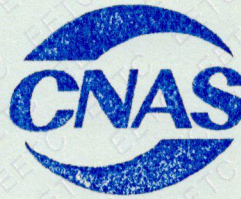




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国际互认
检测
TESTING
CNAS L0699



TEST REPORT

CEPRI-EETC08-2019-0547 (E)

Client: Shenzhen Woer Electric Technology Co., Ltd.

Object: 18/20(18/30) kV cold shrinkable straight joint

Type: WLJ-18/20(18/30)-3×185

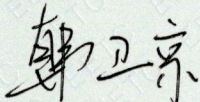
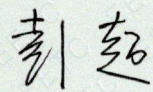
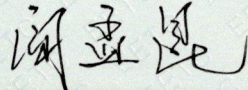
Test Category: Type Tests



POWER INDUSTRY QUALITY INSPECTION AND TEST
CENTER FOR ELECTRIC EQUIPMENT

Catalogue

1. Catalogue.....	1
2. Signature Page	2
3. Test Results.....	3
4. Content.....	5
5. Appendix A Object Parameters.....	7
6. Appendix B The Main Test Devices	8
7. Appendix C Waveforms.....	9
8. Appendix D Other Information	13

Test Report	Power Industry Quality Inspection and Test Center for Electric Equipment		CEPRI-EETC08-2019-0547(E) Total 15 Page 2
Client	Shenzhen Woer Electric Technology Co., Ltd.	Manufacturer	Shenzhen Woer Electric Technology Co., Ltd.
Object	18/20(18/30) kV cold shrinkable straight joint	Type	WLJ-18/20(18/30)-3×185
Sampling procedure	by the Client	Serial No.	EETC08-19/08/15-003
Test Category	Type Tests	Date	2019.10.15~2020.01.10
Requirements	<p>1. 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)</p> <p>2. IEC 60502-4:2010 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)</p>		
Conclusion	<p>According to GB/T 12706.4—2008 and IEC 60502-4:2010, type tests were performed on 18/20(18/30) kV cold shrinkable straight joints which were provided by Shenzhen Woer Electric Technology Co., Ltd. All the results were in accordance with the requirements.</p>		
Note	/		
Tested by: 韩卫京			付平
Checked by: 彭超			Verified by: 苗付贵
Approved by: 阎孟昆			Date of issue: 2020-05-07

Test Results

No.	Item	Requirements	Results				Evaluation
1	Sequence 2.1	/	/				/
1.1	AC voltage test	No breakdown shall occur at 81 kV for 5 min	No breakdown occurred on the combination samples at 81 kV for 5 min				passed
1.2	DC voltage test	No breakdown shall occur at 72 kV for 15 min	No breakdown occurred on the combination samples at 72 kV for 15 min				passed
1.3	Partial discharge test at ambient temperature	The magnitude of the discharge at 30 kV shall not exceed 10 pC	Phase	Y	G	R	passed
			Voltage (kV)	30	30	30	
			Noise background (pC)	1.7	1.7	1.7	
			Discharge (pC)	1.7	1.7	1.7	
1.4	Impulse voltage test at 95 °C ~ 100 °C	No breakdown shall occur at 10 positive and 10 negative impulses of 170 kV	No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 170 kV (See Appendix C.1)				passed
1.5	Heating cycle voltage test	No breakdown shall occur during 30 cycles in air and 30 cycles under water at the conductor temperature of 95°C to 100°C and 45 kV	No breakdown occurred on the combination samples during 30 cycles in air and 30 cycles under water at the conductor temperature of 95°C to 100°C and 45 kV				passed
1.6	Partial discharge test at 95°C ~ 100°C	The magnitude of the discharge at 30 kV shall not exceed 10 pC	Phase	Y	G	R	passed
			Voltage (kV)	30	30	30	
			Noise background (pC)	2.0	2.0	2.0	
			Discharge (pC)	2.0	2.0	2.0	
1.7	Partial discharge test at ambient temperature	The magnitude of the discharge at 30 kV shall not exceed 10 pC	Phase	Y	G	R	passed
			Voltage (kV)	30	30	30	
			Noise background (pC)	2.0	2.0	2.0	
			Discharge (pC)	2.0	2.0	2.0	

