

电力工业电气设备质量检验测试中心

Quality Inspection and Test Center
for Equipment of Electric Power

(2010) 检字 JDL180 号



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检测报告

Inspection Report



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QUALITY INSPECTION AND TEST CENTER FOR EQUIPMENT OF ELECTRIC POWER
P. R. OF CHINA

检测报告

INSPECTION REPORT

(2010检字 JDL 180 号

Ref: 2010JDL180

委托单位 北京芳远电器有限公司
Client Beijing Fangyuan Electric Co., Ltd.

试样说明

名称: 18/30 kV 交联电缆冷缩式户外终端
型号规格: FYWLS-18/30
制造厂: 北京芳远新合电器技术有限公司

试样编号: DL 2010-168

制造日期: 2010年04月

取样方式: 送样

Description of Samples

Name of Test Samples: 18/30 kV XLPE cable cold shrinkable outdoor termination

Type and Size: FYWLS-18/30

Year of Manufacture: Apr., 2010

Manufacturer: Beijing Fangyuan Xinhe Electric technology Co., Ltd.

Sample No: DL 2010-168

Sampling Way: taken by client self

检测标准

GB/T 12706.4—2008 额定电压1 kV($U_m=1.2$ kV)到35 kV($U_m=40.5$ kV)挤包绝缘电力电缆及其附件 第4部分: 额定电压6 kV($U_m=7.2$ kV)到35 kV($U_m=40.5$ kV)电缆附件试验要求

IEC 60502-4:2005 额定电压 1 kV($U_m=1.2$ kV) 到 30 kV($U_m=36$ kV)挤包绝缘电力电缆及其附件 第4部分: 额定电压 6 kV($U_m=7.2$ kV)到 30 kV($U_m=36$ kV)电缆附件试验要求

Specification

GB/T 12706.4—2008 Power cables with extruded insulation and their accessories for rated voltages from 1 kV($U_m=1.2$ kV) up to 35 kV($U_m=40.5$ kV) Part 4: Test requirements on accessories for cables with rated voltages from 6 kV($U_m=7.2$ kV) up to 35 kV($U_m=40.5$ kV)

IEC 60502-4:2005 Power cables with extruded insulation and their accessories for rated voltages from 1 kV($U_m=1.2$ kV) up to 30 kV($U_m=36$ kV) Part 4: Test requirements on accessories for cables with rated voltages from 6 kV($U_m=7.2$ kV) up to 30 kV($U_m=36$ kV)

检测类别 型式试验

Category of Test Type tests

检测日期 2010-04-20~2010-06-13

Date of Testing 2010-04-20~2010-06-13

检测结论 根据 GB/T 12706.4—2008 和 IEC 60502-4:2005 标准, 对北京芳远电器有限公司送检的 FYWLS-18/30 型 18/30 kV 交联电缆冷缩式户外终端样品进行检测, 所检测的型式试验项目合格。

Conclusion The type FYWLS-18/30 kV XLPE cable cold shrinkable outdoor terminations taken to test by client self have passed the type tests specified in GB/T 12706.4—2008 and IEC 60502-4:2005.

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Approved by Huang Weimin

签发日期:

Date of issue: 2010-07-06

1 前言

本报告用中文书写, 应委托方要求译成英文。如对本报告的解释有意义上的差异时则以中文为准。

Foreword

This report was written in Chinese and translated into English as requested by the client. In the event of any differences in the interpretation of this report, the Chinese text shall take precedence over the English translation.

2 试样的数量和安装

由制造厂将四套被试终端安装在两根 YJV22-18/30 3×185 的电缆上构成 1 号和 2 号组合试样, 组合试样中电缆终端之间的电缆长度均大于 5 m。其中, 1号组合试样用于进行标准中表 4 规定的 1.1 系列、1.2 系列和 1.3 系列的试验; 2 号组合试样用于进行标准中表 4 规定的 1.5 系列的试验。

The Number and Installation of Combination Samples

It was required that four sets of terminations to be tested were installed by the manufacturer on two length of cables forming No.1 and No.2 combination samples. The length of the cable in the combination sample was greater than 5 m between the two terminations. The cable used in the combination sample was a XLPE insulated three cores cables for rated voltage 18/30 kV, a cross-section of 185 sq.mm. The type tests sequence 1.1, 1.2 and 1.3 were carried out on No.1 combination samples. The type tests sequence 1.5 were carried out on No.2 combination samples.

