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检测
TESTING
CNAS L0699

CEPRI

TEST REPORT

CEPRI-EETC08-2022-0022(E)

Client: ANHUI CHARDON ELECTRIC LTD.

Object: 8.7/15(17.5)kV cold shrinkable straight joint

Type: 17-CSCJ 1×185

Test Category: Type Tests

POWER INDUSTRY QUALITY INSPECTION AND TEST CENTER FOR ELECTRIC EQUIPMENT

Catalogue

Test Report	Power Industry Quality Inspection and Test Center for Electric Equipment		CEPRI-EETC08-2022-0022(E) Total 16 Page 2
Client	ANHUI CHARDON ELECTRIC LTD.	Manufacturer	ANHUI CHARDON ELECTRIC LTD.
Object	8.7/15(17.5)kV cold shrinkable straight joint	Type	17-CSCJ 1×185
Sampling procedure	by the Client	Serial No.	EETC08-22/01/03-006
Test Category	Type Tests	Date	2022.01.18~2022.05.10
Requirements	1. GB/T 12706.4－2020 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) 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)		
Conclusion	According to GB/T 12706.4－2020 and IEC 60502-4:2010, type tests were performed on 8.7/15(17.5)kV cold shrinkable straight joints which were provided by ANHUI CHARDON ELECTRIC LTD.. All the results were in accordance with the requirements.		
Note	In the event of any difference in meanings, the Chinese report shall take priority over the English version.		

Tested by: 邓凯 邓凯　　赫留洋 赫留洋

Checked by: 张伟 张伟　　**Verified by:** 苗付贵 苗付贵

Approved by: 阎孟昆 阎孟昆　　**Date of issue:** 2022-05-30

Test Results

No.	Item	Requirements	Results	Evaluation
1	Sequence 2.1	/	/	/
1.1	AC voltage test	No breakdown shall occur at 39 kV for 5 min	No breakdown occurred on the combination samples at 39 kV for 5 min	passed
1.2	DC voltage test	No breakdown shall occur at 35 kV for 15 min	No breakdown occurred on the combination samples at 35 kV for 15 min	passed
1.3	Partial discharge test at ambient temperature	The magnitude of the discharge at 15 kV shall not exceed 10 pC	Phase: 1 / 2 / 3 / 4 Voltage (kV): 15 / 15 / 15 / 15 Sensitivity (pC): 2.8 / 2.8 / 2.8 / 2.8 Discharge (pC): No detectable discharge exceeding the sensitivity	passed
1.4	Impulse voltage test at 95 ℃～100 ℃	No breakdown shall occur at 10 positive and 10 negative impulses of 95 kV	No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 95 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℃ to 100℃ and 22 kV	No breakdown occurred on the combination samples during 30 cycles in air and 30 cycles under water at the conductor temperature of 95℃ to 100℃ and 22 kV	passed
1.6	Partial discharge test at 95℃～100℃	The magnitude of the discharge at 15 kV shall not exceed 10 pC	Phase: 1 / 2 / 3 / 4 Voltage (kV): 15 / 15 / 15 / 15 Sensitivity (pC): 2.2 / 2.2 / 2.8 / 2.8 Discharge (pC): No detectable discharge exceeding the sensitivity	passed
1.7	Partial discharge test at ambient temperature	The magnitude of the discharge at 15 kV shall not exceed 10 pC	Phase: 1 / 2 / 3 / 4 Voltage (kV): 15 / 15 / 15 / 15 Sensitivity (pC): 3.2 / 3.2 / 3.0 / 3.0 Discharge (pC): No detectable discharge exceeding the sensitivity	passed

No.	Item	Requirements	Results	Evaluation
1.8	Impulse voltage test	No breakdown shall occur at 10 positive and 10 negative impulses of 95 kV	No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 95 kV (See Appendix C.2)	passed
1.9	AC voltage test	No breakdown shall occur at 22 kV for 15 min	No breakdown occurred on the combination samples at 22 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 39 kV for 5 min	No breakdown occurred on the combination samples at 39 kV for 5 min	passed
2.2	DC voltage test	No breakdown shall occur at 35 kV for 15 min	No breakdown occurred on the combination samples at 35 kV for 15 min	passed
2.3	Thermal short-circuit test (screen)	No visible deterioration at 3.0 kA, 1 s, twice	No visible deterioration at 3.010 kA, 1.04 s and 3.022kA, 1.04 s (See Appendix C.4)	passed
2.4	Thermal short-circuit test (conductor)	No visible deterioration at 23.7kA, 2 s, twice	No visible deterioration at 24.16 kA, 2.04s and 24.25 kA, 2.04s (See Appendix C.5)	passed
2.5	Dynamic short-circuit test	No visible deterioration at 83.9 kA, not less than 10 ms	No visible deterioration at 84.95 kA, 87 ms (See Appendix C.6)	passed

No.	Item	Requirements	Results	Evaluation
2.6	Impulse voltage test	No breakdown shall occur at 10 positive and 10 negative impulses of 95 kV	No breakdown occurred on the combination samples at 10 positive and 10 negative impulses of 95 kV (See Appendix C.3)	passed
2.7	AC voltage test	No breakdown shall occur at 22 kV for 15 min	No breakdown occurred on the combination samples at 22 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 2 of GB/T 12706.4—2020

1.1 AC voltage test

No breakdown occurred at 39 kV for 5 min.

