

# 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

(2007) 缆字第 499 号



2006000711D



## 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 AND TEST REPORT

(2007)缆字第 499 号  
Ref: 2007LZ499

委托单位 北京芳远新合电器技术有限公司 北京芳远电器有限公司  
Client BEIJING FANGYUAN XINHE ELECTRIC APPLIANCE TECHNOLOGY CO.,LTD.  
BEIJING FANGYUAN ELECTRIC APPLIANCE CO.,LTD.

试样说明

名称: 12/20(24) kV 屏蔽型可分离连接器(可分离式终端)  
型号规格: JOK-24/630  
制造厂: 北京芳远新合电器技术有限公司

试品编号: DL2007-406  
制造日期: 2007年9月  
取样方式: 送样

Description of Samples

Name of Test Samples: 12/20(24) kV screened separable connector  
Type and Size: JOK-24/630  
Manufacturer: BEIJING FANGYUAN XINHE ELECTRIC APPLIANCE TECHNOLOGY CO.,LTD.  
Year of Manufacture: Sep., 2007

Sample No: DL2007-406  
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 ( $U_m=40.5 kV$ )

检测类型 型式试验

Category of Test Type tests

检测日期 2007-11-02~2007-12-03

Date of Testing 2007-11-02~2007-12-03

检测结论 根据 GB/T 12706.4-2002 标准, 对北京芳远新合电器技术有限公司和北京芳远电器有限公司送检的 JOK-24/630 型 12/20(24) kV 屏蔽型可分离连接器(可分离式终端)样品进行检测, 所检测的型式试验项目合格。

Conclusion The type JOK-24/630 12/20(24) kV screened separable connectors taken to test by client self have passed the type tests specified in GB/T 12706.4-2002 and the 12/20(24) kV screened separable connectors tested were up to the standard.

检测人员:

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Designation: Director

签发日期: 2007-12-05

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## 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

由制造厂将六个被试样品安装在两根 YJV-12/20 3×185 的电缆上构成组合试样, 用于进行标准中表 7 规定的 4.1 系列、4.2 系列和 4.3 系列的试验。在组合试样中电缆终端和被试品之间的电缆长度均大于 5 m。屏蔽电阻和屏蔽泄漏电流试验在单独的试样上进行。

### The Number and Installation of Combination Samples

It was required that six samples to be tested were installed by the manufacturer on the cables forming combination samples on which the type tests sequence 4.1 and 4.2 and 4.3 in table 7 were carried out. The cable used in the combination sample was a XLPE insulated three cores cable with rated voltage 12/20 kV, a cross-section of 185 sq.mm. The length of the cable in the combination sample was greater than 5 m between the screened separable connectors and terminations. Screen resistance and screen leakage current test were carried out on separate 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 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 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 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 ℃~10 ℃, 随后至少 3 h 自然冷却至不超过环境温度 10 ℃。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 8 h duration with at least 2 h at a steady temperature of 5℃~10℃ above the maximum cable conductor temperature in normal operation followed by at least 3 h of natural cooling to within 10℃ of ambient temperature. During the whole 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 屏蔽电阻试验**

试验按 IEC 61442:1997 第 14 章的规定进行。

**Screen resistance tests**

The tests were carried out in accordance with IEC 61442:1997, clause 14.

**3.7 屏蔽泄露电流试验**

试验按 IEC 61442:1997 第 15 章的规定进行。

**Screen leakage current tests**

The tests were carried out in accordance with IEC 61442:1997, clause 15.

**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 4.1 系列)、表 2 (标准中规定 4.2 和 4.3 系列)和表 3(其它项目)。

**Test Sequence and Results**

The test sequence and results were given in Table 1 (sequence 4.1) and Table 2 (sequence 4.2 and 4.3) and Table 3(the other items).

