



ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION
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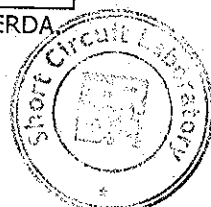


TEST REPORT

SHEET 1 OF 13

NAME & ADDRESS OF CUSTOMER CROMPTON GREAVES LIMITED. S6 DIVISION, D-2 MIDC, WALUJ, AURANGABAD - 431 136. MAHARASHTRA, INDIA.	REPORT No.: LSCS/091 DATE: 23.06.2011	
	CUSTOMER REF. NO.: NIL	DATED: 01.06.2011
	DATE OF SAMPLE RECEIPT:	DATE OF TESTING:
	01.06.2011	01.06.2011 to 13.06.2011
SAMPLE DESCRIPTION 145 kV CURRENT TRANSFORMER Rated voltage: 132 kV, H.S.V : 145kV Ratio: 600-300/1-1-1-1A for core 1, 2, 4 & 5. 300-150/1A for core 3. Burden: -/-/20/-/-VA, No. of Cores: Five, Frequency: 50 Hz., Class: PS/PS/0.2/PS/PS Rated Insulation Level: 275 kVrms/650 kVp Rated short time current & its duration: 31.5 kArms for 1 Sec. With 80 kApeak Further details as per sheet No. 4 OF 13	SAMPLE IDENTIFICATION ERDA IDENTIFICATION NO.: LSCS-11-049/01 SERIAL No.: 102076 TYPE: IOSK:145/275/650 DRAWING NO.: 413512676 CT2 GA REV. NO. 1 SHT. NO 2. 413512676 CT2 RS-E REV. NO. 0 SHT NO. 4. 413512676 CT2 SB REV. NO. 0 SHT NO. 6.	
	TEST DETAILS As per SHEET 2 OF 13 ENCLOSURES: NUMBER OF OSCILLOGRAM : TWO NUMBER OF PHOTOGRAPH : ONE NUMBER OF TEST CIRCUIT DIAGRAM : ONE NUMBER OF DRAWINGS : THREE TEST WITNESSED BY: Mr. VIVEK S. DANDAWATE	TEST SPECIFICATIONS As per customer's requirement Test procedure followed as per IEC 60044-1 : 2003.
REMARKS: The sample conforms to the requirement of test carried out as specified on SHEET 2 OF 13.		
 PREPARED BY	 CHECKED BY	 APPROVED BY

NOTE: 1. This report relates only to the particular sample received for testing in good condition at ERDA.
2. This report cannot be reproduced in part under any circumstances.
3. Publication of this report requires prior permission in writing from Director, ERDA.
4. Only test asked for by customer have been carried out.



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DATE: 23.06.2011

SHEET 2 OF 13

TEST DETAILS:

Tests	Standards Details
Current Error And Phase Displacement (Accuracy Test) (Before & After short time current test)	Cl.No.11.5 of IEC 60044-1:2003
Turns Ratio Error For PS Class (Before & After short time current test)	Sub Cl.No.14.4.3 of IEC 60044-1:2003
Knee Point Voltage And Exciting Current For PS Class (Before & After short time current test)	Sub Cl.No.14.4.1 of IEC 60044-1:2003
Winding Resistance Measurement For PS Class (Before & After short time current test)	Sub Cl.No.14.4.2 of IEC 60044-1:2003
Measurement Of Instrument Security Factor For Metering Class (Before & After short time current test)	Cl. No. 11.6 of IEC 60044-1:2003
Short Time Current Test	As per customer's requirement, Test procedure followed as per Cl.No.7.1 of IEC 60044-1:2003
High Voltage Power Frequency Dry Test (After short time current test)	Sub Cl.No.8.2.1 & 8.3 of IEC 60044-1:2003
*Partial Discharge Measurement (After short time current test)	Sub Cl.No.8.2.2. of IEC 60044-1: 2003
Inter Turn Overvoltage Test (After short time current test)	Cl.No.8.4 & 14.2.2 of IEC 60044-1:2003

*** NOTE:** Sub contracted – Tests were carried out at customer's premises.

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SHEET 3 OF 13

Contents	
Technical specification of test object assigned by customer	Sheet No. 4 of 13
Tests results before short time current test	Sheet No. 5 of 13 to Sheet No. 7 of 13
Short time current test	Sheet No. 8 of 13
Tests results after short time current test	Sheet No. 9 of 13 to Sheet No. 13 of 13.
Oscillogram No.	103/01 to 103/02
Photograph No.	LSCS-11-049/156
Test circuit diagram No.	OLSC/IT/13
Drawing No.	413512676 CT2 GA REV. NO. 1 SHT. NO 2. 413512676 CT2 RS-E REV. NO. 0 SHT NO. 4. 413512676 CT2 SB REV. NO. 0 SHT NO. 6.

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SHEET 4 OF 13

TECHNICAL SPECIFICATIONS ASSIGNED BY CUSTOMER

1. Name of manufacturer : **CROMPTON GREAVES LIMITED.**
2. Equipment : **145 kV CURRENT TRANSFORMER**
3. Standard reference : As per customer's requirement
Test procedure followed as per
IEC 60044-1: 2003
4. Rated voltage : 132 kV
5. H.S.V. : 145 kV
6. Type : IOSK: 145/275/650
7. Sr. No. : 102076
8. Number of cores : Five
9. Rated insulation level : 275kVrms/650kVp
10. Rated frequency : 50 Hz
11. Rated short time current & its duration : 31.5 kArms for 1 sec. with 80 kApeak
12. Core Details :

Core No.	1	2	3	4	5
Ratio (Amp.)	600-300/1	600-300/1	300-150/1	600-300/1	600-300/1
Rated Burden (VA)	--	--	20	--	--
Accuracy Class	PS	PS	0.2	PS	PS
Knee point voltage (Volt)(Min.)	600/300	600/300	--	600/300	600/300
ISF	--	--	≤5	--	--
Exciting current at V _k (mA)(Max.)	30/60	30/60	--	30/60	30/60
Resistance at 75°C (ohms)	≤6/≤3	≤6/≤3	--	≤6/≤3	≤6/≤3

13. No. of secondary turns : 1800 in core 1, 2, 4 & 5.
900 in core 3.
14. Material of Secondary Winding : Copper
15. No of primary turns : 3
16. Material of Primary Winding : Aluminium
17. Size of primary : 1st TURN: ROD - ø 50
2nd TURN: TUBE = ø 70/80 (ID. /OD.)
3rd TURN: TUBE = ø 90/100 (ID. /OD.)
3rd TURN: FLAT = 70x6 THK. = 2 Nos.
18. Class of insulation : A

NOTE: The current transformer is hermetically sealed. So, on the request of customer primary & secondary conductor was not verified.