Result: Passed.

1.2 DC voltage test

No breakdown occurred at 35 kV for 15 min.

Result: Passed.

1.3 Partial discharge test at ambient temperature

The test voltage was raised gradually to and held at 18 kV for 10 s and then slowly reduced to 15 kV.

Requirements	Result		
	Phase	Sensitivity (pC)	Discharge (pC)
15kV, the magnitude of the discharge shall not exceed 10 pC	1	2.8	1.4
	2	2.8	1.4
	3	2.8	1.4
	4	2.8	1.4

Result: Passed.

1.4 Impulse voltage test at 95 ℃～100 ℃

The conductor of the cable was heated and stabilized for at least 2 h at a temperature of 95 ℃～100 ℃. No breakdown occurred at 10 positive and 10 negative impulses of 95 kV.

Result：Passed.

1.5 Heating cycle voltage test

Each heating cycle in air was at least 8 h duration with at least 2 h at a steady temperature of 5 ℃ to 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. No breakdown occurred during 30 cycles in air and 30 cycles under water at the conductor temperature of 95℃ to 100℃ and 22 kV.

Result：Passed.

1.6 Partial discharge test at 95 ℃～100 ℃

The test voltage was raised gradually to and held at 18 kV for 10 s and then slowly reduced to 15 kV. The conductor temperature was 95℃ to 100℃ during the test.

Requirements	Result		
	Phase	Sensitivity（pC）	Discharge（pC）
15kV，the magnitude of the discharge shall not exceed 10 pC	1	2.2	1.1
	2	2.2	1.1
	3	2.8	1.4
	4	2.8	1.4

Result：Passed.

1.7 Partial discharge test at ambient temperature

The test voltage was raised gradually to and held at 18 kV for 10 s and then slowly reduced to 15 kV.

Requirements	Result		
	Phase	Sensitivity（pC）	Discharge（pC）
15kV，the magnitude of the discharge shall not exceed 10 pC	1	3.2	1.6
	2	3.2	1.6
	3	3.0	1.5
	4	3.0	1.5

Result：Passed.

1.8 Impulse voltage test

No breakdown occurred at 10 positive and 10 negative impulses of 95 kV.

Result：Passed.

1.9 AC voltage test

No breakdown occurred at 22 kV for 15 min.

Result：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.

Result：Passed.

2. Sequence 2.2 and 2.3 in Table 2 of GB/T 12706.4—2020

2.1 AC voltage test

No breakdown occurred at 39 kV for 5 min.

Result: Passed.

2.2 DC voltage test

No breakdown occurred at 35 kV for 15 min.

Result: Passed.

2.3 Thermal short-circuit test (screen)

At the beginning of the test, the cable conductor was heated to reach a steady temperature of 5 ℃ to 10 ℃ above the maximum cable conductor temperature in normal operation and shall last for at least 2 h. Then two short-circuits were applied to the screen. The short-circuit current and duration time was 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 was allowed to cool to a temperature less than 10 ℃ above its temperature prior to the first short-circuit. There was no visible deterioration on the samples.

Ambient temperature: 15.0℃

Requirements	Result
No visible deterioration at 3.0 kA, 1 s, twice	No visible deterioration at 3.010 kA, 1.04 s and 3.022kA, 1.04 s (See Appendix C.4)

Result: Passed.

2.4 Thermal short-circuit test (conductor)

Two short-circuits were applied using AC to raise the conductor temperature to the maximum permissible short-circuit temperature(250℃) of the cable within 5 s. Between the two short-circuits, the test loop was allowed to cool to a temperature less than 10 ℃ above its temperature prior to the first short-circuit. There was no visible deterioration on the samples.

Ambient temperature: 20.0℃

Requirements	Result
No visible deterioration at 23.7kA, 2 s, twice	No visible deterioration at 24.16 kA, 2.04s and 24.25 kA, 2.04s (See Appendix C.5)

Result: Passed.

2.5 Dynamic short-circuit test (conductor)

The dynamic short-circuit current value was 2.5 times of the thermal short-circuit value when the thermal short-circuit time equals 1s. There was no visible deterioration on the samples after the short-circuit lasts for at least 10ms.

Requirements	Result
No visible deterioration at 83.9 kA, not less than 10 ms	No visible deterioration at 84.95 kA, 87 ms (See Appendix C.6)

Result: Passed.

2.6 Impulse voltage test

No breakdown occurred at 10 positive and 10 negative impulses of 95 kV.

Result: Passed.

2.7 AC voltage test

No breakdown occurred at 22 kV for 15 min.

Result: 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.

