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TESTING  
CNAS L0699



# TEST REPORT

CEPRI-EETC08-2020-1000 (E)

Client: Shenzhen Woer Heat-Shrinkable Material Co., Ltd.

Object: Pre-moulded straight joint for 64/110 kV XLPE cable

Type: WYJTI2 64/110 1×1600

Test Category: Type tests



INDUSTRY QUALITY INSPECTION AND TEST  
CENTER FOR ELECTRIC EQUIPMENT

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Test Report	Power Industry Quality Inspection and Test Center for Electric Equipment		CEPRI-EETC08-2020-1000(E) Total 11 Page 2
Client	Shenzhen Woer Heat-Shrinkable Material Co., Ltd.	Manufacturer	Shenzhen Woer Heat-Shrinkable Material Co., Ltd.
Object	Pre-moulded straight joint for 64/110 kV XLPE cable	Type	WYJTI2 64/110 1×1600
Sampling procedure	Taken by client self	Serial No.	EETC08-20/08/08-101
Test Category	Type tests	Date	2020.09.08~2020.10.14
Requirements	1. GB/T 11017.3—2014 Power cables with cross-linked polyethylene insulation and their accessories for rated voltage of 110 kV ( $U_m=126$ kV)—Part 3: Accessories 2. IEC 60840(Edition 5.0): 2020 Power cables with extruded insulation and their accessories for rated voltages above 30 kV ( $U_m=36$ kV) up to 150 kV ( $U_m=170$ kV) -Test methods and requirements		
Conclusion	The pre-moulded straight joint for 64/110 kV XLPE cable, the type and size of which is WYJTI2 64/110 1×1600 taken to test by the client's own self has successfully passed the type tests specified in GB/T 11017.3—2014 and IEC 60840(Edition 5.0): 2020.		
Note	In the event of any difference in meanings, the Chinese report shall take priority over the English version.		
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Approved by: 付超	付超	Date of issue:	2020-11-03

## Test Results

No.	Item	Requirements	Results	Evaluation
1	Partial discharge test at ambient temperature	No detectable discharge exceeding the sensitivity from the test assembly at 96 kV	No detectable discharge was found at 96 kV exceeding the sensitivity of 3.28 pC	Passed
2	Heating cycle voltage test	As per clause 1.2 of content in this report	Subjected to heating cycle voltage test, and heating cycle had been carried out 20 times	Passed
3	Partial discharge test at high temperature	No detectable discharge exceeding the sensitivity from the test assembly at 96 kV	No detectable discharge was found at 96 kV exceeding the sensitivity of 3.28 pC	Passed
4	Partial discharge test at ambient temperature	No detectable discharge exceeding the sensitivity from the test assembly at 96 kV	No detectable discharge was found at 96 kV exceeding the sensitivity of 3.28 pC	Passed
5	Lightning impulse voltage test	The assembly shall withstand without failure or flashover 10 positive and 10 negative voltage impulses of 550 kV	No breakdown occurred on the test assembly at 10 positive and 10 negative impulses of 550 kV	Passed
6	Power frequency voltage test after lightning impulse voltage test	The assembly shall be subjected to a power frequency voltage test at 160 kV for 15 min, and no breakdown of the insulation or flashover shall occurred	No breakdown occurred at 160 kV for 15 min	Passed
7	Examination	As per clause 1.4 of content in this report	No signs of deterioration on which could affect the sample in service operation was found	Passed

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**Content****1. Test methods****1.1 Partial discharge tests**

The tests were carried out at ambient temperature and high temperature in accordance with GB/T 3048.12 and IEC 60885-3, There shall be no detectable discharge exceeding the declared sensitivity from the test object at 96 kV. The background noise is no more than 1.64 pC during these tests.

The test voltage shall be raised gradually to and held at 112 kV for 10 s and then slowly reduced to 96 kV and the partial discharge tests were carried out at 96 kV. At high temperature the test shall be performed on the sample at a conductor temperature of (95~100) °C. The conductor temperature shall be maintained within the stated temperature limits for at least 2 h.