3 试验方法

Test Methods

3.1 工频电压试验

试验按 IEC 61442:2005 第 4 章的规定在室温下进行。

AC voltage withstand test

The tests were carried out at ambient temperature in accordance with IEC 61442: 2005, clause 4.

3.2 局部放电试验

试验按 IEC 61442: 2005 第 7 章的规定进行。

Partial discharge test

The tests were carried out in accordance with IEC 61442: 2005, clause 7.

3.3 冲击电压试验

试验按 IEC 61442: 2005 第 6 章的规定进行。

Impulse voltage withstand test

The tests were carried out in accordance with IEC 61442: 2005, clause 6.

3.4 恒压负荷循环试验

每个负荷循环时间为 8 h, 其中至少有 2 h 使导体温度保持在正常运行时最高温度以上 5 °C ~ 10 °C, 随后至少 3 h 自然冷却至不超过环境温度 10 °C。在整个试验期间, 试品上应施加 45 kV 的工频电压。

Heating cycle voltage test

Each thermal cycle was of 8h duration with at least 2 h at a steady temperature of 5 °C ~ 10 °C above the maximum cable conductor temperature in normal operation followed by at least 3 h of natural cooling to within 10 °C of ambient temperature. During the whole of the test period a voltage of 45 kV shall be applied to the sample.

3.5 动热稳定试验

试验按 IEC 61442: 2005 第 11 章和第 12 章的规定进行。

Dynamic short-circuit and thermal short-circuit tests

The tests were carried out in accordance with IEC 61442: 2005, clause 11 and clause 12.

3.6 盐雾试验

试验按 IEC 61442: 2005 第 13 章的规定进行。

Salt fog tests

The tests were carried out in accordance with IEC 61442: 2005, clause 13.

4 试验顺序和检测结果

试验顺序和检测结果见表 1 (标准中规定 1.1 系列)、表 2 (标准中规定 1.2 系列和 1.3 系列)和表 3 (标准中规定 1.5 系列)。

Test Sequence and Results

The test sequence and results were given in Table 1 (sequence 1.1), Table 2(sequence 1.2 ,1.3) and Table 3 (sequence 1.5).

表1 / Table 1

试验顺序 Test sequence	检测项目 Items	标准要求 Requirements	检测结果 Results				评价 Remarks
1	工频电压试验 AC withstand voltage test	81 kV, 5 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 81 kV for 5 min	81 kV, 5 min, 组合试样各 相均未击穿和闪络 No breakdown and flashover occurred on the combination samples at 81 kV for 5 min				符合要求 PASS
2	淋雨下工频电 压试验 AC withstand voltage test under rain	72 kV, 1 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 72 kV for 1 min	72 kV, 1 min, 组合试样均未 击穿和闪络 No breakdown and flashover occurred on the combination samples at 72 kV for 1 min				符合要求 PASS
3	室温下局部放 电试验 Partial discharge test at ambient temperature	30 kV 放电量 不大于 10 pC The magnitude of the discharge at 30 kV shall not exceed 10 pC	相别 phase	黄 Y	绿 G	红 R	符合要求 PASS
			电压.kV voltage	30	30	30	
			背景, pC noise background	2.0	2.0	2.0	
			放电量, pC discharge	≤ 2.0	≤ 2.0	≤ 2.0	
4	高温下冲击电 压试验 Impulse withstand voltage test at 95 °C~100 °C	170 kV, 正负极性各 10 次, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 10 positive and 10 negative impulses of 170 kV	170 kV, 正负极性各 10 次 (见附录 B) 组合试样各相均 未击穿和闪络 No breakdown and flashover occurred on the combination samples at 10 positive and 10 negative impulses of 170 kV(See Annex B)				符合要求 PASS
5	恒压负荷循环 试验 Heating cycle voltage test	在 45 kV 电压和导 体加热至温度 95 °C~100 °C, 共进行 60 次循环 不击穿, 不闪络 Neither breakdown nor flashover shall occur during 60 cycles in air at the conductor temperature of 95 °C to 100 °C and 45 kV	在 45 kV 电压和导体温度 95 °C~100 °C, 共经受 60 次循 环, 组合试样均未击穿和闪络 No breakdown and flashover occurred on the combination samples during 60 cycles in air at the conductor temperature of 95°C to 100°C and 45 kV				符合要求 PASS