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**REPORT NO. LSCS/091****SHEET 5 OF 13****DATE: 23.06.2011****TEST RESULTS BEFORE SHORT TIME CURRENT TEST****A) CURRENT ERROR AND PHASE DISPLACEMENT (ACCURACY TEST)**

[Cl.No.11.5 of IEC 60044-1: 2003]

1) At 100% Burden:

Test conducted on core 3 of current transformer at ratio 300/1 Amp. Class: 0.2

Sr. No.	Test at % of rated current applied	Tested Between Terminals	Burden connected in VA	Power factor = 0.8	
				Current Error (%)	Phase Displacement (minutes)
1.	5	3S1 - 1 (Short 2-3S3)	20	-0.0773	4.13
2.	20	3S1 - 1 (Short 2-3S3)	20	-0.0478	2.24
3.	100	3S1 - 1 (Short 2-3S3)	20	0.0054	0.024
4.	120	3S1 - 1 (Short 2-3S3)	20	0.0124	0.00

2) At 25% Burden:

Test conducted on core 3 of current transformer at ratio 300/1 Amp. Class: 0.2

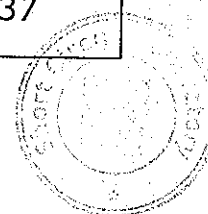
Sr. No.	Test at % of rated current applied	Tested Between Terminals	Burden connected in VA	Power factor = 0.8	
				Current Error (%)	Phase Displacement (minutes)
1.	5	3S1 - 1 (Short 2-3S3)	5	0.055	1.67
2.	20	3S1 - 1 (Short 2-3S3)	5	0.0631	1.22
3.	100	3S1 - 1 (Short 2-3S3)	5	0.0719	0.64
4.	120	3S1 - 1 (Short 2-3S3)	5	0.0734	0.57

3) At 100% Burden:

Test conducted on core 3 of current transformer at ratio 150/1 Amp. Class: 0.2

Sr. No.	Test at % of rated current applied	Tested Between Terminals	Burden connected in VA	Power factor = 0.8	
				Current Error (%)	Phase Displacement (minutes)
1.	5	3S1 - 1 (Short 2-3S2)	20	-0.362	9.80
2.	20	3S1 - 1 (Short 2-3S2)	20	-0.250	3.68
3.	100	3S1 - 1 (Short 2-3S2)	20	-0.107	0.53
4.	120	3S1 - 1 (Short 2-3S2)	20	-0.132	2.37

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**REPORT NO. LSCS/091****SHEET 6 OF 13****DATE: 23.06.2011****4) At 25% Burden:**

Test conducted on core 3 of current transformer at ratio 150/1 Amp. Class: 0.2

Sr. No.	Test at % of rated current applied	Tested Between Terminals	Burden connected in VA	Power factor = 0.8	
				Current Error (%)	Phase Displacement (minutes)
1.	5	3S1 - 1 (Short 2-3S2)	5	0.0555	3.93
2.	20	3S1 - 1 (Short 2-3S2)	5	0.0749	2.53
3.	100	3S1 - 1 (Short 2-3S2)	5	0.110	0.65
4.	120	3S1 - 1 (Short 2-3S2)	5	0.114	0.54

B) TURNS RATIO ERROR FOR PS CLASS

[Cl.No.14.4.3 of IEC 60044-1: 2003]

Test conducted on core 1, 2, 4 & 5 of current transformer at ratio 600-300/1 Amp.

Sr. No.	Test at % of rated current applied	Tested Between Terminals	Turns Ratio Error %
1.	100	1S1-1S2	-0.0159
2.	100	1S1-1S3	-0.0664
3.	100	2S1-2S2	-0.0266
4.	100	2S1-2S3	-0.0308
5.	100	4S1-4S2	-0.0223
6.	100	4S1-4S3	-0.0153
7.	100	5S1-5S2	-0.0290
8.	100	5S1-5S3	-0.0139

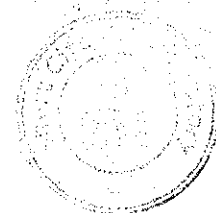
C) WINDING RESISTANCE MEASUREMENT (For PS class)

[Cl.No.14.4.2 of IEC 60044-1: 2003]

Test conducted on core 1, 2, 4 & 5 of current transformer at ratio 600-300/1 Amp.

Sr. No.	Measured between terminals	Rct at Ambient Temp. 35.6°C (Ω)	Rct at 75 °C (Ω)
1.	1S1-1S2	1.869	2.141
2.	1S1-1S3	4.630	5.304
3.	2S1-2S2	1.790	2.051
4.	2S1-2S3	4.441	5.088
5.	4S1-4S2	1.836	2.103
6.	4S1-4S3	4.666	5.345
7.	5S1-5S2	1.882	2.156
8.	5S1-5S3	4.877	5.587

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DATE: 23.06.2011

D) KNEE POINT VOLTAGE AND EXCITING CURRENT (For PS Class) [Cl.No.14.4.1 of IEC 60044-1: 2003]

Test conducted on core 1, 2, 4 & 5 of current transformer at ratio 600-300/1 Amp.

Sr. No.	Tested between terminals	Specified knee-point Voltage (Vk) In Volt		Excitation current measured (mA)
1.	1S1-1S2	Vk	300	18.6
		1.1Vk	330	21.0
2.	1S1-1S3	Vk	600	8.9
		1.1Vk	660	10.6
3.	2S1-2S2	Vk	300	25.1
		1.1Vk	330	30.3
4.	2S1-2S3	Vk	600	12.4
		1.1Vk	660	14.9
5.	4S1-4S2	Vk	300	30.6
		1.1Vk	330	37.2
6.	4S1-4S3	Vk	600	15.0
		1.1Vk	660	18.5
7.	5S1-5S2	Vk	300	20.1
		1.1Vk	330	22.3
8.	5S1-5S3	Vk	600	9.4
		1.1Vk	660	11.0

E) MEASUREMENT OF INSTRUMENT SECURITY FACTOR

[Cl. No. 11.6 of IEC 60044-1:2003]

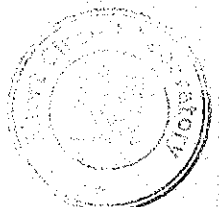
Test conducted on core 3 of current transformer at ratio 300-150/1 Amp.

Tested between terminals	Exciting current (Amp.)	Secondary Limiting e.m.f calculated (Volts)	Measured voltage at I _{ex} (Volts)	ISF	
				Required	Measured
3S1-1 (Short 2 - 3S3)	0.5	107.40	96.3	≤5	4.48
3S1 - 1 (Short 2-3S2)	0.5	102.83	96.3	≤5	4.68

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DATE: 23.06.2011

SHORT TIME CURRENT TEST

[Cl.No.7.1 of IEC 60044-1: 2003]

The short time current test was performed on primary winding connected to source as per test circuit diagram no.: OLSC/IT/13 and secondary winding short circuited through a copper link of negligible impedance.

Condition of the equipment under test: As after tests mentioned in sheet 5, 6, 7 OF 13.

CT Ratio: 600-300/1-1-1-1 Amp. For core 1, 2, 4 & 5.
300-150/1 Amp. For core 3.

