KEMA

Report.

TDT 3140-10

Type test on 15 kV straight joint for XLPE insulated cable

Manufacturer
Shenzhen Woer Heat-Shrinkable Material Co., Ltd.
Shenzhen, Guangdong, China

Arnhem, 30 September 2010

I N S P E C T I O N R E P O R T

Report number	TDT 3140-10
Client	Shenzhen Woer Heat-Shrinkable Material Co., Ltd. Woer Mansion North Lanjing Road Great Industrial Area Shenzhen, Guangdong, China
Reference	Agreement 70048112-TDT 10-75004A
Concerning	Type test
Date	22 June 2010 until 21 July 2010
Location of tests	Inspection and Test Center of State Grid Electric Power Research Institute (SGEPRI) Wuhan, China
Objects	15 kV straight joint for XLPE insulated cable
Manufacturer	Shenzhen Woer Heat-Shrinkable Material Co., Ltd. Shenzhen, Guangdong, China

REQUIREMENTS
The requirements as mentioned in the standard IEC 60502-4 (2005).

TEST PROGRAMME
The programme was specified by the client.
For the programme reference is made to page 6.

SUMMARY AND CONCLUSION
The test results obtained relate only to the work ordered and to the material tested.
For the test programme listed in page 6, the tests were passed successfully.

KEMA Nederland B.V.

Author Gu Bin

P.G.A. Bus
KEMA T&D Testing Services
Managing Director

This report consists of:
37 pages incl. 11 annexes (21 pages)

Arnhem, 30 September 2010

MATERIAL DATA

A STRAIGHT JOINT

Manufacturer	Shenzhen Woer Heat-Shrinkable Material Co., Ltd.
Type	8,7/15 kV RSJY -3/3
Meanings of the type code	RS: heat shrinkable (Re Suo in Chinese) J: joint Y: XLPE cable 1st 3: 3 cores 2nd 3: suitable for cross-sections 150, 180 and 240 mm^2
Manufacturing date	100525(YYMMDD)
Manufacturing code	100525(YYMMDD)

Ratings assigned by the manufacturer

Rated voltages $U_o/U/U_m$	8,7/15/17,5 kV
Rated frequency	50 Hz
Rated current	As per the cable
Rated minimum and maximum cable conductor cross-section	150 to 240 mm^2
Material and shape of cable conductor	Copper and round
Insulating material	EVA & PE
Minimum and maximum cable insulation diameters	24 to 31 mm
AC 5 minute withstand voltage level (dry)	39 kV
Impulse withstand voltage level	95 kV
Partial discharge level	≤ 10 pC at 15 kV

Construction details

Drawing number	2010052001 01
Date	20 May 2010
Revision number	2
Installation instructions code	2010052001
Date	20 May 2010
Revision number	2

B OUTDOOR TERMINATION

Manufacturer	Shenzhen Woer Heat-Shrinkable Material Co., Ltd.
Type	8,7/15 kV RSWY -3/3
Meanings of the type code	RS: heat shrinkable (Re Suo in Chinese) W: outdoor termination Y: XLPE cable 1st 3: 3 cores 2nd 3: suitable for cross-sections 150, 180 and 240 mm^2

Ratings assigned by the manufacturer

Rated voltages $U_o/U/U_m$	8,7/15/17,5 kV
Rated frequency	50 Hz

The outdoor terminations are not part of the type test.

For the type test of this type of outdoor termination reference is made to KEMA inspection report no. TDT 3149-10

C EXTRUDED SOLID DIELECTRIC INSULATED POWER CABLE

The cable is not part of the type test.

General

Rated voltages $U_o/U/U_m$	8,7/15/17,5 kV
Rated frequency	50 Hz
Maximum rated conductor temperature	90 °C
Cross-section	185 mm^2
Number of cores	3
Diameter of the cable	66,9 mm
Diameter over the core	27,8 mm

Conductor

Nominal cross-section of the conductor	185 mm^2
Conductor material	Copper
Diameter on conductor	16,5 mm
Max. continuous conductor temperature	90 °C

Conductor screen

Thickness of semi-conducting conductor screen	0,6 mm

Insulation

Insulating material	XLPE
Nominal thickness of the insulation	4,5 mm

Core screen

Thickness of semi-conducting core screen	0,6 mm

Metallic sheath

Material	Copper tape
Nominal layer x thickness x width	1 x 0,1 mm x 40 mm

Outer sheath

Sheath material	PVC
Nominal thickness of the sheath	3,1 mm
Colour of the sheath	Black

The manufacturer has guaranteed that the objects submitted to the tests have been manufactured in accordance with the technical data represented before.
The manufacturer is responsible for the correctness of these data.
For pictures of the straight joint during the type tests reference is made to annex H and I.
For the drawing and installation instructions of the straight joint reference is made to annex J and K.

TEST PROGRAMME

		IEC 60502-4 Table 5 Clause
0	INSPECTION OF THE TEST SET-UP	
1	TYPE TESTS ACCORDING TEST SEQUENCE 2.1 ON TWO TEST INSTALLATIONS CONSISTING OF: ± 8 METER OF 8,7/15/17,5 kV 3x185 MM^2 XLPE CABLE, TWO THREE-CORE OUTDOOR TERMINATIONS AND ONE STRAIGHT JOINT	
1.1	AC withstand voltage test	1
1.2	Partial discharge test at ambient temperature	2
1.3	Impulse voltage test at high temperature	3
1.4	Heating cycle voltage test in air (30 cycles)	4
1.5	Heating cycle voltage test under water (30 cycles)	5
1.6	Partial discharge test at high and ambient temperature	6
1.7	Impulse voltage test at ambient temperature	10
1.8	AC withstand voltage test (15 min at 2,5 U_0)	11
1.9	Examination	12
2	TYPE TESTS ACCORDING TEST SEQUENCE 2.3 ON A TEST INSTALLATION CONSISTING OF: ± 8 METER OF 8,7/15/17,5 kV 3x185 MM^2 XLPE CABLE, TWO THREE-CORE OUTDOOR TERMINATIONS AND ONE STRAIGHT JOINT	
2.1	AC withstand voltage test	1
2.2	Thermal short-circuit test on the conductor	8
2.3	Dynamic short-circuit test	9
2.4	Impulse test at ambient temperature	10
2.5	AC withstand voltage test (15 min at 2,5 U_0)	11
2.6	Examination	12
3	IDENTIFICATION OF THE CABLE USED FOR THE TYPE TEST	
3.1	Check of the cable construction	Clause 6.1.1

PERSONS ATTENDING THE TESTS

Mr. Miao Fugui	Inspection and Test Center of State Grid Electric Power Research Institute (SGEPRI), Wuhan, China
Mr. Han Weijing	Inspection and Test Center of State Grid Electric Power Research Institute (SGEPRI), Wuhan, China
Mr. Kang Shufeng	Shenzhen Woer Heat-Shrinkable Material Co., Ltd.
Mr. Gao Chenghua	Shenzhen Woer Heat-Shrinkable Material Co., Ltd.
Mr. Hu Xifu	Shenzhen Woer Heat-Shrinkable Material Co., Ltd.

THE INSPECTION WAS CARRIED OUT BY

Mr. Gu Bin	KEMA Nederland B.V.

PURPOSE OF THE TESTS

Purpose of the tests was to verify whether the material complies with the specified requirements.