**1.2 Heating cycle voltage test**

According to GB/T 11017.3—2014 and IEC 60840(Edition 5.0): 2020, the test assembly shall be heated by conductor current until the cable conductor reaches a temperature of (95~100) °C. The heating shall be applied for at least 8 h. The conductor temperature shall be maintained within the stated temperature limits for at least 2 h of each heating period. This shall be followed by at least 16 h of natural cooling to a conductor temperature less than or equal to 30 °C or within 10 K of ambient temperature, whichever is the higher. The cycle of heating and cooling shall be carried out 20 times. During the whole of the test period a voltage of 128 kV shall be applied to the sample.

**1.3 Lightning impulse voltage test followed by a power frequency voltage test**

The assembly shall be heated by conductor current only, until the cable conductor reaches a steady temperature of (95~100) °C. The conductor temperature shall be maintained within the stated temperature limits for at least 2 h.

The lightning impulse voltage shall be applied according to the GB/T 3048.13. The assembly shall withstand without failure or flashover 10 positive and 10 negative voltage impulses of 550 kV. After the lightning impulse voltage test, the test assembly shall be subjected to a power frequency voltage test at 160 kV for 15 min. No breakdown of the insulation.

**1.4 Examination**

Examination of the accessories by dissection of a sample and, whenever possible, of the accessories by dismantling with normal or corrected vision without magnification shall reveal no signs of deterioration (e.g. electrical degradation, leakage, corrosion or harmful shrinkage) which could affect the system in service operation.

**2. Test data**

The values of lightning impulse voltages on the test assembly after heating cycle voltage test  
(at high temperature, 550 kV, ±3 % tolerance)

Ambient temperature: 25.0°C    Relative humidity: 61 %    Barometric pressure: 0.1012 MPa

unit: kV

Positive voltages	554	553	551	554	554	553	554	554	555	553
Negative voltages	555	549	552	553	555	553	552	554	553	553

## Appendix A Object Parameters

### A.1 Specification of sample

#### A.1.1 Sample state

The sample was manufactured in June, 2020, and was received on August 8, 2020 at Power Cable Quality Inspection Station of Power Industry Quality Inspection and Test Center for Electric Equipment, and it was in good condition without breakage.

#### A.1.2 Related information of sample

The material of connector is copper T<sub>2</sub>, the material used for pre-moulded unit is EPDM rubber, and the cable conductor is compacted with the connector by pressure.