Test No.	Oscillogram No.	Short circuit current (kA)		Duration (sec.)	Test Details	Observation During test
		Peak	Rms			
1.	103/01	-	31.832	1.003	Thermal current Withstand test	No Abnormality
2.	103/02	81.044	-	0.063	Dynamic peak Withstand test	No Abnormality

Observation after test: - No visible damage observed.
- C.T. body was intact.

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**REPORT NO. LSCS/091****DATE: 23.06.2011****SHEET 9 OF 13****TEST RESULTS AFTER SHORT TIME CURRENT TEST****A) CURRENT ERROR AND PHASE DISPLACEMENT (ACCURACY TEST)**
[Cl.No.11.5 of IEC 60044-1: 2003]**1) At 100% Burden:**

Test conducted on core 3 of current transformer at ratio 300/1 Amp. Class: 0.2

Sr. No.	Test at % of rated current applied	Tested between Terminals	Burden connected in VA	Power factor =0.8		Difference in errors after Short time current test	
				Current Error (%)	Phase Displacement (minutes)	Current Error (%)	Phase Displacement (minutes)
1.	5	3S1 - 1 (Short 2-3S3)	20	-0.0752	4.17	-0.0021	-0.04
2.	20	3S1 - 1 (Short 2-3S3)	20	-0.0452	2.15	-0.0026	0.09
3.	100	3S1 - 1 (Short 2-3S3)	20	-0.0018	0.31	0.0072	-0.286
4.	120	3S1 - 1 (Short 2-3S3)	20	0.0061	0.04	0.0063	-0.04

2) At 25% Burden:

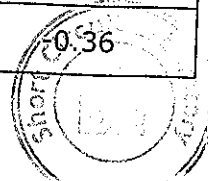
Test conducted on core 3 of current transformer at ratio 300/1 Amp. Class: 0.2

Sr. No.	Test at % of rated current applied	Tested between Terminals	Burden connected in VA	Power factor =0.8		Difference in errors after Short time current test	
				Current Error (%)	Phase Displacement (minutes)	Current Error (%)	Phase Displacement (minutes)
1.	5	3S1 - 1 (Short 2-3S3)	5	0.0576	1.60	-0.0026	0.07
2.	20	3S1 - 1 (Short 2-3S3)	5	0.0645	1.15	-0.0014	0.07
3.	100	3S1 - 1 (Short 2-3S3)	5	0.0720	0.56	-0.0001	0.08
4.	120	3S1 - 1 (Short 2-3S3)	5	0.0731	0.49	0.0003	0.08

3) At 100% Burden:

Test conducted on core 3 of current transformer at ratio 150/1 Amp. Class: 0.2

Sr. No.	Test at % of rated current applied	Tested between Terminals	Burden connected in VA	Power factor =0.8		Difference in errors after Short time current test	
				Current Error (%)	Phase Displacement (minutes)	Current Error (%)	Phase Displacement (minutes)
1.	5	3S1 - 1 (Short 2-3S2)	20	-0.364	10.35	0.002	-0.55
2.	20	3S1 - 1 (Short 2-3S2)	20	-0.247	3.85	-0.003	-0.17
3.	100	3S1 - 1 (Short 2-3S2)	20	-0.110	0.74	0.003	-0.21
4.	120	3S1 - 1 (Short 2-3S2)	20	-0.137	2.73	0.005	-0.36

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DATE: 23.06.2011

4) At 25% Burden:

Test conducted on core 3 of current transformer at ratio 150/1 Amp. Class: 0.2

Sr. No.	Test at % of rated current applied	Tested between Terminals	Burden connected in VA	Power factor =0.8		Difference in errors after Short time current test	
				Current Error (%)	Phase Displacement (minutes)	Current Error (%)	Phase Displacement (minutes)
1.	5	3S1 - 1 (Short 2-3S2)	5	0.0631	3.67	-0.0076	0.26
2.	20	3S1 - 1 (Short 2-3S2)	5	0.0814	2.28	-0.0065	0.25
3.	100	3S1 - 1 (Short 2-3S2)	5	0.112	0.63	-0.002	0.02
4.	120	3S1 - 1 (Short 2-3S2)	5	0.117	0.45	-0.003	0.09

Results: The difference in current error and phase displacement measured before and after short time current test found **within** half the limit of accuracy class as specified in standard.

B) TURNS RATIO ERROR FOR PS CLASS

[Cl.No.14.4.3 of IEC 60044-1: 2003]

Test conducted on core 1, 2, 4 & 5 of current transformer at ratio 600-300/1 Amp.

Sr. No.	Test at % of rated current applied	Tested Between Terminals	Turns Ratio Error %	Difference in Turns Ratio Error after Short time current test (%)
1.	100	1S1-1S2	-0.0283	0.0124
2.	100	1S1-1S3	-0.0730	0.0066
3.	100	2S1-2S2	-0.0391	0.0125
4.	100	2S1-2S3	-0.0239	-0.0069
5.	100	4S1-4S2	-0.0333	0.011
6.	100	4S1-4S3	-0.0185	0.0032
7.	100	5S1-5S2	-0.0543	0.0253
8.	100	5S1-5S3	-0.0241	0.0102

Results: The difference in Turns ratio error measured before and after short time current test found **within** half the limit of accuracy class as specified in standard.

C) WINDING RESISTANCE MEASUREMENT (For PS class)

[Cl.No.14.4.2 of IEC 60044-1: 2003]

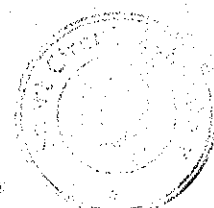
Test conducted on core 1, 2, 4 & 5 of current transformer at ratio 600-300/1 Amp.

Sr. No.	Measured between terminals	Rct at Ambient Temp. 35.1°C (Ω)	Rct at 75 °C (Ω)
1.	1S1-1S2	1.855	2.129
2.	1S1-1S3	4.610	5.291
3.	2S1-2S2	1.779	2.042
4.	2S1-2S3	4.426	5.080
5.	4S1-4S2	1.821	2.090
6.	4S1-4S3	4.645	5.331
7.	5S1-5S2	1.867	2.143
8.	5S1-5S3	4.855	5.572

TE 0650984

PREPARED BY: *D. J. Phalot*

CHECKED BY: *Alhas*





Certificate No. : T-0071

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Web : http://www.erda.org

**REPORT NO. LSCS/091****SHEET 11 OF 13****DATE: 23.06.2011****D) KNEE POINT VOLTAGE AND EXCITING CURRENT** (For PS Class)

[Cl.No.14.4.1 of IEC 60044-1: 2003]

Test conducted on core 1, 2, 4 & 5 of current transformer at ratio 600-300/1 Amp.