Result: Passed.

Appendix A Object Parameters

A.1 Sample state

The sample was received by Power Cable Station on 03/01/2022. The sample was in good condition.

A.2 Sample

The sample is designed with stress cone structure and the raw liquid material is liquid silicone rubber. The material of connector is T2 copper. The cable conductor is compacted with the connector by confining pressure.

A.3 The number and installation of samples

According to GB/T 12706.4 — 2020, it was required that four sets of straight joints to be tested were installed by the manufacturer on four length of cables forming No.1, NO.2, NO.3 and No.4 combination samples on which the type tests sequence 2.1, 2.2 and 2.3 were carried out. Four sets of indoor terminations and four sets of outdoor joints were also installed by the manufacturer on the combination samples. The cable used in the combination samples was a XLPE insulated single-core cable for rated voltage 8.7/15 kV, a cross-section of 185sq.mm.

A.4 Photograph of samples

A.5 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	150kV test system	EETC08-0267	(0～150)kV	Grade 3	National high voltage measurement station	2022.11.23
2	JFD-2H PD measurement system	EETC08-0013	(0.5~1000) pC	Class 10	National high voltage measurement station	2022.05.19
3	FY Ⅰ 900/600 Weakly damped capacitive voltage divider	EETC08-0019	(0~900) kV	Class 3	National high voltage measurement station	2022.06.29
4	CY2009 Data collected system	EETC05-2056	20A~300 kA	Class 1	The 29th Metrology and Testing Center of the Ministry of Machinery Industry (Tianshui)	2022.08.27
5	LCC-V Heating cycle monitoring system	EETC08-0042	(0~3000) A	Class 3	National high voltage measurement station	2023.03.30
6	287C Digital voltage meter	EETC08-0148	(0~700) V	Class 1	Vkan Certification & Testing Co., Ltd. Measuring Center	2022.05.20

Appendix C Waveforms

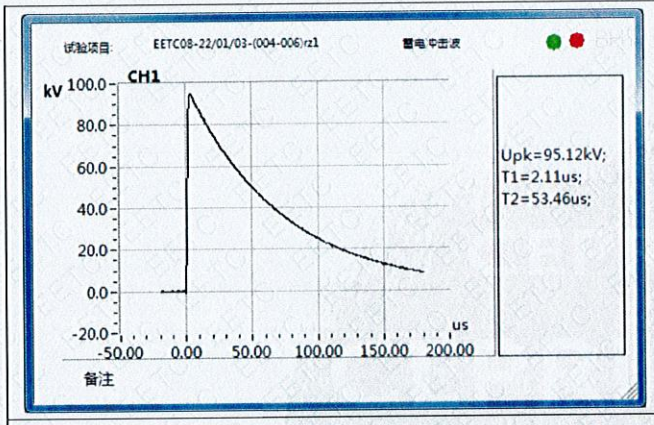
C.1 The values and waveforms of impulse voltage on the combination samples before heating cycles voltage test

C.1.1 The values of impulse voltage test

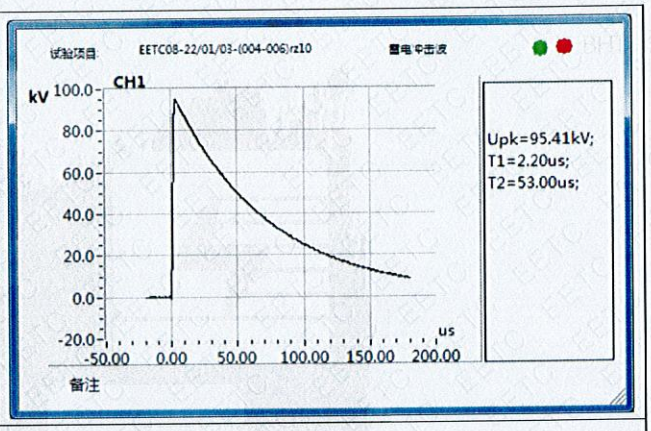
Ambient temperature: 10.5℃ Relative humidity: 55% Atmosphere: 0.1012MPa

Positive polarity (kV)	95.1	94.7	94.7	94.8	95.2	95.1	93.8	95.8	95.7	95.4
Negative polarity (kV)	95.2	95.2	95.3	95.0	93.9	95.0	94.8	95.4	94.6	95.1

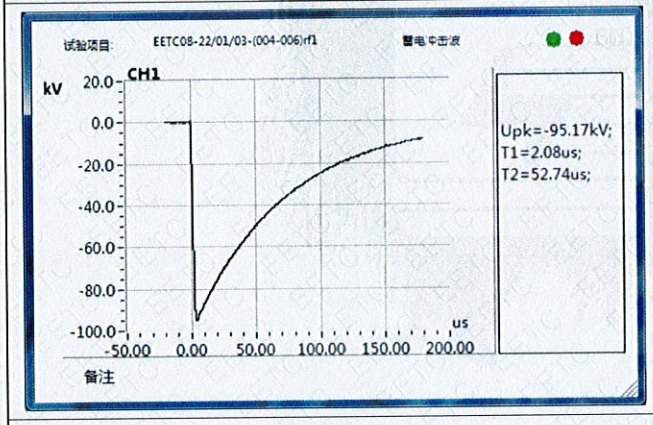
C.1.2 The waveforms of impulse voltage test



