

电力工业电气设备质量检验检测中心

Quality Inspection and Test Center
for Equipment of Electric Power

(2009) 检字 JDL387 号



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No.L1026

检 测 报 告

Inspection Report



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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
P. R. OF CHINA

检测报告

INSPECTION REPORT

(2009)检字JDL 387 号

Ref: 2009JDL387

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: 8.7/15 kV 交联电缆冷缩式户外终端
型号规格: WLSY-10 (15) /185 (3.3)
制造厂: 北京新合电器技术有限公司

试品编号: DL 2009-376

制造日期: 2009年07月

取样方式: 送样

Description of Samples

Name of Test Samples: 8.7/15 kV XLPE cable cold shrinkable outdoor termination
Type and Size: WLSY-10 (15) /185 (3.3) Year of Manufacture: Jul., 2009
Manufacturer: Beijing Xinhe Electric Technology Co., Ltd.
Sample No: DL2009-376 Sampling Way: taken by client self

检测标准

GB/T 12706.4-2002 额定电压 1 kV ($U_m=1.2kV$)到 35 kV ($U_m=40.5 kV$)挤包绝缘电力电缆及附件 第 4 部分: 额定电压 6 kV ($U_m=7.2 kV$)到 35 kV ($U_m=40.5 kV$)电力电缆附件试验要求

Specification

GB/T 12706.4-2002 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 35kV ($U_m=40.5 kV$)

检测类别 型式试验

Category of Test Type tests

检测日期 2009-08-31~2009-11-03

Date of Testing 2009-08-31~2009-11-03

检测结论 根据 GB/T 12706.4-2002 标准, 对北京芳远电器有限公司送检的 WLSY-10 (15) /185 (3.3) 型 8.7/15 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 WLSY-10 (15) /185 (3.3) 8.7/15 kV XLPE cable cold shrinkable outdoor terminations taken to test by client self have passed the type tests specified in GB/T 12706.4-2002, the 8.7/15 kV XLPE cable cold shrinkable outdoor terminations tested were up to the standard.

检测人员: _____

Inspected and Tested by Han Weijing

廖星宇

Liao Xingyu

校核: _____

Checked by Miao Fugui

审

核: _____

Examined and verified by Yan Mengkun

批准: _____

Approved by Huang Weimin

职务: _____

Designation: Director

签发日期: _____

Date of issue: 2009-11-13

1 前言

本报告用中文书写，应委托方要求译成英文对照。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 YJV-8.7/15 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 8.7/15 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: 1997 第 4 章的规定在室温下进行。

AC voltage withstand test

The test was made at ambient temperature in accordance with IEC 61442: 1997, clause 4.

3.2 局部放电试验

试验按 IEC 61442: 1997 第 7 章的规定进行，试验时背景干扰为 1.8 pC。

Partial discharge test

The tests were carried out in accordance with IEC 61442: 1997, clause 7, the level of maximum noise background being 1.8 pC during the tests.

3.3 冲击电压试验

试验按 IEC 61442:1997 第 6 章的规定进行。

Impulse voltage withstand test

The tests were carried out in accordance with IEC 61442:1997, 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 $5\text{ }^{\circ}\text{C}\sim 10\text{ }^{\circ}\text{C}$, 随后至少 3 h 自然冷却至不超过环境温度 $10\text{ }^{\circ}\text{C}$ 。在整个试验期间, 试品上应施加 23 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 $5\text{ }^{\circ}\text{C}\sim 10\text{ }^{\circ}\text{C}$ above the maximum cable conductor temperature in normal operation followed by at least 3 h of natural cooling to within $10\text{ }^{\circ}\text{C}$ of ambient temperature. During the whole of the test period a voltage of 23 kV shall be applied to the sample.

3.5 动热稳定试验

试验按 IEC 61442:1997 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 61442:1997, clause 11 and clause 12.

