

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

(2004) 缆字第 314 号



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检测报告



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电力工业电气设备质量检验测试中心
QUALITY INSPECTION AND TESTING CENTRE FOR EQUIPMENT OF ELECTRIC POWER
P. R. OF CHINA

检测报告
INSPECTION AND TEST REPORT

(2004)缆字第 314 号
Ref: 2004LZ314

委托单位 3M 中国有限公司
Client 3M China Limited

试样说明

名称: 8.7/10kV 交联电缆冷缩式户内终端
型号规格: QT II 5624 PST-G
制造厂: 3M 中国有限公司

试样编号: DL 2004-291
制造日期: 2004年08月
取样方式: 送样

Description of Samples

Name of Test Samples: 8.7/10kV XLPE cable cold shrink indoor termination
Type and Size: QT II 5624 PST-G Year of Manufacture: Aug. 2004
Manufacturer: 3M China Limited Sample No: DL 2004-291 Sampling way: taken by client self

检测标准 GB/T 12706.4-2002 额定电压1kV(Um=1.2kV)到35kV(Um=40.5kV)挤包绝缘电力电缆及其附件 第4部分: 额定电压6kV(Um=7.2kV)到35kV(Um=40.5kV)电缆附件试验要求
IEC 60502-4:1997 额定电压1kV(Um=1.2kV)到30kV(Um=36kV)挤包绝缘电力电缆及其附件 第4部分: 额定电压6kV(Um=7.2kV)到30kV(Um=36kV)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 1kV(Um=1.2kV) up to 35kV(Um=40.5kV) Part 4: Test requirements on accessories for cables with rated voltages from 6kV(Um=7.2kV) up to 35kV(Um=40.5kV)

IEC 60502-4:1997 Power cables with extruded insulation and their accessories for rated voltages from 1kV(Um=1.2kV) up to 30kV(Um=36kV) Part 4: Test requirements on accessories for cables with rated voltages from 6kV(Um=7.2kV) up to 30kV(Um=36kV)

检测类别 型式试验

Category of Test Type tests

检测日期 2004-09-01~2004-11-01

Date of Testing 2004-09-01~2004-11-01

检测结论 根据 GB/T 12706.4—2002和IEC 60502-4:1997标准, 对3M中国有限公司送检的QT II 5624 PST-G型8.7/10kV交联电缆冷缩式户内终端样品进行检测, 所测型式试验项目合格。

Conclusion The type QT II 5624 PST-G 8.7/10kV XLPE cable cold shrink indoor termination taken to test by client self have passed the type tests specified in GB/T 12706.4—2002 and IEC 60502-4:1997, the 8.7/10kV XLPE cable cold shrink indoor termination tested was up to standard.

检测人员: 赵健康 阎孟昆 彭超
Inspected and Tested by Zhao Jiankang Yan Mengkun Peng Chao

校核: 杨荣凯 审核: 杨黎明
Checked by Yang Rongkai Examined and verified by Yang Liming

批准: 范群国 签发日期: 2004-11-02
Approved by Fan Qunguo Date of issue: 2004-11-02

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冷缩式电力电缆户内终端安装在两根 YJV22-8.7/15 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5m。其中, 1号组合试样用于进行标准中表4规定的1.1系列和1.2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1.4系列的试验。

The Number and Installation of Combination Samples

It was required that four XLPE cable cold shrink indoor 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 5m 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. No.1 combination samples on which the type tests sequence 1.1, 1.2 and 1.3 were carried out. No.2 combination samples on which the type tests sequence 1.4 were carried out.

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1pC。

Partial Discharge Test

The tests were carried out in accordance with IEC 61442:1997, clause 7, the level of maximum noise background being 1pC 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 热循环电压试验

每个负荷循环时间为8h, 其中至少有2h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3h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23kV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℃~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 of the test period a voltage of 23kV 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 潮湿试验

试验按IEC 61442:1997第13章的规定进行。

Humidity 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1.3系列)和表3(标准中规定1.4系列)。

Test Sequence and Results

The test sequence and results were given in Table 1(sequence 1.1), Table 2(sequence 1.3) and Table 3(sequence 1.4).