No.	Item	Requirements	Results	Evaluation
1.8	Impulse voltage test	No breakdown shall occur at 10 positive and 10 negative impulses of 170 kV	No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 170 kV (See Appendix C.2)	passed
1.9	AC voltage test	No breakdown shall occur at 45 kV for 15 min	No breakdown occurred on the combination samples at 45 kV for 15 min	passed
1.10	Examination	It is advised that the accessory is examined for signs of any of the following: (i) cracking in the filling media and/or tape or tube components; (ii) a moisture path across a primary seal; (iii) corrosion and/or tracking and/or erosion; (iv) leakage of an insulating material.	(i) No cracking in the filling media and tape or tube components; (ii) No moisture path across a primary seal; (iii) No evident corrosion, tracking and erosion; (iv) No leakage of an insulating material.	passed
2	Sequence 2.2 and 2.3	/	/	/
2.1	AC voltage test	No breakdown shall occur at 81 kV for 5 min	No breakdown occurred on the combination samples at 81 kV for 5 min	passed
2.2	DC voltage test	No breakdown shall occur at 72 kV for 15 min	No breakdown occurred on the combination samples at 72 kV for 15 min	passed
2.3	Thermal short-circuit test (screen)	No visible deterioration at 3.5 kA, 1 s, twice	No visible deterioration at 3.580 kA, 1.02 s and 3.557 kA, 1.02 s (See Appendix C.4)	passed
2.4	Thermal short-circuit test (conductor)	No visible deterioration at 24.2 kA, 2 s, twice	No visible deterioration at 24.72 kA, 2.03 s and 24.65 kA, 2.03 s (See Appendix C.5)	passed
2.5	Dynamic short-circuit test (conductor)	No visible deterioration at 85.7 kA, not less than 10 ms	No visible deterioration at 86.49 kA, 87ms (See Appendix C.6)	passed
2.6	Impulse voltage test	No breakdown shall occur at 10 positive and 10 negative impulses of 170 kV	No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 170 kV (See Appendix C.3)	passed

No.	Item	Requirements	Results	Evaluation
2.7	AC voltage test	No breakdown shall occur at 45 kV for 15 min	No breakdown occurred on the combination samples at 45 kV for 15 min	passed
2.8	Examination	It is advised that the accessory is examined for signs of any of the following: (i) cracking in the filling media and/or tape or tube components; (ii) a moisture path across a primary seal; (iii) corrosion and/or tracking and/or erosion; (iv) leakage of an insulating material.	(i) No cracking in the filling media and tape or tube components; (ii) No moisture path across a primary seal; (iii) No evident corrosion, tracking and erosion; (iv) No leakage of an insulating material.	passed

Content

1. Sequence 2.1 in Table 5 of GB/T 12706.4—2008

1.1 AC voltage test

1.1.1 Test method

The test shall be carried out in accordance with GB/T 18889—2002, clause 4 and IEC 61442:2005, clause 4. No breakdown shall occur at 81 kV for 5 min.

1.2 DC voltage test

1.2.1 Test method

The test shall be carried out in accordance with GB/T 18889—2002, clause 5 and IEC 61442:2005, clause 5. No breakdown shall occur at 72 kV for 15 min.

1.3 Partial discharge test at ambient temperature

1.3.1 Test method

The test voltage shall be raised gradually to and held at 36 kV for 10 s and then slowly reduced to 30 kV. The test shall be carried out in accordance with GB/T 18889—2002, clause 7 and IEC 61442:2005, clause 7.

1.4 Impulse voltage test at 95 °C~100 °C

1.4.1 Test method

The test shall be carried out in accordance with GB/T 18889—2002, clause 6 and IEC 61442:2005, clause 6. The conductor of the cable shall be heated and stabilized for at least 2 h at a temperature of 95 °C ~ 100 °C. No breakdown shall occur at 10 positive and 10 negative impulses of 170 kV.

1.5 Heating cycle voltage test

1.5.1 Test method

The test shall be carried out in accordance with GB/T 18889—2002, clause 9 and IEC 61442:2005, clause 9. Each heating cycle shall be of at least 8 h duration with at least 2 h at a steady temperature of 5 °C to 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. No breakdown shall occur during 30 cycles in air and 30 cycles under water at the conductor temperature of 95°C to 100°C and 45 kV.

1.6 Partial discharge test at 95 °C~100 °C**1.6.1 Test method**

The test voltage shall be raised gradually to and held at 36 kV for 10 s and then slowly reduced to 30 kV. The test shall be carried out in accordance with GB/T 18889—2002, clause 7 and IEC 61442:2005, clause 7. The conductor temperature shall be of 95°C to 100°C during the test.

1.7 Partial discharge test at ambient temperature**1.7.1 Test method**

The test voltage shall be raised gradually to and held at 36 kV for 10 s and then slowly reduced to 30 kV. The test shall be carried out in accordance with GB/T 18889—2002, clause 7 and IEC 61442:2005, clause 7.

1.8 Impulse voltage test**1.8.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 6 and IEC 61442:2005, clause 6. No breakdown shall occur at 10 positive and 10 negative impulses of 170 kV.

1.9 AC voltage test**1.9.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 4 and IEC 61442:2005, clause 4. No breakdown shall occur at 45 kV for 15 min.

1.10 Examination**1.10.1 Test method**

It is advised that the accessory is examined for signs of any of the following: (i) cracking in the filling media and/or tape or tube components; (ii) a moisture path across a primary seal; (iii) corrosion and/or tracking and/or erosion; (iv) leakage of an insulating material.

2. Sequence 2.2 and 2.3 in Table 5 of GB/T 12706.4—2008**2.1 AC voltage test****2.1.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 4 and IEC 61442:2005, clause 4. No breakdown shall occur at 81 kV for 5 min.

