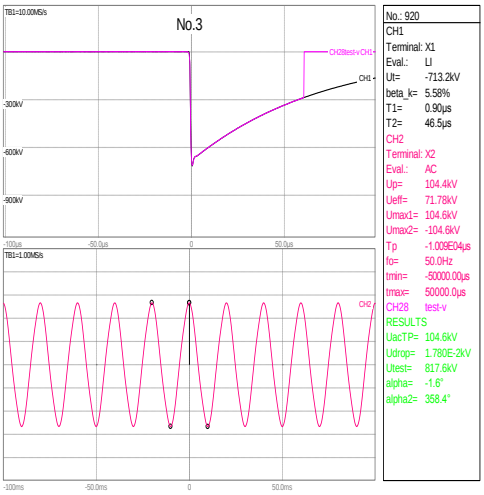

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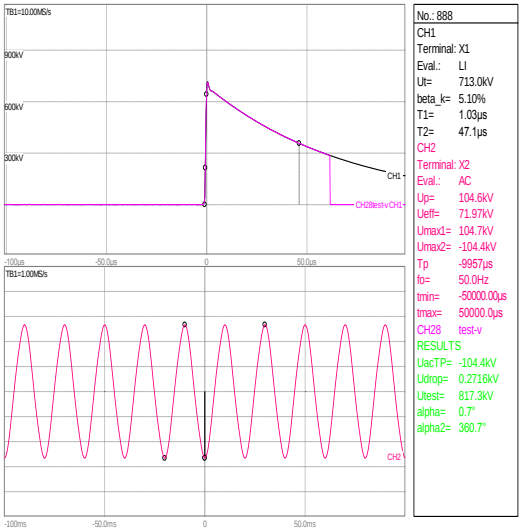

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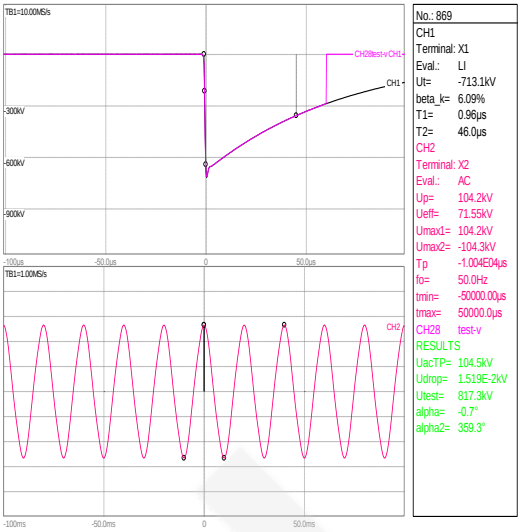