3.6 盐雾试验

试验按 IEC 61442:1997 第 13 章的规定进行。

Salt fog tests

The tests were carried out in accordance with IEC 61442:1997, 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	39 kV, 5 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 39 kV for 5 min	39 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 39 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	35 kV, 1 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 35 kV for 1 min	35 kV, 1 min, 组合试 样各相均未击穿和闪络 No breakdown and flashover occurred on the combination samples at 35 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	15 kV 放电 量不大于 10 pC The magnitude of the discharge at 15 kV shall not exceed 10 pC	15 kV, 组合试样各相 放电均不大于 1.8 pC The magnitude of the discharge of the combination samples didn't exceed 1.8 pC at 15 kV	符合要求 Pass
4	高温下冲击电压 试验 Impulse withstand voltage test at 95 °C~100 °C	95 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 95 kV	95 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 95 kV(See Annex B)	符合要求 Pass
5	在空气中恒压负荷 循环试验 Heating cycles voltage test in air	在 23 kV 电压和导 体加热至温度 95 °C~100 °C下, 共进行 3 次循环 不击穿, 不闪络 Neither breakdown nor flashover shall occur during 3 cycles in air at the conductor temperature of 95 °C to 100 °C and 23 kV	在 23 kV 电压和导体温 度 95 °C~100 °C 下, 共经受 3 次循环组合试 样均未击穿和闪络 No breakdown and flashover occurred on the combination samples during 3 cycles in air at the conductor temperature of 95 °C to 100 °C and 23 kV	符合要求 Pass
6	高温下局部放电 试验 Partial discharge test at 95 °C~ 100 °C	15 kV 放电 量不大于 10 pC The magnitude of the discharge at 15 kV shall not exceed 10 pC	15 kV,组合试样各相 放电均不大于 1.8 pC The magnitude of the discharge of the combination samples didn't exceed 1.8 pC at 15 kV	符合要求 Pass

试验顺序 Test sequence	检测项目 Items	标准要求 Requirements	检测结果 Results	评价 Remarks
7	室温下局部放电 试验 Partial discharge test at ambient temperature	15 kV 放电量 不大于 10 pC The magnitude of the discharge at 15 kV shall not exceed 10 pC	15 kV, 组合试样各相 放电量均不大于 1.8 pC The magnitude of the discharge of the combination samples didn't exceed 1.8 pC at 15 kV	符合要求 Pass
8	恒压负荷循环试验 Heating cycle voltage test	在 23 kV 电压和导 体加热至温度 95 °C~100 °C下, 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 23 kV	在 23 kV 电压和导体温 度 95 °C~100 °C 下, 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 23 kV	符合要求 Pass
9	高温下局部放电 试验 Partial discharge test at 95 °C~ 100 °C	15 kV 放电量 不大于 10 pC The magnitude of the discharge at 15kV shall not exceed 10 pC	15 kV, 组合试样各相 放电量均不大于 1.8 pC The magnitude of the discharge of the combination samples didn't exceed 1.8 pC at 15 kV	符合要求 Pass
10	室温下局部放电试 验 Partial discharge test at ambient temperature	15 kV 放电量 不大于 10 pC The magnitude of the discharge at 15 kV shall not exceed 10 pC	15 kV, 组合试样各相 放电量均不大于 1.8 pC The magnitude of the discharge of the combination samples didn't exceed 1.8 pC at 15 kV	符合要求 Pass
11	冲击电压试验 Impulse withstand voltage test	95 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 95 kV	95 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 95 kV (See Annex C)	符合要求 Pass
12	工频电压试验 AC withstand voltage test	23 kV, 15 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 23 kV for 15 min	23 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 23 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	39 kV, 5 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 39 kV for 5 min	39 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 39 kV for 5 min	符合要求 Pass
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	23.10 kA, 2.01 s 和 23.12 kA, 2.00 s 无可见的损坏 (见附录E2) No visible deterioration at 23.10 kA, 2.01 s and 23.12 kA, 2.00 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	83.46 kA, 51 ms, 无可见的损坏 (见附录E1) No visible deterioration at 83.46 kA, 51 ms (See Annex E1)	符合要求 Pass
4	冲击电压试验 Impulse voltage withstand	95 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 95 kV	95 kV, 正负极性各 10 次 (见附录D) 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 95 kV (See Annex D)	符合要求 Pass
5	工频电压试验 AC withstand voltage test	23 kV, 15 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 23kV for 15 min	23 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 23 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	11 kV, 1000 h, 不击穿, 不闪络, 无 电蚀和机械损伤 Neither breakdown nor flashover, no tracking, erosion or mechanical damage shall occur at 11 kV for 1000 h	完成 11 kV, 1000 h 盐雾 试验, 组合试样各相均未击穿 和闪络, 无电蚀和机械损伤 No breakdown, flashover, tracking, erosion and mechanical damage occurred on the combination samples at 11 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 Sequence	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 Effective duration
1	35 kV 高压试验 系统 35 kV High voltage test system	0105	(0~35) kV	1.5 级 Grade 1.5	国家高电压计量站 National high voltage measurement station	2010-01-06
2	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	2010-10-16
3	JFD-2H 局放检测系统 PD measurement system	2004120 2	(0.5~1000) pC	10 级 Grade 10	国家高电压计量站 National high voltage measurement station	2010-05-24
4	冲击分压器 Impulse voltage divider	03	(0~900) kV	1 级 Grade 1	国家高电压计量站 National high voltage measurement station	2010-05-20
5	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	2010-10-06
6	H-DJF-2 数据采集系统 Data collected system	C11-13	(0~100) kA	0.5 级 Grade 0.5	国家高电压计量站 National high voltage measurement station	2012-01-14
7	LM-0.5 电流互感器 Current transformer	0810	(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
8	DDS-307 电导率仪 conductivity meter	610508 110058	(0~1×10 ⁵)μ S/cm	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	2010-01-14
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	2009-11-09

