

<b>PROJECT:</b>	<b>PGCIL ISOLATORS</b>
<b>ITEM:</b>	<b>Supply of Spares items of Isolators</b>
<b>SUBJECT:</b>	<b>BID SPECIFIC ATC</b>

<b>1.</b>	For any <b>technical clarification</b> , please contact Mr. Nishant Singh, Dy. Manager (TBEM). Contact No. 0120-0674-8515; e-mail: <a href="mailto:nishant.singh@bhel.in">nishant.singh@bhel.in</a>								
<b>2.</b>	For any <b>commercial clarification</b> , please contact Mr. Sandeep, Dy. Manager (TBMM). Contact No. 0120-6748540; e-mail: <a href="mailto:kumar.sandeep@bhel.in">kumar.sandeep@bhel.in</a>								
<b>3.</b>	<b>Terms of Payment:</b>								
(Supply & Services)	<p>As per GTC of GeM (Payment due date shall be 90 Days) Supply Payment:</p> <p>a) 100% of payment within 90 days from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows:</p> <ul style="list-style-type: none"> <li>• LR / GR duly endorsed by BHEL Site Official.</li> <li>• Material Receipt Certificate issued by BHEL Site Official.</li> <li>• GST Compliant Tax Invoice</li> <li>• Packing List (Case-wise)</li> <li>• Copy of Transit Insurance Certificate from underwriters.</li> <li>• Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management</li> <li>• Guarantee Certificate</li> </ul> <p><b><i>Vendor has to submit the duly signed check-list along with Bill.</i></b></p> <p><b>However, Payments due shall be as below depending on the nature of enterprises</b></p> <table border="1"> <thead> <tr> <th>Type of Bidder</th> <th>Payment Terms (Number of Days)</th> </tr> </thead> <tbody> <tr> <td>Micro &amp; Small Enterprises (MSEs)</td> <td>45 Days</td> </tr> <tr> <td>Medium Enterprises</td> <td>60 Days</td> </tr> <tr> <td>Non - MSME</td> <td>90 Days</td> </tr> </tbody> </table>	Type of Bidder	Payment Terms (Number of Days)	Micro & Small Enterprises (MSEs)	45 Days	Medium Enterprises	60 Days	Non - MSME	90 Days
Type of Bidder	Payment Terms (Number of Days)								
Micro & Small Enterprises (MSEs)	45 Days								
Medium Enterprises	60 Days								
Non - MSME	90 Days								
<b>4.</b>	<b>Terms of Delivery:</b>								
As per GeM. However, unloading at site is in the scope of BHEL. Bidders to quote price accordingly.									
<b>5.</b>	<b>Delivery Time:</b>								
14 Weeks (98 days) from the date of PO by BHEL as per Activity schedule (Annexure-A). Early Delivery is acceptable.									
<b>Date calculated as per activity schedule. To be re- fixed as per actual time taken. LR or invoice date whichever is later will be treated as delivery date</b>									
<b>Note:</b> In case, BHEL's delivery requirement is not met by vendor(s), then a chance may be given to all such vendors to review their quoted delivery schedule in line with BHEL's delivery requirement. However, if vendor fails to meet the requisite delivery plan, then BHEL reserves the right not to consider the offer of such vendor(s).									
<b>6.</b>	<b>Prices:</b>								
The quoted prices shall be on <b>Firm basis including packing and forwarding charges</b> . Price to be quoted as inclusive of GST. i.e. Ex-Works + F&I + GST.									
<b>7.</b>	<b>Liquidated Damage of delayed Delivery:</b>								
As per GeM terms and conditions.									
<b>8.</b>	<b>Item &amp; BOQ:</b>								
<b>BOQ:</b> As per Annexure									
<b>9.</b>	<b>Technical Specification:</b>								
As per approved drawings of PO No. 157P209									

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<b>10.</b>	<b>Pre-Qualification Requirement:</b>
	NA
<b>11.</b>	<b>MQP (Manufacturing Quality Plan):</b>
	MQP format is indicative only, however inspection shall be carried out as per approved Quality Plan. Supplier has to submit Quality Plan to BHEL for Customer approval.
<b>12.</b>	<b>Inspection:</b>
	Inspection shall be carried out as per customer as per approved Quality Plan.
<b>13.</b>	<b>Destination / Delivery Location:</b>
	Shall be provided later
<b>14.</b>	<b>Bill to Address:</b>
	Bharat Heavy Electricals Limited-TBG, 10th Floor, Plot No.C-20/1A/1, Joy Tower, Sector-62, Noida-201301, U.P. GSTN-09AAACB4146P2ZC

<b>15.</b>	<b>Guarantee Clause (Defect Liability Period):</b>
	The equipment / material supplied and services rendered (if applicable) shall be guaranteed to be free from all defects and faults in design & engineering, material, workmanship & manufacture and in full conformity with the Purchase Order / Contract, Technical Specifications & approved drawings / data sheets, if any, for 18 months from the date of last delivery.
<b>16.</b>	<b>Performance Bank Guarantee:</b>
	Not required being consumable & small value items.
<b>17.</b>	Bidders to ensure that Third party / customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document / certificate issuing authority such as name & designation of Issuing Authority and its organization contact number and e-mail Id etc. In case the same found not available, Purchaser has right to reject such document from evaluation.
<b>18.</b>	<b>Acceptance of Offer:</b>
	NA
<b>19.</b>	<b>Deviations:</b>
	a) Technical Deviation: No Technical Deviation is envisaged. b) Commercial Deviation: No Commercial Deviation is envisaged.
<b>20.</b>	All other terms & conditions shall be as per GTC of GeM

**Note: This Purchase is against single tender being OEM items. The offer shall be accepted from M/s S&S Power Switchgear Ltd. only.**

Signature & Seal of supplier  
Date

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**ACTIVITY SCHEDULE**

**Annexure-A**

SL. NO.	ACTIVITY	ACTIVITY TIME IN WEEKS
1.	Submission of documents necessary for getting manufacturing clearance Drawings, data sheets (In scope of vendor)	NA
2.	Review and Approval of documents and issue of manufacturing clearance (In scope of BHEL)	NA
3.	Manufacturing Time (In scope of vendor)	10
4.	Inspection (In scope of BHEL)	02
5.	Issue of MICC (In scope of BHEL)	01
6.	Dispatch (In scope of vendor)	01
7.		14 Weeks

1. Inspection call to be issued 01 weeks in advance.
2. Supplier must ensure the completeness and correctness of the requisite documents before submission for approval. Delay in approval on account of incomplete / inadequate information shall be the responsibility of supplier.
3. Inspection call should be given in the prescribed format only. Inspection calls not in the prescribed format shall not be entertained.

Signature & Seal of Supplier  
Date

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**Annexure-V**

<b>Item/Package Name :</b>	<b>Supply of Isolator Spares</b>
<b>Enquiry No.:</b>	
<b>Project:</b>	<b>PGCIL Raigarh</b>
<b>Type of project</b>	
<b>Percentage of Local Content</b>	<b><i>(Bidder to enter the applicable % of local content)</i></b>

**Format of Self certification regarding Local Content in line with PPP-MII order, 2017 & its revision dated 04.06.2020.**

**Date:.....**

I \_\_\_\_\_ S/o, D/o, W/o, \_\_\_\_\_ Resident of \_\_\_\_\_ hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Order, 2017 (*hereinafter PPP-MII order*) of Government of India issued vide Notification No: P-45021/2/2017-BE-II dated 15/06/2017, its revision dated 04/06/2020 and any subsequent modifications/Amendments, if any.

That the information furnished hereinafter is correct to the best of my knowledge and belief and I undertake to produce relevant records before the procuring entity/BHEL or any other Government authority for the purpose of assessing the local content of goods/services/works supplied by me for ..... ***(Enter the name of the Equipment/Item for Project)***.

That the local content for all inputs which constitute the said goods/services/works has been verified by me and I am responsible for the correctness of the claims made therein.

That the goods/services/works supplied by me for ..... ***(Enter the name of the Equipment/Item for Project)*** contains.....% ***(mention the Local content in %age)*** Local Content.

That the value addition for the purpose of meeting the 'Minimum Local Content' has been made by me at ..... ***(Enter the details of the location(s) at which value addition is made)***.

That in the event of the local content of the goods/services/works mentioned herein is found to be incorrect and not meeting the prescribed supplier class categorization criteria as per said order, based on the assessment of procuring agency (i.e.)/BHEL/Government Authorities for the purpose of assessing the local content, action shall be taken against me in line with the PPP-MII order and provisions of the Integrity pact/ Bidding Documents.

I agree to maintain the following information in the Company's record for a period of 8 years and shall make this available for verification to any statutory authority.

- i. Name and details of the Local Supplier  
(Registered Office, Manufacturing unit location, nature of legal entity)
- ii. Date on which this certificate is issued
- iii.

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***Annexure-V***

- iv. Goods/services/works for which the certificate is produced
- v. Procuring entity to whom the certificate is furnished
- v. Percentage of local content claimed and whether it meets the Minimum Local Content prescribed
- vi. Name and contact details of the unit of the Local Supplier (s)
- vii. Sale Price of the product
- viii. Ex-Factory Price of the product
- ix. Freight, insurance and handling
- x. Total Bill of Material
- xi. List and total cost value of input used to manufacture the Goods/to provide services/in construction of works
- xii. List and total cost of input which are domestically sourced. Value addition certificates from suppliers, if the input is not in-house to be attached
- xiii. List and cost of inputs which are imported, directly or indirectly

For and on behalf of..... (Name of firm/entity)

**Authorized signatory (To be duly authorized by the Board of Directors)**

<Insert Name, Designation and Contact No.>

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**SCHEDULE OF COMMERCIAL DEVIATION**

The following are the deviations/ variations exception from the General Terms and Conditions:

SL. NO.	CLAUSE NO. OF TERMS AND CONDITIONS	STATEMENT OF DEVIATION
	NIL DEVIATION	NIL DEVIATION

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the General Terms and Conditions.

If there is NIL deviation, even then the format to be filled as NIL DEVIATION.

**Note :** 1. Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

2. Deviation mentioned in this schedule shall only be considered.

**This Format is to be submitted in original duly signed by bidder.  
Reproduction of the same in any sort is not acceptable.**

Place: .....

Date : .....

Signature of the authorized representative of

Bidder's name

:.....

Designation:.....

..

Company

Seal:.....

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**SCHEDULE OF TECHNICAL DEVIATION**

The following are the deviations/ variations exception from the Technical Specifications:

SL. NO.	CLAUSE NO. OF TERMS AND CONDITIONS	STATEMENT OF DEVIATION
	NIL DEVIATION	NIL DEVIATION

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the Technical Specifications,

If there is NIL deviation, even then the format to be filled as NIL DEVIATION.

**Note :** 1. Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

2. Deviation mentioned in this schedule shall only be considered.

**This Format is to be submitted in original duly signed by bidder.  
Reproduction of the same in any sort is not acceptable.**

Place: .....

Date : .....

Signature of the authorized representative of  
Bidder's name :.....  
Designation:.....

<b>PROJECT:</b>	<b>PGCIL ISOLATORS</b>
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<b>Item No.</b>	<b>Item Description</b>	<b>Item Quantity</b>	<b>Unit of Measure</b>	<b>Unit Price (Inclusive of F&amp;I &amp; GST)</b>	<b>GST % Applicable</b>
1	Isolator : Thermostat for Isolator MOM Box	31	No	Mention "Quoted" as	Mention GST %
2	Isolator : Space Heater for Isolator MOM Box	31	No	Mention "Quoted" as	Mention GST %

Signature & Seal of Supplier  
Date:

Sr no	Document No	Rev	Document Title	Category of Approval	Remarks/ comments
1	003EATDIP15S0091	0	Test on auxiliary and control circuit and IP55 test category 2 for Motor operating drive box for Raigarh (BHEL)	Not in order	Offered Motor Operating drive (MOD) has bigger in size than type test. Also clarify no of holes in both tested and offer MOD. Test on auxiliary and control circuit is generally in order .refer comment 1 below also
2	2C68327-2973	A	Assembly of base for 95kV DC centre break disconnecter with single earth switch for Raigarh (BHEL)	IV	
3	3C6E084-2973	A	Assembly of earth switch and earth fixed contact for 95kV DC centre break disconnecter for Raigarh (BHEL)	IV	
4	3C6E085-2973	A	Assembly of earth switch and earth fixed contact for 95kV DC maintenance earth switch for Raigarh (BHEL)	IV	
5	3C6G110-2973	A	General arrangement of 95kV DC, 2316A 1pole centre break disconnecter without earth switch for Raigarh (BHEL)	I	
6	3C6G210-2973	A	General arrangement of 95kV DC, 2316A 1pole centre break disconnecter with single earth switch (MGB-MGB) for Raigarh (BHEL)	I	
7	3C6H003-2973	A	Assembly of male and female blade for 95kV DC, 2316A centre break disconnecter for Raigarh (BHEL)	IV	
8	3C6L210-2973	A	Loading data for 95kV DC 1pole centre break disconnecter with single earth switch (MGB-MGB) for Raigarh (BHEL)	IV	
9	3C6P001-2973	A	Name plate details for 95kV DC centre break disconnecter with single earth switch for Raigarh (BHEL)	II	
10	3C6P002-2973	A	Name plate details for 95kV DC centre break disconnecter without single earth switch and MES for Raigarh (BHEL)	II	
11	3E6G100-2973	A	General arrangement of 95kV DC, 1 pole maintenance earth switch (MGB) for Raigarh (BHEL)	I	
12	3UCA209-2973	A	Auxiliary switch details for disconnecter, earth switch and MES for Raigarh (BHEL)	IV	
13	3UCD025-2973	A	Assembly of motor operating box for 95kV DC disconnecter with single, without and maintenance earth switch for Raigarh (BHEL)	IV	
14	3UCN001-2973	A	Common legends and notes for Raigarh (BHEL)	IV	
15	3UCOOO3-2973	A	Index sheet for 95kV DC disconnecter for Raigarh (BHEL)	IV	
16	3UCS150-2973	A	DC and AC control circuit for disconnecter with single earth switch and without earth switch for Raigarh (BHEL)	IV	

C/ENGG/HVDC/RP800/324/1323

Dated 11.04.2018

17	3UCS151-2973	A	DC and AC control circuit for disconnecter with single earth switch and MES for Raigarh (BHEL)	IV	
18	43-1-2007-HV4368S&S	0	Lightning impulse withstand voltage and power frequency withstand voltage test for Raigarh (BHEL)	Not in order	Performed Type test date should be before July 2008 as per RS clause-10.
19	43-1-2013-HV-1738-ABI	0	Type tests reports for 245kV solid post insulators for Raigarh (BHEL)	Generally in order	
20	8108276112-100-KPS-04	0	Mechanical endurance test for 245kV 3 pole earth switch for Raigarh (BHEL)	Not in order	See comment 1 below
21	8112431725-100-SS-01	0	Mechanical endurance tests on 245kV, 2000A, disconnecter with earth switch for Raigarh (BHEL)	Not in order	See 1 comment below
22	987382-1	0	245kV S-C Post insulator for Raigarh (BHEL)	I	
23	BHEL-RP-3-12-DC-NDISC-GTP	0	GTP for 95kV DC disconnectors and earth switches for Raigarh (BHEL)	I	See remarks inside document
24	HPL07179	0	Short time withstand current test and peak withstand current test on 245kV centre break disconnecter for Raigarh (BHEL)	Generally in order	Subject to justification in line with comment 1
25	HPL08222	0	Short time withstand current test and peak withstand current test on earth switch for Raigarh (BHEL)	Generally in order	Subject to justification in line with comment 1
26	RP-1314-026211	0	Type tests (mechanical) reports for 245kV solid post insulators for Raigarh (BHEL)	Generally in order	
27	WO2973-TTRS-95	1	Type Test Summary Reports for 95kV DC Disconnectors and Earthing Switches for Raigarh (BHEL)	II	See comment 1 & 5 below.

**Note:**

1. Equipment make is subject to approval of POWERGRID QA & I department.
2. Any other item quantity required for successful completion of project and fulfilment of requirements of TS shall be provided by ABB/BHEL without any financial implication to POWERGRID.
3. **Material of arcing contact of disconnecter will be Stainless steel as confirm by email attached with letter.**

**CATEGORIES: -**

- I Approved.
- II Approved with comments.
- III Returned for correction.
- IV For Information.

Generally in order /Not in order-For Type test reports

**Comments:**

- 1) Technical justification will be submitted for difference between tested and offered Equipment along with type test Summary reports but Offered type tested equipment and final equipment shall have same design and insulation class in line with TS clause- 1.2.3.5 (ii).
- 2) Provide nameplate in Hindi also.
- 3) Main and Spare Terminal connector for disconnecter to be provided.
- 4) Submit following valid type test as per RS Clause-10..
  1. Lighting frequency withstand test
  2. Switching withstand as per RS
  3. Power frequency withstand test
  4. RIV test
  5. Temperature rise test for 2425
  6. Seismic requirement test
  7. Degree of protection for IP55
  8. Wet DC withstand test for 143KV (95\*1.5) as per RS 10.9.
  9. Lock baled test on close and open positions.

ABB, HVDC  
 RP800 Project Office  
 4th Floor, Plot No. 58  
 Sector 44, Gurgaon – 122001.  
 India

Transmittal No: TM-RP1-180278  
 Issue Date: 2018-03-01

Managed by: S, Neerajsingh

To: Powergrid (RP800) - Engineering  
 Attn: Mr. B.B. Mukherjee, AGM (Corporate Engineering)  
 Cc: Mr.R.N. Singh, Executive Director (RP800), Mr.Rajeev K Chauhan (ED-Engineering),

Enclosed please find the following documents for Approval

Documents of TM-RP1-180278

Doc No	Revision	Title	Document Kind	For Info / Approval	Due date (28 Months Pole 1 Completion)	Due Date (36 Months Bipole 1 Completion)	EQ class	Station
003EATDIP15S0091	0	Test on auxiliary and control circuit and IP55 test category 2 for Motor operating drive box for Raigarh (BHEL)	Type test report	Approval	2018-03-11	2018-03-22	058	Raigarh
2C68327-2973	A	Assembly of base for 95kV DC centre break disconnector with single earth switch for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3C6E084-2973	A	Assembly of earth switch and earth fixed contact for 95kV DC centre break disconnector for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3C6E085-2973	A	Assembly of earth switch and earth fixed contact for 95kV DC maintenance earth switch for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3C6G110-2973	A	General arrangement of 95kV DC, 2316A 1pole centre break disconnector without earth switch for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3C6G210-2973	A	General arrangement of 95kV DC, 2316A 1pole centre break disconnector with single earth switch (MGB-MGB) for Raigarh (BHEL)	Arrangement drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3C6H003-2973	A	Assembly of male and female blade for 95kV DC, 2316A centre break disconnector for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh

ABB, HVDC  
 RP800 Project Office  
 4th Floor, Plot No. 58  
 Sector 44, Gurgaon – 122001.  
 India

Transmittal No: TM-RP1-180278  
 Issue Date: 2018-03-01

Managed by: S, Neerajsingh

3C6L210-2973	A	Loading data for 95kV DC 1pole centre break disconnecter with single earth switch (MGB-MGB) for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3C6P001-2973	A	Name plate details for 95kV DC centre break disconnecter with single earth switch for Raigarh (BHEL)	Rating plate drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3C6P002-2973	A	Name plate details for 95kV DC centre break disconnecter without single earth switch and MES for Raigarh (BHEL)	Rating plate drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3E6G100-2973	A	General arrangement of 95kV DC, 1 pole maintenance earth switch (MGB) for Raigarh (BHEL)	Arrangement drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3UCA209-2973	A	Auxiliary switch details for disconnecter, earth switch and MES for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3UCD025-2973	A	Assembly of motor operating box for 95kV DC disconnecter with single, without and maintenance earth switch for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3UCN001-2973	A	Common legends and notes for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3UCOOO3-2973	A	Index sheet for 95kV DC disconnecter for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3UCS150-2973	A	DC and AC control circuit for disconnecter with single earth switch and without earth switch for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
3UCS151-2973	A	DC and AC control circuit for disconnecter with single earth switch and MES for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
43-1-2007-HV4368S&S	0	Lightning impulse withstand voltage and power frequency withstand voltage test for Raigarh (BHEL)	Type test report	Approval	2018-03-11	2018-03-22	058	Raigarh
43-1-2013-HV-1738-ABI	0	Type tests reports for 245kV solid post insulators for Raigarh (BHEL)	Type test report	Approval	2018-03-11	2018-03-22	058	Raigarh

HVDC

±800kV, 6000MW HVDC Raigarh – Pugaiur Terminals Document Transmittal

ABB, HVDC  
RP800 Project Office  
4th Floor, Plot No. 58  
Sector 44, Gurgaon – 122001.  
India

Transmittal No: TM-RP1-180278  
Issue Date: 2018-03-01

Managed by: S, Neerajsingh

8108276112-100-KPS-04	0	Mechanical endurance test for 245kV 3 pole earth switch for Raigarh (BHEL)	Type test report	Approval	2018-03-11	2018-03-22	058	Raigarh
8112431725-100-SS-01	0	Mechanical endurance tests on 245kV, 2000A, disconnecter with earth switch for Raigarh (BHEL)	Type test report	Approval	2018-03-11	2018-03-22	058	Raigarh
987382-1	0	245kV S-C Post insulator for Raigarh (BHEL)	Drawing	Approval	2018-03-11	2018-03-22	058	Raigarh
BHEL-RP-3-12-DC-NDISC-GTP	0	GTP for 95kV DC disconnectors and earth switches for Raigarh (BHEL)	Technical data	Approval	2018-03-11	2018-03-22	058	Raigarh
HPL07179	0	Short time withstand current test and peak withstand current test on 245kV centre break disconnector for Raigarh (BHEL)	Type test report	Approval	2018-03-11	2018-03-22	058	Raigarh
HPL08222	0	Short time withstand current test and peak withstand current test on earth switch for Raigarh (BHEL)	Type test report	Approval	2018-03-11	2018-03-22	058	Raigarh
RP-1314-026211	0	Type tests (mechanical) reports for 245kV solid post insulators for Raigarh (BHEL)	Type test report	Approval	2018-03-11	2018-03-22	058	Raigarh
WO2973-TTRS-95	1	Type Test Summary Reports for 95kV DC Disconnectors and Earthing Switches for Raigarh (BHEL)	Type test summary report	Approval	2018-03-11	2018-03-22	058	Raigarh

Best Regards,  
Neeraj Singh  
Document Control

E-mail: neerajsingh.s@in.abb.com

The above documents are submitted for approval / comments as per the requirements of GCC Clause 20.3.1 read with SCC GCC Clause 20.3.2.

CPRI

## TEST REPORT



**Central Power Research Institute**

(A Govt. of India Society)

P.B.No. 8066, Sadashivanagar Post Office,  
Sir C.V. Raman Road,  
Bangalore - 560 080 (INDIA)

# CENTRAL POWER RESEARCH INSTITUTE

## TEST REPORT



**CPRI**

Test Report Number: 003EATDIP15S0091

Dated: 01.04.2015

Name & Address of the Customer : M/s. S & S Power Switchgear Equipment Ltd.,  
NO: 4, EVR Street, Sedarapet,  
Puducherry – 605 111.

Name & Address of the Manufacturer : M/s. S & S Power Switchgear Equipment Ltd.,  
NO: 4, EVR Street, Sedarapet,  
Puducherry – 605 111.

### Particulars of sample tested

Condition of the sample on Receipt : New  
Type : Outdoor (220V DC)  
Designation : Motor Operating Drive Box for Disconnecter.  
Serial Number : 068E  
Number of samples tested : One only  
Date (s) of Test (s) : 30.03.2015 to 01.04.2015  
CPRI sample code no(s) : EATDIP15S0091

### Particulars of tests conducted

Test in accordance with Standard / specification : IP 55 Test Category 2 as per IEC 60529 Edition 2.2,  
2013-08 Standard. Clause 13.4.  
Sampling Plan : Not applicable  
Customer's requirement : 1. IP 55 Test Category 2 as per IEC 60529 Edition 2.2,  
2013-08 Standard. Clause 13.4.  
2. Insulation Resistance Measurement at 500V DC and  
3. Power Frequency High Voltage withstand test at 2.0kV AC  
to be applied for one minute between all the terminals  
shorted together and the body of the Motor Operating Drive  
Box Enclosure to be conducted before and after IP 55 Test.

Deviations if any : -Nil-

### Name of the witnessing persons

Customer's representative : Mr. K. Anandh, Engineer – Technical.  
Other than customer's representatives : None  
Test subcontracted with address of the laboratory : None

### Documents constituting this report (In words)

Number of sheets : Three Only  
Number of oscillograms : -Nil-  
Number of graphs : -Nil-  
Number of photos : -Nil-  
Number of test circuit diagrams : -Nil-  
Number of drawing : Two only. DRAWING NO. 3UCD100/TTST, REV. No.-A  
SHEET 1 OF 2 and SHEET 2 OF 2.

  
(GUJJALA B. BALAKRISHNA)  
Test Engineer



  
(M. SIDDHARTHA BHATT)  
Additional Director

# CENTRAL POWER RESEARCH INSTITUTE



Test Report Number: 003EATDIP15S0091

Dated: 01.04.2015

## TEST RESULTS.

**CPRI**

SL. NO.	PARTICULARS		OBSERVATIONS/VALUES OBTAINED		
	TESTS CONDUCTED	REFERENCE CLAUSE			
1.0	IP 5X Test Category 2 as per IEC 60529 Edition 2.2, 2013-08 Standard.	Clause 13.4 Protection against Ingress of Solid Foreign Objects – Dust Test.	No entry of dust found observed inside the Motor Operating Drive Box Enclosure.		
2.0	IP X5 Test as per IEC 60529 Edition 2.2, 2013-08 Standard.	Clause 14.2.5 Protection against harmful ingress of water – Hose jet of water using nozzle of dia. 6.30 mm, water flow rate 12.5 Ltrs/min $\pm$ 5% at 3 mts distance.	No entry of water found observed inside the Motor Operating Drive Box Enclosure.		
3.0	<b>Electrical Tests Conducted</b>		<b>Before IP 5X Test</b>	<b>After IP 5X Test / Before IP X5 Test</b>	<b>After IP X5 Test</b>
3.1	Insulation Resistance Measurement at 500V DC, to be applied for one minute between all the terminals shorted together and the body of the Motor Operating Drive Box Enclosure.		478M $\Omega$	>1.0 G $\Omega$	449M $\Omega$
3.2	Power Frequency High Voltage withstand test at 2.0kV AC to be applied for one minute between all the terminals shorted together and the body of the Motor Operating Drive Box Enclosure.		Withstood	Withstood	Withstood

  
 Test Engineer

# CENTRAL POWER RESEARCH INSTITUTE




Test Report Number: 003EATDIP15S0091

Dated: 01.04.2015

**CPRI**

## 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 correction / erasure invalidate this test report / certificate.
- d) NABL has accredited this laboratory as per ISO/IEC 17025: 2005 standard vide certificate No. T - 0010. for the tests conducted
- e) Any anomaly / discrepancy in the test report / certificate should be brought to our notice within 45 days from the date of issue.
- f) The verification of the sample drawings by CPRI is limited to dimensional checks only wherever possible.

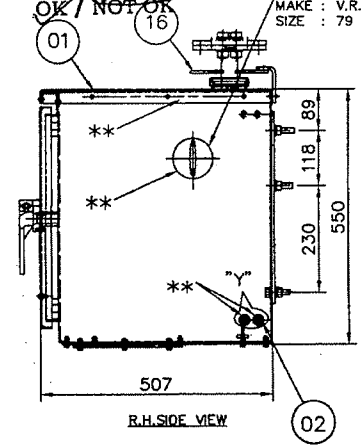
  
Test Engineer

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ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

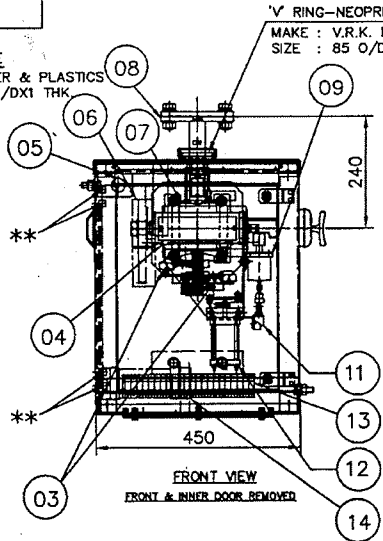
IF IN DOUBT ASK

External Dimension  
OK / NOT OK



R.H. SIDE VIEW

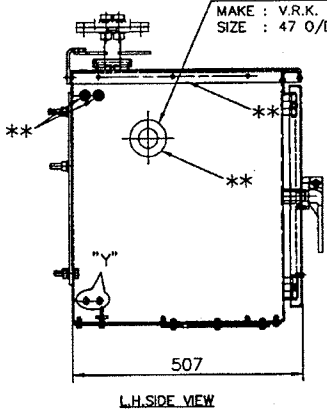
CAP SEAL-NEOPRENE  
MAKE : V.R.K. RUBBER & PLASTICS  
SIZE : 79 0/DX56 1/DX1 THK.



FRONT VIEW  
FRONT & INNER DOOR REMOVED

V RING-NEOPRENE  
MAKE : V.R.K. RUBBER & PLASTICS  
SIZE : 85 0/DX73 1/DX15.5

BREATHER SEAL-NEOPRENE  
MAKE : V.R.K. RUBBER & PLASTICS  
SIZE : 47 0/DX36 1/DX1 THK.

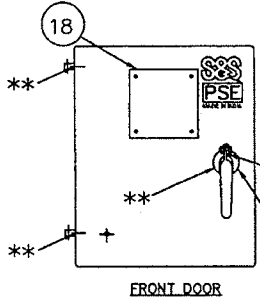


L.H. SIDE VIEW

NOTES:

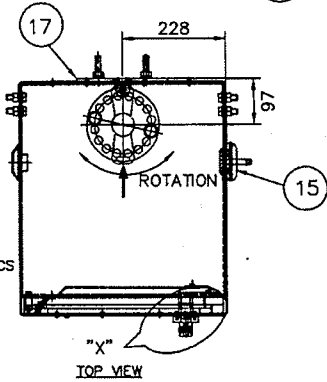
1. ALWAYS KEEP THE DRIVE IN UPRIGHT POSITION.
2. WEIGHT OF DRIVE BOX IS 60 Kg APPROXIMATELY.
3. DEGREE OF PROTECTION IS IP55 AS PER IEC:60529.
4. ALL DOORS & REMOVABLE COVERS SHALL BE SEALED BY GASKETS.
- 5a. "ON" AND "OFF" LABEL FIXED TO THE OPERATING FLANGE AT REQUIRED ANGLE OF DRIVE INDICATE THE PHYSICAL POSITION OF DISCONNECTOR.
- b. ARROW POSITION ON TOP OF MOTOR OPERATING CABINET INDICATES ON/OFF POSITION OF DISCONNECTOR.
- 5c. a,b TOGETHER WILL FORM MECHANICAL POSITION INDICATOR.
6. MATERIAL OF CABINET : 3mm THICK ALUMINIUM SHEET
7. FINISH : NATURAL FINISH - RIVETED CONSTRUCTION.
8. ALL DIMENSION ARE IN MM.
9. GENERAL TOLERANCE APPLICABLE AS PER RELEVANT STANDARDS.  
IP - INGRESS PROTECTION

MARKED THUS \*\* AREA APPLY SILASTIC RTV 1080  
MAKE : DOWCORNING

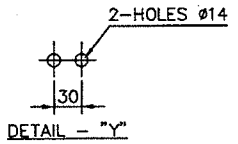


FRONT DOOR

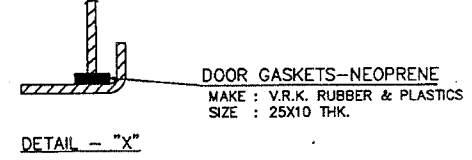
HANDLE SEAL-NEOPRENE  
MAKE : V.R.K. RUBBER & PLASTICS  
SIZE : 54 0/DX36 1/DX1 THK.



"X" TOP VIEW



DETAIL - "Y"



DETAIL - "X"

DOOR GASKETS-NEOPRENE  
MAKE : V.R.K. RUBBER & PLASTICS  
SIZE : 25X10 THK.

Attestation of this drawing is limited to the checking of Dimensions only. This Drawing pertains to the Test Report No. 003EATDIPESAT91 dated 01/04/2015

TEST ENGINEER  
EATD, CPRI  
Bengaluru - 560 080



ITEM	DESCRIPTION	QTY
18	NAME PLATE	1
17	GEAR BOX SUPPORT PLATE	1
16	PAD LOCK	1
15	OPERATING HANDLE ENTRY HOLE WITH COVER	1
14	HEATER-240V AC BOW	1
13	TERMINAL BLOCKS-10A	43
12	AUXILIARY SWITCH-Ith-10A	1
11	LIMIT SWITCH - EMLS-Ith-10A	1
10	HANDLE WITH PAD LOCK FACILITY	1
09	BOLT COIL ASSY.(MBC)-500 mA	1
08	DRIVE FLANGE	1
07	MOTOR-220V DC 0.5HP	1
06	GREASE GUARD	1
05	LAMP 240V AC 8W	1
04	GEAR BOX ASSEMBLY	1
03	LIMIT SWITCH- LSO/LSC-Ith-10A	2
02	EARTHING POINTS WITH M2 BOLT	4
01	CABINET	1

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

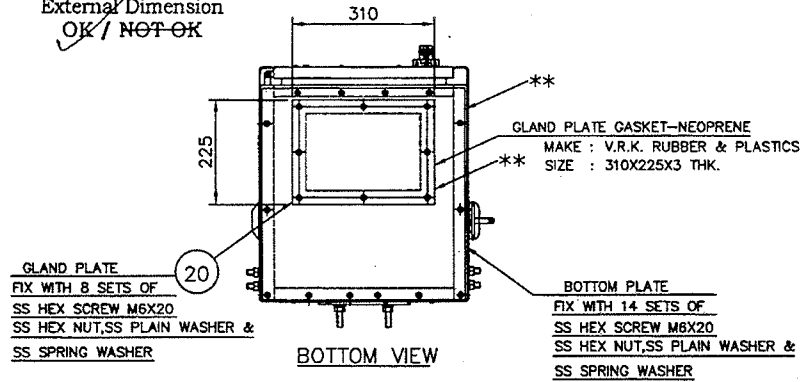
	SCALE	TITLE :	DRN.
		MOTOR OPERATING DRIVE BOX FOR DISCONNECTOR	2013/1/5
	S & S POWER SWITCHGEAR EQUIPMENT LTD NO. 4, EVR STREET, SEDARAPET PUDUCHERRY - 605111, INDIA	CHD.	2/2/15
		APPD.	2/2/15
		DRAWING NO.	REV. No.
		3UCD100/TTST	A-

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IF IN DOUBT ASK

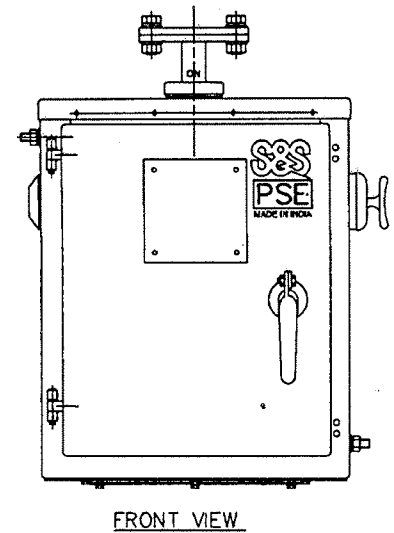
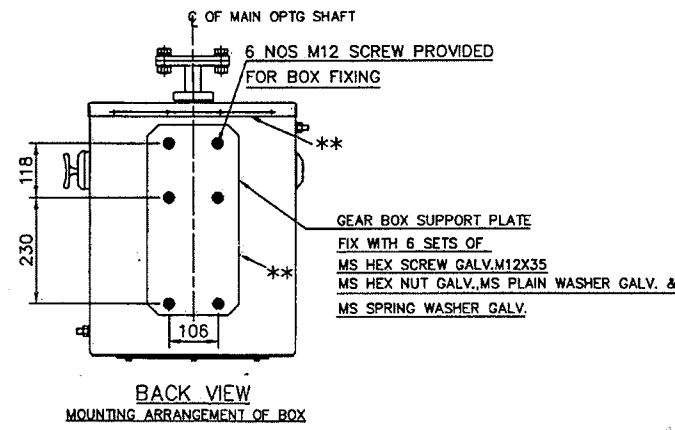
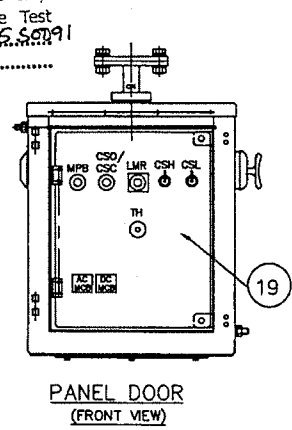
External Dimension  
OK / NOT OK



MARKED THUS \*\* AREA APPLY SILASTIC RTV 1080  
MAKE : DOWCORNING

Attestation of this drawing is limited  
to the checking of Dimensions only.  
This Drawing pertains to the Test  
Report No. 003/ATD/PLS/5091  
dated 01/04/2015

TEST BY  
EATD, CPRI  
Changaluru - 560 080



20	GLAND PLATE	1
19	PANEL DOOR-2mm thk	1
ITEM	DESCRIPTION	QTY

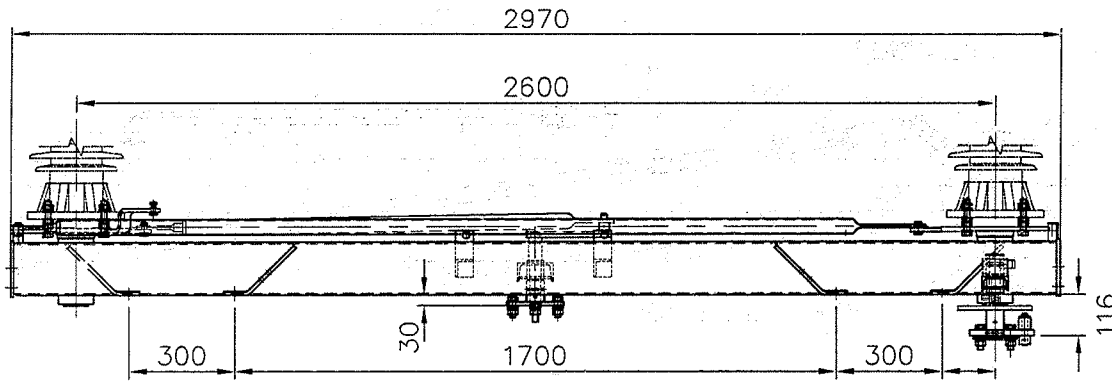
REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

	SCALE	TITLE :	DRN.	30/3/15
		MOTOR OPERATING DRIVE BOX FOR DISCONNECTOR	CHD.	23/3/15
			APPD.	2/5/18
		S & S POWER SWITCHGEAR EQUIPMENT LTD NO:4, EVR STREET, SEDARAPET PUDUCHERRY - 605111, INDIA	DRAWING NO.	
				REV. No. 3UCD100/TTST A-

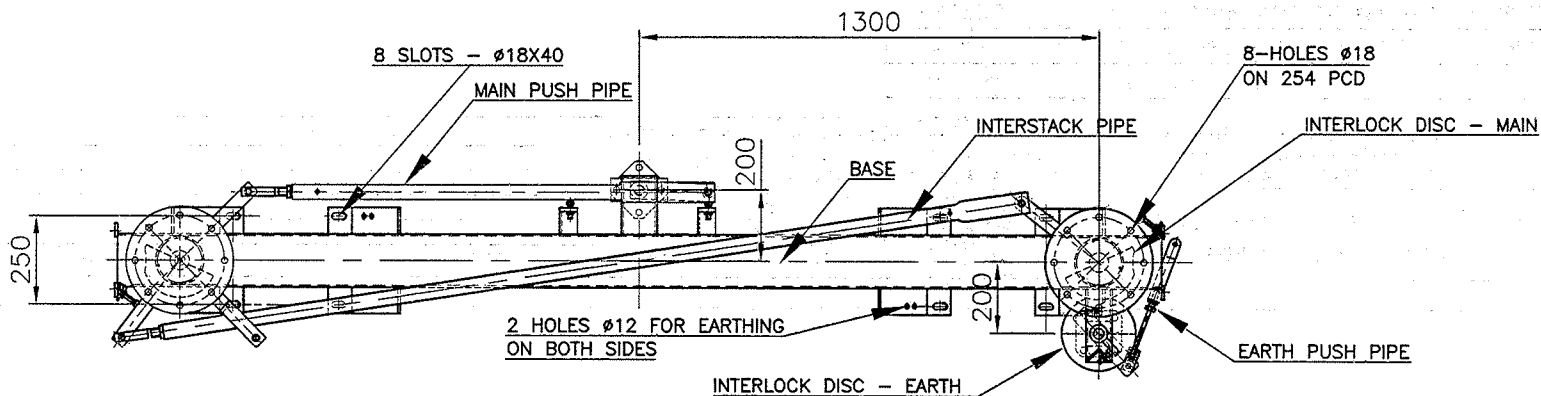
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ELEVATION



