



Certificate No. : T-0071

ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

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ERDA Road, Makarpura Industrial Estate, Vadodara-390 010, India.



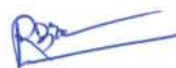
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**TEST REPORT****SHEET: 1 of 8**

NAME & ADDRESS OF CUSTOMER KEC International Ltd., Pl. No. 803, Samlaya-Savli Road, Village Godampura, Taluka - Savli, Vadodara, Gujarat - 391 520. (INDIA)	REPORT NO.: HCCT/05/452-1 DATE : 06.07.2012	
	CUSTOMER REF. NO Nil	DATE 27.04.2012
	DATE OF SAMPLE RECEIPT 10.05.2012	DATE OF TESTING 30.05.2012 to 05.07.2012
SAMPLE DESCRIPTION: 1 Core X 630 sq. mm. HT XLPE insulated and black colored PVC outer sheathed armoured cable Cable code : 2XWaY(P) Voltage Grade : 19/33 kV Class of copper conductor : 2 Type of insulation : XLPE Type of PVC outer sheath : ST-2	SAMPLE IDENTIFICATION: ERDA SAMPLE CODE NO. : HCCT - 178 EMBOSSING: KEC INTERNATIONAL LTD., "ASIAN", [RPG] 19/33 KV ELECTRIC CABLE 1C X 630 mm ² XLPE 2XWaY[P] 2012 U.ID.NO : 0008	
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.		
 PREPARED BY	 CHECKED BY	 APPROVED BY
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REPORT NO.: HCCT/05/452-1

SHEET: 2 of 8

DATE : 06.07.2012

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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REPORT NO. : HCCT/05/452-1				SHEET: 3 of 8
DATE : 06.07.2012				
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] i) Annealing test(for Copper) iv) Conductor resistance test (Corrected at 20°C), ohm/km	Not applicable Max. 0.0283	Not applicable 0.0283	-- 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	9.9/9.42 1.1 2.90	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	17.0 475	Conforms Conforms

* The Armouring is of non magnetic Aluminium Wire.

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**REPORT NO. : HCCT/05/452-1****SHEET : 4 of 8****DATE : 06.07.2012**

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	Max. ± 25 Max. ± 25	+18 0	Conforms Conforms
	(iii) Hot set test (At $200 \pm 3^\circ\text{C}$ for 15 minutes) - Elongation under load, % - Permanent Elongation(set), %	Max. 175 Max. 15	60 0	Conforms Conforms
	(iv) Shrinkage test (At $130 \pm 3^\circ\text{C}$ for 1 hour) - Shrinkage, %	Max. 4	1	Conforms
	(v) Water absorption test (Gravimetric) (at $85 \pm 2^\circ\text{C}$ for 14 days) - Water absorbed, mg/cm^2	Max. 1	0.01	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	14.0 260	Conforms Conforms

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**REPORT NO. : HCCT/05/452-1****SHEET: 5 of 8****DATE : 06.07.2012**

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	13.6	Conforms
	- Elongation at break, %	Min. 150	268	Conforms
	Variation, %			
	- Tensile strength	Max. ± 25	-3	Conforms
	- Elongation at break	Max. ± 25	+3	Conforms
	(iii) Shrinkage test (At $150 \pm 2^\circ\text{C}$ for 15 min.)			
	- Shrinkage, %	Max. 4	1	Conforms
	(iv) Hot deformation test (At $80 \pm 2^\circ\text{C}$ for 6 hours)			
	- Depth of indentation, %	Max. 50	30	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	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	> 180	Conforms

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**REPORT NO. : HCCT/05/452-1****SHEET: 6 of 8****DATE : 06.07.2012**

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	Min. 1×10^{14}	3×10^{15}	Conforms
	- At 90°C	Min. 1×10^{12}	3×10^{14}	Conforms
7.	Flammability test: [Cl. No. 18.1.q of IS : 7098 (Part 2) - 1985]			
	- Period of burning after removal of flame, seconds	Max. 60	2	Conforms
	- Unaffected portion from the lower edge of the top Clamp, mm.	Min. 50	345	Conforms
8.	Partial discharge test: [Cl. No. 18.1.g of IS : 7098 (Part 2) - 1985]			
	- At 1.5U _o	Max. 20 pC	1 pC	Conforms
9.	Bending test: [Cl. No. 18.1.h of IS : 7098 (Part 2) - 1985]	The sample shall be subjected to 3 bending cycles. The sample shall conform the partial discharge test after bending test.		
	Partial discharge test after bending test :	Max. 20 pC	1 pC	Conforms

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**REPORT NO.:** HCCT/05/452-1**SHEET:** 7 of 8**DATE** : 06.07.2012

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 - Rise from 0.5 U_0 to 2 U_0 [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	0.00292 0.00018 0.00281 0.00292	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 - Dielectric power factor after heating cycle a) At U_0 b) Rise from 0.5 U_0 to 2 U_0	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 Max. 0.004 Max. 0.002	1 pC 0.00256 0.00084	Conforms Conforms Conforms