续表1/ Continuing Table 1

试验顺序 Test sequence	检测项目 Items	标准要求 Requirements	检测结果 Results				评价 Remarks
			相别 phase	黄 Y	绿 G	红 R	
6	高温下局部放电试验 Partial discharge test at ambient temperature	30 kV 放电量不大于 10 pC The magnitude of the discharge at 30 kV shall not exceed 10 pC	电压,kV voltage	30	30	30	符合要求 PASS
			背景, pC noise background	1.6	1.6	1.6	
			放电量, pC discharge	≤ 1.6	≤ 1.6	≤ 1.6	
			相别 phase	黄 Y	绿 G	红 R	
7	室温下局部放电试验 Partial discharge test at ambient temperature	30 kV 放电量不大于 10 pC The magnitude of the discharge at 30 kV shall not exceed 10 pC	电压,kV voltage	30	30	30	符合要求 PASS
			背景, pC noise background	1.8	1.8	1.8	
			放电量, pC discharge	≤ 1.8	≤ 1.8	≤ 1.8	
			相别 phase	黄 Y	绿 G	红 R	
8	冲击电压试验 Impulse withstand voltage test	170kV, 正负极性各 10 次, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 10 positive and 10 negative impulses of 170 kV	170 kV, 正负极性各 10 次 (见附录 C) 组合试样各相均未击穿和闪络 No breakdown and flashover occurred on the combination samples at 10 positive and 10 negative impulses of 170 kV (See Annex C)				符合要求 PASS
9	工频电压试验 AC withstand voltage test	45 kV, 15 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 45 kV for 15 min	45 kV, 15 min, 组合试样各相均未击穿和闪络 No breakdown and flashover occurred on the combination samples at 45 kV for 15 min				符合要求 PASS

表2 / Table 2

试验顺序 Test sequence	检测项目 Items	标准要求 Requirements	检测结果 Results	评价 Remarks
1	工频电压试验 AC withstand voltage test	81 kV, 5 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 81 kV for 5 min	81 kV, 5 min, 组合试样均未击穿和闪络 No breakdown and flashover occurred on the combination samples at 81 kV for 5 min	符合要求 PASS

续表2 / Continuing Table 2

试验顺序 Test sequence	检测项目 Items	标准要求 Requirements	检测结果 Results	评价 Remarks
2	热稳定试验 Thermal short-circuit test	23.0 kA, 2 s 两次, 无可见的损坏 No visible deterioration at 23.0 kA, 2 s	23.46 kA, 2.01 s 和 23.48 kA, 2.01 s 无可见的损坏 (见附录E2) No visible deterioration at 23.46 kA, 2.01 s and 23.48 kA, 2.01 s (See Annex E2)	符合要求 PASS
3	动稳定试验 Dynamic short-circuit test	83.0 kA, 不少于 10 ms, 无可见的损坏 No visible deterioration at 83.0 kA, not less than 10 ms	83.06 kA, 53 ms, 无可见的损坏 (见附录E1) No visible deterioration at 83.06 kA, 53 ms (See Annex E1)	符合要求 PASS
4	冲击电压试验 Impulse voltage withstand	170 kV, 正负极性各 10次不击穿, 不闪络 Neither breakdown nor flashover shall occur at 10 positive and 10 negative impulses of 170 kV	170 kV, 正负极性各 10 次 (见附录D) 组合试样均未 击穿和闪络 No breakdown and flashover occurred on the combination samples at 10 positive and 10 negative impulses of 170 kV (See Annex D)	符合要求 PASS
5	工频电压试验 AC withstand voltage test	45 kV, 15 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 45 kV for 15 min	45 kV, 15 min, 组合试样均 未击穿和闪络 No breakdown and flashover occurred on the combination samples at 45 kV for 15 min	符合要求 PASS

表3 / Table 3

试验顺序 Test sequence	检测项目 Items	标准要求 Requirements	检测结果 Results	评价 Remarks
1	盐雾试验 Salt fog tests	22.5 kV, 1000 h, 不击穿, 不闪络, 跳 闸不超过三次, 无显 著的损伤 Neither breakdown nor flashover, no more than three trippings, no substantial damage shall occur at 22.5 kV for 1000 h	完成 22.5 kV, 1000 h 盐雾 试验, 组合试样均未击穿和闪 络, 无跳闸, 无显著的损伤 No breakdown, flashover, tracking, tripping, substantial damage occurred on the combination samples at 22.5 kV for 1000 h	符合要求 PASS

