CPRI

TEST REPORT

Central Power Research Institute

(A Govt.of India Society,)
P.B. No.8066, Sadashivanagar Post Office
Prof. Sir.C.V. Raman Road,
Bangalore - 560 080(INDIA)

CENTRAL POWER RESEARCH INSTITUTE

अतिरिक्त परीक्षण रिपोर्ट
ADDITIONAL TEST REPORT

CPRI

TEST REPORT

Test Report Number : DCCD- 13826 **Dated** : 25.03.2014

Name & Address of the Customer : M/s KEC International Ltd.,(Cables Division),
Survey No. 803-805, Village Godampura(Samlaya),
Taluka Savli, District Vadodara-391520, Gujarat, India.

Name & Address of the Manufacturer : **(Cable)**
M/s KEC International Ltd.,(Cables Division),
Survey No. 803-805, Village Godampura(Samlaya),
Taluka Savli, District Vadodara-391520, Gujarat, India.

(Accessories)
Raychem RPG (P) Ltd.,
Near Halol, GIDC,Village Kanjari, Taluka Halol,
District Panchmahal, 389350, Gujarat, India..

Particulars of sample tested : 1 X 1000 mm^2 76/132(Um 145) kV XLPE Cable With Oil filled outdoor termination, Plug in type Dry Switchgear (GIS) termination and shield Break joint.

Condition of the sample on receipt : New.

Type : 145 kV Cable System
(2XAY XLPE Power Cable,OHVT-145C, PHVS-145, EHVS-145 accessories)

Designation : **Cable**
Conductor Material : Copper Compacted, Circular
No. of cores : One
Size : 1000 mm^2
Insulation : XLPE
Metallic Sheath : Corrugated Aluminium
Outer sheath : PVC- ST2
Voltage Rating : 76/132 kV
Nom.. Capacitance: 0.237 uF/km
Embossing : KEC INT. LTD RPG CABLES 76/132 KV ELECTRIC CABLE 1X 1000 Sq.mm XLPE 2013

Accessories
Outdoor Terminations: Two
Type: Outdoor Oil Filled with composite insulator - OHVT-145C
No. of Plug in Type Dry (GIS) Switchgear Termination- Two
Type: PHVS -145
No. of Joint- One
Type: Shield Break with Heat shrink wraparound protection EHVS-145

Serial Number : Nil
Number of Samples tested : One Complete Cable System with above components
Date(s) of Test(s) : 16.12.2013 TO 24.03.2014
CPRI Sample Code no(s) : DCCDCAB13S0201

(Thirumurthy)
TEST ENGINEER

(S.Ganga)
Joint Director

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Particulars of test conducted	: Type Test on Cable System
Test in accordance with Standard /Specification	: As per IEC 60840-2011
Sampling plan	: Not Applicable
Customer's requirement	: Nil
Deviation if any	: Nil
Name of the witnessing persons	
Customer's representatives	: Mr. B.B. Kutal of KEC Interntional Ltd., Mr. Fency Anthony,Mr.Mohammed Siddiqui &,Mr.Padmanabhan of M/s Raychem RPG (P) Ltd..
Other than customer's representatives	: None
Test subcontracted with address of the laboratory	: Nil

Documents constituting this report (in words)

Number of sheets	: Thirteen
Number of oscillogram/s	: Twenty Eight (Six pages)
Number of graphs	: Nil
Number of photos	: One
Number of test circuit diagrams	: Nil
Number of drawings	: Four

1. EHV/Al Sh
2. IEYT900028-001
3. IEYT900028-002
4. IEYT900028-003

(Thirumurthy)'
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I.TESTS ON CONDUCTOR

1. Conductor Resistance Test:

a) Specified Maximum : 0.01760 Ω/Km at 20 ^{0}

b) Observed value : 0.01749 Ω/Km at 20 ^{0} C

2. Conductor Examination Test:

a) Specified Number of strands: 53(Minimum)

b) Observed Number of strands: 80

II. TESTS ON INSULATION:

1. Test for Thickness of insulation

a) Specified Minimum : 16.2 mm

b) Observed Minimum : 17.102 mm

c) Variation of thickness $((t_{max} - t_{min})/t_{max})$

d) Specified Variation of thickness $((t_{max} - t_{min})/t_{max})$: 0.15 (max)

e) Observed Variation of thickness $((t_{max} - t_{min})/t_{max})$: 0.063

2. Tensile strength and Elongation at Break:

A) Before Ageing:

a) Specified Tensile Strength (Min) : 12.5 N/mm^2

b) Specified Elongation at Break (Min) : 200 %

c) Observed Tensile Strength : 20.97 N/mm^2

d) Observed Elongation at break : 539.5 %

B) Ageing :

a) Sample : Dumb-bell specimens

b) Temperature: 135 ± 3 ^{0}C

c) Duration : 168 hours

C) After Ageing:

a) Observed Tensile Strength : 19.0 N/mm^2

b) Observed Elongation at break : 517.5 %

D) Variations observed from before ageing samples:

a) Specified percentage variations (Max):± 25 %

b) Observed percentage variations:

Tensile strength : -9.42 %

Elongation at break : -4.08 %

E) After Completed Cable Ageing:

i) Ageing conditions:

a) Sample : 200 mm of Completed cable

b) Duration : 168 hours

c) Temperature : 100 ± 2°C

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ii) Observed Values:

a) Observed Tensile Strength :19.98 N/mm^2
b) Elongation at break :522.20 %

iii) Variations Observed from Before Ageing Samples:

a) Specified percentage variations (Max) : ± 25 %
b) Observed percentage variations:
Tensile strength : -4.73 %
Elongation at break : -3.21 %

3. Shrinkage Test:

a) Sample length : 200 mm
b) Test temperature : 130 ± 3 ^{0} C
c) Duration of test : 6 hours
d) Specified shrinkage allowed (Max) : 4.5 %
e) Observed shrinkage : 2.61 %

4. Hot Set Test:

a) Test temperature : 200 ± 3 ^{0} C
b) Load applied : 20 N/cm^2
c) Time under load : 15 minutes
d) Specified Hot set elongation at 200 ^{0} C (Max) :175.0%
e) Specified Permanent set elongation after cooling (Max) :15.0 %
f) Observed Hot set elongation at 200 ^{0} C : 41.0 %
g) Observed permanent set elongation : 0.60 %

III. TEST ON SEMICONDUCTING LAYERS:

1). Dimensions:

Sl.No	Sample	Observed Values (mm)		Specified Values (mm)	
		Average	Minimum	Average	Minimum
1	Conductor Screen	1.147	1.033	---	0.80
2	Insulation screen	1.192	1.048	---	0.80

2). Resistivity Test for Semiconducting layers:

a) Temperature during measurement: 90 ^{0} C
b) Specified Resistivity
For conductor screen : 1000 Ω -metre (Max)
For insulation screen : 500 Ω-metre (Max)
c) Observed values

Sl.No	Sample	Resistivity in Ω-metre	
		Unaged	Aged
1	Conductor Screen	0.17	0.88
2	Insulation screen	6.33	1.48

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IV. TESTS ON SHEATH: (PVC ST2)

1. Dimension of PVC outer sheath (Non-metallic):

a) Specified Minimum : 2.96 mm
b) Observed Minimum : 4.23 mm

2. Tensile Strength & Elongation at Break:

A. Before Ageing

a) Specified Tensile Strength (Min) : 12.5 N/mm^2
b) Specified Elongation at Break (Min) : 150.0 %
c) Observed Tensile Strength : 20.31 N/mm^2
d) Observed Elongation at Break : 256.0 %

