



ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION
(Accredited by the National Accreditation Board for Testing and Calibration Laboratories, Govt. of India)
ERDA Road, Makarpura Industrial Estate, Vadodara-390 010, India.
EPABX : +91 (0265) 2642942, 2642964, 2642377, 3043128 / 29 / 30 / 31 / 33
Fax : +91 (0265) 2638382
E-mail : erda@erda.org
Web : http://www.erda.org



TEST REPORT

SHEET: 1 of 8

NAME & ADDRESS OF CUSTOMER KEC International Ltd., Pl. No. 803, Samlaya-Savli Road, Village Godampura, Taluka - Savli, Vadodara, Gujarat - 391 520. (INDIA)	REPORT NO.: RP-1314-008034 DATE : 24.08.2013	
	CUSTOMER REF. NO	DATE
	Nil	02.07.2013
	DATE OF SAMPLE RECEIPT	DATE OF TESTING
	02.07.2013	27.07.2013 to 17.08.2013
SAMPLE DESCRIPTION: 1 Core X 630 sq. mm. HT XLPE insulated and black colored PVC outer sheathed armoured cable Cable code : A2XWaY Voltage Grade : 19/33 kV Class of Aluminium conductor : 2 Type of insulation : XLPE Type of PVC outer sheath : ST-2 Type of PVC inner sheath : ST-2	SAMPLE IDENTIFICATION: ERDA SAMPLE CODE NO. : ERDA-00011476 EMBOSSING: KEC INTERNATIONAL LTD. RPG CABLES 19/33 KV ELECTRIC CABLE 1C X 630 mm ² XLPE A2XWaY(P) 2013 "1932"	
TEST DETAILS: As per sheet No. 2 of 8	TEST SPECIFICATION: IS : 7098 (Part 2) - 1985	
TEST RESULTS: As per sheet No. 3 of 8 to 8 of 8.		
ENCLOSURE: Annexure - 1 (Sheet 1 to 2 - Impulse Waveforms)		
REMARKS: The sample conforms to the requirements of the above mentioned test specification with respect to the tests carried out.		
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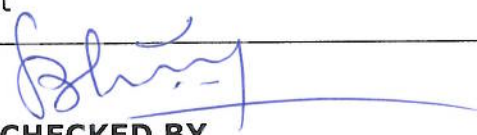
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REPORT NO.: RP-1314-008034			SHEET: 2 of 8
DATE : 24.08.2013			
TEST DETAILS :			
TEST SPECIFICATION : IS : 7098 (Part 2) - 1985			
SR. NO.	CL. NO.	TEST PARTICULARS	
1	18.1.a	Test on Conductor	
2	18.1 b	Tests for round steel wire armour/formed steel wire(strip) armour	
3	18.1.c	Test for Thickness of Insulation and Sheath	
4	18.1.d	Physical Tests for Insulation	
5	18.1.e	Physical Tests for Outer Sheath	
6	18.1.k	Insulation Resistance (volume Resistivity) test	
7	18.1.q	Flammability test	
8	18.1.g	Partial Discharge test	
9	18.1.h	Bending test	
10	18.1.j	Dielectric Power Factor test	
11	18.1.m	Heating Cycle test	
12	18.1.n	Impulse withstand test	
13	18.1.p	High Voltage test	
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Certificate No. : T-0071

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**REPORT NO. : RP-1314-008034****SHEET: 3 of 8****DATE : 24.08.2013****TEST RESULTS:**