附录A 检测中使用的主要试验仪器设备清单

Annex A List of the main equipment and instruments used in tests

序号 Sequ- ence	仪器设备名称 型号/规格 Name of the equipment and instruments Model / Type	设备编号 No.	测量范围 Measuring range	不确定度/ 准确度 Uncertaint y/ Veracity	检定/校准 机构 Verification /Calibration institution	有效日期 Valid period
1	7800-3200 SR 4A 800 kV 工频分压器 4A 800 kV AC voltage divider	003190-0 0	(0~800) kV	1 级	国家高电压计量站 National high voltage measurement station	2010-11-15
2	JFD-2H 局放检测系统 PD measurement system	20041202	(0.5~1000) pC	10 级 Grade 10	国家高电压计量站 National high voltage measurement station	2012-05-22
3	冲击分压器 Impulse voltage divider	03	(0~900) kV	1 级	国家高电压计量站 National high voltage measurement station	2011-05-20
4	IPM23A 峰值电压表 Meter in peak value of voltage	070	(0~600) kV	1 级 Grade 1	国家高电压计量站 National high voltage measurement station	2010-10-21
5	H-DJF-2 数据采集系统 Data collected system	CJ 06	(0~100) kA	0.5 级	国家高电压计量站 National high voltage measurement station	2012-01-03
6	LM-0.5 电流互感器 Current transformer	0814	(0~3000) A	0.5 级 Grade 0.5	国家高电压计量站 National high voltage measurement station	2010-12-07
7	TAWF 串联谐振装置 Series resonance system	312068	(0~75) kV	1 级 Grade 1	国家高电压计量站 National high voltage measurement station	2010-10-17
8	DDS-307 电导率仪 conductivity meter	6105081 10058	—	0.5 级 Grade 0.5	湖北省计量测试技术 研究院 Hubei Institute of Measurement and Testing Technology	2010-12-24
9	DT9806 数字电压表 Digital voltage meter	A053632	(0~200) mV	0.5 级 Grade 0.5	湖北省计量测试技术 研究院 Hubei Institute of Measurement and Testing Technology	2010-11-08

附录B 恒压负荷循环试验前组合试样冲击电压试验实际耐受电压值和冲击电压波形(高温下, 170 kV, 允许 ±3% 偏差)

Annex B The values and oscillograms of impulse voltages on the combination samples before heating cycles voltage test (at high temperature, 170 kV, ±3% tolerance)

B1 冲击电压实际耐受电压值

The values of impulse voltages

温度: 16.0 °C 相对湿度: 62% 大气压: 0.1018 MPa

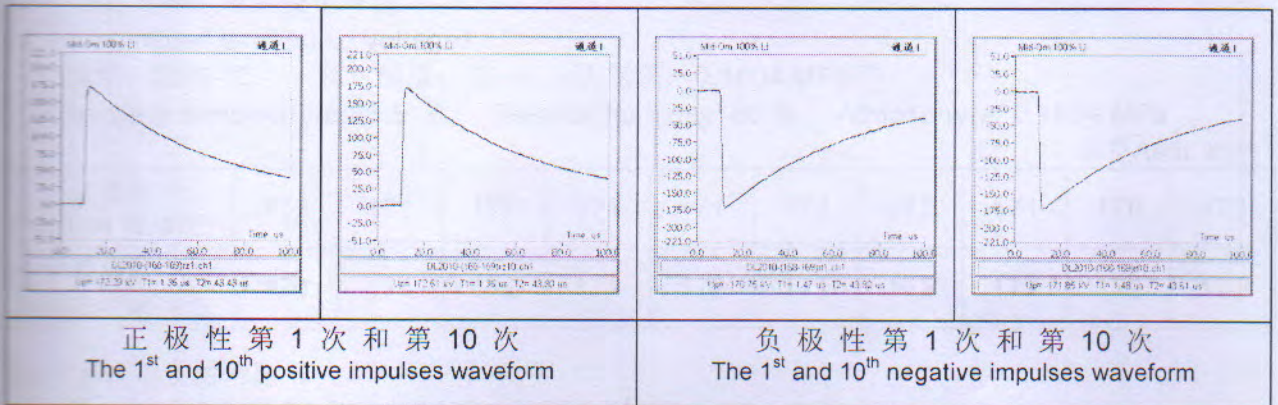
Ambient temperature: 16.0 °C, Relative humidity: 62%, Atmosphere: 0.1018 MPa