PLAN

Cat IV

	पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड POWER GRID CORPORATION OF INDIA LIMITED		
± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)			
Approved in Category :	I	II	III
			IV
	Checked by	Verified by	Reviewed by
Signature :			
Date :	10/04/18		

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE NTS	TITLE :	DRN.	SAM
	ASSEMBLY OF BASE FOR 95kV DC CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH	CHD.	KAH
	S & S POWER SWITCHGEAR EQUIPMENT LTD	APPD.	KAH
	PUDUCHERRY - 605111, INDIA	DRAWING NO.	REV. No.
		2068327/2973	A-

TIGHTENING TORQUE FOR SCREWS

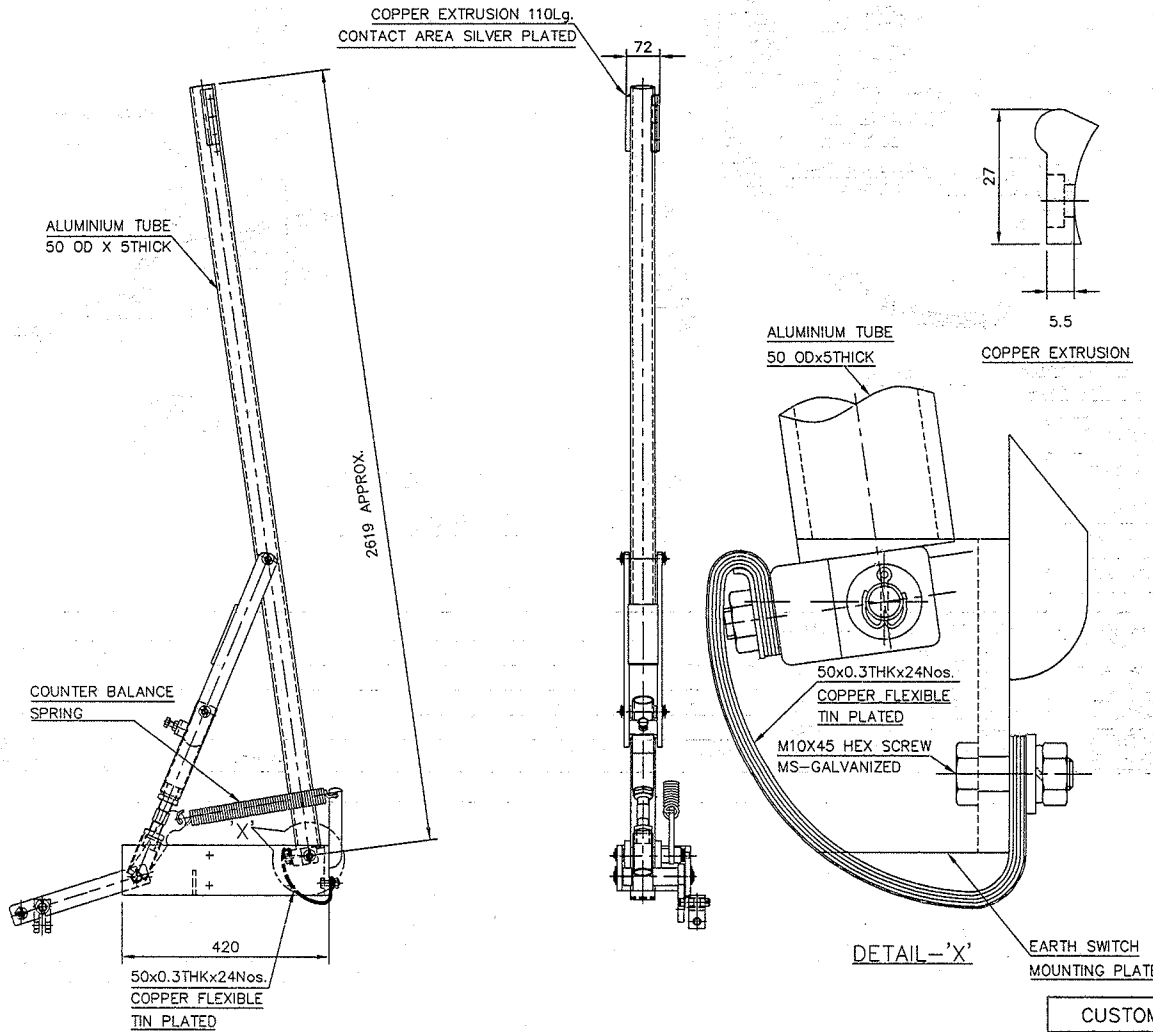
M6	- 06.1 TO 06.8Nm
M8	- 18.1 TO 18.7Nm
M10	- 29.1 TO 30.7Nm
M12	- 50.8 TO 55.5Nm
M16	- 126 TO 134Nm
M20	- 246 TO 273Nm

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

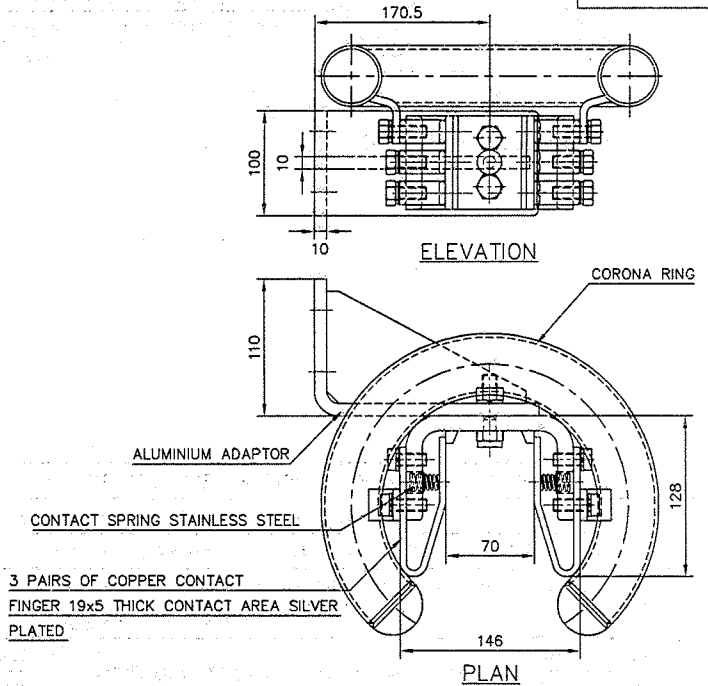
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IF IN DOUBT ASK



ELEVATION SIDE VIEW  
DIRECT ENTRY EARTH SWITCH



EARTH FIXED CONTACT

	पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड POWER GRID CORPORATION OF INDIA LIMITED		
	± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)		
Approved in Category:	<input type="checkbox"/> I	<input type="checkbox"/> II	<input checked="" type="checkbox"/> III
Checked by	Verified by	Reviewed by	
Signature:			
Date:	10/04/18		

Cat IV

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kv, 6000MW HVDC RAIGARH – PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE	1:10	TITLE :	ASSEMBLY OF EARTH SWITCH AND EARTH FIXED CONTACT FOR 95kV DC CENTRE BREAK DISCONNECTOR
DRN.	SAM	04.01.18	
CHD.	KAH	04.01.18	
APPD.	KAH	04.01.18	
S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY – 605111, INDIA		DRAWING NO.	REV. No.
		3C6E084/2973	A-

TIGHTENING TORQUE FOR SCREWS

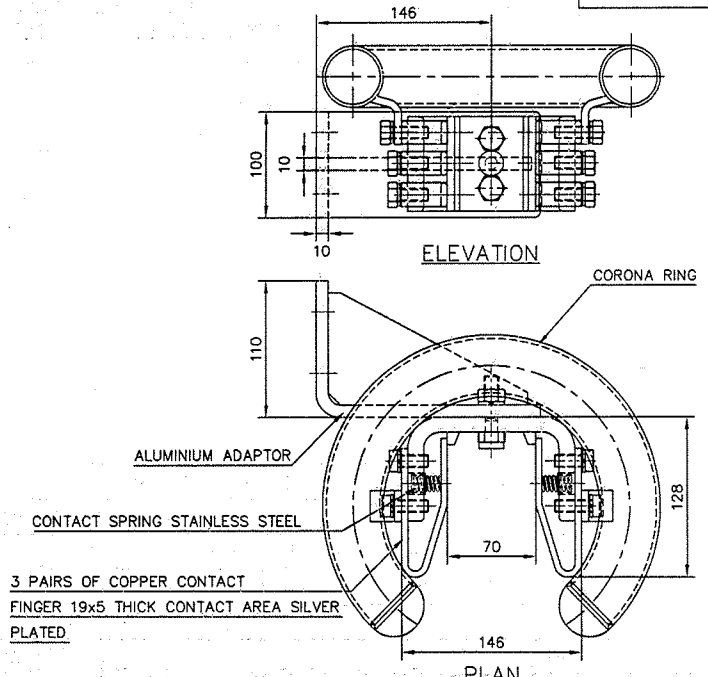
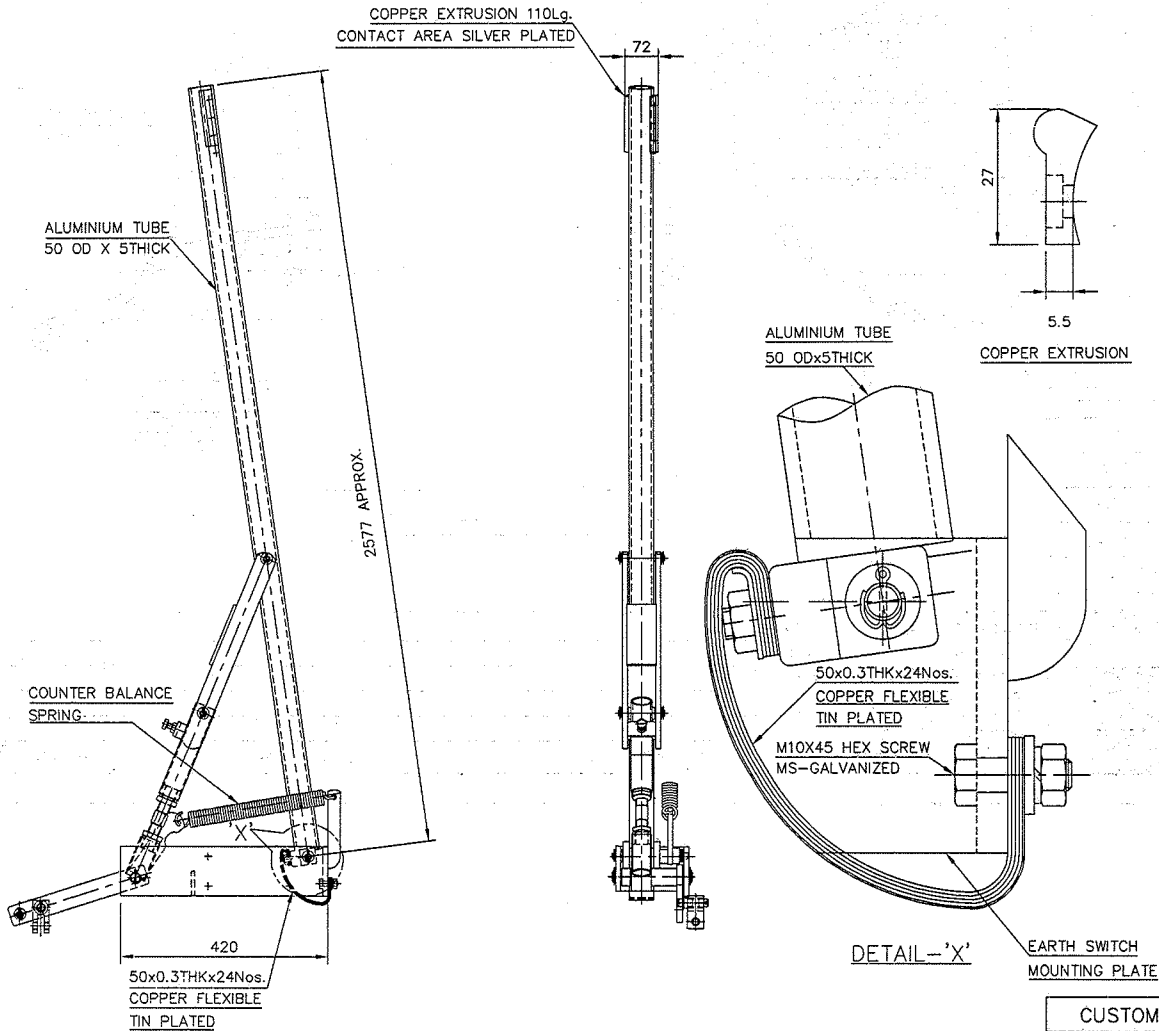
M6	06.1 TO 06.8Nm
M8	18.1 TO 18.7Nm
M10	29.1 TO 30.7Nm
M12	50.8 TO 55.5Nm
M16	126 TO 134Nm
M20	246 TO 273Nm

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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IF IN DOUBT ASK



**POWER GRID CORPORATION OF INDIA**  
**POWER GRID CORPORATION OF INDIA** (SCALE 1:1.25)  
 ± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)

Approved in Category: **I II III IV** *Cat IV*

Checked by: *[Signature]* Verified by: *[Signature]* Reviewed by: *[Signature]*

Signature: *[Signature]*

Date: *10/09/18*

**ELEVATION SIDE VIEW**  
**DIRECT ENTRY EARTH SWITCH**

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kv, 6000MW HVDC RAIGARH – PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE	1:10	TITLE :	ASSEMBLY OF EARTH SWITCH AND EARTH FIXED CONTACT FOR 95kv DC MAINTENANCE EARTH SWITCH
DRN.	SAM	04.01.18	
CHD.	KAH	04.01.18	
APPD.	KAH	04.01.18	
S & S POWER SWITCHGEAR EQUIPMENT LTD		DRAWING NO.	REV. No.
PUDUCHERRY – 605111, INDIA		3C6E085/2973	A-

**TIGHTENING TORQUE FOR SCREWS**

M6	– 06.1 TO 06.8Nm
M8	– 18.1 TO 18.7Nm
M10	– 29.1 TO 30.7Nm
M12	– 50.8 TO 55.5Nm
M16	– 126 TO 134Nm
M20	– 246 TO 273Nm

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

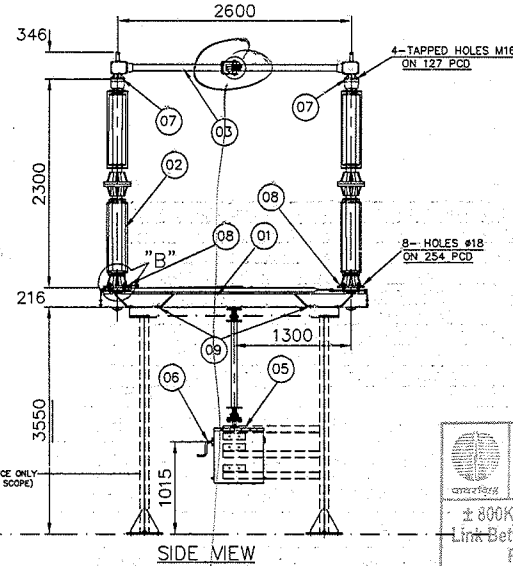
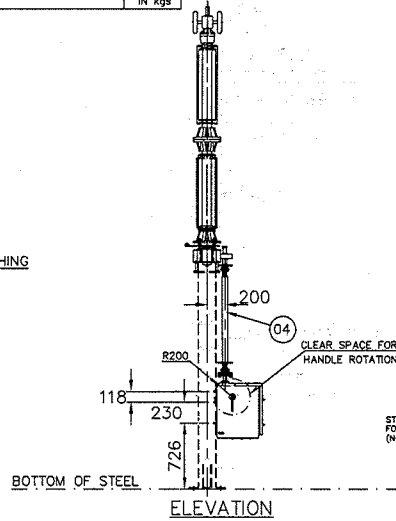
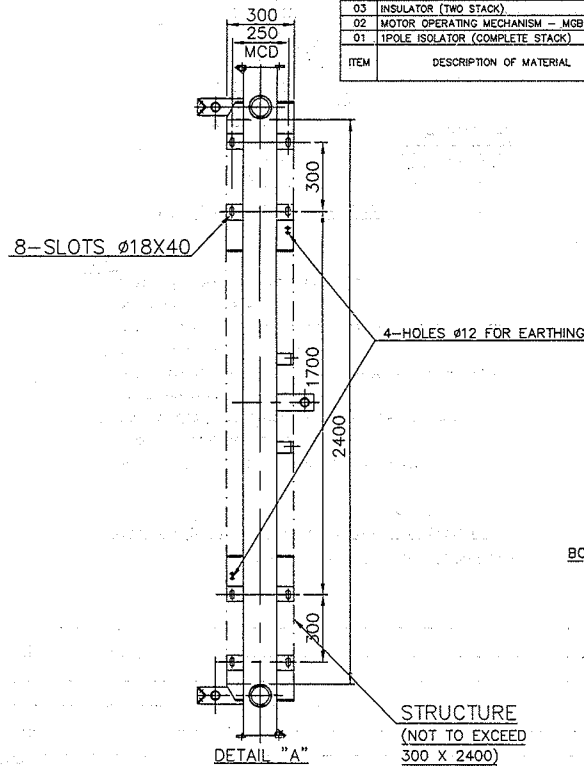


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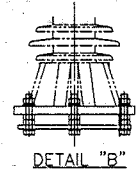
ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

IF IN DOUBT ASK

03	INSULATOR (TWO STACK)	155
02	MOTOR OPERATING MECHANISM - MGB (MAIN)	65
01	1POLE ISOLATOR (COMPLETE STACK)	600
ITEM	DESCRIPTION OF MATERIAL	WEIGHT (APPROX) IN kgs



ITEM DESIGNATION	QUANTITY
WN1.Q(11,13)	2 No's
WN2.Q(11,13)	2 No's
WN.Q(15,16,31)	3 No's



**पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड**  
**POWER GRID CORPORATION OF INDIA LIMITED**  
 ± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)

Approved in Category:  I  II  III  IV

Checked by: [Signature] Verified by: [Signature] Reviewed by: [Signature]

Signature: [Signature]

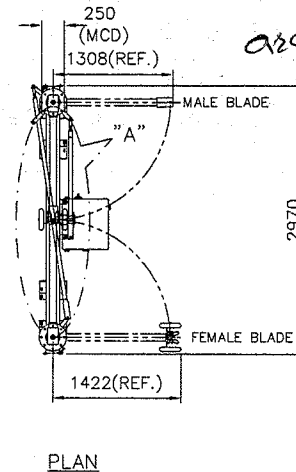
Date: 10/07/18

*arching contact - stainless steel*

**NOTES :**

1. MCD - MOUNTING CENTRE DISTANCE.
2. NB - NOMINAL BORE.
3. ALL EXPOSED FERROUS PARTS ARE HOT DIP GALVANIZED.
4. ALL DIMENSIONS ARE IN MM.
5. ALL CONTACT AREAS ARE SILVER PLATED TO 25 MICRONS THICK MINIMUM.
6. MIN CREEPAGE DISTANCE OF INSULATOR: 6125MM.
7. MGB - MOTORIZED GEARED BOX.
8. UNDERLINED DIMENSIONS ARE NOT IN SCALE.

DIRECTION OF CLOSING OF OPERATING DRIVE FLANGE:  
 185° CLOCKWISE FOR DISCONNECTOR

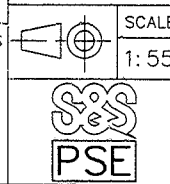


ITEM	DESCRIPTION	QTY
09	MS HEX SCREW GALVANIZED M16X60 WITH NUT, FLAT & SPRING WASHERS	8 SETS
08	MS HEX SCREW GALVANIZED M16X90 WITH NUTS, FLAT & SPRING WASHERS	16 SETS
07	MS HEX SCREW GALVANIZED M16X35 WITH FLAT & SPRING WASHERS	8 SETS
06	MANUAL OPERATING HANDLE - MAIN	1
05	DISCONNECTOR OPERATING DRIVE TYPE : MOTOR-3UCD025/2973	1
04	DOWN OPERATING PIPE FOR MAIN NB50 - HOT DIP GALVANIZED	1
03	MALE AND FEMALE HAMPER ASSEMBLY WITH CORONA SHIELDS-3C6H003/2973	1
02	INSULATORS (IN S&S SCOPE OF SUPPLY)	2
01	BASE ASSEMBLY - HOT DIP GALVANIZED	1

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kv, 6000MW HVDC RAIGARH - PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE	1:55	TITLE :	DRN. SAM 04.01.18
		GENERAL ARRANGEMENT OF 95KV DC, 2316A 1POLE CENTRE BREAK DISCONNECTOR WITHOUT EARTH SWITCH (MGB)	CHD. KAH 04.01.18
		S & S POWER SWITCHGEAR EQUIPMENT LTD	APPD. KAH 04.01.18
		PUDUCHERRY - 605111, INDIA	DRAWING NO. REV. No.
			3C6G110/2973 A-

**TIGHTENING TORQUE FOR SCREWS**

M6	- 06.1 TO 06.8Nm
M8	- 18.1 TO 18.7Nm
M10	- 29.1 TO 30.7Nm
M12	- 50.8 TO 55.5Nm
M16	- 126 TO 134Nm
M20	- 246 TO 273Nm

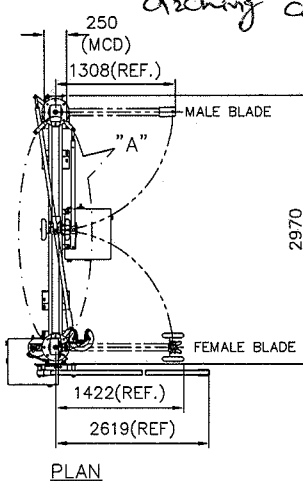
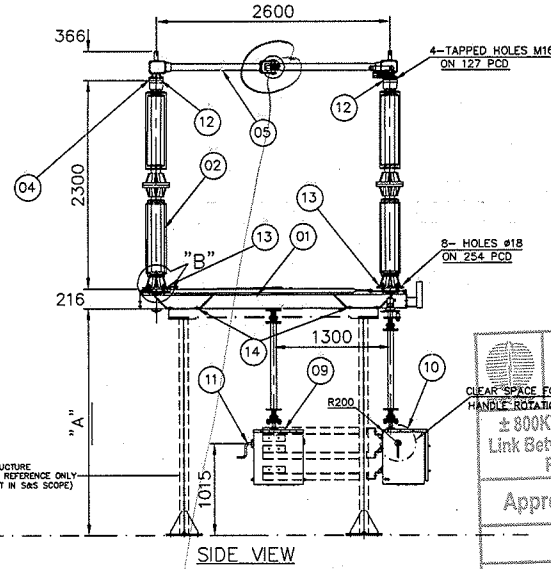
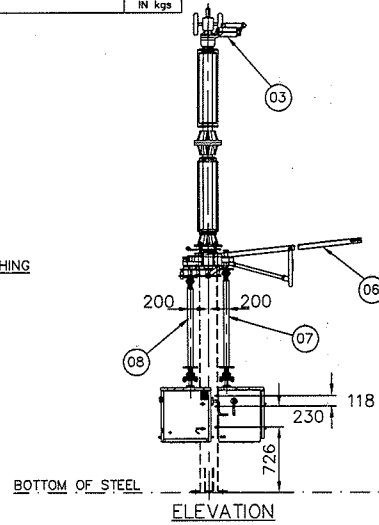
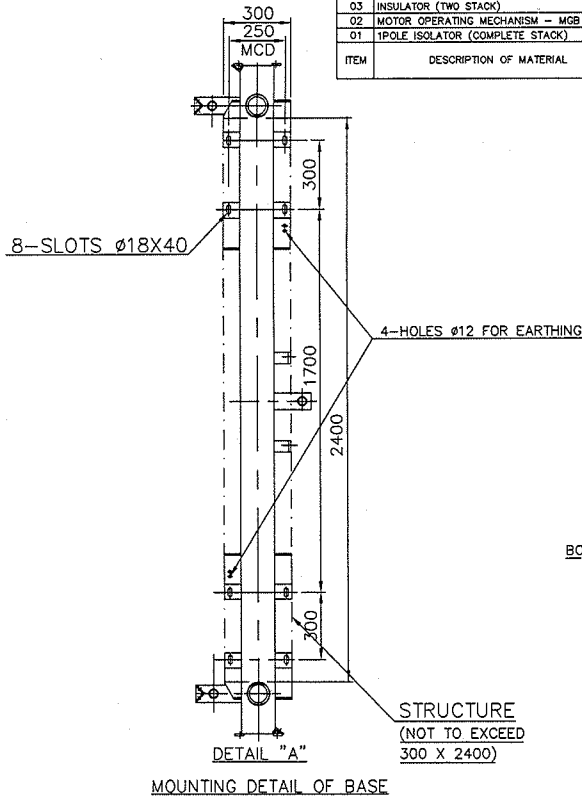


REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

IF IN DOUBT ASK

ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

03	INSULATOR (TWO STACK)	155
02	MOTOR OPERATING MECHANISM - MGB (MAIN & EARTH)	65
01	1POLE ISOLATOR (COMPLETE STACK)	750
ITEM	DESCRIPTION OF MATERIAL	WEIGHT (APPROX) IN kgs



- NOTES :
- MCD - MOUNTING CENTRE DISTANCE.
  - NB - NOMINAL BORE.
  - ALL EXPOSED FERROUS PARTS ARE HOT DIP GALVANIZED.
  - ALL DIMENSIONS ARE IN MM.
  - ALL CONTACT AREAS ARE SILVER PLATED TO 25 MICRONS THICK MINIMUM.
  - MIN CREEPAGE DISTANCE OF INSULATOR: 6125MM.
  - MGB - MOTORIZED GEARED BOX.
  - UNDERLINED DIMENSIONS ARE NOT IN SCALE.

DIRECTION OF CLOSING OF OPERATING DRIVE FLANGE:  
 185° CLOCKWISE FOR DISCONNECTOR  
 120° ANTICLOCKWISE FOR EARTH SWITCH

ITEM DESIGNATION	QUANTITY	ST.HT "A"
WN1.Q(12,14)	2 No's	5550
WN2.Q(12,14)	2 No's	5550
WN.Q(17,18)	2 No's	5550
P(1,2,3,4),Z1.Q12	4 No's	3550

**Cat I**

**POWER GRID CORPORATION OF INDIA LIMITED**

± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)

Approved in Category :  I  II  III  IV

Checked by: \_\_\_\_\_ Verified by: \_\_\_\_\_ Reviewed by: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: 10/04/18

ITEM	DESCRIPTION	QTY
14	MS HEX SCREW GALVANIZED M16X60 WITH NUT, FLAT & SPRING WASHERS	8 SETS
13	MS HEX SCREW GALVANIZED M16X90 WITH NUTS, FLAT & SPRING WASHERS	16 SETS
12	MS HEX SCREW GALVANIZED M16X55 WITH FLAT & SPRING WASHERS	8 SETS
11	MANUAL OPERATING HANDLE - MAIN & EARTH	2
10	EARTH SWITCH OPERATING DRIVE TYPE : MOTOR-3UCD025/2973	1
09	DISCONNECTOR OPERATING DRIVE TYPE : MOTOR-3UCD025/2973	1
08	DOWN OPERATING PIPE FOR EARTH NB50 - HOT DIP GALVANIZED	1
07	DOWN OPERATING PIPE FOR MAIN NB50 - HOT DIP GALVANIZED	1
06	ASSEMBLY OF EARTH MOVING BLADE-3C6E084/2973	1
05	MALE AND FEMALE HAMPER ASSEMBLY WITH CORONA SHIELDS-3C6H003/2973	1
04	DUMMY ADAPTOR	1
03	ASSEMBLY OF EARTH FIXED CONTACT WITH CORONA RING-3C6E084/2973	1
02	INSULATORS (IN S&S SCOPE OF SUPPLY)	2
01	BASE ASSEMBLY - HOT DIP GALVANIZED	1

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)			
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED			
PROJECT	±800KV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS			
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25			
STATION	RAIGARH SUBSTATION			
SCALE 1:55	TITLE :	DRN.	SAM	04.01.18
	GENERAL ARRANGEMENT OF 95KV DC, 2316A 1POLE CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH (MGB/MGB)	CHD.	KAH	04.01.18
S & S PSE	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA	APPD.	KAH	04.01.18
		DRAWING NO.	REV. No.	
		3C6G210/2973	A-	

TIGHTENING TORQUE FOR SCREWS
M6 - 06.1 TO 06.8Nm
M8 - 18.1 TO 18.7Nm
M10 - 29.1 TO 30.7Nm
M12 - 50.8 TO 55.5Nm
M16 - 126 TO 134Nm
M20 - 246 TO 273Nm

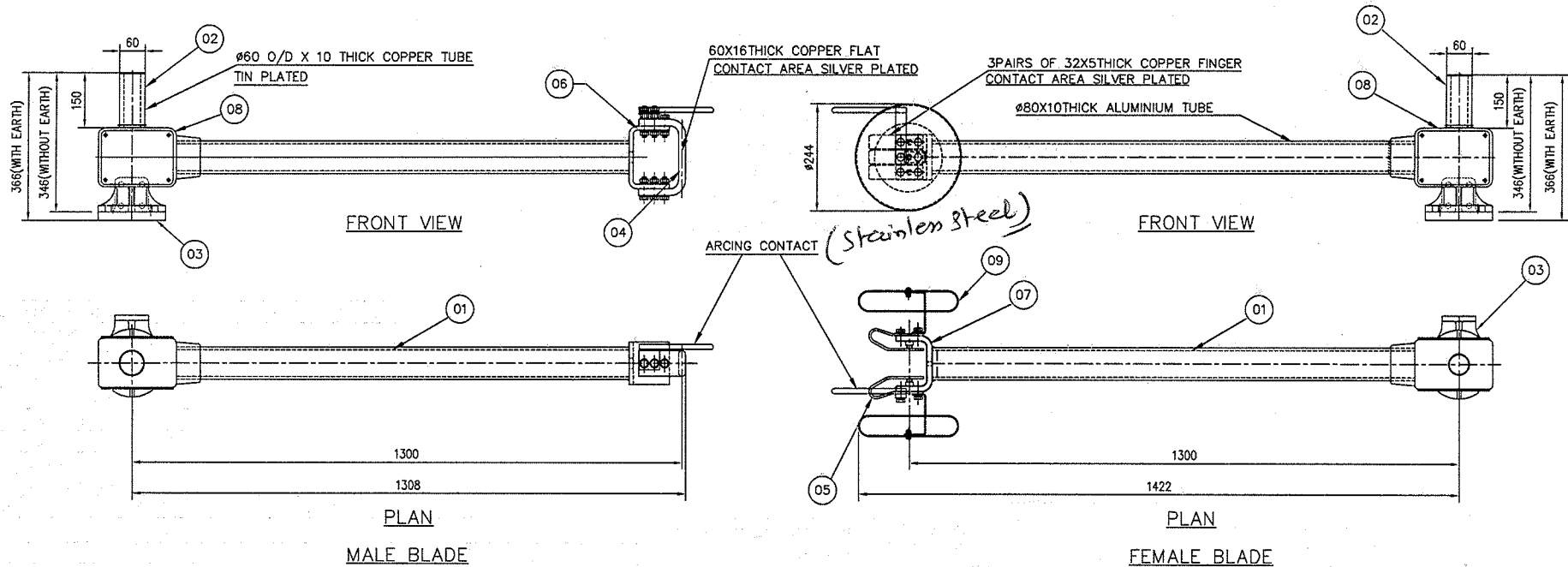
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REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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IF IN DOUBT ASK



**NOTES:**

1. IN CASE OF DOUBLE EARTH SWITCH, EARTH ADAPTOR WILL BE PROVIDED ON BOTH SIDES.
2. IN CASE OF SINGLE EARTH SWITCH, EARTH ADAPTOR WILL BE PROVIDED ONLY IN THE EARTH SWITCH SIDE. DUMMY ADAPTOR WILL BE PROVIDED IN THE OTHER END.
3. IN CASE OF WITHOUT EARTH SWITCH, BOTH EARTH/DUMMY ADAPTOR WILL NOT BE PROVIDED.

4. SILVER PLATING THICKNESS IN THE CONTACT AREA SHALL BE 25 MICRONS THICK MINIMUM.
5. MANUFACTURING TOLERANCES WILL BE ±8.0MM UNLESS OTHERS SPECIFIED.

पावर ग्रिड कॉर्पोरेशन लिमिटेड  
POWER GRID CORPORATION OF INDIA

600kV, 6000MW HVDC Terminals Associated With HVDC Bipole  
Between Western Region (Raigarh, Chhattisgarh) and Southern  
Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)

Approved in Category: **I II III IV**

Checked by: [Signature] Verified by: [Signature] Reviewed by: [Signature]

Signature: [Signature] Date: 10/04/18

*Cat IV*

ITEM	DESCRIPTION	MATERIAL	QTY
09	CORONA SHIELD	ALUMINIUM	2
08	HOUSING ALUMINIUM CASTING	ALUMINIUM	2
07	FEMALE CONTACT SUPPORT	ALUMINIUM	1
06	MALE CONTACT SUPPORT	ALUMINIUM	1
05	FINGER-Contact area silver plated	COPPER	6
04	MALE CONTACT-Contact area silver plated	COPPER	1
03	EARTH/DUMMY ADAPTOR	ALUMINIUM	2
02	CONNECTOR STEM - TUBE	COPPER	2
01	MOVING BLADE TUBE	ALUMINIUM	2

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		

TIGHTENING TORQUE FOR SCREWS

M6	06.1 TO 06.8Nm
M8	18.1 TO 18.7Nm
M10	29.1 TO 30.7Nm
M12	50.8 TO 55.5Nm
M16	126 TO 134Nm
M20	246 TO 273Nm

SCALE: 1:10

**S & S PSE**

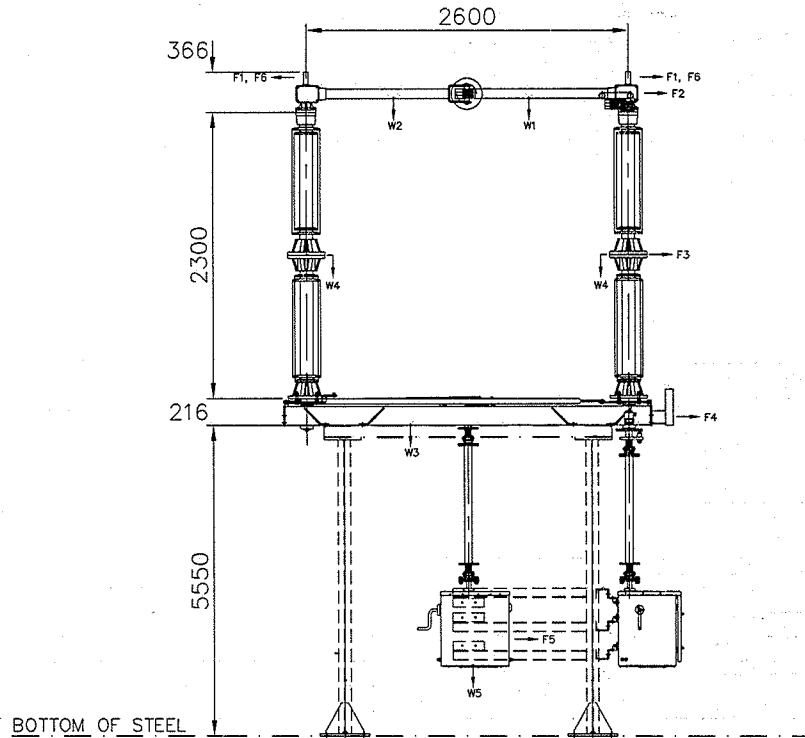
TITLE : ASSEMBLY OF MALE AND FEMALE BLADE FOR 95kV DC, 2316A CENTRE BREAK DISCONNECTOR	DRN.	SAM	04.01.18
	CHD.	KAH	04.01.18
	APPD.	KAH	04.01.18
S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA		DRAWING NO.	REV. No.
		3C6H003/2973	A-

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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IF IN DOUBT ASK



**BENDING LOADS:**

F1	SHORT CIRCUIT FORCE	4.0	Kgf
F2	WIND LOAD ON THE ARMS	33.12	Kgf
F3	WIND LOAD ON THE INSULATOR	51.54	Kgf
F4	WIND LOAD ON THE BASE FRAME	66.82	Kgf
F5	WIND LOAD ON THE DRIVE BOX	49.50	Kgf
F6	TERMINAL LOAD (STRAIGHT)	1000	N
F6	TERMINAL LOAD (CROSS)	330	N

**DEAD WEIGHTS:**

W1	WEIGHT OF THE FEMALE ARM	16	Kg. APPX.
W2	WEIGHT OF THE MALE ARM	16	Kg. APPX.
W3	WEIGHT OF THE BASE FRAME	140	Kg. APPX.
W4	WEIGHT OF EACH INSULATOR	155	Kg. APPX.
W5	WEIGHT OF THE DRIVE BOX	65	Kg. APPX.

CENTRE OF GRAVITY = 5472mm  
FROM GROUND LEVEL

	पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड <b>POWER GRID CORPORATION OF INDIA LIMITED</b>		
	± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)		
Approved in Category :		<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV	Cat IV
Checked by	Verified by	Reviewed by	
Signature :			
Date :	10/04/18		

**NOTES:**

- ALL LOADS CONSIDERED ARE INDICATED.
- WIND LOAD ON INSULATOR IS EXTRAPOLATED AND CONSIDERED TO ACT AT THE TOP.
- LOADS F1, F2 & F3 WILL ACT ON ALL INSULATORS.
- SHORT CIRCUIT FORCE IS CALCULATED BY CONSIDERING 7.2kA/1sec.
- PHASE SPACING CONSIDERED AS 4000 mm.
- WIND PRESSURE ASSUMED AS 150 Kg / SQ. METRE.
- OPERATING TORQUE FOR DISCONNECTOR & EARTH SWITCH - 35Kgm.
- STALLING TORQUE OF THE MOTOR DRIVE - 65 Kgm.