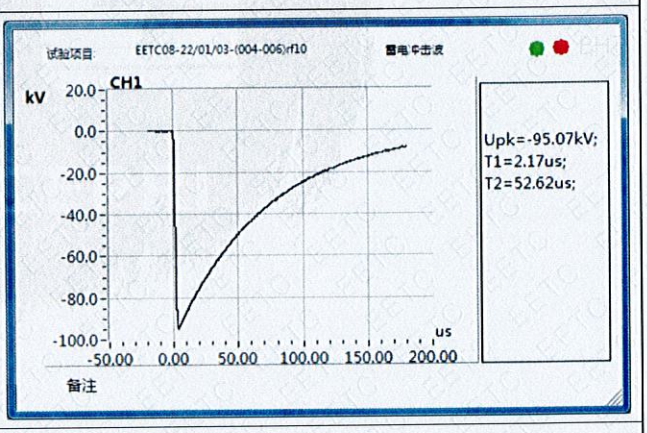
The 1st positive impulses waveform



The 10th positive impulses waveform



The 1st negative impulses waveform



The 10th negative impulses waveform

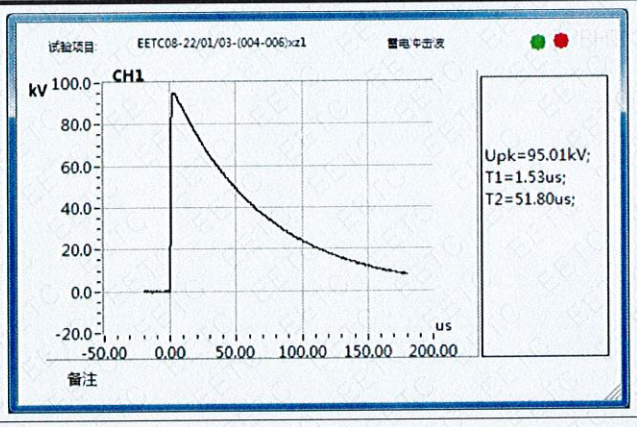
C.2 The values and waveforms of impulse voltage on the combination samples after heating cycles voltage test

C.2.1 The values of impulse voltage test

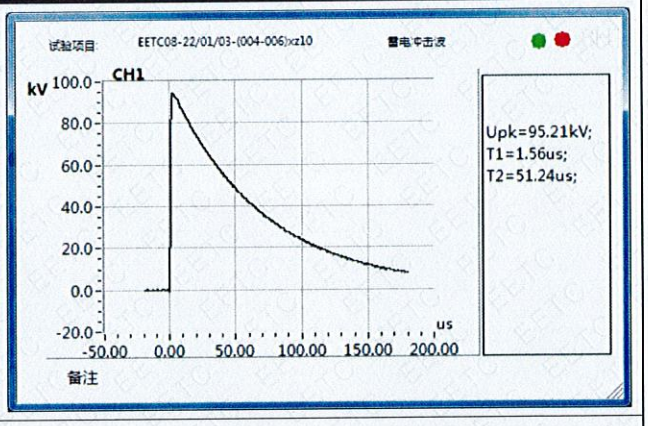
Ambient temperature:22.5℃ Relative humidity:58% Atmosphere: 0.1020MPa

Positive polarity (kV)	95.0	95.6	95.2	96.3	95.2	95.7	94.5	95.2	94.1	95.2
Negative polarity (kV)	95.8	95.8	95.1	95.6	96.1	95.1	95.0	94.5	95.1	94.7

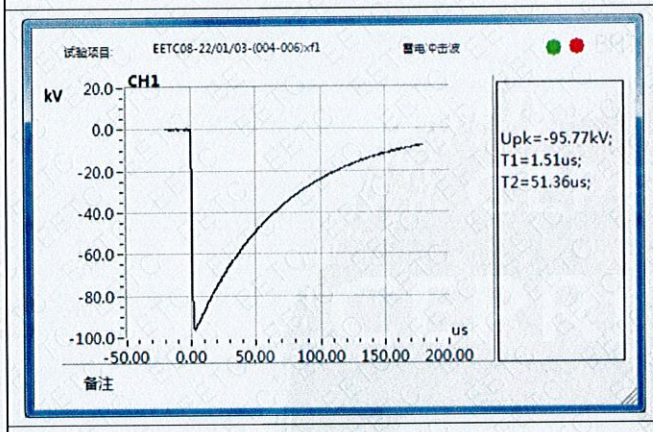
C.2.2 The waveforms of impulse voltage test