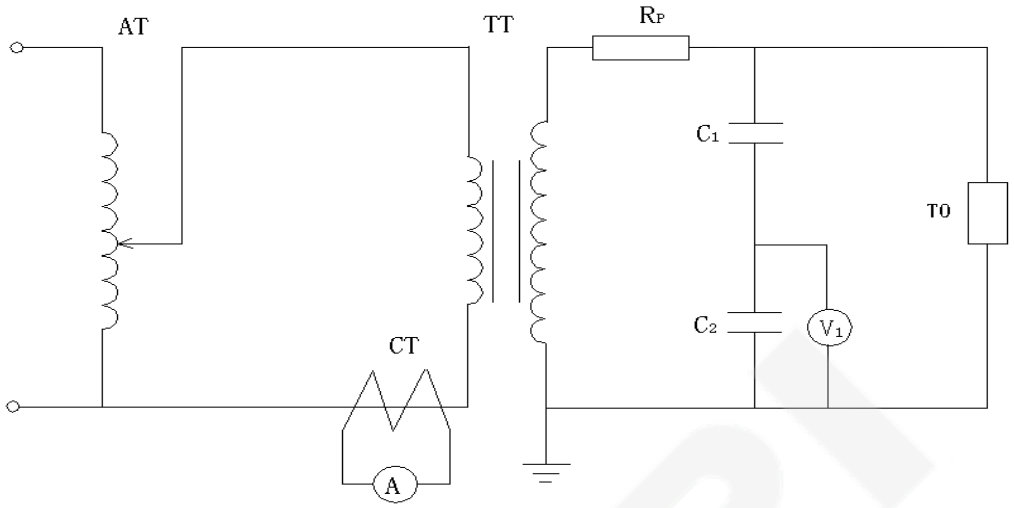
IPVBT230963G-012

试验照片
Photograph

IPVZP230963G-002

工频耐受电压试验回路图

Power-frequency withstand voltage test circuit



AT	调压器	Regulator	R_p	保护电阻	Protection resistance
CT	电流互感器	Current transformer	TT	工频试验变压器	PF transformer
TO	试品	Test object	A	电流表	Currentmeter
C_1	高压臂电容	H.V arm capacitance	C_2	低压臂电容	L.V arm capacitance
V_1	数字电压表 Voltmeter	型号 Type: DMI551		编号 SN: 175994	
550kV/2200kVA 工频电压测量系统 550kV/2200kVA power-frequency voltage measuring system					

工频系统主要参数 Parameters of TT system

U/S (kV/kVA)	f_{TT}(Hz)	R_p(kΩ)	C_1(pF)	C_2(μF)
550/2200	50	2	500	2.12

工频耐受电压试验

Power-frequency withstand voltage test

试验日期 Date: 2023-11-29

试区大气条件 Atmospheric conditions: P=98.5kPa t=15.7℃ RH=26.5%

大气/海拔修正因数 Atmospheric/Altitude correction factor: K_{t1}=0.953K_a=

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c($kV_{r.m.s.}$)	实测电压 U_t($kV_{r.m.s.}$)	耐受时间 Duration (s)	加压次数 No.A	击穿次数 No.D
相间及对地 P-to-P & P-to-E	Aa	BCbcF	309.7	309.7	60	1	0
	Bb	ACacF		310.1	60	1	0

试验结果 Result: 通过 Passed。

注 Note:

a)$U_c=U_e\times K_{t1}$.

工频耐受电压试验（湿）

1min power-frequency withstand voltage test(wet)

试验日期 Date: 2023-11-29

试区大气条件 Atmospheric conditions: P=98.5kPa t=15.7℃ RH=26.5%

大气/海拔修正因数 Correction factor: K_1= 0.994 K_a=/

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c($kV_{r.m.s.}$)	实测电压 U_t($kV_{r.m.s.}$)	耐受时间 Duration (s)	加压次数 No.A	击穿次数 No.D
相间及对地 P-to-P & P-to-E	Aa	BCbcF	323.0	323.1	60	1	0
	Bb	ACacF		323.3	60	1	0

