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TESTING
CNAS L0699



TEST REPORT

CEPRI-EETC08-2021-1092 (E)

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

Object: Dry GIS termination for 64/110 kV XLPE cable

Type: WYJZGG 64/110 1×1600

Test Category: Type tests

**POWER 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-EETC08-2021-1092(E) Total 11 Page 2
Client	Shenzhen Woer Heat - Shrinkable Material Co., Ltd.	Manufacturer	Shenzhen Woer Heat - Shrinkable Material Co., Ltd.
Object	Dry GIS termination for 64/110 kV XLPE cable	Type	WYJZGG 64/110 1×1600
Sampling procedure	Taken by client self	Serial No.	EETC08-21/09/06-008
Test Category	Type tests	Date	2021.09.20~2021.11.12
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 dry GIS termination for 64/110 kV XLPE cable, the type and size of which is WYJZGG 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.		
Tested by: 马文瀚	马文瀚	倪玉林	倪玉林
Checked by: 侯俊平	侯俊平	Verified by: 徐明忠	徐明忠
Approved by: 阎孟昆	阎孟昆	Date of issue: 2021-12-16	



Test Results

No.	Item	Requirements	Results	Evaluation
1	Pressure leak test	(250±10) kPa for 1 h , no leakage shall occur	(250±10) kPa for 1 h , no leakage occurred	Passed
2	Vacuum leak test	As per clause 1.2 of content in this report	The increased value of vacuum pressure did not exceed 10 kPa	Passed
3	Partial discharge test at ambient temperature	No detectable discharge exceeding the sensitivity from the test object at 96 kV	No detectable discharge was found at 96 kV exceeding the sensitivity of 3.28 pC	Passed
4	Heating cycle voltage test	As per clause 1.4 of content in this report	Subjected to heating cycle voltage test, and heating cycle had been carried out 20 times	Passed
5	Partial discharge test at high temperature	No detectable discharge exceeding the sensitivity from the test object at 96 kV	No detectable discharge was found at 96 kV exceeding the sensitivity of 3.28 pC	Passed
6	Partial discharge test at ambient temperature	No detectable discharge exceeding the sensitivity from the test object at 96 kV	No detectable discharge was found at 96 kV exceeding the sensitivity of 3.28 pC	Passed
7	Lightning impulse voltage test	The test assembly shall withstand without failure 10 positive and 10 negative voltage impulses of 550 kV	No breakdown occurred at 10 positive and 10 negative voltage impulses of 550 kV	Passed
8	Power frequency voltage test after lightning impulse voltage test	The test assembly shall be subjected to a power frequency voltage test at 160 kV for 15 min, and no breakdown of the insulation shall occurred	No breakdown occurred at 160 kV for 15 min	Passed
9	Examination	As per clause 1.6 of content in this report	No signs of deterioration which could affect the system in service operation was found	Passed



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Content

1. Test methods**1.1 Pressure leak test**

After the sample was installed, the sample shall be filled to a pressure of (250±10) kPa and maintained for 1 h at ambient temperature, no gas leakage shall occur at the sealed surface.

1.2 Vacuum leak test

After the sample was installed, the sample at environment temperature vacuum to the residual pressure is 10 kPa and maintained for 1 h. At the end of the test, the increased value of vacuum pressure shall not exceed 10 kPa.

1.3 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.

1.4 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 with in 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.

1.5 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.

1.6 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: 32.0 °C Relative humidity: 53 % Barometric pressure: 0.1012 MPa

unit: kV

Positive voltages	553	550	553	554	553	549	552	547	552	552
Negative voltages	551	547	547	550	551	554	556	550	553	549



Appendix A Object Parameters

A.1 Specification of sample

A.1.1 Sample state

The sample was manufactured in August, 2021, and was received on September 06, 2021 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 T₂, the material used for stress relief cone is EPDM, 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 mm², the type and size of cable is ZC-YJLW03-Z 64/110 1×1600.