**TIGHTENING TORQUE FOR SCREWS**

M6	- 06.1 TO 06.8Nm
M8	- 18.1 TO 18.7Nm
M10	- 29.1 TO 30.7Nm
M12	- 50.8 TO 55.5Nm
M16	- 126 TO 134Nm
M20	- 246 TO 273Nm


CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)				
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED				
PROJECT	±800kv, 6000MW HVDC RAIGARH - PUGALUR TERMINALS				
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 DT.: 17-01-25				
STATION	RAIGARH SUBSTATION				
	SCALE	TITLE :	DRN.	SAM	04.01.18
	1:40		LOADING DATA FOR 95 kV DC 1POLE CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH (MGB/MGB)	CHD.	KAH
	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA		APPD.	KAH	04.01.18
			DRAWING NO.	REV. No.	
			3C6L210/2973	A-	

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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IF IN DOUBT ASK



**S & S POWER SWITCHGEAR EQUIPMENT LTD**  
 PUDUCHERRY - 605111, INDIA  
 www.sspower.com

	DISCONNECTOR	EARTH SWITCH
DESIGNATION OF TYPE	RC 95	
SERIAL NO.	*	
VOLTAGE (kV)	95	
NORMAL CURRENT (A)	2316	
FREQUENCY (Hz)	50	
DESIGN AMBIENT TEMPERATURE (°C)	50	
SHORT-TIME WITHSTAND CURRENT(kA)rms/peak	7.2/18	
DURATION OF SHORT CIRCUIT (s)	1	
LIGHTNING IMPULSE WITHSTAND VOLTAGE(kVp)	644	
POWER FREQUENCY WITHSTAND VOLTAGE(kV)	-	
SWITCHING IMPULSE WITHSTAND VOLTAGE(kVp)	-	
TYPE OF DRIVE	MOTOR	
AUXILIARY VOLTAGE (V DC)	220	
MOTOR VOLTAGE (V DC)	220	
MASS (kg)	500	
CONTRACT NO.	RAIGARH - 16kV DC	
PROJECT	Raigarh - 16kV HVDC Project	
WORK ORDER NO.	17/12/D/N/2973	
SUBSTATION	Raigarh	
YEAR OF MANUFACTURING	2018	

4-HOLES  $\phi$ 3.2



**S & S POWER SWITCHGEAR EQUIPMENT LTD**  
 PUDUCHERRY - 605111, INDIA  
 www.sspower.com

	DISCONNECTOR	EARTH SWITCH
DESIGNATION OF TYPE		DEE
SERIAL NO.		**
VOLTAGE (kV)		95
NORMAL CURRENT (A)		-
FREQUENCY (Hz)		50
DESIGN AMBIENT TEMPERATURE (°C)		50
SHORT-TIME WITHSTAND CURRENT(kA)rms/peak		7.2/18
DURATION OF SHORT CIRCUIT (s)		1
LIGHTNING IMPULSE WITHSTAND VOLTAGE(kVp)		644
POWER FREQUENCY WITHSTAND VOLTAGE(kV)		-
SWITCHING IMPULSE WITHSTAND VOLTAGE(kVp)		-
TYPE OF DRIVE		MOTOR
AUXILIARY VOLTAGE (V DC)		220
MOTOR VOLTAGE (V DC)		220
MASS (kg)		100
CONTRACT NO.	RAIGARH - 16kV DC	
PROJECT	Raigarh - 16kV HVDC Project	
WORK ORDER NO.	17/12/D/N/2973	
SUBSTATION	Raigarh	
YEAR OF MANUFACTURING	2018	

4-HOLES  $\phi$ 3.2

FOR WSE - MAIN

DISCONNECTOR DETAILS	SERIAL NUMBER	
	*	**
RC95kV_DC, 2316A, DISCONNECTOR WSE (MGB/MGB)	001 TO 010	001E TO 010E
RC95kV_DC, 2316A, DISCONNECTOR WSE (MGB/MGB)-SPARE	011 & 012	011E & 012E

FOR WSE - EARTH

ITEM DESIGNATION	QUANTITY
WN1.Q(12,14)	2 No's
WN2.Q(12,14)	2 No's
WN.Q(17,18)	2 No's
P(1,2,3,4).Z1.Q12	4 No's

POWER GRID CORPORATION OF INDIA LIMITED

800kV/6000MW HVDC Terminals Associated With HVDC Biplar Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)


Approved in Category:	I <input checked="" type="checkbox"/> II <input checked="" type="checkbox"/> III <input checked="" type="checkbox"/> IV <input checked="" type="checkbox"/>
Checked by	Verified by
Signature:	Date: 10/4/18

NOTE:

- COLOUR OF LETTERS, LINES & 3.5mm BORDER : BLACK
- BACK GROUND : WHITE
- MATERIAL : ALUMINIUM 1MM THK

TIGHTENING TORQUE FOR SCREWS

M6 - 06.1 TO 06.8Nm
M8 - 18.1 TO 18.7Nm
M10 - 29.1 TO 30.7Nm
M12 - 50.8 TO 55.5Nm
M16 - 126 TO 134Nm
M20 - 246 TO 273Nm


CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE 1:1	TITLE :	NAME PLATE DETAILS FOR 95kV DC CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH	DRN. 04.01.18
			SAM 04.01.18
	S & S POWER SWITCHGEAR EQUIPMENT LTD	DRAWING NO.	REV. No.
	PUDUCHERRY - 605111, INDIA	3C6P001/2973	A-

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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IF IN DOUBT ASK



**S & S POWER SWITCHGEAR EQUIPMENT LTD**  
 PUDUCHERRY - 605111, INDIA  
 www.sspower.com

	DISCONNECTOR	EARTH SWITCH
DESIGNATION OF TYPE	RC 95	
SERIAL NO.	*	
VOLTAGE (kV)	95	
NORMAL CURRENT (A)	2316	
FREQUENCY (Hz)	50	
DESIGN AMBIENT TEMPERATURE (°C)	50	
SHORT-TIME WITHSTAND CURRENT(kA)rms/peak	7.2/18	
DURATION OF SHORT CIRCUIT (s)	1	
LIGHTNING IMPULSE WITHSTAND VOLTAGE(kVp)	644	
POWER FREQUENCY WITHSTAND VOLTAGE(kV)	-	
SWITCHING IMPULSE WITHSTAND VOLTAGE(kVp)	-	
TYPE OF DRIVE	MOTOR	
AUXILIARY VOLTAGE (V DC)	220	
MOTOR VOLTAGE (V DC)	220	
MASS (kg)	500	
CONTRACT NO.	-	
PROJECT	RAIGARH - 16kV DC	
WORK ORDER NO.	17/12/D/N/2973	
SUBSTATION	-	
YEAR OF MANUFACTURING	2018	



**S & S POWER SWITCHGEAR EQUIPMENT LTD**  
 PUDUCHERRY - 605111, INDIA  
 www.sspower.com

	DISCONNECTOR	EARTH SWITCH
DESIGNATION OF TYPE		MES
SERIAL NO.	*	**
VOLTAGE (kV)	95	
NORMAL CURRENT (A)	-	
FREQUENCY (Hz)	50	
DESIGN AMBIENT TEMPERATURE (°C)	50	
SHORT-TIME WITHSTAND CURRENT(kA)rms/peak	7.2/18	
DURATION OF SHORT CIRCUIT (s)	1	
LIGHTNING IMPULSE WITHSTAND VOLTAGE(kVp)	644	
POWER FREQUENCY WITHSTAND VOLTAGE(kV)	-	
SWITCHING IMPULSE WITHSTAND VOLTAGE(kVp)	-	
TYPE OF DRIVE		MOTOR
AUXILIARY VOLTAGE (V DC)		220
MOTOR VOLTAGE (V DC)		220
MASS (kg)		100
CONTRACT NO.		-
PROJECT	RAIGARH - 16kV DC	
WORK ORDER NO.	17/12/D/N/2973	
SUBSTATION		
YEAR OF MANUFACTURING		2018

*cat II*

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड  
 POWER GRID CORPORATION OF INDIA LIMITED

± 800kV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)

Approved in Category: **I**  **II**  **III**  **IV**

Checked by: *[Signature]* Verified by: *[Signature]* Reviewed by: *[Signature]*

Signature: *[Signature]* Date: *[Date]*

FOR WOE - MAIN 4-HOLES Ø3.2

FOR MES 4-HOLES Ø3.2

*for comment refer on dno. No - 3CP6001/2973-A*

DISCONNECTOR DETAILS	SERIAL NUMBER
RC95kV_DC, 2316A, DISCONNECTOR WOE (MGB)	* 013 TO 019
RC95kV_DC, 2316A, DISCONNECTOR WOE (MGB) - SPARE	020

DISCONNECTOR DETAILS	SERIAL NUMBER	Date:
95kV_DC, MES (MGB)	** 021 TO 024	
95kV_DC, MES (MGB) - SPARE	025	

Approved in Category: **I**  **II**  **III**  **IV**

POWER GRID CORPORATION OF INDIA LIMITED  
 पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड

± 800kV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)

ITEM DESIGNATION	QUANTITY
WN1.Q(11,13)	2 No's
WN2.Q(11,13)	2 No's
WN.Q(15,16,31)	3 No's

ITEM DESIGNATION	QUANTITY
P(1,2,3,4).WN.Q21	4 No's

**NOTE:**  
 COLOUR OF LETTERS, LINES & 3.5mm BORDER : BLACK  
 BACK GROUND : WHITE  
 MATERIAL : ALUMINIUM 1MM THK

TIGHTENING TORQUE FOR SCREWS

M6 - 06.1 TO 06.8Nm
M8 - 18.1 TO 18.7Nm
M10 - 29.1 TO 30.7Nm
M12 - 50.8 TO 55.5Nm
M16 - 126 TO 134Nm
M20 - 246 TO 273Nm

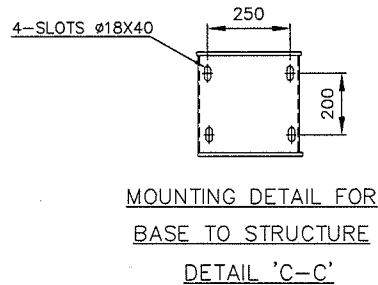
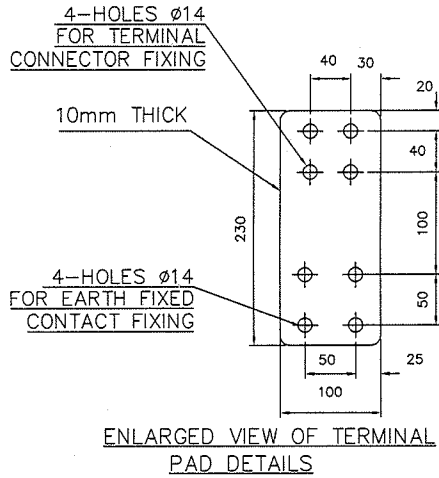
CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE 1:1	TITLE :	NAME PLATE DETAILS FOR 95kV DC CENTRE BREAK DISCONNECTOR WITHOUT EARTH SWITCH AND MES	DRN. SAM 04.01.18 CHD. KAH 04.01.18 APPD. KAH 04.01.18
	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA		DRAWING NO. REV. No. 3CP6002/2973 A-

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

IF IN DOUBT ASK



NOTES :

1. MCD - MOUNTING CENTRE DISTANCE.
2. NB - NOMINAL BORE.
3. ALL EXPOSED FERROUS PARTS ARE HOT DIP GALVANIZED.
4. ALL DIMENSIONS ARE IN MM.
5. ALL CONTACT AREAS ARE SILVER PLATED TO 25 MICRONS THICK MINIMUM.
6. MIN CREEPAGE DISTANCE OF INSULATOR: 6125MM.
7. MGB - MOTORIZED GEARED BOX.
8. UNDERLINED DIMENSIONS ARE NOT IN SCALE.

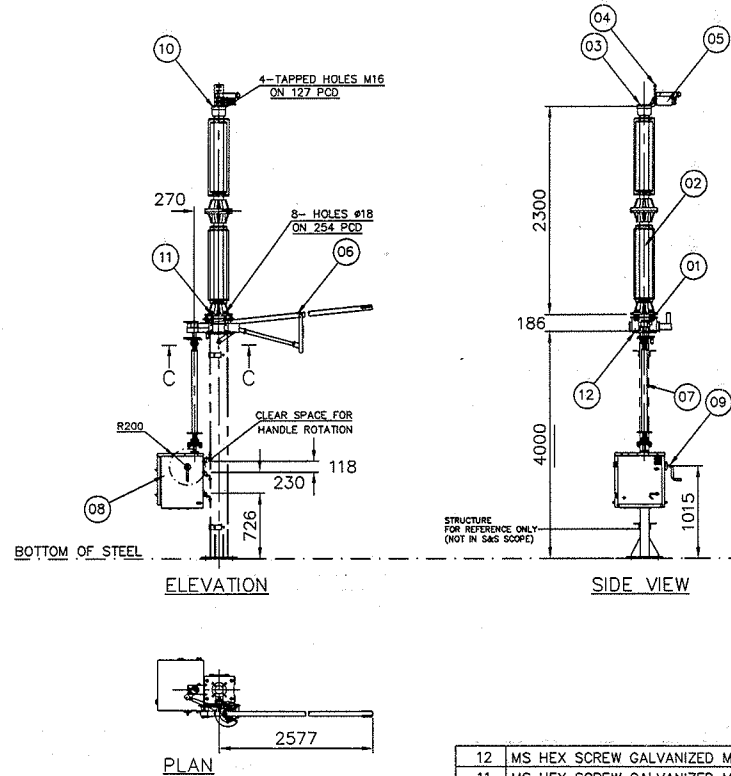
DIRECTION OF CLOSING OF OPERATING DRIVE FLANGE:

120° ANTICLOCKWISE FOR EARTH SWITCH

03	INSULATOR (TWO STACK)	155
02	MOTOR OPERATING MECHANISM - MGB (EARTH)	85
01	1POLE ISOLATOR (COMPLETE STACK)	350
ITEM	DESCRIPTION OF MATERIAL	WEIGHT (APPROX) IN kgs

TIGHTENING TORQUE FOR SCREWS

M6	- 06.1 TO 06.8Nm
M8	- 18.1 TO 18.7Nm
M10	- 29.1 TO 30.7Nm
M12	- 50.8 TO 55.5Nm
M16	- 126 TO 134Nm
M20	- 246 TO 273Nm



ITEM DESIGNATION	QUANTITY
P(1,2,3,4).WN.Q21	4 No's

*cat 102*

<p>पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड POWER GRID CORPORATION OF INDIA LIMITED</p> <p>± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)</p>	Approved in Category : <input checked="" type="checkbox"/> I <input checked="" type="checkbox"/> II <input checked="" type="checkbox"/> III <input checked="" type="checkbox"/> IV		
	Checked by	Verified by	Reviewed by
Signature :	<i>[Signatures]</i>		
Date :	10/4/18		

12	MS HEX SCREW GALVANIZED M16X60 WITH NUT, FLAT & SPRING WASHERS	4 SETS
11	MS HEX SCREW GALVANIZED M16X90 WITH NUTS, FLAT & SPRING WASHERS	8 SETS
10	MS HEX SCREW GALVANIZED M16X45 WITH FLAT & SPRING WASHERS	4 SETS
09	MANUAL OPERATING HANDLE - EARTH	1
08	EARTH SWITCH OPERATING DRIVE TYPE : MOTOR-3UCD025/2973	1
07	DOWN OPERATING PIPE FOR EARTH NB50 - HOT DIP GALVANIZED	1
06	ASSEMBLY OF EARTH MOVING BLADE-3C6E085/2973	1
05	ASSEMBLY OF EARTH FIXED CONTACT WITH CORONA RING-3C6E085/2973	1
04	TERMINAL PAD	1
03	EARTH FIXED CONTACT MOUNTING FLANGE	1
02	INSULATORS (IN S&S SCOPE OF SUPPLY)	1
01	BASE ASSEMBLY - HOT DIP GALVANIZED	1
ITEM	DESCRIPTION	QTY

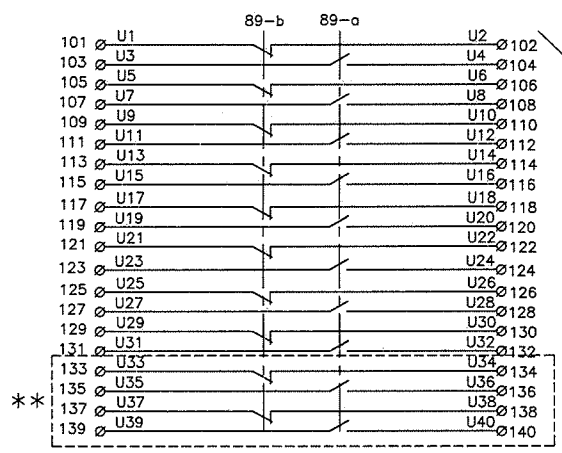
CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)				
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED				
PROJECT	±800kV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS				
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 DT.: 17-01-25				
STATION	RAIGARH SUBSTATION				
	SCALE	TITLE :	DRN.	SAM	04.01.18
	1:55	GENERAL ARRANGEMENT OF 95kV DC, 1 POLE MAINTENANCE EARTH SWITCH (MGB)	CHD.	KAH	04.01.18
S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA			APPD.	KAH	04.01.18
			DRAWING NO.	REV. No.	
			3E6G100/2973	A-	

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

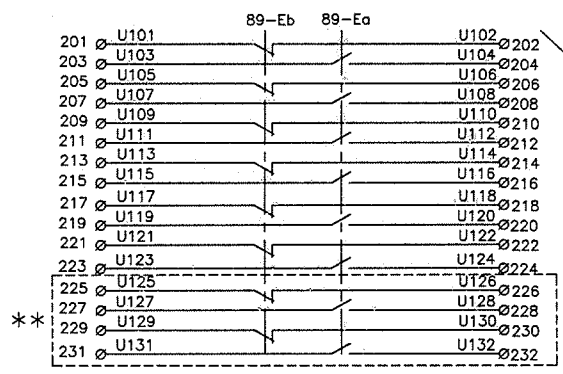
IF IN DOUBT ASK

ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

**AUXILIARY SWITCH DIAGRAM FOR DISCONNECTOR MAIN**



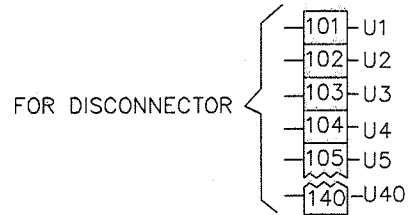
**AUXILIARY SWITCH DIAGRAM FOR EARTH SWITCH & MES**



AUXILIARY SWITCH CONTACT OF DISCONNECTOR SHOWN IN OPEN POSITION

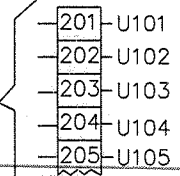
AUXILIARY SWITCH CONTACT OF EARTH SWITCH & MES SHOWN IN OPEN POSITION

**TERMINAL BLOCKS**



**TERMINAL BLOCKS**

FOR EARTH SWITCH AND MES



**AUXILIARY SWITCH CONTACT DIAGRAM NOMINAL CLOSING POINT**

PERCENTAGE CLOSED	0%	20%	40%	60%	80%	100%
DISCONNECTOR MAIN CONTACTS	OPEN					
AUX. SWITCH LOCAL & REMOTE INDICATIONS AND SPARE	NO	OPEN				
	NC				OPEN	
** - MBB CONTACTS	NC				OPEN	
	NO	OPEN				

NOTES:

\*\* - REFERS TO MBB CONTACTS

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड  
**POWER GRID CORPORATION OF INDIA LIMITED**  
 ± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)  
 Approved in Category: I II III IV  
 Checked by: [Signature] Verified by: [Signature] Reviewed by: [Signature]  
 Date: 10/11/18

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kv, 6000MW HVDC RAIGARH – PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE	TITLE :	DRN.	SAM
NTS	AUXILIARY SWITCH DETAILS FOR DISCONNECTOR, EARTH SWITCH AND MES	CHD.	KAH
S&S PSE	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY – 605111, INDIA	APPD.	KAH
		DRAWING NO.	REV. No.
		3UCA209/2973	A-

TIGHTENING TORQUE FOR SCREWS

M6	- 06.1 TO 06.8Nm
M8	- 18.1 TO 18.7Nm
M10	- 29.1 TO 30.7Nm
M12	- 50.8 TO 55.5Nm
M16	- 126 TO 134Nm
M20	- 246 TO 273Nm

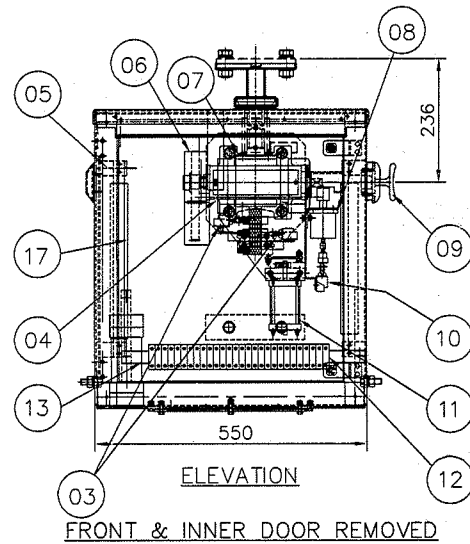
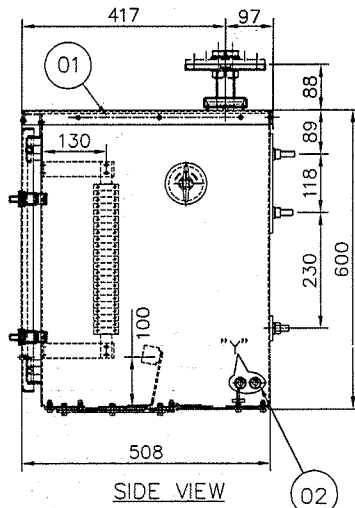
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REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

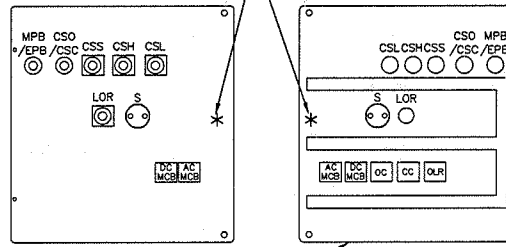
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IF IN DOUBT ASK

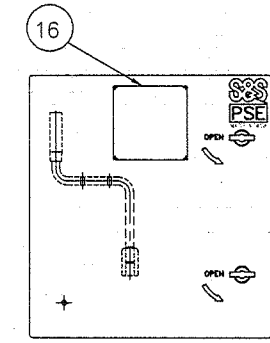


THE POSITION OF ELECTRICAL ITEMS ARE ONLY INDICATIVE. POSITION MAY CHANGE DEPENDING UPON IMPROVEMENT IN DESIGN.



- NOTES:
- ALWAYS KEEP THE DRIVE IN UPRIGHT POSITION.
  - WEIGHT OF DRIVE BOX 65 Kg APPROXIMATELY.
  - DEGREE OF PROTECTION IS IP55 AS PER IEC:60529.
  - ALL DOORS & REMOVABLE COVERS SHALL BE SEALED BY GASKETS.
  - "ON" AND "OFF" LABEL FIXED TO THE OPERATING SHAFT AT REQUIRED ANGLE OF DRIVE INDICATE THE PHYSICAL POSITION OF DISCONNECTOR AND E.S.W.
    - ARROW POSITION ON TOP OF MOTOR OPERATING CABINET INDICATES ON/OFF POSITION OF DISCONNECTOR AND E.S.W.
    - TOGETHER WILL FORM MECHANICAL POSITION INDICATOR.
  - MATERIAL OF CABINET - 3.0mm THICK ALUMINIUM SHEET
  - FINISH - PAINTED (RAL 7032 (S.GREY)) RIVETED CONSTRUCTION
  - FOR LEGEND REFER DRG.30CND01/2973
  - DIRECTION OF CLOSING REFER DRAWING: 30C6210, 30C6110, 30C6100/2973
  - INGRESS PROTECTION - North Trichur (Kerala)

cat IV

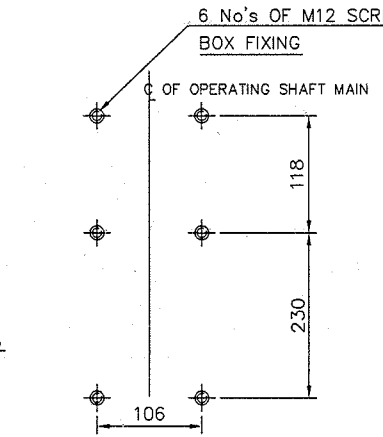
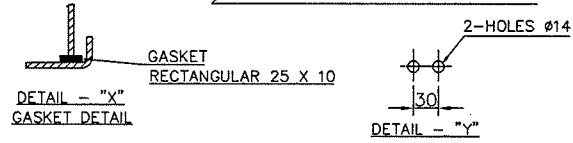
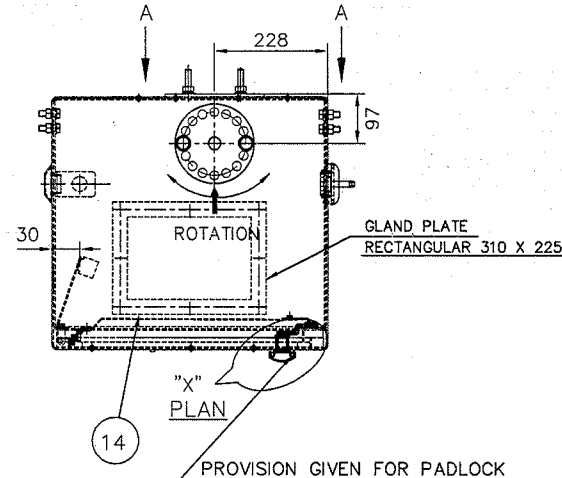


FRONT DOOR

ITEM DESIGNATION	QUANTITY
WN1.Q(12,14)	2 No's
WN2.Q(12,14)	2 No's
WN.Q(17,18)	2 No's
P(1,2,3,4).Z1.Q12	4 No's

ITEM DESIGNATION	QUANTITY
WN1.Q(11,13)	2 No's
WN2.Q(11,13)	2 No's
WN.Q(15,16,31)	3 No's

ITEM DESIGNATION	QUANTITY
P(1,2,3,4).WN.Q21	4 No's



MOUNTING ARRANGEMENT OF BOX VIEW 'AA'

Approved in Category:	I	II	III	IV
PROVIDED FOR	Checked by	Verified by	Reviewed by	
Signature:				
Date:	10/9/18			

ITEM	DESCRIPTION
17	TERMINAL BLOCKS - FOR CONTROL CIRCUIT
16	NAME PLATE-1MM THICK ALUMINIUM
15	INNER PANEL DOOR-2MM THICK ALUMINIUM
14	GLAND PLATE-3MM THICK ALUMINIUM
13	HEATER 240V AC 100W
12	TERMINAL BLOCKS - FOR AUXILIARY SWITCH
11	AUXILIARY SWITCH - 10A
10	LIMIT SWITCH - EMLS - 10A
09	OPERATING HANDLE ENTRY HOLE WITH COVER
08	BOLT COIL ASSEMBLY (MBC/EBC) - 220V DC
07	MOTOR - 220V DC 0.5H.P
06	GREASE GUARD
05	LAMP 240V AC 9W
04	GEAR BOX ASSEMBLY
03	LIMIT SWITCH- LSO/LSC - 10A
02	EARTHING POINTS WITH M12 BOLT
01	CABINET

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED
PROJECT	±800kV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25
STATION	RAIGARH SUBSTATION

SCALE 1:10	TITLE : ASSEMBLY OF MOTOR OPERATING BOX FOR 95kV DC DISCONNECTOR WITH SINGLE, WITHOUT AND MAINTENANCE EARTH SWITCH	DRN.	SAM	04.01.18
		CHD.	KAH	04.01.18
S & S PSE	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA	APPD.	KAH	04.01.18
		DRAWING NO.		REV. No.
		3UCD025/2973		A-

TIGHTENING TORQUE FOR SCREWS

M6	- 06.1 TO 06.8Nm
M8	- 18.1 TO 18.7Nm
M10	- 29.1 TO 30.7Nm
M12	- 50.8 TO 55.5Nm
M16	- 126 TO 134Nm
M20	- 246 TO 273Nm

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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IF IN DOUBT ASK

### COMMON LEGENDS AND NOTES

REF	DESCRIPTION	RATING	MAKE
OLR/SPP	OVERLOAD RELAY / SINGLE PHASE PRIVENTER	0.63-1.0A SETTING-0.9A	TELEMECHNIQUE/SIEMENS/C&S/EATON
CC	CLOSING CONTACTOR	220V DC, 9A 5.4W	TELEMECHNIQUE/SIEMENS/C&S/EATON
OC	OPENING CONTACTOR	220V DC, 9A 5.4W	TELEMECHNIQUE/SIEMENS/C&S/EATON
LOR	LOCAL/OFF/REMOTE SELECTOR SWITCH (WITH KEY)	240V AC 6A	KAYCEE/SWITRON/JAI BALAJI
MCB	DC/AC MCB	4A/16A	SCHNEIDER/EATON
MPB/EPB	MAIN/EARTH PUSH BUTTON	I <sub>th</sub> -10A	JAI BALAJI/SIEMENS/C&S/TECHNIC/VAISHNO/EATON
CSO/CSC	CONTROL SWITCH FOR OPEN/CLOSE	I <sub>th</sub> -10A	JAI BALAJI/SIEMENS/C&S/TECHNIC/VAISHNO
CSH	CONTROL SWITCH FOR HEATER	240V AC,6A	KAYCEE/SWITRON/JAI BALAJI
CSL	CONTROL SWITCH FOR LAMP	240V AC,6A	KAYCEE/SWITRON/JAI BALAJI
CSS	CONTROL SWITCH FOR SOCKET	240V AC,6A	KAYCEE/SWITRON/JAI BALAJI
TH	THERMOSTAT	30-90°C 240V AC	GIRISH EGO
LSO/LSC	LIMIT SWITCH OPEN/CLOSE	I <sub>th</sub> -10A	JAI BALAJI/KAYCEE/SALZER/BCH
EMLS	ELECTRO MECHANICAL LIMIT SWITCH	I <sub>th</sub> -10A	JAI BALAJI/KAYCEE/SALZER/BCH
S	SOCKET	240V AC, 5/15A	LEGRAND/ANCHOR
L	LAMP - CFL	220V AC, 9W	KHAITAN/PHILIPS
H	HEATER	100W 240V AC	SOFIA/SURYA/RK/APT
MBC/EBC	MAIN/EARTH BOLT COIL	220V DC	PUSHPA/SUNKID/S&S
89/89E (a,b)	AUXILIARY SWITCH	I <sub>th</sub> -10A	MANI
M	MOTOR	220V DC 0.5H.P	ROTOMAG
ø	TERMINAL BLOCKS--SCREW TYPE KUT 4 - OTHER THAN POWER CIRCUIT RT 8/EQUIVALENT - FOR POWER CIRCUIT	I <sub>th</sub> -10A	ELMEX/CONNECTWELL/WAGO/PHOENIX

*Cat IV*

	<b>पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड</b> <b>POWER GRID CORPORATION OF INDIA LIMITED</b>
± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)	
Approved in Category :	<input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input checked="" type="checkbox"/> IV
Checked by	Verified by
Signature :	 Date : 10/4/18
Date :	

*make will be powergrid  
approve make*

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800KV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-1/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE	TITLE :	DRN.	SAM
NTS	COMMON LEGENDS AND NOTES	04.01.18	04.01.18
	S & S POWER SWITCHGEAR EQUIPMENT LTD	APPD.	KAH
	PUDUCHERRY - 605111, INDIA	DRAWING NO.	REV. No.
		3UCN001/2973	A-

**TIGHTENING TORQUE FOR SCREWS**

M6 - 06.1 TO 06.8Nm  
 M8 - 18.1 TO 18.7Nm  
 M10 - 29.1 TO 30.7Nm  
 M12 - 50.8 TO 55.5Nm  
 M16 - 126 TO 134Nm  
 M20 - 246 TO 273Nm

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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IF IN DOUBT ASK

SL.NO.	PRODUCT	ITEM DESIGNATION	QUANTITY
01	95kV DC, 2316A, 7.2kA/1sec, 1 POLE, CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH (MAIN-MOTOR OPERATED/EARTH-MOTOR OPERATED) WITH INSULATORS (CREEPAGE 6125mm, CANTILEVER STRENGTH 8KN). BUT WITHOUT SUPPORT STRUCTURE AND TERMINAL CONNECTORS.	WN1.Q(12,14), WN2.Q(12,14), WN.Q(17,18) P(1,2,3,4).Z1.Q12	10 SETS
02	95kV DC, 2316A, 7.2kA/1sec, 1 POLE, CENTRE BREAK DISCONNECTOR WITHOUT EARTH SWITCH (MAIN-MOTOR OPERATED) WITH INSULATORS (CREEPAGE 6125mm, CANTILEVER STRENGTH 8KN). BUT WITHOUT SUPPORT STRUCTURE AND TERMINAL CONNECTORS.	WN1.Q(11,13), WN2.Q(11,13) WN.Q(15,16,31)	7 SETS
03	95kV DC, 7.2kA/1sec, 1 POLE, MAINTENANCE EARTH SWITCH (EARTH-MOTOR OPERATED) WITH INSULATORS (CREEPAGE 6125mm, CANTILEVER STRENGTH 8KN). BUT WITHOUT SUPPORT STRUCTURE AND TERMINAL CONNECTORS.	P(1,2,3,4).WN.Q21	4 SETS
04	FOR SPARE DETAILS REFER SHEET 02 OF 02	-	1 LOT

REFERENCE DRAWINGS

SL NO.	DRG NO. / CODE NO.	REV.	DESCRIPTION
1	3C6G210/2973	A-	GENERAL ARRANGEMENT OF 95kV DC, 2316A 1POLE CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH (MGB/MGB)
2	3C6G110/2973	A-	GENERAL ARRANGEMENT OF 95kV DC, 2316A 1POLE CENTRE BREAK DISCONNECTOR WITHOUT EARTH SWITCH (MGB)
3	3E6G100/2973	A-	GENERAL ARRANGEMENT OF 95kV DC, 1 POLE MAINTENANCE EARTH SWITCH (MGB)
4	3C6H003/2973	A-	ASSEMBLY OF MALE AND FEMALE BLADE FOR 95kV DC, 2316A CENTRE BREAK DISCONNECTOR
5	3C6E084/2973	A-	ASSEMBLY OF EARTH SWITCH AND EARTH FIXED CONTACT FOR 95kV DC CENTRE BREAK DISCONNECTOR
6	3C6E085/2973	A-	ASSEMBLY OF EARTH SWITCH AND EARTH FIXED CONTACT FOR 95kV DC MAINTENANCE EARTH SWITCH
7	3UCD025/2973	A-	ASSEMBLY OF MOTOR OPERATING BOX FOR 95kV DC DISCONNECTOR WITH SINGLE, WITHOUT AND MAINTENANCE EARTH SWITCH
8	3UCS150/2973	A-	DC AND AC CONTROL CIRCUIT FOR DISCONNECTOR WITH SINGLE EARTH SWITCH AND WITHOUT EARTH SWITCH-MAIN
9	3UCS151/2973	A-	DC AND AC CONTROL CIRCUIT FOR DISCONNECTOR WITH SINGLE EARTH SWITCH EARTH SWITCH AND MES
10	3UCA209/2973	A-	AUXILIARY SWITCH DETAILS FOR DISCONNECTOR, EARTH SWITCH AND MES
11	3UCN001/2973	A-	COMMON LEGENDS AND NOTES
12	3C6P001/2973	A-	NAME PLATE DETAILS FOR 95kV DC CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH
13	3C6P002/2973	A-	NAME PLATE DETAILS FOR 95kV DC CENTRE BREAK DISCONNECTOR WITHOUT EARTH SWITCH AND MES
14	2C68327/2973	A-	ASSEMBLY OF BASE FOR 95kV DC CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH
15	3C6L210/2973	A-	LOADING DATA FOR 95 kV DC 1POLE CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH (MGB/MGB)

*cat IV*

	पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड POWER GRID CORPORATION OF INDIA LIMITED			
	± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)			
Approved in Category :	I	II	III	IV
Checked by	Verified by	Reviewed by		
Signature				
Date :	10/4/18			

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)				
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED				
PROJECT	±800kV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS				
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25				
STATION	RAIGARH SUBSTATION				
	SCALE	TITLE :	DRN.	SAM	04.01.18
	NTS		INDEX SHEET for 95kV DC Disconnector	CHD.	KAH
	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA		APPD.	KAH	04.01.18
			DRAWING NO.	REV. No.	
			3UC0003/2973	A-	

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

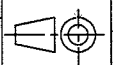

TIGHTENING TORQUE FOR SCREWS  
M6 - 06.1 TO 06.8Nm  
M8 - 18.1 TO 18.7Nm  
M10 - 29.1 TO 30.7Nm  
M12 - 50.8 TO 55.5Nm  
M16 - 126 TO 134Nm  
M20 - 246 TO 273Nm

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IF IN DOUBT ASK

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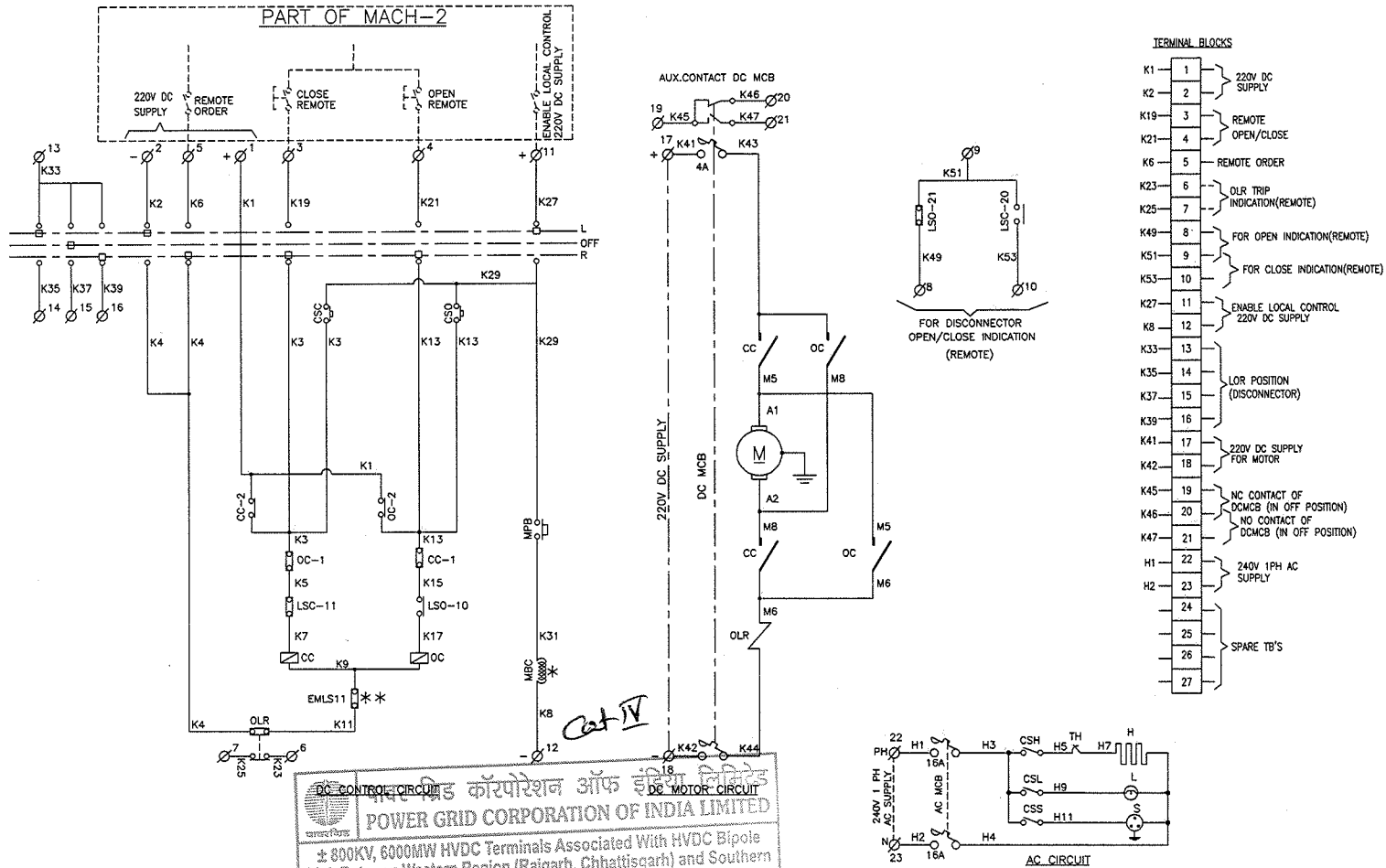
SL.NO.	PRODUCT	UNIT	QUANTITY
01	95kV DC, 2316A, 7.2kA/1sec, 1 POLE, CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH (MAIN-MOTOR OPERATED/EARTH-MOTOR OPERATED) WITH INSULATORS (CREEPPAGE 6125mm, CANTILEVER STRENGTH 8KN). BUT WITHOUT SUPPORT STRUCTURE AND TERMINAL CONNECTORS.	2 SETS	-
02	95kV DC, 2316A, 7.2kA/1sec, 1 POLE, CENTRE BREAK DISCONNECTOR WITHOUT EARTH SWITCH (MAIN-MOTOR OPERATED) WITH INSULATORS (CREEPPAGE 6125mm, CANTILEVER STRENGTH 8KN). BUT WITHOUT SUPPORT STRUCTURE AND TERMINAL CONNECTORS.	1 SET	-
03	95kV DC, 7.2kA/1sec, 1 POLE, MAINTENANCE EARTH SWITCH (EARTH-MOTOR OPERATED) WITH INSULATORS (CREEPPAGE 6125mm, CANTILEVER STRENGTH 8KN). BUT WITHOUT SUPPORT STRUCTURE AND TERMINAL CONNECTORS.	1 SET	-
04	a. MALE CONTACT FOR 95kV DC 2316A - 60X15 THICK COPPER FLAT	2 SETS	1 No
	b. FEMALE CONTACT FINGER FOR 95kV DC 2316A - 32X5 THICK COPPER FLAT		6 No's
05	a. 220Vdc 9A OPEN & CLOSE CONTACTORS	1 SET	2 No's
	b. OVER LOAD RELAY (0.6 - 1.0A)		1 No
	c. 10A PUSH BUTTON WITH 1NO CONTACT ELEMENT		1 No
	d. 220Vdc 2P 4A DC MCB		1 No
	e. 240Vac 2P 16A AC MCB		1 No
	f. 220Vdc BOLT COIL		1 No
06	a. 2NO+2NC LIMIT SWITCH - 10A	1 SET	4 No's
	b. 10NO + 10NC (2MBB) AUXILIARY SWITCH FOR MAIN		1 No
	c. 08NO + 08NC (2MBB) AUXILIARY SWITCH FOR EARTH		1 No
	d. 1NO+1NC LIMIT SWITCH - 10A		2 No's
07	ROTOR HOUSING BEARING ASSEMBLY	1 SET	4 No's
08	220Vdc 0.5H.P MOTOR ALONG WITH PINION	1 SET	-
09	a. BALL BEARING SHIELD TY 6009-2Z	1 SET	2 No's
	b. BALL BEARING SHIELD TY 6010-2Z		2 No's
10	a. MALE BLADE FOR 95kV DC 2316A	3 SETS	1 No
	b. FEMALE BLADE FOR 95kV DC 2316A		1 No
11	220Vdc BOLT COIL	1 SET	1 No
12	TERMINAL STUD - CONNECTOR STEM #60 COPPER ROD	2 SETS	2 No's
13	EXT.CIRCLIP 60DIA TYPE C	1 SET	3 No's

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)				
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED				
PROJECT	±800kV, 6000MW HVDC RAIGARH - PUGALUR TERMINALS				
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25				
STATION	RAIGARH SUBSTATION				
 SCALE NTS	TITLE :		DRN.	SAM	04.01.18
	<b>SPARE DETAILS</b>		CHD.	KAH	04.01.18
			APPD.	KAH	04.01.18
	S & S POWER SWITCHGEAR EQUIPMENT LTD		DRAWING NO.		REV. No.
	PUDUCHERRY - 605111, INDIA		3UC0003/2973		A-

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

TIGHTENING TORQUE FOR SCREWS  
 M6 - 06.1 TO 06.8Nm  
 M8 - 18.1 TO 18.7Nm  
 M10 - 29.1 TO 30.7Nm  
 M12 - 50.8 TO 55.5Nm  
 M16 - 126 TO 134Nm  
 M20 - 246 TO 273Nm

ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.