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	39kV, 5 min. 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 39kV for 5 min	39kV下, 5min. 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 OK
2	室温下局部放电试验 Partial discharge test at ambient temperature	15 kV下放电电量不大于10pC The magnitude of the discharge at 15 kV shall not exceed 10pC	15 kV下,组合试样各相放电电量均 \leq 2pC The magnitude of the discharge of the combination Samples didn't exceed 2pC at 15 kV	符合要求 OK
3	高温下冲击电压试验 Impulse voltage withstand at 95 $^{\circ}$ C~100 $^{\circ}$ 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	符合要求 OK
4	在空气中热循环电压试验 Heating cycles voltage test in air	在23kV电压和导体加热至温度95 $^{\circ}$ C~100 $^{\circ}$ C下, 共3个循环 3 cycles at the conductor temperature of 95 to 100 $^{\circ}$ C and 23kV	在23kV电压和导体温度95 $^{\circ}$ C~100 $^{\circ}$ C下, 共经受3个循环 Subjected to 3 cycles in air at the conductor temperature of 95 to 100 $^{\circ}$ C and 23kV	符合要求 OK
5	高温下局部放电试验 Partial discharge test at 95 $^{\circ}$ C~100 $^{\circ}$ C	15kV下放电电量不大于10pC The magnitude of the discharge at 15kV shall not exceed 10pC	15kV下,组合试样各相放电电量均 \leq 2pC The magnitude of the discharge of the combination samples didn't exceed 2pC at 15 kV	符合要求 OK
6	室温下局部放电试验 Partial discharge test at ambient temperature	15 kV下放电电量不大于10pC The magnitude of the discharge at 15kV shall not exceed 10pC	15 kV下,组合试样各相放电电量均 \leq 2pC The magnitude of the discharge of the combination samples didn't exceed 2pC at 15 kV	符合要求 OK

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	热循环电压试验 Heating cycles voltage test	在23kV电压和导体 加热至温度95℃~ 100℃下, 在空气中 60个循环, 60 cycles in air at the conductor temperature of 95℃ to 100℃ and 23kV	在23kV电压和导体温度95 ℃~100℃下, 共经受了在 空气中60个循环, Subjected to 60 cycles in air at the conductor temperature of 95℃ to 100℃ and 23kV	符合要求 OK
8	高温下局部放电 试验 Partial discharge test at 95℃~ 100℃	15kV下放电电量不大 于10pC The magnitude of the discharge at 15kV shall not exceed 10pC	15kV下,组合试样各相放电 量均≤2pC The magnitude of the discharge of the combination samples didn't exceed 2pC at 15 kV	符合要求 OK
9	室温下局部放电 试验 Partial discharge test at ambient temperature	15kV下放电电量不大 于10pC The magnitude of the discharge at 15kV shall not exceed 10pC	15kV下,组合试样各相放电 量均≤2pC The magnitude of the discharge of the combination samples didn't exceed 2pC at 15 kV	符合要求 OK
10	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	符合要求 OK
11	工频电压试验 AC withstand	23kV, 15 min, 不 击穿, 不闪络 Neither breakdown nor flashover shall occur at 23kV for 15 min	23kV下, 15min, 组合试样 各相均未击穿和闪络 No breakdown and flashover occurred on the combination samples at 23kV for 15 min	符合要求 OK

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	39kV, 5 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 39kV for 5 min	39kV下, 5min, 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 OK
2	热稳定试验 Thermal short-circuit test	23.2 kA, 2s 两次, 无可见的损坏 No visible deterioration at 23.2 kA, 2s	23.2kA, 2.04s和23.2 kA, 2.04s无可见的损坏 No visible deterioration at 23.2 kA, 2.04 s and 23.2 kA, 2.04s	符合要求 OK
3	动稳定试验 Dynamic short-circuit test	82.3kA, 不少于10ms, 无可见的损坏 No visible deterioration at 82.3kA at least 10ms	83.8 kA, 0.07s, 无可见的损坏 No visible deterioration at 83.8kA, 0.07s	符合要求 OK
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	符合要求 OK
5	工频电压试验 AC withstand	23kV, 15 min, 不击穿, 不闪络 Neither breakdown nor flashover shall occur at 23kV for 15 min	23kV下, 15min, 组合试样各相均未击穿和闪络 No breakdown and flashover occurred on the combination samples at 23kV for 15 min	符合要求 OK