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SHEET : 8 of 8

REPORT NO.: HCCT/05/452-1

DATE : 06.07.2012

Sr. No.	Particulars of Tests and Cl. No.	Requirement as per specifications	Obtained Value	Remarks
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 _o for four hours without any breakdown	Sample withstood the applied voltage of 3U _o satisfactorily.	Conforms

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**TEST REPORT****SHEET: 1 of 2**

NAME & ADDRESS OF CUSTOMER KEC INTERNATIONAL LTD., Pl. No. 803, Samlaya-Savli Road, Village Godampura, Taluka - Savli, Vadodara, Gujarat - 391 520. (INDIA)			REPORT NO.: HCCT/05/452-2 DATE : 06.07.2012	
CUSTOMER REF. NO		DATE		
Nil		27.04.2012		
DATE OF SAMPLE RECEIPT		DATE OF TESTING		
10.05.2012		13.06.2012		
SAMPLE DESCRIPTION: Bare copper conductor wire (Before stranding)			SAMPLE IDENTIFICATION: ERDA SAMPLE CODE NO. : HCCT - 178	
SR. NO.	CL.NO.	TEST DETAILS	TEST SPECIFICATION	
1	6.1.2.1	Annealing test (for copper)	IS : 8130 - 1984	
TEST RESULTS: As per sheet No. 2 of 2.				
REMARKS: The sample CONFORMS to the requirements of the above mentioned test specification with respect to the tests carried out.				
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  PREPARED BY </div> <div style="text-align: center;">  CHECKED BY </div> <div style="text-align: center;">  APPROVED BY </div> </div>				
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REPORT NO.: HCCT/05/452-2

SHEET: 2 of 2

DATE : 06.07.2012

SR. NO.	PARTICULARS OF TESTS AND CL. NO.	REQUIREMENT AS PER SPECIFICATIONS	OBTAINED VALUE	REMARKS
1.	Annealing test : (for Copper) [Cl. No. 6.1.2.1 of IS : 8130 -1984] - Elongation at break, %	Min. 22.5	40.8	Conforms

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ANNEXURE - 1

TEST REPORT No.: HCCT/05/452-1
DATE : 06/07/2012

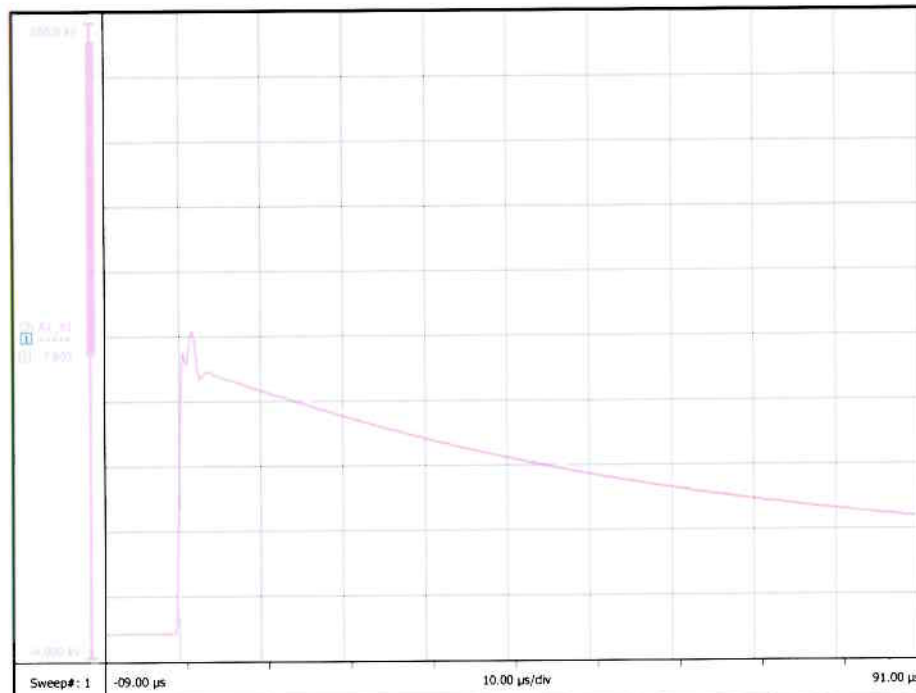
SHEET No.: 1 OF 2

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
TEST VOLTAGE	: 170 kVp
No. OF SHOTS APPLIED	: 10 +VE & 10 -VE POLARITY SHOTS
SHOTS RECORDED	: CALIBRATION PULSE, FIRST & LAST SHOT BOTH POLARITY