B. Ageing:

a) Sample : Dumb-bell specimens
b) Temperature : 100 ± 2 ^{0} C
c) Duration : 168 Hours

C. After Ageing:

a) Specified Tensile Strength (Min) : 12.5 N/mm^2
b) Specified Elongation at Break (Min) : 150.0 %
c) Observed Tensile Strength : 19.33 N/mm^2
d) Observed Elongation at Break : 236.9 %

D. Variations observed from before ageing samples:

a) Specified percentage variations (Max):± 25 %
b) Observed percentage variations:
Tensile strength : -4.81 %
Elongation at break : -7.46 %

E. Completed Cable Ageing:

Ageing conditions:
a) Sample : 200 mm of Completed cable
b) Duration : 168 hours
c) Temperature : 100 ± 2 ^{0}C

F. After Completed Cable Ageing:

a) Specified Tensile Strength (Min) : 12.5 N/mm^2
b) Specified Elongation at Break (Min) : 150.0 %
c) Observed Tensile Strength : 19.71 N/mm^2
d) Observed Elongation at Break : 250.4 %

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G. Variations observed from before ageing samples:
a) Specified percentage variations (Max):± 25 %
b) Observed percentage variations:
Tensile strength : -2.95 %
Elongation at break : -2.19 %

3. Pressure Test at High Temperature:
a) Test temperature :90 ± 2° C
b) Duration : 6 hours
c) Depth of indentation (specified) : 50 % (Max)
d) Depth of indentation (Observed) : 22.02 %

4. Loss of Mass Test:
a) Sample : Dumb-bell specimens
b) Temperature : 100 ±2° C
c) Duration : 168 hours
d) Specified loss of mass (Max) : 1.5 mg/cm^2
e) Observed loss of mass : 0.68 mg/cm^2

5. Heat Shock Test:
a) Temperature :150 ±3 ° C
b) Duration : One Hour
c) REQUIREMENT : No Cracks or any other abnormalities shall be observed after test.
d) RESULT : No Cracks or any other abnormalities were observed after test.

6. Elongation Test at Low Temperature:
a) Specified Elongation at break (at -15 ±2 Deg.C) : 20.0 % (min)
b) Observed Elongation at break (at -15 ±2 Deg.C): 158 %

7. Impact Test at Low Temperature:
a) Test Temperature : -15 ± 2 ° C
b) Mass of the Hammer : 1500 gms
c) REQUIREMENT : No cracks to be observed after test on both outer and inner surface of sheath
d) RESULT : No cracks or any other abnormalities observed on both outer and inner surface of the sheath.

V. TESTS ON METALLIC SHEATH:

1. Test for Thickness of corrugated Aluminium sheath:
a) Specified Minimum thickness : 1.50 mm
b) Observed Minimum thickness : 1.94 mm

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VI. Longitudinal Water Tightness Test:

a) Bending test:

An Eight metre length of completed cable was subjected for bending test under the following parameters.

(i) Diameter of conductor	: 38.37 mm
(ii) Diameter of Cable	: 98.80 mm
(iii) Diameter of test cylinder	: 3500 mm
(iv) Number of bending cycles	: Three

b) A Six meters long cable was cut from the cable sample which has been subjected to the bending test and placed horizontally. A ring approx. 50 mm wide was removed from the centre of the length up to the insulation screen. A suitable water enclosure with tube of 10 mm diameter was so arranged as to position the tube vertically above the ring. The enclosure was filled with water so that the water level in the tube was maintained at 1 metre height above the cable axis. The sample was subjected to heating cycle as given below, after allowing it to remain for 24 hours.

i) Length of cable	: 6 metres
ii) No. of heating cycles	: 10
iii) Duration of heating	: 8 hours
iv) Temperature of the Conductor during heating cycle	: 95- 100 ^{0} C
v) Duration of cooling	: 16 hours
vi) Result	: No traces of water were observed at the ends of the sample during the test and after the test.

VII. ELECTRICAL TYPE TEST ON CABLE SYSTEM :

The following tests were carried out in the order of sequence.

1. Bending Test :

((i) Diameter of conductor	: 38.37 mm
(ii) Diameter of Cable	: 98.80 mm
(iii) Diameter of test cylinder	: 3500 mm
(iv) Number of bending cycles	: Three

After Bending test , the Cable was provided with two oil filled terminations, Plug in type Dry (GIS) Switchgear termination, and a shield break joint. Then the following tests were carried out in the order of sequence.

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2. Partial Discharge Test:

a) Length of the sample : 24 metres
b) Sensitivity of the detector : 5 pC
c) Status of the sample : Cable with two oil filled outdoor terminations, two Plug in type Dry (GIS) Switchgear termination & one Shield break joint.
d) Method of connection : High voltage applied to conductor and metallic sheath grounded.
e) Pre stressed voltage for 10 sec (1.75 Uo) : 133 kV ac
f) Measuring voltage (1.5 Uo) : 114 kV ac
g) Specified discharge magnitude at 1.5 Uo (Max) : 5 pC
h) Observed Discharge magnitude : Less than 5 pC

3. Tan Delta Measurement: (on separate Cable sample)

(i) Temperature during Measurement : 95 to 100 ^{0}C
(ii) Test Voltage : 76 kV ac
(iii) Specified tan delta at Uo (Max) absolute : 0.0010
(iv) Observed tan delta at Uo absolute : 0.00078

4. Measurement of Capacitance: (On Separate Cable Sample)

(i) Ambient Temperature : 28 ^{0}C
(ii) Test Voltage : 76 kV ac
(iii) Declared Nominal Capacitance : 0.237 μF/km
(iv) Observed Nominal Capacitance : 0.211 μF/km

5. Heating Cycle Voltage Test:

1. The following test conditions were maintained during each heating cycle voltage test on the cable installed with two oil filled terminations, two Plug in type Dry (GIS) Switchgear termination & One Shield break joint
   a) Total duration of heating cycle voltage test : 24 hours
   b) Duration of heating period : 8 hours
   c) Duration of natural cooling period : 16 hours
   d) Temperature of the conductor during heating cycle : 95 to 100 ^{0}C
   e) AC voltage applied throughout the heating cycle voltage test (2Uo) : 152 kV ac
2. Number of heating cycle voltage test : 20
3. RESULT : WITHSTOOD

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6. Partial Discharge Test at Elevated Temperature:

a) Length of the sample : 24 metres
b) Sensitivity of the detector : 5 pC
c) Status of the sample : Cable with two oil filled outdoor terminations, two Plug in type Dry (GIS) Switchgear termination & one Shield break joint
d) Method of connection : High voltage applied to conductor and metallic sheath grounded
e) Temperature of conductor during test : 95 to 100 Deg.C
f) Pre stressed voltage for 10 sec (1.75 Uo) : 133 kV ac
g) Measuring voltage (1.5 Uo) : 114 kV ac
h) Specified discharge magnitude at 1.5 Uo (Max): 5 pC
i) Observed Discharge magnitude : Less than 5 pC