Sr. No.	Tested between terminals	Specified knee-point Voltage (Vk) in Volt		Excitation current measured (mA)
1.	1S1-1S2	Vk	300	18.9
		1.1Vk	330	21.8
2.	1S1-1S3	Vk	600	9.0
		1.1Vk	660	10.8
3.	2S1-2S2	Vk	300	25.5
		1.1Vk	330	30.8
4.	2S1-2S3	Vk	600	14.3
		1.1Vk	660	15.4
5.	4S1-4S2	Vk	300	30.9
		1.1Vk	330	36.2
6.	4S1-4S3	Vk	600	15.3
		1.1Vk	660	18.9
7.	5S1-5S2	Vk	300	20.1
		1.1Vk	330	22.6
8.	5S1-5S3	Vk	600	9.5
		1.1Vk	660	11.0

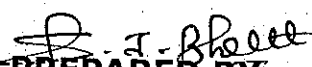
E) MEASUREMENT OF INSTRUMENT SECURITY FACTOR

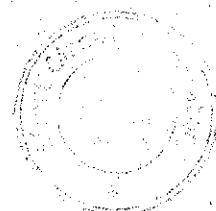
[Cl. No. 11.6 of IEC 60044-1:2003]

Test conducted on core 3 of current transformer at ratio 300-150/1 Amp.

Tested between terminals	Exciting current (Amp.)	Secondary Limiting e.m.f. calculated (Volts)	Measured voltage at I _{ex} (Volts)	ISF	
				Required	Measured
3S1-1 (Short 2 - 3S3)	0.5	107.73	96.3	≤5	4.47
3S1 - 1 (Short 2-3S2)	0.5	102.73	96.3	≤5	4.69

TE 0650983


PREPARED BY:

CHECKED BY




Certificate No. : T-0071

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REPORT NO. LSCS/091

SHEET 12 OF 13

DATE: 23.06.2011

F) HIGH VOLTAGE POWER FREQUENCY DRY TEST (at 90%)

[Cl.No.8.2.1 & 8.3 of IEC 60044-1: 2003]

Sr. No.	Test	Applied voltage (kV)	Duration (sec.)	Remarks
a)	Between Primary winding terminals connected together and earth. During the test frame, case, core and all the terminals of secondary winding connected together and earthed.	247.5	60	Withstood
b)	Between terminals of 1 st core and earth. During the test frame, case, other cores and all the terminals of Primary winding connected together and earthed.	2.7	60	Withstood
c)	Between terminals of 2 nd core and earth. During the test frame, case, other cores and all the terminals of Primary winding connected together and earthed.	2.7	60	Withstood
d)	Between terminals of 3 rd core and earth. During the test frame, case, other cores and all the terminals of Primary winding connected together and earthed.	2.7	60	Withstood
e)	Between terminals of 4 th core and earth. During the test frame, case, other cores and all the terminals of Primary winding connected together and earthed.	2.7	60	Withstood
f)	Between terminals of 5 th core and earth. During the test frame, case, other cores and all the terminals of Primary winding connected together and earthed.	2.7	60	Withstood

G) PARTIAL DISCHARGE MEASUREMENT (at 90%)*

(Cl.No.8.2.2. of IEC: 60044-1-2003)

Procedure: B (As per Cl.No.8.2.2.2 of IEC: 60044-1-2003)

Prestress voltage: $0.9 \times (0.8 \times 275\text{kVrms}) = 198 \text{ kVrms}$

The partial discharge test was performed after the power-frequency withstand test. The power frequency voltage of 198 kVrms was applied to the primary winding for 60 secs, and then reduced without interruption to the specified partial discharge test voltages. The secondary windings and body were connected together to the earth during the test.

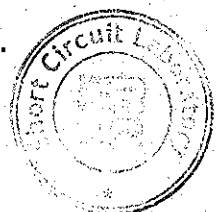
$U_m = 145\text{kV}$

PD test voltage (r.m.s.)	Permissible PD Limit (pC)	Measured Value of PD (pC)
$0.9 \times U_m$	10	3
$1.2 \times 0.9 \times U_m / \sqrt{3}$	5	3

* **NOTE:** Sub contracted – Tests were carried out at customer's premises.

PREPARED BY: *D. J. Phet*

CHECKED BY: *Alfiah*



TE 0650982



Certificate No.: T-0071

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REPORT NO. LSCS/091

DATE: 23.06.2011

SHEET 13 OF 13

H) INTER TURN OVERVOLTAGE TEST (at 90%)

[Cl.No.8.4 & 14.2.2 of IEC 60044-1: 2003]

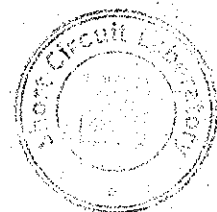
With primary winding open circuited, voltage applied to secondary winding terminals at rated frequency such as to produce 90% of rated current in secondary for core 3 as per clause No. 8.4 of IEC: 60044-1-2003 and Test Voltage 5.4 kV peak (90% of 10 times of r.m.s. knee point e.m.f.) in core 1, 2, 4 & 5 as per sub clause No. 14.2.2 of IEC: 60044-1-2003 for PS class.

Test Voltage (kVp)	Test Current (Amp.)	Tested between terminals	Duration (Sec.)	Remarks
5.4	-	1S1-1S3	60	Withstood
5.4	-	2S1-2S3	60	Withstood
-	0.9	3S1-1 (Short 2 - 3S3)	60	Withstood
5.4	-	4S1-4S3	60	Withstood
5.4	-	5S1-5S3	60	Withstood

