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XIHARI

No. 215695

检 验 报 告

TEST REPORT

试 品 型 号: TYPE	HXGN□-12/125-31.5
试 品 名 称: DESIGNATION	交流金属封闭环网开关设备 ALTERNATING-CURRENT METAL-ENCLOSED SWITCHGEAR
委 托 单 位: APPLICANT	南京奥博电气有限公司 NANJING AUBO ELECTRIC CO.,LTD.
制 造 单 位: MANUFACTURER	南京奥博电气有限公司 NANJING AUBO ELECTRIC 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常州有限责任公司

XI'AN HIGH VOLTAGE APPARATUS RESEARCH INSTITUTE CHANGZHOU 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:

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——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

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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 检验报告封面到结论页页面右下角无查询二维码无效。The entire report shall be considered invalid if there is no QR code in the bottom-right corner from the cover page to the "Conclusions " page.

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试品基本信息
Description of the test object

型号名称: HXGN□-12/125-31.5 交流金属封闭环网开关设备
Type and Designation: Alternating-Current Metal-Enclosed Switchgear
委托单位: 南京奥博电气有限公司
Applicant: Nanjing Aubo Electric Co.,Ltd.
地址: 南京民族工业集中区（六合区竹镇镇内） (211500)
Address: Nanjing National Industrial Concentration Zone (Zhuzhen Town, Luhe District) (211500)
电话 Tel: 025-85281966-806 传真 Fax: 025-85282166
制造单位: 南京奥博电气有限公司
Manufacturer: Nanjing Aubo Electric Co.,Ltd.
地址: 南京市六合区竹镇镇竹丰路 15 号 (211500)
Address: No.15, Zhufeng Road, Zhuzhen Town, Luhe, Nanjing, Jiangsu, China (211500)
电话 Tel: 025-85281966-806 传真 Fax: 025-85282166

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	12	
额定电流 Rated current A	125	
额定频率 Rated frequency Hz	50	
额定短路开断电流 Rated short-circuit breaking current kA	31.5	
额定短路关合电流 Rated short-circuit making current kA	80	
额定转移电流 Rated transfer current A	1500	
额定短时工频耐受电压 Rated short-duration power-frequency withstand voltage kV	42	✓
额定雷电冲击耐受电压 Rated lightning impulse withstand voltage kV	75	✓
额定短时工频耐受电压(断口) Rated power-frequency withstand voltage(across the open switching device) kV	42	✓
额定雷电冲击耐受电压(断口) Rated lightning impulse withstand voltage(across the open switching device) kV	75	✓
SF6 气体的额定压力(20℃表压) Rated pressure of SF6 gas(meter pressure at 20℃) Mpa	0.045	
SF6 气体的最低功能压力(20℃表压) Min. function pressure of SF6 gas(meter pressure at 20℃) Mpa	0.03	
出厂日期及编号 Manufacture date and serial number	2021-08、AB202108018	

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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.

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检验结论
Conclusions

型号名称: HXGN□-12/125-31.5 交流金属封闭环网开关设备
Type and Designation: Alternating-Current Metal-Enclosed Switchgear

委托单位: 南京奥博电气有限公司
Applicant: Nanjing Aubo Electric Co.,Ltd.
地址: 南京民族工业集中区（六合区竹镇镇内） (211500)
Address: Nanjing National Industrial Concentration Zone (Zhuzhen Town, Luhe District) (211500)
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制造单位: 南京奥博电气有限公司
Manufacturer: Nanjing Aubo Electric Co.,Ltd.
地址: 南京市六合区竹镇镇竹丰路 15 号 (211500)
Address: No.15, Zhufeng Road, Zhuzhen Town, Luhe, Nanjing, Jiangsu, China (211500)
电话 Tel: 025-85281966-806 传真 Fax: 025-85282166

依据标准 Standards for Test Performance: GB/T 3906-2020

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	工频耐受电压试验 Power frequency withstand voltage tests	相间及对地 Between phases, to earth: 42kV 1min 断口 Across the open switching device: 42kV 1min	GB/T 3906-2020 7.2	符合 Satisfied
2	雷电冲击耐受电压试验 Lightning impulse withstand voltage tests	相间及对地 Between phases, to earth: 75kV 断口 Across the open switching device: 75kV	GB/T 3906-2020 7.2	符合 Satisfied
3	局部放电测量 partial discharge measurement	13.2kV ≤20pC	GB/T 3906-2020 7.2.10	符合 Satisfied

编写 Edited: 校核 Checked: 批准 Approved:

日期 Date: 2021-10-14 日期 Date: 2021-10-14 日期 Date: 2021-10-14

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试品确认
Identification of the test object

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

HXGN□-12/125-31.5 交流金属封闭环网开关设备 Alternating-Current Metal-Enclosed Switchgear

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）熔断器 Fuse

型号 Type: XRNT-12/125

额定电压 额定电压: 12kV

额定电流 Rated current: 125A

额定频率 Rated frequency: 50Hz

熔断器撞击器的型式(轻/中/重型) Striker type: 中 Medium

预期开断电流 Prospective breaking current: 31.5kA

制造单位 Manufacturer: 西安熔断器制造公司 Xi'an Fuse Manufacturing Company

2）组合电器 Switch—fuse combination

型号 Type: FLRN36-12/125-31.5(YB)（三工位 Three-position）

额定电压 Rated voltage: 12kV

额定电流 Rated current: 125A

额定频率 Rated frequency: 50Hz

额定短路开断电流 Rated short-circuit breaking current: 31.5kA

额定短路关合电流 Rated short-circuit making current: 80kA

额定转移电流 Rated transfer current: 1500A

配用操动机构型号、名称 Operating device: 手力弹簧储能操动机构 Manual Spring Operating Mechanism

SF6 气体额定压力(20℃时表压) Rated pressure of SF6 (meter pressure at 20℃): 0.045MPa

SF6 气体的最低功能压力(20℃表压) Min. function pressure of SF6(meter pressure at 20℃): 0.03MPa

出厂日期 Manufacture date: 2021-03

出厂编号 Serial number: Z210302341

制造单位 Manufacturer: 南京奥博电气有限公司 Nanjing Aubo Electric Co.,Ltd.

3）试品外形尺寸 Overall dimension

宽 width × 深 depth × 高 height : 500 × 1050 × 1630mm × mm × mm

4）母线 Busbar

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主母线尺寸 Dimensions(main busbar): TMY-40 × 8mm × mm

接地母线尺寸 Dimensions(earthing busbar): TMY-50 × 6mm × mm

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:

AB.520.004JT HXGN□-12/125-31.5 交流金属封闭环网开关设备 技术条件 Technical specification of HXGN□-12/125-31.5 Alternating-Current Metal-Enclosed Switchgear

AB.362.003JT HXGN□-12/125-31.5 交流金属封闭环网开关设备 鉴定大纲 To test the outline of identification of HXGN□-12/125-31.5 Alternating-Current Metal-Enclosed Switchgear

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:

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

AB.T025.037 总装图 (日期 Date: 2021-07)

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: 2021-09-06

7、委托方代表 Tests witnessed by:

于朦朦 南京奥博电气有限公司

Yu Mengmeng Nanjing Aubo Electric Co.,Ltd.