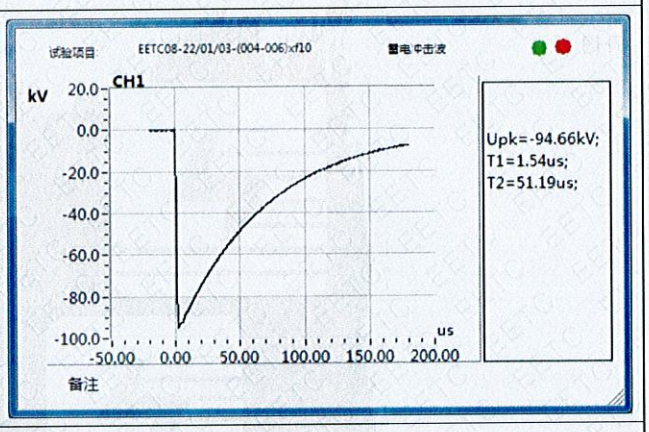
The 1st positive impulses waveform



The 10th positive impulses waveform



The 1st negative impulses waveform



The 10th negative impulses waveform

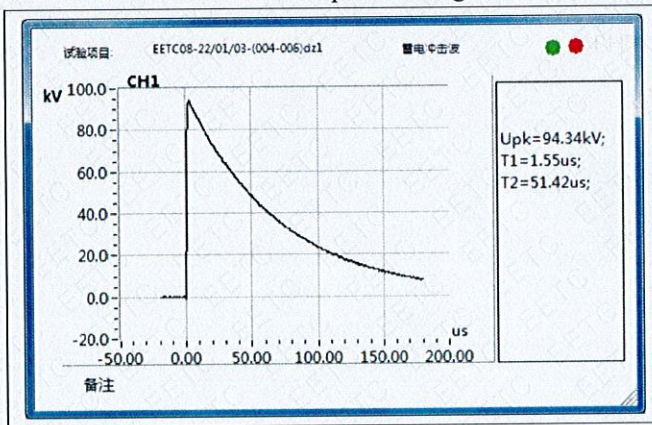
C.3 The values and waveforms of impulse voltage on the combination samples after thermal and dynamic short-circuit tests

C.3.1 The values of impulse voltage test

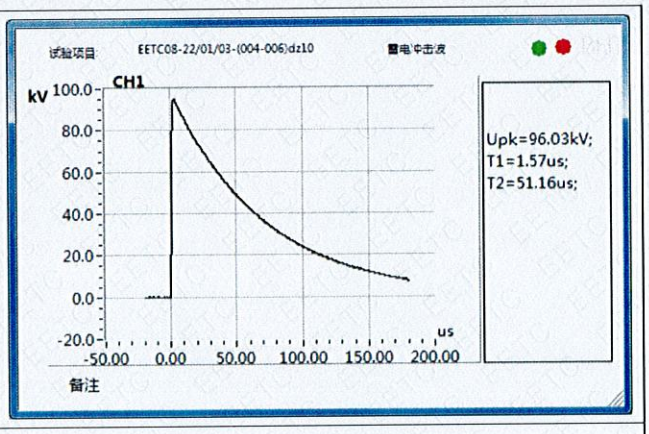
Ambient temperature:23.4℃ Relative humidity: 46% Atmosphere: 0.1004MPa

Positive polarity (kV)	94.3	94.3	94.4	94.0	95.9	95.0	95.6	95.4	96.3	96.0
Negative polarity (kV)	95.0	96.4	93.9	93.8	96.3	93.9	94.1	95.7	93.9	96.4

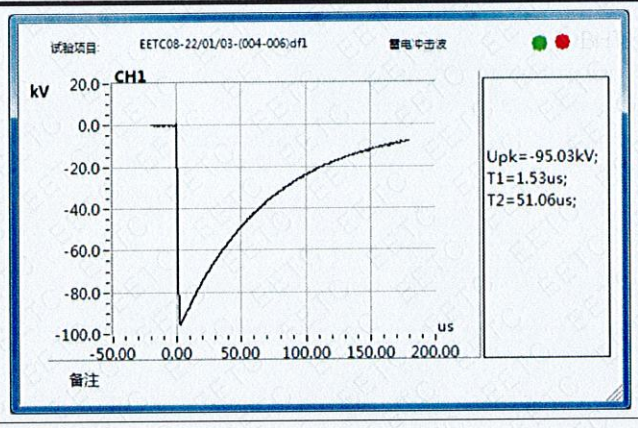
C.3.2 The waveforms of impulse voltage test