2.2 DC voltage test**2.2.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 5 and IEC 61442:2005, clause 5. No breakdown shall occur at 72 kV for 15 min.

2.3 Thermal short-circuit test (screen)**2.3.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 10 and IEC 61442:2005, clause 10. At the beginning of the test, the cable conductor shall be heated to reach a steady temperature of 5 °C to 10 °C above the maximum cable conductor temperature in normal operation and shall last for at least 2 h. Then two short-circuits shall be applied to the screen. The short-circuit current and duration time shall be specified as the agreement between manufacturer and user according to the actual short-circuit condition of the power grid. Between the two short-circuits, the test loop shall be allowed to cool to a temperature less than 10 °C above its temperature prior to the first short-circuit. There shall be no visible deterioration on the samples.

2.4 Thermal short-circuit test (conductor)**2.4.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 11 and IEC 61442:2005, clause 11. Two short-circuits shall be applied using AC to raise the conductor temperature to the maximum permissible short-circuit temperature (250°C) of the cable within 5 s. Between the two short-circuits, the test loop shall be allowed to cool to a temperature less than 10 °C above its temperature prior to the first short-circuit. There shall be no visible deterioration on the samples.

2.5 Dynamic short-circuit test**2.5.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 12 and IEC 61442:2005, clause 12. The dynamic short-circuit current value shall be 2.5 times of the thermal short-circuit value when the thermal short-circuit time equals 1s. There shall be no visible deterioration on the samples after the short-circuit lasts for at least 10ms.

2.6 Impulse voltage test**2.6.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 6 and IEC 61442:2005, clause 6. No breakdown shall occur at 10 positive and 10 negative impulses of 170 kV.

2.7 AC voltage test**2.7.1 Test method**

The test shall be carried out in accordance with GB/T 18889—2002, clause 4 and IEC 61442:2005, clause 4. No breakdown shall occur at 45 kV for 15 min.

2.8 Examination**2.8.1 Test method**

It is advised that the accessory is examined for signs of any of the following: (i) cracking in the filling media and/or tape or tube components; (ii) a moisture path across a primary seal; (iii) corrosion and/or tracking and/or erosion; (iv) leakage of an insulating material.

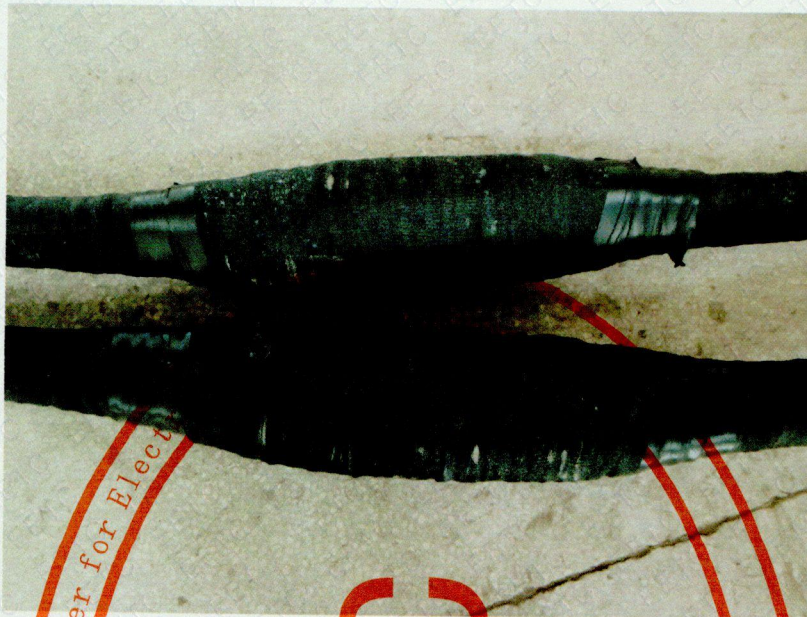
Appendix A Object Parameters**A.1 Sample information**

The sample was received by Power Cable Station on 15/08/2019. The sample was in good condition with the factory number of DL2019-146 and the date of manufacture not provided.