#### A.1.3 Installation description

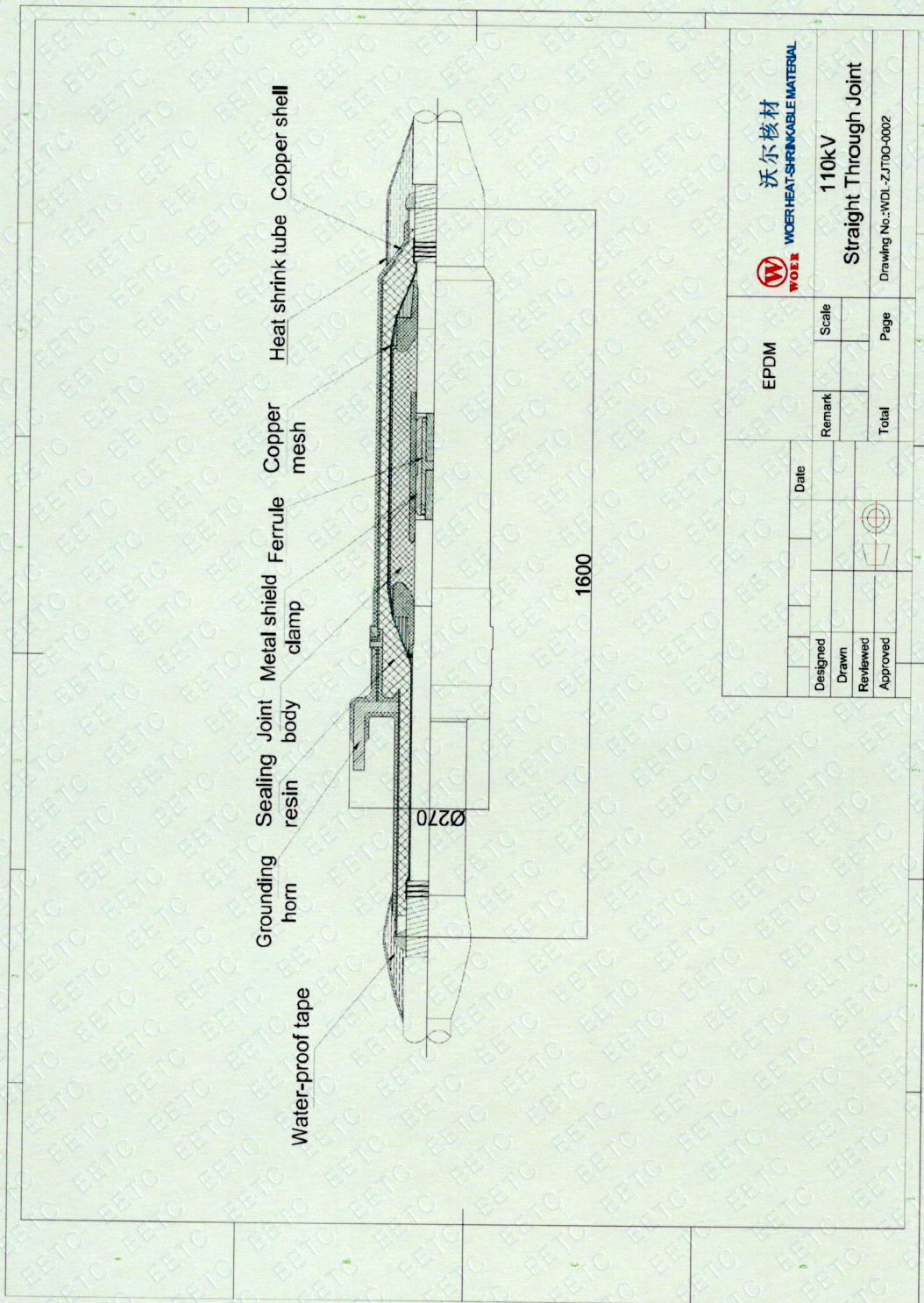
The sample to be tested has been installed by the manufacturer on a XLPE insulated single core cable with rated voltage 64/110 kV and having a cross-section of 1600 mm<sup>2</sup>, the type and size of cable is ZA-YJLW03-Z 64/110 1 × 1600.

### A.2 Photograph of sample



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A.3 The dimensions of main construction of the sample tested



## Appendix B The Main Test Devices

Sequ- ence	Name of the equipment and instruments Type/Size	Serial No.	Full-scale range	Uncertainty / Accuracy	Verification / Calibration authority	Term of validity
1	RSZ-800-6-50 Corona-free series-resonant test system	204488	(0~800) kV	—	—	—
2	KKF-800-5 Power frequency voltage divider	454485	(0~800) kV	Class 1	National Meterage Center of High Voltage and Heavy Current	2021.07.21
3	Digital partial discharge detectot	2013-023	(0.1~999) pC	10 %	National Meterage Center of High Voltage and Heavy Current	2020.11.04
4	CJDY-3000/600 Impulse voltage generator	01	(0~3000) kV	—	—	—
5	CJDY-3000 HV divider for impulse voltage divider measurement	001	(0~3000) kV	Class 1	National Meterage Center of High Voltage and Heavy Current	2021.07.07
6	HiAS1214 Digital impulse Voltage analysis system	20050512	(0~3000) kV	Class 3	National Meterage Center of High Voltage and Heavy Current	2021.05.20
7	272 Wet and dry bulb hygrometer	304	(0~50) °C	General	Hubei Meteorological Metrology Station	2021.10.11