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	潮湿试验 Humidity test	在 11kV, 300 h 下, 不击穿, 不闪络, 无电蚀和机械损伤 Neither breakdown nor flashover, tracking, erosion or mechanical damage shall occur at 11kV for 300h	完成 11kV, 300 h 潮湿试验, 组合试样各相均未击穿和闪络, 无电蚀和机械损伤 No breakdown and flashover, tracking, erosion or mechanical damage occurred on the combination samples at 11kV for 300h	符合要求 OK

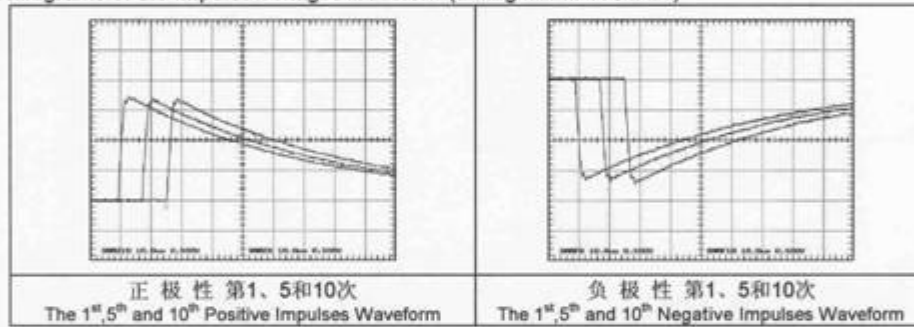
附录A: 热循环电压试验前组合试样冲击电压试验实际耐受电压值(95kV, 允许±3%偏差)
 Annex A: The values of impulse voltages on the combination samples before heating cycles
 voltage test (95kV, ±3% tolerance)

温度: 27℃ 相对湿度: 56% 大气压: 0.1008MPa
 Ambient temperature: 27℃, Relative humidity: 56%, Atmosphere: 0.1008MPa

单位/unit: kV

正极性 Positive polarity	97.7	95.2	95.5	95.7	95.2	96.2	95.7	96.5	96.4	95.2
负极性 Negative polarity	94.2	97.7	97.4	95.8	95.9	94.6	94.5	95.0	95.0	96.1

冲击电压波形图 (时标: 10 μs/格)
 Oscillograms of the impulse voltages waveform (timing mark: 10 μs/div)



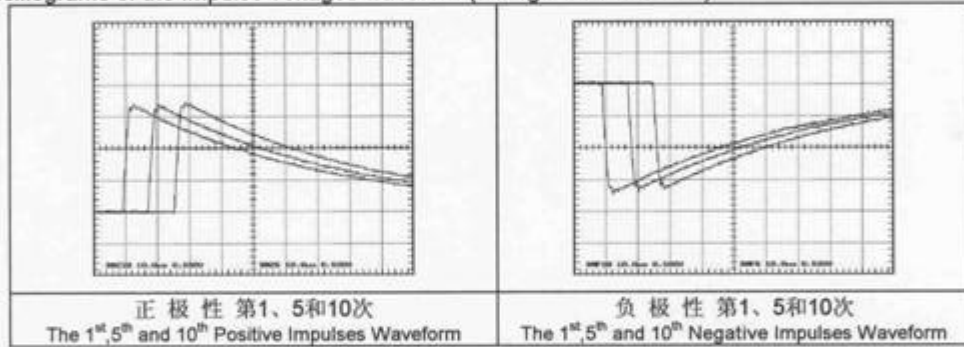
附录B: 热循环电压试验后组合试样冲击电压试验实际耐受电压值(95kV, 允许±3%偏差)
 Annex B: The values of impulse voltages on the combination samples after heating cycles
 voltage test (95kV, ±3% tolerance)

温度: 25.5℃ 相对湿度: 44% 大气压: 0.1012MPa
 Ambient temperature: 25.5℃, Relative humidity: 44%, Atmosphere: 0.1012MPa