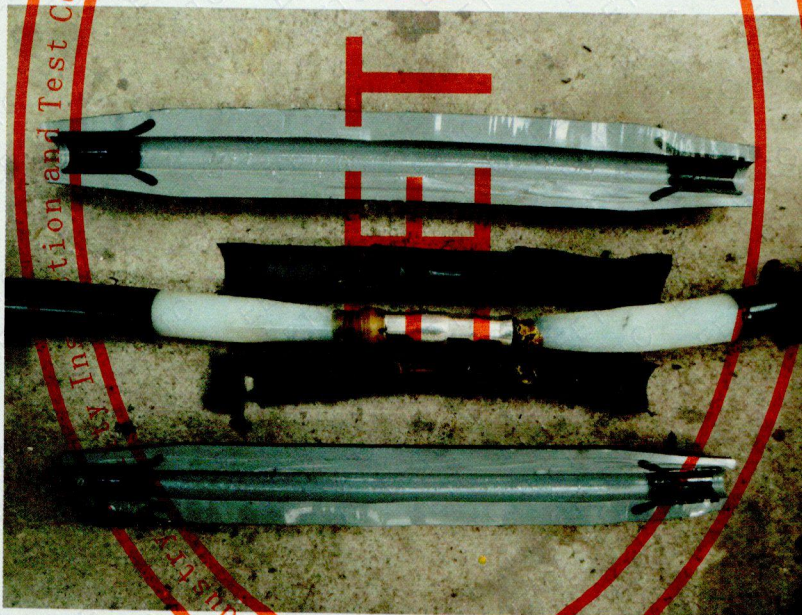
A.2 The number and installation of samples

According to GB/T 12706.4—2008, It was required that two sets of straight joints to be tested were installed by the manufacturer on two length of cables forming No.1 and No.2 combination samples on which the type tests sequence 2.1, 2.2 and 2.3 were carried out. Two sets of indoor terminations and two sets of outdoor terminations were also installed by the manufacturer on the combination samples. The cable used in the combination samples was a XLPE insulated three-core cable for rated voltage 18/30 kV, a cross-section of 185 sq.mm.

A.3 Photograph of samples



A.4 Photograph of dissected samples



Appendix B The Main Test Devices

No.	Name/ Type/ Specification	Serial No.	Measurement Range	Uncertainty / Accuracy class / Maximum Permissible Error	Calibration Institute	Valid Date
1	YD(W)-JZ-15/150 AC/DC Test Device	084326	(0~150)kV	Class 3	National high voltage measurement station	2020.07.18
2	TRF300-0.002 AC voltage measurement system	110650	(0~300) kV	Class 3	National high voltage measurement station	2020.07.21

No.	Name/ Type/ Specification	Serial No.	Measurement Range	Uncertainty / Accuracy class / Maximum Permissible Error	Calibration Institute	Valid Date
3	JFD-2H PD measurement system	20041202	(0.5~1000) pC	Class 10	National high voltage measurement station	2022.03.25
4	FY I 900/600 Weakly damped capacitive voltage divider	11165-2-1	(0~900) kV	Class 3	National high voltage measurement station	2020.06.29
5	H-DJF-2 Data collected system	CJ06	(0~100) kA	Class 0.5	National high voltage measurement station	2020.12.30
6	LCC-V Heating cycle monitoring system	DLRXH01 2	(0~3000) A	Class 3	National high voltage measurement station	2020.10.26
7	287C Digital voltage meter	31470016	(0~700) V	Class 1	Vkan Certification & Testing Co., Ltd. Measuring Center	2020.05.20

Appendix C Waveforms

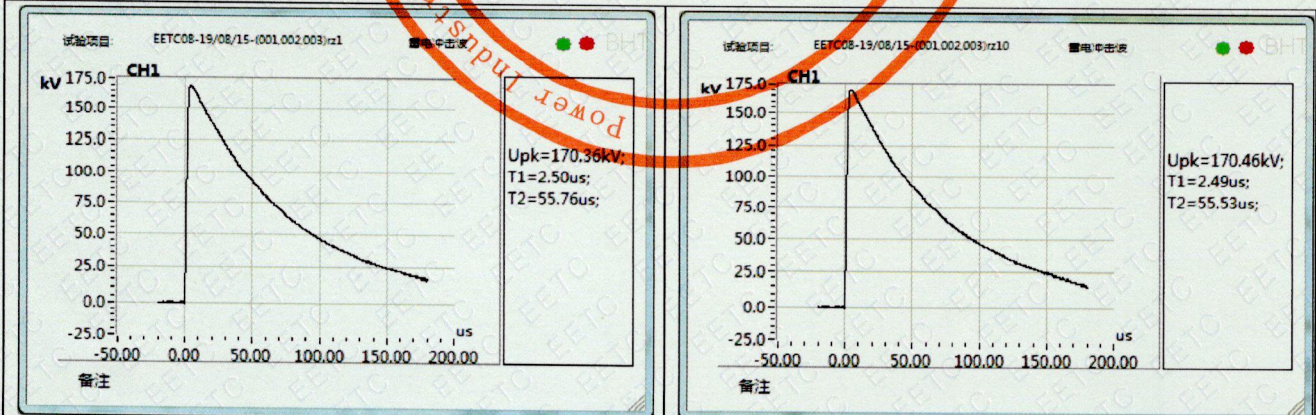
C.1 The values and waveforms of impulse voltage on the combination samples before heating cycles voltage test