P. J. Bhelle
PREPARED BY

Shankar
CHECKED BY

TE 0650979





Certificate No. : T-0071

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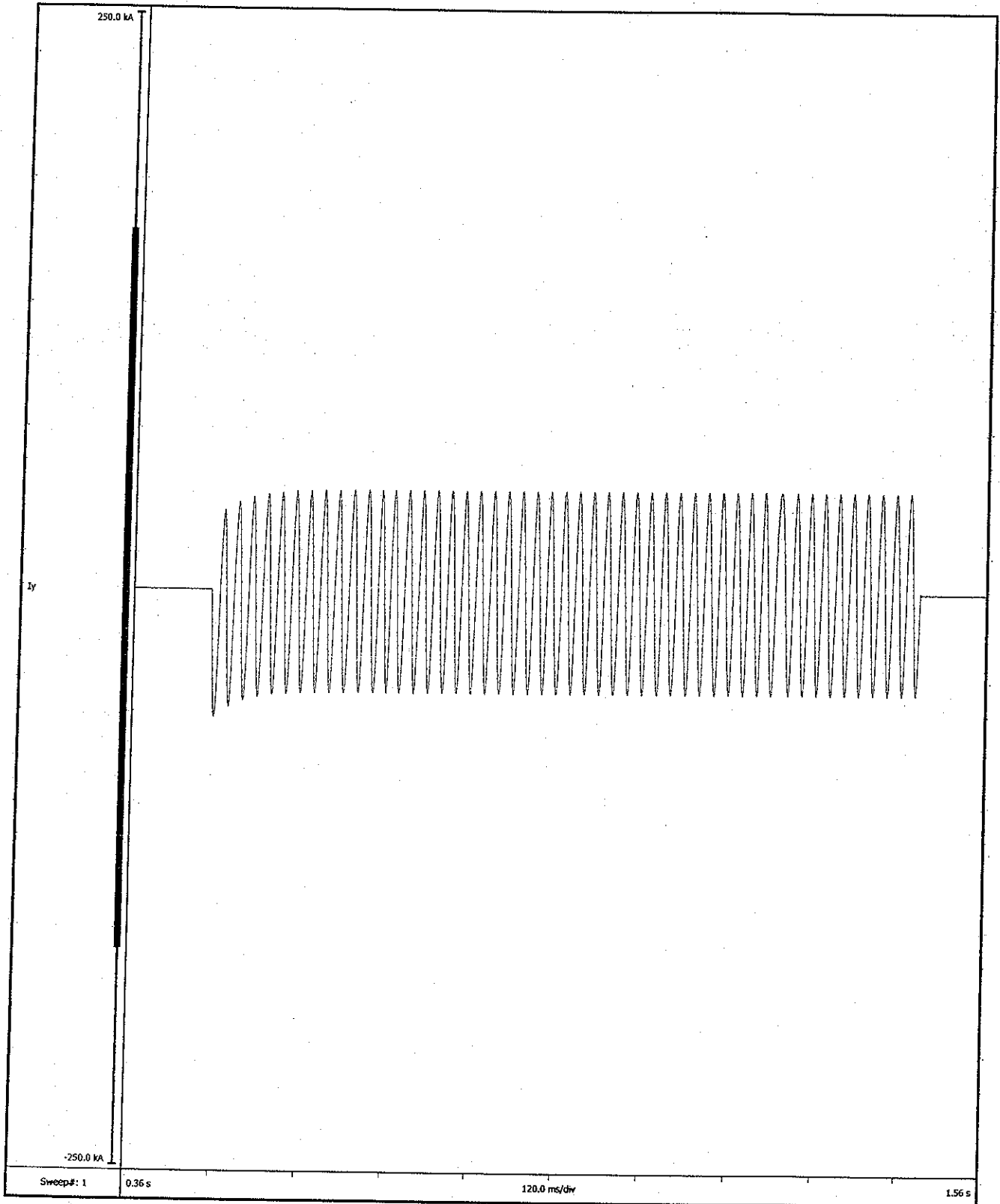
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REPORT NO.: LSCS/091

DATE : 23.06.2011



OSCILLOGRAM NO. : 103/01

[Signature]
I. Bhale

TE 0650361



Certificate No. : T-0071

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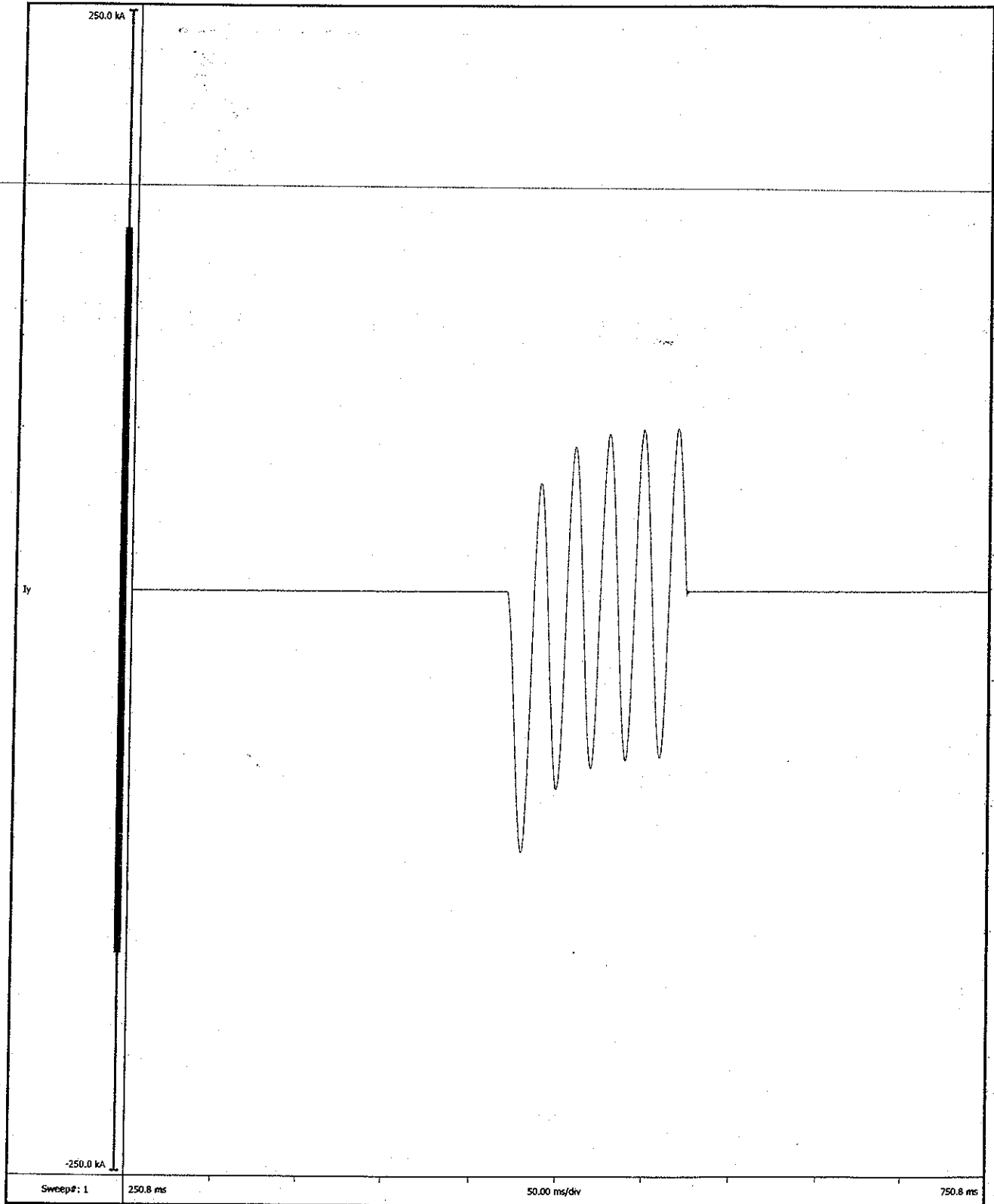
E-mail : erda@erda.org