试验结果 Result: 通过 Passed。

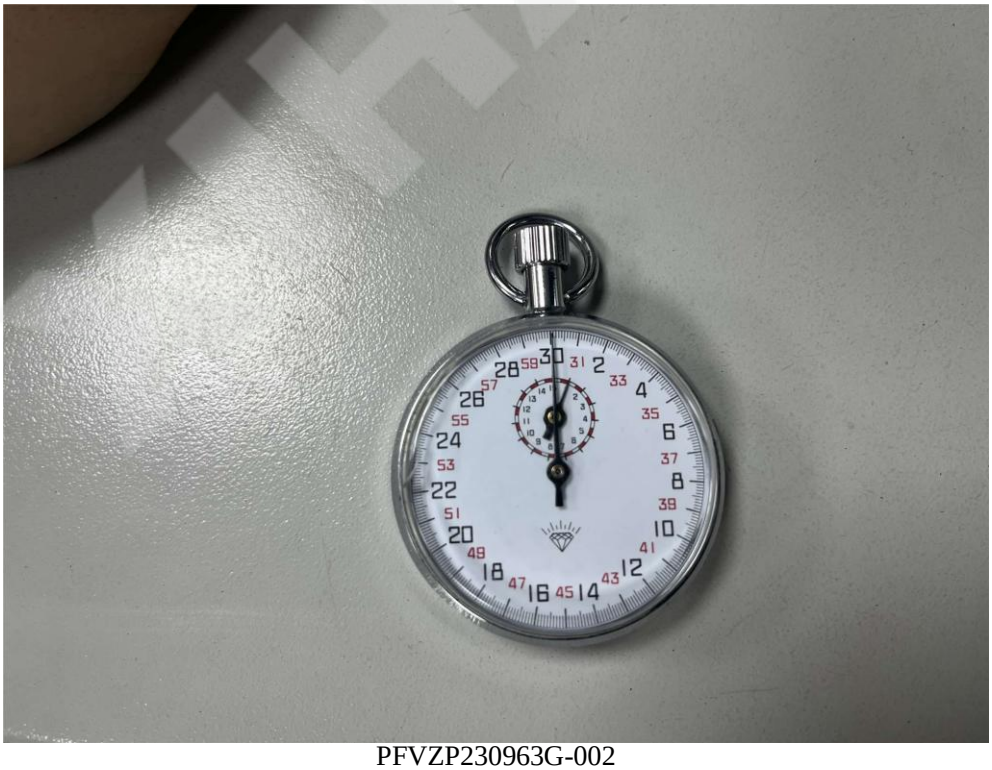
注 Notes:

a)$U_c=U_e\times K_1$;

b)雨水电导率(rain conductivity): 102.4μS/cm，水平分量(horizon): 1.3mm/min; 垂直分量(vertical): 1.2mm/min; 水温（water temperature）: 13.4℃。