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, 95 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, 95 kV, ±3% tolerance)

B1 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: 62% 大气压: 0.1011 MPa

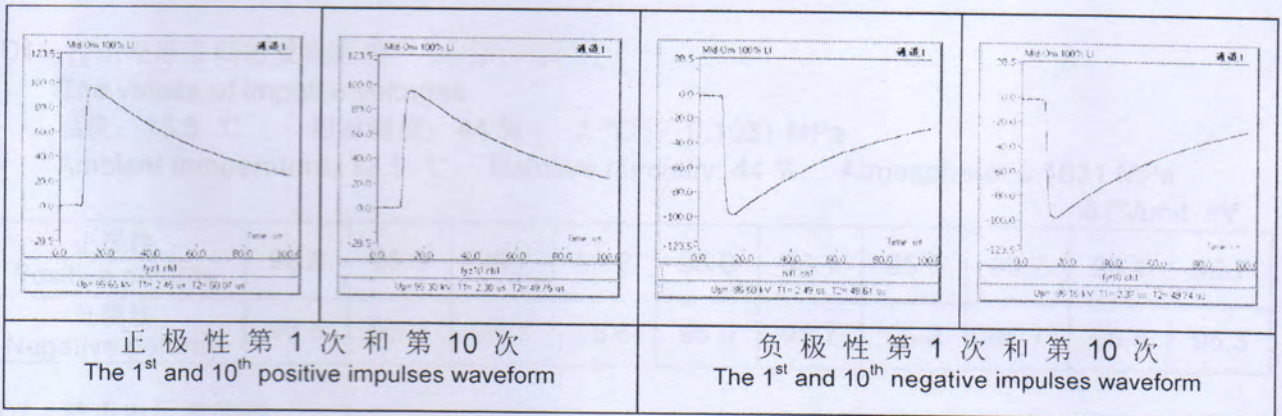
Ambient temperature: 24.0 °C, Relative humidity: 62%, Atmosphere: 0.1011 MPa

单位/unit: kV

正极性 Positive polarity	95.7	95.5	95.1	95.6	95.9	96.1	95.7	95.3	95.9	95.3
负极性 Negative polarity	96.5	95.0	95.7	96.0	95.7	95.3	96.1	95.8	95.4	96.2

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, 95 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, 95 kV, ±3% tolerance)