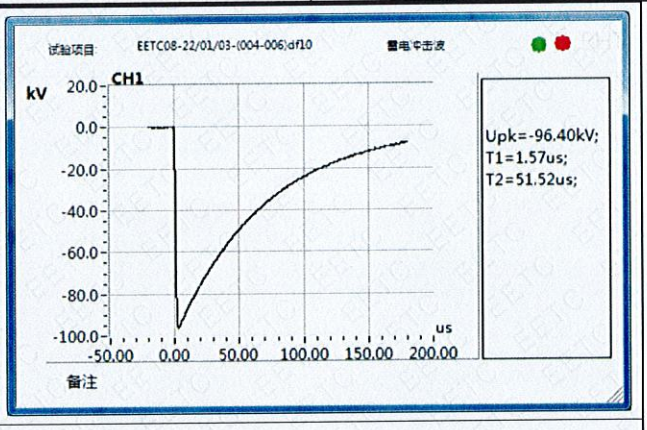
The 1st positive impulses waveform



The 10th positive impulses waveform

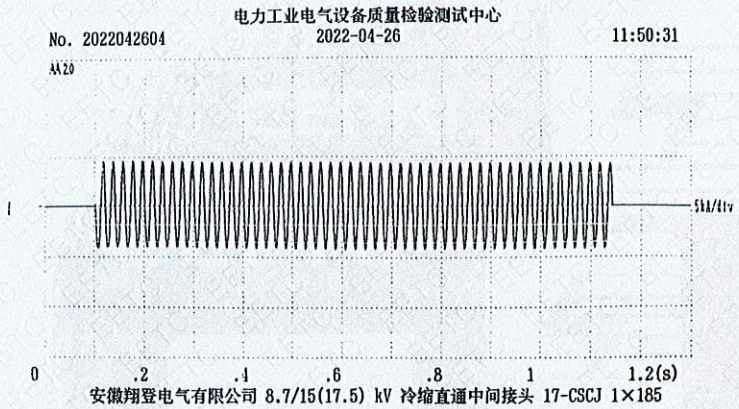


The 1st negative impulses waveform

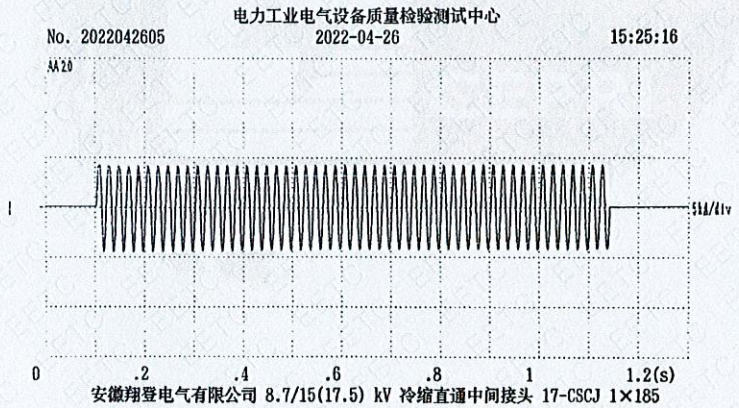


The 10th negative impulses waveform

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



安徽翔登电气有限公司 8.7/15(17.5) kV 冷缩直通中间接头 17-CSCJ 1×185



安徽翔登电气有限公司 8.7/15(17.5) kV 冷缩直通中间接头 17-CSCJ 1×185

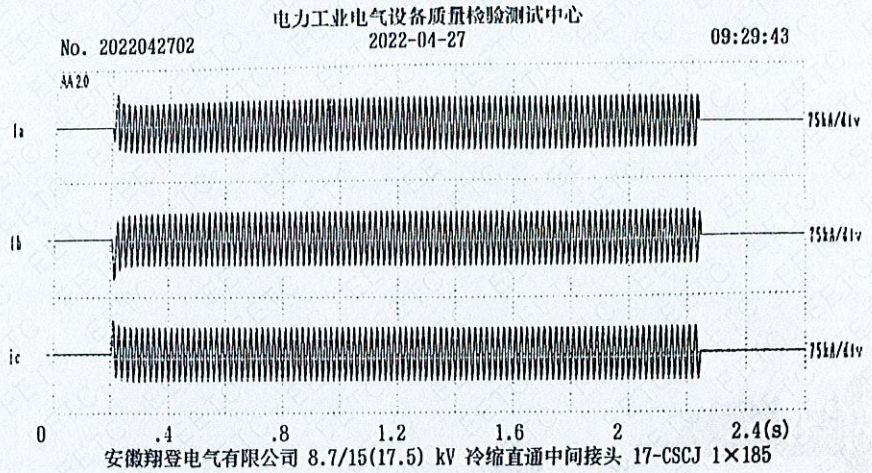
动、热 稳 定 试 验

示波图编号	试验电流峰值(kA)			动稳定通电时间(s)	试验电流周期分量有效值(kA)			热稳定通电时间(s)	热稳定值(AAs) 10E6		
	A	B	C		A	B	C		A	B	C
2022042604					3.010			1.04	9.423		