DESCRIPTION OF THE TESTS

0 INSPECTION OF THE TEST SET-UP

The tests were carried out in the laboratory of Inspection and Test Center of State Grid Electric Power Research Institute (SGEPRI), Wuhan, China. This laboratory is therefore jointly responsible for the correctness of the results obtained. The measuring devices and the test set-up were checked by KEMA and where necessary calibrated.

Result

The inspection did not give rise to remarks.

1 TYPE TESTS ACCORDING TEST SEQUENCE 2.1 ON TWO TEST INSTALLATIONS CONSISTING OF: ± 8 METER OF 8,7/15/17,5 KV 3X185 MM^2 XLPE CABLE, TWO THREE-CORE OUTOOR TERMINATIONS AND ONE STRAIGHT JOINT

1.1 AC withstand voltage test in accordance with IEC 60502-4, table 5 clause 1

The voltage test was carried out with an AC voltage of 50 Hz. The test was performed in accordance with IEC 61442, clause 4.
The test installation was tested with a voltage of at least 4,5 U_o (39 kV) during 5 minutes in accordance with the specification.
Both the test set-ups were tested parallel.

Result

The test was completed successfully.

1.2 Partial discharge test at ambient temperature in accordance with IEC 60502-4, table 5 clause 2

After the AC withstand voltage test as described under 1.1 the test installation was examined for partial discharges in accordance with IEC 61442, clause 7. The sensitivity of the measuring circuit was checked with a calibrator, the noise level detected was <1 pC. The voltage was first set to 2 U_o (17,4 kV) for 10 s and then lowered to 1,73 U_o (15 kV). At 1,73 U_o (15 kV) the partial discharges were measured.
The results are stated in annex A.

Result

The test was completed successfully.

1.3 Impulse voltage test at high temperature in accordance with IEC 60502-4, table 5 clause 3

After the above-mentioned tests the test installation was tested with an impulse voltage.
The test was performed in accordance with IEC 61442, clause 6.
During the test the cable was heated by a current through the conductor until a conductor temperature of at least 95 °C (5 °C to 10 °C above the maximum cable conductor temperature in normal operation) was reached. This temperature was maintained for at least two hours. The test set-up was tested with 10 positive and 10 negative impulses of 95 kV.
Both the test set-ups were tested parallel.
The oscillograms of the test are stated in annex B.
For a picture of the complete test set-up reference is made to annex H.

Result

The test was completed successfully.

1.4 Heating cycle voltage test in air (30 cycles) in accordance with IEC 60502-4, table 5 clause 4

The test was performed in accordance with IEC 61442 clause 9.1 and 9.2.
The test set-up was subjected to at least 30 heating cycles in air.
Each heating cycle consisted of 8 hours heating followed by at least 3 hours of natural cooling. During the last 2 hours of each heating period, the conductor reached a temperature of at least 95 °C (5 °C above the maximum rated conductor temperature).
During this test the set-up was subjected to an AC voltage test of 2,5 U_o (23 kV) at 50 Hz.

Result

The test was completed successfully.

1.5 Heating cycle voltage test under water (30 cycles) in accordance with IEC 60502-4, table 5 clause 5

The test was performed in accordance with IEC 61442, clause 9.1 and 9.3.
After the 30 cycles in air the joint was put under water. The test set-up was subjected to at least 30 heating cycles in water. The water height was at least 1 meter above the top surface. Each heating cycle consisted of 8 hours heating followed by at least 3 hours of natural cooling. During the last 2 hours of each heating period, the conductor reached a temperature of at least 95 °C (5 °C above the maximum rated conductor temperature).
During this test the set-up was subjected to an AC voltage test of 2,5 U_o (23 kV) at 50 Hz.
For a picture of the complete test set-up reference is made to annex H.

Result

The test was completed successfully.

1.6 Partial discharge test at high and ambient temperature in accordance with IEC 60502-4, table 5 clause 6

After the above-mentioned tests the test installation was examined for partial discharges in accordance with IEC 61442, clause 7.
Before the test the cable was heated by a current through the conductor until a conductor temperature of at least 95 °C (5 °C to 10 °C above the maximum cable conductor temperature in normal operation) was reached. The sensitivity of the measuring circuit was checked with a calibrator, the noise level detected was 2 pC at high temperature and 2,5 pC at ambient temperature. The voltage was first set to 2 U_o (17,4 kV) for 10 s and then lowered to 1,73 U_o (15 kV). At 1,73 U_o (15 kV) the partial discharges were measured. After this measurement the connectors were allowed to cool to the ambient temperature. At this temperature the partial discharges were measured again.
The results are stated in annex A.

Result

The test was completed successfully.

1.7 Impulse voltage test at ambient temperature in accordance with IEC 60502-4, table 5 clause 10

After the above-mentioned tests the test set-up was tested with an impulse voltage.
During this test both the test set-ups were at ambient temperature. The test was performed in accordance with IEC 61442, clause 6.
The test set-up was tested with 10 positive and 10 negative impulses of 95 kV.
Both the test set-ups were tested parallel.
The oscillograms of the test are stated in annex C.

Result

The test was completed successfully.

1.8 AC withstand voltage test in accordance with IEC 60502-4, table 5 clause 11

The voltage test was carried out with an AC voltage of 50 Hz. The test was performed in accordance with IEC 61442, clause 4.
The test installation was tested with a voltage of at least 2,5 U_o (23 kV) during 15 minutes in accordance with the specification.
Both the test set-ups were tested parallel.

Result

The test was completed successfully.

1.9 Examination in accordance with IEC 60502-4, table 5 clause 12

Upon completion of all tests the test set-up was dismantled.
The joints were generally checked, the dimensions were compared with the drawings.
For pictures of the dismantling reference is made to annex H.

Result

The dimensions complied with the drawing.
No cracks, corrosion or electrical degradation were detected. Also the stress cones did not show electrical degradation.

2 TYPE TESTS ACCORDING TEST SEQUENCE 2.3 ON A TEST INSTALLATION CONSISTING OF: ± 8 METER OF 8,7/15/17,5 kV 3X185 MM^2 XLPE CABLE, TWO THREE-CORE OUTDOOR TERMINATIONS AND ONE STRAIGHT JOINT

2.1 AC withstand voltage test in accordance with IEC 60502-4, table 5 clause 1

The voltage test was carried out with an AC voltage of 50 Hz. The test was performed in accordance with IEC 61442, clause 4.
The test installation was tested with a voltage of at least 4,5 U_o (39 kV) during 5 minutes in accordance with the specification.

Result

The test was completed successfully.

2.2 Thermal short-circuit test on the conductor in accordance with IEC 60502-4, table 5 clause 8

After the above-mentioned test the test set-up was tested with a thermal short-circuit test on the conductor. The test was performed in accordance with IEC 61442, clause 11.

Three ends of the cable were connected to a short-circuit generator. The other three ends of the cable were connected to a short-circuiting bar. The test was performed at ambient temperature. Two short-circuits were applied using AC current to raise the conductor temperature to the maximum permissible short-circuit temperature of the cable within 5 seconds. Between the two short-circuits, the test loop was allowed to cool 5 °C to 10 °C above ambient temperature prior to the second short-circuit. The short-circuit current applied met the appropriate values of time and current as described in the standard.
The results are listed in annex D.
For a picture of the test set-up reference is made to annex I.

Result

No visible deterioration occurred on the parts at 23 kA for 2 seconds. The test was completed successfully.