试验照片
Photograph

PFVZP230963G-001



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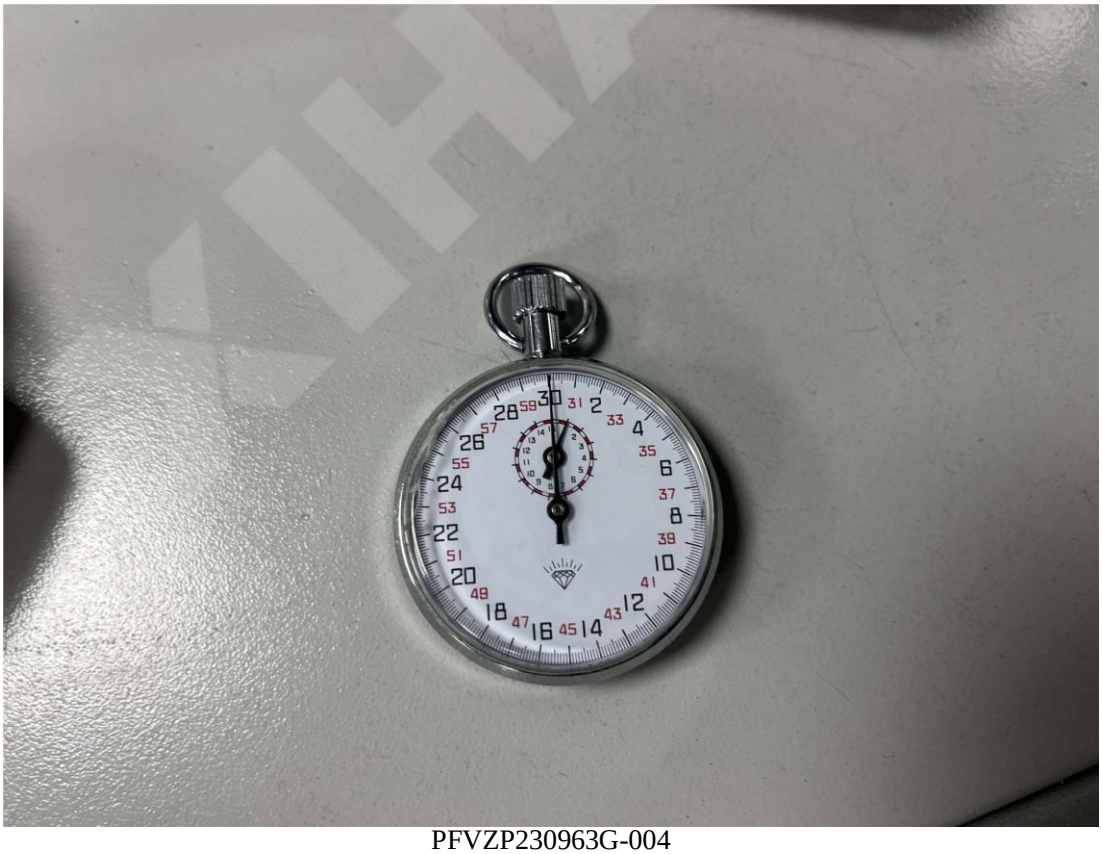
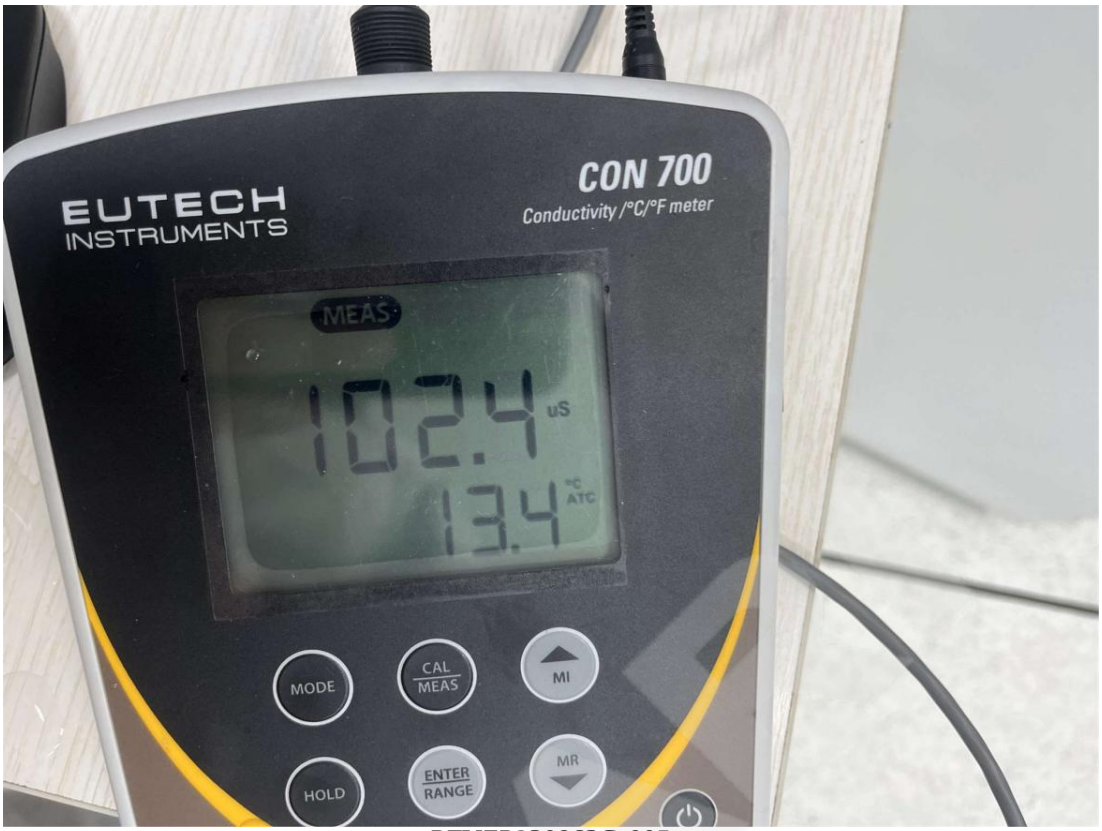
PFVZP230963G-003