单位/unit: kV

正极性 Positive polarity	94.8	94.0	96.3	95.1	95.3	94.0	97.2	94.0	95.8	97.9
负极性 Negative polarity	98.2	97.1	97.2	95.7	95.5	94.5	95.4	95.1	95.0	94.7

冲击电压波形图 (时标: 10 μs/格)
 Oscillograms of the impulse voltages waveform(timing mark: 10 μs/div)



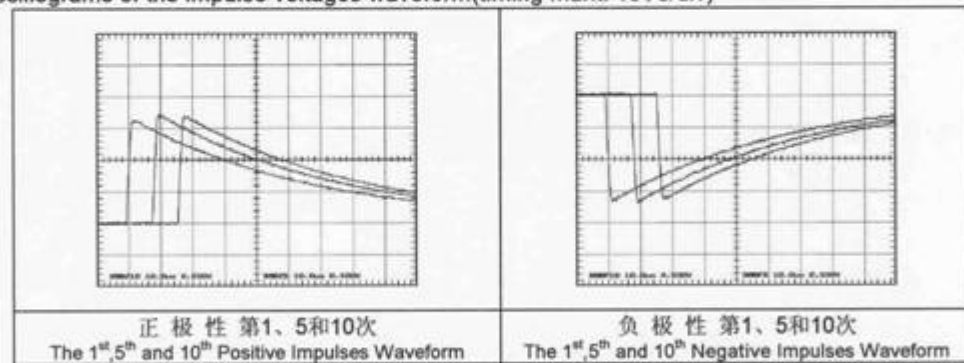
附录C: 动热稳定试验后组合试样冲击电压试验实际耐受电压值(95kV, 允许±3%偏差)
 Annex C: The values of impulse voltages on the combination samples after Dynamic short-circuit
 and thermal short-circuit tests (95kV, ±3% tolerance)

温度: 25℃ 相对湿度: 64% 大气压: 0.1013MPa
 Ambient temperature: 25℃, Relative humidity: 64%, Atmosphere: 0.1013MPa

单位/unit: kV

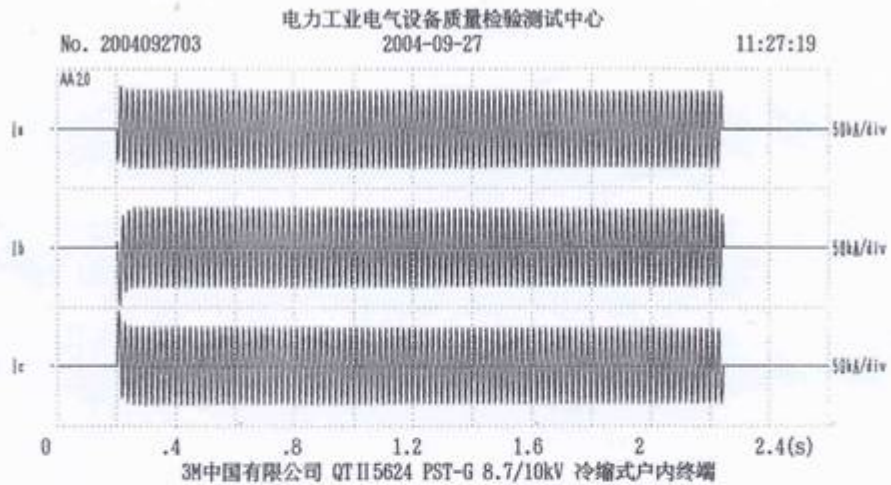
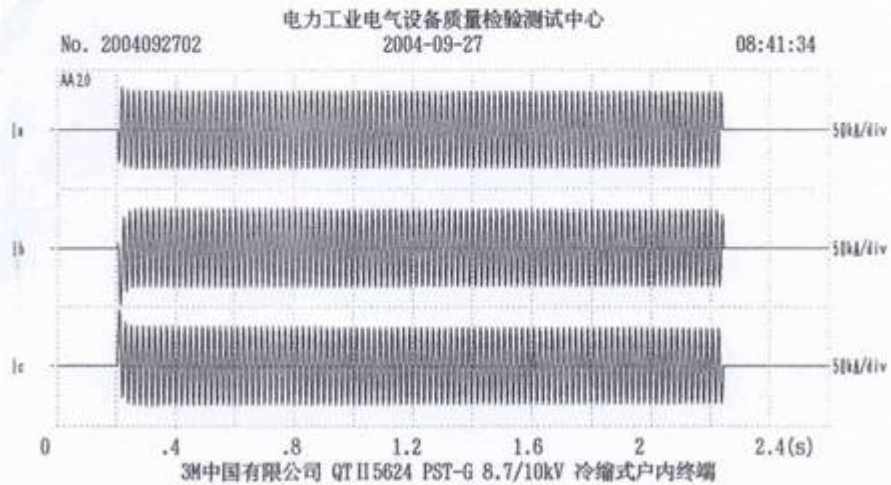
正极性 Positive polarity	96.0	95.9	96.8	95.8	96.8	97.1	96.9	96.6	96.4	95.7
负极性 Negative polarity	95.3	96.8	97.5	95.8	96.2	97.5	97.9	97.6	97.4	94.4