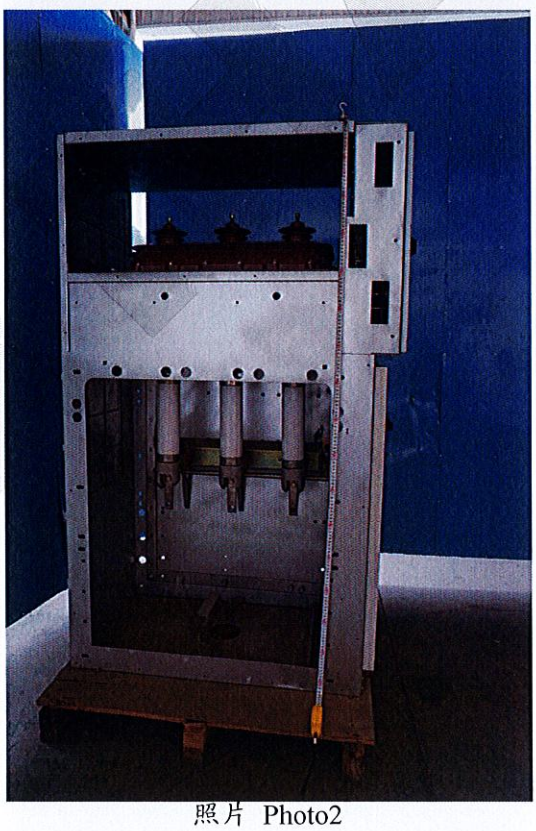
8、检验日期 Date of tests: 起 from 2021-09-13 止 to 2021-09-14

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试品照片 Photographs:

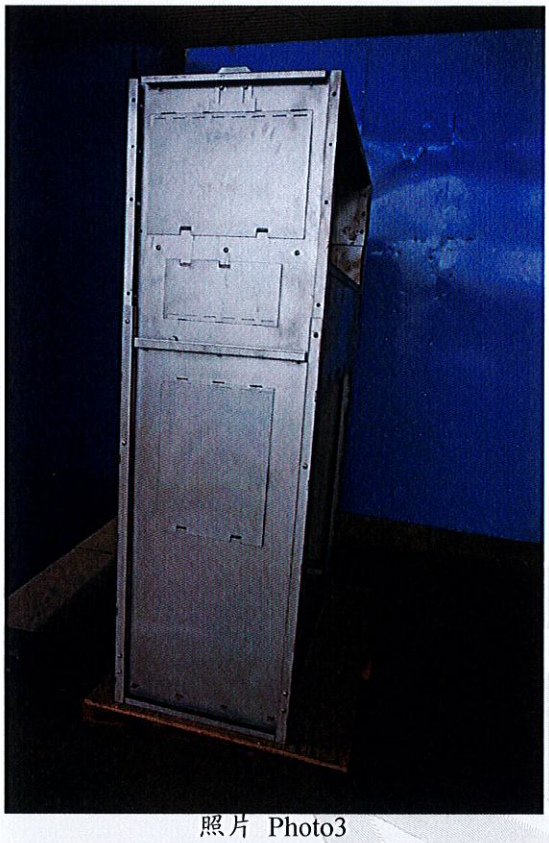


照片 Photo1



照片 Photo2

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照片 Photo3



照片 Photo4

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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	冲击电压波形时间测量系统 (Time measurement system for impulse voltage waveform)	$U<5\%$ (k=2)
3	温度(Temperature) ZDR-F_{20}温湿度记录仪 ZDR-F_{20} Temperature and humidity recorder	U<1.0℃ (k=2)
4	绝对湿度(Absolute humidity) ZDR-F_{20}温湿度记录仪 ZDR-F_{20} Temperature and humidity recorder	U<1g/m^3 (k=2)
5	大气压力(Air pressure) DW476-1 数字压力计 DW476-1Digital pressure gauge	U<0.2 kPa (k=2)
6	雨水电导率(Rain conductivity) 530 电导率仪 530 Conductivity meter	U=1.2% (k=2)
7	局部放电测量系统 (PD measuring system)	< 20 pC: U=2.4pC (k=2) 20pC ~ 50pC: U=5.5pC (k=2) > 50 pC: U=12% (k=2)

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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 used in test report	说明 Description
LI	雷电冲击 Lightning impulse
LIC	雷电冲击截波 Chopped lightning impulse
IG	冲击电压发生器 Impulse 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
kVp	电压峰值 Voltage peak value
RMS	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_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
AID	隔离断口 Across the isolating distance
ISPW	观察窗 Inspection window
VCB	真空断路器 Vacuum circuit breaker
K_1	空气密度修正系数 Air density correction factor
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_u	辅助和控制回路的海拔修正系数 Altitude correction factor for dielectric test on auxiliary and control

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绝缘试验总则
General of dielectric test

1.试品编号 Serial No: AB202108018;

2.依据标准 Applied standard: GB/T 3906-2020;

3.试品是一个新的、干净的交流金属封闭环网开关设备，包括熔断器、组合电器、操作机构、母线及所有正常运行时的其它部件；Tested object is a new,clean AC metalclad switchgear,including fuse, combination, operating mechanism, busbarand all other components as in service;

4.P_{SF6}=0.03(20℃)

5.试品最小电气间隙为：对地 140mm，相间中心距 210mm；Minimum electrical clearance for tested object are, P-to-E 140mm, phase center distance 210 mm;

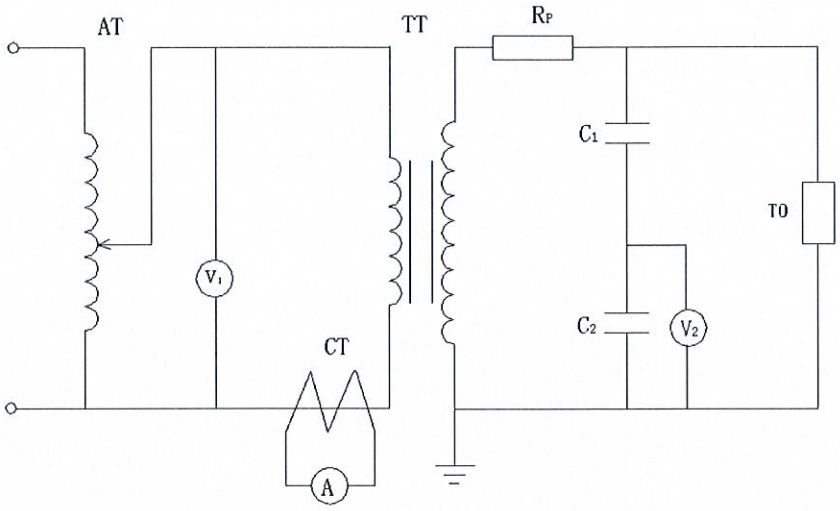
6.试验过程中未更换和整修零部件；No part is renewed or reconditioned during the tests;

7.A、B、C 为动触头端，a、b、c 为静触头端，F 为试品外壳。A, B, C are moving contacts and a, b, c are fixed contacts, F is test object enclosure.