C.1.1 The values of impulse voltage test

Ambient temperature: 22.0°C Relative humidity: 57% Atmosphere: 0.1009MPa

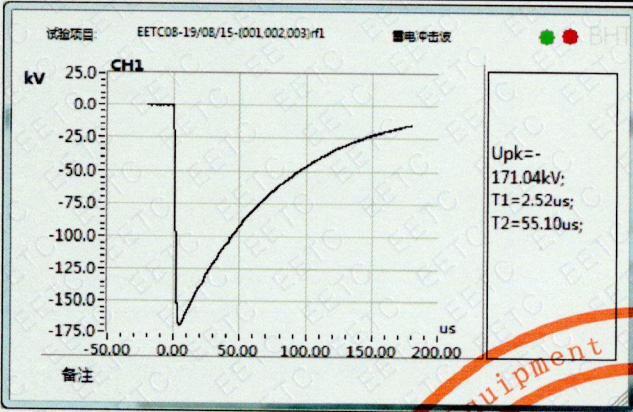
Positive polarity (kV)	170	170	169	170	169	170	171	170	170	170
Negative polarity (kV)	171	170	168	169	170	170	170	169	170	169

C.1.2 The waveforms of impulse voltage test

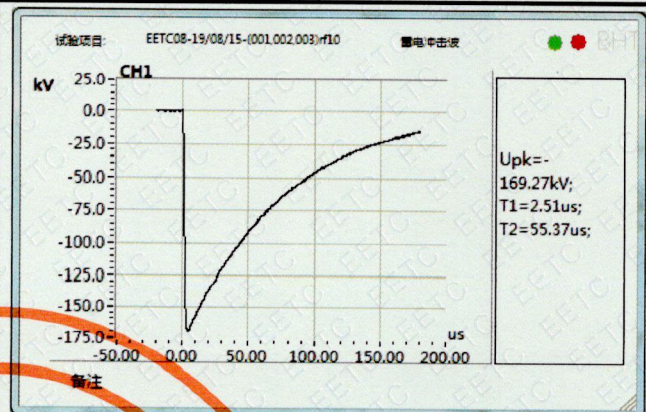


The 1st positive impulses waveform

The 10th positive impulses waveform



The 1st negative impulses waveform



The 10th negative impulses waveform

C.2 The values and waveforms of impulse voltage on the combination samples after heating cycles voltage test

C.2.1 The values of impulse voltage test

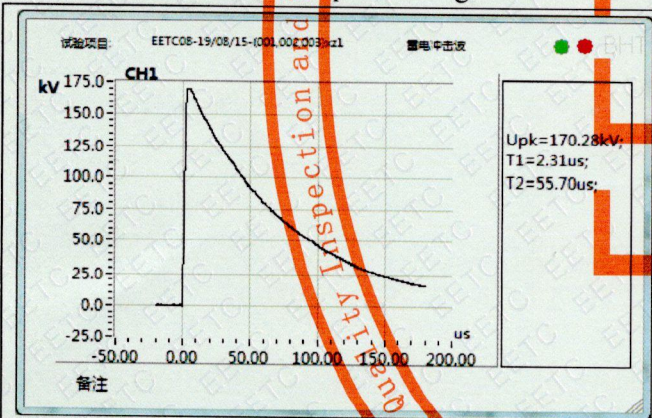
Ambient temperature: 15.5°C

Relative humidity: 31%

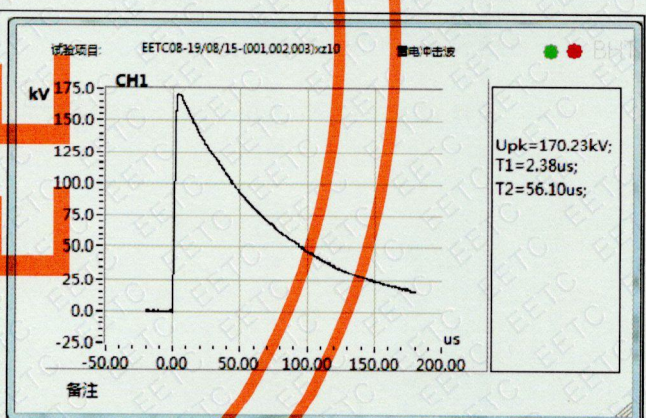
Atmosphere: 0.1024MPa

Positive polarity (kV)	170	171	171	172	170	171	171	171	170	170
Negative polarity (kV)	171	170	170	170	170	170	170	169	169	169

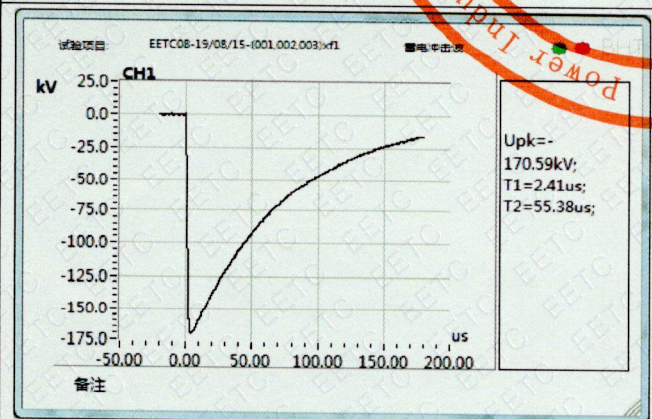
C.2.2 The waveforms of impulse voltage test