CALIBRATION PULSE



T1 1.218 μ s

T2 58.62 μ s

Up 85.62 kV

TE 0992402

R. J. mistry
PREPARED BY

[Signature]
CHECKED BY

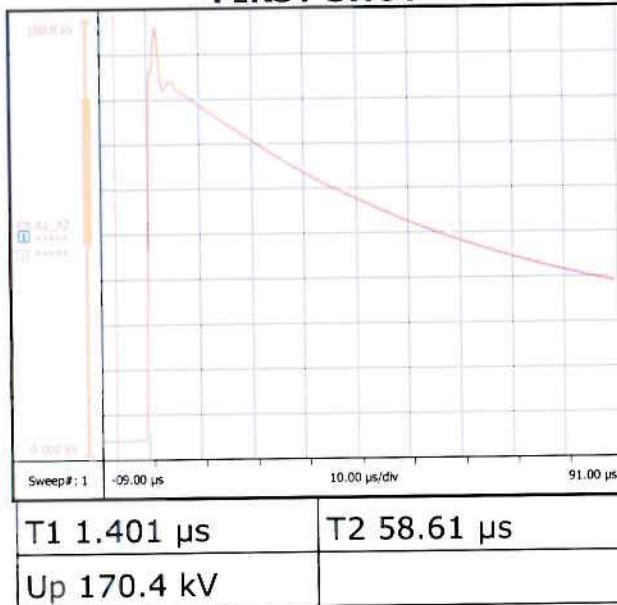
TEST REPORT No.: HCCT/05/452-1
DATE : 06/07/2012

SHEET No.: 2 OF 2

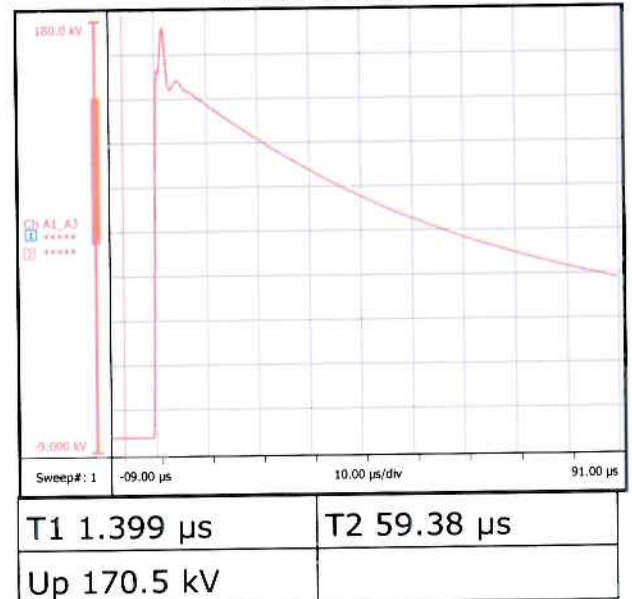
LIGHTNING IMPULSE VOLTAGE WITHSTAND TEST ON H. T. XLPE CABLE

POSITIVE POLARITY

FIRST SHOT

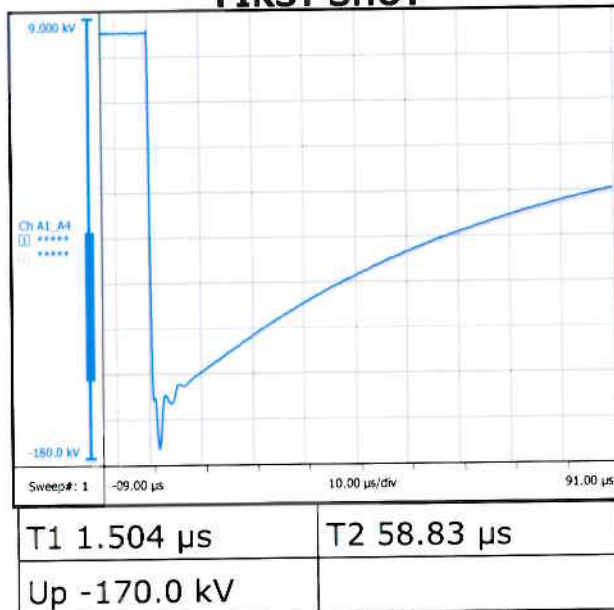


LAST SHOT

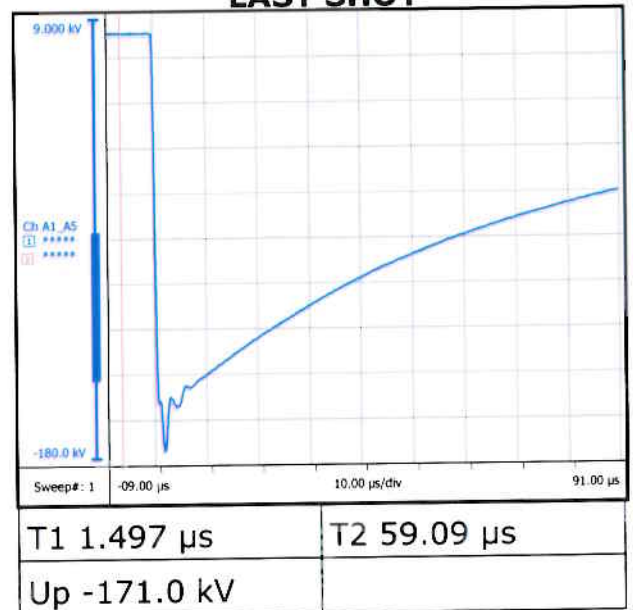


NEGATIVE POLARITY

FIRST SHOT



LAST SHOT



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

R. J. Mistry
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[Signature]
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