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	54 kV, 5 min, 不击穿 No breakdown shall occur at 54 kV for 5 min	54 kV 下, 5 min, 组合试 样各相均未击穿 No breakdown occurred on the combination samples at 54 kV for 5 min	符合要求 PASS
2	室温下局部放电 试验 Partial discharge test at ambient temperature	20 kV 下放电 量不大于 10 pC The magnitude of the discharge at 20 kV shall not exceed 10 pC	20 kV 下, 组合试样各相 放电均不大于 2 pC The magnitude of the discharge of the combination samples didn't exceed 2 pC at 20 kV	符合要求 PASS
3	高温下冲击 电压试验 Impulse withstand voltage test at 95 °C~100 °C	125 kV, 正负极性各 10 次, 不击穿 No breakdown shall occur at 10 positive and 10 negative impulses of 125 kV	125 kV, 正负极性各 10 次(见附录B)组合试样各 相均未击穿 No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 125 kV (See Annex B)	符合要求 PASS
4	在空气中恒压 负荷循环试验 Heating cycles voltage test in air	在 30 kV 电压和导体 加热至温度 95 °C~ 100 °C下, 共进行 3 个循环, 不击穿 No breakdown shall occur during 3 cycles in air at the conductor temperature of 95 °C to 100 °C and 30 kV	在 30 kV 电压和导体温度 95 °C~100 °C下, 共经受 3 个循环组合试样均未击穿 No breakdown occurred on the combination samples during 3 cycles in air at the conductor temperature of 95 °C to 100 °C and 30 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
5	高温下局部放电 试验 Partial discharge test at 95 °C ~ 100 °C	20 kV 下放电不大于 10 pC The magnitude of the discharge at 20 kV shall not exceed 10 pC	20 kV 下, 组合试样各相 放电均不大于 2 pC The magnitude of the discharge of the combination samples didn't exceed 2 pC at 20 kV	符合要求 PASS
6	室温下局部放电 试验 Partial discharge test at ambient temperature	20 kV 下放电不大于 10 pC The magnitude of the discharge at 20 kV shall not exceed 10 pC	20 kV 下, 组合试样各相 放电均不大于 2 pC The magnitude of the discharge of the combination samples didn't exceed 2 pC at 20 kV	符合要求 PASS
7	恒压负荷循环试 验 Heating cycle voltage test	在 30 kV 电压和导体 加热至温度 95 °C ~ 100 °C 下, 30 个循环在 空气中, 30 个循环在 水中, 不击穿 30 cycles in air and 30 cycles under water at the conductor temperature of 95 °C ~ 100 °C and 30 kV, no breakdown shall occur	在 30 kV 电压和导体温度 95 °C ~ 100 °C 下, 共经受 了 30 个循环在空气中, 30 个循环在水中, 组合试样 均未击穿 No breakdown occurred on the combination samples subjected to 30 cycles in air and 30 cycles under water at the conductor temperature of 95 °C to 100 °C and 20 kV	符合要求 PASS
8	高温下局部放电 试验 Partial discharge test at 95 °C ~ 100 °C	20 kV 下放电不大于 10 pC The magnitude of the discharge at 20 kV shall not exceed 10 pC	20 kV 下, 组合试样各相放 电均不大于 2 pC The magnitude of the discharge of the combination samples didn't exceed 2 pC at 20 kV	符合要求 PASS
9	室温下局部放电 试验 Partial discharge test at ambient temperature	20 kV 下放电不大于 10 pC The magnitude of the discharge at 20 kV shall not exceed 10 pC	20 kV 下, 组合试样各相放 电均不大于 2 pC The magnitude of the discharge of the combination samples didn't exceed 2 pC at 20 kV	符合要求 PASS
10	冲击电压试验 Impulse withstand voltage test	125 kV, 正负极性各 10 次, 不击穿 No breakdown shall occur at 10 positive and 10 negative impulses of 125 kV	125 kV, 正负极性各 10 次 (见附录 C) 组合试样各相 均未击穿 No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 125 kV (See Annex C)	符合要求 PASS
11	工频电压试验 AC withstand voltage test	30 kV, 15 min, 不击穿 No breakdown shall occur at 30 kV for 15 min	30 kV 下, 15 min, 组合试 样各相均未击穿 No breakdown occurred on the combination samples at 30 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	54 kV, 5 min, 不击穿 No breakdown shall occur at 54 kV for 5 min	54 kV 下, 5 min, 组合试 样各相均未击穿 No breakdown occurred on the combination samples at 54 kV for 5 min	符合要求 PASS
2	热稳定试验 Thermal short-circuit test	24.1 kA, 2 s 两次, 无可见的损坏 No visible deterioration at 24.1 kA, 2 s	24.31 kA, 2.01 s 和 24.24 kA, 2.01 s 无可见的损坏 (见附录 E2) No visible deterioration at 24.31 kA, 2.01 s and 24.24 kA, 2.01 s (See Annex E2)	符合要求 PASS
3	动稳定试验 Dynamic short-circuit test	85.4 kA, 不少于10 ms, 无可见的损坏 No visible deterioration at 85.4 kA at least 10 ms	86.46 kA, 68 ms, 无可见的损坏 (见附录 E1) No visible deterioration at 86.46 kA, 68 ms (See Annex E1)	符合要求 PASS
4	冲击电压试验 Impulse withstand voltage test	125 kV, 正负极性各 10 次, 不击穿 No breakdown shall occur at 10 positive and 10 negative impulses of 125 kV	125 kV, 正负极性各 10 次 (见附录 D) 组合试样各相 均未击穿 No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 125 kV (See Annex D)	符合要求 PASS
5	工频电压试验 AC withstand voltage test	30 kV, 15 min, 不击穿 No breakdown shall occur at 23 kV for 15 min	30 kV 下, 15 min, 组合试 样各相均未击穿 No breakdown 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	屏蔽电阻试验 Screen resistance tests	老化前后屏蔽电阻 不大于 5000 Ω Screen resistance before and after the heating period shall not exceed 5000 Ω	老化前 before ageing	老化后 after ageing	符合要求 PASS
			554 Ω	541 Ω	
2	屏蔽泄漏电流 Screen leakage	在 17.5 kV 下, 泄漏 电流不大于 0.5 mA Screen leakage shall not exceed 0.5 mA at 17.5 kV	在 17.5 kV 下, 泄漏电流 小于 0.5 mA Screen leakage didn't exceed 0.5 mA at 17.5 kV		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 Uncertainty / Veracity	检定/校准 机构 Verification /Calibration institution	有效日期 Effective duration
1	TAWF 串联谐振装置 Series resonance system	0311205	(0~75) kV	1 级 Grade 1	国家高电压计量站 National high voltage measurement station	2008-10-17
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	2008-05-24
3	DDG-A-180/18×2 大电流试验装置 Equipment of have current test	86021	(0~5000) A	—	—	—
4	LM-0.5 电流互感器 Current transformer	0514	(0~3000) A	0.5 级 Grade 0.5	国家高电压计量站 National high voltage measurement station	2008-05-14
5	CYF900-0.022 冲击电压发生器 Impulse voltage generator	03	(0~900) kV	—	—	—
6	64M 峰值电压表 Meter in peak value of voltage	080816	(0~600) kV	1 级 Grade 1	国家高电压计量站 National high voltage measurement station	2008-05-19
7	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	2008-11-01