SR. NO.	PARTICULARS OF TESTS AND CL. NO.	REQUIREMENT AS PER SPECIFICATIONS	OBTAINED VALUE	REMARKS
1.	Test on conductor [Cl. No. 18.1.a of IS : 7098 (Part 2) - 1985] iv) Conductor resistance test (Corrected at 20°C), ohm/km	Max. 0.0469	0.0457	Conforms
2.	Tests for round/formed steel wire (strip) armour : [Cl. No. 18.1.b of IS : 7098 (Part 2) - 1985]	Not applicable	Not applicable	*
3.	Test for thickness of insulation & sheath: [Cl. No. 18.1.c of IS : 7098 (Part 2) - 1985] -Thickness, mm A] Insulation B] Inner sheath C] Outer sheath	Nom. / Min. 8.8 / 7.82 Min. 0.6 Min. 2.36	9.20/8.21 1.72 2.91	Conforms Conforms Conforms
4.	Physical tests for insulation: [Cl. No. 18.1.d of IS : 7098 (Part 2) - 1985] (i) Tensile strength and elongation at break - Tensile strength, N/mm ² - Elongation at break, %	Min. 12.5 Min. 200	18.8 520	Conforms Conforms

* The armouring is of non magnetic Aluminium Wire.

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SHEET: 4 of 8

DATE : 24.08.2013

SR. NO.	PARTICULARS OF TESTS AND CL. NO.	REQUIREMENT AS PER SPECIFICATIONS	OBTAINED VALUE	REMARKS
	(ii) Ageing in air oven (At $135 \pm 3^\circ\text{C}$ for 7 days) Variation, % - Tensile strength - Elongation at break (iii) Hot set test (At $200 \pm 3^\circ\text{C}$ for 15 minutes) - Elongation under load, % - Permanent Elongation(set), % (iv) Shrinkage test (At $130 \pm 3^\circ\text{C}$ for 1 hour) - Shrinkage, % (v) Water absorption test (Gravimetric) (at $85 \pm 2^\circ\text{C}$ for 14 days) - Water absorbed, mg/cm^2	 Max. ± 25 Max. ± 25 Max. 175 Max. 15 Max. 4 Max. 1	 -1 -2 78 0 0.6 0.02	 Conforms Conforms Conforms Conforms Conforms Conforms
5.	Physical tests for outer sheath: [Cl. No. 18.1.e of IS : 7098 (Part 2) -1985] (i) Tensile Strength and Elongation at break - Tensile strength, N/mm^2 - Elongation at break, %	 Min. 12.5 Min. 150	 15.1 208	 Conforms Conforms

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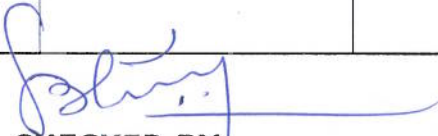


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REPORT NO. : RP-1314-008034				SHEET: 5 of 8
DATE : 24.08.2013				
SR. NO.	PARTICULARS OF TESTS AND CL. NO.	REQUIREMENT AS PER SPECIFICATIONS	OBTAINED VALUE	REMARKS
	(ii) Ageing in air oven (At $100 \pm 2^\circ\text{C}$ for 7 days)			
	- Tensile strength, N/ mm^2	Min. 12.5	15.1	Conforms
	- Elongation at break, %	Min. 150	210	Conforms
	Variation, %			
	- Tensile strength	Max. ± 25	0	Conforms
	- Elongation at break	Max. ± 25	+1	Conforms
	(iii) Shrinkage test (At $150 \pm 2^\circ\text{C}$ for 15 min.)			
	- Shrinkage, %	Max. 4	0.5	Conforms
	(iv) Hot deformation test (At $80 \pm 2^\circ\text{C}$ for 6 hours)			
	- Depth of indentation, %	Max. 50	21.2	Conforms
	(v) Loss of Mass in air oven (At $100 \pm 2^\circ\text{C}$ for 7 days)			
	- Loss of mass, mg/ cm^2	Max. 2	1.3	Conforms
	(vi) Heat shock test (at $150 \pm 2^\circ\text{C}$ for 1 hour)	No sign of crack or scale shall be observed	No sign of crack or scale was observed	Conforms
	(vii) Thermal stability test (At 200°C), minutes	Min. 80	166	Conforms
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DATE : 24.08.2013