TERMINAL BLOCKS

K1	1	220V DC SUPPLY
K2	2	
K19	3	REMOTE OPEN/CLOSE
K21	4	
K6	5	REMOTE ORDER
K23	6	OLR TRIP INDICATION(REMOTE)
K25	7	
K49	8	FOR OPEN INDICATION(REMOTE)
K51	9	FOR CLOSE INDICATION(REMOTE)
K53	10	
K27	11	ENABLE LOCAL CONTROL 220V DC SUPPLY
K8	12	LOR POSITION (DISCONNECTOR)
K33	13	
K35	14	220V DC SUPPLY FOR MOTOR
K37	15	
K39	16	NC CONTACT OF DCMCB (IN OFF POSITION)
K41	17	
K42	18	NO CONTACT OF DCMCB (IN OFF POSITION)
K45	19	
K46	20	240V 1PH AC SUPPLY
K47	21	
H1	22	SPARE TB'S
H2	23	
	24	
	25	
	26	
	27	

ITEM DESIGNATION	QUANTITY
WN1.Q(12,14)	2 No's
WN2.Q(12,14)	2 No's
WN.Q(17,18)	2 No's
P(1,2,3,4).Z1.Q12	4 No's

ITEM DESIGNATION	QUANTITY
WN1.Q(11,13)	2 No's
WN2.Q(11,13)	2 No's
WN.Q(15,16,31)	3 No's

NOTES:

- ALL CIRCUITS SHOWN IN DE-ENERGIZED CONDITION.
  - ALL WIRING DONE WITH 2.5sq mm. COLOUR CODED STRAND FRLS INSULATED COPPER WIRE.
  - DOTTED LINE CONNECTIONS NOT IN S&S SCOPE OF SUPPLY.
  - FOR LEGEND & NOTES REF: 3UCN001/2973.
  - FOR AUXILIARY SWITCH DETAILS REF:3UCA209/2973.
- \* THE MANUAL OPERATION OF DISCONNECTOR IS POSSIBLE ONLY WHEN IMB IS ENERGIZED.  
 \*\* OPEN WHEN MANUAL HANDLE INSERTED.

POWER GRID CORPORATION OF INDIA LIMITED  
 DE MOTOR CIRCUIT

Approved in Category: I II III IV ✓

Checked by: [Signature] Verified by: [Signature] Reviewed by: [Signature]

Signature: [Signature] Date: 19/11/18

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800kV, 6000MW HVDC RAIGARH – PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		

TIGHTENING TORQUE FOR SCREWS

M6	06.1 TO 06.8Nm
M8	18.1 TO 18.7Nm
M10	29.1 TO 30.7Nm
M12	50.8 TO 55.5Nm
M16	126 TO 134Nm
M20	246 TO 273Nm

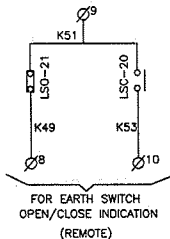
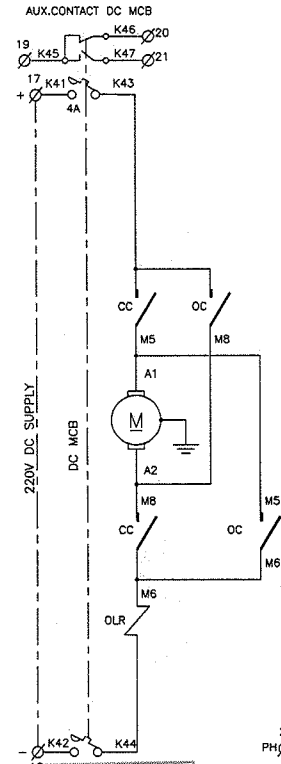
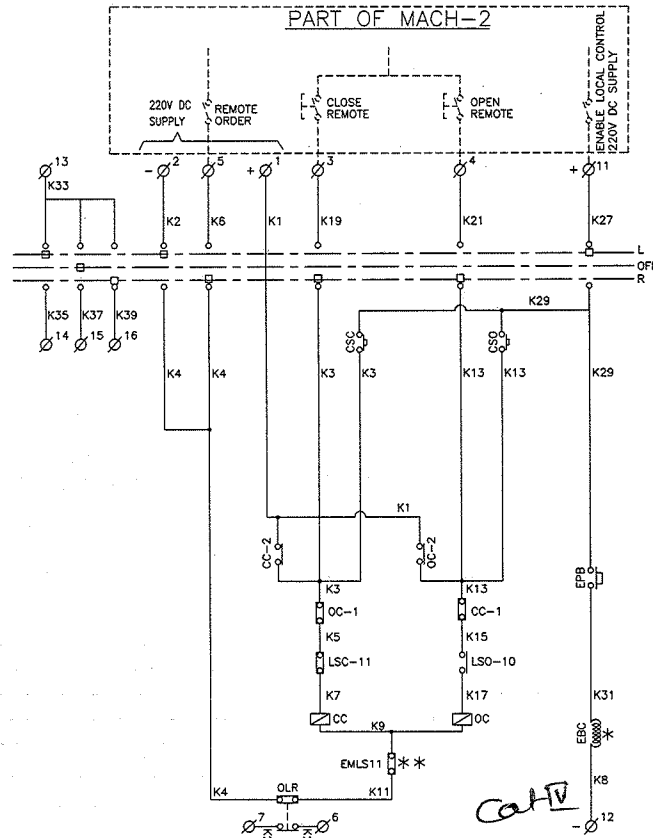
SCALE NTS	TITLE : DC AND AC CONTROL CIRCUIT FOR DISCONNECTOR WITH SINGLE EARTH SWITCH AND WITHOUT EARTH SWITCH-MAIN	DRN.	SAM	04.01.18
		CHD.	KAH	04.01.18
S & S PSE	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY – 605111, INDIA	APPD.	KAH	04.01.18
		DRAWING NO.	REV. No.	
				3UCS150/2973 A-

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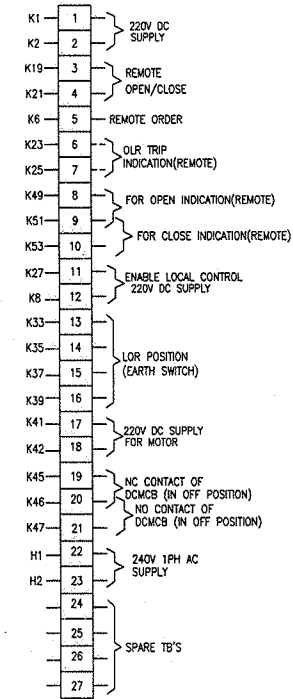
REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

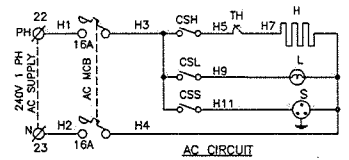
IF IN DOUBT ASK



TERMINAL BLOCKS



ITEM DESIGNATION	QUANTITY
WN1.Q(12,14)	2 No's
WN2.Q(12,14)	2 No's
WN.Q(17,18)	2 No's
P(1,2,3,4).Z1.Q12	4 No's



ITEM DESIGNATION	QUANTITY
P(1,2,3,4).WN.Q21	4 No's

NOTES:

- ALL CIRCUITS SHOWN IN DE-ENERGIZED CONDITION.
- ALL WIRING DONE WITH 2.5sq mm. COLOUR CODED STRAND FRLS INSULATED COPPER WIRE.
- DOTTED LINE CONNECTIONS NOT IN S&S SCOPE OF SUPPLY.
- FOR LEGEND & NOTES REF: 3UCN001/2973.
- FOR AUXILIARY SWITCH DETAILS REF:3UCA209/2973.
- \* THE MANUAL OPERATION OF EARTH SWITCH IS POSSIBLE ONLY WHEN "EBC" IS ENERGIZED.
- \*\* OPEN WHEN MANUAL HANDLE INSERTED.

POWER GRID CORPORATION OF INDIA LIMITED  
 ± 800KV, 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)  
 Category: I II III IV ✓  
 Checked by: [Signature] Verified by: [Signature] Reviewed by: [Signature]  
 Signature: [Signature]  
 Date: 30/11/15

TIGHTENING TORQUE FOR SCREWS

M6	06.1 TO 06.8Nm
M8	18.1 TO 18.7Nm
M10	29.1 TO 30.7Nm
M12	50.8 TO 55.5Nm
M16	126 TO 134Nm
M20	246 TO 273Nm

CUSTOMER	POWER GRID CORPORATION OF INDIA LTD. (POWERGRID)		
CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED		
PROJECT	±800KV, 6000MW HVDC RAIGARH – PUGALUR TERMINALS		
CA No.	CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 DT.: 17-01-25		
STATION	RAIGARH SUBSTATION		
SCALE NTS	TITLE :	DRN.	SAM
	DC AND AC CONTROL CIRCUIT FOR DISCONNECTOR WITH SINGLE EARTH SWITCH EARTH SWITCH AND MES	CHD.	KAH
S&S PSE	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY – 605111, INDIA	APPD.	KAH
		DRAWING NO.	REV. No.
		3UCS151/2973	A-

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REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.



CPRI



HIGH VOLTAGE DIVISION
CENTRAL POWER RESEARCH INSTITUTE
P.B.NO.8066, SADHASHIVANAGAR SUB P.O.
PROF. SIR. C.V.RAMAN ROAD, BANGALORE - 560 080, INDIA. NABL Accredited
Phone : +91 (0) 80 - 23601917 Fax : +91 (0) 80 - 23601213, 23601917 Laboratory

Sheet 1 of 3

Certificate No.T-0010

TEST REPORT

Test Report Number : No.43/1/2007-HV/4368/S&S
Name & Address of the customer : M/s. S&S Power Switchgear Ltd, EVR Street Sedarapet Industrial Estate, Sedarapet, Pondicherry - 605111.
Name & Address of the Manufacturer : M/s. S&S Power Switchgear Ltd, EVR Street Sedarapet Industrial Estate, Sedarapet, Pondicherry - 605111.
Particulars of Sample tested. Condition of sample on Receipt. Type : New. Designation : RC245. 245kV, 1250/2000A, 3Φ Centre Break Disconnecter with Single Side Earth Switch
Serial Number. : TEST-6
Number of samples tested : One.
Date(s) of Test(s) : 25/06/2007.
CPRI Sample Code Number. : HPL07S0191
Particulars of tests conducted : 1. Lightning Impulse Voltage Withstand Test. 2. Power Frequency Voltage Withstand Test (Dry). 3. Power Frequency Voltage Withstand Test (Wet).
Test in accordance with standard/ Specification. : IEC 62271-102/2003, 60694/2002-01
Sampling plan : Nil.
Customer's requirement : Nil.
Deviations if any : Nil.
Name of the witnessing persons Customer's representatives : Mr.S.Kalyanasundaram (Vice President).
Other than customer's representatives : Nil
Tests subcontracted with : Nil
Address of the laboratory.
Documents constituting this report (in words) Number of Sheets : Three.
Number of oscillogram/s : Nil.
Number of graphs : Nil.
Number of photo/s : Nil.
Number of Test Circuit Diagrams : Nil.
Number of Drawings : Two [Drawing No: 1). 3C6G003/TTST Rev No. A. 2). 220-SC-A-0104 Rev. 1.]

Dated: 21-08-2007.

Date : 25-06-2007

(K.R.DASHARATHI) Test Engineer

(P.V.VASUDEVAN NAMBU DIRI) Joint Director

AUTHORISED SIGNATORIES



CPRI

**HIGH VOLTAGE DIVISION  
CENTRAL POWER RESEARCH INSTITUTE  
P.B.NO.8066, SADHASHIVANAGAR SUB P.O.  
PROF. SIR. C.V.RAMAN ROAD, BANGALORE - 560 080, INDIA.  
Phone : +91 (0) 80 - 23601917 Fax : +91 (0) 80 - 23601213, 23601917**



NABL Accredited  
Laboratory

Sheet 2 of 3

Certificate No.T-0010

Test Report No.: No.43/1/2007-HV/4368/S&S

Dated:21-08-2007.

**Test Arrangement for the Tests:-**

Test Arrangement	Disconnecter Position	Earth Switch Position	H.V. connected to	Earth connected to
1	Closed	Open	Aa	Bb,Cc & F
2	Closed	Open	Bb	Cc, Aa & F
3	Open	Open	A	a,B,b,C,c & F
4	Open	Open	B	b,C,c,A,a & F
5	Open	Open	A	a,B,b ,C,c
6	Open	Open	B	b,C,c,A,a

For Test Arrangements 5 & 6 Frame was Isolated.

**1.Lightning Impulse Voltage Withstand Test.**

Test Arrangement	Test Voltage kV (Peak)		Remarks
	Positive (15 Shots)	Negative (15 Shots)	
1	1050	1050	Withstood
2	1050	1050	Withstood
3	1050	1050	Withstood
4	1050	1050	Withstood
5	1200	1200	Withstood
6	1200	1200	Withstood

**2. Power Frequency Voltage Withstand Test (Dry).**


Test Arrangement	Test Voltage in kV (rms)	Remarks
1	460	Withstood for One Minute
2	460	Withstood for One Minute
5	530	Withstood for One Minute
6	530	Withstood for One Minute

**3. Power Frequency Voltage Withstand Test (Wet).**

Test Arrangement	Test Voltage in kV (rms)	Remarks
1	460	Withstood for One Minute
2	460	Withstood for One Minute
5	530	Withstood for One Minute
6	530	Withstood for One Minute

Above voltages are applied under ambient conditions which are given below.

Temperature in Degree Celsius		Atmospheric Pressure in mm of Hg.
Dry Bulb	Wet Bulb	
23.0	16.0	682.0

  
**(K.R DASHARATHI)**  
**Test Engineer**



**CPRI**



NABL Accredited  
Laboratory

**HIGH VOLTAGE DIVISION**  
**CENTRAL POWER RESEARCH INSTITUTE**  
**P.B.NO.8066, SADHASHIVANAGAR SUB P.O.**  
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Phone : +91 (0) 80 - 23601917 Fax : +91 (0) 80 - 23601213, 23601917

Sheet 3 of 3

Certificate No.T-0010

Test Report No.: No.43/1/2007-HV/4368/S&S

Dated:21-08-2007.

**NOTE:**

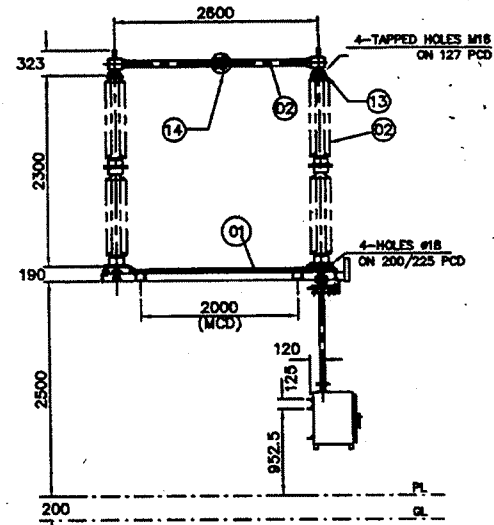
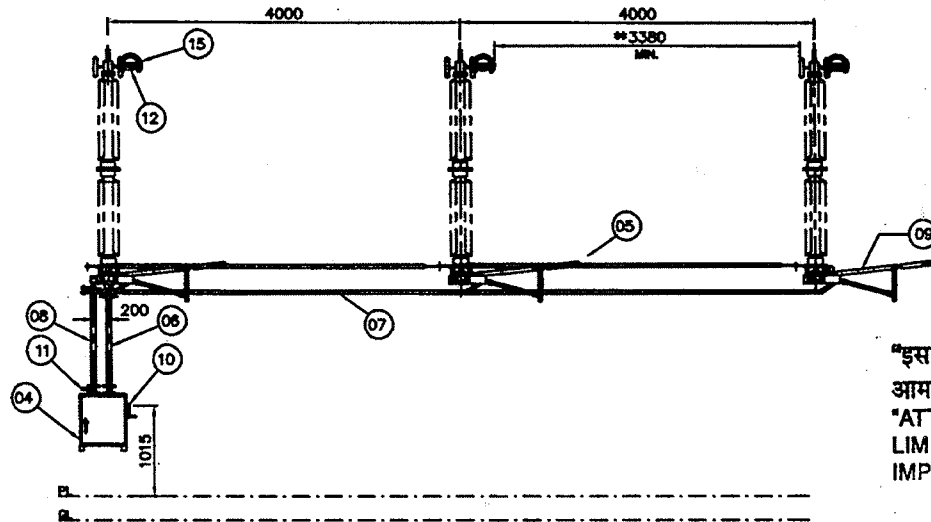
- a) The test results relate only to the items tested
- b) Publication or reproduction of this report in any form other than by complete set of the whole report and in the language written is not permitted without the written consent of CPRI.
- c) Any Corrections/erasures invalidate this test report/certificate.
- d) Any anomaly/discrepancy in this test report/certificate should be brought to our notice within 45 days from the date of issue
- e) The Verification of the Samples drawings by CPRI is limited to dimensional checks only wherever possible

(K.R.DASHARATHI)  
Test Engineer

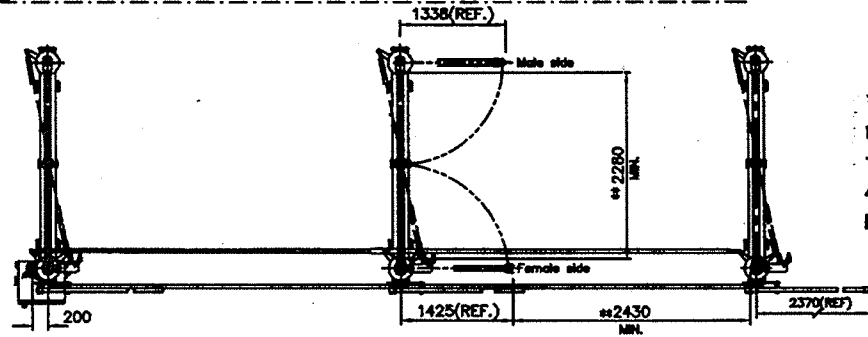
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ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

IF IN DOUBT AS.



"इस चित्र का साक्ष्यकन महत्वपूर्ण आमापों की जाँच तक हि सीमित है।"  
 "ATTESTATION OF THIS DRAWING IS LIMITED TO THE CHECKING OF IMPORTANT DIMENSIONS ONLY"



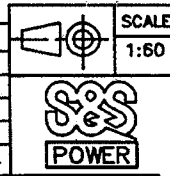
यह चित्र परीक्षण दस्तावेज सं. 43/1/.....  
 एचवी ता..... से संबंधित है।  
 THIS DRAWING PERTAINS TO TEST REPORT  
 43/1/2007-HV/4368/S&S  
 Dated..... 21/8/07

इंजीनियरी अधिकारी  
 ENGINEERING OFFICER  
 सी आर टी एल / सी पी आर आई  
 CRTL / CPRI  
 बंगलूर-80  
 BANGALORE-80

15	EARTH FIXED CONTACT CORONA RING	3
14	CORONA SHIELDS - MAIN CONTACTS	6
13	CORONA SHIELD - INSULATOR	6
12	EARTH FIXED CONTACT	3
11	MANUAL OPTG. HANDLE - EARTH	1
10	MANUAL OPTG. HANDLE - MAIN	1
08	EARTH MOVING BLADE	3
08	DOWN OPTG. PIPE HDG-EARTH NB50	1
07	GANG PIPE FOR EARTH HDG NB32	2
06	DOWN OPTG. PIPE HDG-MAIN NB50	1
05	GANG PIPE FOR MAIN HDG NB32	2
04	DISCONNECTOR & EARTH SWITCH OPTG.DRIVE-TYPE-MGB & MOM	1
03	MALE & FEMALE HAMPER ASSEMBLY-Aluminium	3
02	INSULATORS (BROWN - GLAZED)	6
01	BASE ASSEMBLY	3
S/No.	DESCRIPTION	QTY.

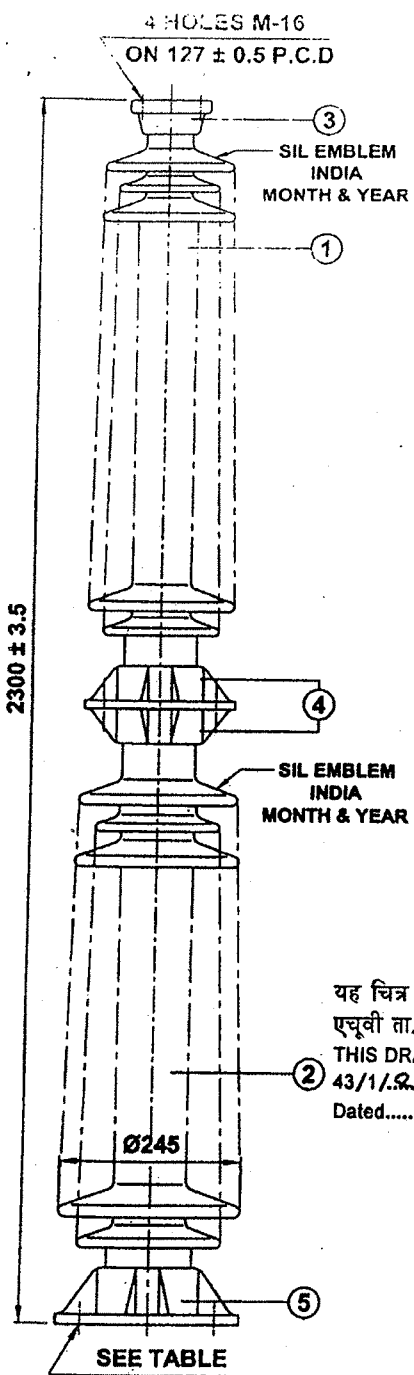
- NOTE:
1. MCD - MOUNTING CENTRE DISTANCE.
  2. HDG - HOT DIP GALVANISED.
  3. G.A - GENERAL ARRANGEMENT.
  4. OPTG. - OPERATING
  5. PL - PLYTH LEVEL
  6. NB - NOMINAL BORE
  7. GL - GROUND LEVEL

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.



SCALE	TITLE : G A OF 245 KV, 1250/2000A CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH MAIN - MOTOR & EARTH - MANUAL	DRN.	CSN	03.05.07
1:60		CHD.	NVR	03.05.07
		APPD.	KS	03.05.07
	S & S POWER SWITCHGEAR LTD., PONDICHERRY - 605111 INDIA	DRAWING NO.	REV. No.	
		3C6G003/TTST	A-	

220-SC-A-0104



**GUARANTEED TECHNICAL PARTICULARS**

**GENERAL :**

- STANDARDS APPLICABLE : IS 2544 - 1973 / IEC : 168 - 1994
- TYPE OF INSULATOR : SOLIDCORE POST TYPE
- NO. OF UNITS PER STACK 2
- MIN. NOM. CREEPAGE DISTANCE MM 6125
- SHED PROFILES CONFORMS TO IEC 815
- NET WEIGHT (APPROX.) Kgs 130

"इस चित्र का साक्ष्यकन महत्पूर्ण  
आमार्पो की जाँच तक हि सीमित है।"

**MECHANICAL VALUES :**

- ULTIMATE CANTILEVER STRENGTH LIMITED TO THE CHECKING OF 6
- ULTIMATE TORSIONAL STRENGTH IMPORTANT DIMENSIONS ONLY 4.5
- ULTIMATE TENSILE STRENGTH KN 110
- ULTIMATE COMPRESSION STRENGTH KN 270

"ATTESTATION OF THIS DRAWING IS

**ELECTRICAL VALUES :**

- NOMINAL SYSTEM VOLTAGE KV (rms) 220
- HIGHEST SYSTEM VOLTAGE KV (rms) 245
- DRY POWER FREQUENCY WITHSTAND VOLTAGE KV (rms) 510
- WET POWER FREQUENCY WITHSTAND VOLTAGE KV (rms) 480
- LIGHTNING IMPULSE WITHSTAND VOLTAGE (1.2 / 50 µSEC. WAVE) KV (peak) 1050
- DRY POWER FREQUENCY FLASHOVER VOLTAGE KV (rms) 575
- WET POWER FREQUENCY FLASHOVER VOLTAGE KV (rms) 525
- IMPULSE FLASHOVER VOLTAGE (1.2 / 50 µSEC) +VE / -VE WAVE  
POSITIVE KV (peak) 1150  
NEGATIVE KV (peak) 1160
- VISIBLE (CORONA EXTINCTION) VOLTAGE KV (rms) 156

**PACKING PARTICULARS :**

	TOP	BOT
1. No. OF INSULATORS PER CRATE.	1	1
2. GROSS (PACKED) WEIGHT APPROX.	Kg 74	94
3. PACKED VOLUME	M <sup>3</sup> 0.131	0.152

यह चित्र परीक्षण दस्तावेज सं. 43/1/.....  
एचवी ता..... से संबंधित है।

THIS DRAWING PERTAINS TO TEST REPORT  
43/1/2007 - HV/4368/6 & 5  
Dated..... 2.1.08/07

ITEM	HOLE SIZE	P.C.D
C	4 HOLES Ø18	200 ± 1
B	8 HOLES Ø18	254 ± 1
A	4 HOLES Ø18	225 ± 1

इंजीनियरी अधिकारी  
ENGINEERING OFFICER  
सी आर टी एल / सी पी आर आइ  
CRTL / CPRI  
बंगलूर-80  
BANGALORE-80

3,4,5	CAP & FLANGE	M.C.I. / S.G.I.	4	HOT - DIP - GALVANIZED
1 & 2	INSULATOR BODY	ALUMINA PORCELAIN KER - 110 - 2	2	BROWN GLAZED
SL. No.	DESCRIPTION	MATERIAL	No.OFF	FINISH
CUSTOMER REF.			SCALE	MAT. SEE TABLE
TITLE			NTS	WT. (APX)
220 / 245 KV SOLIDCORE POST INSULATOR (C6 - 1050 - CD - 25 mm / KV)			DRAWN	
			CHECKED	
SARAVANA INSULATORS LIMITED Admini. Office & Works : Cuddalore Road, P.N. Kuppam, Kurinjipadi Post Cuddalore Dist. 607 302 Tamil Nadu.			APPROVED	
			DATE	02.05.04
SEE TABLE			DRG. NO.	REV.
			220-SC-A-0104	1

REV. 1 DATE : 22.05.04





**CENTRAL POWER RESEARCH INSTITUTE  
(MEMBER STL)**

**TEST REPORT**

**CPRI**

Test Report Number : No.43/1/2013/HV/1738/ABI Dated: 10/12/2013.

Name & Address of the customer : M/s. Aditya Birla Insulators,  
(A Unit of Aditya Birla Nuvo Ltd.),  
P.O.: Meghasar, Halol, Dist : Panchmahal,  
Gujarat - 389 330.  
Ref. No: Nil. Dated: 25/11/2013.

Name & Address of the Manufacturer : M/s. Aditya Birla Insulators,  
(A Unit of Aditya Birla Nuvo Ltd.),  
P.O.: Meghasar, Halol, Dist : Panchmahal,  
Gujarat - 389 330.

**Particulars of samples tested**

Condition of the sample on receipt : New.  
Type : Solid Core.  
Designation : 245kV Solid core post insulators.  
Serial Number : Sample 1- Top: 0813/14779, Bottom: 1013/10808.  
Sample 2- Top: 0813/14778, Bottom: 1013/10835.

Number of samples tested : Two.  
Date(s) of test(s) : 26 & 27-11-2013.  
CPRI sample code number : HVML 2013 S1006

**Particulars of tests conducted**

Test in accordance with standard/  
Specification : Refer Page 2 of 7.  
Sampling Plan : Refer Page 2 of 7.  
Customer's requirement : Not applicable.  
Deviations if any : Test Voltages for test at Sl. No. 4, 6 & 8.  
Test procedure for test at Sl. No. 9.  
Test Voltages for test at Sl. No. 4, 6 & 8.

**Name of the witnessing persons**

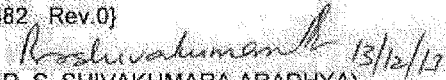
Customer's representatives : Shri. Deepak Cherian - Asst. Manager  
Other than customer's representatives : Nil.

Test subcontracted with address of the  
laboratory : None.

**Documents constituting this report(in words)**

Number of sheets : Seven.  
Number of oscillogram/s : Nil.  
Number of graphs : Nil.  
Number of photo/s : Nil.  
Number of test circuit diagrams : One.  
Number of drawings : One (Drawing No. 1) 987382, Rev.0)

  
(U.R. SHESHAGIRI RAO)  
Test Engineer

  
(Dr. R. S. SHIVAKUMARA ARADHYA)  
Additional Director





**CENTRAL POWER RESEARCH INSTITUTE**  
(MEMBER STL)

**TEST REPORT**

**CPRI** Test Report No.43/1/2013/HV/1738/ABI

Date: 10/12/2013

Sl.No	TEST DESCRIPTION	Standards.
1	Visual Examination.	IS:2544/1973 RA 2001 CI-9.12
2	Verification of dimensions.	IS:2544/1973 RA 2001 CI-9.7
3	50% Dry Lightning Impulse Flashover Voltage Test	IEC 60168-2001-04 CI-4.5
4	Dry Lightning Impulse Withstand Voltage Test (Max)	IEC 60168-2001-04 CI-4.5
5	Dry Power Frequency Flashover Voltage Test	IEC 60168-2001-04 CI-4.7.3
6	Dry Power Frequency Withstand Voltage Test (Max)	IEC 60168-2001-04 CI-4.7
7	Wet Power Frequency Flashover Voltage Test	IEC 60168-2001-04 CI-4.8.3
8	Wet Power Frequency Withstand Voltage Test (Max)	IEC 60168-2001-04 CI-4.8
9	Corona Inception / Extinction Voltage Test.	In general accordance IEC 60060-1/2010 and as per Customer procedure.
10	Radio Interference Test.	IEC 60437/1997 and as per PGCIL Specification
11	Visible Discharge Test.	IS: 2544/1973 RA 2001 CI - 9.2

  
(U.R. SHESHAGIRI RAO)  
Test Engineer



**CENTRAL POWER RESEARCH INSTITUTE  
(MEMBER STL)**

**TEST REPORT**

**CPRI**

Test Report No.43/1/2013/HV/1738/ABI

Date: 10/12/2013

Sl. No.	Test	Sample No.	Remarks
1	Visual Examination	1	Found to be in order
		2	Found to be in order
2	Verification of Dimensions	1	Verified & found OK as per drawing.
		2	Verified & found OK as per drawing.

**3. 50% Dry Lightning Impulse Flashover Voltage Test**

Sample No.	Test Voltage kV (Peak) \$	
	Positive Polarity	Negative Polarity
1.	1251	1544
2.	1212	1518

**4. Dry Lightning Impulse Withstand Voltage Test (Max).**

Sample No.	Test Voltage kV (Peak) \$		Remarks
	Positive Polarity	Negative Polarity	
1.	1217	1493	Withstood
2.	1180	1464	Withstood

**5. Dry Power Frequency Flashover Voltage Test**

Sample No.	Test Voltage kV(rms)	Remarks
1.	714*	Flashed over
2.	712**	Flashed over

**6. Dry Power Frequency Withstand Voltage Test (Max)**

Sample No.	Test Voltage kV(rms)	Remarks
1.	612*	Withstood for one minute
2.	605**	Withstood for one minute

  
 (U.R. SHESHAGIRI RAO)  
 Test Engineer



CPRI

CENTRAL POWER RESEARCH INSTITUTE  
(MEMBER STL)

TEST REPORT

Test Report No.43/1/2013/HV/1738/ABI

Date: 10/12/2013

7. Wet Power Frequency Flashover Voltage Test

Sample No.	Test Voltage kV(rms)	Remarks
1.	631*	Flashed over
2.	626**	Flashed over

8. Wet Power Frequency Withstand Voltage Test (Max)

Sample No.	Test Voltage kV(rms)	Remarks
1.	529*	Withstood for one minute
2.	514**	Withstood for one minute

9. Corona Inception/Extinction Voltage Test

**Test Procedure:** The specimen was mounted in a darkened hall. Power frequency voltage was applied across to it and gradually increased till visible corona is observed anywhere on it (corona inception) by naked eye. The voltage was then gradually decreased till the disappearance of corona so observed (corona extinction). The procedure was repeated thrice and the lowest value of corona inception/extinction is recorded. Atmospheric correction shall be applied.

Sample No.	Description	Test Voltage kV (rms) **	Remarks
1.	Corona Inception/Extinction Voltage Test	200	Inception
		195	Extinction
2.		205	Inception
		200	Extinction

(U.R. SHESHAGIRI RAO)  
Test Engineer



**CENTRAL POWER RESEARCH INSTITUTE  
(MEMBER STL)**

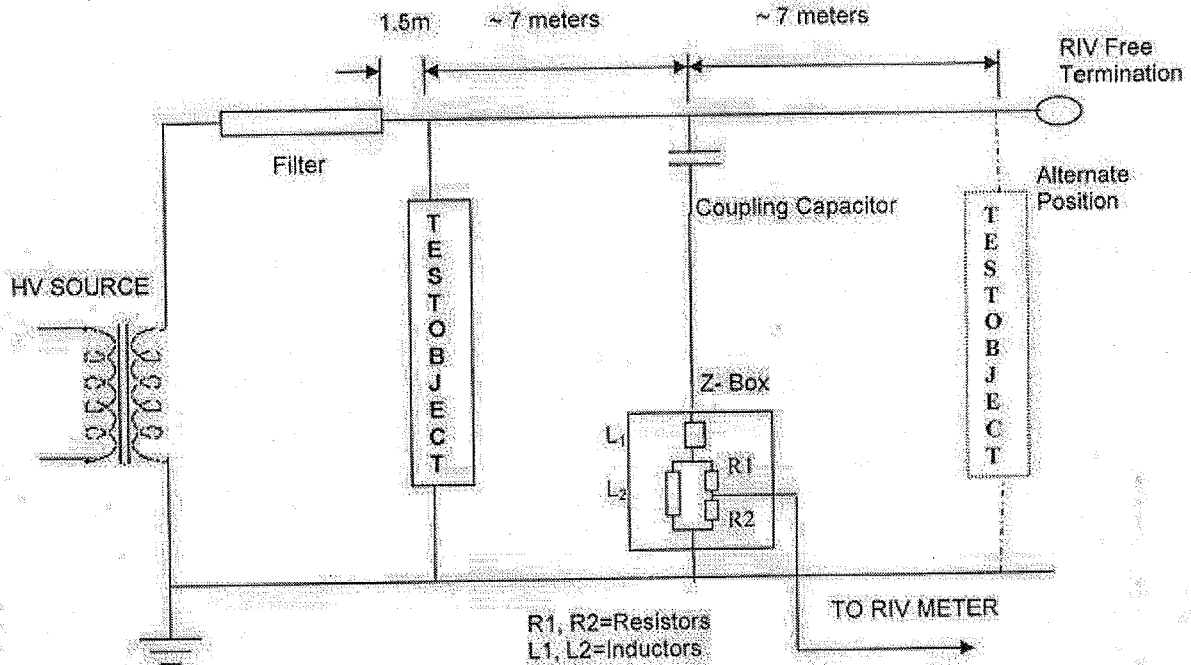
**TEST REPORT**

**CPRI** Test Report No.43/1/2013/HV/1738/ABI

Date: 10/12/2013

**10. Radio Interference Test.**

Test arrangement for testing of insulators/other equipments above 33kV up to including 400 kV Rating.



**Test Procedure:** RIV Test procedure was followed as per CISPR publication 16-1. The measuring circuit was tuned to 0.5 MHz to 2 MHz. The solid core post insulator was conditioned at 110% of the test voltage for 5 minutes by keeping the voltage constant at this level. The voltage was then reduced to 100% and 85% of the radio interference voltage respectively in steps and again increased to 100% and 110% of the radio interference voltage again in steps. This procedure was repeated 3 times and at each level (steps) radio interference voltage is recorded. The last set of reading has been recorded as below.

Sample No.	Test voltage in kV(rms) @	$\mu$ V at 1MHz
1	172(110%)	151
	156(100%)	107
	133(85%)	85
Sample No.	Test voltage in kV(rms) @	$\mu$ V at 1MHz
2	172(110%)	151
	156(100%)	135
	133(85%)	120

(U.R. SHESHAGIRI RAO)  
 Test Engineer



CPRI

CENTRAL POWER RESEARCH INSTITUTE  
(MEMBER STL)

TEST REPORT

Test Report No.43/1/2013/HV/1738/ABI

Date: 10/12/2013

11. Visible discharge test.

Sample No.	Test Voltage kV(rms)@	Remarks
1	156	No visible Discharge
2	156	No visible Discharge

@ These voltages are applied under ambient conditions, which are given below :

\*, \*\*, \$ These voltages are final values after applying corrections for ambient conditions, which are given below:

	Temperature in Degree Celsius		Atmospheric Pressure in mm of Hg.
	Dry Bulb	Wet Bulb	
**,@,\$	24	20	682
*	24	20	680

  
(U.R. SHESHAGIRI RAO)  
Test Engineer



**CPRI**

**CENTRAL POWER RESEARCH INSTITUTE  
(MEMBER STL)**

**TEST REPORT**

Test Report No.43/1/2013/HV/1738/ABI

Date: 09/12/2013

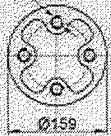
**NOTE:**

- a) The Test results relate only to the item(s) tested.
- b) Publication or reproduction of the test report /Certificate in any form other than by complete set of the whole test report /Certificate and in the language written is not permitted without the written consent of CPRI.
- c) Any Corrections/erasure invalidates the test Report/Certificate
- d) NABL has accredited this laboratory as per ISO 17025-2005 standard vide certification No: T-0010 for the tests carried out.
- e) Any anomaly/discrepancy in the test report /Certificate should be brought to the notice of CPRI within 45 days from the date of issue.
- f) The verification of the sample drawings by CPRI is limited to dimensional checks only wherever possible.

  
**(U.R. SHESHAGIRI RAO)**  
**Test Engineer**

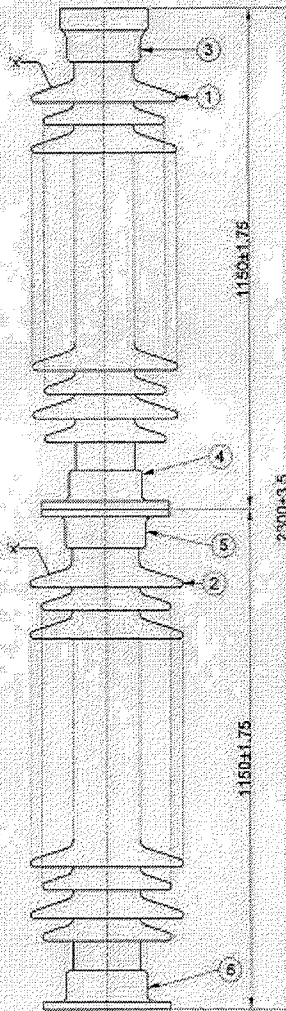
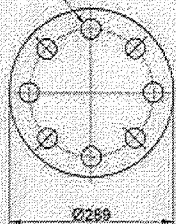
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS CONFIDENTIAL & SHOULD NOT BE USED WITHOUT PROPER CONSENT OF ADITYA BIRLA INSULATORS

4flapped holes  
M16at PCD127



Top flange of top unit

8holes Ø18  
at PCD254



Notes:-

Shed profile meets all the requirements of IEC:60815  
Name of Mfg., trade mark, month & year of Manufacture., Sr.no. to be marked at "x"  
All ferrous parts to be hot dip galvanized as per IS:2633, IS:4759  
Galvanized Thickness shall be - Avg. 86 micron minimum.  
Intermediate interconnecting Nut, Bolt & Washers ( Galvanized) shall be supplied, in case of Multiunit stacks.  
View of actual metal part / porcelain may vary from the view shown in the drawing.  
Colour of glazed BROWN / GREY  
Top & Bottom PCD shall be provided as per Customer's Requirement.  
Standard PCD's used are Ø127 mm for Top & Ø 254 mm for Bottom Fitting.