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, 125 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, 125 kV, ±3 % tolerance)

B1 冲击电压实际耐受电压值

The values of impulse voltages

温度: 20.0 ℃ 相对湿度: 51 % 大气压: 0.1002 MPa

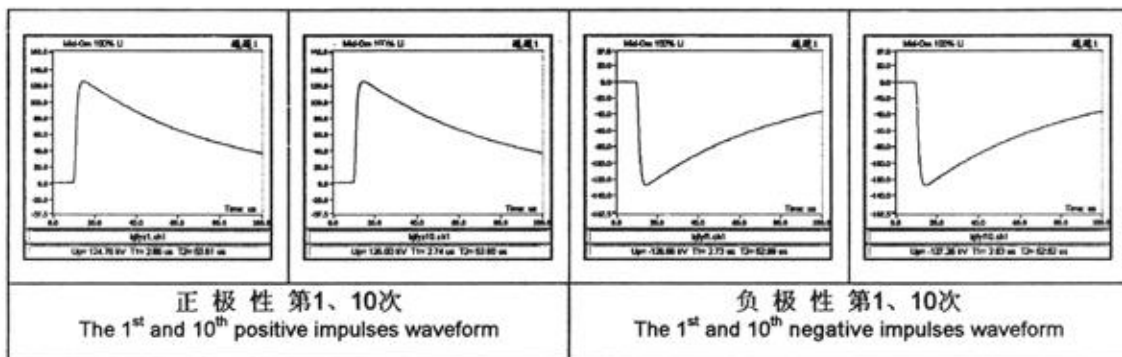
Ambient temperature: 20.0 ℃, Relative humidity: 51 %, Atmosphere: 0.1002 MPa