SR. NO.	PARTICULARS OF TESTS AND CL. NO.	REQUIREMENT AS PER SPECIFICATIONS	OBTAINED VALUE	REMARKS
6.	Insulation resistance (Volume resistivity): [Cl. No. 18.1.k of IS : 7098 (Part 2) - 1985] Volume Resistivity, ohm-cm - At 27°C - At 90°C	 Min. 1×10^{14} Min. 1×10^{12}	 1.0×10^{17} 5.3×10^{15}	 Conforms Conforms
7.	Flammability test: [Cl. No. 18.1.q of IS : 7098 (Part 2) - 1985] - Period of burning after removal of flame, seconds - Unaffected portion from the lower edge of the top Clamp, mm.	 Max. 60 Min. 50	 0 325	 Conforms Conforms
8.	Partial discharge test: [Cl. No. 18.1.g of IS : 7098 (Part 2) - 1985] - At 1.5U ₀ Where, U ₀ = 19 kV	 Max. 20 pC	 1 pC	 Conforms
9.	Bending test: [Cl. No. 18.1.h of IS : 7098 (Part 2) - 1985] Partial discharge test after bending test : [Cl. No. 18.1.g of IS : 7098 (Part 2) - 1985] - At 1.5U ₀ Where, U ₀ = 19 kV	 The sample shall be subjected to 3 bending cycles. The sample shall conform the partial discharge test after bending test. Max. 20 pC	 The sample was subjected to 3 bending cycles. After completion of bending test, sample was subjected to Partial discharge test 1 pC	 Conforms

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REPORT NO.: RP-1314-008034

SHEET: 7 of 8

DATE : 24.08.2013

Sr. No.	Particulars of Tests and Cl. No.	Requirement as per specifications	Obtained Value	Remarks
10.	Dielectric power factor test: [Cl. No. 18.1.j of IS : 7098 (Part 2) - 1985] [a] As a function of voltage: - At U_0 (i.e : 19 kV) - Rise from 0.5 U_0 to 2 U_0 Where, U_0 = 19 kV [b] As a function of temp.: - At an ambient temp. & At 2 kV - At max. Conductor temp. (90°C) at 2 kV	Max. 0.004 Max. 0.002 Max. 0.004 Max. 0.008	0.000547 0.000062 0.000413 0.001034	Conforms Conforms Conforms Conforms
11.	Heating cycle test: [Cl. No. 18.1.m of IS : 7098 (Part 2) - 1985] - Partial discharge test after heating cycle: [Cl. No. 18.1.g of IS : 7098 (Part 2) - 1985] - At 1.5 U_0 Where, U_0 = 19 kV	The sample shall be subjected to three cycles (including 2 hrs. heating followed by 4 hrs. cooling in natural air). Sample shall Conform to the partial discharge & dielectric power factor test after heating cycle test. Max. 20 pC	The sample was subjected to 3 heating cycles. After completion of 3 rd cycle, sample was subjected to Partial discharge and Dielectric power factor test 1 pC	Conforms Conforms

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SHEET: 8 of 8

DATE : 24.08.2013

Sr. No.	Particulars of Tests and Cl. No.	Requirement as per specifications	Obtained Value	Remarks
	- Dielectric power factor after heating cycle: [Cl. No. 18.1.j of IS : 7098 (Part 2) - 1985] - At U ₀ (i.e. : 19 kV) - Rise from 0.5 U ₀ to 2 U ₀ Where, U ₀ = 19 kV	Max. 0.004 Max. 0.002	0.000722 0.000129	Conforms Conforms
12.	Impulse withstand test: [Cl. No. 18.1.n of IS : 7098 (Part 2) - 1985]	Sample shall withstand 170 kV without breakdown for 10 +ve & 10 -ve shots	Please refer Annexure - 1 for detail results.	Conforms
13.	High voltage test: [Cl. No. 18.1.p of IS : 7098 (Part 2) - 1985]	Sample shall withstand power frequency voltage of 3U ₀ (i.e.: 57 kV) for four hours without any breakdown	Sample withstood the applied voltage of 3U ₀ (i.e.: 57 kV) for four hours satisfactorily.	Conforms