单位/unit: kV

正极性 Positive polarity	172	172	173	172	172	171	173	171	172	173
负极性 Negative polarity	171	172	173	172	171	172	171	172	171	172

B2 冲击电压波形图

Oscillograms of the impulse voltages waveform



附录C 恒压负荷循环试验后组合试样冲击电压试验实际耐受电压值和冲击电压波形(室温下, 170 kV, 允许 ±3% 偏差)

Annex C The values and oscillograms of impulse voltages on the combination samples after heating cycles voltage test (at ambient temperature, 170 kV, ±3% tolerance)

C1 冲击电压实际耐受电压值

The values of impulse voltages

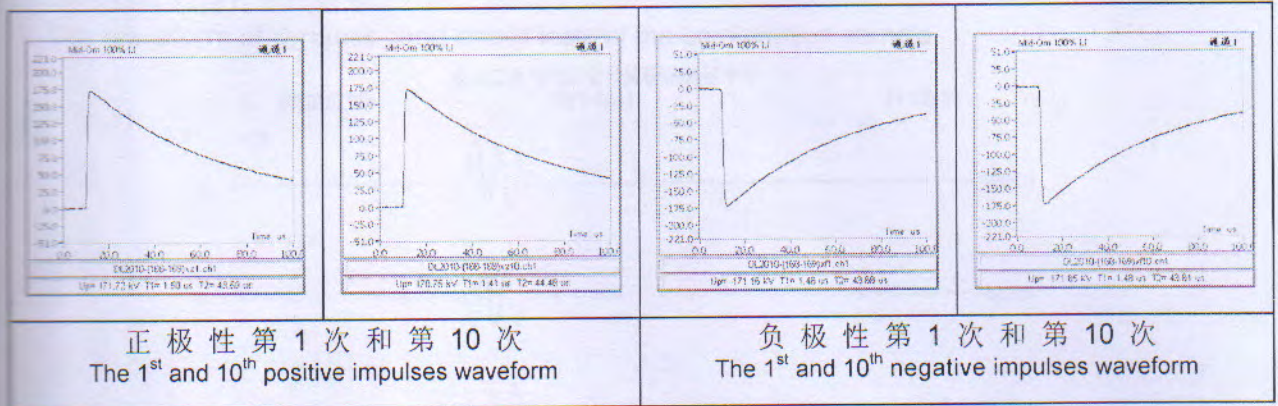
温度: 24.0 °C 相对湿度: 76% 大气压: 0.0999 MPa

Ambient temperature: 24.0 °C, Relative humidity: 76%, Atmosphere: 0.0999 MPa

单位/unit: kV

正极性 Positive polarity	172	172	172	173	172	171	172	171	172	171
负极性 Negative polarity	171	172	172	172	171	172	171	172	171	172

C2 冲击电压波形图
Oscillograms of the impulse voltages waveform



附录D 动热稳定试验后组合试样冲击电压试验实际耐受电压值(室温下, 170 kV, 允许±3%偏差)
Annex C The values of impulse voltages on the combination samples after thermal short-circuit tests (at ambient temperature, 170 kV, ±3 % tolerance)