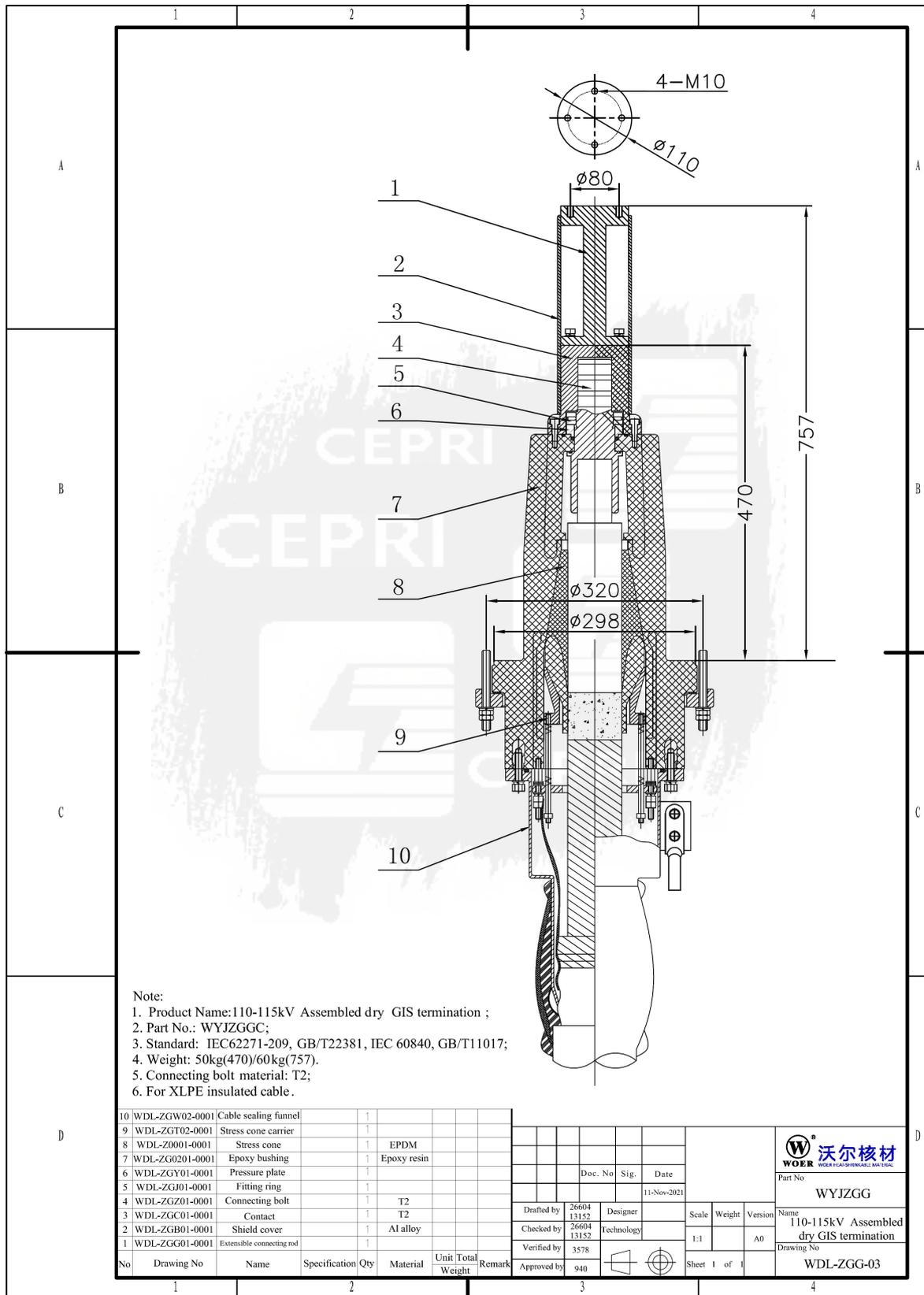
A.2 Photograph of sample



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



Appendix B The Main Test Devices

Sequence	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	EETC08-9011	(0~800) kV	—	—	—
2	KKF-800-5 Power frequency voltage divider	EETC08-0024	(0~800) kV	Class 1	National Meterage Center of High Voltage and Heavy Current	2022.07.20
3	Digital partial discharge detectot	EETC08-0051	(0.1~999) pC	10 %	National Meterage Center of High Voltage and Heavy Current	2021.12.06
4	CJDY-3000/600 Impulse voltage generator	EETC08-0218	(0~3000) kV	—	—	—
5	CJDY-3000 HV divider for impulse voltage divider measurement	EETC08-0027	(0~3000) kV	Class 1	National Meterage Center of High Voltage and Heavy Current	2022.07.04
6	HiAS1214 Digital impulse Voltage analysis system	EETC08-0028	(0~3000) kV	Class 3	National Meterage Center of High Voltage and Heavy Current	2022.07.18
7	Digital temperature and humidity atmospheric pressure gauge	EETC08-0174	(0~50) °C	General	Hubei Meteorological Metrology Station	2022.04.11