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ANNEXURE - 1

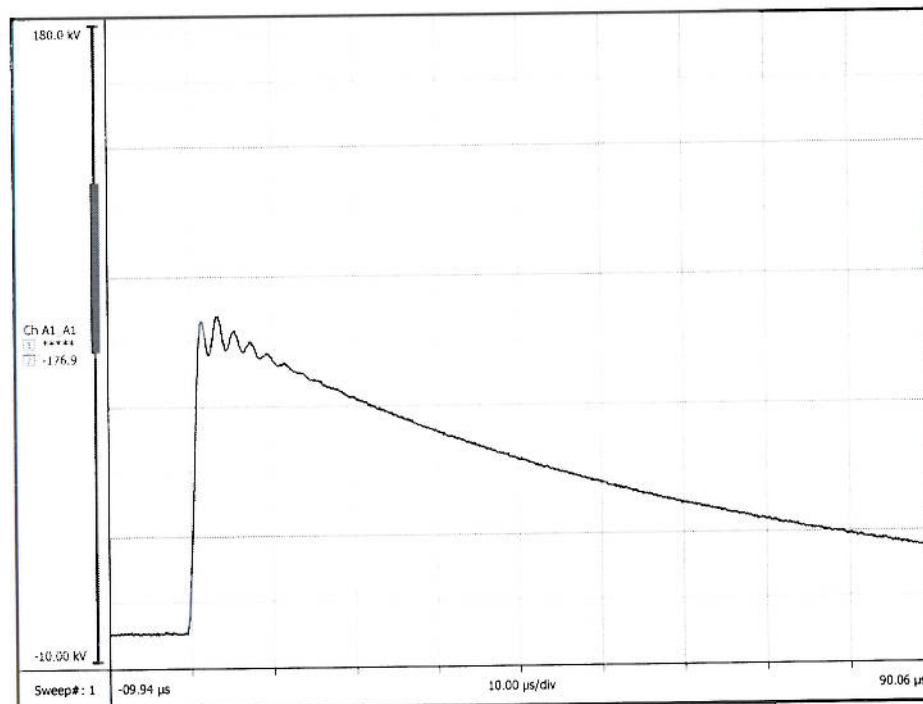
TEST REPORT No.: RP-1314-008034
DATE : 24/08/2013

SHEET No.: 1 OF 2

LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST ON H. T. XLPE CABLE TEST PARAMETERS:

SIZE OF CABLE : 1C X 630 sq. mm
VOLTAGE GRADE : 19/33 kV
AMBIENT TEMP. : 28.5 ° C
TEST TEMP. : 95.0 ° C
TEST VOLTAGE : 170 kVp
No. OF SHOTS APPLIED : 10 +ve & 10 -ve Polarity Shots
SHOTS RECORDED : Calibration Pulse, First & Tenth Shot Both Polarity
MAKE : M/s. KEC International Ltd.

CALIBRATION PULSE



T1 1.534 μs

T2 46.46 μs

Up 91.13 kV

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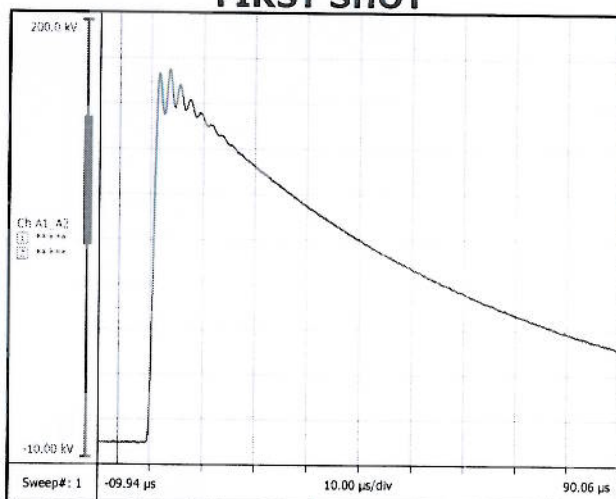
SHEET No.: 2 OF 2