C1 冲击电压实际耐受电压值

The values of impulse voltages

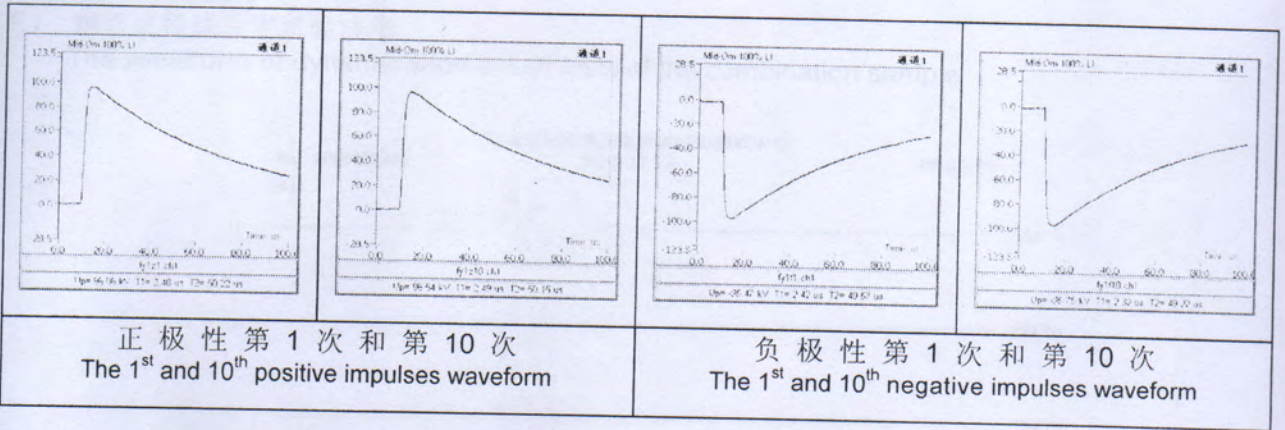
温度: 23.0 °C 相对湿度: 65% 大气压: 0.1016 MPa

Ambient temperature: 23.0 °C, Relative humidity: 65%, Atmosphere: 0.1016 MPa

单位/unit: kV

正极性 Positive polarity	96.1	95.3	95.1	95.6	95.7	96.2	96.3	95.7	95.5	96.5
负极性 Negative polarity	95.5	95.7	96.1	96.3	96.9	96.7	95.9	95.1	95.8	95.8

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, 95 kV, 允许±3%偏差)
Annex D The values of impulse voltages on the combination samples after thermal short-circuit tests (at ambient temperature, 95 kV, ±3 % tolerance)

D1 冲击电压实际耐受电压值

The values of impulse voltages

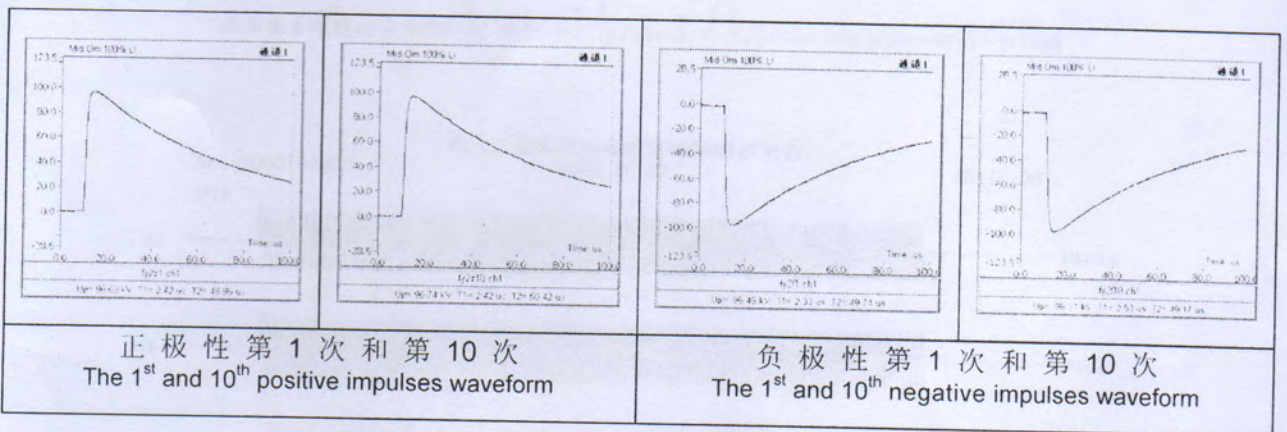
温度: 13.5 °C 相对湿度: 44 % 大气压: 0.1031 MPa

Ambient temperature: 13.5 °C, Relative humidity: 44 %, Atmosphere: 0.1031 MPa

单位/unit: kV

正极性 Positive polarity	96.6	95.9	95.7	96.2	96.0	96.1	95.9	95.7	95.1	96.7
负极性 Negative polarity	96.5	95.3	95.7	95.5	96.0	95.7	96.2	95.7	95.8	96.3