Web : <http://www.erda.org>



REPORT NO.: LSCS/091

DATE : 23.06.2011



OSCILLOGRAM NO. : 103/02

[Signature]
B. J. Bhatt

TE 0650360



NABL

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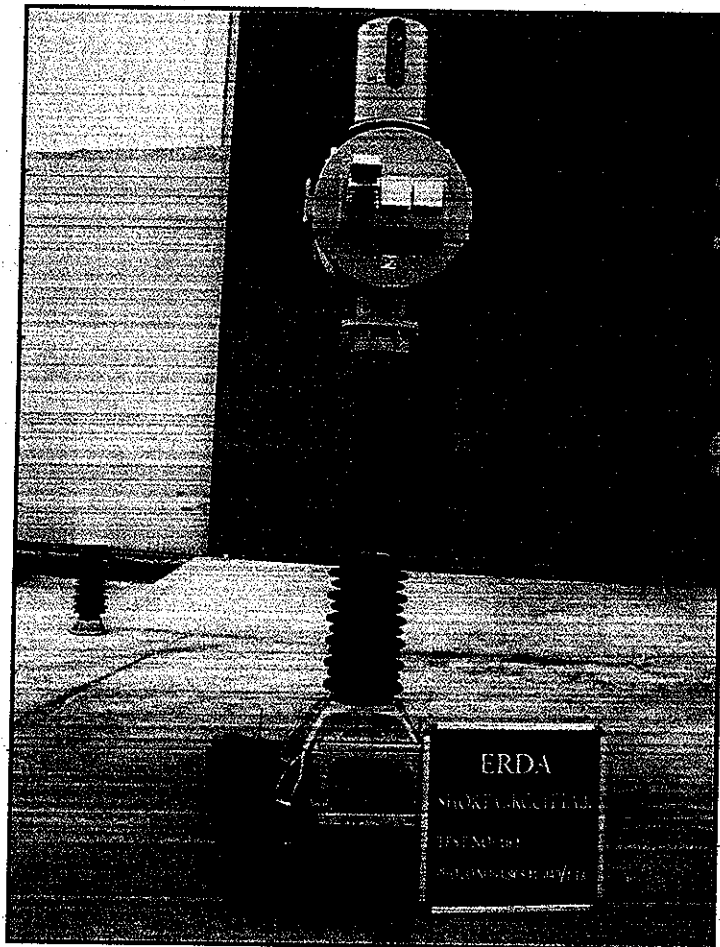
E-mail : erda@erda.org

Web : <http://www.erda.org>



REPORT NO.: LSCS/091

DATE: 23.06.2011

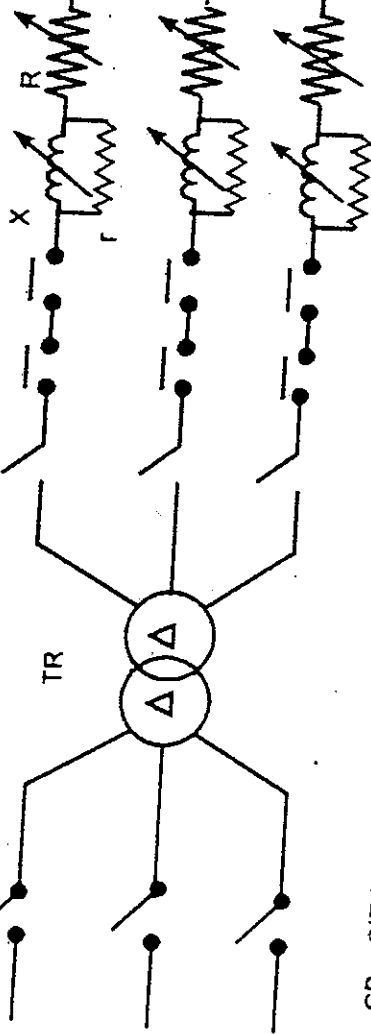


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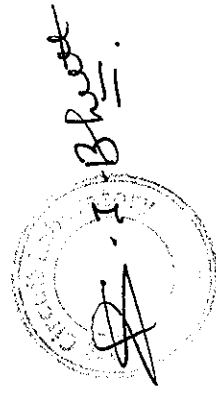
CB

ISO BCB HMS

Z



CB = CIRCUIT BREAKER
 TR = TRANSFORMER
 ISO = ISOLATOR
 BCB = BACKUP CIRCUIT BREAKER
 HMS = HT MAKE SWITCH
 Z = SOURCE SIDE IMPEDANCE
 X = REACTANCE
 R = RESISTANCE
 S = SHUNT RESISTOR
 SC/TR = SHORT CIRCUIT TRANSFORMER
 TO = TEST OBJECT
 S = CURRENT SENSING DEVICE



ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

SCHEMATIC CIRCUIT DIAGRAM

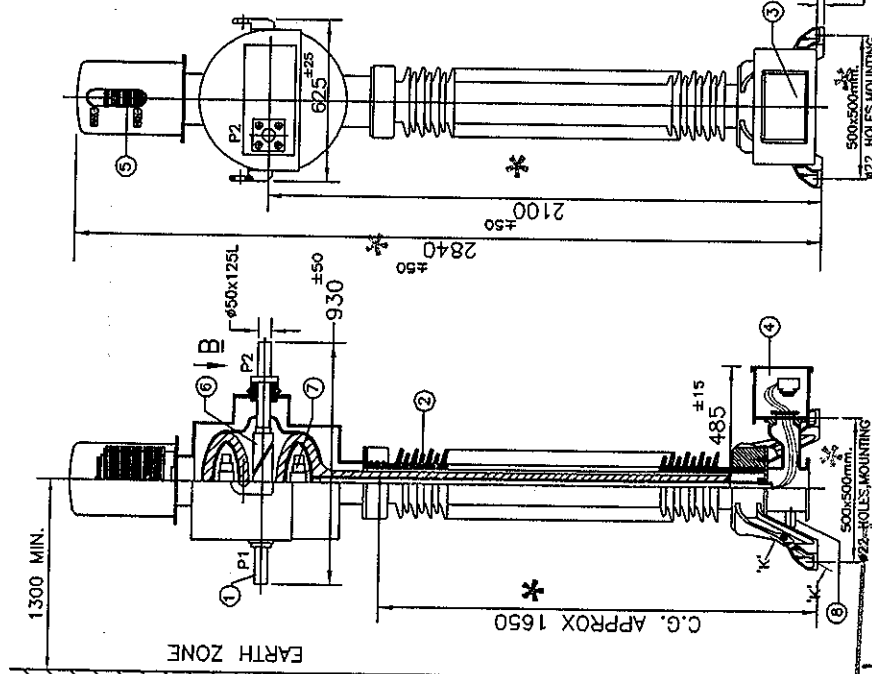
DRN H. A. S.	CKD BY M. B. M.	DATE 13/11/2008	DRAWING No. OLSC/IT/13
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REPORT NO.: LSCS/eq1
 DATE: 23.06.2011

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Test Report No. L.S. 81/091
Date : 23.06.2011
Product : 145 KV PRIMARY CONDUCTOR SIZE/CROSS SECTION : 1st TURN : ROD-Ø50. CROSS SECTION = 19.62 SQ.CM.
2nd TURN : TUBE = Ø70/80 (ID/OD) CROSS SECTION = 11.77 SQ.CM.
3rd TURN : TUBE = Ø90/100 (ID/OD) CROSS SECTION = 14.91 SQ.CM.
4th TURN : FLAT = 70x6thk. 2No's CROSS SECTION = 8.40 SQ.CM.
Verified By :
Verification of test results by ERDA is limited to reference only.
Verified dimensions

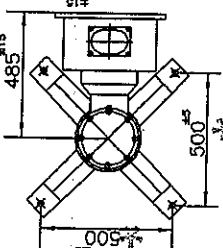
- NOTES:
1) MAIN INSULATION MEDIUM IS OIL IMPREGNATED PAPER(OIP).
2) SECONDARY WINDINGS ARE DISTRIBUTED AROUND THE CORE CIRCUMFERENCE.
3) SECONDARY WINDING JUNCTIONS ARE CRIMPED WITH COPPER INLINE CONNECTORS AND TERMINATED WITH CRIMPED COPPER LUGS.
4) ALL SECONDARY CORES ARE HOUSED IN A METALLIC HOUSING (SHELL) AS SHOWN IN CROSS SECTIONAL VIEW.
5) CONDUCTOR USED FOR SECONDARY WINDING IS HIGH CONDUCTIVITY ANNEALED COPPER CONDUCTOR ENAMELED WITH TEREPHTHALATE POLYESTER BASE
6) PRIMARY WINDINGS ARE DISTRIBUTED AROUND THE INSULATED GUT CIRCUMFERENCE.