7. Partial Discharge Test at Ambient Temperature:

a) Length of the sample : 24 metres
b) Sensitivity of the detector : 5 pC
c) Status of the sample : Cable with two oil filled outdoor terminations, two Plug in type Dry (GIS) Switchgear termination & one Shield break joint
d) Method of connection : High voltage applied to conductor and metallic sheath grounded
e) Temperature of conductor during test : 29 Deg.C
f) Pre stressed voltage for 10 sec (1.75 Uo): 133 kV ac
g) Measuring voltage (1.5 Uo) :114 kV ac
h) Specified discharge magnitude at 1.5 Uo (Max): 5 pC
i) Observed Discharge magnitude : Less than 5 pC

8 . Lightning Impulse Voltage Withstand Test

a) Dry Temperature: 25 Deg.C,
b) Wet Temperature: 20 Deg.C,
c) Atmospheric Pressure: 685 mm of Hg
d) Temperature of Conductor during Test: 95 to 100 Deg.C

No. of Shots	Test Voltage kV (Peak)				Remarks
	Positive Polarity	Oscillogram No.	Negative Polarity	Oscillogram No.	
1	651	01	656	11	Withstood
2	650	02	650	12	Withstood
3	650	03	650	13	Withstood
4	650	04	650	14	Withstood
5	651	05	649	15	Withstood
6	649	06	650	16	Withstood
7	651	07	649	17	Withstood
8	648	08	650	18	Withstood
9	650	09	651	19	Withstood
10	650	10	649	20	Withstood

Oscillogram 43/1/2014-HV/1947/KEC dated 26/02/2014 (Four Sheets) enclosed

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DIAGNOSTIC, CABLES & CAPACITORS DIVISION
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TEST RESULTS

9. High Voltage Test after Impulse Withstand Test:

a) Test connection : High voltage applied to conductor and metallic sheath grounded
b) Test Voltage : 190 kV ac
c) Duration of test : 15 minutes
d) Ambient Temperature : 25 ^{0} C
e) Length of the sample : 24 metres (Including Terminations)
f) Result : Withstood

The shield break joint was cut from the above sample after high voltage test and subjected to the following test.

VIII .TEST OF OUTER PROTECTION FOR BURIED JOINTS

1. Water immersion and Heat Cycling

The Joint Assembly was immersed in water to a depth of not less than 1 metre at the highest point of the outer protection. Then the samples was subjected to heating/cooling cycles as given below.

Temperature of Water during Heating Cycle : 70 to 75 Deg.C
Duration of Heating Period after attaining temperature : 5 Hours
Total No. of Cycles :Twenty

On Completion of Heating cycles and with the test assembly still immersed, voltage tests are carried out as follows.

a) DC Voltage Test:

i) Test Voltage: 25 kV dc
ii) Duration : One Minute
iii) Ambient Temperature : 27 Deg.C

Sl.No	Test Connection	Test Result
1	Between the metallic sheath of the joint , at either end of the joint	Withstood
2	Between the metallic sheath and the earthed exterior of the joint outer protection	withstood

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b) Impulse Voltage Test between Parts

Test Voltage kV peak	Temperature of Conductor During Test(^{0}C)	Ambient Temperature (^{0}C)		No.of Impulses
		Dry Bulb	Wet Bulb	
75.0	Ambient	32.0	20.0	10 Positive & 10 Negative

Test Connection	Between the metallic sheath of the joint , at either end of the joint

Polarity	Shot Number	Oscillogram Number	Test Result
Positive	First	1745	Withstood
	Tenth	1750	
Negative	First	1755	
	Tenth	1817	

(OSCILLOGRAMS ENCLOSED)

c) Impulse Voltage Test between each part to earth

Test Voltage kV peak	Temperature of Conductor During Test(^{0}C)	Ambient Temperature (^{0}C)		No.of Impulses
		Dry Bulb	Wet Bulb	
37.5 kV	Ambient	32.0	20.0	10 Positive & 10 Negative

Test Connection	Between the metallic sheath and the earthed exterior of the joint outer protection

Polarity	Shot Number	Oscillogram Number	Test Result
Positive	First	1637	Withstood
	Tenth	1643	
Negative	First	1647	
	Tenth	1652	

(OSCILLOGRAMS ENCLOSED)

IX. Visual Examination of Cable & Cable System consisting of two outdoor terminations, two plug n type Dry(FGIS) Switchgear terminations and one shield break joint after completing electrical type tests:

Result: No deterioration or abnormalities were observed to affect the performance of the cable system

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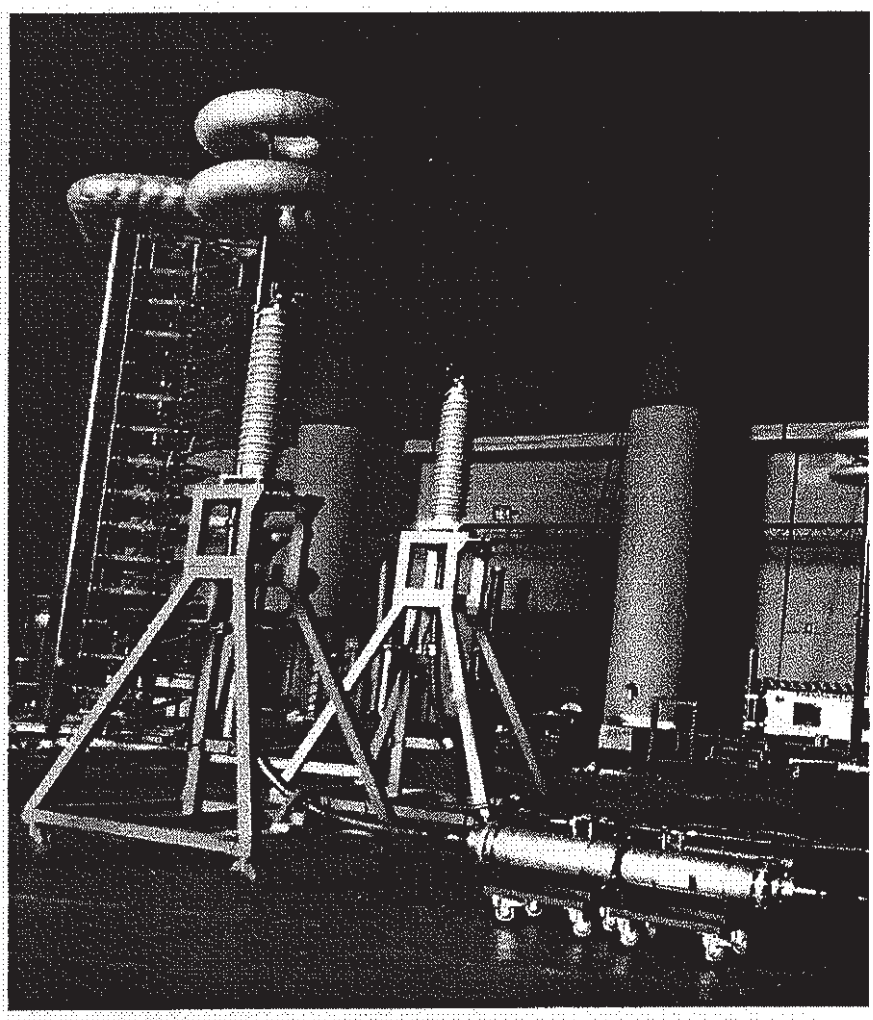

Photograph No.1: Photograph of Cable system

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NOTE

a) The Test results relate only to the item(s) tested.

b) Publication or reproduction of this report in any form other than by complete set of the whole report and in the language written, is not permitted without the written consent of CPRI.

c) Any Corrections/erasure invalidates this test report.

d) NABL has Accredited this laboratory as per ISO 17025-2005 standard, vide certificate no.T-0010 for the tests carried out.

e) Any anomaly/discrepancy in this test report should be brought to our notice within 45 days from the date of issue.