"इस रेखाचित्र का साक्ष्यांकन महत्वपूर्ण  
आमार्पो की जाँच तक ही सीमित है।"  
"ATTESTATION OF THIS DRAWING IS  
LIMITED TO THE CHECKING OF  
IMPORTANT DIMENSIONS ONLY"

इस रेखाचित्र परीक्षण दस्तावेज सं. 43/11/.....  
एच वी त..... से संबंधित है।  
THIS DRAWING PERTAINS TO TEST REPORT  
43/11/2013-HV/1738/ABI  
Dated... 10/12/2013

*(Signature)*  
संयुक्त निदेशक  
Joint Director  
उच्च वोल्टता प्रभाग  
High Voltage Division  
केन्द्रीय विद्युत अनुसंधान संस्थान  
Central Power Research Institute

पौ. नं. सं. 8086  
P.B. No. 8086  
बंगलूर - 560 080  
Bangalore-560 080

Grey:2	993038
Brown:1	997382
Finish	Code
Product code	

REV.	DATE	DESCRIPTION	APPD.

TECHNICAL DATA

Applicable Standards IS:2544, IEC:60168, IEC:60273, IEC:60815			
<b>DIMENSIONS</b>			
Height	mm	2300±3.5	
Min. Creepage Distance	mm	6125	
Protected Creepage Distance	mm	2800	
Dry arcing distance	mm	1945	
Heavy Polluted	Level III (Heavy Polluted)		
<b>MECHANICAL VALUES</b>			
Camlover Strength	kgf.	800	
Torsional Strength	kgfm	500	
Tension Strength	kgf	13000	
Compression Strength	kgf	26000	
<b>ELECTRICAL VALUES</b>			
Nominal System Voltage	kV	220	
Highest System Voltage	kV	245	
P.F. Withstand Voltage	Dry	kV	510
	Wet	kV	460
P.F. Flashover voltage	Dry	kV	625
	Wet	kV	570
Impulse Withstand Voltage	+ve/-ve	kVp	1050
Impulse Flashover Voltage	+ve	kVp	1210
	-ve	kVp	1450
Corona extinction voltage	(min.)	kV	156
Switching impulse withstand voltage		kVp	NA
P.F. Puncture Voltage			Puncture proof
<b>RIV TEST</b>			
Test voltage to ground	kV	156	
Max. RIV at 1000KHz	µV	500	
<b>PACKING DETAILS</b>			
Net Weight (approx)	Kg	155	

9	Spring washer M16			SS Galv	4	
8	Flat washer M16			MS HDG	6	
7	Hex. bolt & nut M16X90			MS HDG	4	
6	Bottom flange			SGI-HDG	1	
5	Intermediate flange-2			SGI-HDG	1	
4	Intermediate flange-1			SGI-HDG	1	
3	Top flange			SGI-HDG	1	
2	Porcelain shell B			Porcelain	1	
01	Porcelain Shell-1			Porcelain	01	
SR NO.	DESCRIPTION	DRG. No.	WEIGHT	MATERIAL	QTY.	REMARKS
TITLE				DRN	Gpanchal	05/10/2010
24SKV. SOLID CORE INSULATORS				CKD	DBC	05/10/2010
				APD	DBC	05/10/2010
REF-	TYPE TEST		ALL DIMENSIONS ARE IN mm.		SCALE:	NTS
				Drg. No.		Rev.No.
				987382		0
ADITYA BIRLA INSULATORS HALOL - INDIA						

TÜV INDIA PVT. LTD.  
2<sup>nd</sup> Floor, Dhun Building,  
#827, Anna Salai  
Chennai - 600 002  
Tel: 044 2852 8875 / 2852 1052  
Fax: 044 2852 1676  
E-mail: [chennai@tuv-nord.com](mailto:chennai@tuv-nord.com)



## Certificate No. 8108276112-100-KPS-04

This is to certify that the undersigned Representative to TÜV India witnessed the Mechanical endurance test on Earth switch as described below at the works of S&S Power Switch Gear Equipment Limited., Pondicherry

Item Description	: 245 kV, Three Pole Earth Switch M0 Class
Reference standard	: IEC- 62271-102/2003
GA Drawings	: 3D6G250/TTST Rev. A, 3D6E084/TTST Rev. A 3UCD160/TTST Rev. A, 3UCS152/TTST Rev. A 211-C-1518/TTST Rev. 0
Date of Test	: 26.09.2011 to 28.09.2011
Operating Mechanism	: Motor operated
Auxiliary Switches	: 6 NO + 6 NC

The operation and Mechanical endurance test with (class M0) on Earth Switch conducted as per the provisions of IEC-62271-102/2003 and the results found meeting to the requirements. For refer TC No.: 019/26.09.2011 to 28.09.2011 Dt. 28.09.2011 of S&S Power Switch Gear Equipment Limited.

Calibration reports for the instruments used during the temperature rise test were reviewed and found with valid calibration.

Location : Chennai

Date : 28 September 2011

  
K. P. S. Iyer

Manager-Industrial Services to TÜV India

N/A SL

**S & S PSE****TEST REPORT**

Date: 28/09/2011

Sheet 01 of 01

Test report number & date : 019 -20110928

Test sample : **245 kV Three Pole Earth Switch** Type: DEE

Manufacturer : **S & S POWER SWITCHGEAR EQUIPMENT LTD, PUDUCHERRY – INDIA**

Insulators Used : **Modern Insulators**

Operating mechanism : **Motor Operated – 0.5 HP, 3ø - 415 VAC**

Auxiliary switch details : **6NO + 6NC**

Drawing Nos : 1. GA drawing of disconnecter – 3D6G250  
2. GA drawing of Earth Switch & Earth Fixed Contact – 3D6E084  
3. GA drawing of operating mechanism – 3UCD160  
4. GA of scheme – 3UCS152  
5. GA drawing of insulator – 211-C-1518

Tests conducted : Test 1. Mechanical endurance test on earth switch  
Test 2. Operation during application of the rated static terminal load

Load Applied :  
i) for endurance test : 74kg on the Main Terminal of Disconnecter on Fa1 Direction  
ii) for rated static terminal load : 148kg on the main Terminal of Disconnecter on Fa1 Direction  
: 80kg on the main Terminal of Disconnecter on Fb1 Direction  
: 127kg on the main Terminal of Disconnecter on Fc Direction.

Tests conducted at : M/s. S & S Power Switchgear equipment Ltd.  
EVR Street, Sedarapet, Puducherry-605111

Test procedure : Test 1 Conducted as per clause 6.102.3 of IEC: 62271 – 102 / 2003  
Test 2 Conducted as per clause 6.102.4 of IEC: 62271 – 102 / 2003

Date(s) of test : 26.09.11 & 28.09.11

Test Results : Refer Annexure -I

Tests witnessed by : **K.P.S. Iyer**  
(Manager-Industrial Services TUV India)

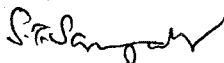
**Documents constituting this report**

Number of sheets

Number of drawings

: One &amp; Annexure-I

: Five

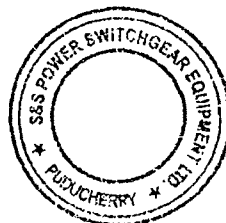
**TESTED BY:**

S.T. Sampath

(Dy. Manager, QC&amp;Testing)

**VERIFIED BY:**  
N. Vijaya raghavan  
(Sr Manager - Technical & QC)**WITNESSED BY:**  
K.P.S. Iyer  
(Manager-Industrial Services)

TUV India

J. Maheshanand  
(Engineer, QC&Testing)



## RD -245KV/2500A-EARTH SWITCH

ANNEXURE - I

Date 26/09/11 to 28/09/11

**a) Mechanical Endurance Test results/observation**

OPERATING CYCLES OF EARTH SWITCH		OBSERVATION POINTS							
		CURRENT DRAWN BY MOTOR ( Ampere )		OPERATING TIME (SECONDS)		AUXILLARY POSITION		MECHANICAL POSITION INDICATION	
		OP TO CL	CL TO OP	OP TO CL	CL TO OP	CL	OP	CL	OP
NO LOAD OPERATION BEFORE START OF TEST	FIVE OPERATIONS AT 85% RATED VOLTAGE ( 187V DC & 352V AC )	0.65	0.84	6.63	6.16	ok	ok	ok	ok
		0.73	0.78	6.27	6.00	ok	ok	ok	ok
		0.73	0.77	6.27	6.18	ok	ok	ok	ok
		0.73	0.75	6.22	5.95	ok	ok	ok	ok
		0.72	0.78	6.37	5.99	ok	ok	ok	ok
	FIVE OPERATIONS AT 100% RATED VOLTAGE ( 220V DC & 416V AC )	0.62	0.61	6.20	6.20	ok	ok	ok	ok
		0.70	0.60	6.20	6.20	ok	ok	ok	ok
		0.70	0.60	6.39	6.06	ok	ok	ok	ok
		0.73	0.63	6.24	6.02	ok	ok	ok	ok
		0.67	0.61	6.31	6.01	ok	ok	ok	ok
	FIVE OPERATIONS AT 110% RATED VOLTAGE ( 242V DC & 457V AC )	0.99	1.02	6.47	6.16	ok	ok	ok	ok
		1.00	1.02	6.13	6.02	ok	ok	ok	ok
		1.00	1.01	6.17	6.12	ok	ok	ok	ok
		1.02	0.98	6.14	5.77	ok	ok	ok	ok
		0.98	1.01	6.14	5.93	ok	ok	ok	ok
	WITH LOAD OPERATION	900 OPERATIONS AT 100% RATED VOLTAGE ( 220V DC & 416V AC )	0.69	0.76	6.14	6.07	ok	ok	ok
0.82			0.78	6.20	6.29	ok	ok	ok	ok
50 OPERATIONS AT 85% RATED VOLTAGE ( 187V DC & 352V AC )		0.77	0.62	0.63	6.06	ok	ok	ok	ok
		0.80	0.65	6.70	5.99	ok	ok	ok	ok
50 OPERATIONS AT 110% RATED VOLTAGE ( 242V DC & 457V AC )		1.02	1.02	6.72	6.20	ok	ok	ok	ok
		1.02	1.04	6.30	5.85	ok	ok	ok	ok

b) Static terminal load Test results/observation

WITH LOAD Full OPERATION	20 OPERATIONS AT 100% RATED VOLTAGE ( 242V DC & 457V AC)	0.75	0.76	10.93	10.85	ok	ok	ok
		0.80	0.74	10.83	10.84	ok	ok	ok

**Observations:**

1. All parts of the Earth Switch including contacts were in good condition and did not show undue wear after the test.
2. The operations of all auxillary contacts and mechanical position indicating devices were satisfactory after the test.
3. Close and open signaling took place at fully closed and open position of movable contacts respectively.
4. The condition of the mechanical travel limit stops and found satisfactory after test.

**Remarks:**

The Earth Switch met the requirements of Extended mechanical endurance test as per clause 6.102.5 of IEC 62271-102/2003.

Witnessed

TESTED BY:

*S.T. Sampath*  
S.T. Sampath

(Dy. Manager, QC&Testing)

VERIFIED BY:

*N. Vijaya raghavan*  
N. Vijaya raghavan

(Sr Manager - Technical & QC)

WITNESSED BY:

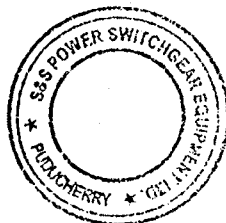
*K.P.S. Iyer*  
K.P.S. Iyer

(Manager-Industrial Services, FUV India)

*J. Mabeshanand*

J. Mabeshanand

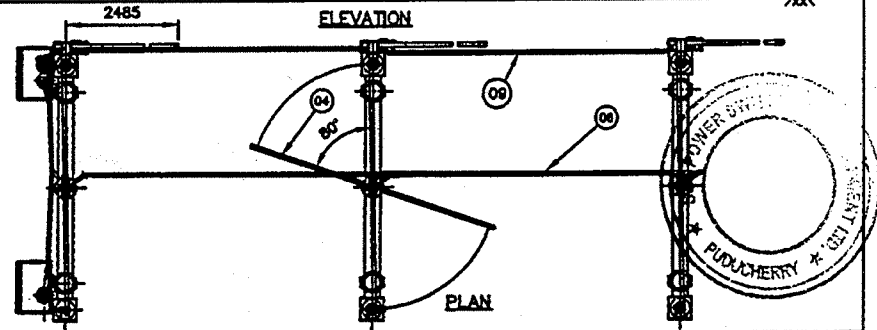
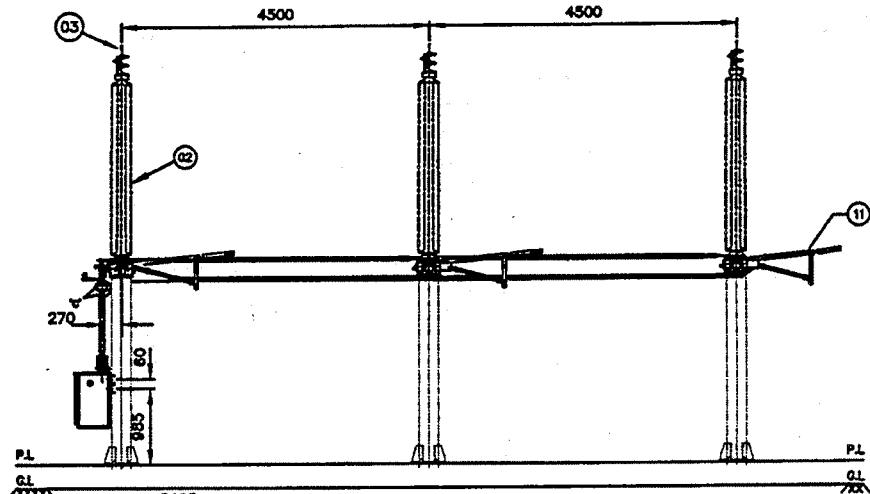
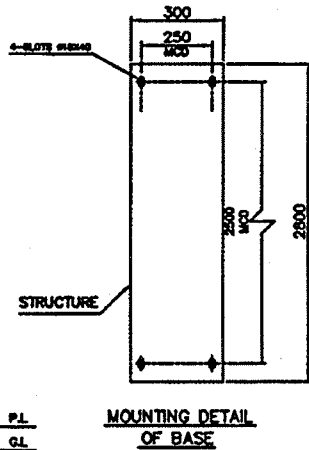
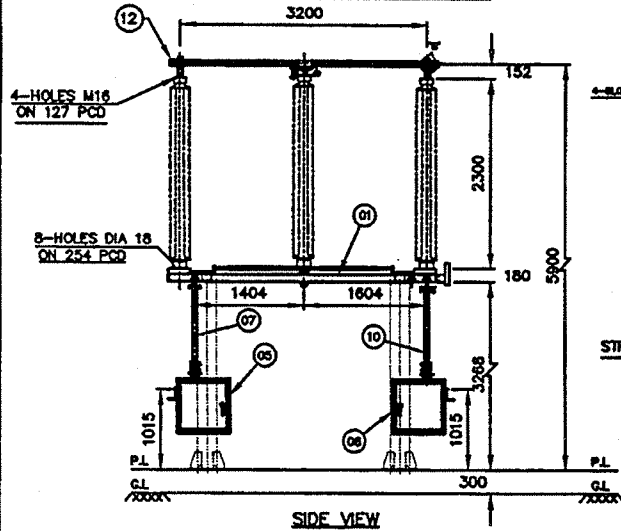
(Engineer, QC&Testing)



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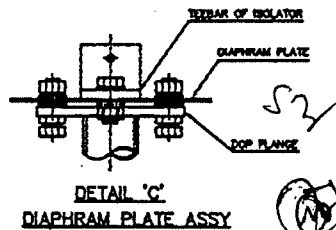
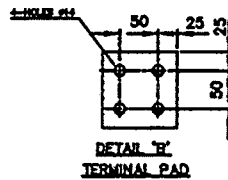
ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

IF IN DOUBT ASK



**NOTE:**

1. MCD - MOUNTING CENTRE DISTANCE.
2. HDG. - HOT DIP GALVANISED.
3. G.A. - GENERAL ARRANGEMENT
4. GL - GROUND LEVEL
5. OPTG. - OPERATING
6. NB - NOMINAL BORE
7. PL - PLINTH LEVEL
8. Insulator to Base and Base to Structure fixing hardware to be arranged by customer



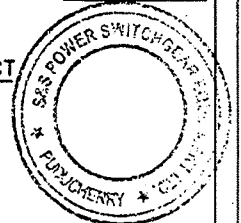
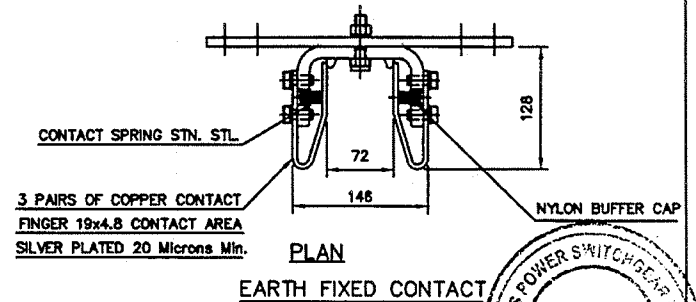
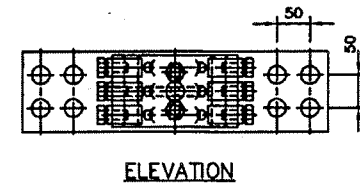
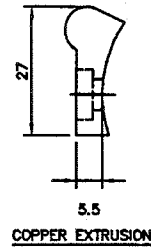
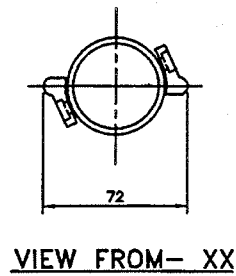
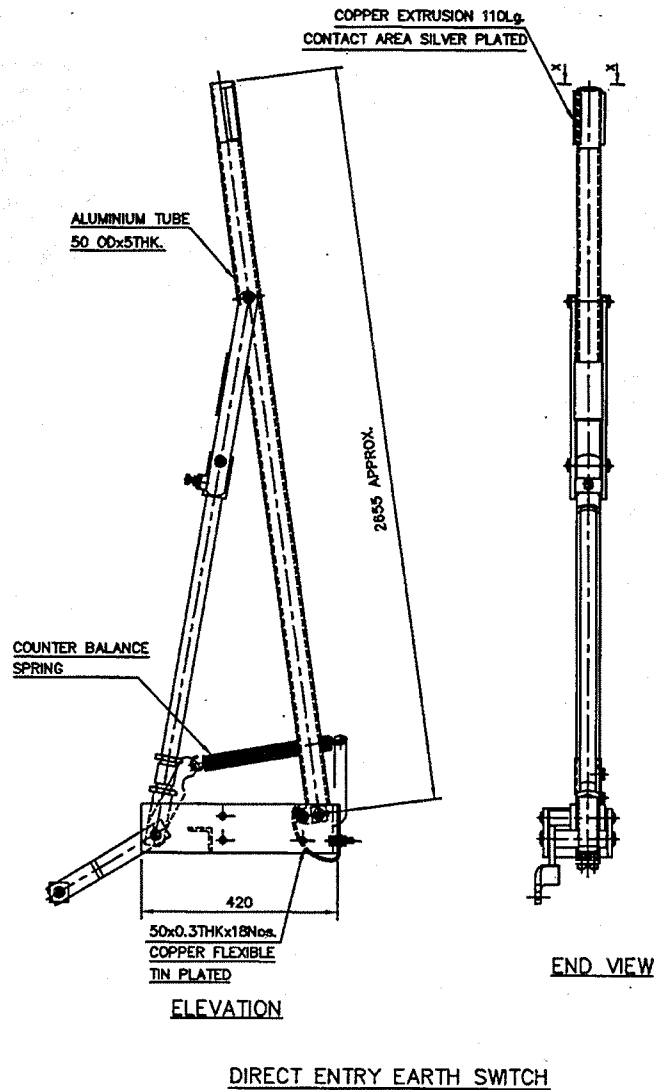
SLNo	DESCRIPTION	QTY.
12	EARTH FIXED CONTACT ASSY	3
11	EARTH MOVING BLADE	3
10	DOWN OPTG.PIPES HDG-EARTH NB50 WITH DIAPHRAM PLATE	1
09	GANG PIPE FOR EARTH HDG NB32	2
08	OPTG.DRIVE FOR EARTH SW.(MOTOR OPERATED)	1
07	DOWN OPTG.PIPES HDG-MAIN NB50 WITH DIAPHRAM PLATE	1
06	GANG PIPE FOR MAIN HDG NB32	2
05	OPTG.DRIVE FOR MAIN (MOTOR)	1
04	MOVING BLADE ASSEMBLY	3
03	FIXED CONTACT ASSEMBLY	6
02	INSULATORS SOLIDCORE	9
01	BASE ASSEMBLY	3
REV. NO.	CHG. NO.	CHANGE DETAILS
		DATE PRD. APPD.

		<b>POWER GRID CORPORATION OF INDIA LIMITED</b>	
PROJECT			
LOA NO.			
TITLE	GA OF 245KV, 1600/2500A DOUBLE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH (MGB/MGB)		
SCALE	CONTRACTOR	DRN.	RTL
1:60	<b>S &amp; S POWER SWITCHGEAR EQUIPMENT LTD</b> (A JV between S&S power & COELME) PUDUCHERRY - 605111, INDIA	07.01.11	07.01.11
		CHD.	NVR
		07.01.11	07.01.11
		APPD.	NVR
		07.01.11	07.01.11
		DRAWING NO.	REV. No.
		JD6G250	A-

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ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

IF IN DOUBT ASK



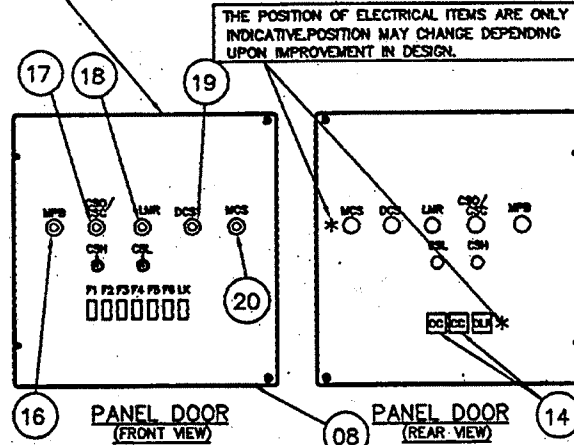
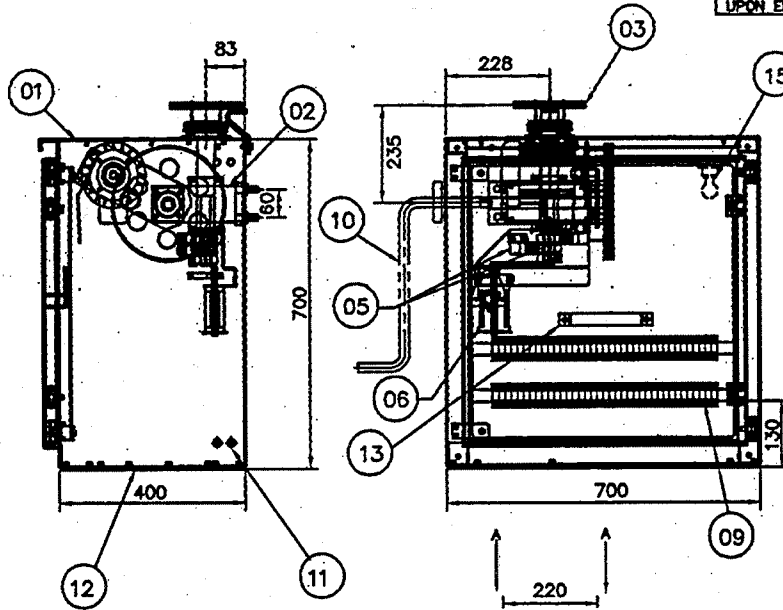
		<b>POWER GRID CORPORATION OF INDIA LIMITED</b>		
PROJECT	<i>Approved</i>			
LOA NO.	<i>Approved</i>			
TITLE	G.A.OF 245KV DIRECT ENTRY EARTH SWITCH & EARTH FIXED CONTACT ASSY.			
SCALE 1:10	CONTRACTOR	DRN.	RTL	07.01.11
	 S & S POWER SWITCHGEAR EQUIPMENT LTD (A JV between S&S power & COELME) PUDUCHERRY - 605111, INDIA	CHD.	NVR	07.01.11
			APPD.	NVR
		DRAWING NO.	REV. No.	
		3D6E084	A-	

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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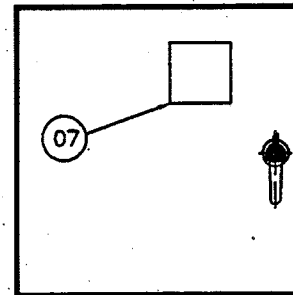
IF IN DOUBT ASK



**NOTES:**

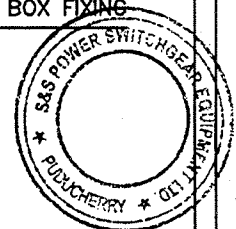
1. ALWAYS KEEP THE DRIVE IN UPRIGHT POSITION
2. WEIGHT OF DRIVE BOX 90 Kg APPROXIMATELY.
3. DEGREE OF PROTECTION IS IP55 AS PER IEC:60529
4. ALL DOORS & REMOVABLE COVERS SHALL BE SEALED BY NEOPRENE/EPDM GASKETS.
- 5a. "ON" AND "OFF" LABEL FIXED TO THE OPTG. FLANGE AT REQUIRED ANGLE OF DRIVE INDICATE THE PHYSICAL POSITION OF DISCONNECTOR
- b. ARROW POSITION ON TOP OF MOTOR OPTG. CABINET INDICATES ON/OFF POSITION OF DISCONNECTOR
- c. a,b TOGETHER WILL FORM MECHANICAL POSITION INDICATOR
6. SHEET THICKNESS : 3mm Aluminium Sheet FINISH : NATURAL
7. FOR LEGEND REF DRG:3UCN001
8. 20% EXTRA TERMINAL BLOCK PROVIDED

MCD - MOUNTING CENTRE DISTANCE  
 GA - GENERAL ARRANGEMENT  
 IP - INGRESS PROTECTION  
 OPTG. - OPERATING

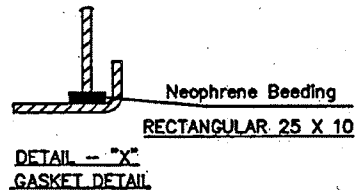


4 NOS M14 SCREW PROVIDED FOR BOX FIXING

MOUNTING ARRANGEMENT OF BOX



20	MOTOR CONTROL SWITCH
19	DC CONTROL SWITCH
18	LOCAL/MANUAL REMOTE SWITCH
17	CONTROL SWITCH OPEN/CLOSE
16	MAIN BUSH BUTTON
15	LAMP
14	OPEN/CLOSE CONTACTOR
13	HEATER
12	GLAND PLATE-MS-2.5mm THK. WITH
11	EARTHING POINT WITH M12 BOLT
10	MAIN HANDLE
09	TERMINAL BLOCKS
08	INNER PANEL DOOR
07	NAME PLATE
06	AUXILIARY SWITCH
05	LIMIT SWITCH- LSO/LSC
04	MOTOR
03	DRIVE FLANGE
02	GEAR BOX ASSEMBLY
01	CABINET



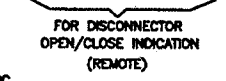
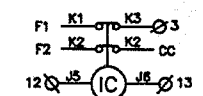
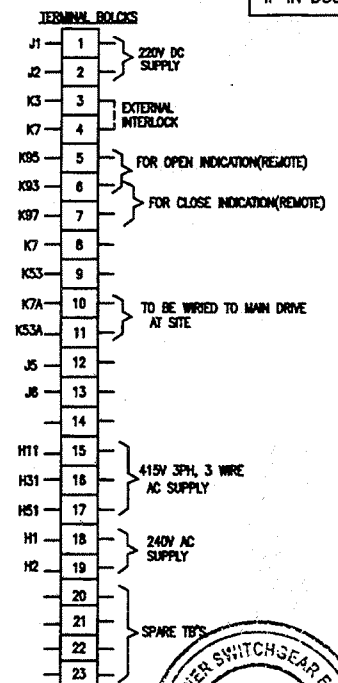
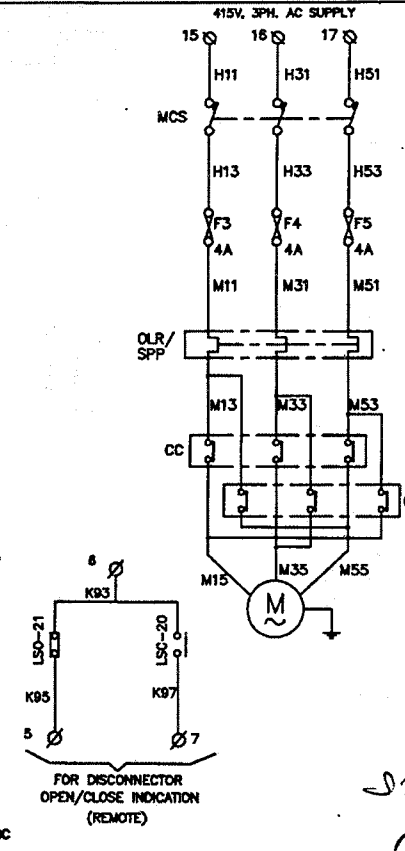
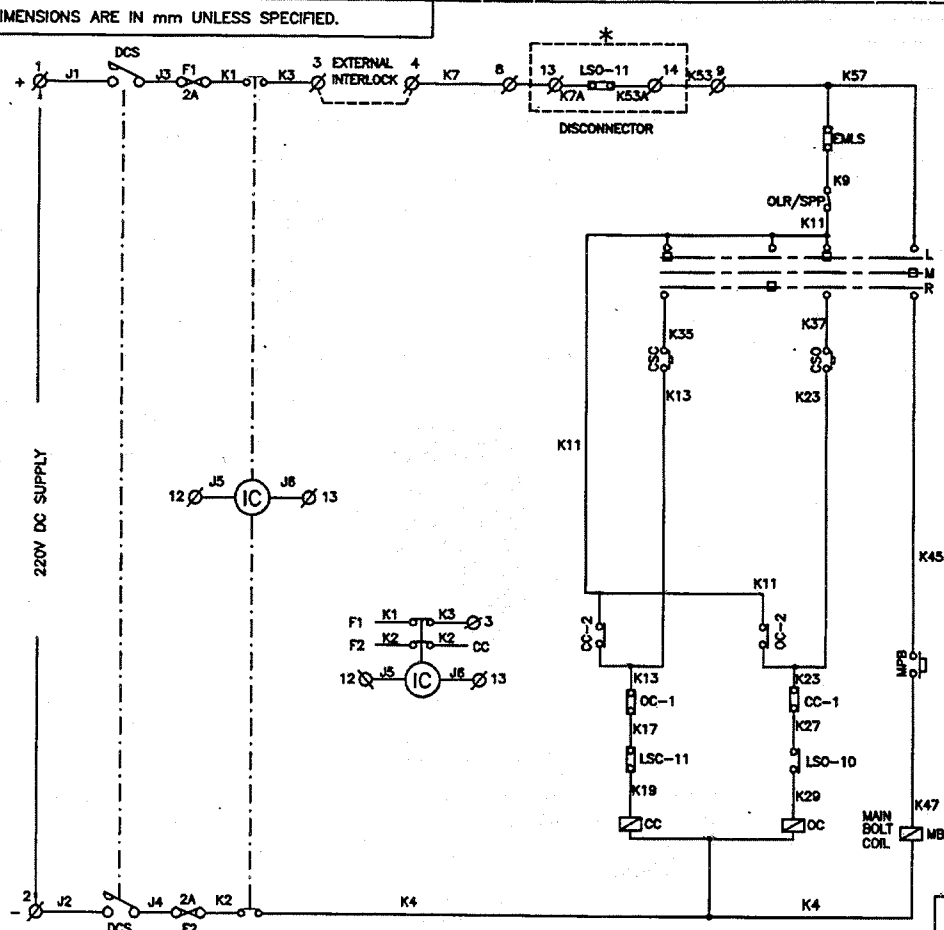
REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

		<b>POWER GRID CORPORATION OF INDIA LIMITED</b>		
PROJECT				
LOA NO.				
TITLE	GA OF MOTOR OPERATING BOX FOR 245KV EARTH SWITCH			
SCALE	CONTRACTOR	DRN.	RTL	05.01.11
	S & S POWER SWITCHGEAR EQUIPMENT LTD (A JV between S&S power & COELME) PUDUCHERRY - 605111, INDIA	CHD.	NVR	05.01.11
		APPD.	NVR	05.01.11
		DRAWING NO.	REV. No.	
		3UCD160	A-	

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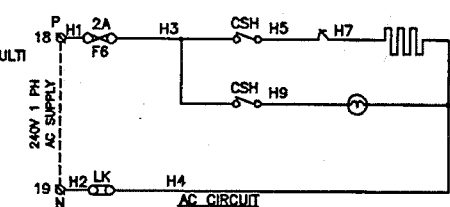
IF IN DOUBT ASK



**NOTE:**

1. ALL CIRCUITS SHOWN IN DEENERGISED CONDITION.
2. ALL WIRING DONE WITH 2.5sq mm. COLOUR CODED ,1.1KV GRADE MULTI STRANDED PVC INSULATED COPPER WIRE.
3. DOTTED LINE CONNECTIONS NOT IN S&S SCOPE

\* LSO-11 OF MAIN BOX TO BE WIRED ON TB NO:10 & 11



		<b>POWER GRID CORPORATION OF INDIA LIMITED</b>	
PROJECT			
LOA NO.			
TITLE <b>DC &amp; AC CONTROL CIRCUIT FOR EARTH SWITCH (MECHANICALLY GANGED-245KV)</b>			
		SCALE CONTRACTOR	
		<b>S &amp; S POWER SWITCHGEAR EQUIPMENT LTD ( A JV between S&amp;S power &amp; COELME). PUDUCHERRY - 605111, INDIA</b>	
DRN.	RTL	07.01.11	
CHD.	NVR	07.01.11	
APPD.	NVR	07.01.11	
DRAWING NO.		REV. No.	
3UCS152		A-	

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

Holes M16x22 deep  
DIN 121 P.C.D.

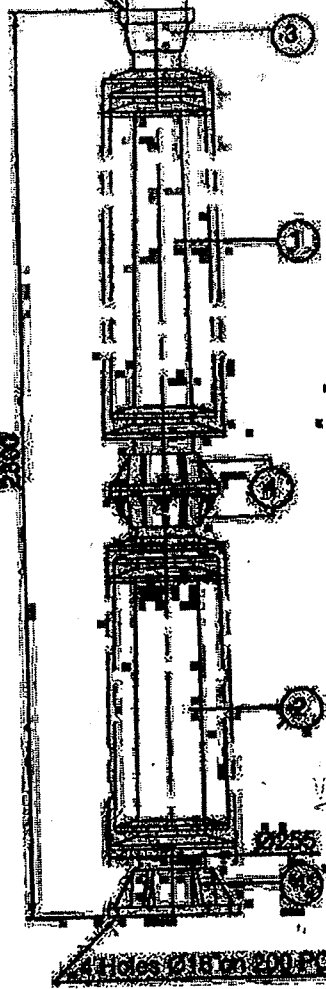
**TECHNICAL PARTICULARS**

**MECHANICAL VALUES**

Bending strength (Upright)	KN	6
Compression strength	KN	220
Tensile strength	KN	110
Torsional strength	KNm	3.5

**ELECTRICAL VALUES**

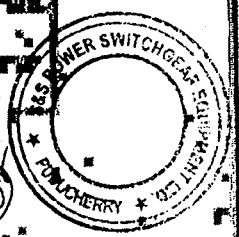
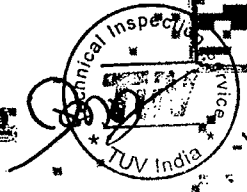
Dry power frequency withstand voltage	KV	530
Wet power frequency withstand voltage	KV	450
Dry power frequency flashover voltage	KV	570
Wet power frequency flashover voltage	KV	520
Lightning impulse withstand voltage	KV	1030
Impulse flashover voltage	KV	1150
Minimum creepage distance	mm	6125
Volume resistivity	KV	151
Rated voltage	KV	110



**NOTE**

Refer to drawing no. MINS 2541, 1350, MINS 2010, 23

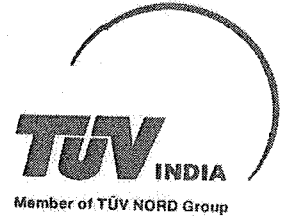
Reviewed  
Witnessed



QTY	DESCRIPTION	MATERIAL	REMARKS
1	220KV SOLIDCORE POST INSULATOR 635-11032		
<b>MODERN INSULATORS LIMITED</b> <b>ABU ROAD</b>		Drawn: [Signature] Checked: [Signature] Approved: [Signature] Date: 1982-2033	Kg. No. [ ] [ ] [ ] [ ] 241-GL-1618-10

TÜV INDIA PVT. LTD.  
2<sup>nd</sup> Floor, Dhun Building,  
#827, Anna Salai  
Chennai - 600 002  
Tel: 044 2852 8875 / 2852 1052  
Fax: 044 2852 1676

E-mail: [DL-India\\_chennai@tuv-nord.com](mailto:DL-India_chennai@tuv-nord.com)



## Certificate No. 8112431725-100-SS-01

This is to certify that the undersigned representative to TÜV India witnessed the Mechanical endurance test on Disconnector as described below at the works of S&S Power Switch Gear Equipment Limited., Puducherry.

Item Description	: 245 kV, 2000A Horizontal Centre Break M2 Class Disconnector with Earth Switch.
Reference standard	: IEC- 62271-102/2003
GA Drawings	: 3C6G241/P006 Rev A, 3C6H004 /P006 Rev. A 3UCD023/P006 Rev. A, 3UCS594/P006 Rev. A 3C6E084/P006-Rev A, 5.6105.OQ.
Date of Test	: 20.05.2015 to 27.05.2015
Operating Mechanism	: Motor operated (0.5HP, 220V DC)
Auxiliary Switches	: Disconnector- 8NO + 8 NC & Earth -6NO+ 6 NC

The operation and Mechanical endurance test with extended mechanical endurance test (Class M2) on Disconnector conducted as per the provisions of IEC-62271-102/2003 and the results found meeting to the requirements. For measurement of resistance values observed refer Test Report No.: 34B/P006-20150527 Dt. 27.05.2015 of S&S Power Switch Gear Equipment Limited.

Calibration reports for the instruments used during the endurance test were reviewed and found with valid calibration.

Location : Chennai

Date : 27<sup>th</sup> May 2015

S. Stalin  
Surveyor to TÜV India Private Limited



S & S PSE

TEST REPORT

Date: 27/05/2015

Sheet 01 of 03

Test report number & date : 34B - P006-20150527

Test sample : 245 kV, 2000 A, Horizontal Centre Break M2 Class Disconnecter with earth switch

Type : RC 245

Manufacturer : S & S POWER SWITCHGEAR EQUIPMENT LTD, PUDUCHERRY – INDIA

Insulators Used : WS Industries Ltd.

Operating mechanism : Disconnecter, Motor Operated – 0.5 HP, 220V DC

Auxiliary switch details : Disconnecter Main– 8NO + 8NC & Earth 6NO+6NC

Drawing No's : 1. GA drawing of disconnecter – 3C6G241/P006 - Rev A  
2. GA drawing of Male & Female blade – 3C6H004/P006 - Rev A  
3. GA drawing of operating mechanism – 3UCD023/P006 - Rev A  
4. GA of scheme – 3UCS594/P006 - Rev A  
5. GA Drawing of Earth – 3C6E084/P006 - Rev A  
6. GA drawing of Insulator – 5.6105.OQ

Tests conducted : Test: 1 Mechanical endurance test on disconnecter  
Test: 2 Operation during application of the rated static terminal load on disconnector  
Test: 3 Extended mechanical endurance test on disconnector

Tests conducted at : M/s. S & S Power Switchgear equipment Ltd.  
EVR Street, Sedarapet, Puducherry-605111

Test procedure : Test: 1 Conducted as per clause 6.102.3 of IEC: 62271 – 102 / 2003  
Test: 2 Conducted as per clause 6.102.4 of IEC: 62271 – 102 / 2003  
Test: 3 Conducted as per clause 6.102.5 of IEC: 62271 – 102 / 2003

Date(s) of test : 20.05.2015 to 27.05.2015

Tests witnessed by : S. Stalin  
(Inspection Engineer, TUV India)

Documents constituting This report

Number of sheets : Annexure-I two Sheets & photographs in two sheets.