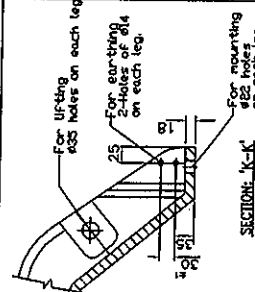
DETAILS OF PRIMARY WINDING

1st TURN : ROD-Ø50. CROSS SECTION = 19.62 SQ.CM.
2nd TURN : TUBE = Ø70/80 (ID/OD) CROSS SECTION = 11.77 SQ.CM.
3rd TURN : TUBE = Ø90/100 (ID/OD) CROSS SECTION = 14.91 SQ.CM.
4th TURN : FLAT = 70x6thk. 2No's CROSS SECTION = 8.40 SQ.CM.
PRIMARY TERMINAL = Ø50x125mm.

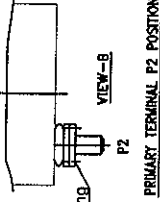
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5) CONDUCTOR USED FOR SECONDARY WINDING IS HIGH CONDUCTIVITY ANNEALED COPPER CONDUCTOR ENAMELED WITH TEREPHTHALATE POLYESTER BASE
6) PRIMARY WINDINGS ARE DISTRIBUTED AROUND THE INSULATED GUT CIRCUMFERENCE.



VIEW FROM 'A'



VIEW-B



PRIMARY TERMINAL P2 POSITION

NOTES:

- MAKE OF ALL ITEMS TO PGCL'S QA APPROVAL
- DEGREE OF PROTECTION FOR SECONDARY TERMINAL BOX- IP 55
- INSULATION OF OIL SHALL BE ENV GRADE AS PER IS335-1993, IEC96-1982
- HARDWARE-H10 BELLOW ELECTROGALVANISED M12 & ABOVE STAINLESS STEEL
- RIV LEVEL AT 92 KV LESS THAN 500 MICRO VOLTS
- PROJECTED AREA OF PRODUCT - 10 SQUARE
- CANTILEVER LOAD OF INSULATION= 700 Kgs.
- PRIMARY NO OF TURN- 3
- MIN. CROSS SECTION= 840 Square ALUMINIUM
- FINISH - HOT DIP GALVANIZED

NET WEIGHT : 450 Kg. (Approx.)
GROSS WEIGHT : 800 Kg. (Approx.)

DETAILS OF SECONDARY WINDING :

TOTAL NO OF SECONDARY TURNS (ND)	CONDUCTOR SIZE (SWG/SDMM)	MATERIAL OF TAPPED SECONDARY WINDING	CORE DETAILS CROSS SECTIONAL AREA (SQ.CM)
1800	16X1/2075.18X1/1167	COPPER	YES
1800	16X1/2075.18X1/1167	COPPER	YES
900	19X4/2244.18X1/1167	COPPER	YES
1800	16X1/2075.18X1/1167	COPPER	YES
1800	16X1/2075.18X1/1167	COPPER	YES

SR.NO. : 102076

NOTE : PLEASE REFER INSTRUCTION MANUAL FOR HANDLING & TRANSPORTATION OF CT.

CONTRACTOR

ICSA (INDIA) LTD
PLOT NO. 12, 1st Floor, Software Units Layout,
Cyberabad, HYDERABAD

POWER GRID CORPORATION OF INDIA LIMITED

PROJECT: SUBSTATION PACKAGE - 'PB-ST' ASSOCIATED WITH PALLATANA GBPP & BONGAGON TPS TRANSMISSION SYSTEM IN NORTH EASTERN REGION
LOA No: C-62001-S119A-3/G7/NOA-3/G7/NOA-II/3293
Dt: 08.03.2010

TITLE: GENERAL ARRANGEMENT DRAWING

DATE	SCALE	DRG. NO.	REV. NO.
15.09.10	NTS		1
	A3	413512676 CT2 GA	2

CHROMPTON GRAVES LTD, AURANGABAD

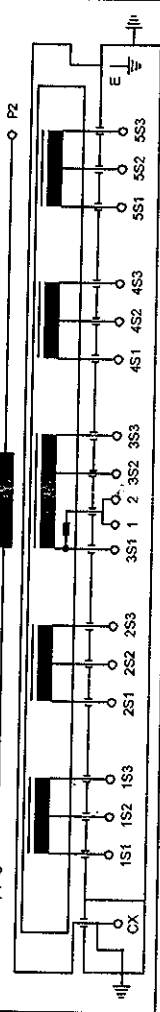
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270
256

145 KV CURRENT TRANSFORMER RATING & SCHEMATIC DIAGRAM

MFG. BY :- CROMPTON GRAVES LTD. D2 MIDC, WALU, AURANGABAD.

CUSTOMER: POWER GRID CORPORATION OF INDIA LIMITED
PROJECT: SUBSTATION PACKAGE - 'PB-S1' ASSOCIATED WITH PALLATANA GBPP & BONGAIGON TPS TRANSMISSION SYSTEM IN NORTH EASTERN REGION
TYPE: ICSK-145/275/650
INSULATION LEVEL: 275KV/650KV
FREQUENCY: 50 Hz
SHORT TIME CURRENT RATING: 31.5 KA/1 SEC.
DYNAMIC: 80 KA
RATED PRIMARY CURRENT: 600 AMP
SPECIFICATION: IEC: 60044.1
CREPAGE DISTANCE: 3625 mm.
LOA NO.: C-62001-S119A-3/G7/NOA-1/3292&C-62001-S119A-3/G7/NOA-II/3293 Dt: 08.03.2010
SR NO.: 413512676
YEAR: 2010



CORE NO.	I	II	III	IV	V
RATIO 1	300/1	600/1	300/1	600/1	600/1
PRIMARY TERMINAL	P1-P2	P1-P2	P1-P2	P1-P2	P1-P2
SECONDARY TERMINAL	1S1-1S2	2S1-2S2	3S1-1S2 SHORT 2-S2	4S1-4S2	5S1-5S2
BURDEN (VA)	-	-	20	-	-
CLASS	PS	PS	PS	PS	PS
IS/FALF	-	-	0.2	-	-
RPV (MIN) V	300	600	600	300	600
I _{exc} (max.) AT %	60	30	30	60	30
Rat @ 75°C	≤ 3	≤ 6	≤ 6	≤ 3	≤ 6

TOTAL WEIGHT: 450 KG
OIL WEIGHT: 120 Litre
CAUTION: SHORT ALL SEC. TERMINALS WHEN NOT IN USE OR BEFORE DISCONNECTING BURENS
CONNECT CX TERMINAL TO EARTH WHEN CT IS IN OPERATION.