(Thirumurthy)
TEST ENGINEER

Central Power Research Institute
High Voltage Division
Bangalore-80

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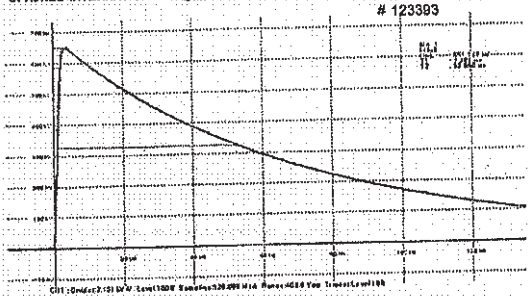
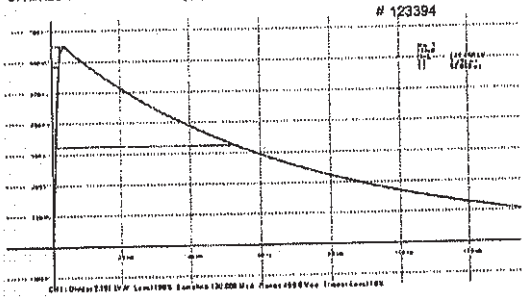
CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:33:56 A # 123393



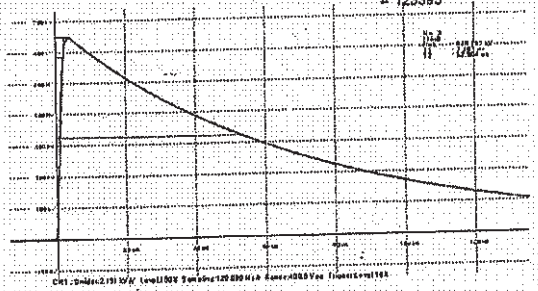
No. 1 LI full Upk: 651.147 kV T1: 2.484 us T2: 52.850 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:34:29 A # 123394



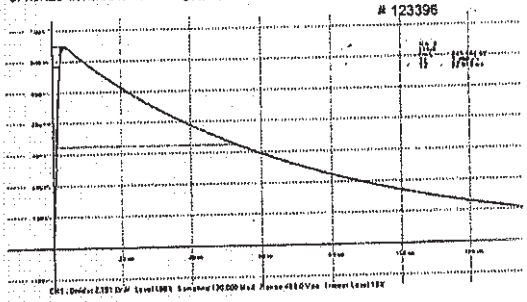
No. 2 LI full Upk: 649.650 kV T1: 2.494 us T2: 52.869 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:35:02 A # 123395



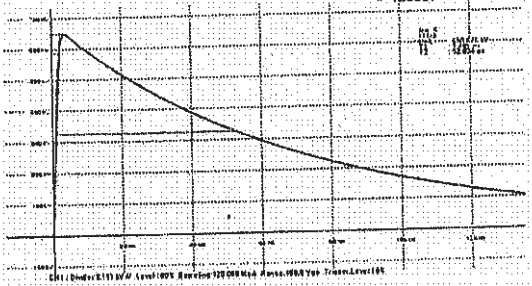
No. 3 LI full Upk: 649.752 kV T1: 2.483 us T2: 52.904 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:35:38 A # 123396



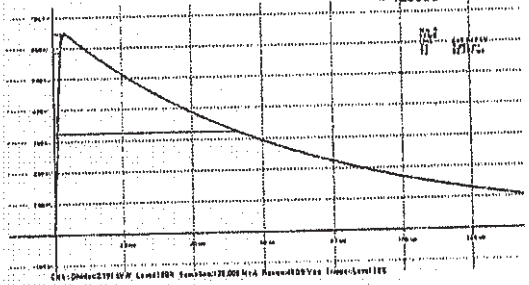
No. 4 LI full Upk: 649.564 kV T1: 2.480 us T2: 52.810 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:36:09 A # 123397



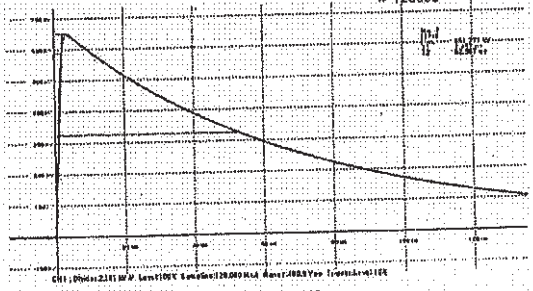
No. 5 LI full Upk: 650.676 kV T1: 2.481 us T2: 52.834 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:36:43 A # 123398



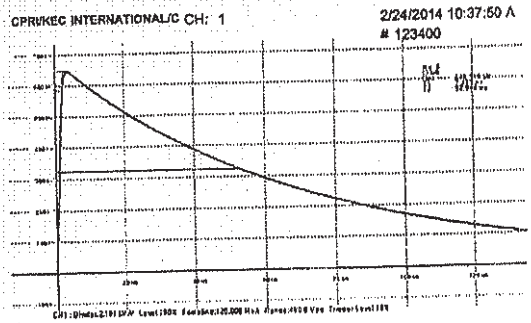
No. 6 LI full Upk: 649.042 kV T1: 2.481 us T2: 52.797 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:37:17 A # 123399



No. 7 LI full Upk: 651.271 kV T1: 2.487 us T2: 52.967 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:37:50 A # 123400



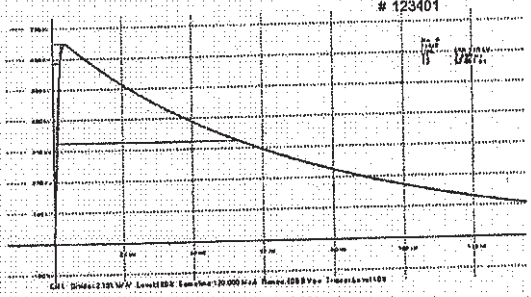
No. 8 LI full Upk: 649.315 kV T1: 2.473 us T2: 52.944 us

Test Report No. 43/1/2014-HV/1947/KEC Dated: 26/02/2014 TEST ENGINEER

Central Power Research Institute
High Voltage Division
Bangalore-80

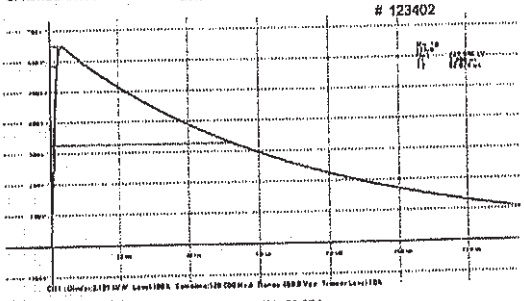
CPRI

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:38:23 A
123401



No. 9 LI full Upk: 650.210 kV T1: 2.499 us T2: 52.861 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:38:57 A
123402