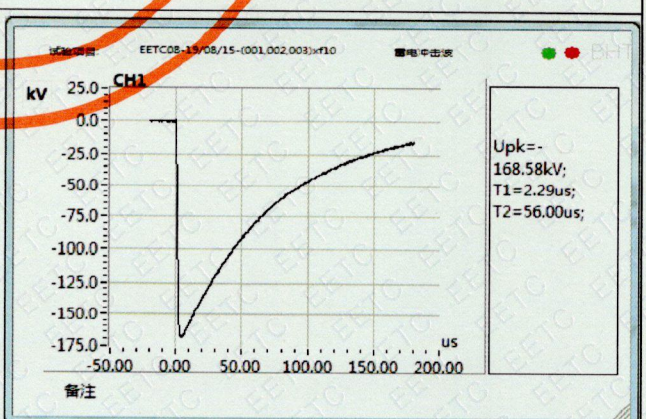
The 1st positive impulses waveform



The 10th positive impulses waveform



The 1st negative impulses waveform



The 10th negative impulses waveform

C.3 The values and waveforms of impulse voltage on the combination samples after thermal and dynamic short-circuit tests

C.3.1 The values of impulse voltage test

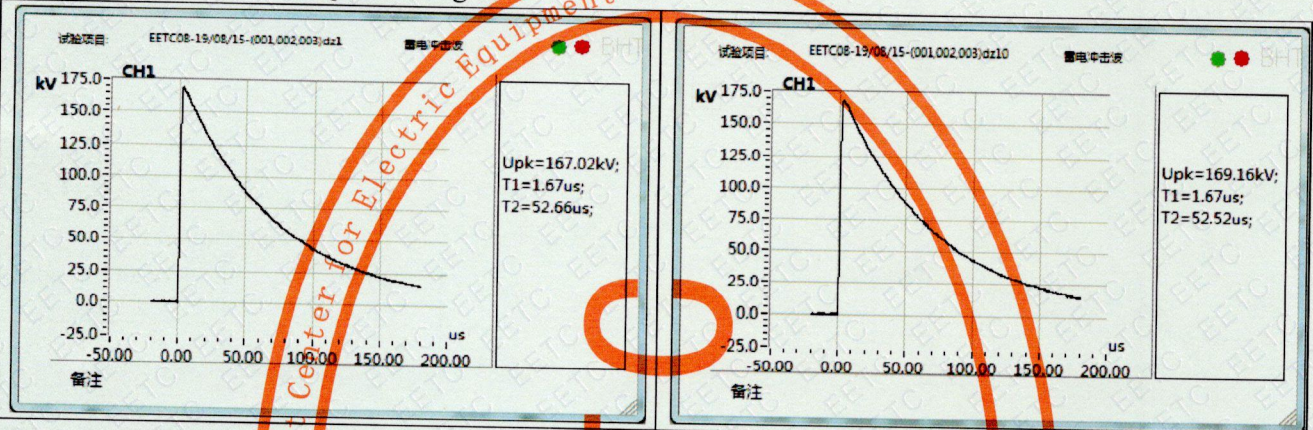
Ambient temperature: 11.4°C

Relative humidity: 67%

Atmosphere: 0.1027MPa

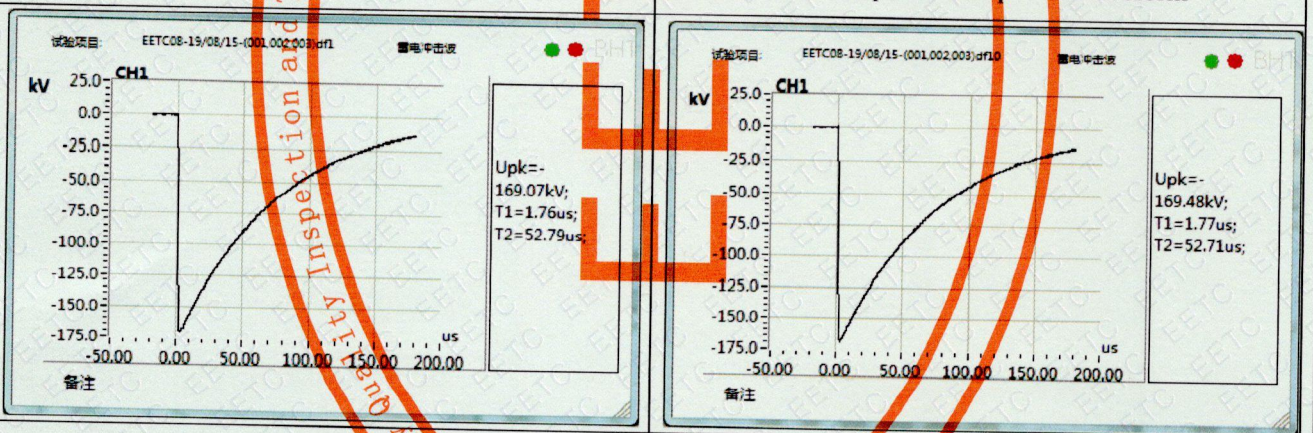
Positive polarity (kV)	167	170	170	169	170	170	170	170	169	169
Negative polarity (kV)	169	170	170	170	171	170	169	171	170	169