Number of drawings : Six drawings

TESTED BY:

VERIFIED BY:

WITNESSED BY:

  
S.T. Sampath  
(Dy. Manager - QC & Testing)

  
M. Rengaraj  
(Manager – QC & QA)



Reviewed  
Witnessed



  
S. Stalin  
(Inspection Engineer TUV India)



S & S PSE

Date: 27/05/2013

Test Report No.: 34B - P006-20150527

Sheets 02 of 03

**Mounting Arrangements:** The sample was erected on a standard metallic support structure as per GA Drawing of the disconnector.

**TEST RESULTS**

**1. MECHANICAL ENDURANCE TEST AS PER CL: 6.102.3, 6.102.4, 6.102.5 OF IEC: 62271-102**

a) Measurement of main circuit resistance before the test

DC in Amps	Measured resistance of main circuit, micro ohms (Three Pole)			Ambient Temperature in °C
	"R"	"Y"	"B"	
100	97.3	98.0	101.2	35

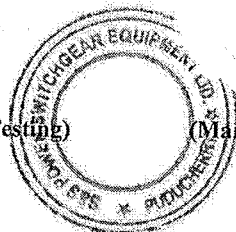
- b) 5 operations on No load of Three Pole Disconnector done before the start of the test. The current drawn by motor, operating time in seconds, open close indication of disconnector and auxiliary switch position indication results. Refer ANNEXURE- I attached
- c) 50 % of the rated static terminal load as per the procedure (50 % of 150 =75 Kgs) was applied on three pole both ends of the Disconnector in Fa1 direction, And load current drawn by motor and operating time in seconds And open close indication of disconnector, auxiliary switch position indication results recorded in ANNEXURE-I
- d) Measurement of main circuit resistance after each 1000 operations

DC in 100 amps	Measured resistance of main circuit, micro ohms (Three Pole)			Ambient Temperature in °C
	R	Y	B	
1000 <sup>th</sup> - operation	98.6	99.9	103.2	35
2000 <sup>th</sup> - operation	94.8	103.8	103.7	35
3000 <sup>th</sup> - operation	98.2	106.2	105.9	32
4000 <sup>th</sup> - operation	99.8	106.9	105.9	35
5000 <sup>th</sup> - operation	99.9	106.8	105.4	36
6000 <sup>th</sup> - operation	101.3	107.1	103.0	35
7000 <sup>th</sup> - operation	101.3	106.7	103.0	35
8000 <sup>th</sup> - operation	101.4	106.4	105.3	32
9000 <sup>th</sup> - operation	103.0	106.3	108.7	36
10000 <sup>th</sup> - operation	104.5	104.9	105.2	35

TESTED BY:



S.T. Sampath  
(Dy. Manager - QC & Testing)



VERIFIED BY:



M. Rengara  
(Manager - QC & QA)

WITNESSED BY:

Reviewed  
Witnessed



S. Stalin  
(Inspection Engineer TUV India)

**2. Operation during application of the rated mechanical static terminal load**

- Longitudinal Load applied on both Terminal in Direction Fa1 – 75 Kg.
- Perpendicular Load applied on both Terminal in Direction Fb1 – 40 Kg.
- Downward force Load applied on both Terminal in Direction Fc – 64 Kg.

Twenty Operating Cycles were carried out with the rated power supply applied with the rated mechanical static terminal load applied at both terminals with the above mentioned load

a) Measurement of main circuit resistance before the full load test

DC in Amps	Measured resistance of main circuit, micro ohms (Three Pole)			Ambient Temperature in °C
100	“R”-98.9	“Y”-94.3	“B”-95.5	35

b) Measurement of main circuit resistance after full load the test

DC in Amps	Measured resistance of main circuit, micro ohms (Three Pole)			Ambient Temperature in °C
100	“R”-104.3	“Y”-105.4	“B”-105.2	35

- c) Full load applied on Three pole both ends of the Disconnecter in Fa1, Fb1, Fc1 direction, And load current drawn by motor and operating time in seconds And open close indication of disconnecter, auxiliary switch position indication result recorded in ANNEXURE- I


**Observations:**

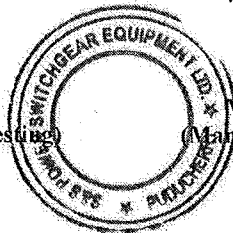
1. All parts of the disconnecter including contacts were in good condition and did not Show undue wear after the test.
2. The operations of all auxiliary contacts and mechanical on/off position indicating devices were satisfactory after the test.
3. Close and open signaling took place at fully closed and open position of movable contacts respectively.
4. The condition of the mechanical travel limit stops was found satisfactory after test.
5. The contact resistance variation before and after the test was found to be less than 10%.

**Remarks:**


The disconnecter meet the requirements of mechanical endurance test, extended mechanical endurance test as per clause 6.102.3, 6.102.4 and 6.102.5 of IEC 62271-102.

TESTED BY:

  
**S.T. Sampath**  
 (Dy. Manager - QC & Testing)



VERIFIED BY:

  
**V. Rengaraj**  
 (Manager - QC & QA)

WITNESSED BY:

Reviewed  
 Witnessed



  
**S. Stalin**  
 (Inspection Engineer TUV India)



RC 245 kV- 2000 A  
ANNEXURE - I



a) Mechanical Endurance Test results/observation

Page 01 of 02

OPERATING CYCLES OF MAIN		OBSERVATION POINTS							
		CURRENT DRAWN BY MOTOR ( Amipere )		OPERATING TIME (SECONDS)		AUXILLARY POSITION		MECHANICAL POSITION INDICATION	
		OP TO CL	CL TO OP	OP TO CL	CL TO OP	CL	OP	CL	OP
NO LOAD OPERATION BEFORE START OF TEST	FIVE OPERATIONS AT 65% RATED VOLTAGE ( 167 DC )	0.37	0.43	4.61	4.19	OK	OK	OK	OK
		0.34	0.36	5.21	4.84	OK	OK	OK	OK
OPERATION WITH LOAD	900 OPERATIONS AT 100% RATED VOLTAGE ( 220V DC )	0.77	0.37	4.84	3.35	OK	OK	OK	OK
		0.68	0.37	4.91	3.47	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE ( 187 DC )	0.79	0.36	5.85	4.03	OK	OK	OK	OK
		0.60	0.34	5.84	3.93	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE ( 242V DC )	0.95	0.49	4.59	3.28	OK	OK	OK	OK
		0.96	0.53	4.57	3.35	OK	OK	OK	OK

b) Extented Mechanical Endurance Test results/observation

OPERATION WITH LOAD	1500 OPERATIONS AT 100% RATED VOLTAGE ( 220V DC )	0.72	0.38	4.85	3.66	OK	OK	OK	OK
		0.74	0.43	4.94	3.59	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE ( 187V DC )	0.82	0.28	5.88	4.02	OK	OK	OK	OK
		0.79	0.31	5.79	4.11	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE ( 242V DC )	0.89	0.50	4.60	3.21	OK	OK	OK	OK
		0.90	0.62	4.58	3.25	OK	OK	OK	OK
WITH LOAD OPERATION	2200 OPERATIONS AT 100% RATED VOLTAGE ( 220V DC )	0.78	0.43	5.00	3.39	OK	OK	OK	OK
		0.77	0.36	4.97	3.47	OK	OK	OK	OK
	80 OPERATIONS AT 85% RATED VOLTAGE ( 187V DC )	0.80	0.34	5.88	3.99	OK	OK	OK	OK
		0.81	0.35	5.84	4.07	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE ( 242V DC )	0.93	0.55	4.62	3.21	OK	OK	OK	OK
		0.92	0.62	4.55	3.27	OK	OK	OK	OK
OPERATION WITH LOAD	3800 OPERATIONS AT 100% RATED VOLTAGE ( 220V DC )	0.79	0.32	4.90	3.34	OK	OK	OK	OK
		0.74	0.30	4.93	3.34	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE ( 187V DC )	0.76	0.29	5.99	4.08	OK	OK	OK	OK
		0.81	0.31	5.86	4.05	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE ( 242V DC )	0.96	0.48	4.65	3.33	OK	OK	OK	OK
		0.95	0.47	4.59	3.24	OK	OK	OK	OK
OPERATION WITH LOAD	4300 OPERATIONS AT 100% RATED VOLTAGE ( 220V DC )	0.77	0.38	5.06	3.42	OK	OK	OK	OK
		0.75	0.37	5.03	3.50	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE ( 187V DC )	0.84	0.33	5.92	4.05	OK	OK	OK	OK
		0.79	0.32	5.96	4.02	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE ( 242V DC )	0.89	0.51	4.52	3.28	OK	OK	OK	OK
		0.87	0.45	4.65	3.27	OK	OK	OK	OK

02

Reviewed  
Witnessed



OPERATION WITH LOAD	5000 OPERATIONS AT 100% RATED VOLTAGE (220V DC)	0.74	0.38	5.09	3.69	OK	OK	OK	OK
		0.75	0.43	4.99	3.59	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE (187V DC)	0.83	0.37	5.90	4.02	OK	OK	OK	OK
		0.78	0.31	5.84	4.08	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE (242V DC)	0.89	0.52	4.47	3.22	OK	OK	OK	OK
		0.91	0.48	4.57	3.26	OK	OK	OK	OK

OPERATION WITH LOAD	5000 OPERATIONS AT 100% RATED VOLTAGE (220V DC)	0.72	0.29	5.03	3.34	OK	OK	OK	OK
		0.76	0.42	4.96	3.62	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE (187V DC)	0.83	0.29	5.87	4.21	OK	OK	OK	OK
		0.82	0.31	5.79	4.07	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE (242V DC)	0.94	0.53	4.48	3.31	OK	OK	OK	OK
		0.91	0.49	4.57	3.28	OK	OK	OK	OK

WITH LOAD OPERATION	7500 OPERATIONS AT 100% RATED VOLTAGE (220V DC)	0.76	0.36	5.01	3.52	OK	OK	OK	OK
		0.78	0.37	5.04	3.44	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE (187V DC)	0.81	0.39	5.96	4.08	OK	OK	OK	OK
		0.83	0.29	5.89	4.02	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE (242V DC)	0.86	0.49	4.52	3.22	OK	OK	OK	OK
		0.90	0.48	4.50	3.26	OK	OK	OK	OK

OPERATION WITH LOAD	5000 OPERATIONS AT 100% RATED VOLTAGE (220V DC)	0.70	0.36	5.03	3.34	OK	OK	OK	OK
		0.74	0.37	5.02	3.47	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE (187V DC)	0.81	0.31	5.88	4.03	OK	OK	OK	OK
		0.79	0.35	5.86	4.07	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE (242V DC)	0.95	0.48	4.48	3.28	OK	OK	OK	OK
		0.92	0.53	4.59	3.22	OK	OK	OK	OK

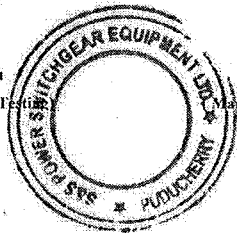
OPERATION WITH LOAD	5000 OPERATIONS AT 100% RATED VOLTAGE (220V DC)	0.77	0.34	5.06	3.56	OK	OK	OK	OK
		0.76	0.38	5.05	3.46	OK	OK	OK	OK
	50 OPERATIONS AT 85% RATED VOLTAGE (187V DC)	0.84	0.41	5.89	4.10	OK	OK	OK	OK
		0.86	0.35	5.95	4.01	OK	OK	OK	OK
	50 OPERATIONS AT 110% RATED VOLTAGE (242V DC)	0.89	0.50	4.50	3.26	OK	OK	OK	OK
		0.88	0.52	4.51	3.28	OK	OK	OK	OK

C) Static terminal load test result / observation

WITH FULL LOAD OPERATION	20 OPERATION AT 100% RATED VOLTAGE (220V DC)	0.79	0.38	5.09	3.60	OK	OK	OK	OK
		0.78	0.40	5.10	3.58	OK	OK	OK	OK

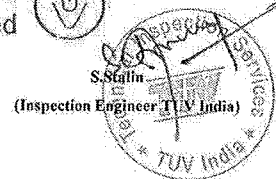
Note: Off-Open, Close

*S.T. Sampath*  
S.T. Sampath  
(Dy. Manager - QC & T)

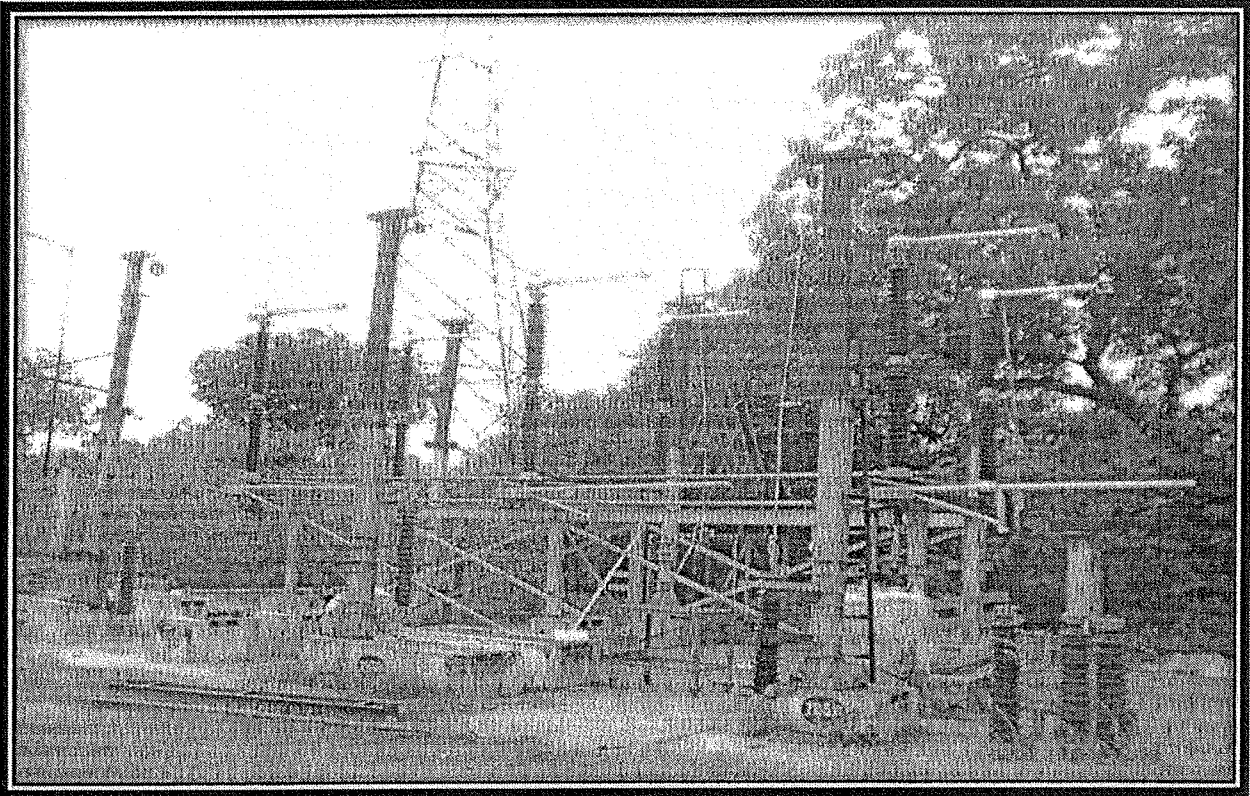


*M.Rengasaj*  
M.Rengasaj  
(Manager - QC & QA)

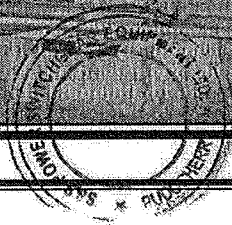
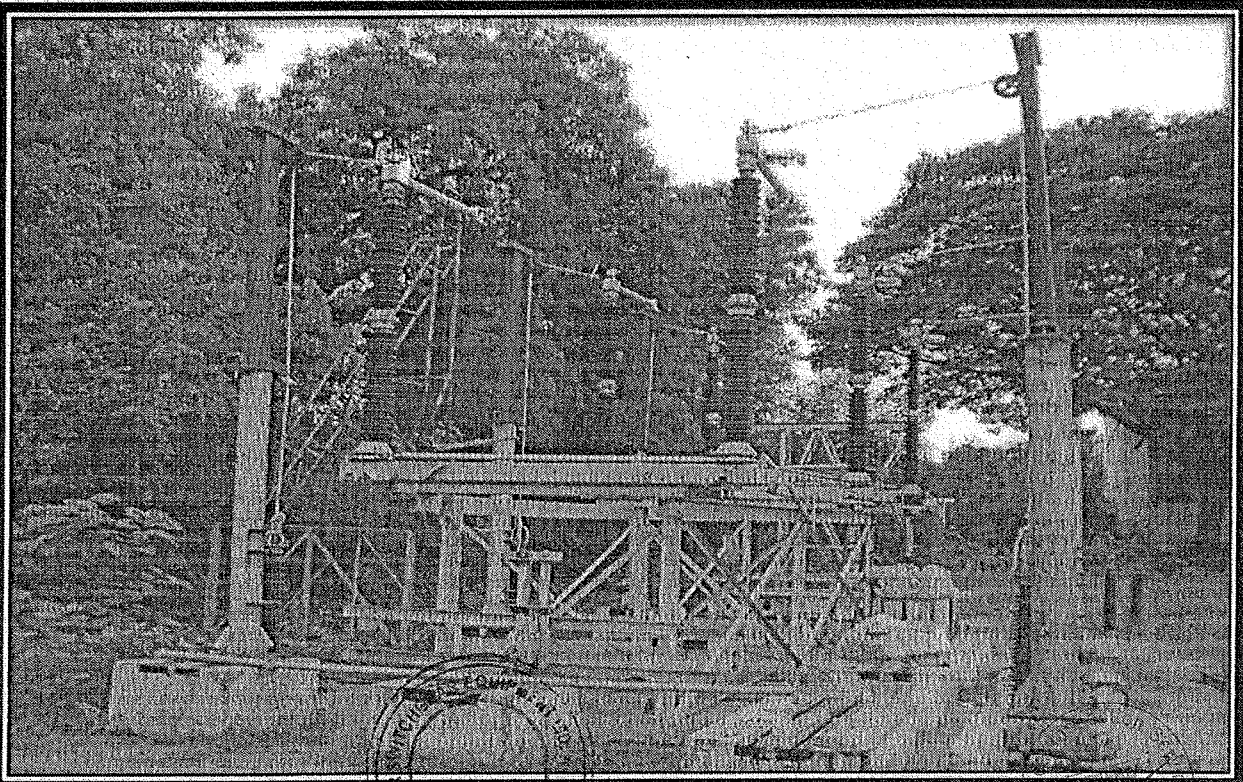
Reviewed  
Witnessed



**ENDURANCE TEST ARRANGEMENT FOR 245kV / 2000A DISCONNECTOR**



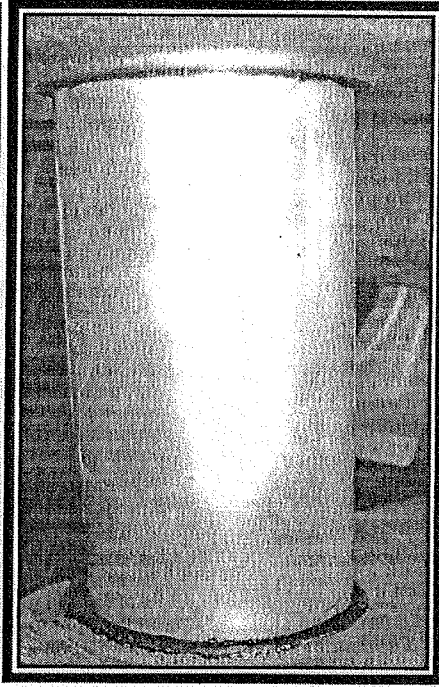
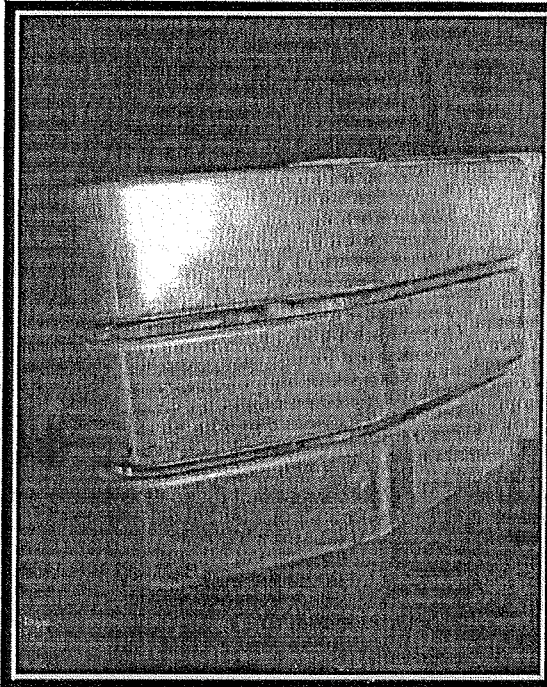
*Handwritten signature or initials.*



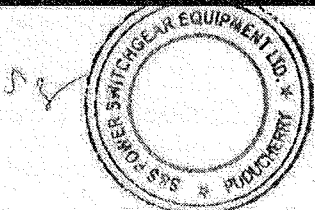
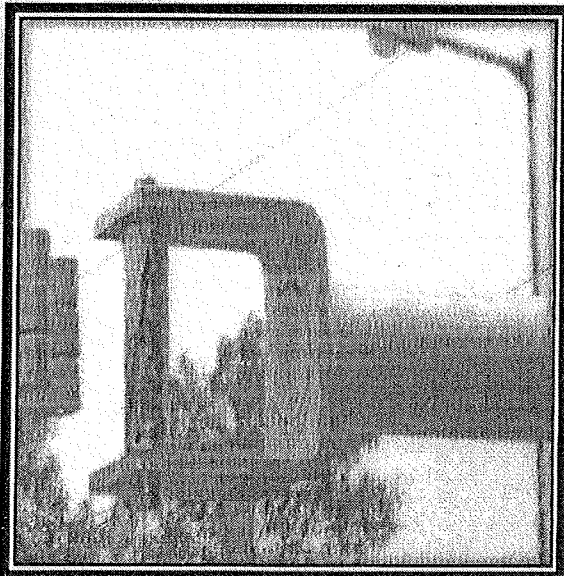
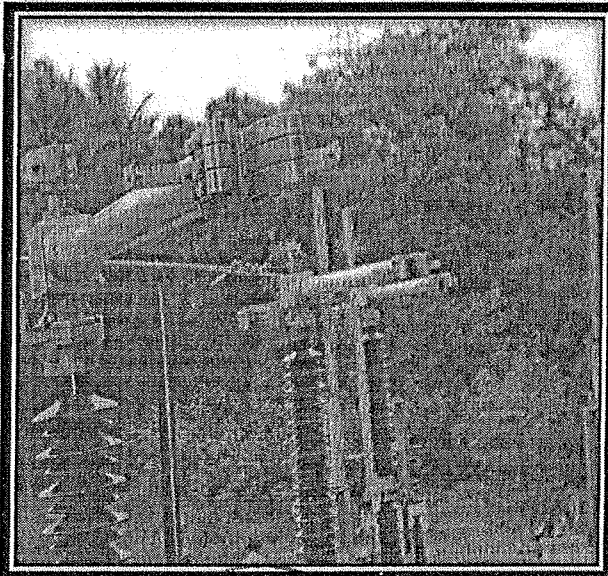
*Handwritten signature or initials.*



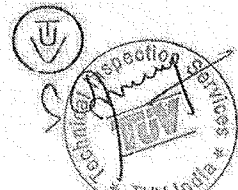
MAIN CONTACTS BEFORE ENDURANCE TEST



MAIN CONTACTS AFTER ENDURANCE TEST



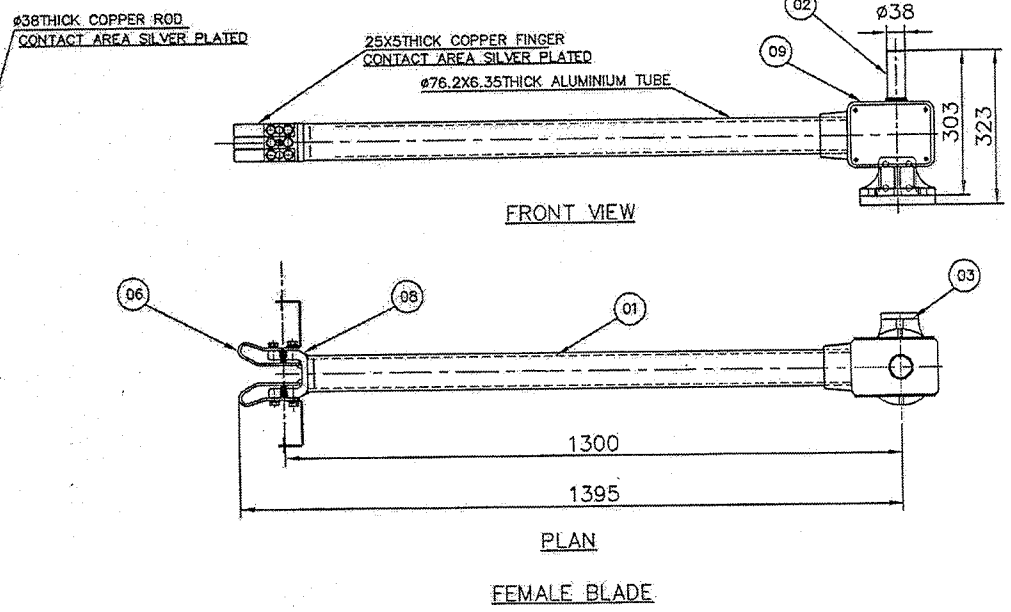
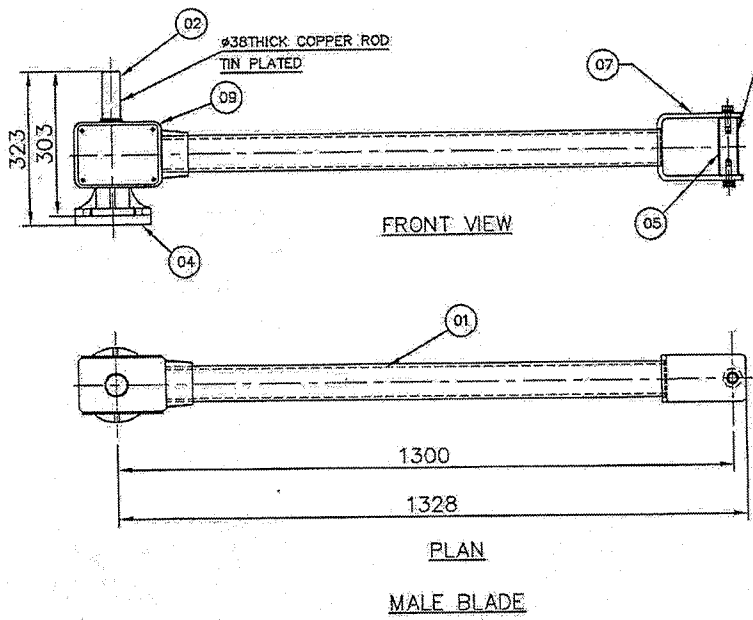
Reviewed  
Witnessed



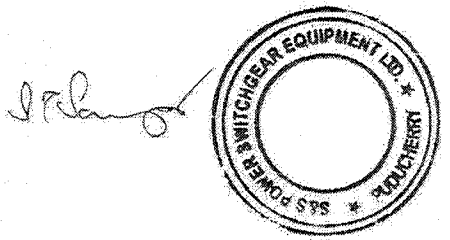
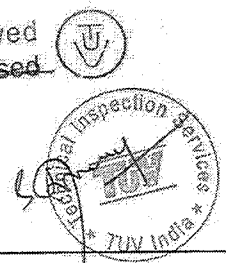
IF IN DOUBT ASK

ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

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Reviewed  
Witnessed



ITEM	DESCRIPTION	MATERIAL	QTY
09	HOUSING ALUMINIUM CASTING	ALUMINIUM	2
08	FEMALE CONTACT SUPPORT	ALUMINIUM	1
07	MALE CONTACT SUPPORT	ALUMINIUM	1
06	FINGER	COPPER	6
05	MALE CONTACT	COPPER	1
04	DUMMY ADAPTOR	ALUMINIUM	1
03	EARTH ADAPTOR	ALUMINIUM	1
02	CONNECTOR STEM - ROD	COPPER	2
01	MOVING TUBE	ALUMINIUM	2

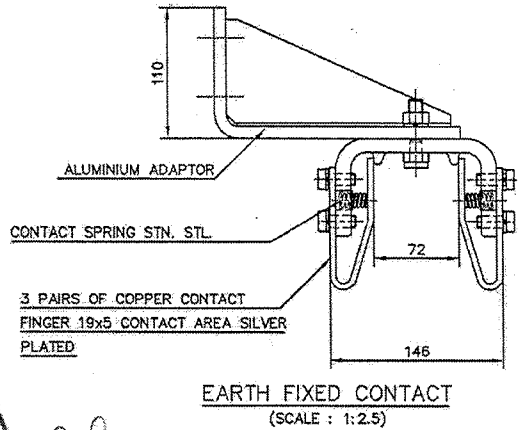
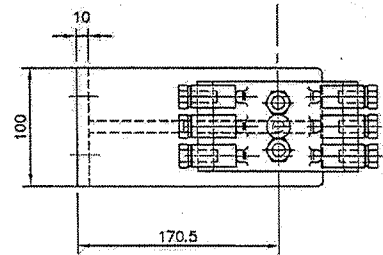
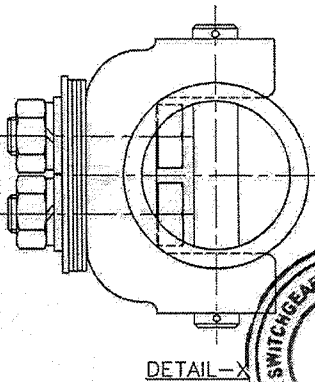
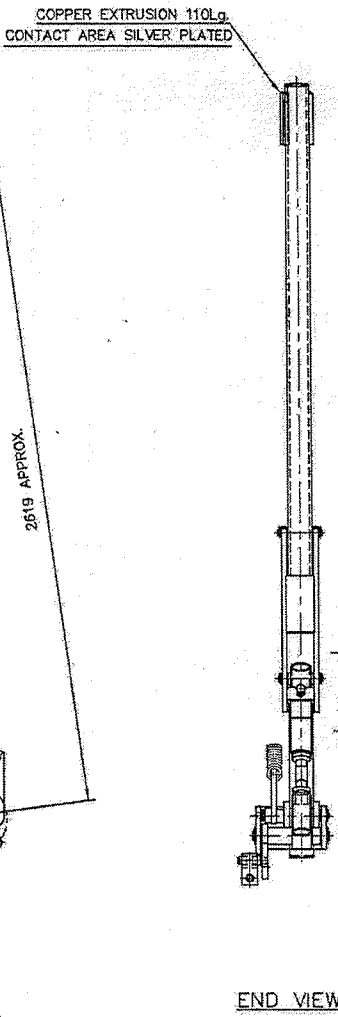
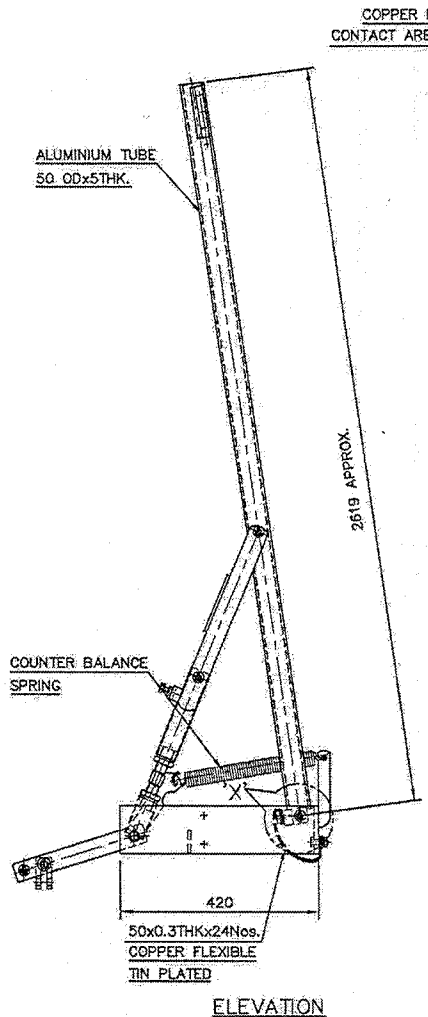
REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

 SCALE 1:5	TITLE : GENERAL ARRANGEMENT OF MALE & FEMALE BLADE FOR 245KV, 2000A CENTRE BREAK DISCONNECTOR WITH SINGLE E.SW(RH)		DRN.	KAH	14.05.15
	S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA		CHD.	VJK	14.05.15
	DRAWING NO. 3C6H004/P006		APPD.	NVRAM	14.05.15
REV. No.					A-

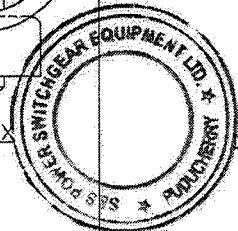
ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

IF IN DOUBT ASK

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Reviewed  
Witnessed



- NOTE:
- 1) ALL DIMENSIONS ARE IN MM
  - 2) GENERAL TOLERANCE APPLICABLE AS PER RELEVANT STANDARDS

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

SCALE  
1:10

TITLE :  
GENERAL ARRANGEMENT OF 245KV EARTH  
SWITCH AND EARTH FIXED CONTACT

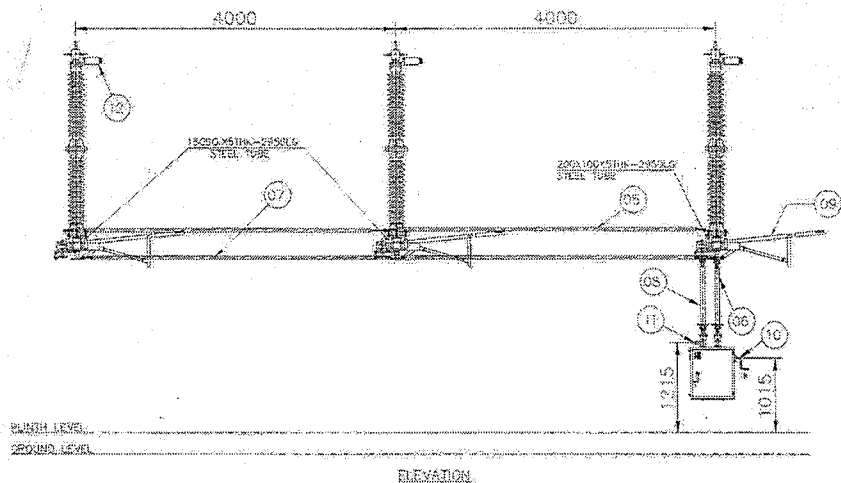
S & S POWER SWITCHGEAR EQUIPMENT LTD  
PUDUCHERRY - 605111, INDIA

DRN.	KAH	14.05.15
CHD.	VJK	14.05.15
APPD.	NVRAM	14.05.15
DRAWING NO.		REV. No.
3C6E084/PO06		A--

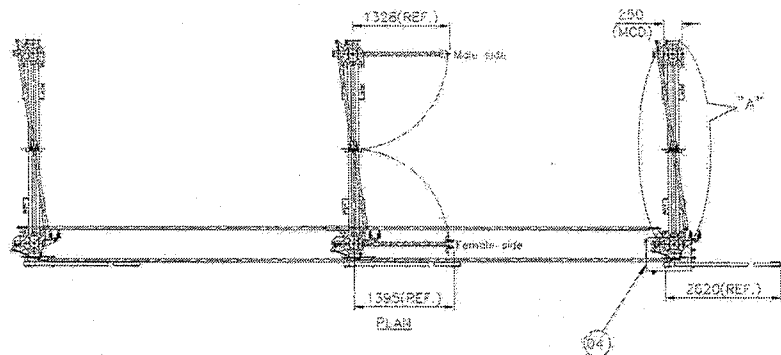
THIS DRAWING IS CONFIDENTIAL. IT MUST NOT BE COPIED OR PASSED TO A THIRD PARTY WITHOUT WRITTEN CONSENT. WE RESERVE ALL THE RIGHTS ON NEW IDEAS/CHARACTERISTICS ESPECIALLY FOR PATENT PURPOSES.

ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

IF IN DOUBT A.S.



ELEVATION



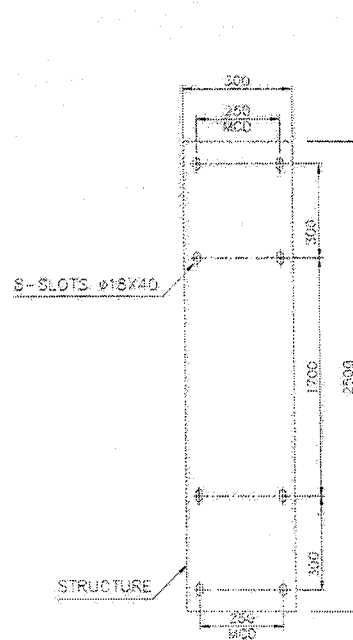
PLAN

NOTES

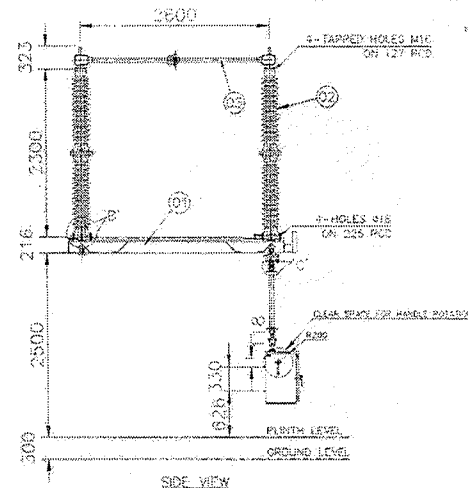
1. MCD - MOUNTING CENTRE DISTANCE
2. MD - NOMINAL DIAM
3. ALL EXPOSED FERROUS PARTS ARE HOT DIP GALVANIZED
- \* MAIN HANDLE WILL BE PROVIDED IN ALUMINUM FOR 2 SWITCHES

DIRECTION OF CLOSING

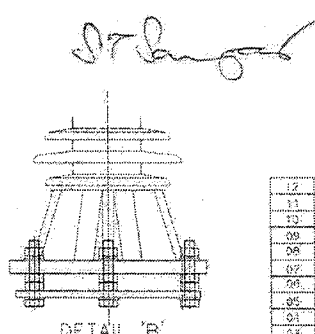
- MAIN: ANTICLOCKWISE (90 DEG)
- EARTH: ANTICLOCKWISE (120 DEG)



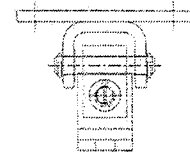
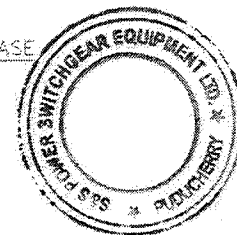
DETAIL "A"  
MOUNTING DETAIL OF BASE



SIDE VIEW



DETAIL "B"

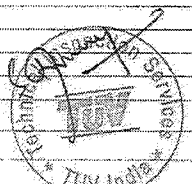


ENLARGED VIEW OF  
UNIVERSAL COUPLING  
DETAIL "C"

SL. NO.	DESCRIPTION	QTY.
12	EARTH FIXED CONTACT	3
11	MANUAL OPERATING HANDLE - EARTH	1
10	MANUAL OPERATING HANDLE - MAIN	1
09	EARTH MOVING ELAVE	3
08	DOWN OPERATING PIPE FOR EARTH LINED WITH UNIVERSAL COUPLING - HOT DIP GALVANIZED	3
07	GANG PIPE FOR EARTH PIPE - HOT DIP GALVANIZED	2
06	DOWN OPERATING PIPE FOR MAIN LINED WITH UNIVERSAL COUPLING - HOT DIP GALVANIZED	3
05	GANG PIPE FOR MAIN PIPE - HOT DIP GALVANIZED	2
04	DISCONNECTOR & EARTH SWITCH OPERATING GEAR TYPE - MOTOR/MANUAL	1
03	HANDLE & ZENITH HANDLE ASSEMBLY	1
02	INSULATORS (ON S&S SCOPE OF SUPPLY)	3
01	BASE ASSEMBLY - HOT DIP GALVANIZED	1
	TOTAL	27

REV. NO.	CHG. NO.	CHANGE DETAILS	DATE	PRO.	APPD.