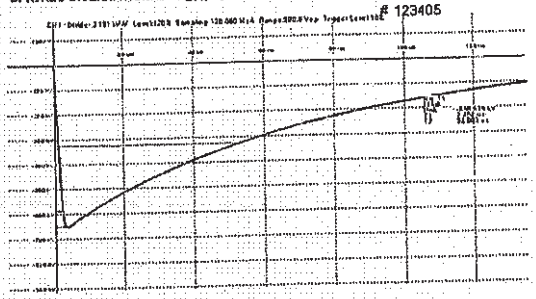
No. 10 LI full Upk: 649.996 kV T1: 2.480 us T2: 52.824 us

Test Report No. 43/1/2014-HV/1947/KEC Dated: 26/02/2014

TEST ENGINEER

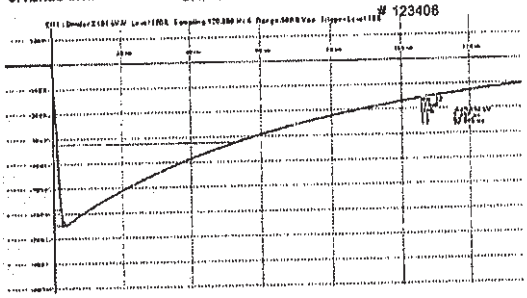
CPRI

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:42:10 A # 123405



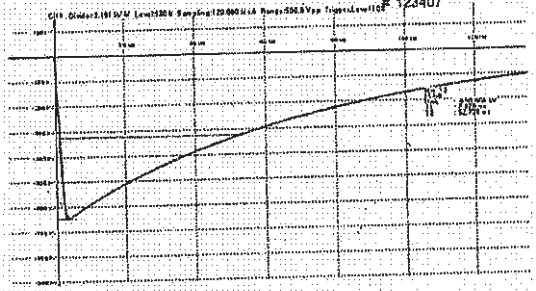
No. 11 LI full Upk: -655.519 kV T1: 2.484 us T2: 52.803 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:42:44 A # 123406



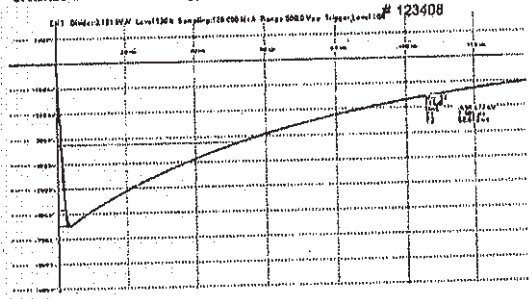
No. 12 LI full Upk: -649.884 kV T1: 2.492 us T2: 52.845 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:43:17 A # 123407



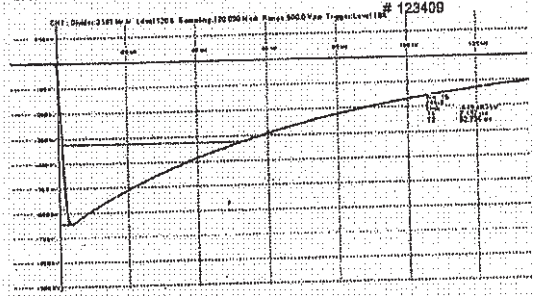
No. 13 LI full Upk: -650.066 kV T1: 2.478 us T2: 52.725 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:43:51 A # 123408



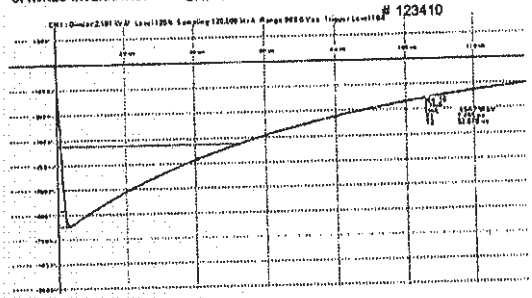
No. 14 LI full Upk: -650.477 kV T1: 2.501 us T2: 52.813 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:44:24 A # 123409



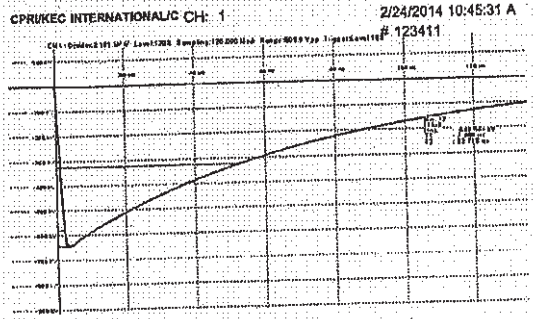
No. 15 LI full Upk: -649.483 kV T1: 2.497 us T2: 52.736 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:44:58 A # 123410



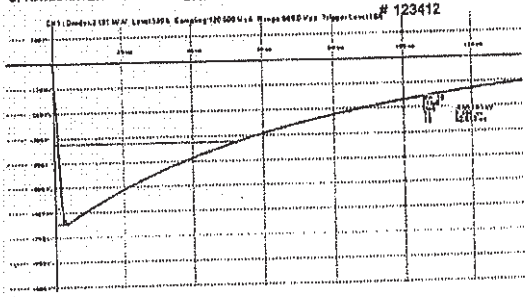
No. 16 LI full Upk: -650.295 kV T1: 2.496 us T2: 52.879 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:45:31 A # 123411



No. 17 LI full Upk: -648.964 kV T1: 2.486 us T2: 52.718 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:46:04 A # 123412



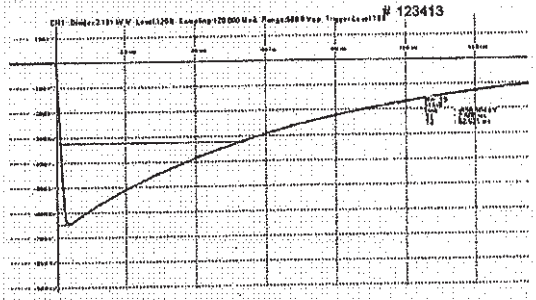
No. 18 LI full Upk: -650.183 kV T1: 2.486 us T2: 52.643 us

Test Report No. 43/1/2014-HV/1947/KEC Dated: 26/02/2014 TEST ENGINEER

CPRI

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:46:38 A

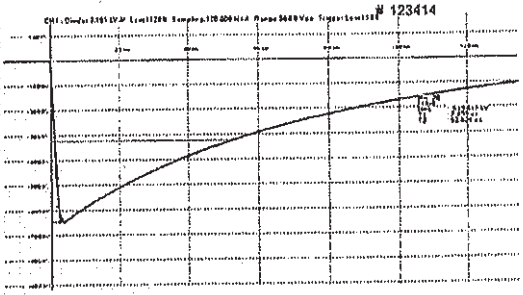
123413



No. 19 LI full Upk: -650.504 kV T1: 2.505 us T2: 52.821 us

CPRI/KEC INTERNATIONAL/C CH: 1 2/24/2014 10:47:11 A

123414



No. 20 LI full Upk: -649.012 kV T1: 2.499 us T2: 52.634 us

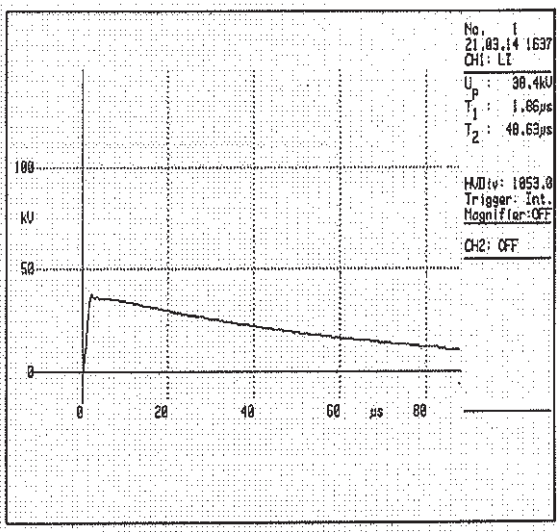
Test Report No. 43/1/2014-HV/1947/KEC Dated: 26/02/2014