单位/unit: kV

正极性 Positive polarity	124.7	126.5	125.6	126.4	124.5	125.5	124.7	126.7	124.6	125.0
负极性 Negative polarity	126.7	127.5	125.6	125.7	127.4	124.5	125.1	125.3	126.7	127.2

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, 125 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, 125 kV, ±3 % tolerance)

C1 冲击电压实际耐受电压值

The values of impulse voltages

温度: 10.0 ℃ 相对湿度: 51 % 大气压: 0.1021 MPa

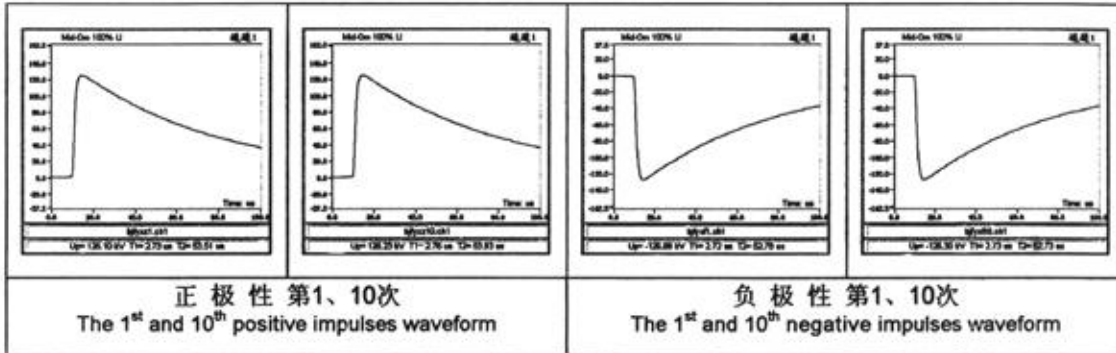
Ambient temperature: 10.0 ℃, Relative humidity: 51 %, Atmosphere: 0.1021 MPa

单位/unit: kV

正极性 Positive polarity	125.1	125.7	127.0	126.6	126.7	126.6	126.8	125.8	126.3	125.2
负极性 Negative polarity	126.7	126.5	126.4	125.9	126.3	127.0	126.6	126.3	126.5	126.3



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, 125 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, 125 kV, ±3 % tolerance)

D1 冲击电压实际耐受电压值

The values of impulse voltages

温度: 13.0 ℃ 相对湿度: 42 % 大气压: 0.1023 MPa

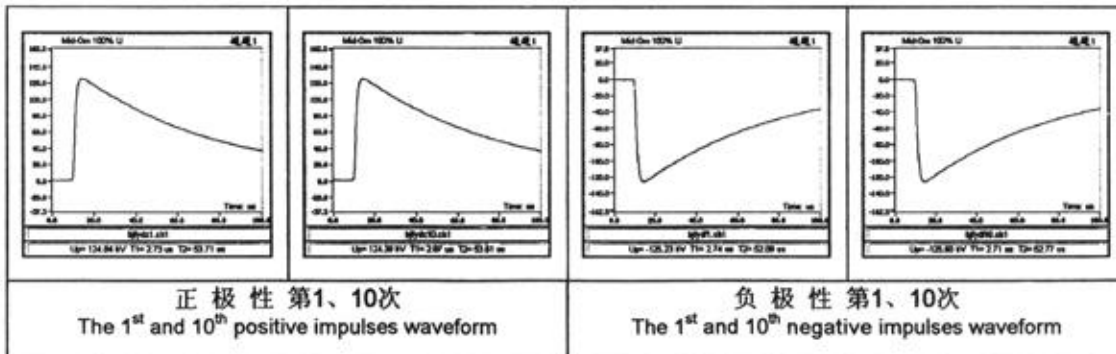
Ambient temperature: 13.0 ℃, Relative humidity: 42 %, Atmosphere: 0.1023 MPa