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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	Tested 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_2	峰值电压表(Voltmeter)		型号(Type)：PV2-1A		编号(SN)：071261
150kV 工频电压测量系统 150kVPower frequency voltage measuring systems					

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)
150/300	50.0	5.0	500.0	0.5

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工频耐受电压试验

Power frequency withstand voltage test

试验日期 Test date: 2021-09-13

试区大气条件 Atmospheric conditions: P=100.7kPa t=24.3℃ RH=67.8%

大气/海拔修正因数 Correction factor: K_{t1}=0.980 K_{t2}=/ K_1=/ 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① P-to-P & P-to-E	Aa	BCbcF ISPW	42.0	42.1	60	1	0
	Bb	ACacF ISPW		41.9	60	1	0
	Cc	ABabF ISPW		41.9	60	1	0
组合电器 Combination	A	BCabcF	42.0	42.0	60	1	0
	a	ABCbcF		42.0	60	1	0
	B	ACabcF		42.1	60	1	0
	b	ABCacF		42.0	60	1	0
	C	ABabcF		41.8	60	1	0
	c	ABCabF		42.1	60	1	0

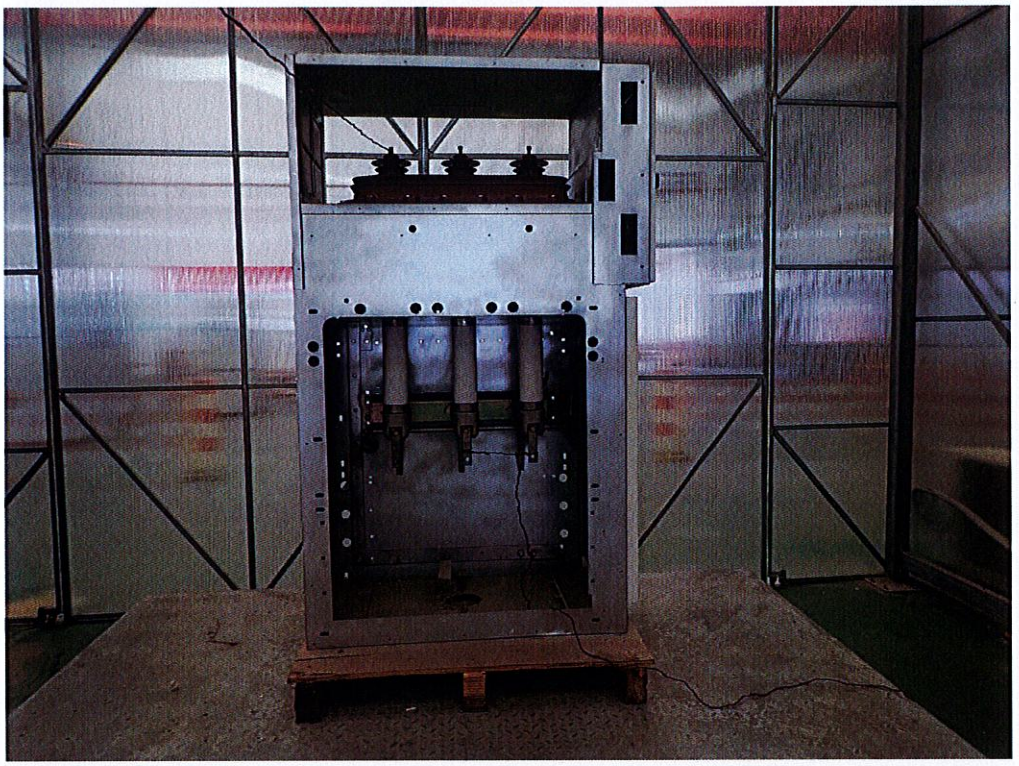
试验结果 Test result: 通过 Passed。

注 Notes:

a)①$U_c=U_e\times K_{t1}\times K_a$，实际试验时取 K_{t1}=1.000.Choosing K_{t1}=1.000 during test。

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试验照片
Photograph



PFVZP215695-01

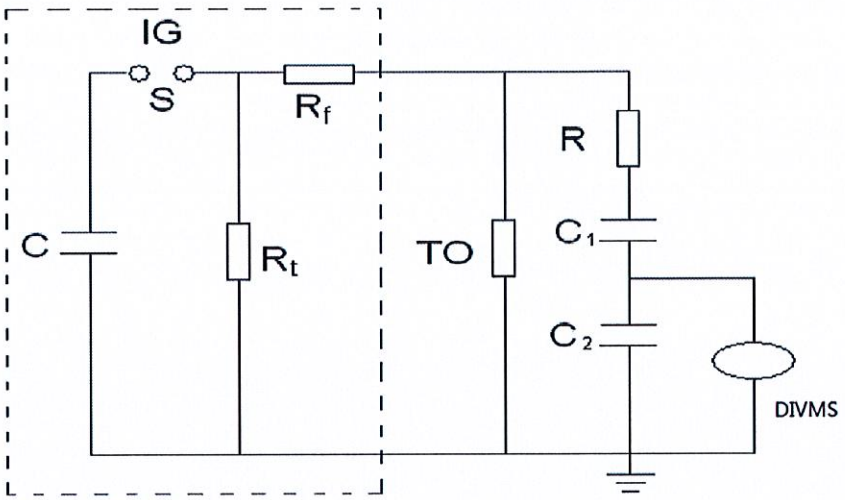


PFVZP215695-02

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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	Tested object	C_2	低压臂电容	L.V arm capacitance
DIVMS	数字冲击电压测量系统(Digital impulse voltage measuring systems)				
400kV/20kJ 冲击电压测量系统 400kV/20kJ Impulse voltage measuring systems					

冲击系统主要参数(Parameters of IG system)

波形(Type)	U(kV)	C(μF)	R_f(Ω)	R_t(Ω)	C_1(pF)	C_2(μF)
雷电 (LI)	400	0.25	465	213	300	0.555

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雷电冲击耐受电压试验
Lightning impulse withstand voltage test