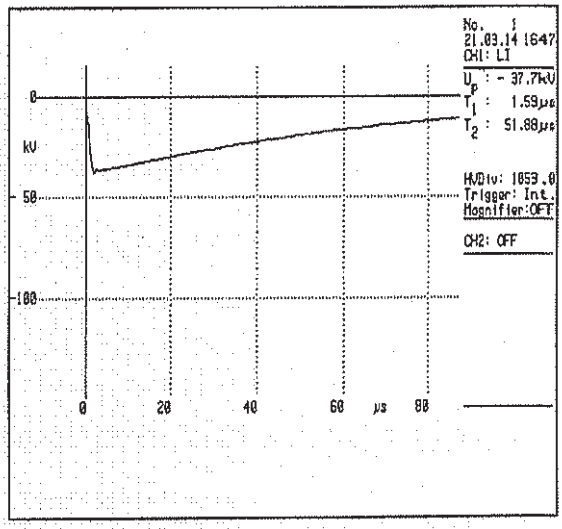
TEST ENGINEER

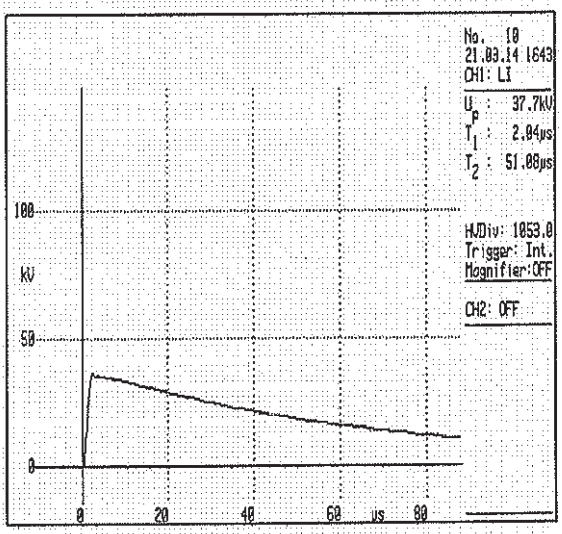
CENTRAL POWER RESEARCH INSTITUTE

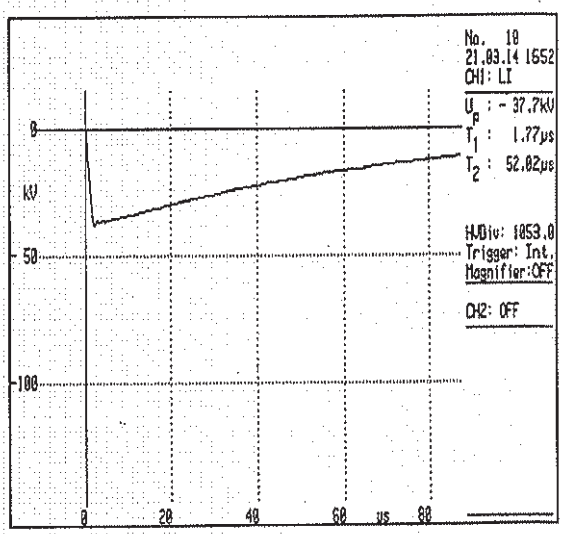
CPRI

Customer : M/s KEC International Ltd, Vadodara
Test Report No. & Date : DCCD-13826 Dated: 25.03.2014
Sample Code : DCCDCAB13S0201









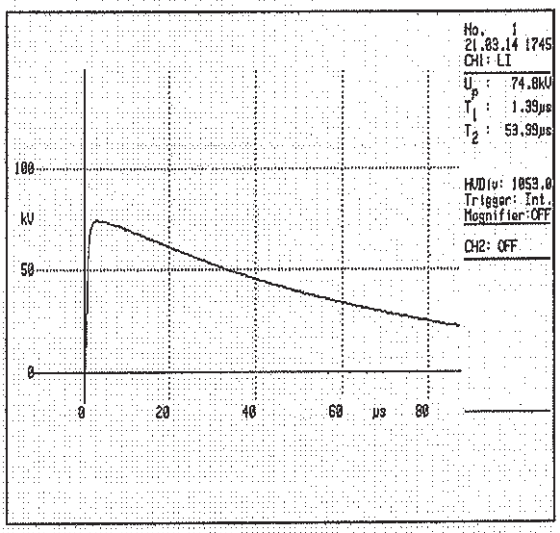
(Thirumurthy)
TEST ENGINEER

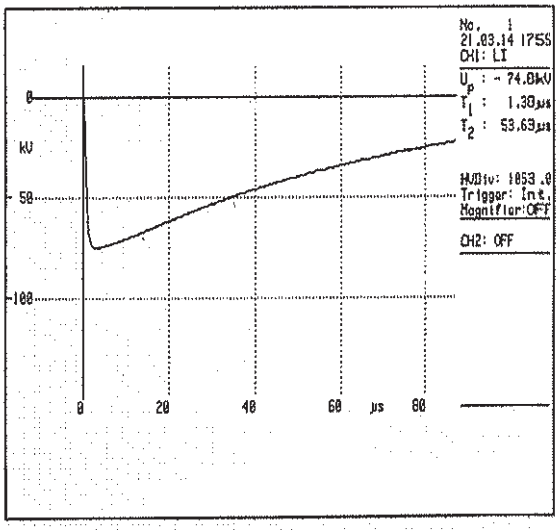
DIAGNOSTIC, CABLES & CAPACITORS DIVISION
CABLES & CAPACITORS DIVISION
P.B.NO.8066, SADASHIVANAGAR P.O
PROF.SIR.C.V.RAMAN ROAD, BANGALORE - 560 080, INDIA
Tele/Fax: +91 (0) 80-2360 4435