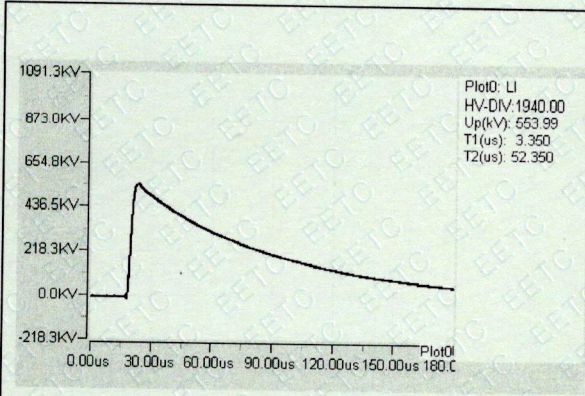


Appendix C Test Circuit Diagrams

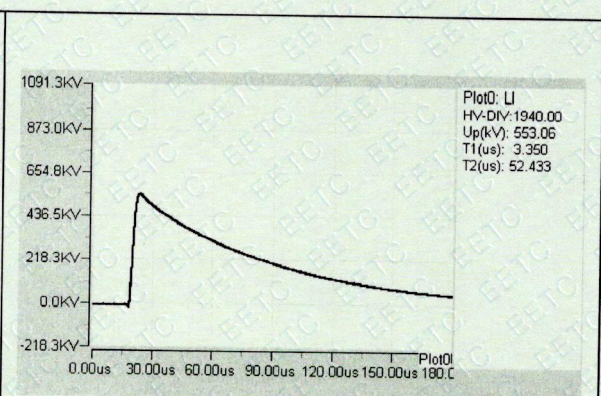


Appendix D Waveform

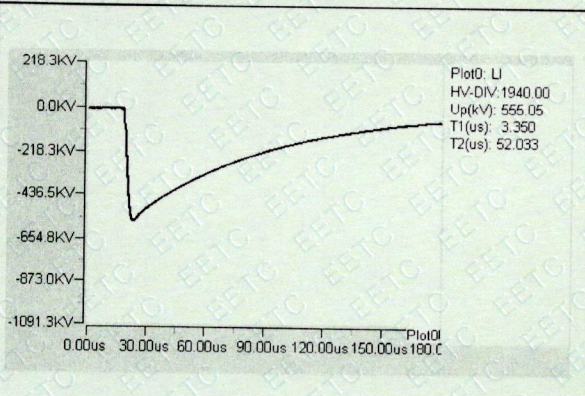
D.1 Oscillograms of the impulse voltages waveform



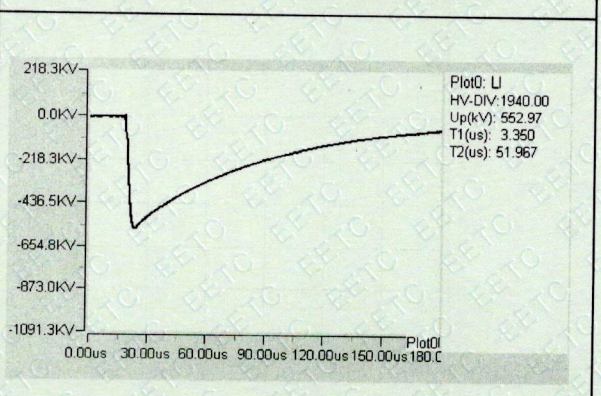
The 1<sup>st</sup> positive impulse waveform