试验日期 Testdate: 2021-09-13

试区大气条件 Atmospheric conditions: P=100.7kPa t=24.3℃ RH=67.8%

大气/海拔修正因数 Correction factor: K_{t1}=0.980K_{t2}=/ K_1=/ 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 $U_c(kV_p)$		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			
相间及对地① P-to-P& P-to-E	Aa	BCbcF ISPW	75.0	+	74.8	75.2	75.1	75.0	75.3	75.2	74.8	75.0	75.2	75.3	74.7	75.4	75.4	74.9	75.1	15	0	01
				-	74.7	75.4	75.1	75.4	75.2	75.4	75.0	74.9	74.9	75.2	74.8	75.3	74.6	75.4	74.8	15	0	02
	Bb	ACacF ISPW		+	74.9	75.0	75.3	75.2	75.1	74.7	74.6	74.8	74.7	75.0	75.2	75.0	75.1	75.0	75.4	15	0	03
				-	74.6	74.9	75.2	75.3	75.1	74.6	75.0	74.7	74.8	75.0	75.1	74.6	74.8	75.2	74.8	15	0	04
	Cc	ABabF ISPW		+	75.3	75.3	74.7	75.2	75.0	75.4	75.1	75.4	75.2	75.4	74.8	74.7	75.0	75.1	75.2	15	0	05
				-	74.8	75.1	75.0	75.2	75.1	74.9	74.9	74.9	75.4	75.1	75.1	75.3	74.8	75.4	75.0	15	0	06

试验结果 Test result: 通过 Passed。

注 Notes:

a)①$U_c=U_e\times K_{t1}\times K_a$，实际试验时取 K_{t1}=1.000; Choosing K_{t1}=1.000 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。

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雷电冲击耐受电压试验
Lightning impulse withstand voltage test

试验日期 Testdate: 2021-09-13

试区大气条件 Atmospheric conditions: P=100.7kPa t=24.3℃ RH=67.8% 大气/海拔修正因数 Correction factor: K_{t1}=/ K_{t2}=/ K_1=/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 $U_c(kV_p)$		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			
组合电器 Combination	A	BCabcF	75.0	+	75.1	75.0	75.1	74.9	75.1	75.3	74.7	74.8	75.2	74.7	74.8	74.7	75.1	75.1	75.1	15	0	07
				-	75.0	74.9	75.1	74.8	74.9	75.4	75.3	75.1	74.8	75.1	75.1	74.8	74.9	74.8	75.2	15	0	08
	a	ABCbcF		+	75.2	75.1	74.9	74.8	75.2	74.9	75.3	75.4	75.4	75.2	75.2	75.4	75.2	75.4	74.9	15	0	09
				-	75.2	74.9	75.0	74.7	74.8	75.0	74.7	75.3	75.0	75.4	75.3	75.0	74.9	75.2	75.4	15	0	10
	B	ACabcF		+	74.7	75.2	74.9	75.3	74.9	75.4	74.9	75.2	75.4	74.7	75.0	75.2	74.7	74.9	75.1	15	0	11
				-	75.1	74.8	75.2	74.8	74.9	75.1	75.0	75.4	74.9	75.4	75.0	75.3	74.8	74.7	74.9	15	0	12
	b	ABCacF		+	75.0	75.2	74.7	75.1	75.4	75.4	74.9	75.0	75.0	74.9	74.7	75.0	74.9	75.0	75.1	15	0	13
				-	75.2	74.8	74.7	75.2	74.9	75.1	74.7	74.9	74.8	75.1	75.0	75.3	75.2	75.3	75.4	15	0	14
	C	ABabcF		+	74.7	75.3	75.0	75.3	75.2	74.7	74.7	75.0	75.4	75.2	75.4	75.1	74.7	75.0	75.3	15	0	15
				-	75.4	75.0	74.9	75.2	75.1	75.3	74.6	74.8	75.3	74.6	75.1	75.0	75.1	75.4	75.2	15	0	16
	c	ABCabF		+	74.9	75.3	75.0	74.7	75.0	74.8	75.0	75.1	74.9	75.2	75.4	74.6	75.2	75.2	75.1	15	0	17
				-	75.4	75.4	75.2	74.7	75.3	75.0	75.1	75.4	75.0	74.9	75.1	75.4	74.8	75.3	75.2	15	0	18

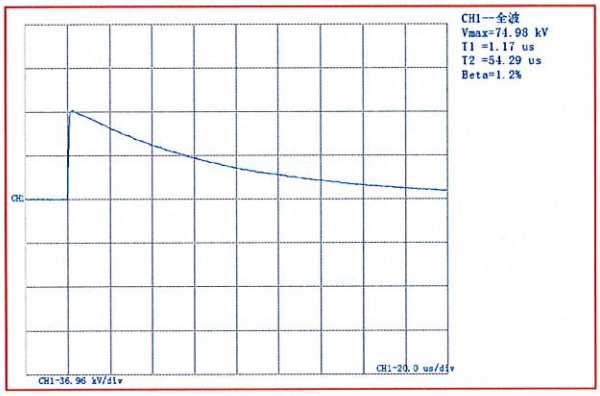
试验结果 Test result: 通过 Passed。

注 Notes:

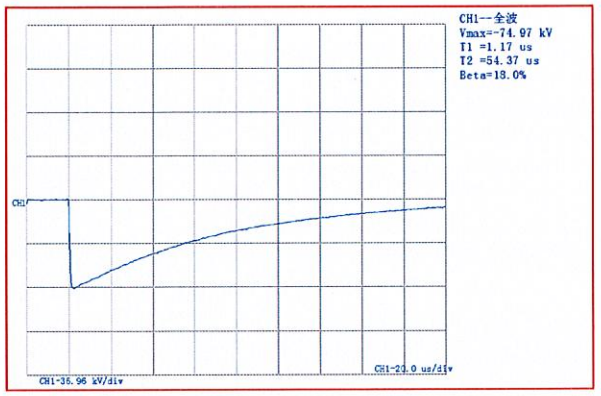
a)施加了一次 50%的 Uc 进行调波，分别施加 65%和 80%的 Uc 对波形进行校验。50%,65%,80%Uc are applied in sequence to verify parameters。

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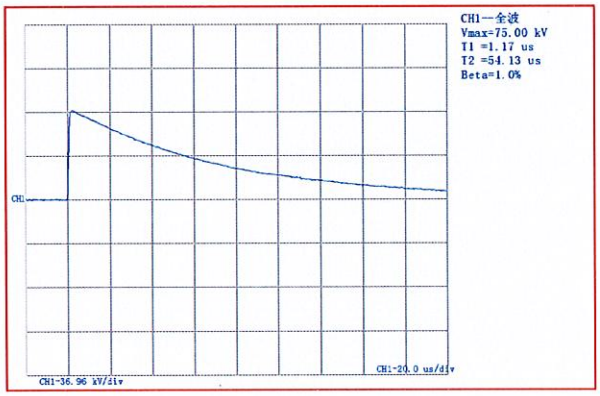
示波图
Oscillogram