C.3.2 The waveforms of impulse voltage test



The 1st positive impulses waveform

The 10th positive impulses waveform



The 1st negative impulses waveform

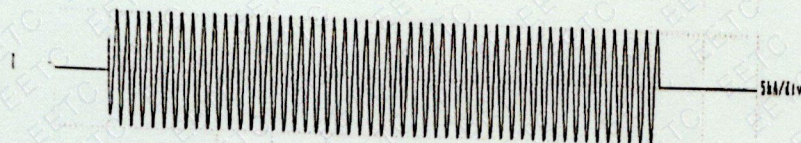
The 10th negative impulses waveform

C.4 The waveform of thermal short-circuit tests of the combination samples (screen)

No. 2019122402
AA20

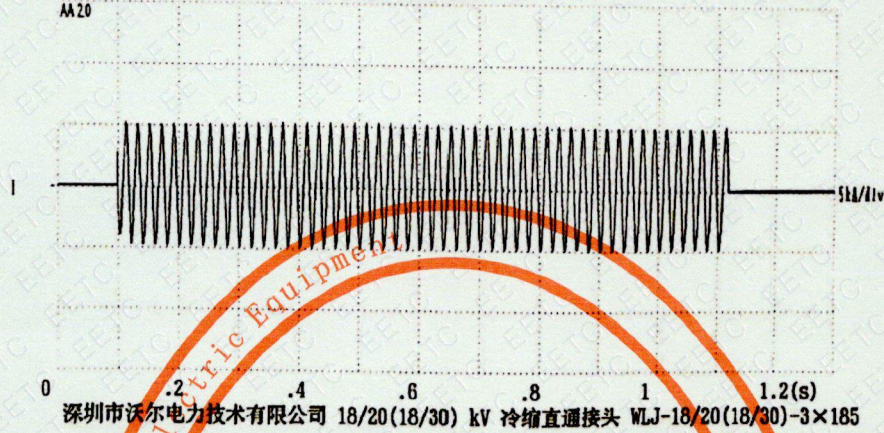
电力工业电气设备质量检验检测中心
2019-12-24

10:26:08



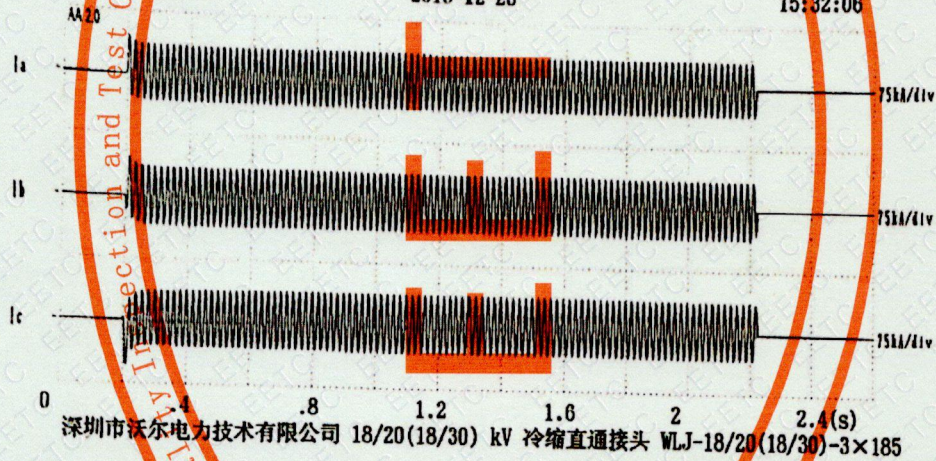
0 .2 .4 .6 .8 1 1.2(s)
深圳市沃尔电力技术有限公司 18/20(18/30) kV 冷缩直通接头 WLJ-18/20(18/30)-3×185