DATE : 24/08/2013

LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST ON H. T. XLPE CABLE

POSITIVE POLARITY

FIRST SHOT

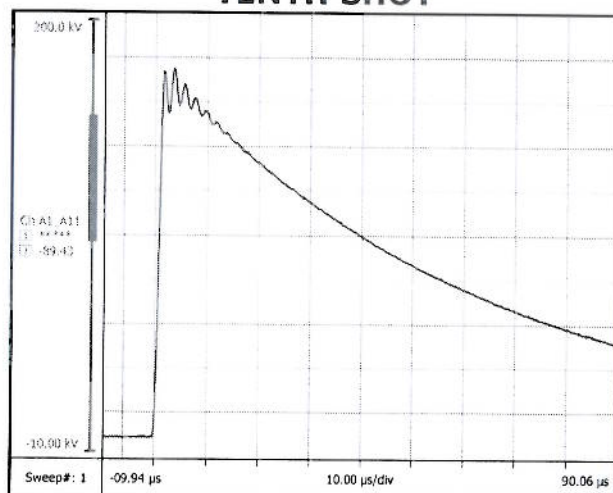


T1 1.535 μs

T2 46.79 μs

Up 171.3 kV

TENTH SHOT



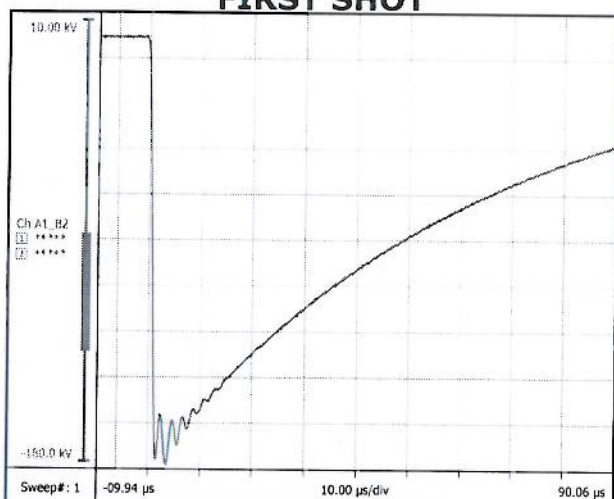
T1 1.517 μs

T2 47.08 μs

Up 171.2 kV

NEGATIVE POLARITY

FIRST SHOT

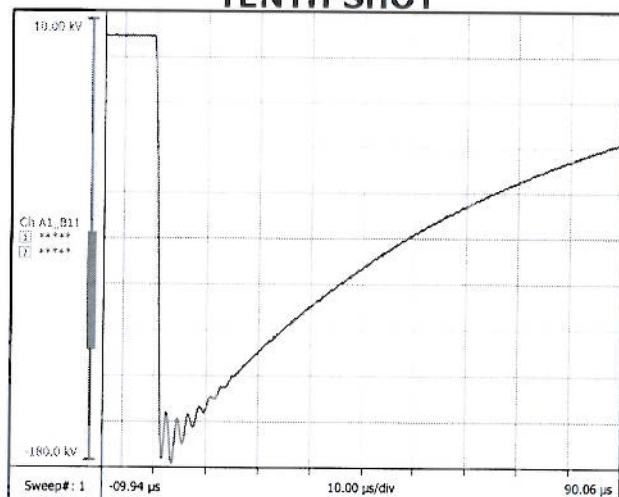


T1 1.333 μs

T2 48.26 μs

Up -171.8 kV

TENTH SHOT



T1 1.343 μs

T2 48.21 μs

Up -171.7 kV

REMARKS: The above sample **"CONFORMS"** to the requirements of aforesaid reference standard with respect to the test carried out.

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