ø4.5 Holes, 4Nos.
MATERIAL: STAINLESS STEEL

Test Report No. LSCSI 091
Date: 23.06.2011
Product: 145KV CT
Verified By: [Signature]
Verification of this product is limited to the information provided only.



SR.NO.: 102076

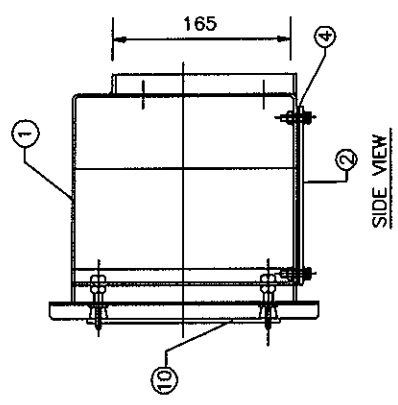
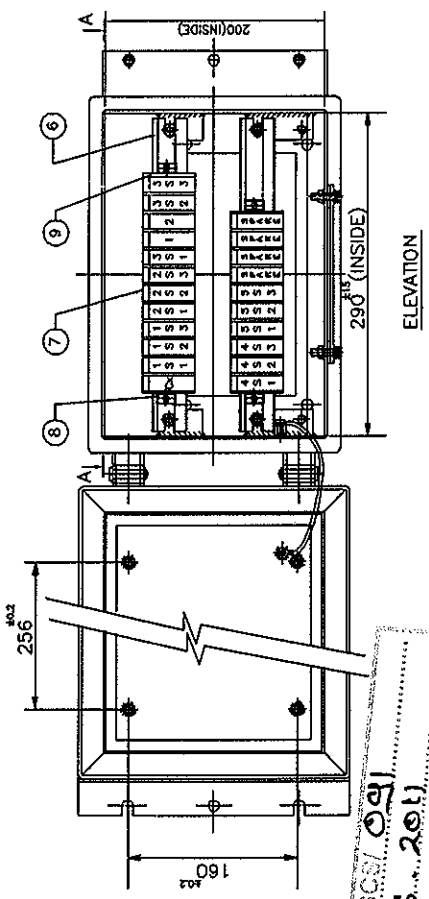
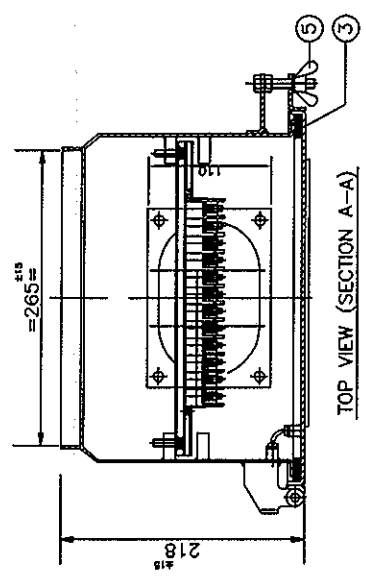
CONTRACTOR		ICSA (INDIA) LTD PLOT NO. 12, 1st Floor, Software Units Layout, Cyberabad, HYDERABAD	
PROJECT		SUBSTATION PACKAGE - 'PB-S1' ASSOCIATED WITH PALLATANA GBPP & BONGAIGON TPS TRANSMISSION SYSTEM IN NORTH EASTERN REGION	
LOA No:		C-62001-S119A-3/G7/NOA-1/3292&C-62001-S119A-3/G7/NOA-II/3293 Dt: 08.03.2010	
TITLE			
RATING & SCHEMATIC DIAGRAM - ENGLISH			
DATE	SCALE	DRG. NO.	REV. NO.
15.09.10	NTS		0
	SIZE		SHT. NO.
	A3		4
		413512676 CT2 RS-E	



REV. NO.	DATE	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY	APPD	DATE

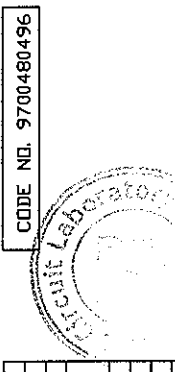
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Test Report No. LSCSL 091
 Date: 23.06.2011
 Mod: 145 KV C.T.
 Verified By: [Signature]
 Verification of Designing by BDA is
 valid for over 10 years only.



- NOTES:**
- 1) SECONDARY BOX ASSEMBLY TO CONFORM IP55 AS PER IS:13947-1993.
 - 2) CX-TERMINAL FOR CAPACITANCE & TAN DELTA MEASUREMENT ONLY.
 - 3) MATERIAL : SHEET THK. 2mm.CRCA.
 - 4) FINISH : HOT DIP GALVANIZED.
 - 5) ALL TERMINALS SHALL BE STUD TYPE. NON DISCONNECTING TYPE TERMINALS.

CONTRACTOR		ICSA (INDIA) LTD PLOT NO. 12, 1st Floor, Software Units Layout, Cyberabad, HYDERABAD	
PROJECT		SUBSTATION PACKAGE - 'PB-S1' ASSOCIATED WITH PALLATANA CBPP & BONGAON TPS TRANSMISSION SYSTEM IN NORTH EASTERN REGION	
LOA No:		C-62001-S119A-3/G7/NOA-1/3292&C-62001-S119A-3/G7/NOA-II/3293	
Dt:		08.03.2010	
TITLE		SECONDARY BOX GA.	
DATE	SCALE	DRG. NO.	REV. NO.
15.09.10	NTS		0
	SIZE		SHT. NO.
	A3		6
413512676 CT2 SB			



REV. NO.	DATE	DESCRIPTION	DRAWN	DESIGN	CHKD.	CHECKED BY	APPRD.	DATE	APPROVED
10	2	RATING & SCHEMATIC DIAGRAM	NYLON	MAKE/CONNECTWELL	---				
9	2	END PLATE	STEEL	MAKE/CONNECTWELL	---				
8	4	END CLAMP	NYLON	MAKE/CONNECTWELL	---				
7	22	SECONDARY TERMINAL BLOCK WITH MARKER	STEEL	STD. STD-M8	---				
6	2	DINRAIL	S-STEEL	---	---				
5	2	WING NUT	NEOPRENE	---	---				
4	1	GASKET	NEOPRENE	---	---				
3	1	GASKET	MS	---	---				
2	1	GLAND PLATE	MS	---	---				
1	1	SECONDARY BOX ASSEMBLY	MS	---	---				
SL. NO.	QTY	ITEM	MATERIAL	RM. SIZE / SPECIFICATION					



GROOMPTON GREAVES LTD., AURANGABAD