No. 2019122403 电力工业电气设备质量检验测试中心 2019-12-24 14:01:56
AA20

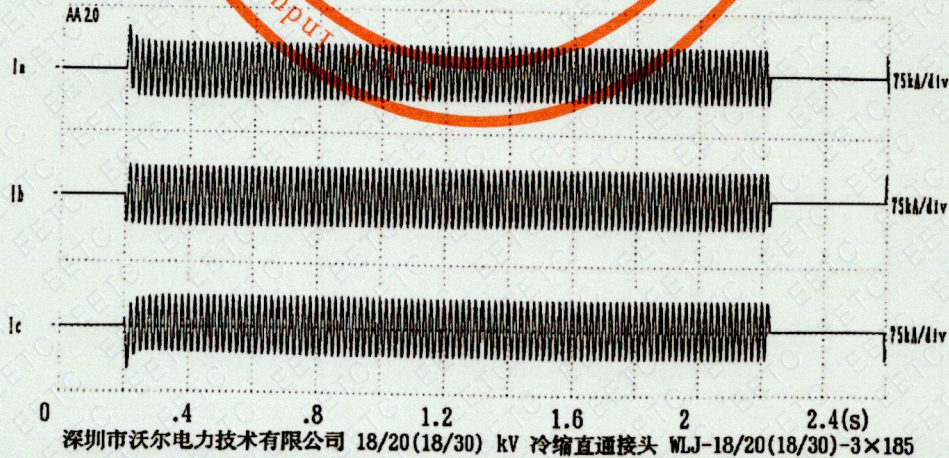


C.5 The waveform of thermal short-circuit tests of the combination samples (conductor)

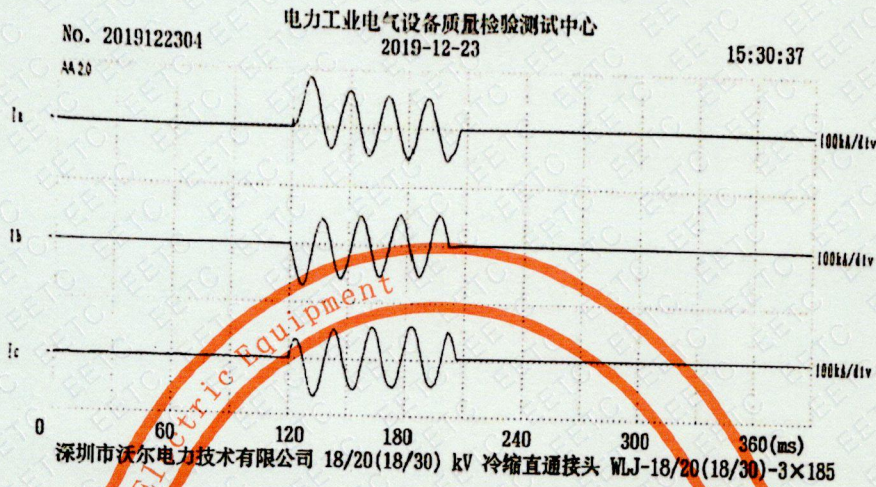
No. 2019122305 电力工业电气设备质量检验测试中心 2019-12-23 15:32:06
AA20



No. 2019122401 电力工业电气设备质量检验测试中心 2019-12-24 09:04:56
AA20



C.6 The waveform of dynamic short-circuit tests of the combination samples



Appendix D Other Information

D.1 Sample packing list

18/20(18/30)kV冷缩三芯中间接头配套清单

序号	名称	单位	数量	备注
1	冷缩中间接头	个	3	中间接头主体, 关键部件
2	防水胶带	卷	10-12	中间接头防水密封
3	铠装带	袋	5-7	中间接头机械防护
4	铜网	条	3	恢复中间接头金属屏蔽
5	地线	条	4	延展电缆金属屏蔽接地
6	黑色阻燃胶带	卷	3	包裹固定中间接头
7	白色电工胶带	卷	1	定位及临时包裹
8	导电胶带	盒	3	金属导电和半导体过渡
9	恒力弹簧	个	8	固定地线
10	PE手套	双	2	涂抹绝缘润滑脂专用手套
11	绝缘润滑脂	支	2	填补电缆绝缘层间隙
12	密封胶	条	1	填补压接后连接管与电缆绝缘层之间缝隙
13	电缆清洁纸	包	12	清洁电缆绝缘层
14	橡胶手套	双	1	缠绕铠装带防护手套
15	砂条	条	1	打磨掉绝缘层刀痕及导电颗粒
16	矿泉水	瓶	1	浸泡铠装带, 使其吸水硬化
17	创可贴	贴	1	临时包裹意外创伤
18	盒尺	个	1	计量尺寸工具
19	合格证	份	1	合格产品凭证
20	安装工艺	张	1	正确安装指导说明书(内附装箱单)

D.2 Identification of test cable (specified in GB/T 12706.2—2008)

rated voltage $U_0/U(U_m)$		18/30(36)kV
construction	core	three-core
	construction of screen	separated screen
conductor	material	copper
	type	round compact stranded
	cross section	185 mm ²
	diameter	16.1 mm
insulation	material	XLPE
	thickness	8.0 mm
	diameter	34.3 mm
screen	thickness of conductor screen	0.9 mm
	thickness of insulation screen	0.9 mm
	strippability of insulation screen	strippable
	diameter of insulation screen	36.1 mm
	metallic screen	copper tape
armour		/
oversheath	material	PVC
	diameter	83.7mm
mark of cable		YJV-18/30 3×185

D.3 Main structure dimensions of the samples