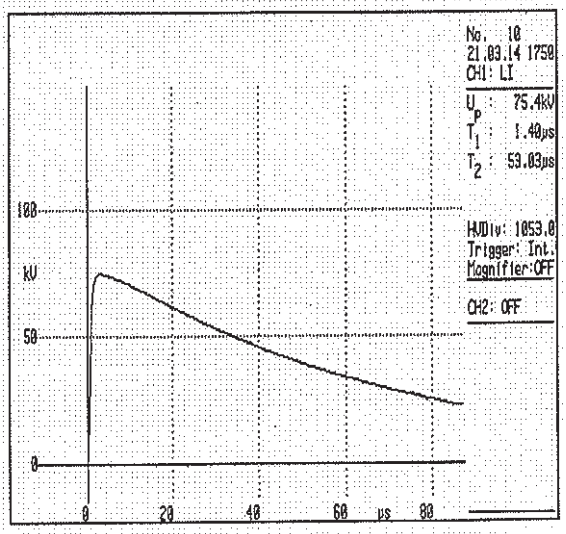
CENTRAL POWER RESEARCH INSTITUTE

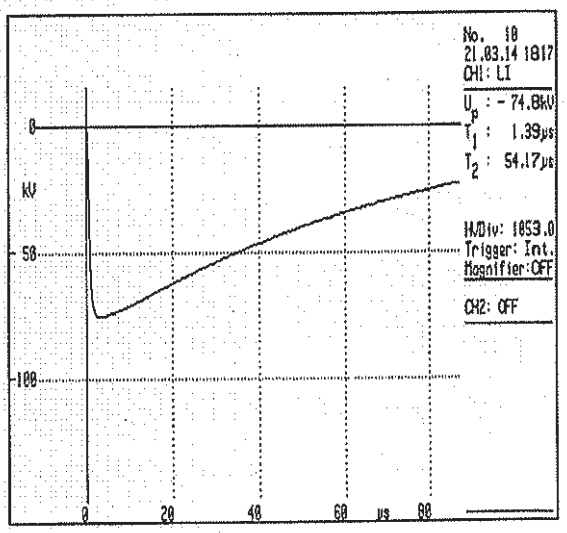
CPRI

Customer : M/s KEC International Ltd, Vadodara
Test Report No. & Date : DCCD-13826 Dated: 25.03.2014
Sample Code : DCCDCAB13S0201









(Thirumurthy)
TEST ENGINEER

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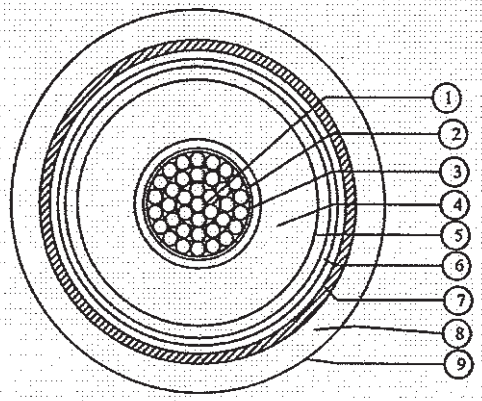
Tele/Fax: +91 (0) 80-2360 4435

CROSS SECTIONAL SKETCH

132kV(E), 1x1000mm²



Sr. No.	Description	Material
1	Conductor	Copper Conductor compacted circuler - Approx dia - 37.8 mm
2	Tape over conductor	Semiconducting Tape
3	Conductor Screen	Semiconducting XLPE compound - Minimum thickness - 0.8 mm
4	Insulation	XLPE compond - Minimum thickness - 16.2 mm
5	Insulation Screen	Semiconducting XLPE compound - Minimum thickness - 0.8 mm
6	Longitudinal Water Blocking	Semiconducting Water Blocking
7	Radial Water Blocking	Corrugated aluminium Sheath - Minimum thickness - 1.5 mm
8	Outer Sheath	PVC Type ST 2 Minimum thickness - 2.96 mm
9	Semi-conducting Layer	Graphite Powder Coating Overall diameter of cable - 99.0 Approximate

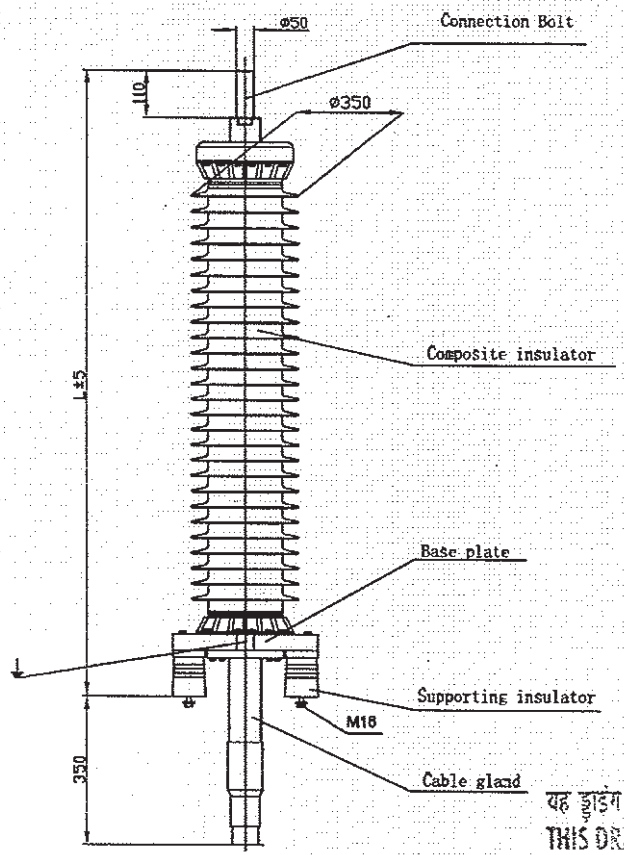
Testing shall be carried out as per IEC 60840-2011

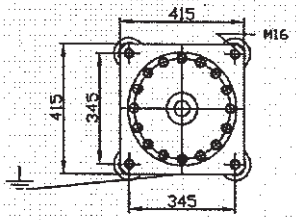
यह कुटेशन [illegible] से संबंधित है।
THIS QUOTATION [illegible] TEST REPORT
सं. क्रमांक 13826
दिनांक/Dated 25.03.2014

परीक्षण इंजीनियर/Test Engineer

SCALE : N.T.S.

	Date : 11.05.2013	**KEC INTERNATIONAL LTD. "Brand name RPG Cables.,**
Voltage : 76/132 kV	**Drawn by : BS**	**Vadodara**
Type: 2XAY		**EHV/Al Sh**





Main technical parameter

Highest Voltage (Um)	kV	145
Lightning Impulse Voltage	kV	650
Length	mm	1850
Diameter over sheds S	mm	350
Cantilever Force	N	5000
Flashover distance	mm	1340
Creepage Distance	mm	4500
Pollution Level (IEC60137:1995;VDE0674 Teil5) at U_m		IV
Oil Volume approx.	l	47
Weight approx.	kg	140
Conductor Size Cu	mm^2	1000
Outer Diameter Cable insulation	mm	74.7
Outer Diameter Cable Oversheath	mm	99

यह ड्राइंग सं. [illegible] की संलग्न रिपोर्ट से संबंधित है।
THIS DRAWING [illegible] TEST REPORT
सं. डी [illegible] 13826
दिनांक [illegible] 25.03.2024

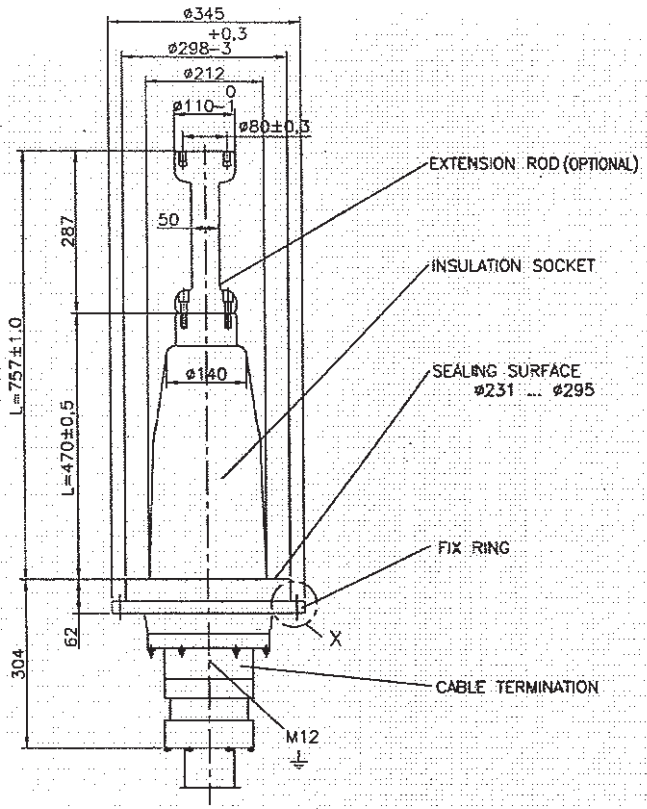
परीक्षण इंजीनियर/Test Engineer

Raychem RPG
TE ITC CONNECTIVITY-RPG ENTERPRISE JV RPG

REV	DESCRIPTION	DSND	SCK DRWN	FA CHKD	FA APPD
A	New Drg prepared.				