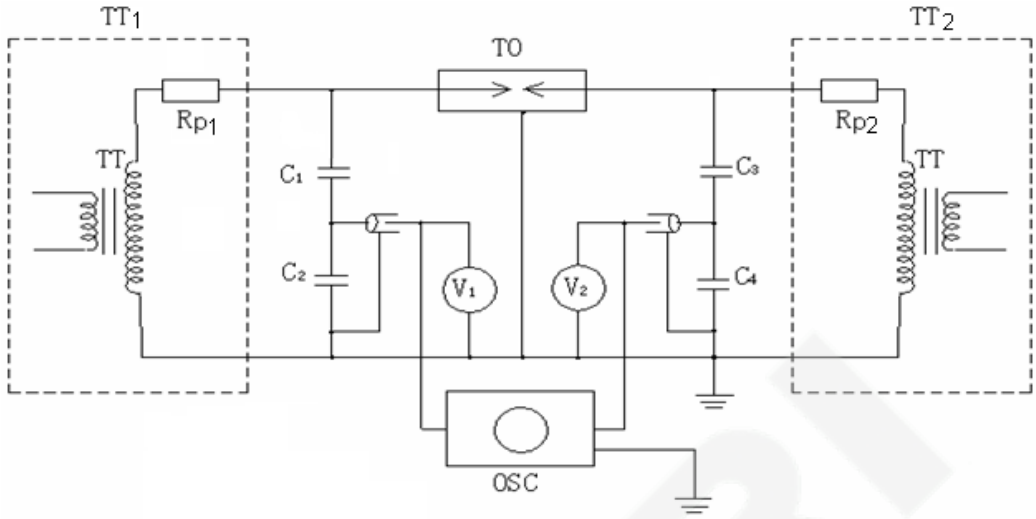
PFVZP230963G-004



PFVZP230963G-005

工频+工频联合电压试验回路图

Power-frequency and power-frequency combined voltage test circuit



TT_1	工频试验变压器	PF transformer	R_{p1}	保护电阻	Protection resistance
TT_2	工频试验变压器	PF transformer	R_{p2}	保护电阻	Protection resistance
C_1	高压臂电容	H.V arm capacitance	C_2	低压臂电容	L.V arm capacitance
C_3	高压臂电容	H.V arm capacitance	C_4	低压臂电容	L.V arm capacitance
TO	试品	Test object			
V_1	数字电压表 Voltmeter	型号 Type: DMI551			编号 SN: 173760
V_2	数字电压表 Voltmeter	型号 Type: DMI551			编号 SN: 175994
OSC	数字示波器 Oscilloscope	型号 Type: DPO4054			编号 SN: C021074
550kV/2200kVA 工频电压测量系统 550kV/2200kVA power-frequency voltage measuring system					
800kV/1600kVA 工频电压测量系统 800kV/1600kVA power-frequency voltage measuring system					

工频系统主要参数 Parameters of TT system

TT_1					TT_2				
U/S (kV/kVA)	f_{TT}(Hz)	R_{p1}(kΩ)	C_1(pF)	C_2(μF)	U/S (kV/kVA)	f_{TT}(Hz)	R_{p2}(kΩ)	C_3(pF)	C_4(μF)
550/2200	50	2	500	2.12	800/1600	50	5	500	3.0

工频+工频联合电压试验

Power-frequency and power-frequency combined voltage test

试验日期 Date: 2023-11-29

试区大气条件 Atmospheric conditions: P=98.5kPa t=15.7℃ RH=26.5%

大气/海拔修正因数 Atmospheric/Altitude correction factor: K_{t2}=0.945 K_a=/

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c($kV_{r.m.s.}$)	实测电压 U_t($kV_{r.m.s.}$)	耐受时间 Duration (s)	加压次数 No.A	击穿次数 No.D
断路器 CB	A+a	BCbcF	308.8+47.5	308.2+47.2	60	1	0
	a+A	BCbcF		308.5+47.9	60	1	0
	B+b	ACacF		309.0+47.4	60	1	0
	b+B	ACacF		308.8+47.8	60	1	0