单位/unit: kV

正极性 Positive polarity	124.8	127.7	127.7	125.7	125.4	124.4	124.4	124.6	126.6	124.4
负极性 Negative polarity	125.2	126.3	124.4	125.5	125.6	126.4	124.4	126.4	126.5	125.6

D2 冲击电压波形图

Oscillograms of the impulse voltages waveform

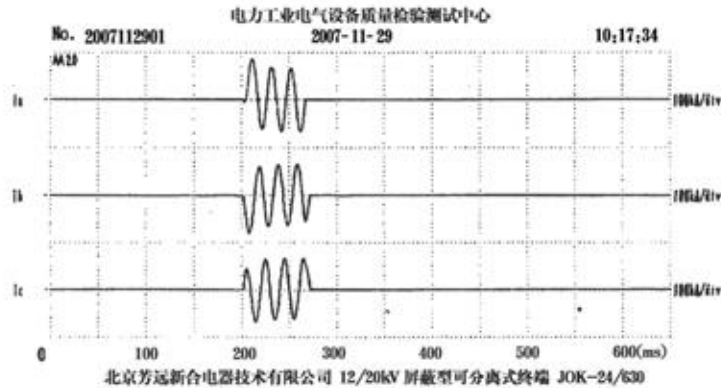


附录E 组合试样动热稳定试验波形

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

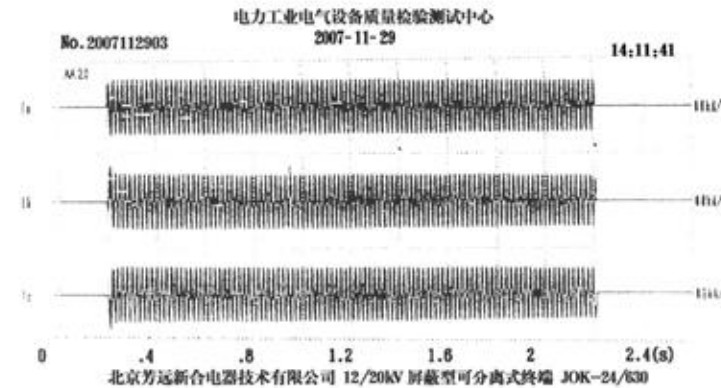
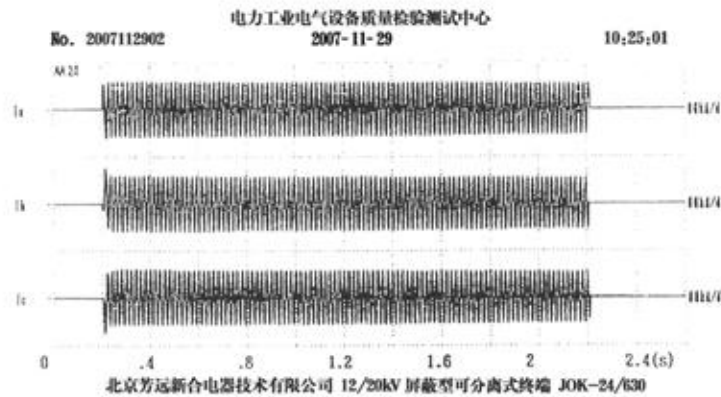
E1 组合试样动稳定试验波形

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	12/20(24)	
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 <sup>2</sup>
	外径 diameter	16.7 mm
绝缘 insulation	材质 material	交联聚乙烯 XLPE
	厚度 thickness	5.5mm
	外径 diameter	28.6 mm
屏蔽 screen	导体屏蔽厚度 thickness of conductor screen	0.7 mm
	绝缘屏蔽厚度 thickness of insulation screen	0.8 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	31.4 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	80.5 mm
电缆标示 mark of cable	YJV-12/20 3×185	