2.3 Dynamic short-circuit test in accordance with IEC 60502-4, table 5 clause 9

After the above-mentioned test the test set-up was tested with a dynamic short-circuit test. The test was performed in accordance with IEC 61442, clause 12. The test was performed at ambient temperature. The short-circuit current applied met the appropriate values of time and current as described in the standard.
The results are listed in annex E.
For a picture of the test set-up reference is made to annex I.

Result

No visible deterioration occurred on the parts at 81,4 kA for 50 msec. The test was completed successfully.

2.4 Impulse voltage test at ambient temperature in accordance with IEC 60502-4, table 5 clause 10

After the above-mentioned tests the test set-up was tested with an impulse voltage at ambient temperature. The test was performed in accordance with IEC 61442, clause 6.
The test set-up was tested with 10 positive and 10 negative impulses of 95 kV.
The oscillograms of the test are stated in annex F.

Result

The test was completed successfully.

2.5 AC withstand voltage test in accordance with IEC 60502-4, table 5 clause 11

The voltage test was carried out with an AC voltage of 50 Hz. The test was performed in accordance with IEC 61442, clause 4.
The test installation was tested with a voltage of at least 2,5 U_o (23 kV) during 15 minutes in accordance with the specification.

Result

The test was completed successfully.

2.6 Examination in accordance with IEC 60502-4, table 5 clause 12

Upon completion of all tests the test set-up was dismantled.
The joints were checked on electrical degradation, cracks, corrosion and water ingress. The dimensions were compared with the drawings.
For pictures of the dismantling reference is made to annex I.

Result

The dimensions complied with the drawing.
No cracks, corrosion or water ingress were detected. Also the stress cones did not show electrical degradation.

3 INDENTIFICATION OF THE CABLE USED FOR THE TYPE TEST

3.1 Check of the cable construction in accordance with IEC 60502-4, clause 6.1.1

At a cable sample of approximately 0,5 m the dimensions were measured and the materials were identified in accordance with annex A of IEC 60502-4.
The results are stated in annex G.

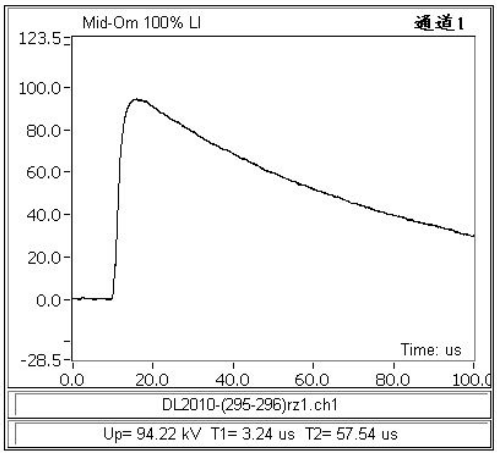
Result

The construction, dimensions and materials of the cable did not give rise to remarks.

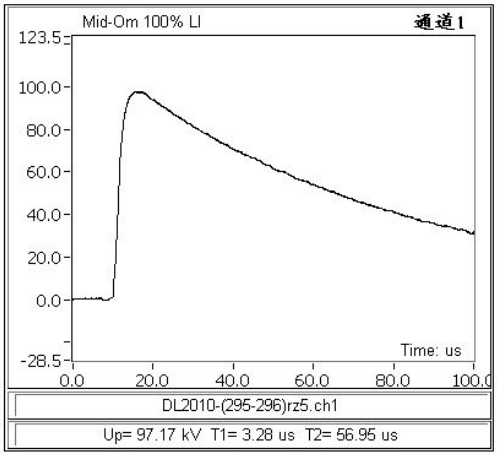
ANNEX A RESULTS OF THE ELECTRICAL TESTS

		Results			Requirements
		Core			
		Red	Yellow	Green	
Partial discharges at 1,73 U_o					
After AC withstand voltage test	pC	< 1	< 1	< 1	≤ 10
After heating cycle voltage test under water at high temperature	pC	< 2,5	< 2,5	< 3	≤ 10
After heating cycle voltage test under water at ambient temperature	pC	< 4,5	< 5,5	< 3	≤ 10
Heating cycle voltage test in air					
Number of cycles	#		30		≥ 30
Number of hours	#		240		≥ 240
Heating cycle voltage test under water					
Number of cycles	#		30		≥ 30
Number of hours	#		240		≥ 240

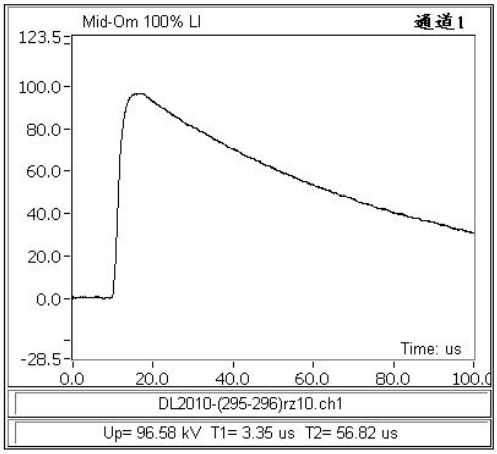
ANNEX B RESULTS OF THE IMPULSE VOLTAGE TEST AT HIGH TEMPERATURE (§ 1.3)