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

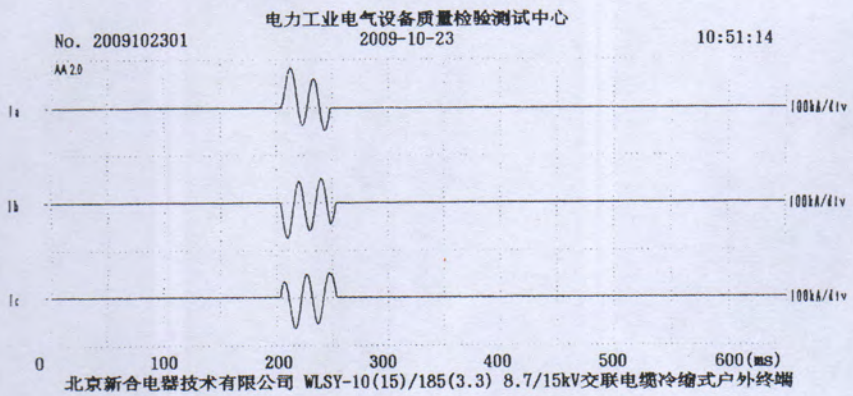


附录E 组合试样动热稳定试验波形

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

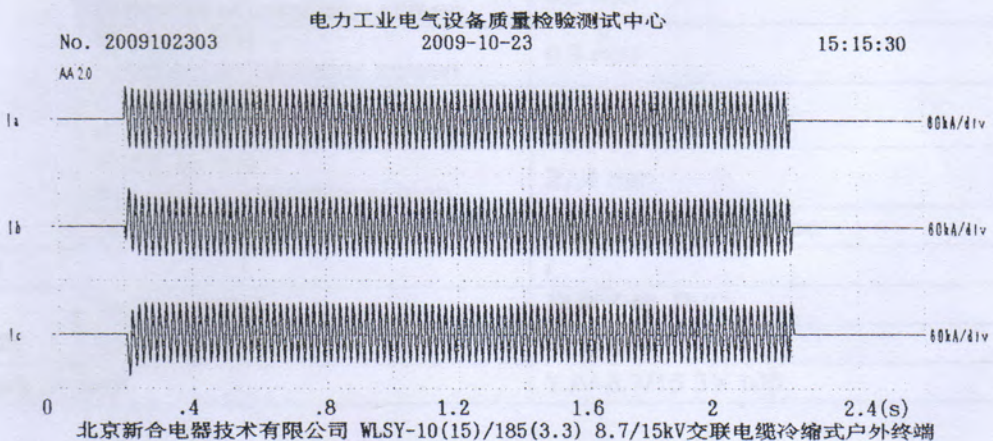
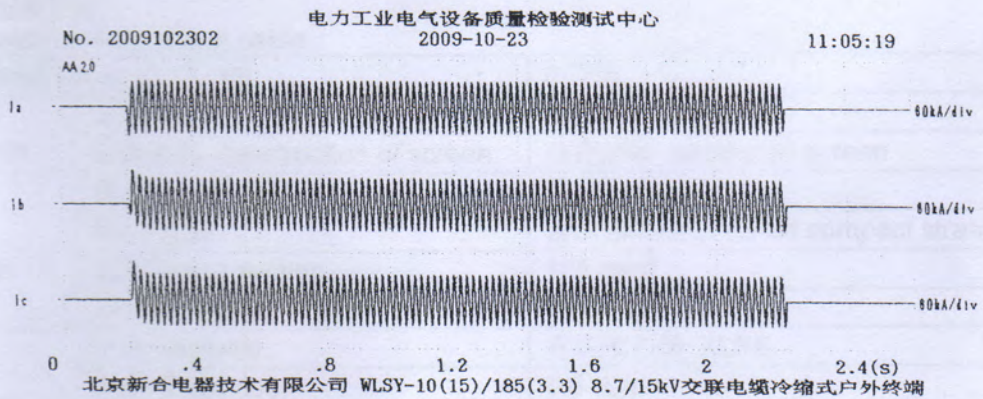
E1 组合试样动稳定试验波形

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

		
户外终端外观图 The appearance of the sample	盐雾试验后（正面） After salt fog test (the right side)	盐雾试验后（反面） After salt fog test (opposite direction)

附录G 试验电缆描述

Annex G Identification of test cable

额定电压 rated voltage U_0/U kV		8.7/15
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	4.6 mm
	外径 diameter	25.8 mm
屏蔽 screen	导体屏蔽厚度 thickness of conductor screen	0.8 mm
	绝缘屏蔽厚度 thickness of insulation screen	0.9 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	27.4 mm
	金属屏蔽 metallic screen	铜带屏蔽 copper tape
铠装 armour		/
外护套 oversheath	材质 material	聚氯乙烯 PVC
	外径 diameter	68.9 mm
电缆标示 mark of cable		YJV-8.7/15 3×185