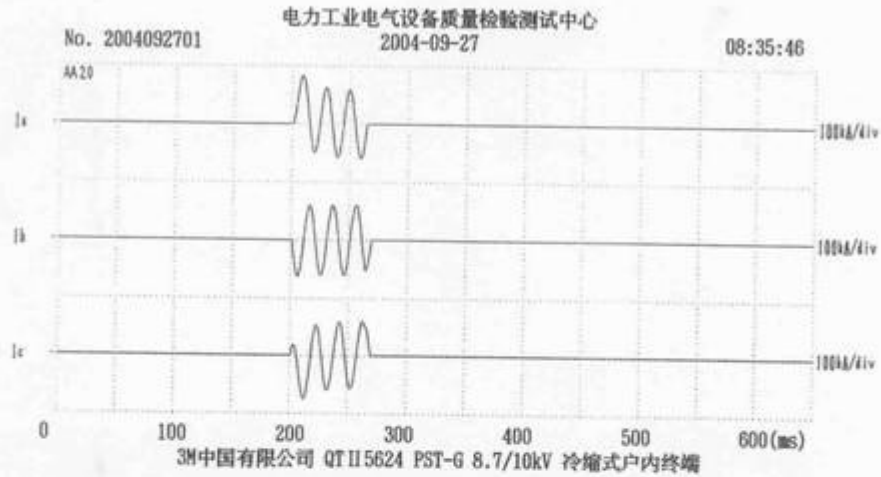
冲击电压波形图 (时标: 10 μs/格)
 Oscillograms of the impulse voltages waveform(timing mark: 10 μs/div)



附录D:组合试样动热稳定试验波形

Annex D: The waveform of Dynamic short-circuit and thermal short-circuit tests of the combination Sample








附录E: 检测中使用的主要试验仪器设备清单

Annex E: List of the equipment and instruments used in tests

序号 Seque- -nce	仪器设备名称 Name of the equipment and instruments	型 号 Type	编 号 No	检定有效期 Effective duration
1	交直流试验变压器 AC/DC test transformer	TSB (JZ)	6104	—
2	数字高压表 Digital HV meter	JSGB-100	9266	2004-01-12~2005-01-11
3	局放检测系统 PD measurement system	JFD-2B	96018	2004-05-22~2006-05-21
4	大电流试验装置 Equipment of have current test	DDG-A-180/18 ×2	—	—
5	电流互感器 Current transformer	LM-0.5	0513	2004-05-22~2006-05-21
6	数字电压表 Digital voltage meter	DT9806	3225271	2003-11-06~2004-11-05
7	试验变压器 Test transformer	YS 630/10	SB12	—
8	数据采集系统 Data collected system	H-DJF-2	C11-13	2003-12-30~2005-12-29
9	冲击电压发生器 Impulse voltage generator	CYF900-0.022	03	—
10	峰值电压表 Meter in peak value of voltage	64M	080816	2004-05-22~2005-05-21

附录F：试验照片
Annex F: Photograph about testing

		
户内终端外观图 The appearance of the sample	潮湿试验后（正面） After humidity test(the right side)	潮湿试验后（反面） After humidity test(opposite direction)