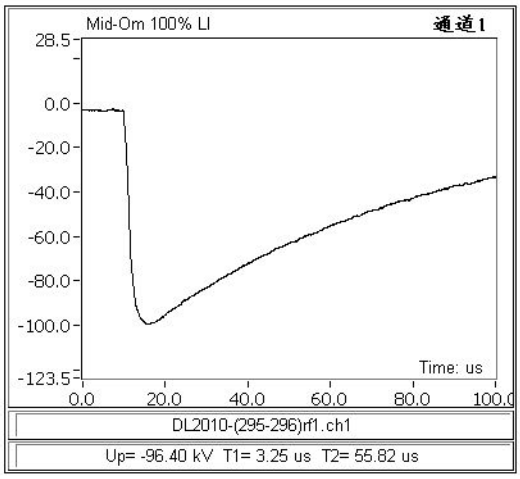
1st positive impulse 95 kV



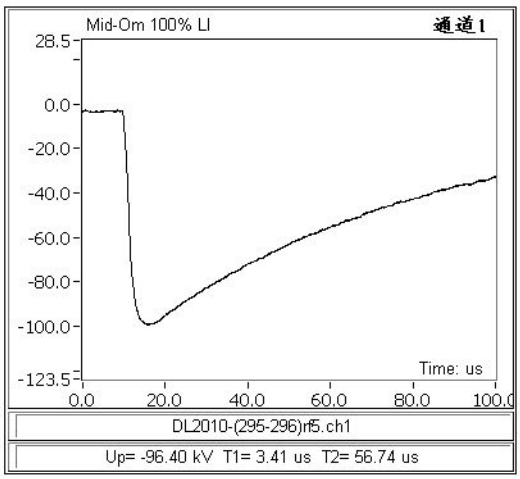
5th positive impulse 95 kV



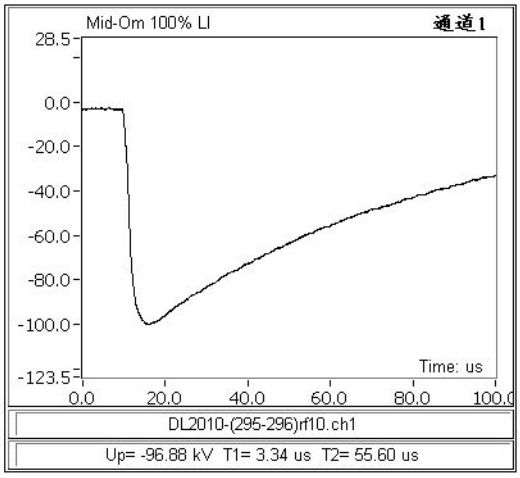
10th positive impulse 95 kV



1st negative impulse 95 kV

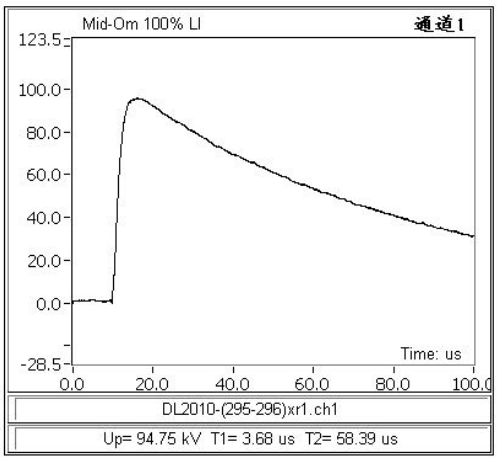


5th negative impulse 95 kV

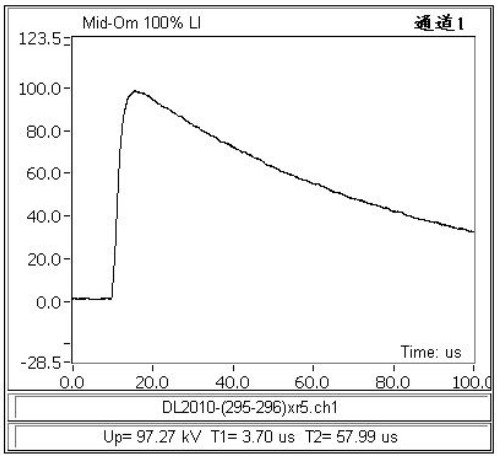


10th negative impulse 95 kV

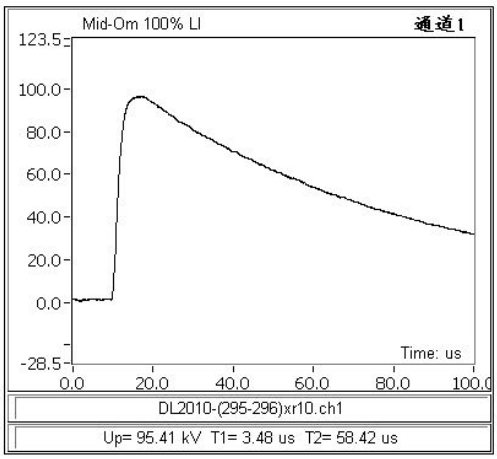
ANNEX C RESULTS OF THE IMPULSE VOLTAGE TEST AT AMBIENT TEMPERATURE (§ 1.7)