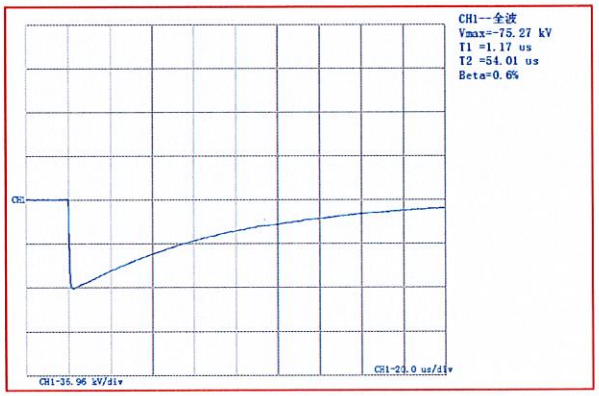
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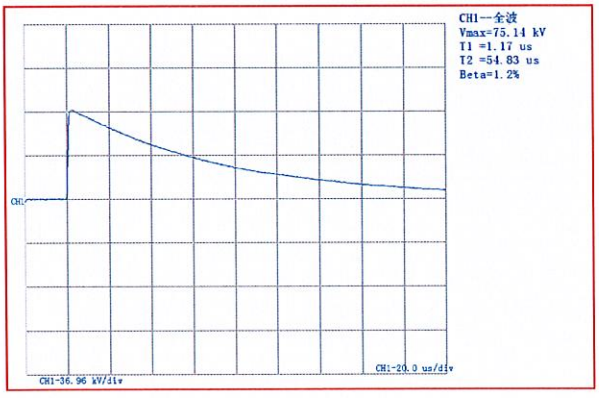
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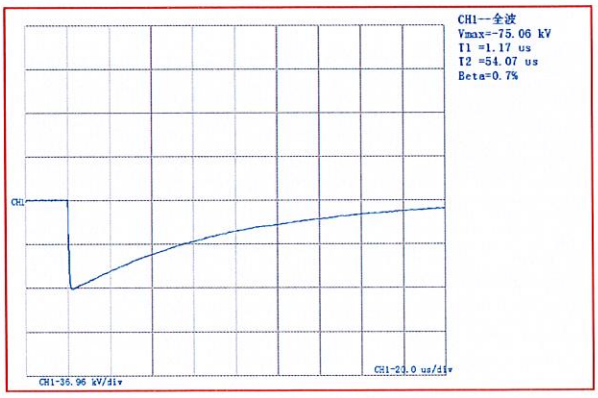
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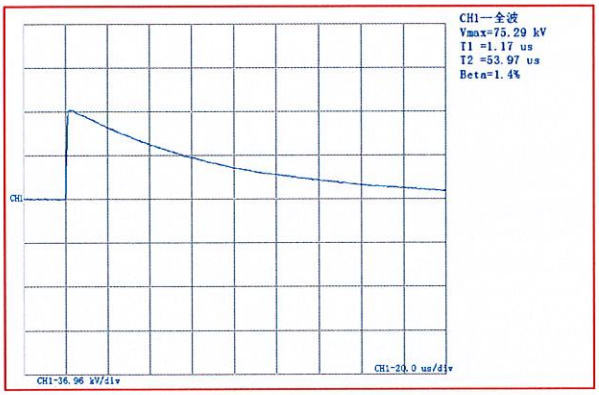


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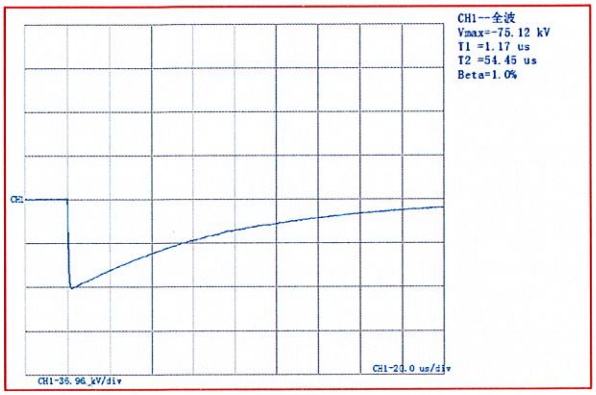


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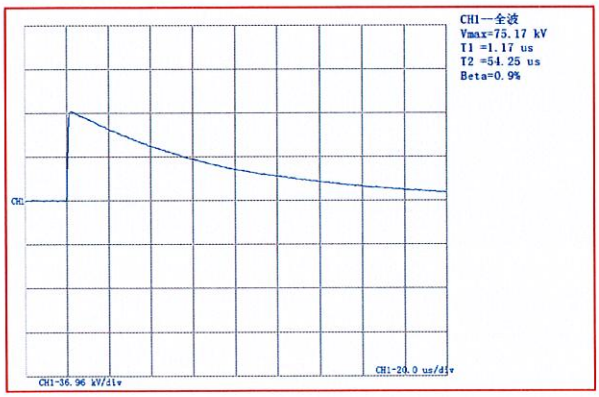
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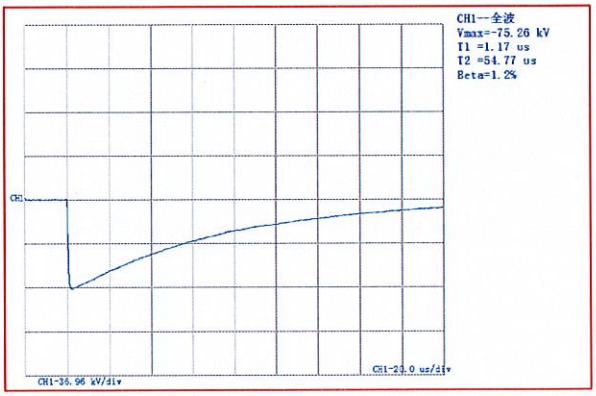
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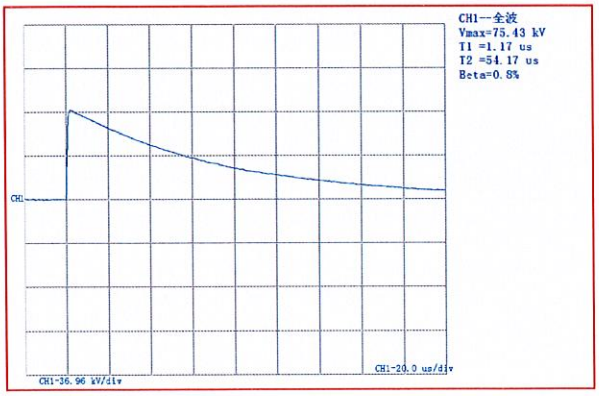
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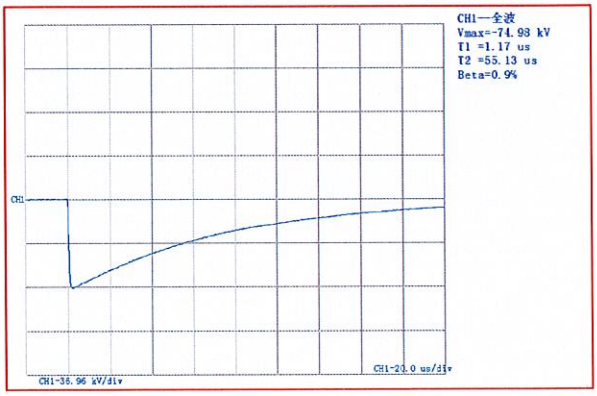
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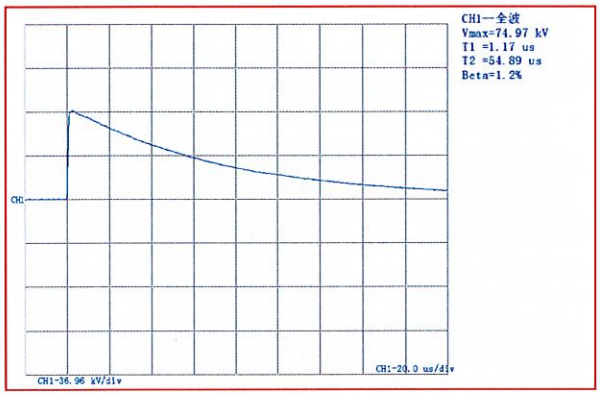