试验结果 Result: 通过 Passed。

注 Notes:

a)$U_c=U_e\times K_{t2}$，实际试验时取 K_{t2}=0.950; Choosing K_{t2}=0.950 during test;

b)“+”前为主工频电压施加的有效值或部位，“+”后为反极性工频电压施加的有效值或部位。Before “+”: applied main PF voltage or position, after “+”: applied reverse auxiliary PF voltage or position.

工频+工频联合电压试验（湿）

Power-frequency and power-frequency combined voltage test(wet)

试验日期 Date：2023-11-29

试区大气条件 Atmospheric conditions：P=98.5kPa t=15.7℃ RH=26.5%

大气/海拔修正因数 Atmospheric/Altitude correction factor：K_{t2}=0.993 K_a=/

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c($kV_{r.m.s.}$)	实测电压 U_t($kV_{r.m.s.}$)	耐受时间 Duration (s)	加压次数 No.A	击穿次数 No.D
断路器 CB	A+a	BCbcF	322.7+49.6	322.2+49.8	60	1	0
	a+A	BCbcF		322.6+49.9	60	1	0
	B+b	ACacF		322.9+49.7	60	1	0
	B+B	ACacF		322.8+49.8	60	1	0

试验结果 Result：通过 Passed。

注 Notes:

a)$U_c=U_e\times K_1$;

b)“+”前为主工频电压施加的有效值或部位，“+”后为反极性工频电压施加的有效值或部位；Before “+”: applied main PF voltage or position, after “+”: applied reverse auxiliary PF voltage or position;

c)雨水电导率(rain conductivity)：102.4μS/cm，水平分量(horizon)：1.3mm/min；垂直分量(vertical)：1.2mm/min；水温（water temperature）：13.4℃。

试品照片
Photograph

PFVZP230963G-006

PFVZP230963G-007

PFVZP230963G-008

PFVZP230963G-009

PFVZP230963G-010

辅助和控制回路的绝缘试验

Dielectric test on auxiliary and control circuit

试验日期 Date: 2023-11-29

试区大气条件 Atmospheric conditions: P=98.5kPa t=15.7℃ RH=26.5%

大气/海拔修正因数 Atmospheric/Altitude correction factor: K_{t1}=/ K_{t2}=/ K_1=/ K_a=/

a)电压加在连接在一起的辅助和控制回路与开关装置的底架之间 Voltage applied between the auxiliary and control circuit connected together as a whole and the frame of the switching device

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c($kV_{r.m.s}$)	实测电压 U_t($kV_{r.m.s}$)	加压次数 No.A	击穿次数 No.D	耐受时间 Duration (s)
辅助和控制回路 Auxiliary and control circuit	二次回路端子 Secondary terminals	F	2.0	2.0	1	0	60

b) 电压加在辅助和控制回路的每一部分（这部分在正常使用中与其他部分绝缘）与连接在一起并和底架相连的其他部分之间 Voltage applied between each part of the auxiliary and control circuits, which in normal use may be insulated from the other parts, and the other parts connected together to the frame

试验部位 Testing position	加压部位 Voltage applied to	接地部位 Earthed terminal	应施电压 U_c($kV_{r.m.s}$)	实测电压 U_t($kV_{r.m.s}$)	加压次数 No.A	击穿次数 No.D	耐受时间 Duration (s)
辅助和控制回路 Auxiliary and control circuit	各二次回路端子 Each secondary terminals	其它二次回路端子与 F Other secondary terminals & F	2.0	2.0	1	0	60

试验结果 Test result: 通过 Passed.

试验照片

Photograph

PFVZP230963G-011

图纸
Drawings