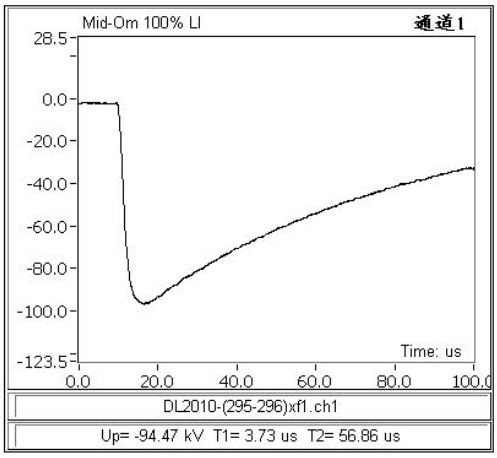
1st positive impulse 95 kV



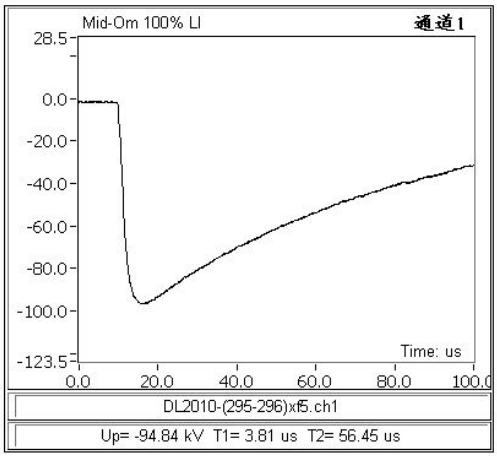
5th positive impulse 95 kV



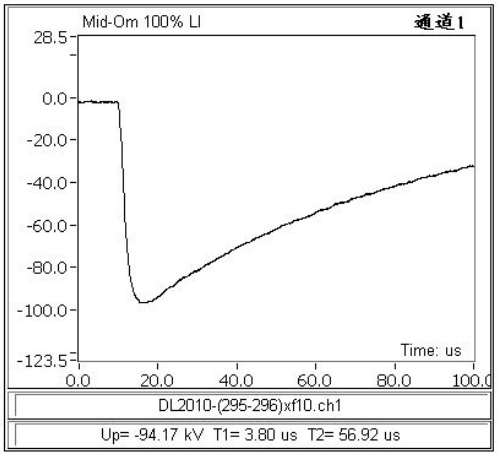
10th positive impulse 95 kV



1st negative impulse 95 kV

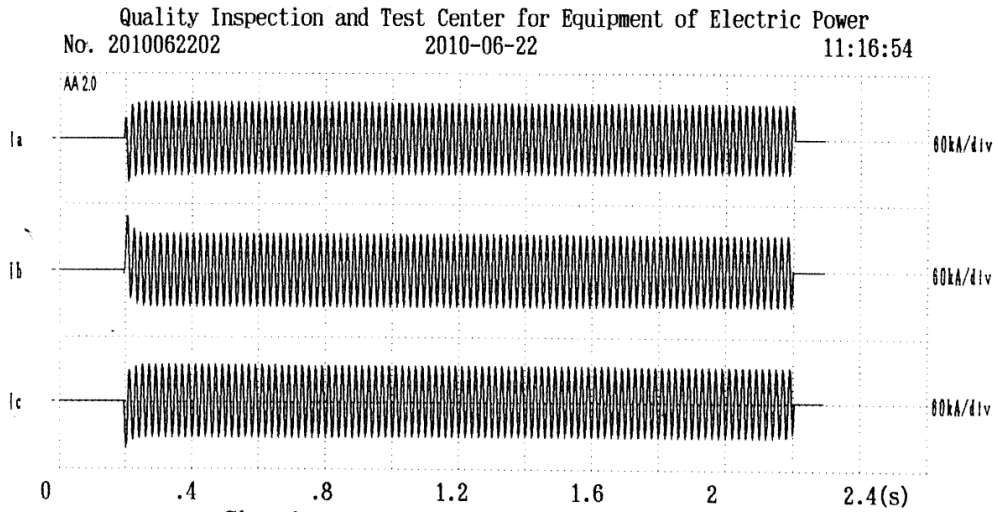


5th negative impulse 95 kV



10th negative impulse 95 kV

ANNEX D RESULT OF THE 1ST THERMAL SHORT-CIRCUIT TEST ON THE CONDUCTOR



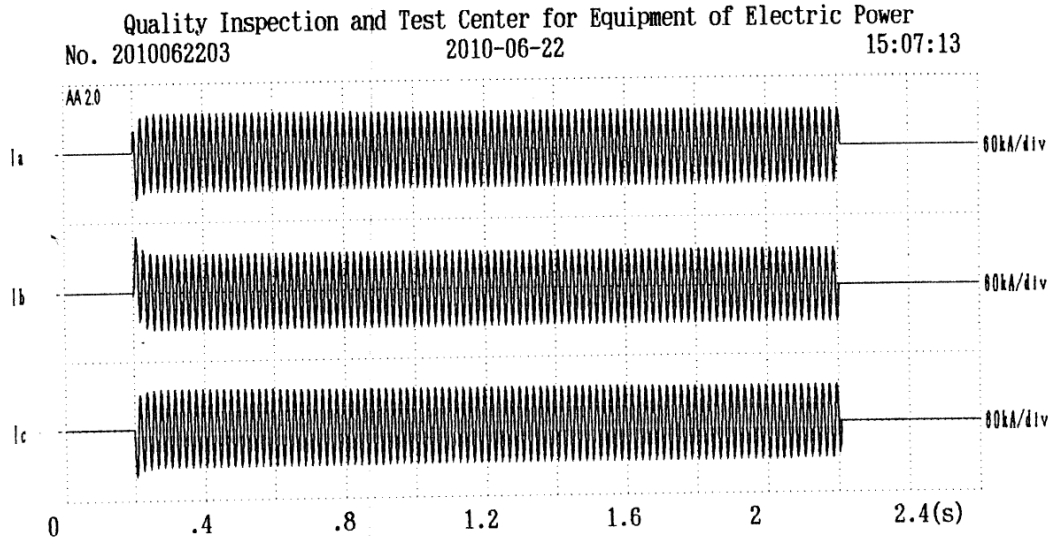
Shenzhen Woer Heat-Shrinkable Material Co., Ltd

8.7/15kV XLPE cable heat shrinkable straight joint 8.7/15 RSJY-3/3 3×185

Oscillogram No.	Peak Amplitude of Test current (kA)			Duration of Peak Withstand Current Test (s)	RMS of Test Current Cycle Component (kA)			Duration of Short-time Withstand Current Test (s)	I^2t (10^6AAs)		
	A	B	C		A	B	C		A	B	C
2010062202					23.11	23.09	23.11	2.01	1073	1071	1072

检测: 金建华 黄志斌

Result of the 2nd thermal short-circuit test on the conductor

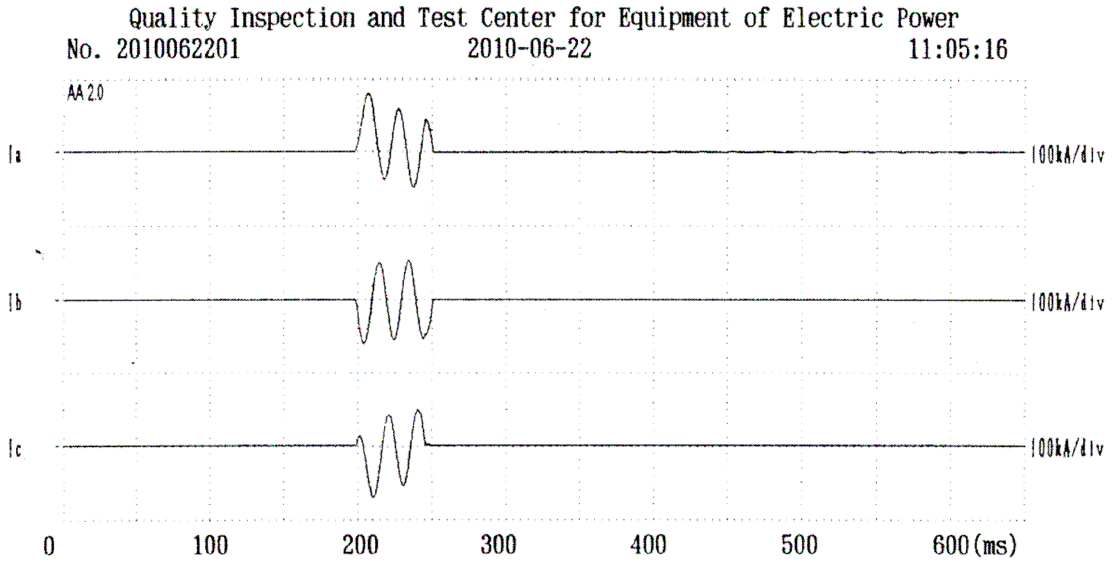


Shenzhen Woer Heat-Shrinkable Material Co., Ltd
8.7/15kV XLPE cable heat shrinkable straight joint 8.7/15 RSJY-3/3 3×185

Oscillogram No.	Peak Amplitude of Test current (kA)			Duration of Peak Withstand Current Test (s)	RMS of Test Current Cycle Component (kA)			Duration of Short-time Withstand Current Test (s)	I^2t (10^6AAs)		
	A	B	C		A	B	C		A	B	C
2010062202					23.35	23.02	23.07	2.01	1096	1065	1070

检测: 金建伟 [illegible]

ANNEX E RESULT OF THE DYNAMIC SHORT-CIRCUIT TEST

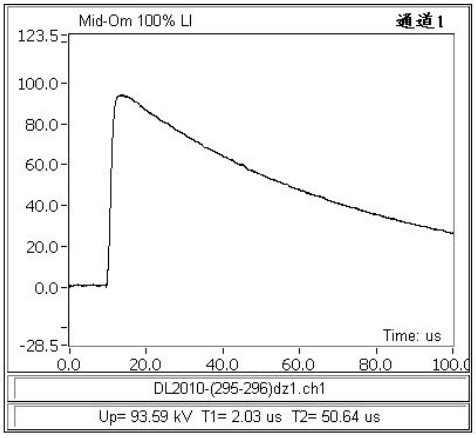


Shenzhen Woer Heat-Shrinkable Material Co., Ltd
8.7/15kV XLPE cable heat shrinkable straight joint 8.7/15 RSJY-3/3 3×185

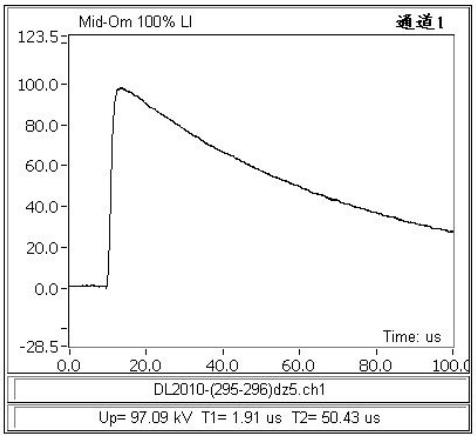
Oscillogram No.	Peak Amplitude of Test current (kA)			Duration of Peak Withstand Current Test (s)	RMS of Test Current Cycle Component (kA)			Duration of Short-time Withstand Current Test (s)	I^2t (10^6AAs)		
	A	B	C		A	B	C		A	B	C
2010062201	81.75	59.93	70.48	0.053							

检测：金建伟 黄志斌

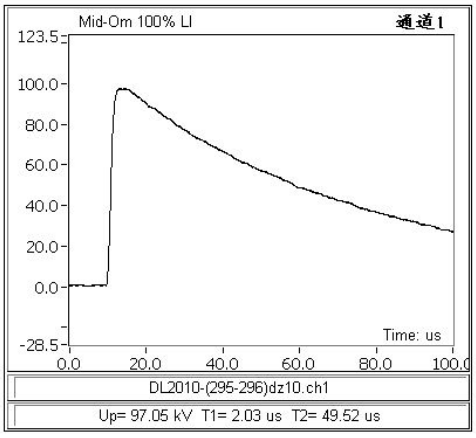
ANNEX F RESULTS OF THE IMPULSE VOLTAGE TEST AT AMBIENT TEMPERATURE AFTER THERMAL AND DYNAMIC SHORT-CIRCUIT TEST (§ 2.4)