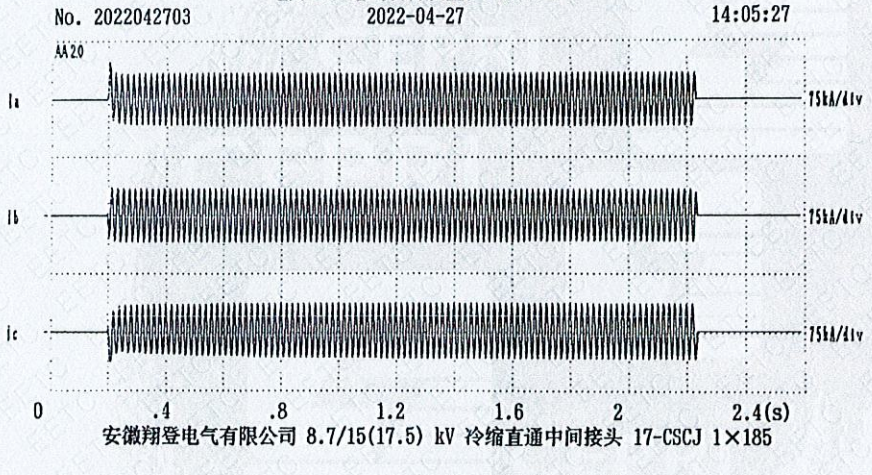
动、热 稳 定 试 验

示波图编号	试验电流峰值(kA)			动稳定通电时间(s)	试验电流周期分量有效值(kA)			热稳定通电时间(s)	热稳定值(AAs) 10E6		
	A	B	C		A	B	C		A	B	C
2022042605					3.022			1.04	9.503		

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



安徽翔登电气有限公司 8.7/15(17.5) kV 冷缩直通中间接头 17-CSCJ 1×185



安徽翔登电气有限公司 8.7/15(17.5) kV 冷缩直通中间接头 17-CSCJ 1×185

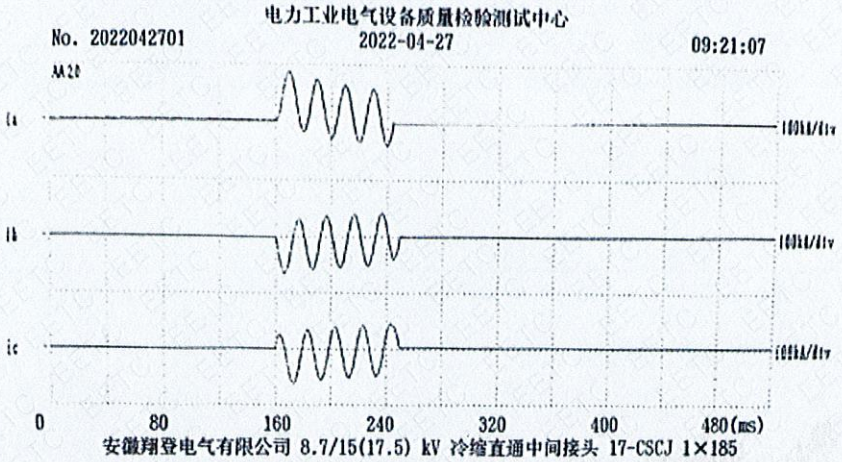
动、热 稳 定 试 验

示波图编号	试验电流峰值(kA)			动稳定通电时间(s)	试验电流周期分量有效值(kA)			热稳定通电时间(s)	热稳定值(AAs) 10E6		
	A	B	C		A	B	C		A	B	C
2022042702					23.82	24.10	24.16	2.04	1159	1186	1192

动、热 稳 定 试 验

示波图编号	试验电流峰值(kA)			动稳定通电时间(s)	试验电流周期分量有效值(kA)			热稳定通电时间(s)	热稳定值(AAs) 10E6		
	A	B	C		A	B	C		A	B	C
2022042703					24.25	23.91	24.10	2.04	1199	1165	1184

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



安徽翔登电气有限公司 8.7/15(17.5) kV 冷缩直通中间接头 17-CSCJ 1×185

动、热 稳 定 试 验

示波图编号	试验电流 峰值(kA)			动稳定通电时间(s)	试验电流周期分量 有效值(kA)			热稳定通电时间(s)	热稳定值 (AAs) 10E6		
	A	B	C		A	B	C		A	B	C
2022042701	84.95	64.67	63.31	0.087							