Reviewed  
Witnessed



SCALE: 1:65  
PSE

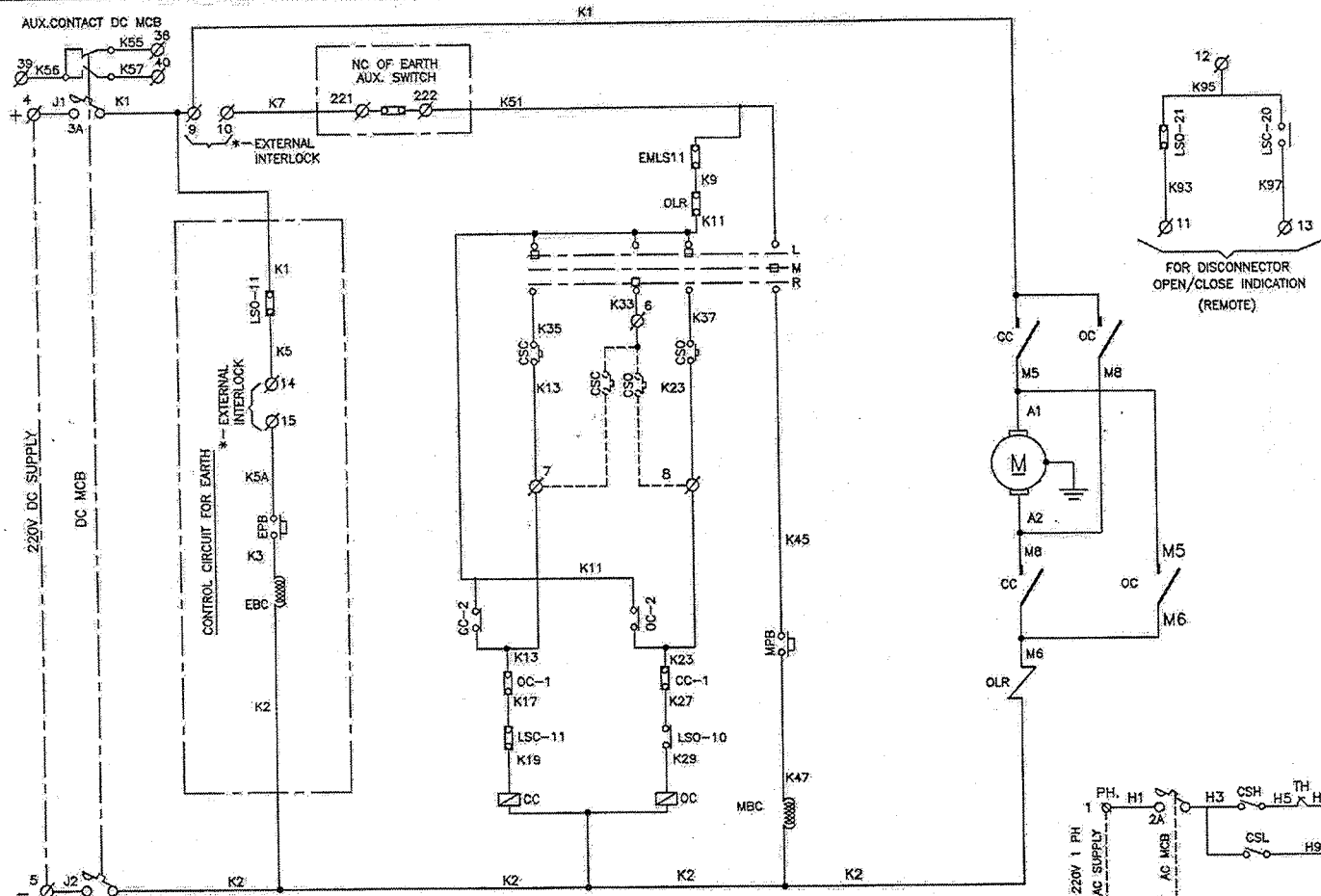
TITLE: GENERAL ARRANGEMENT OF 245kV, 2000A 3 POLE CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH (RH) - (MGB/MCM)  
S & S POWER SWITCHGEAR EQUIPMENT LTD. PUDUCHERRY - 605111, INDIA

DRN.	KAH	14.05.15
CHD	YJK	14.05.15
APPD	NVRAM	14.05.15
DRAWING NO.	REV. NO.	
306G241/P006	A--	

IF IN DOUBT ASK

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**TERMINAL BLOCKS**

1	H1
2	H2
3	
4	J1
5	J2
6	K33
7	K13
8	K23
9	K1
10	K7
11	K93
12	K95
13	K97
14	K5
15	K5A
16	K61
17	K63
18	K65
19	K67
20	K69
21	K71
22	K73
23	K75
24	K77
25	K79
26	K81
27	K83
28	K85
29	K87
30	K89
31	K91
32	K101
33	K103
34	K105
35	K107
36	K109
37	K111
38	K55
39	K56
40	K57
41	SPARE TB

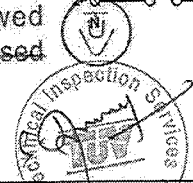
TO BE SHORTED- IF NOT REQUIRED  
FOR DISCONNECTOR OPEN CLOSE INDICATION  
ADDITIONAL LSO CONTACTS  
ADDITIONAL LSC CONTACTS  
NC CONTACT OF DCMCB (IN OFF POSITION)  
NO CONTACT OF DCMCB (IN OFF POSITION)

**NOTE:**

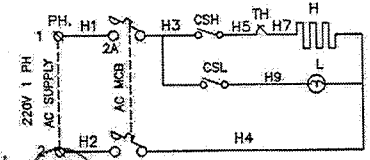
1. ALL CIRCUITS SHOWN IN DE-ENERGIZED CONDITION.
  2. ALL WIRING DONE WITH 1.5sq mm. COLOUR CODED .1.1KV GRADE MULTI STRAND PVC INSULATED COPPER WIRE.
  3. DOTTED LINE CONNECTIONS NOT IN S&S SCOPE.
  4. FOR LEGEND & NOTES REF: 3UCN001/PO06.
  5. FOR AUXILIARY SWITCH DETAILS REF:3UCAS56/PO06.
- \* IN CASE EXTERNAL INTERLOCK NOT REQUIRED, TB 9&10, 14&15 TO BE SHORTED.

LSO	LSC
16 K51 K63	12 K95 K97
17 K53 K65	26 K81 K83
18 K69 K71	28 K85 K87
19 K67 K67	30 K89 K91
20 K69 K71	32 K101 K103
21 K69 K71	34 K105 K107
9 K1 K5	36 K109 K111
14 K93 K95	
12 K93 K95	
23 K73 K75	
24 K77 K79	

Reviewed  
Witnessed



**AC CIRCUIT**



REV. NO.	CHG. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

SCALE: 1:1  
NTS

DC & AC CONTROL CIRCUIT FOR  
DISCONNECTOR WITH SINGLE EARTH SWITCH

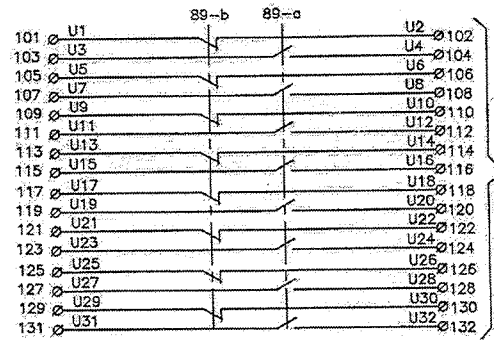
S & S POWER SWITCHGEAR EQUIPMENT LTD  
PUDUCHERRY - 605111, INDIA

DRN.	KAH	14.05.15
CHD.	VJK	14.05.15
APPD.	NVRAM	14.05.15
DRAWING NO.		REV. No.
3UCS594/PO06		A-

IF IN DOUBT ASK

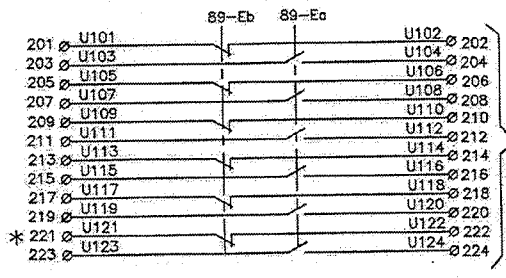
ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED.

**AUXILIARY SWITCH DIAGRAM FOR DISCONNECTOR MAIN**



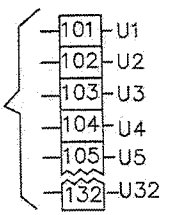
AUXILIARY SWITCH CONTACT OF DISCONNECTOR SHOWN IN OPEN POSITION

**AUXILIARY SWITCH DIAGRAM FOR EARTH-1 & 2**



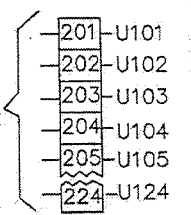
AUXILIARY SWITCH CONTACT OF EARTH 1 & 2 SHOWN IN OPEN POSITION

**TERMINAL BLOCKS IN MAIN**



FOR DISCONNECTOR MAIN

**TERMINAL BLOCKS IN EARTH 1 & 2**



FOR EARTH SWITCH-1 & 2

**AUX. SWITCH CONTACT DIAGRAM**

NOMINAL CLOSING POINT

PERCENTAGE CLOSED	0%	20%	40%	60%	80%	100%
DISCONNECTOR MAIN CONTACTS	OPEN					SE
AUX. SWITCH LOCAL & REMOTE INDICATIONS AND SPARE	NO	OPEN				SE
	NC	SE	OPEN			

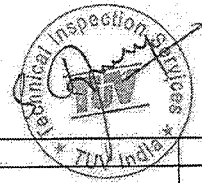
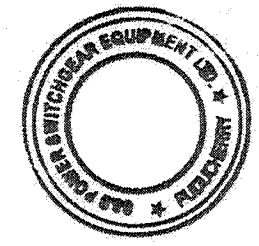
**NOTES:**

\* -USED IN DISCONNECTOR CIRCUIT FOR INTERLOCK PURPOSE

Reviewed Witnessed



*S. Chingal*



REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.		SCALE	TITLE :	DRN.	KAH	14.05.15
							NTS	AUXILIARY SWITCH DETAILS FOR DISCONNECTOR & EARTH SWITCH	CHD.	VJK	14.05.15
								S & S POWER SWITCHGEAR EQUIPMENT LTD PUDUCHERRY - 605111, INDIA	APPD.	NVRAM	14.05.15
									DRAWING NO.	REV. No.	
									3UCA556/PO06	A-	

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DRG.No.  
**5.6105.00**  
REV. X2

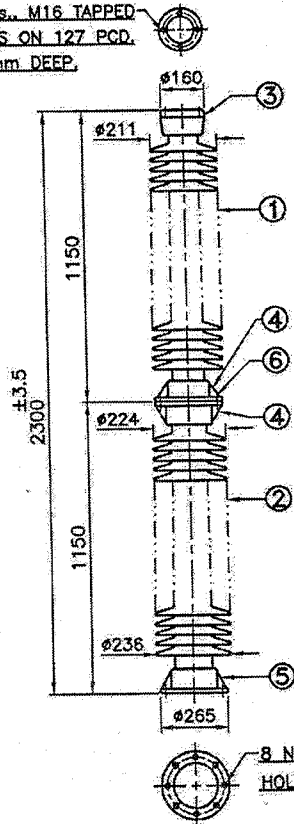
ALL DIMENSIONS ARE IN mm.

This box is for external details / Customer particulars  
-Outside revision control-

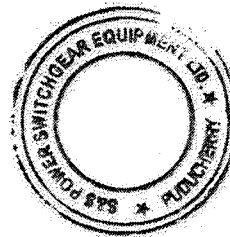
**NOTES:-**

1. GENERAL TOLERANCE:  $\pm(0.04d+1.5)$ mm. WHEN 'd' IS < 300mm.  
 $\pm(0.025d+6)$ mm. WHEN 'd' IS > 300 mm. WHERE 'd' IS THE DIMENSION IN mm.
2. SHED PROFILE: NORMAL SHEDS.
3. EXCESS SAND WILL BE PAINTED BROWN.
4. POLLUTION LEVEL AS PER IEC 60815 HEAVY (CLASS III).
5. ALL FERROUS PARTS SHALL BE HOT DIP GALVANISED AS PER IS:2633 / IS:4759
6. NUMBER OF UNITS PER STACK:: 2 Nos.
7. NUMBER OF SHEDS:49.

4 Nos. M16 TAPPED HOLES ON 127 PCD. 19 mm DEEP.



8 Nos. 18 DRILLED HOLES ON 225 PCD.



*Handwritten signature*

**TECHNICAL PARTICULARS**

01. HIGHEST SYSTEM VOLTAGE	kV (rms)	245
02. MINIMUM NOMINAL CREEPAGE DISTANCE	mm	6125
03. DRY ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE	kV (rms)	490
04. WET ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE	kV (rms)	460
05. DRY POWER FREQUENCY FLASHOVER VOLTAGE	kV (rms)	510
06. WET POWER FREQUENCY FLASHOVER VOLTAGE	kV (rms)	490
07. IMPULSE WITHSTAND VOLTAGE (+Ve & -Ve)	KV (peak)	1050
08. IMPULSE FLASHOVER VOLTAGE (+Ve)	KV (peak)	1100
09. IMPULSE FLASHOVER VOLTAGE (-Ve)	kV (peak)	1150
10. MINIMUM CORONA EXTINCTION VOLTAGE	kV (rms)	156
11. RADIO INTERFERENCE VOLTAGE (MICRO VOLT AT 1MHz)	Micro volt	<500
AT A SYSTEM VOLTAGE OF 156 kV (rms)		
12. CANTILEVER STRENGTH (UPRIGHT)	kg	600
13. TORSIONAL STRENGTH	kgm	300
14. TENSILE STRENGTH	kg	11000
15. COMPRESSIVE STRENGTH	kg	22000
16. APPLICABLE STANDARD	IS:2544, IEC 60168 & IEC 60273	
17. WEIGHT OF COMPLETE STACK (Approx)	kg	167
18. PURITY OF ZINC USED FOR GALVANISING	99.95% AS PER IS:209	

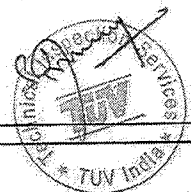
6	M16x60 L HEX. BOLT WITH NUT, FLAT & SPRING WASHER	8 SETS /STACK	M.S.	HOT DIP GALVANISED
5	BOTTOM FLANGE	1	M.C.I. / S.G.I.	HOT DIP GALVANISED
4	MIDDLE FLANGES	2	M.C.I. / S.G.I.	HOT DIP GALVANISED
3	TOP CAP	1	M.C.I. / S.G.I.	HOT DIP GALVANISED
2	BOTTOM INSULATOR	1	PORCELAIN	BROWN GLAZED
1	TOP INSULATOR	1	PORCELAIN	BROWN GLAZED

ITEM	DESCRIPTION	QTY. IN No.	MATERIAL	REMARKS
<b>245 kV</b>				
<b>CYLINDRICAL POST INSULATOR</b>				
			SCALE	NTS
			CHKD.	PCK
			20.02.14	20.02.14
			REDRN	VS
			MKR	20.02.14
			APPD.	20.02.14

W.S. INDUSTRIES (INDIA) LIMITED  
CHENNAI  
DRG.No. **5.6105.00**  
REV. X2

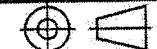
REVISION  
2 DRAWING REVISED AS PER DCR 01.28.01.14 FROM D&D DEPT. MKR 07.02.14

Reviewed  
Witnessed



THE BOTTOM MOST SHED OF ANY UNIT WILL BE A SMALLER ONE OR A BIGGER ONE DEPENDING ON THE CREEPAGE REQUIREMENT.  
WSI RESERVES THE RIGHT TO CHANGE / ALTER THE DESIGN WITHOUT NOTICE TO ENSURE IMPROVEMENT IN PROCESS AND/OR PRODUCT QUALITY.

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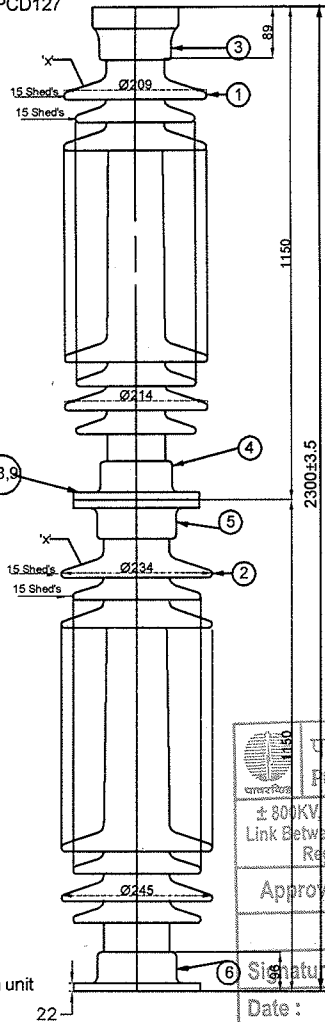
REF.: 5.6105/2A

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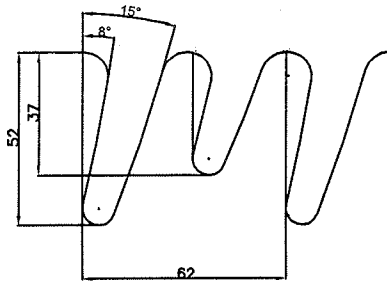
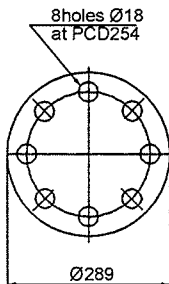
4tapped holes  
M16 x 19 deep on PCD127



Top flange of top unit



Bottom flange of bottom unit



Sr no.	Parameters	Values		Sr no.	Parameters	Values	
		as per IEC	actual			as per IEC	actual
1	C	≥ 30	48.5	5	P1-P2	≥ 15	15
2	S/P = 82/52	≥ 0.8	1.19	6	Inclination of shed top/bottom	≥ 5° / ≥ 2°	15° / 8°
3	ld1/d1, ld2/d2	- / ≤ 5	4.09 / 3.71	7	Profile factor ZP1Z2P2+S	> 0.7	1.127
4	Average dia Dm	-	169.5	8	Creepage factor=1/S1	≤ 4	3.26

**NOTES**

- < Shed profile meets all the requirements of IEC:815.
- < Name of Mfg., trade mark, month & year of Mfr, & Sr.no. to be marked at position "x"
- < All ferrous parts to be hot dip galvanized as per IS:2633, IS:2629
- < Colour of glaze: BROWN
- < Galvanized Thickness shall be - Avg. 86 micron minimum.
- < Intermediate interconnecting Nut, Bolt & Washers (Galvanized) shall be supplied, in case of Multiunit stacks.
- < View of actual metal part / porcelain may vary from the view shown in the drawing.

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड  
POWER GRID CORPORATION OF INDIA LIMITED

± 800KV/ 6000MW HVDC Terminals Associated With HVDC Bipole Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)

Approved in Category:  I  II  III  IV

Checked by: [Signature] Verified by: [Signature] Reviewed by: [Signature]

Signature: [Signature] Date: 10/09/18

Grey :2
Brown:1 987382
Finish Code
Product code

ADITYA BIRLA INSULATORS HALOL - INDIA

REV.	DATE	DESCRIPTION	APPD.

**NOTES**  
Applicable Standards: IS:2544, IEC:60168, IEC:60273, IEC:60815

**DIMENSIONS**  
Height mm 2300±3.5  
Min. Creepage Distance mm 6125  
Dry arcing distance mm 1945  
Protected Creepage Distance mm 2600  
Heavy Polluted Level III (Heavy Polluted)

**MECHANICAL VALUES**  
Cantilever Strength-Upright kN 8  
Torsional Strength kNm 6  
Tension Strength kN 80  
Compression Strength kN 200

**ELECTRICAL VALUES**  
Nominal System Voltage kV 220  
Highest System Voltage kV 245  
Wet D.C. Withstand Voltage For 1 Hr Wet kV 141  
Impulse Withstand Voltage +ve/-ve kVp 1050  
Impulse Flashover Voltage +ve kVp 1210  
-ve kVp 1450  
Corona extinction voltage (min.) kV 154  
Switching impulse withstand voltage kVp NA  
P.F. Puncture Voltage Puncture proof  
RIV TEST  
Test voltage to ground kV 154  
Max. RIV at 1000KHz μV <500

**PACKING DETAILS**  
Net Weight (approx) Kg 155

143 = JSX15

9	Spring washer M16			MS HDG	4	
8	Flat washer M16			MS HDG	4	
7	Hex. bolt & nut M16x60			MS HDG	4	
6	Bottom flange			MCI/SGI	1	
5	Intermediate flange-2			MCI/SGI	1	
4	Intermediate flange-1			MCI/SGI	1	
3	Top flange			MCI/SGI	1	
2	Porcelain shell bottom			Porcelain	1	
1	Porcelain shell top			Porcelain	1	

Sr No.	DESCRIPTION	DRG. No.	WEIGHT	MATERIAL	QTY.	REMARKS
TITLE			DRN	Gpanchal	05/10/2010	PROJECTION
245kV, S/C. POST INSULATOR Raigarh			CKD	DBC	05/10/2010	
			APD	DBC	05/10/2010	
REF:- S&S Power				ALL DIMENSIONS ARE IN mm.		SCALE: NTS
					Drg. No.	Rev.No.
					987382-1	0



## S&S POWER SWITCHGEAR EQUIPMENT LIMITED

Customer: Power grid Corporation Of India Ltd. (POWERGRID)

Project : "±800 kV, 6000 MW HVDC RAIGARH-PUGALUR TERMINALS

CA NO. CC-CS/651-SR2/HVDC-3063/7/G10/CA-I/5817-5821 date: 2017-01-25

Station:-Raigarh & Pugalur

Doc No: BHEL\_RP\_3\_12\_DC\_NDISC\_GTP  
Rev: 00 / Date 11.01.2018

cat I

### GTP OF DC NEUTRAL DISCONNECTORS

Sl.No	Substation	Technical Particulars
		Raigarh SS
Description		95kV DC Disconnecter
1	Name & country of the Manufacturer	S&S Power Switchgear Equipment Limited, India
a)	Manufacturer's type designation	RC 95 ✓
b)	Standard applicable	IEC 62271-102
c)	Voltage (KV DC)	/
	i) Rated Voltage (KV DC)	95kV DC ✓
	ii) Maximum Temporary DC Voltage ( 30Min)	105kV DC ✓
d)	Rated Current (Amps)	
	i) current at 1.1 overload (A)	2316A ✓
	ii) Maximum temporary current ( 30Min)	2425A ✓
e)	Rated frequency (Hz)	Not applicable for DC
f)	Number of poles	Single Pole ✓
g)	Whether all 3 poles are ganged mechanically	Not applicable ✓
h)	Pole to pole spacing	Not applicable
2	Guaranteed Ratings	
	a) Rated short time current of Isolator	
	i) for 1 sec. (kA DC)	7.2kA ✓
	ii) for 3 sec. (kA DC)	-
	ii) Dynamic current	18kA Peak ✓
	b) Opening time of	
	i) Isolator (sec)	≤ 12 Secs ✓
	ii) Earth switch (sec)	≤ 12 Secs ✓
	c) Closing time of	
	i) Isolator (sec)	≤ 12 Secs
	ii) Earth switch (sec)	≤ 12 Secs
	d) Temperature rise over 50 °C	55 °C <span style="float: right;">cat I</span>
	ambient temperature corresponding to maximum continuous current (°C)	Within limits as per Table 3 of IEC 694 clause 4.4.2-1921 Part 3 clause 3.9 इंडिया लिमिटेड

Office: Plot No. 14, CMDA Industrial Area, Chithamanur Village, Maraimalai Nagar - 603 209, Kancheepuram District, Tamil Nadu, Tel: +91 44 4743 1625  
 Works: No.4, EVR Street, Puducherry - 605 111, India, Tel: +91 445-2677122  
 Email : sales@sspower.com Web : www.sspower.com Category : VITTHIV

Signature :	Checked by	Verified by	
Date :	10/4/18	✓	✓

See remarks on Page 2 also



## S&S POWER SWITCHGEAR EQUIPMENT LIMITED

3	Dielectric with-stand capacity of Completely assembled Isolator and earth switch	
	a) DC voltage withstand , 1 Hour	
	i) Terminal to Earth Wet (kV DC)	143 <del>141</del> kV DC
	ii) Across open switch Wet (kV DC)	143 <del>141</del> kV DC
	b) Lightning impulse withstand level	
	i) Terminal to Earth (kV peak)	1050kV (Peak)
	ii) Across open switch (kV peak)	1200kV (Peak)
	c) 250/2500 micro second switching surge withstand test voltage (dry & wet)	
	i) Terminal to Earth (kV peak)	
	ii) Across open switch (kV peak)	Not Applicable
	d) Radio Interference Test Voltage	Not Applicable
	e) Creepage distance of Insulator ( minimum)	5700mm Minimum
4	Operating Mechanism	
	a) Rated torque of the mechanism	65 Kgm
	b) Type and rating of motor	PMDC / 0.5 HP
	c) Rated voltage of motor	220V DC
4.1	Interlockings	
	a) Whether mechanical/ constructional interlock between Isolator and Earth switch provided	Yes
	b) Details of electrical interlock enclosed for	
	i) Isolator	Through Aux contact / Bolt coil
	ii) Earth Switch	Through Aux contact / Bolt coil
4.2	Controls	
	a) Rated D. C. control voltage (Volts)	220V DC
	b) Limits of voltage	+ 10% / - 15%
	c) Power consumption of control coils (W)	66 Watts ( approx )
5	Constructional Features	
	a) Whether position of earth switch can be interchanged at site to either side of pole	No
	b) Main contacts	
	i) Type of contacts	Male – Flat Female: Finger type
	ii) Contact area (cm <sup>2</sup> )	Line contact

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Kancheepuram District, Tamil Nadu , Tel: +91 44 4743 1625

Works: No.4, EVR Street , Puducherry – 605 111 , India. Tel : +91-413-2677122 Page 2 of 3  
Email : sales@sspowers.com Web : www.sspowers.com



## S&S POWER SWITCHGEAR EQUIPMENT LIMITED

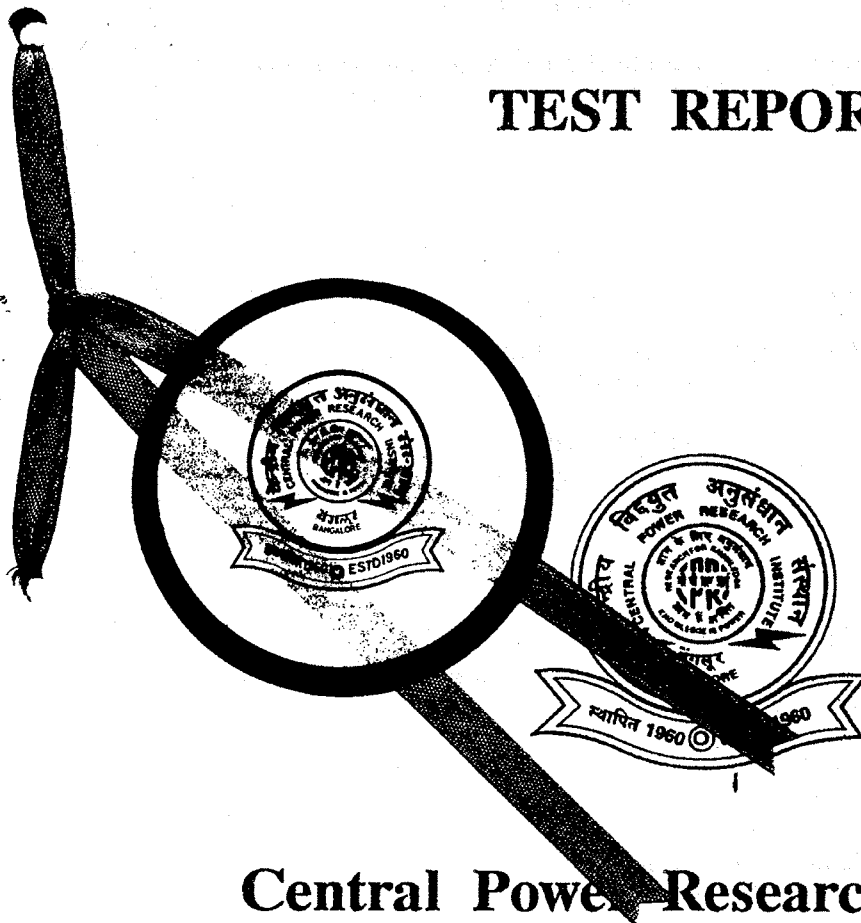
iii) Material of contacts	Silver Plated copper
iv) Contact pressure (Kg/cm <sup>2</sup> )	9kgs per pair of fingers
v) Maximum current density under normal current carrying capacity (Amp/cm <sup>2</sup> )	241Amps/Sq. CM
vi) Thickness of silver plating	25 microns
c. Auxiliary contacts on Isolator	
i) Total number	16+2MBB
i) NO	8 NO
iii) NC	8 NC
iv) Adjustable	No
v) Make before break	2MBB
vi) Rated voltage (volts)	220V DC
vii) Rated continuous current (Amps)	10 Amps
viii) Rated DC breaking current with 20 ms time constant (A)	2Amps
d) Auxiliary contacts on earth switch	
i) Total number	12+2MBB
i) NO	6 NO
iii) NC	6 NC
iv) Adjustable	No
v) Make before break	2MBB
vi) Rated voltage (volts)	220V DC
vii) Rated continuous current (Amps)	10Amps
viii) Rated DC breaking current with 20 ms time constant (A)	2 Amps
e) Whether counter balance spring provided for isolator and earth switch	Yes , Provided for Earth switch only

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Kancheepuram District, Tamil Nadu , Tel: +91 44 4743 1625

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Email : sales@ssp-power.com Web : www.ssp-power.com

**CPRI**

**TEST REPORT**



**Central Power Research Institute**

(A Govt. of India Society,  
P.B. No. 8066, Sadashivanagar S.P.O,  
Prof. Sir. C.V. Raman Road,  
Bangalore - 560 080



**CPRI**

**HIGH POWER LABORATORY  
CENTRAL POWER RESEARCH INSTITUTE,  
P. B.NO. 8066, SADASHIVANAGAR SUB P.O  
PROF. SIR.C.V. RAMAN ROAD, BANGALORE-560 080, INDIA  
PHONE: + 91- (0) 80-23600574, FAX: + 91 (0) 80-23601213**



**NABL ACCREDITED  
LABORATORY  
Certificate No. T0010**

Sheet No. 1 of 5

**TEST REPORT**

Test Report Number : HPL07179 Dated: 06//09/2007

Name & Address of the Customer : M/s S & S Power SwitchGear Ltd.,  
EVR Street,  
Sedarapet Industrial Estate,  
Pondicherry - 605111.

Name & Address of the Manufacturer : M/s S & S Power SwitchGear Ltd.,  
EVR Street,  
Sedarapet Industrial Estate,  
Pondicherry - 605111.

Particulars of sample tested : 245 kV, 2000A Centre Break Disconnecter  
Type : RC 245  
Designation : --  
Serial number : TEST-6  
Number of samples tested : One  
Date(s) of Test(s) : 19<sup>th</sup> June 2007  
CPRI Sample Code No. : HPL07S0192  
Condition of sample on receipt : New

Particulars of tests conducted : Short-time withstand current test and peak withstand current test.

Test in accordance with Standard/Specification : IEC:62271-102 (2001)  
Sampling Plan : Nil  
Customer's requirement : Nil  
Deviation if any : Nil

Name of the witnessing persons  
Customer's representative : Mr. S.Kalyanasundaram, Vice President-Technical.  
Other than Customer's representative : Nil

Test subcontracted with address of the laboratory : Nil

**Documents constituting this report (In words)**

Number of sheets : Five  
Number of oscillograms : One  
Number of graphs : None  
Number of photographs : Two  
Number of test circuit diagrams : One  
Number of sample drawings : Eight

(Maroti)

**TEST ENGINEER**

(G.Sengupta)

**ADDITIONAL DIRECTOR**

**AUTHORISED SIGNATORIES**



4

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**CENTRAL POWER RESEARCH INSTITUTE,**  
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Certificate No. T0010

**CPRI**

Test Report No. HPL07179

Sheet No. 2 of 5

**DESCRIPTION OF SAMPLE TESTED**  
(As assigned by the manufacturer)

Sample	: 245 kV, 2000A Centre Break Disconnecter
Type	: RC 245
Designation	: --
Serial number	: TEST-6
Rated voltage	: 245 kV
Rated Normal current	: 2000 Amps
Rated Class	: Outdoor
Number of poles	: Three
Rated insulation level	: 1050kV peak / 460 kV rms.
Rated short-time withstand current	: 40 kA rms
Duration of short-circuit	: 1 Sec.
Rated frequency	: 50 Hz
Operating mechanism	: Manual/Motor

(Maroti)  
**TEST ENGINEER**



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Certificate No. T0010

Test Report No. HPL07179

Sheet No. 3 of 5

## LIST OF DRAWINGS OF SAMPLE AND PHOTOGRAPHS

### Drawings of the sample tested

The manufacturer has guaranteed that the equipment submitted for the test has been manufactured in accordance with the following drawings. It is verified that these drawings adequately represent the sample tested.

#### Sample drawing numbers

1. 3 C6G004/TTST Rev.A
2. 3 C6H004/TTST Rev.A
3. 4 C39033/TTST Rev.A
4. 4 CC9012/TTST Rev.A
5. 4 UC-9008/ TTST Rev.A
6. 3 UCD092/ TTST Rev.A
7. 3C6P004/TTST Rev.A
8. 220-SC-A-0104 Rev.1

Total: Eight drawings (duly attested)

### Photographs of the sample tested

#### Photograph numbers

- 345 Mounting arrangement before test
- 350 Condition of the contacts after test

Total: Two photographs (duly embossed)

(Maroti)  
**TEST ENGINEER**



**CPRI**

Test Report No. HPL07179

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Sheet No. 4 of 5

### TEST RESULTS

Type of test : Short-time withstand current test and peak withstand current test  
 Test circuit drawing number : CRTL/HPL/1SC15  
 Sources phases : Two  
 Sources frequency : 50 Hz  
**Sample**  
 Number of poles : One  
 Condition before test : New  
 Mounting : Isolator was mounted on its own support and installed with its own operating mechanism, simulating actual service conditions.

**Test connections**  
 Conductor used : Rigid  
 Distance of the return conductor : 8 meters

Oscillogram Number	Short time Current (kA peak)	Short time Current (kA rms)	Duration (Secs.)	Condition of Sample during test
HPL07179.S002	101.8	40.7	1.00 sec	No abnormalities

Condition of Sample after test : Disconnecter operable on no load.  
 No visible damage to contacts.  
 No pitting marks on the contacts.

### Contact Resistance Test

	Ambient Temperature °C	Pole $\mu\Omega$
Before Test	29.0	112.0
After Test	28.0	103.0

(Maroti)  
**TEST ENGINEER**



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Certificate No. T0010

**CPRI**

Test Report No. HPL07179

Sheet No. 5 of 5

**NOTE**

- a) This is not a certificate of rating. A certificate of rating is not issued as only limited tests as requested by the customer were carried out.
- b) The test results relates only to the items tested
- c) 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 approval of CPRI.
- d) Corrections/ erasings invalidate the test report.
- e) Any anomalies/discrepancies in this test report should be brought to our notice within 45 days from the date of issue.

**Additional information:**

CPRI issues following types of reports / certificates:

a) Test Report:

The test report contains the record of the values of test parameters as obtained during testing, the physical condition of the apparatus during / after the test (s) and copy of Oscillogram (s). Test report is issued when partial tests are performed as against the complete test requirement for proving specific ratings.

b) Sealed Certificate:

The sealed certificate is issued, on request and payment of the prescribed charges thereof only when an apparatus of particular type has satisfactorily passed all the specified ratings compliance with the conditions stipulated in a published National or international standard.

c) CPRI issues the following type test certificates based generally on STL Guidelines.

- I. Type test certificate of Short circuit performance
- II. Type test certificate of Switching performance
- III. Type test certificate of Temperature Rise Performance
- IV. Type test certificate of Dielectric Performance
- V. Type test certificate of complete type test.

(Maroti)  
TEST ENGINEER

I1  
kA

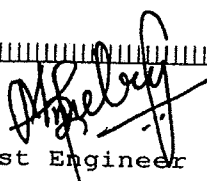
40.7 kA rms

101.8 kA Peak

U1  
V

Duration of Current Flow: 1.00 Sec.