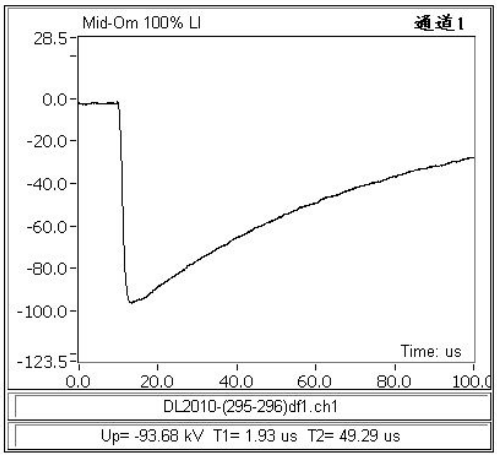
1st positive impulse 95 kV



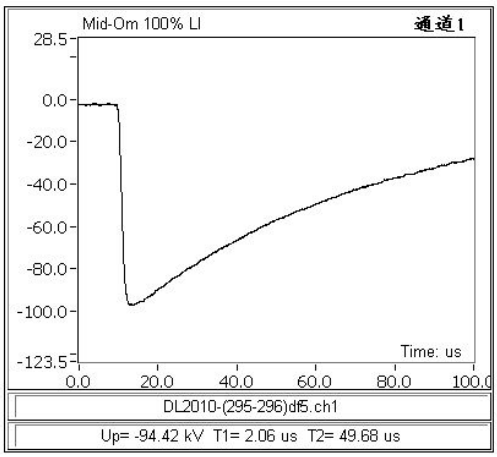
5th positive impulse 95 kV



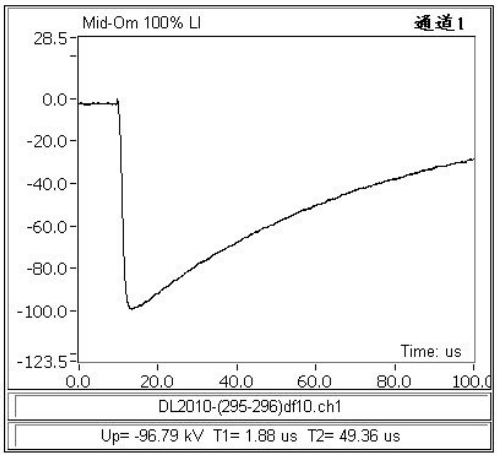
10th positive impulse 95 kV



1st negative impulse 95 kV



5th negative impulse 95 kV



10th negative impulse 95 kV

ANNEX G CHECK OF THE CABLE CONSTRUCTION

Type of cable: 8,7/15 kV XLPE 3 x 185 mm^2 YJV			
			Results
Overall diameter		mm	66,9
Thickness of oversheath	average	mm	2,9
	minimum	mm	2,3
Oversheath material			PVC
Copper screen of each core	average	mm	1 x 0,10 x 40
Diameter over each core	average	mm	27,8
Thickness of the outer semi-conducting layer	average	mm	0,6
	minimum	mm	0,5
Thickness of the insulation	average	mm	4,6
	minimum	mm	4,5
Insulation material			XLPE
Thickness of the inner semi-conducting layer	average	mm	0,6
	minimum	mm	0,5
Diameter of conductor	average	mm	16,5
Number of wires in conductor		#	37
Conductor material			Copper

ANNEX H PICTURES OF THE TEST SET-UP AS PER CHAPTER 1

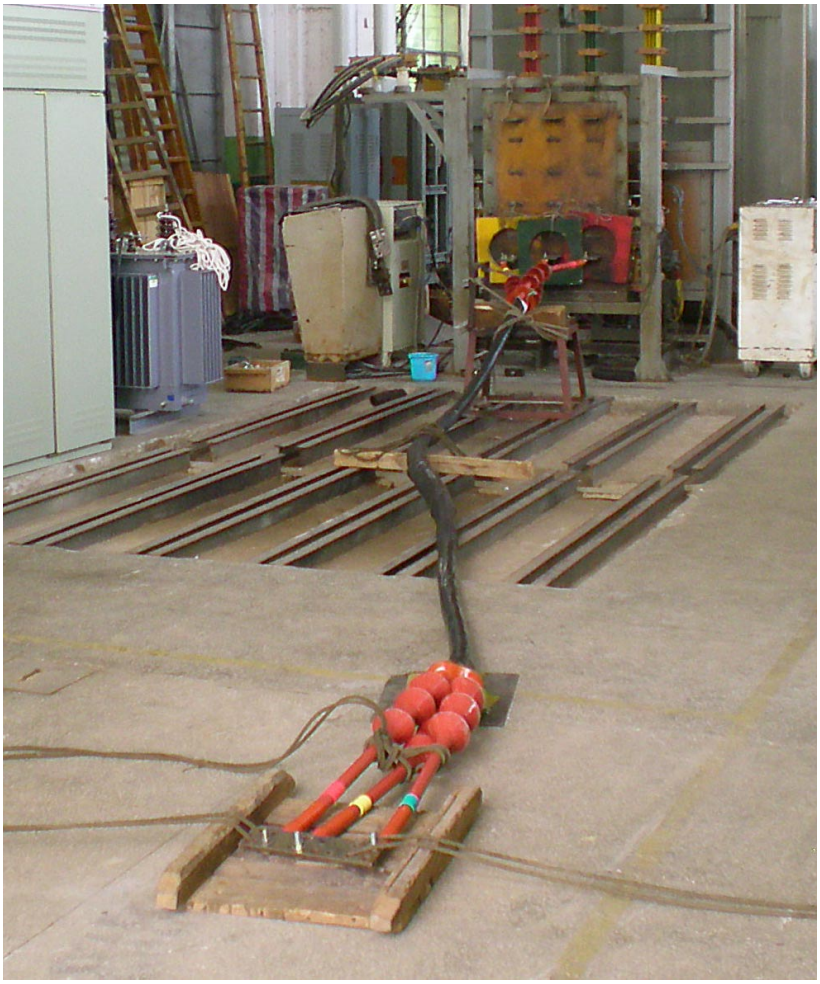
Complete test set-up during impulse voltage test at high temperature