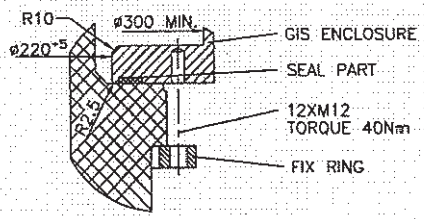
	NAME	DATE
DSGN		
DRWN	SCK	2013-12-18
CHKD	FA	2013-12-19
APPD	FA	2013-12-19

TITLE : 145KV OUTDOOR OIL FILLED TERMINATION WITH COMPOSITE INSULATOR TYPE: OHVT-145C
SCALE : NTS
DRAWING No. : C T T 9 0 0 0 2 0 - 0 0 1
SHEET 1 OF 1
REV. A
RELEASED FOR ☐ PRELIMINARY ☐ [illegible] ☐ INFORMATION ☒ APPROVAL ☐ CONSTRUCTION
PROJECTION



DETAIL X

(FIX METHOD INDICATION)

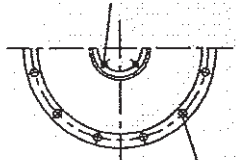


NOTE:
DEFINED BY IEC 60859 AND IEC 62271-209,
THE GIS ENCLOSURE, SEAL PART AND SCREW M12 IN
UPSIDE DRAWING ARE NOT PROVIDED WITH PRODUCT TOGETHER.

TECHNICAL PARAMETER

MAX. OPERATION VOLTAGE Um	kV	145
LIGHTING IMPULSE WITHSTAND(BIL)	kV	650
LENGTH (WITH EXTENSION ROD)	mm	470 (757)
GROSS WEIGHT WITH EXTENSION ROD	kg	42
SF6 OPERATION PRESSURE	bar	2~6
CABLE INSULATION DIAMETER	mm	74.7
CABLE OUTER JACKET DIAMETER	mm	99
CABLE CROSS-SECTION Cu	mm²	1000

HV ELECTRODE
4xM10x25 SCREW HOLES EQUALLY
DISTRIBUTED AT ø80±0.3



FOLLOWS IEC60859 & IEC62271-209
BOTTOM FLANGE
12xø14 EQUALLY DISTRIBUTED AT ø320±0.5

यह ड्राइंग सीधिडार्ट की परीक्षण रिपोर्ट से संबंधित है।
THIS DRAWING IS ... TEST REPORT
सं. डीसी ... 13826
दिनांक/Dated ... 25.03.2014

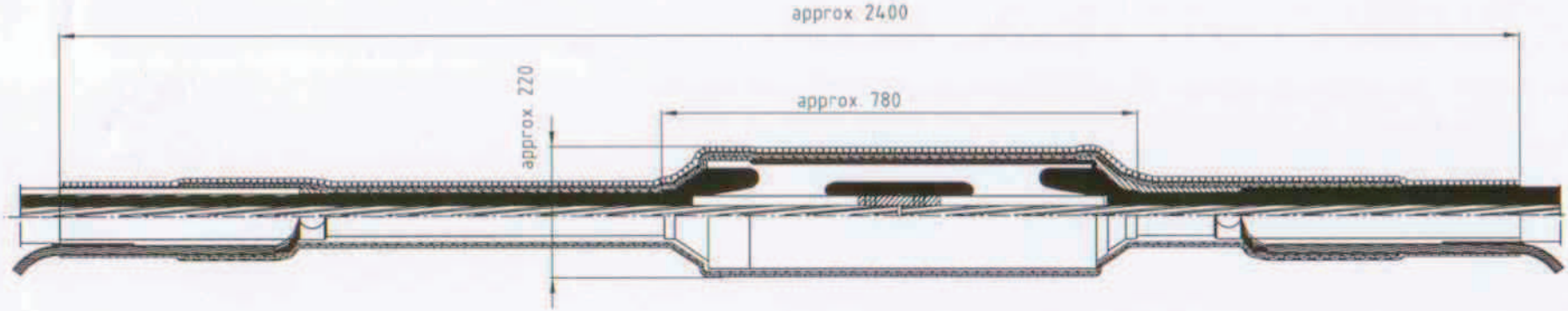
परीक्षण इंजीनियर/Test Engineer

Raychem RPG
TE (TE CONNECTIVITY-RPG ENTERPRISES JV)

REV	DESCRIPTION	DSND	DRWN	CHKD	APPD
A	New Drg prepared.		SDK	FA	FA

	NAME	DATE
DSGN		
DRWN	SDK	2013-12-18
CHKD	FA	2013-12-18
APPD	FA	2013-12-18

TITLE: 145KV INDOOR DRY TYPE GIS TERMINATION TYPE: PMS-145
SCALE : NTS
DRAWING No. E T T 9 8 8 2 8 - 0 0 2
SHEET 1 OF 1
REV. A
RELEASED FOR ☐ PRELIMINARY ☐ TENDER ☐ INFORMATION ☑ APPROVAL ☐ CONSTRUCTION
PROJECTION



यह ड्राइंग सीपीआरआई की परीक्षण रिपोर्ट से संबंधित है।
THIS DRAWING PERTAINS TO CPRI TEST REPORT
सं. डीसीई/DCE No. 13826
दिनांक/Dated 25.03.2014
परीक्षण इंजीनियर/Test Engineer

Technical Data EHVS-145SWS

Highest Voltage U_m	kV	145
Lightning Impulse Voltage	kV	650
Length	mm	2400
Diameter	mm	220
Weight approx.	kg	40
Max. Conductor Size Cu	mm²	1000
Outer Diameter Cable Insulation	mm	74.7
Outer Diameter Cable Oversheath	mm	99

REV	DESCRIPTION	DSND	DRWN	CHKD	APPD
A	New Drg prepared.		SCK	FA	FA

Raychem RPG
TE CONNECTIVITY-RPG ENTERPRISES JV

	NAME	DATE
DSGN		
DRWN	SCK	2013-12-18
CHKD	FA	2013-12-18
APPD	FA	2013-12-18

TITLE : 145KV SHIELD BREAK JOINT WITH HEAT SHRINK WRAPAROUND PROTECTION TYPE: EHVS-145SWS
SCALE : NTS
DRAWING No. 1 E Y 1 9 0 0 0 2 8 - 0 0 3
SHEET 1 OF 1
REV. A
RELEASED FOR ☐ PRELIMINARY ☐ TENDER ☐ INFORMATION ☑ APPROVAL ☐ CONSTRUCTION
PROJECTION