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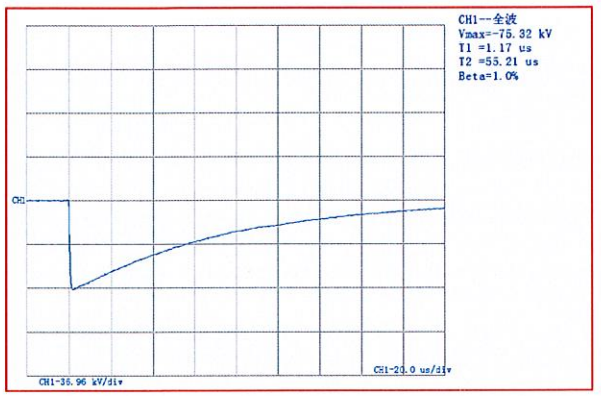


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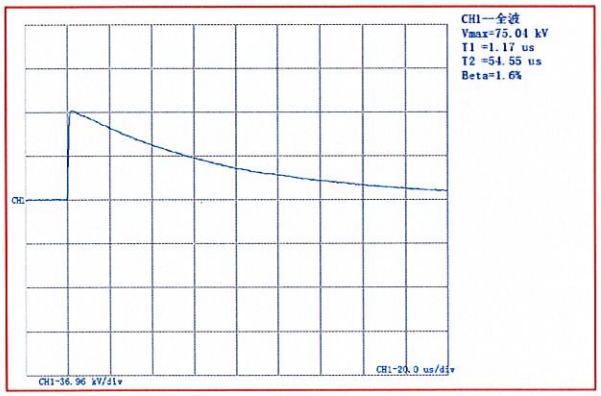
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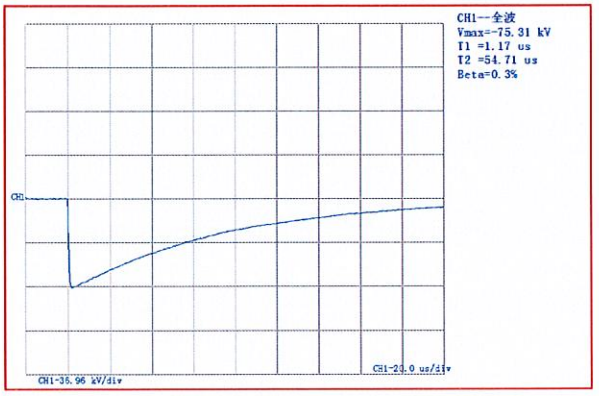
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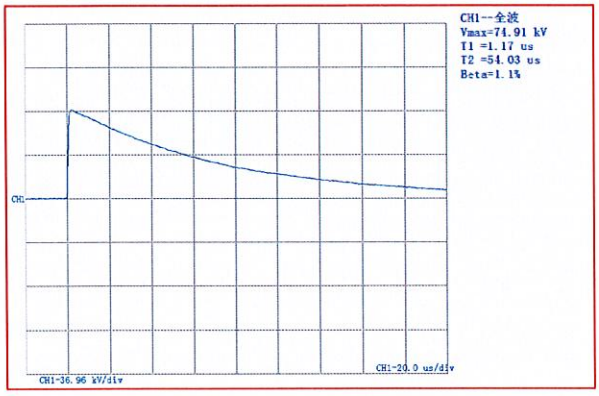
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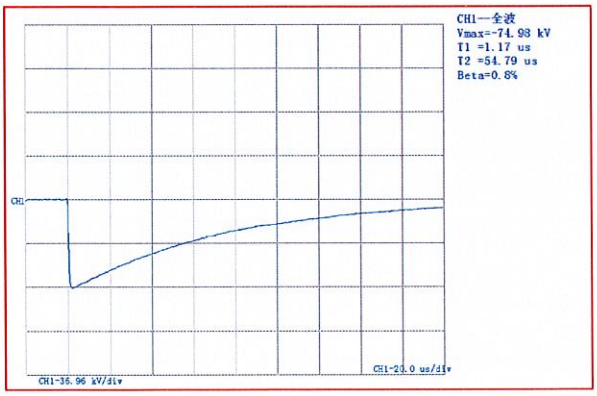
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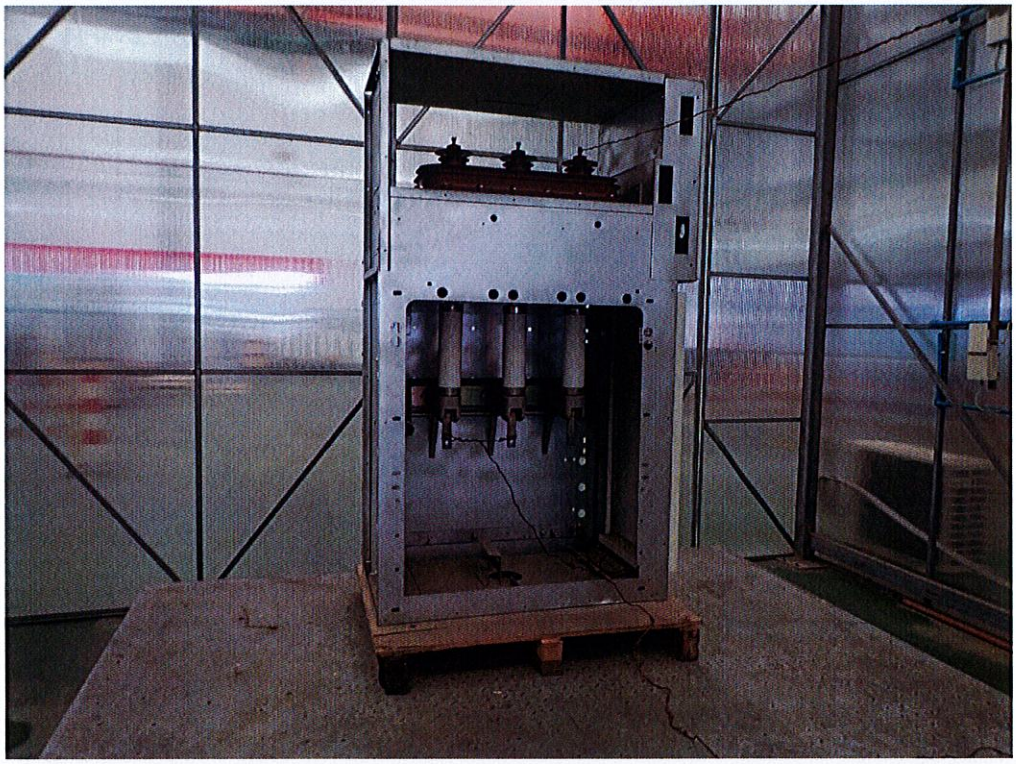
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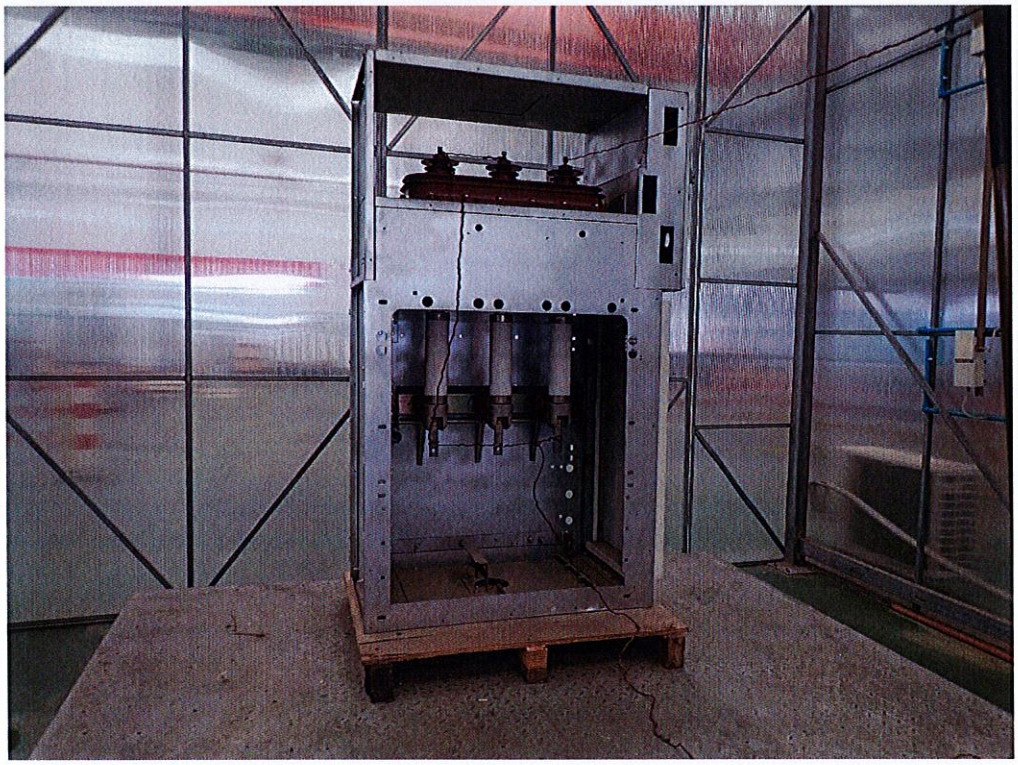
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试验照片
Photograph