D1 冲击电压实际耐受电压值

The values of impulse voltages

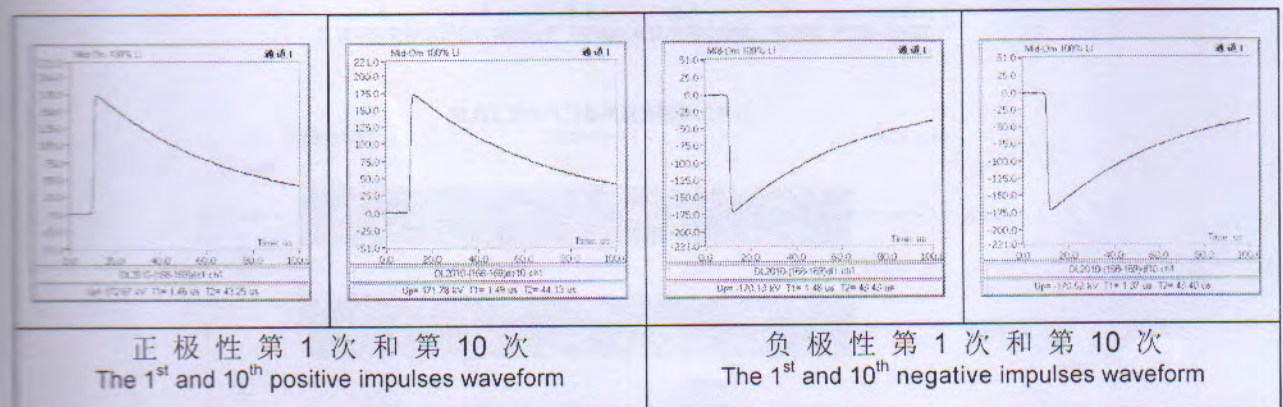
温度: 26.5 °C 相对湿度: 65 % 大气压: 0.1004 MPa

Ambient temperature: 26.5 °C, Relative humidity: 65 %, Atmosphere: 0.1004 MPa

单位/unit: kV

正极性 Positive polarity	173	171	172	171	171	172	172	171	170	172
负极性 Negative polarity	170	171	172	171	172	171	172	171	172	171

D2 冲击电压波形图
Oscillograms of the impulse voltages waveform

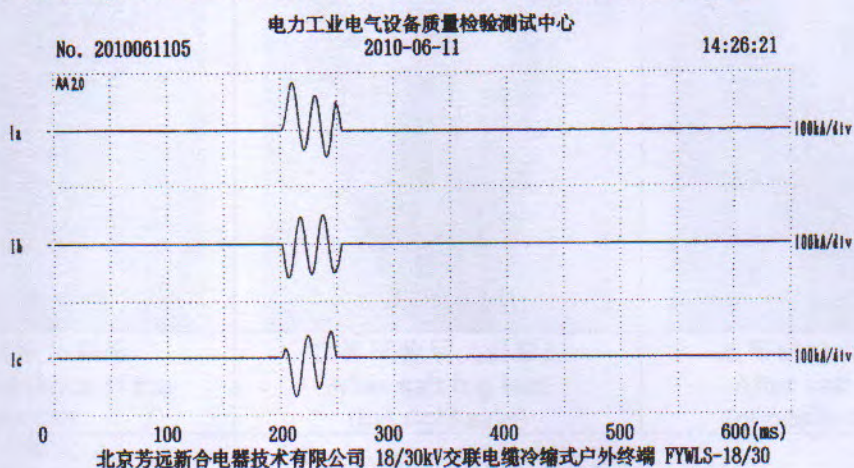


附录E 组合试样动热稳定试验波形

Annex E The waveform of dynamic short-circuit tests and thermal short-circuit tests of the combination sample

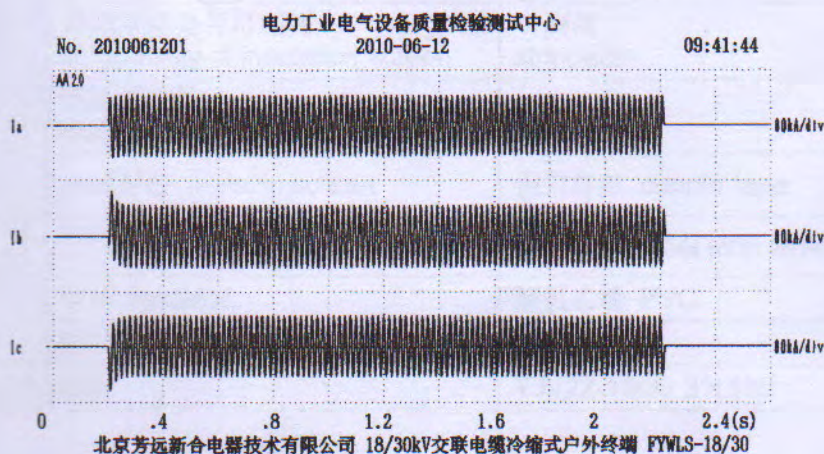
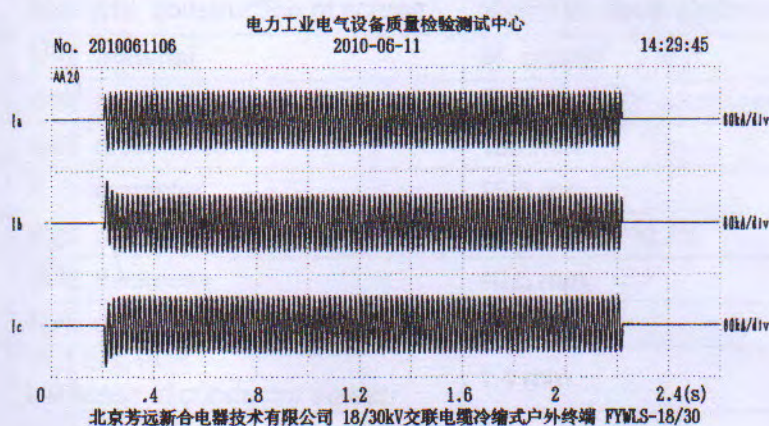
E1 组合试样动稳定试验波形