The 10<sup>th</sup> positive impulse waveform



The 1<sup>st</sup> negative impulse waveform

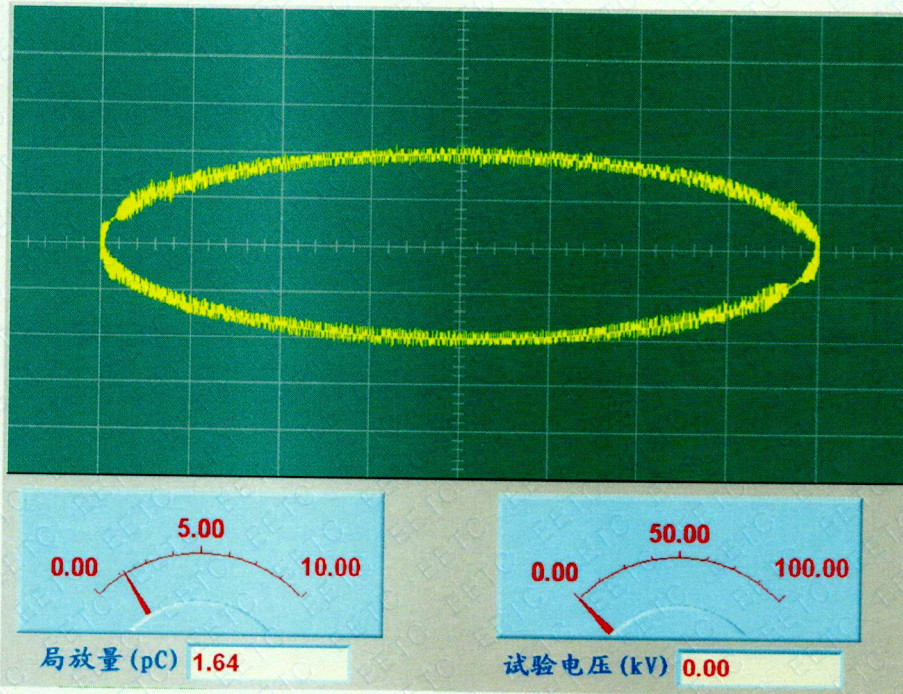


The 10<sup>th</sup> negative impulse waveform

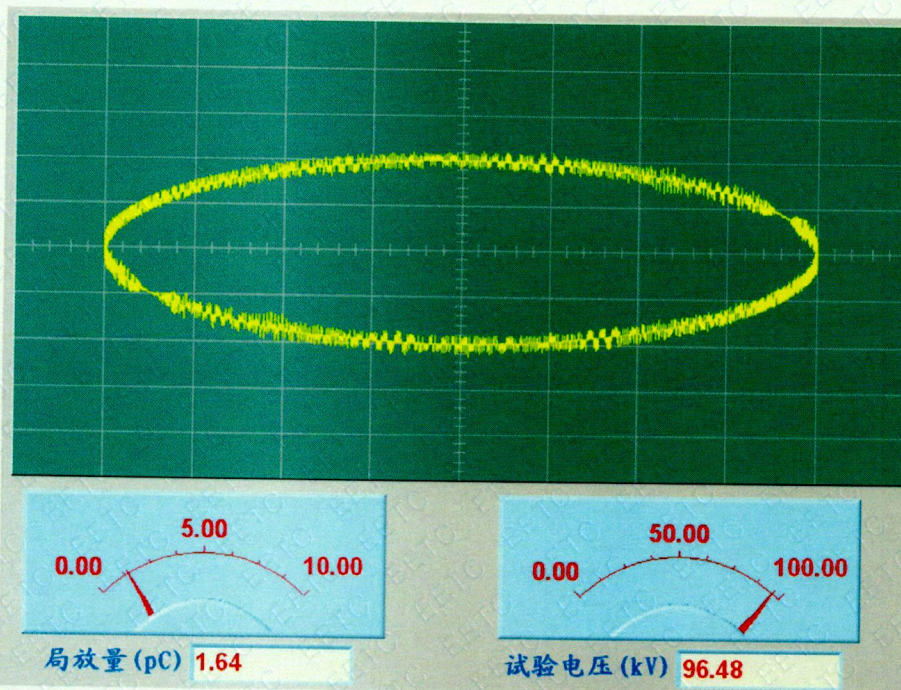
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### D.2 Oscillograms of partial discharges

#### D.2.1 The background noise during partial discharge tests



#### D.2.2 The oscillogram of partial discharges at 96 kV(After heating cycle voltage test at high temperature)



## Appendix E Identification of test cable

Rated voltage $U_0/U(U_m)$ kV		64/110 (126) kV
Construction	Core	Single core
Conductor	Material	Copper TR
	Construction	Milliken conductor
	Cross section	1600 mm <sup>2</sup>
	Diameter	48.4 mm
	Average thickness of conductor screen	2.2 mm
Insulation	Material	XLPE
	Average thickness	16.4 mm
	Diameter	83.9 mm
Screen	Average thickness of insulation screen	1.4 mm
	Diameter of insulation screen	86.7 mm
Cushion and longitudinal water impermeable barrier	Material	A layer of semi-conducting elastic water impermeable swell tape and a layer of semi-conducting water impermeable swell tape
Corrugated metallic sheath	Material	Aluminum
	Average thickness	2.4 mm
	Manufacturing technology of metallic sheath	Seam welded corrugated aluminum sheath
Oversheath	Material	PE
	Average thickness	5.4 mm
	Diameter	118.3 mm
Capacitance		262 pF/m
Outer diameter of complete cable		118.3 mm
Marking of cable		江苏中超电缆股份有限公司 ZA-YJLW03-Z 64/110 kV 1×1600 2020年7月 ZC2005A1701B