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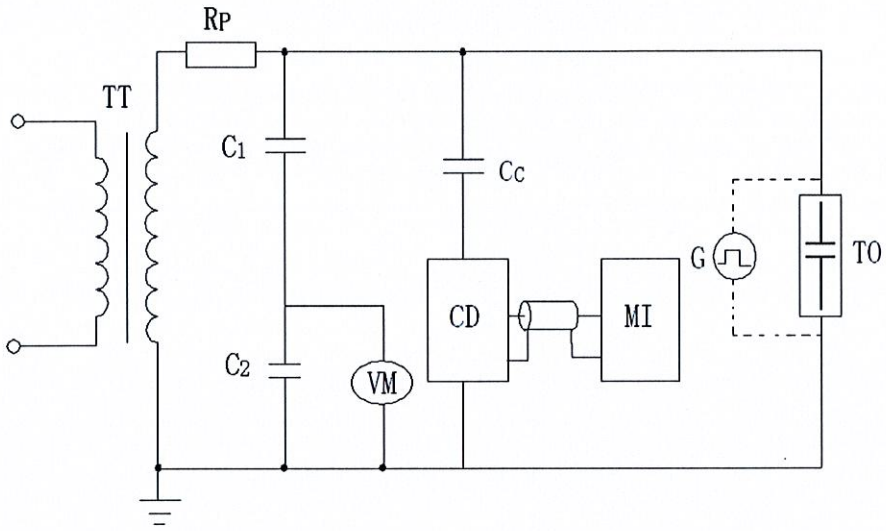


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局部放电试验回路图

Partial discharge test circuit



TT	工频试验变压器	PF transformer	Rp	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
CD	耦合装置	Coupling device	Cc	耦合电容	Coupling capacitor
TO	试品	Tested object	VM	峰值电压表	Voltmeter
G	方波校准器（Step voltage generator）	型号(Type)：XD2102			编号(SN)：JG00005-1
MI	局放测量仪(Measuring instrument)	型号(Type)：XD2012Y			编号(SN)：212142
		频率(Frequency)：10kHz~500kHz			
150kV 工频电压测量系统 150kVPower frequency voltage measurement system					

工频系统主要参数(Parameters of TTsystem)

U/S (kV/kVA)	f_{TT}(Hz)	R_p(kΩ)	C_1(pF)	C_2(μF)
150/150	50.0	5.0	500.0	0.47

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局部放电试验
Partial discharge tests

试验日期 Test date: 2021-09-14

试区大气条件 Atmosphericconditions: P=101.1kPa t=28.5℃ RH=60.2%

试验部位 testing position	加压部位 voltage applied to	接地部位 earthed terminal	预加电压 pre-stressing voltage (t=60 s)		测量电压 test voltage (t=60 s)		实测值 PD value (pC)	要求值 required value (pC)
			应施电压 U_c($kV_{r.m.s}$)	实测电压 U_t($kV_{r.m.s}$)	应施电压 U_c($kV_{r.m.s}$)	实测电压 U_t($kV_{r.m.s}$)		
相间及对地 P-to-P & P-to-E	Aa	BCbcF	15.6	15.6	13.2	13.1	13.4	⩽20
	Bb	ACacF		15.6		13.2	14.1	
	Cc	ABabF		15.7		13.2	12.9	