Complete set-up during heating cycle voltage test under water

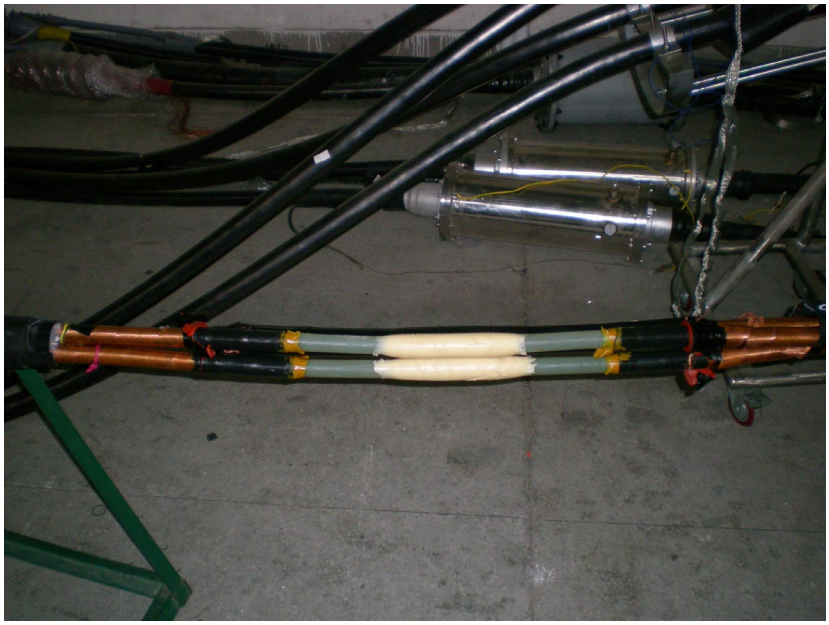
Examination of the joint

Examination of the joint

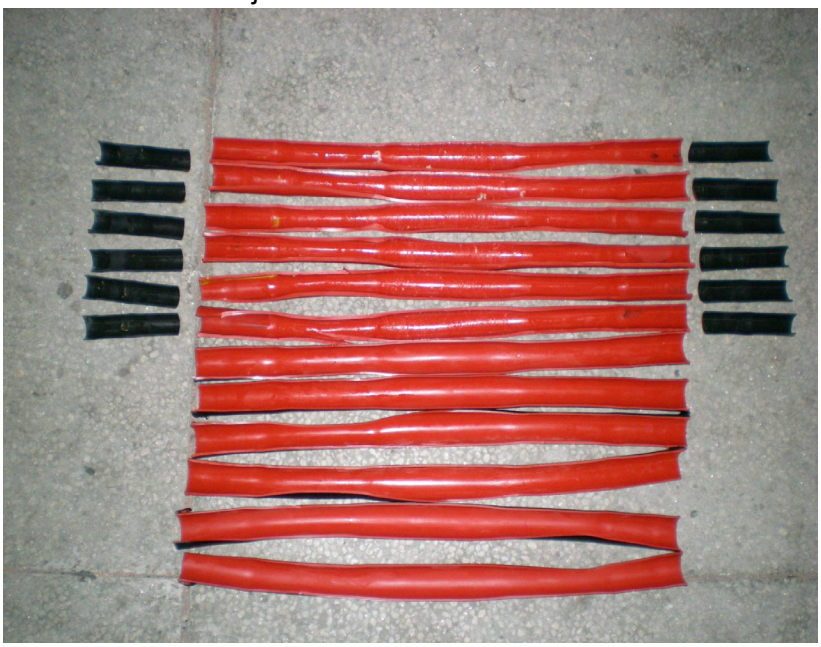
ANNEX I PICTURES OF THE TEST SET-UP AS PER CHAPTER 2



Complete set-up during thermal and dynamic short-circuit test



Examination of the joint



Examination of the joint

ANNEX J CONSTRUCTION DRAWING

8.7/15kV Three-core Straight Joint Construction Sketch

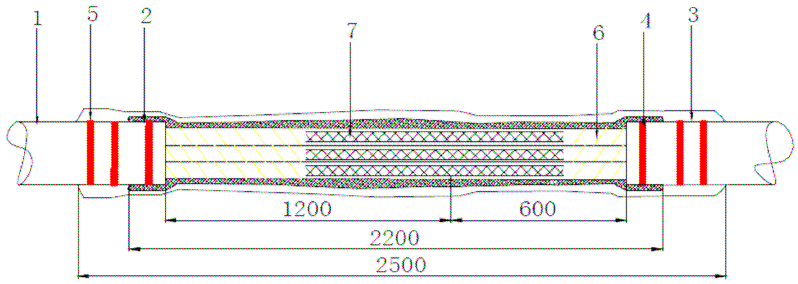


Figure 1

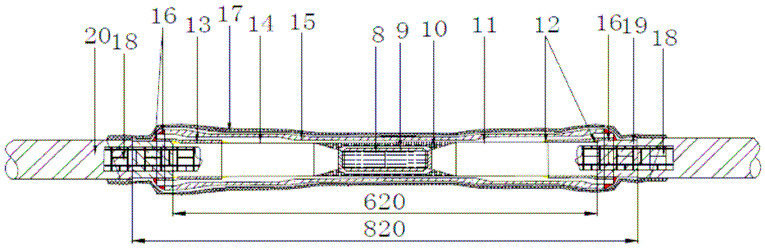


Figure 2

1- Cable sheath 2- Inner protective tube 3- Outer protective tube

4- Inner protective tube waterproof section 5- Outer protective tube waterproof section

6- Copper shielding layer 7- Single core connector 8- Connecting pipe 9- Semi-conductive tape

10- Filling glue 11- Insulation layer 12- Stress relief glue 13- Stress control tube

14- Inner insulation tube 15- Dual wall tube 16- Sealing glue 17- Copper mesh

18- Earth wire 19- Outer semi-conductive tape 20- Copper screen

Note:Figure 2 specifys the details about 7(single core connector) in Figure 1.

WOER	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO., LTD.	8.7/15kV three-core straight joint construction sketch	
DESIGNER	Hu Xi fu	TOTAL 1 PAGE	The first page
CHECKER	Shan Xue min	NO.	2010052001 01
		Revision	The second
APPROVER	Gao Cheng hua	DATE	May 20th. 2010

ANNEX K INSTALLATION INSTRUCTIONS

WOER®

NOTE:

✧This technique is applicable for 8.7/15kV three cores XLPE (all size) accessory installation.

✧The instruction is to supply corrective installation method and process. Please read the instruction earnestly before installation, and install precisely according to the letter.

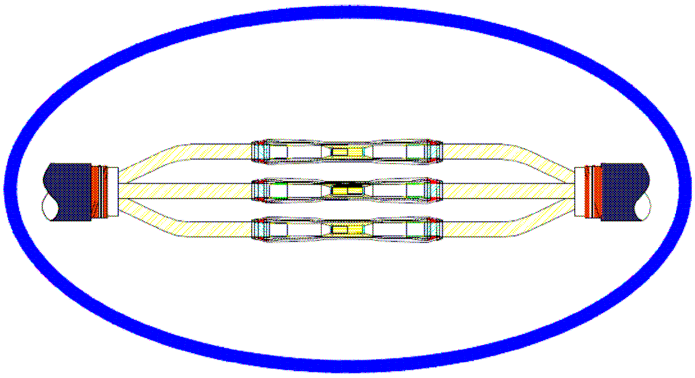
✧Using propane torch is the best way, adjust the flame to take a yellow cusp, avoiding blue subulate flame.

✧Put torch towards the part that will shrink in order to pre-heat tube, move the flame ceaselessly and avoid not singe tube.

THREE CORES XLPE

HEAT SHRINKABLE JOINTING

INSTALLATION INSTRUCTION



SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO., LTD.

Compiling Date	May 20th, 2010	NO.	2010052001	Revision	The second

1. Fix up the cables.

Straighten two cables, overlapp them about 200 mm length. Mark a reference line at the center of the overlap. Saw the cables at the marks.

2. Peel off the sheath , copper screen layer, outer semi-conductive layer.

Peel off the sheath according to Figure.1.