The waveform of dynamic short-circuit tests of the combination sample



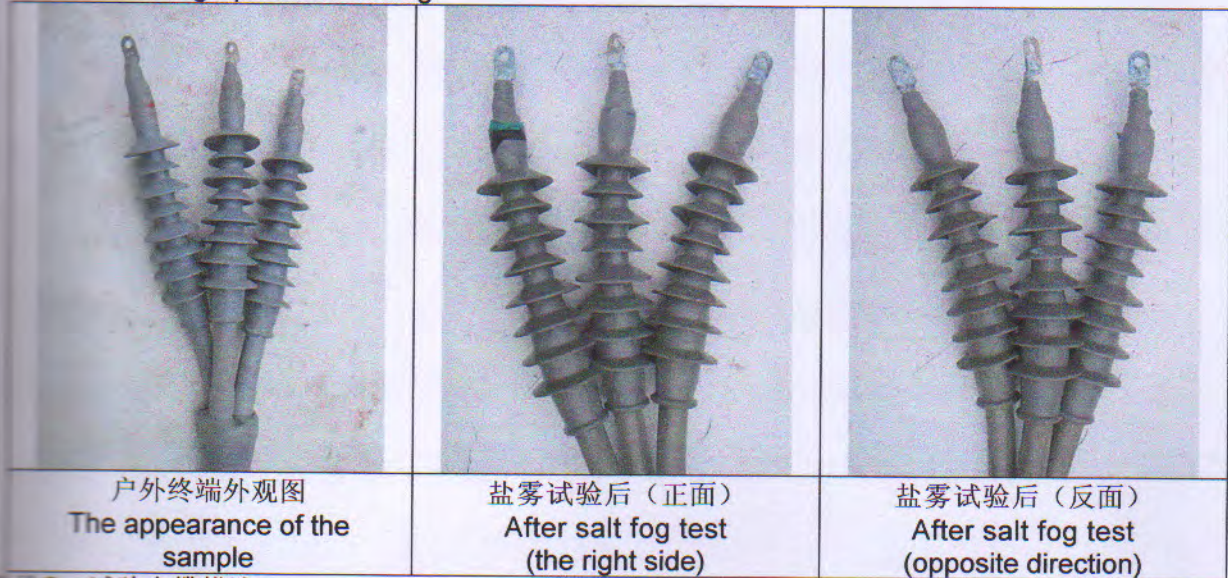
E2 组合试样热稳定试验波形

The waveform of thermal short-circuit tests of the combination sample



附录F 试验照片

Annex F Photograph about testing



附录G 试验电缆描述

Annex G Identification of test cable

额定电压 rated voltage $U_0/U(U_m)$ kV	18/30	
结构 construction	芯数 core	三芯 three cores
	屏蔽结构 construction of screen	分相屏蔽 separated screen
导体 conductor	材质 material	铜 copper
	形状 type	紧压圆形绞合 round compact stranded
	截面 cross section	185 mm ²
	外径 diameter	15.5 mm
绝缘 insulation	材质 material	交联聚乙烯 XLPE
	厚度 thickness	10.6 mm
	外径 diameter	39.7 mm
屏蔽 screen	导体屏蔽厚度 thickness of conductor screen	1.4 mm
	绝缘屏蔽厚度 thickness of insulation screen	1.6 mm
	绝缘屏蔽是否可剥离 strippability of insulation screen	可剥离 strippable
	绝缘屏蔽外径 diameter of insulation screen	42.9 mm
金属屏蔽 metallic screen	铜带屏蔽 copper tape	
铠装 armour	钢带铠装 steel strip armour	
外护套 oversheath	材质 material	聚氯乙烯 PVC
	外径 diameter	107.1 mm
电缆标示 mark of cable	YJV22-18/30 3×185	