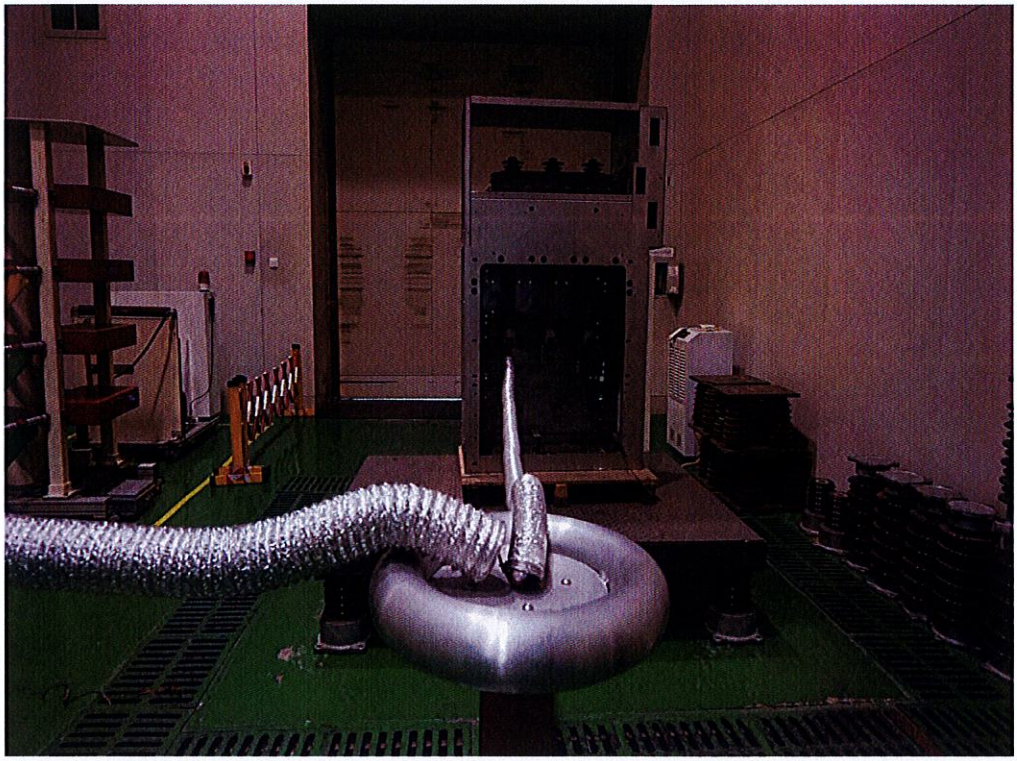
试验结果 Testresult: 通过 Passed。

注(Notes):

a)试验前采用 20pC 校准源对回路进行校准，背景噪音为⩽2.0pC。Step voltage generator:20pC, background noise⩽2.0pC.

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试验照片
Photograph

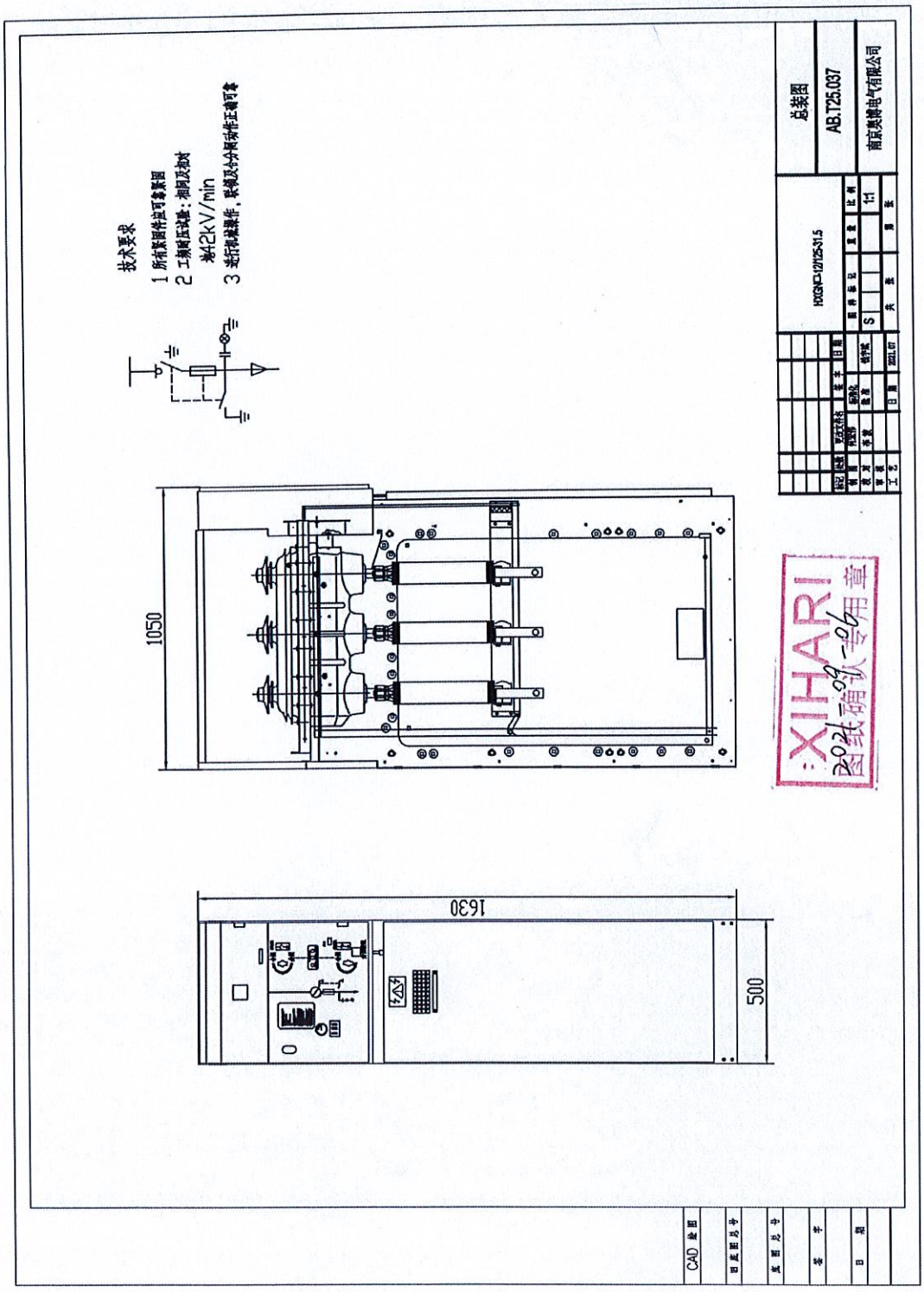


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