Appendix C Test Circuit Diagrams



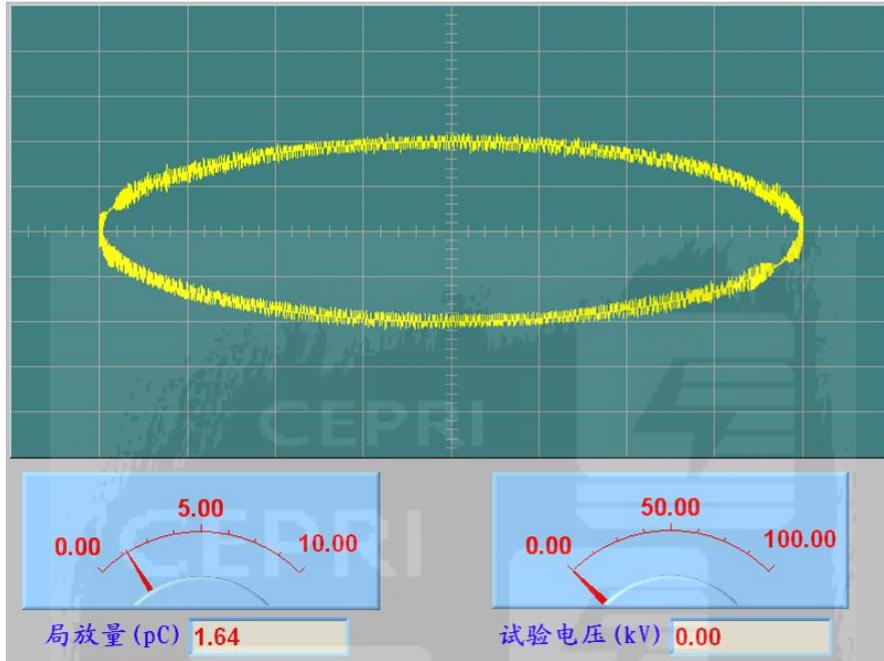
高压试验
专用
检测



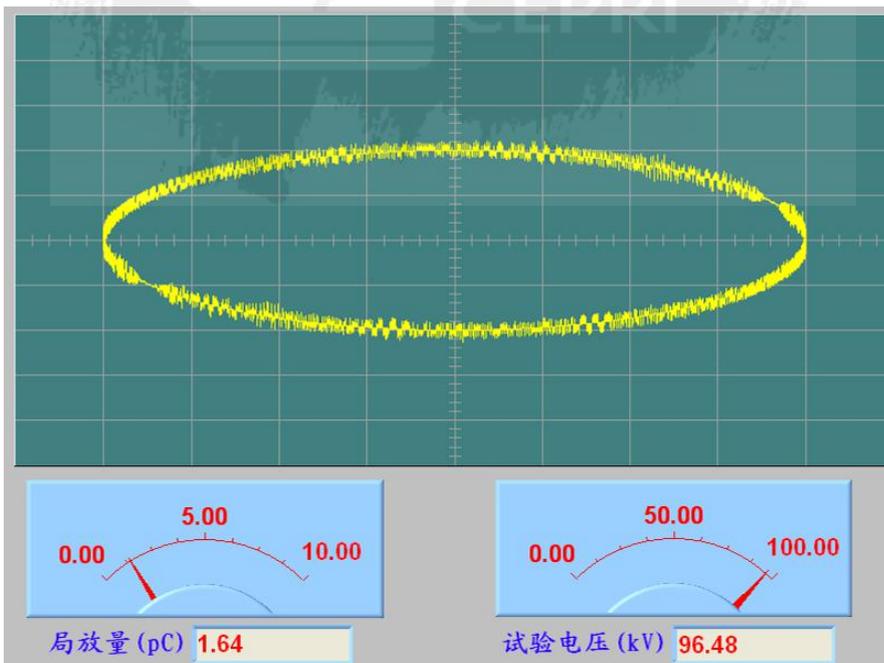
Appendix D Waveform

D.1 Oscillograms of partial discharges

D.1.1 The background noise during partial discharge tests



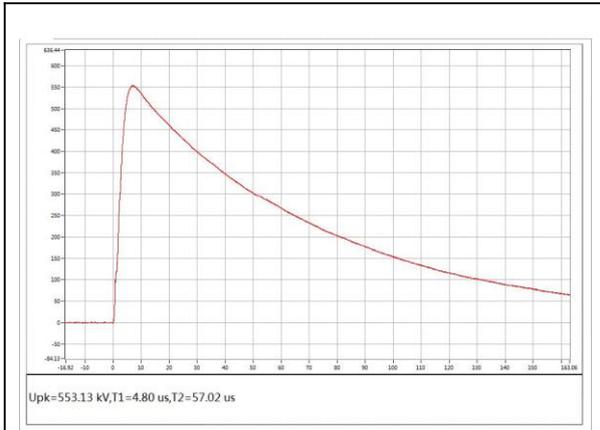
D.1.2 The oscillogram of partial discharges at 96 kV(After heating cycle voltage test at high temperature)



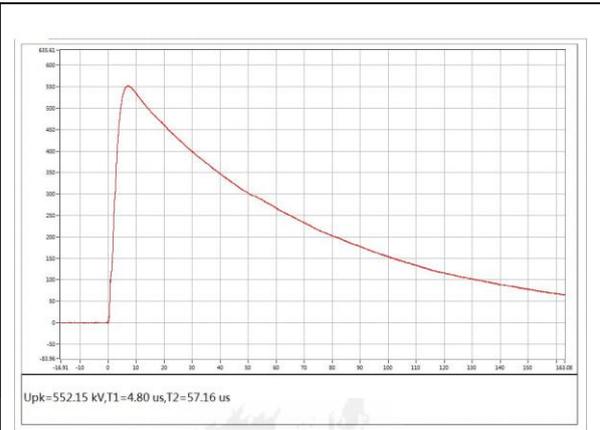
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D.2 Oscillograms of the lightning impulse voltages waveform



The 1st positive impulse waveform



The 10th positive impulse waveform



The 1st negative impulse waveform



The 10th negative impulse waveform

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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 ²
	Diameter	49.9 mm
	Average thickness of conductor screen	1.6 mm
Insulation	Material	XLPE
	Average thickness	15.9 mm
	Diameter	86.0 mm
Screen	Average thickness of insulation screen	1.0 mm
	Diameter of insulation screen	88.0 mm
Cushion and longitudinal water impermeable barrier	Material	Two layers of semi-conducting elastic water impermeable swell tape
Corrugated metallic sheath	Material	Aluminum
	Average thickness	2.5 mm
	Manufacturing technology of metallic sheath	Seam welded corrugated aluminum sheath
Oversheath	Material	PE
	Average thickness	6.7 mm
	Diameter	120.8 mm
Capacitance		261 pF/m
Outer diameter of complete cable		120.8 mm