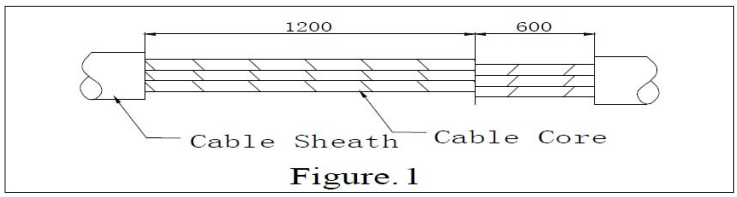


Figure. 1

Separate cores and push three bunches with the tral. Peel off the copper screen layers, outer semi-conductive layer as the Figure.2.

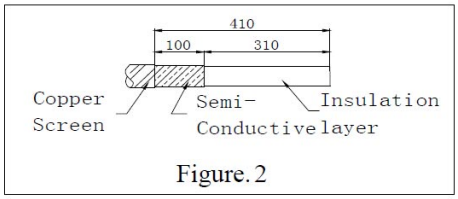


Figure. 2

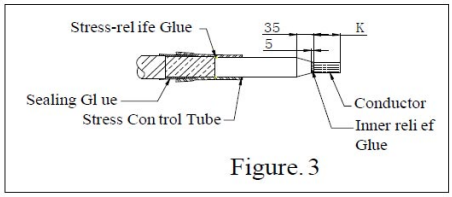


Figure. 3

3. Peel off the insulation layer and fix up stress control tube.

Peel off the insulation layer at the end of the cores as figure. 3. K equals to half length of the connecting pipe plus 5 mm. Cut 35mm core insulation layer at the breakpoint into a 30mm cone, Remain 5mm inner semi-conductive layer. Wrap the sealing glue from the section of copper shield to the semi-conductive layer(overlapping copper shield about 20mm and semi-conductive layer about 60mm), Clean the insulation layer about 100mm length from outer semi-conductor layer breakpoint. Wrap the stress-relief glue to the connection of outer semi-conductive layer and the insulation layer, and then plaste the silicone grease. Cover the stress control tube, overlapping the section of sealing glue about 30mm length , heat up and fasten.

4. Cover the tube and copper mesh.

Cover inner protective tube and outer protective tube on cable's two ends. Wear inner insulation tube and dual wall tubes to all phases at the long end. Wear the copper mesh to all phases at the short end.

5. Connect the conductor, wrap semi-conductive tape and filling glue.

Push cores into connecting tubes and fix it, smoothen the burrs in the connecting tube's surfaces, clean scraps . Wrap the connecting pipe with semi-conductive tape, make sure contacting with the inner semi-conductive layers at same time. Wrap filling glue to semi-conductive tape, 5-6mm higher than core insulation(8 slices per phase). Clean the insulation layer's surfaces and filling glue surface with cleaning paper.

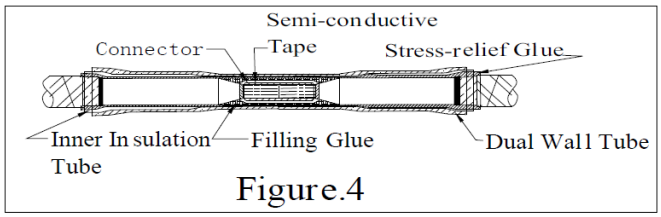


Figure.4

6. **Heat up inner insulation tube and dual wall tube.**

Wrap the stress-relief glue to the connection of the stress control tube and insulation layer. Wrap a waterproof section about 40mm length with the sealing gule from the stress control tube to the connection.Plaster silicone grease on the insulation and stress control tube. Pull the inner insulation tube to the connection and heat from the center to the end. Finishing the heating process,wrap a waterproof section about 30mm length with the sealing gule from the inner insulation tube to the connection.Then do the same procedure for the dual wall tube as the inner insulation tube. The same way for each phase.

7. **Wrap the sealing glue, heat up the semi-conductive tube.**

Wrap the red sealing glue from the section of copper shield to the edge of dual wall tube, pad the clearance into a taper surface. Then wrap the PVC tape on the taper surface.Wrap semi-conductive tape on the dual wall tube and the copper tape screen layer, contacting with 10 mm length each.

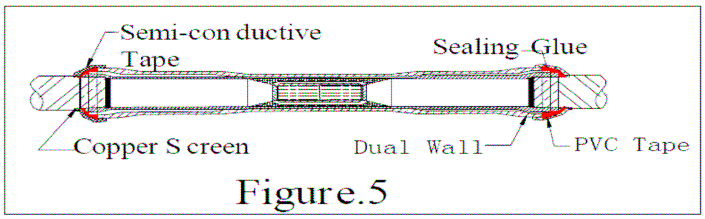


Figure.5

8. **Fix the earth braid and the mesh .**

Pull the copper mesh (that covered early) to the connection, making sure that contact with the copper screen layer. Fix a knitted copper tape on the copper screen layer with the roll spring. Wrap the filling glue on the roll spring.

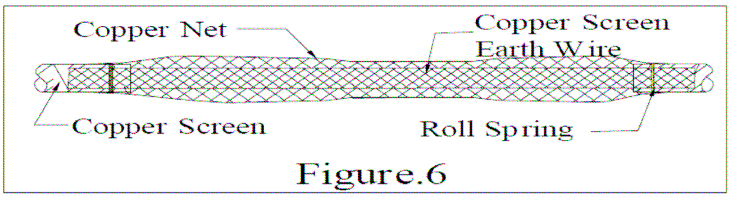


Figure.6

9. **Heat up the inner and outer protective tube.**

Burnish the outer protective layer of cables about 300 mm length, Wrap a waterproof section (near the cable sheath cut 80mm, about 20mm wide, 3-5mm thickness) on the sheath with the sealing glue, Aggregate the three phase and pad the clearance between them, pull the inner protective tube (thinner) to the connection, ensure the inner protective tube overlapping the sheathes. Heat up from the centre to ends. Wrap two waterproof sections (near the inner protective tube opening 40mm and 80mm, about 20mm wide,3-5mm thickness) on the sheath with the sealing glue respectively. Pull outer protective tube to the connection and heat it up to fasten.

Here complete the jointing installation.

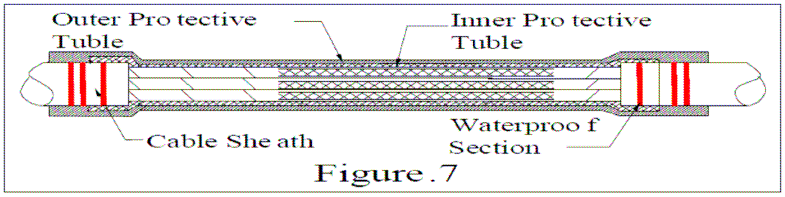


Figure .7

COMPONENT LIST

Component name	Unit	Quantity	Remark
Inner protective tube	pc	1	With glue
Outer protective tube	pc	1	With glue
Inner insulted tube	pc	3	
Dual wall tube	pc	3	
Stress control tube	pc	6	
Filling glue/sealing glue	bag	4	30/14
Copper mesh	bag	3	
Semi-conductive tape	pc	2	
stress- relief glue	bag	6	
silicone grease	bag	3	
Tral	pc	2	Used for three bunches
Earth braid	pc	3	
Roll spring	pc	6	
Gloves	pair	1	
Connector	pair	3	
Emery cloth	pc	3	
Cable Mop paper	bag	1	
Clean tissue	bag	12	
Copper binding wire	pc	1	
PVC tape	roll	1	

Add: Woer Industrial Park, Pinshan,
Longgang, Shenzhen, China
Tel: 0086-755-26622940 26626463 26623453
Fax: 0086-755-26620842
http://www.woer.com