Appendix D Other Information

D.1 Sample packing list

CHARDON GROUP

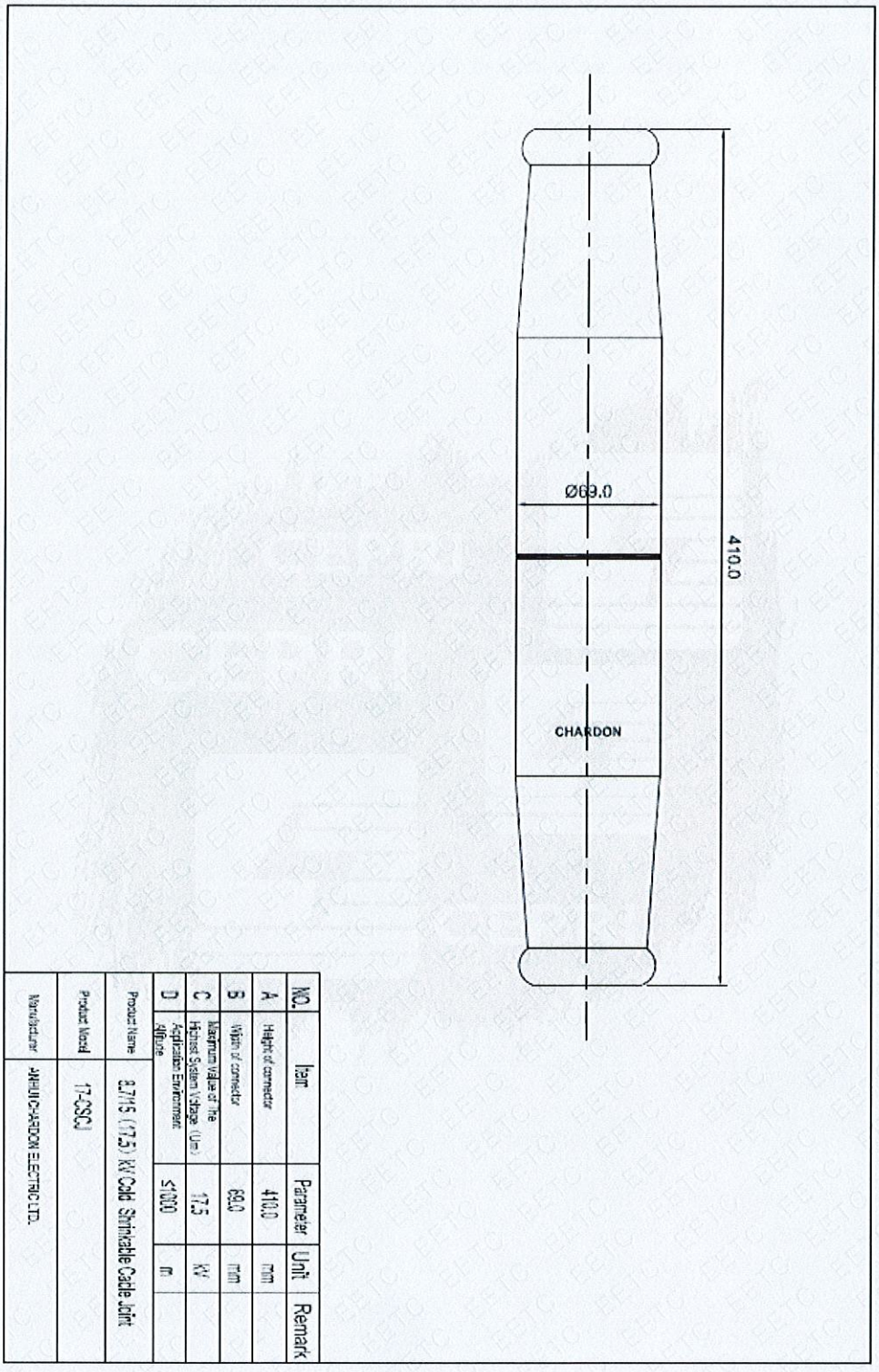
8.7/15 (17.5) kV Cold Shrink Cable Joint Packing List

No.	Product Name	QTY	Unit	Remark
1	Cold shrink Joint	1	PC	
2	Sealing tape	3	PCS	
3	Silicone lubricant	2	PCS	
4	Paper towel	6	PCS	
5	PVC tape	1	PC	
6	Sandpaper belt	2	PCS	
7	Gloves	1	Pair	
8	Constant-force spring	4	PCS	
9	Armor tape	2	PCS	
10	Shield net	1	PC	
11	Semi-conductive tape	1	PC	
12	Certificate of conformity	1	PC	
13	Installation Instructions	1	PC	
14	copper braid	2	PCS	
15	Packing List	1	PC	

D.2 Identification of test cable (specified in GB/T 12706.2－2020)

rated voltage $U_0/U(U_m)$		8.7/15(17.5)kV
construction	core	single-core
	construction of screen	single-phase screen
conductor	material	copper
	type	round compact stranded
	cross section	185 mm^2
	diameter	16.1 mm
insulation	material	XLPE
	thickness	4.5 mm
	diameter	26.9mm
screen	thickness of conductor screen	0.7 mm
	thickness of insulation screen	0.8 mm
	strippability of insulation screen	strippable
	diameter of insulation screen	28.5mm
	metallic screen	copper tape
armour		/
oversheath	material	PVC
	diameter	36.1mm
mark of cable		YJV-8.7/15 1×185

D.3 Main structure dimensions of the samples



NO.	Item	Parameter	Unit	Remark
A	Height of connector	410.0	mm	
B	Width of connector	69.0	mm	
C	Highest System Voltage (Um) Maximum Value of The	17.5	kV	
D	Application Environment Altitude	≤1000	m	
Product Name		8.7/15 (17.5) kV Cold Shrinkable Cable Joint		
Product Model		17-CSCJ		
Manufacturer		ANHUI CHARDON ELECTRIC LTD.		