SCALE  
Each Unit = 10 ms

  
Test Engineer  
CPRI, HPL, Bangalore

HPL07179.S002  
19/06/2007



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Test Report No. HPL07179



Photograph No. 345: Mounting arrangement before test

(Maroti)  
TEST ENGINEER



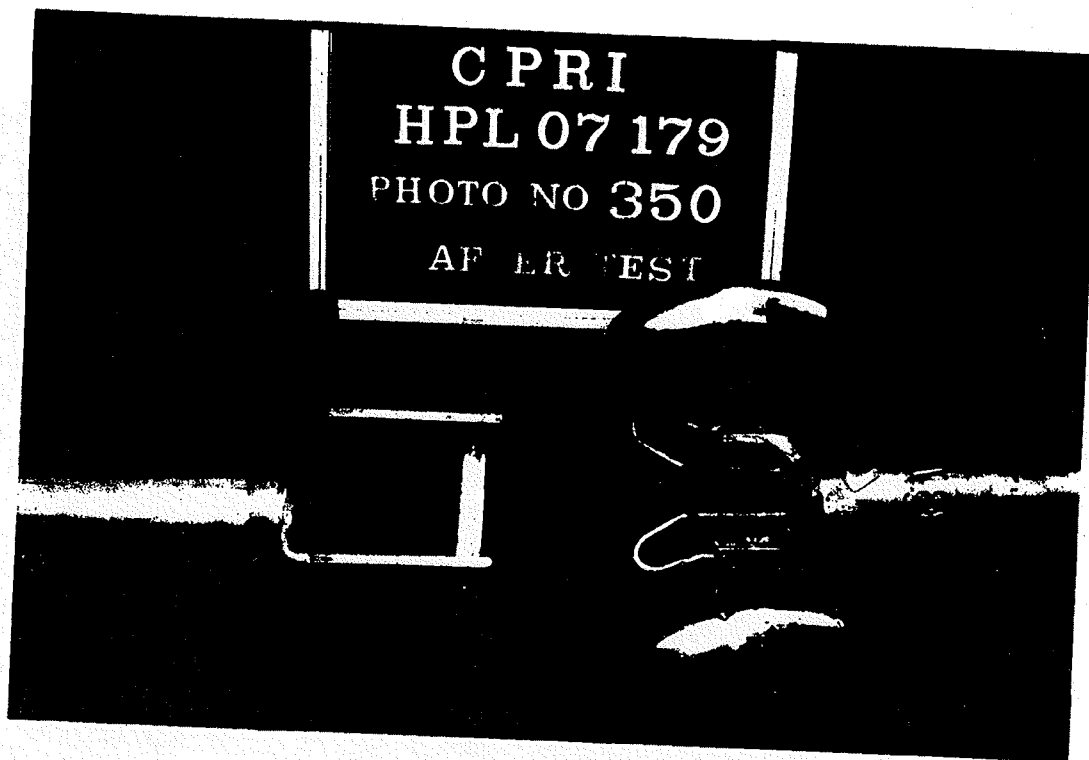
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Test Report No. HPL07179



Photograph No.350: Condition of the contacts after test

  
(Maroti)  
TEST ENGINEER



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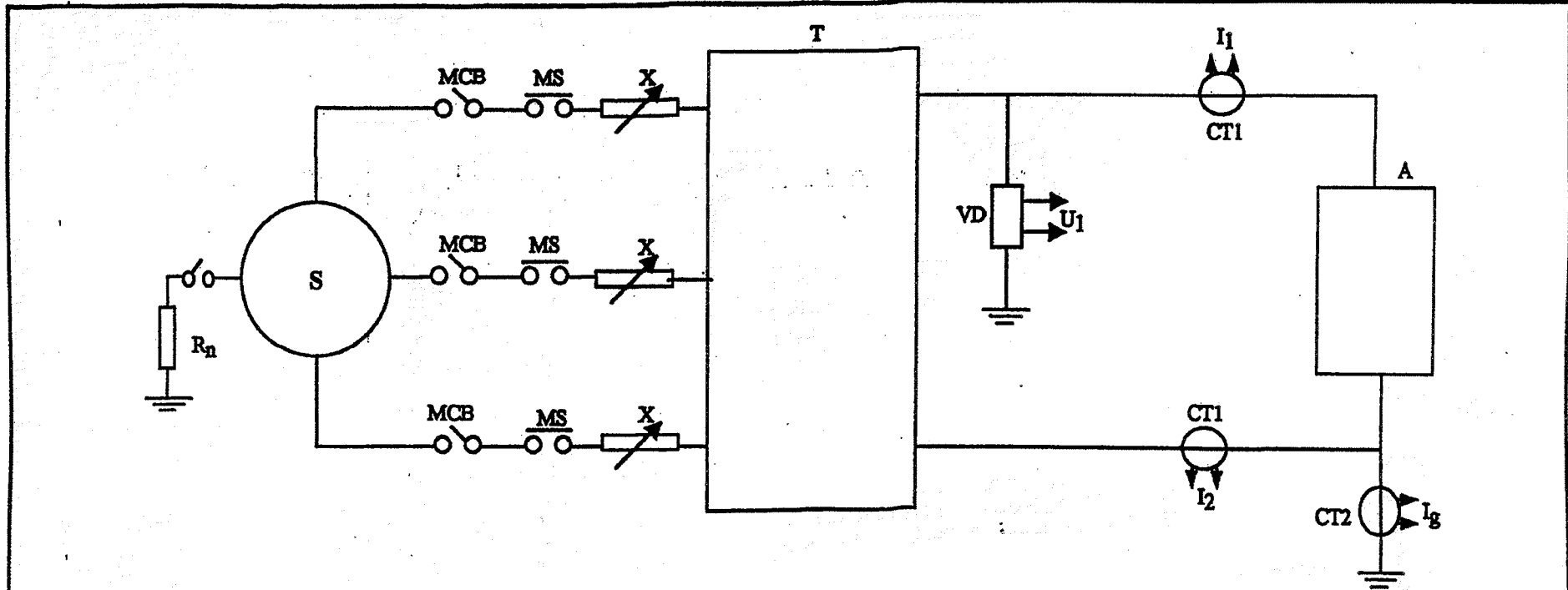
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Test Report No. HPL07179



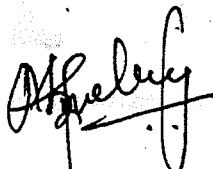
Photograph No. 345: Mounting arrangement before test

(Maroti)  
TEST ENGINEER



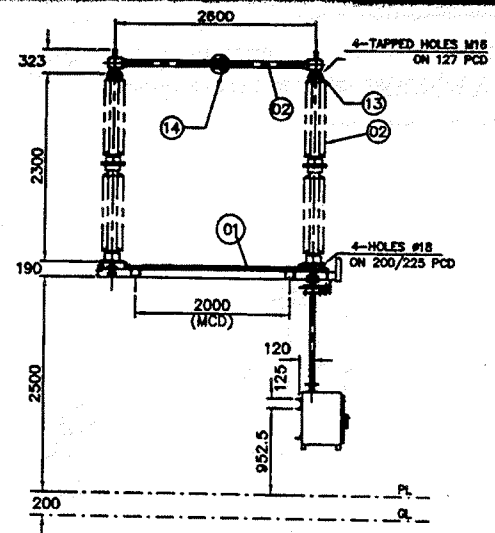
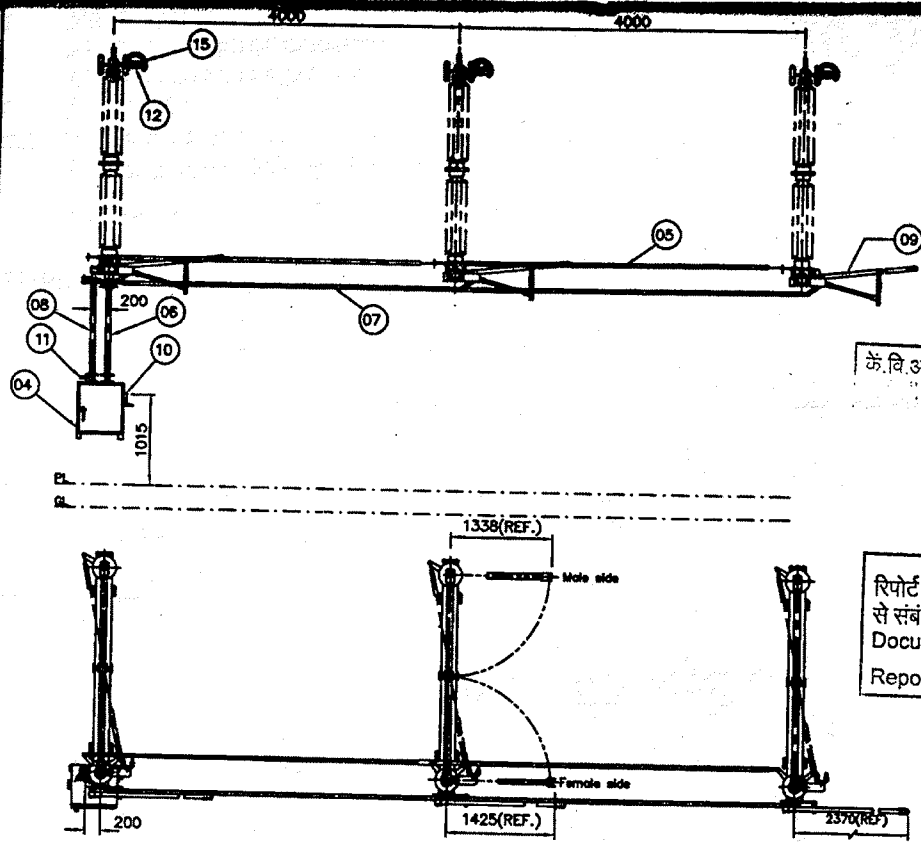
**LEGEND**

- S 2500 MVA short circuit generator
- $R_n$  Generator neutral grounding resistor
- MCB Master circuit breaker
- MS Make switch
- X Variable current limiting reactor
- T 300 kA Short circuit transformer
- VD Voltage divider
- CT1 Measuring current transformer
- CT2 Protection current transformer
- A Apparatus under test

  
 Test Engineer

<b>CPRI</b> HIGH POWER LABORATORY BANGALORE
<b>Schematic diagram of test circuit</b>
Drg. No. CRTL/HPL/ISC 15

THIS DRAWING IS CONFIDENTIAL. IT MUST NOT BE COPIED OR PASSED TO A THIRD PARTY WITHOUT WRITTEN CONSENT. WE RESERVE ALL THE RIGHTS ON NEW IDEAS/CHARACTERISTICS ESPECIALLY FOR PATENT.



कें.वि.अ.सं.द्वारा इस रेखाचित्र का सत्यापन जहाँ  
संभव हो सके विमीय जाँच तक ही सीमित है।  
VERIFICATION OF THIS DRAWING  
BY THE CONCERNED AUTHORITY.

रिपोर्ट क्रमांक .....  
से संबंधित दस्तावेज  
Document Pertaining to  
Report No. H.P.L.O.7.1.79.....

*(Signature)*

परिमाण अभियन्ता / Test Engineer  
उच्च शक्ति प्रयोगशाला / H.P. LAB  
सी.पी.आर.आई. / CPRI  
बैंगलूर / Bangalore

- NOTE:**
1. MCD - MOUNTING CENTRE DISTANCE.
  2. HDG. - HOT DIP GALVANISED.
  3. G.A. - GENERAL ARRANGEMENT.
  4. OPTG. - OPERATING.
  5. PL - PLINTH LEVEL.
  6. HB - NOMINAL BORE.
  7. GL - GROUND LEVEL.

Sl.No.	DESCRIPTION	QTY.
15	EARTH FIXED CONTACT CORONA RING	3
14	CORONA SHIELDS (MAIN CONTACTS)	6
13	CORONA SHIELD - INSULATOR	6
12	EARTH FIXED CONTACT	3
11	MANUAL OPTG. HANDLE - EARTH	1
10	MANUAL OPTG. HANDLE - MAIN	1
09	EARTH MOVING BLADE	3
08	DOWN OPTG. PIPE HDG - EARTH NB50	1
07	GANG PIPE FOR EARTH HDG NB32	2
06	DOWN OPTG. PIPE HDG - MAIN NB50	1
05	GANG PIPE FOR MAIN HDG NB32	1
04	DISCONNECTOR & EARTH SWITCH OPTG. DRIVE - TYPE - MOB & MON	1
03	MALE & FEMALE HAMPER ASSEMBLY - Aluminium	3
02	INSULATORS (BROWN - GLAZED)	6
01	BASE ASSEMBLY	3

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

SCALE  
1:60

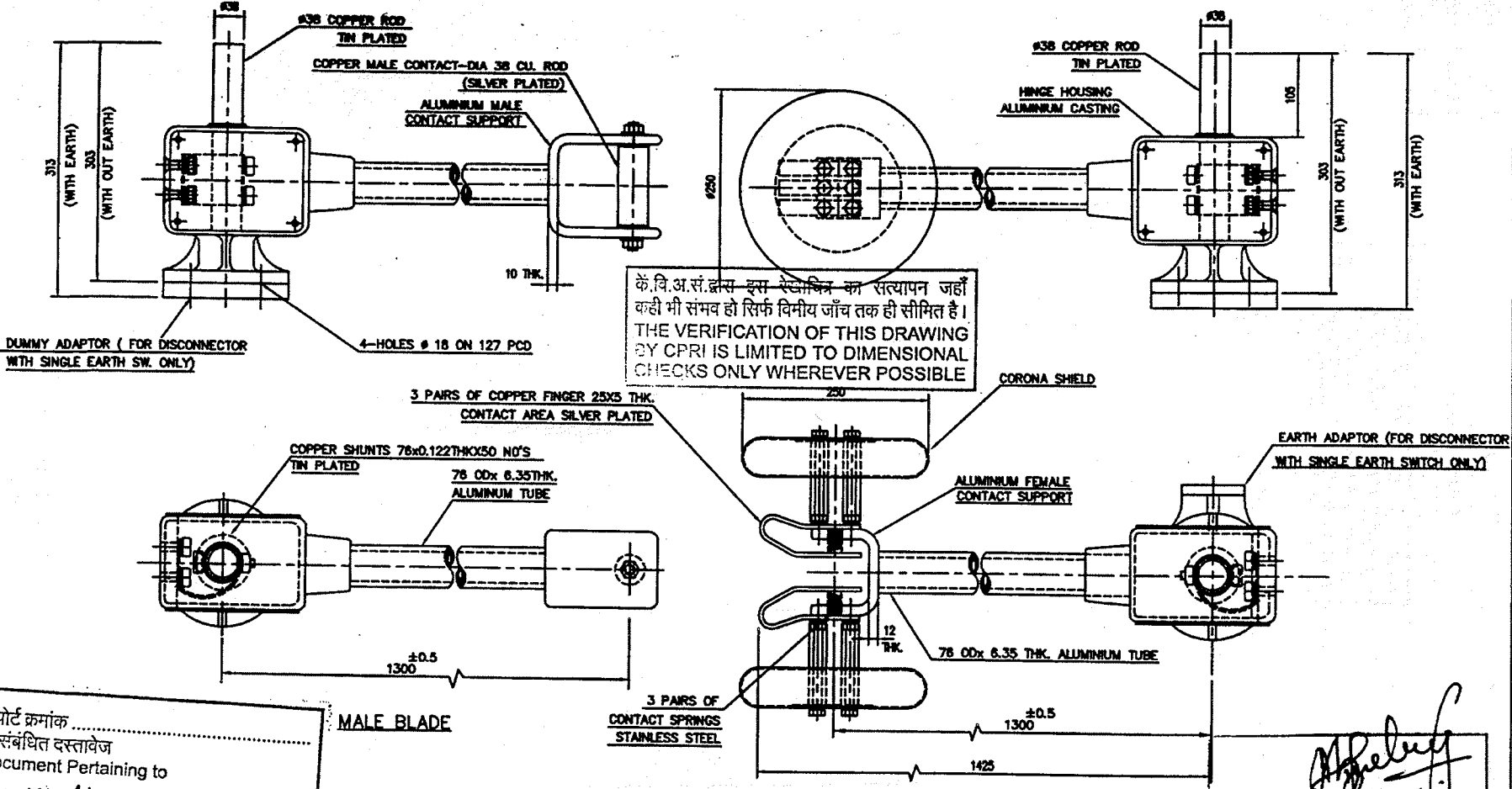
TITLE : G A OF 245 KV, 2000A CENTRE BREAK  
DISCONNECTOR WITH SINGLE EARTH SWITCH  
MAIN - MOTOR & EARTH - MANUAL

S & S POWER SWITCHGEAR LTD.,  
PONDICHERRY - 605111  
INDIA

DRN.	CSN	03.05.07
CHD.	NVR	03.05.07
APPD.	KS	03.05.07
DRAWING NO.		REV. No.
3C6G004/TTST		A-

H.P.L.O.7.1.79

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 Document Pertaining to  
 Report No. H.P.L.D.7179

**NOTE:** \* -1) IN CASE OF SINGLE EARTH SWITCH, EARTH ADAPTOR WILL BE PROVIDED ONLY IN THE EARTH SWITCH SIDE. DUMMY ADAPTOR WILL BE PROVIDED IN THE OTHER END.  
 -2) IN CASE OF DISCONNECTOR WITHOUT EARTH SWITCH, BOTH EARTH ADAPTOR AND DUMMY ADAPTOR WILL NOT BE PROVIDED

*(Signature)*  
 परीक्षण अभियन्ता / Test Engineer  
 उच्च शक्ति प्रयोगशाला / H.P. LAB  
 सी.पी.आर.आई. / CPRI  
 बेंगलूर / Bangalore

REV. NO.	DCL. NO.	CHANGE DETAILS	DATE	PRD.	APPD.	 <b>SCALE</b> 1:5 <b>TITLE :</b> G A OF MALE & FEMALE BLADE FOR 245kV, 2000A CENTRE BREAK DISCONNECTOR S & S POWER SWITCHGEAR LTD., PONDICHERRY - 605111 INDIA	DRN.	CSN	03.05.07
							CHD.	NVR	03.05.07
							APPD.	KS	03.05.07
							DRAWING NO.		REV. No.
							3C6H004/TTST		A-

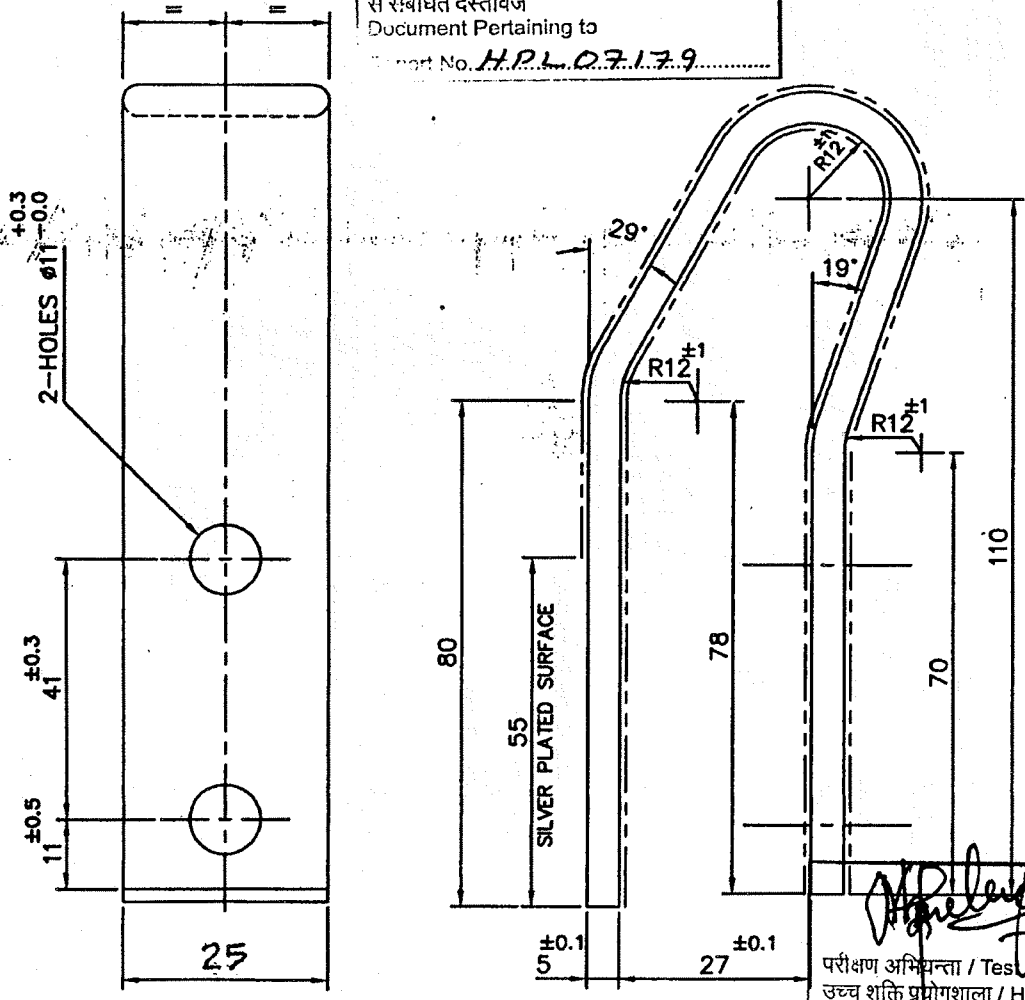
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ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED. UNSPECIFIED TOLERANCE			IF IN DOUBT ASK		
REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

कें.वि.अ.सं.द्वारा इस रेखाचित्र का सत्यापन जहाँ कहीं भी संभव हो सिर्फ विमीय जाँच तक ही सीमित है।  
 THE VERIFICATION OF THIS DRAWING BY CPRLIS LIMITED TO DIMENSIONAL CHECKS ONLY WHEREVER POSSIBLE

**NOTE: -**  
 FINISH : TIN PLATE WHERE EVER MARKED THUS -----  
 AND SILVER PLATING ON REST OF THE OTHER AREA

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 Report No. H.P.L.07179



*[Signature]*  
 परीक्षण अभियन्ता / Test Engineer  
 उच्च शक्ति प्रयोगशाला / H.P. LAB  
 सी.पी.आर.आई. / CPRI  
 Bangalore



SCALE  
 1:2

TITLE :  
**CONTACT FINGER**

DRN.	CSN	03.05.07
CHD.	VUK	03.05.07
APPD.	KS	03.05.07

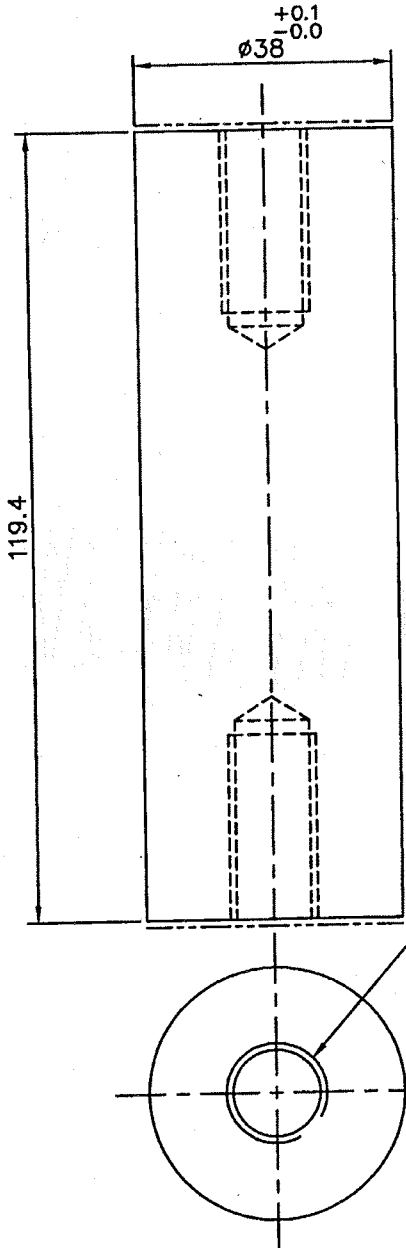


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 PONDICHERRY - 605111  
 INDIA

DRAWING NO.	REV. No.
4C39033/TTST	A-

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ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED. UNSPECIFIED TOLERANCE		IF IN DOUBT ASK		
REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.



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 Document Pertaining to  
 Report No. H.P.L.03179 .....

*(Signature)*  
 परीक्षण अभियन्ता / Test Engineer  
 उच्च शक्ति प्रयोगशाला / H P. LAB  
 सी.पी.आर.आई. / CPRI  
 बेंगलूर / Bangalore

M12 TAPPED HOLE AT BOTH ENDS  
 25 LG THIRD LENGTH MIN.

1. FINISH : TINNING ON SURFACE MARKED THUS -----  
 AND SILVER PLATING ON REST OF THE OUTER SURFACE ONLY.

	SCALE	TITLE :	DRN.	CSN	03.05.07
	1:5		MALE CONTACT FOR 2000 AMPS	CHD.	VUK
	S & S POWER SWITCHGEAR LTD., PONDICHERRY - 605111 INDIA		APPD.	KS	03.05.07
			DRAWING NO.		REV. No.
			4CC9012/TTST		A-

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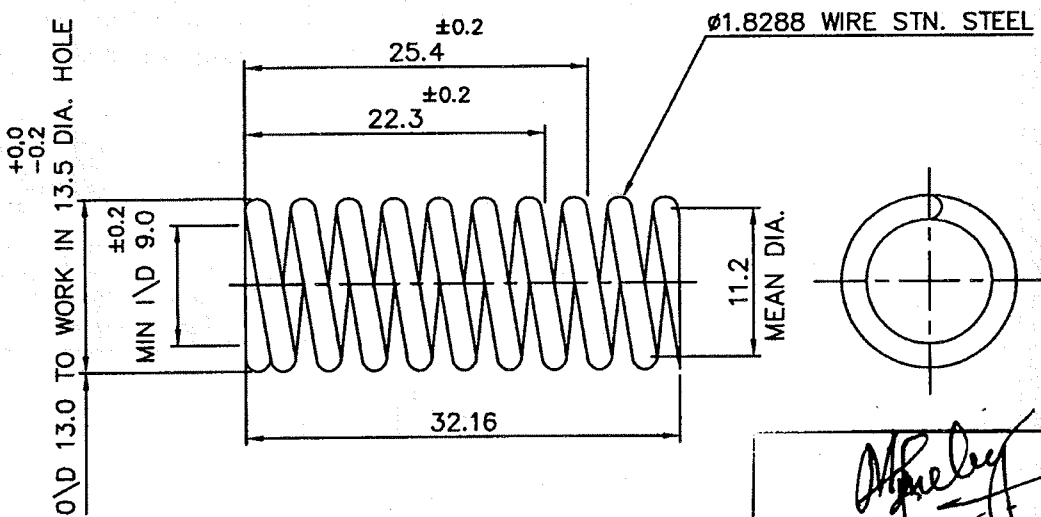
ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED. UNSPECIFIED TOLERANCE IF IN DOUBT ASK

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

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 THE VERIFICATION OF THIS DRAWING BY CPRI IS LIMITED TO DIMENSIONAL CHECKS ONLY WHEREVER POSSIBLE

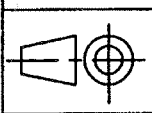
NOTE: 1. LOAD TOLERANCE ±10%

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 से संबंधित दस्तावेज  
 Document Pertaining to  
 Report No.. H.P.2.07.79.....



*[Signature]*  
 परीक्षण अभियन्ता / Test Engineer  
 उच्च शक्ति प्रयोगशाला / H P. LAB  
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- SPRING DATA:
- 1. MEAN DIA. : 11.2
  - 2. OUTER DIA. : 13
  - 3. NO. OF ACTIVE TURNS : 7 1/2
  - 4. TYPE : RH., ENDS SQUARED AND GROUND COMPRESSION
  - 5. LOAD AT 25.4 : 7.03 Kg.
  - 6. LOAD AT 22.225 : 10.9 Kg.



SCALE  
2:1

TITLE :  
**SPRING**

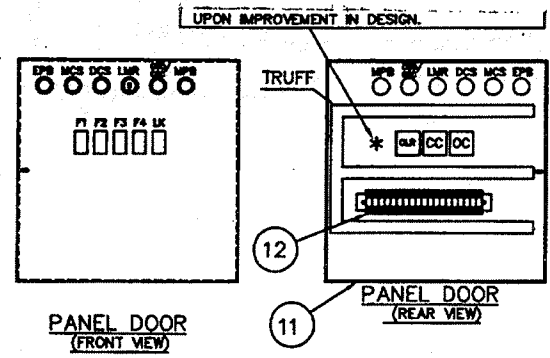
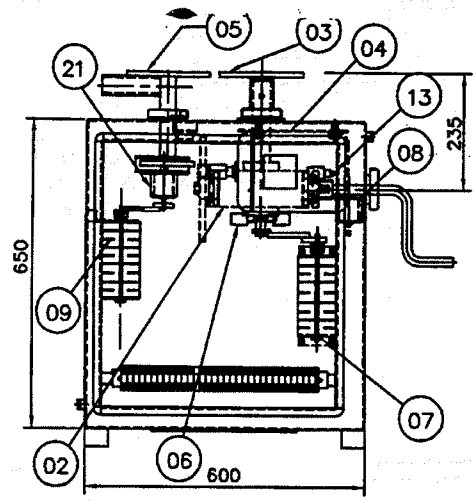
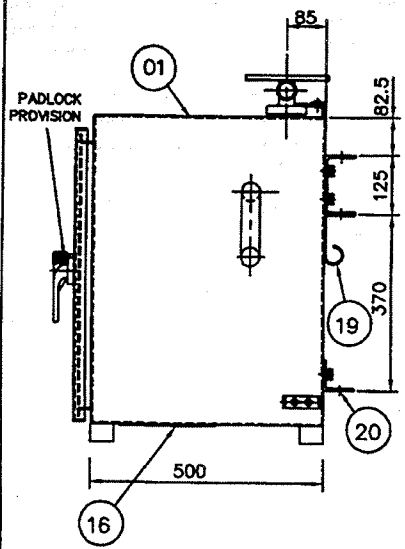
DRN.	CSN	03.05.07
CHD.	VUK	03.05.07
APPD.	KS	03.05.07



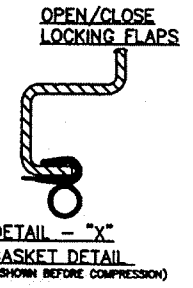
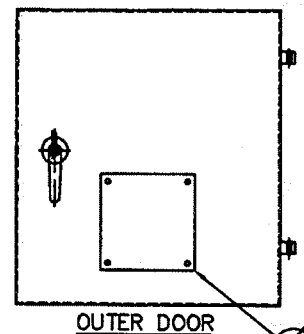
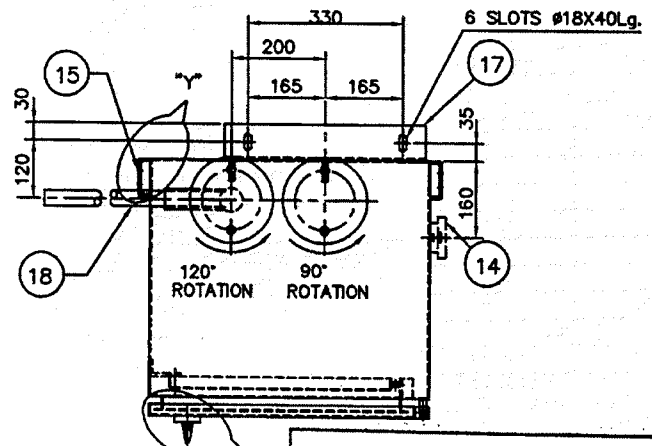
S & S POWER SWITCHGEAR LTD.,  
 PONDICHERRY - 605111  
 INDIA

DRAWING NO.	REV. No.
4UC9008/TTST	A-

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1. WEIGHT OF DRIVE BOX 90 Kg APPROXIMATELY.
  2. DEGREE OF PROTECTION IS IP55 AS PER IEC:529
  3. ALL DOORS & REMOVABLE COVERS SHALL BE SEALED BY EPDM GASKETS.
  - 5a. "ON" AND "OFF" LABEL FIXED TO THE OPTG. FLANGE AT REQUIRED ANGLE OF DRIVE INDICATE THE PHYSICAL POSITION OF DISCONNECTOR
  - b. ARROW POSITION ON TOP OF MOTOR OPTG. CABINET INDICATES ON/OFF POSITION OF DISCONNECTOR
  - a,b TOGETHER WILL FORM MECHANICAL POSITION INDICATOR
  6. SHEET THICKNESS : 3mm Sheet Steel  
FINISH : SIEMENS GREY PAINTED
  7. DIRECTION OF CLOSING.  
MAIN: ANTICLOCKWISE (90 DEG)  
EARTH: ANTICLOCKWISE (120 DEG)
- MCD - MOUNTING CENTRE DISTANCE  
GA - GENERAL ARRANGEMENT  
IP - INGRESS PROTECTION  
OPTG. - OPERATING

21	SHOOT BOLT INTERLOCK - EARTH
20	MOUNTING ANGLE
19	EARTH OPTG. HANDLE HOLDING BRACKET
18	EARTH OPTG. HANDLE
17	MOUNTING CHANNEL
16	GLAND PLATE - 3mm THICK
15	EARTHING POINTS WITH M12 BOLT
14	OPTG. HANDLE ENTRY HOLE WITH COVER
13	LIMIT SWITCH - EMLS
12	TERMINAL BLOCKS
11	INNER PANEL DOOR
10	NAME PLATE
09	AUXILIARY CONTACTS-EARTH
08	SHOOT BOLT INTERLOCK - MAIN
07	AUXILIARY CONTACTS-MAIN
06	LIMIT SWITCH-LSC/LSD
05	DRIVE FLANGE-EARTH
04	MOTOR
03	DRIVE FLANGE-MAIN
02	GEAR BOX ASSEMBLY WITH SPUR GEAR
01	CABINET - SHEET STEEL

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Report No. H.P.L.07179

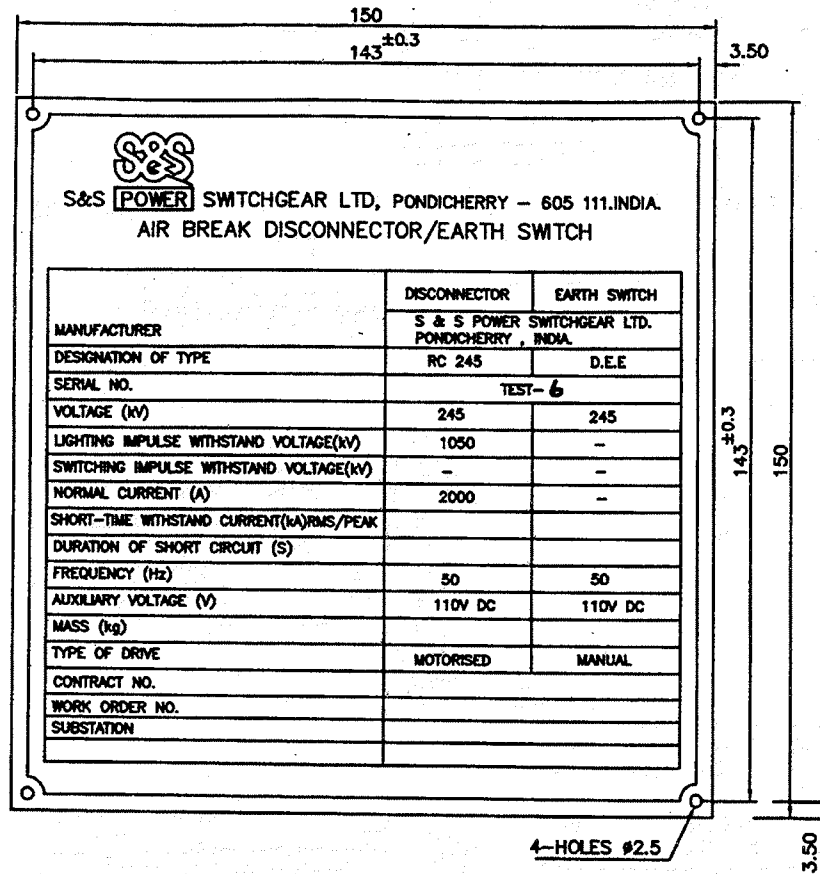
*Signature*  
परीक्षण अभियन्ता / Test Engineer  
उच्च शक्ति प्रयोगशाला / H P LAB  
सी.पी.आर.आई. / CPRI  
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REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.	SCALE	TITLE	DRN.	CSN	REV. No.
						1:10	G A OF OPERATING BOX FOR DISCONNECTOR WITH EARTH SWITCH (WITH MOTOR OPTG. SHAFT ON RIGHT SIDE)			03.05.07
								CHD.	NVR	03.05.07
								APPD.	KS	03.05.07
							S & S POWER SWITCHGEAR LTD., PONDICHERRY - 605111 INDIA			
									DRAWING NO.	REV. No.
									3UCD092/TTST	A-



5

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**S&S POWER SWITCHGEAR LTD, PONDICHERRY - 605 111, INDIA.**  
**AIR BREAK DISCONNECTOR/EARTH SWITCH**

	DISCONNECTOR	EARTH SWITCH
MANUFACTURER	S & S POWER SWITCHGEAR LTD. PONDICHERRY, INDIA.	
DESIGNATION OF TYPE	RC 245	D.E.E
SERIAL NO.	TEST- 6	
VOLTAGE (KV)	245	245
LIGHTING IMPULSE WITHSTAND VOLTAGE(KV)	1050	-
SWITCHING IMPULSE WITHSTAND VOLTAGE(KV)	-	-
NORMAL CURRENT (A)	2000	-
SHORT-TIME WITHSTAND CURRENT(KA)RMS/PEAK		
DURATION OF SHORT CIRCUIT (S)		
FREQUENCY (Hz)	50	50
AUXILIARY VOLTAGE (V)	110V DC	110V DC
MASS (kg)		
TYPE OF DRIVE	MOTORISED	MANUAL
CONTRACT NO.		
WORK ORDER NO.		
SUBSTATION		

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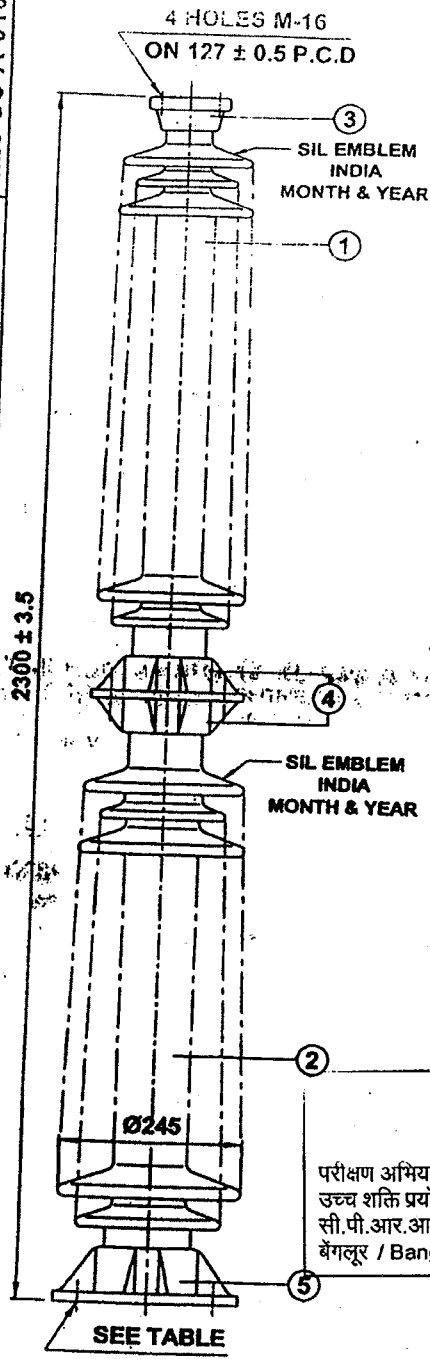
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 Document Pertaining to  
 Report No. H.P. 07179

*(Signature)*  
 परीक्षण अभियन्ता / Test Engineer  
 उच्च शक्ति प्रयोगशाला / H P. LAB  
 सी.पी.आर.आई. / CPRI  
 बेंगलूर / Bangalore

**NOTE:**  
 COLOUR OF LETTERS, LINES & 3.5mm BORDER : BLACK  
 BACK GROUND : WHITE  
 MATERIAL : ALU.(ANODIZED)  
 THICKNESS : 1.0mm

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.		SCALE 1:1	TITLE : NAME PLATE DETAIL FOR 245KV, 2000 AMPS CENTRE BREAK DISCONNECTOR & EARTH SWITCH	DRN. CSN 13.04.07	CHD. VUK 13.04.07	APPD. KS 13.04.07
								S & S POWER SWITCHGEAR LTD., PONDICHERRY - 605111 INDIA	DRAWING NO. 3C6P004/TTST	REV. No. A-	

220-SC-A-0104



**GUARANTEED TECHNICAL PARTICULARS**

**GENERAL :**

1. STANDARDS APPLICABLE : IS 2544 - 1973 / IEC : 168 - 1994
2. TYPE OF INSULATOR : SOLIDCORE POST TYPE
3. NO. OF UNITS PER STACK
4. MIN. NOM. CREEPAGE DISTANCE
5. SHED PROFILES CONFORMS TO IEC 815
6. NET WEIGHT (APPROX.)

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**MECHANICAL VALUES :**

1. ULTIMATE CANTILEVER STRENGTH
2. ULTIMATE TORSIONAL STRENGTH
3. ULTIMATE TENSILE STRENGTH
4. ULTIMATE COMPRESSION STRENGTH

**ELECTRICAL VALUES :**

1. NOMINAL SYSTEM VOLTAGE
2. HIGHEST SYSTEM VOLTAGE
3. DRY POWER FREQUENCY WITHSTAND VOLTAGE
4. WET POWER FREQUENCY WITHSTAND VOLTAGE
5. LIGHTNING IMPULSE WITHSTAND VOLTAGE (1.2 / 50  $\mu$ SEC. WAVE)
6. DRY POWER FREQUENCY FLASHOVER VOLTAGE
7. WET POWER FREQUENCY FLASHOVER VOLTAGE
8. IMPULSE FLASHOVER VOLTAGE (1.2 / 50  $\mu$ SEC) +VE / -VE WAVE
9. VISIBLE (CORONA EXTINCTION) VOLTAGE

**PACKING PARTICULARS :**

1. No. OF INSULATORS PER CRATE.
2. GROSS (PACKED) WEIGHT APPROX.
3. PACKED VOLUME

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 सी.पी.आर.आई. / CPRI  
 बेंगलूर / Bangalore

C	4 HOLES Ø18	200 ± 1
B	8 HOLES Ø18	254 ± 1
A	4 HOLES Ø18	225 ± 1
ITEM	HOLE SIZE	P.C.D

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3,4,5	CAP & FLANGE	M.C.I. / S.G.I.	4	HOT - DIP - GALVANIZED
1 & 2	INSULATOR BODY	ALUMINA PORCELAIN KER - 110 - 2	2	BROWN GLAZED
SL. No.	DESCRIPTION	MATERIAL	No.OFF	FINISH
CUSTOMER REF.			SCALE	MAT. SEE TABLE
TITLE			NTS	WT. (APX)
220 / 245 KV SOLIDCORE POST INSULATOR (C6 - 1050 - CD - 25 mm / KV)			DRAWN	
			CHECKED	
SARAVANA INSULATORS LIMITED Admini. Office & Works : Cuddalore Road, P.N. Kuppam, Kurinjipadi Post Cuddalore Dist. 607 302 Tamil Nadu.			APPROVED	
			DATE	02.05.04
DRG. NO.			REV.	
220-SC-A-0104			1	

REV. 1 DATE : 22.05.04





**HIGH POWER LABORATORY**  
**CENTRAL POWER RESEARCH INSTITUTE,**  
**P. B.NO. 8066, SADASHIVANAGAR SUB P.O**  
**PROF. SIR.C.V. RAMAN ROAD, BANGALORE-560 080, INDIA**  
**PHONE: + 91- (0) 80-23600574, FAX: + 91 (0) 80-23601213**



**NABL ACCREDITED**  
**LABORATORY**  
**Certificate No. T0010**

**CPRI**

Sheet No. 1 of 5

**TEST REPORT**

**Test Report Number** : HPL08222 **Dated:** 06 /01 /2009

**Name & Address of the Customer** : M/s. S & S Power Switchgear Ltd.,  
EVR Street, Sedarapet,  
Pondicherry – 605 111.

**Name & Address of the Manufacturer:** M/s. S S & S Power Switchgear Ltd.,  
EVR Street, Sedarapet,  
Pondicherry – 605 111.

**Particulars of sample tested** : 245 kV Earth switch  
**Type** : DEE  
**Designation** : ---  
**Serial number** : 001  
**Number of samples tested** : One  
**Date(s) of Test(s)** : 24<sup>th</sup> September 2008  
**CPRI Sample Code No.** : HPL08S0232  
**Condition of sample on receipt** : New  
**Particulars of tests conducted** : Short-time withstand current test and peak withstand  
current test on Earth switch  
**Test in accordance with** : IEC:62271-102 (2001)  
**Standard/Specification**  
**Sampling Plan** : Nil  
**Customer's requirement** : Nil  
**Deviation if any** : Nil

**Name of the witnessing persons**  
**Customer's representative** : Mr. S.Kalyanasundaram, Vice President-Technical.  
**Other than Customer's representative** : None

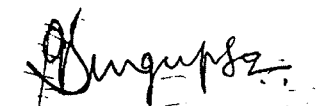
**Test subcontracted with address of the laboratory** : Nil

**Documents constituting this report (In words)**  
**Number of sheets** : Five  
**Number of oscillograms** : One  
**Number of graphs** : None  
**Number of photographs** : Two  
**Number of test circuit diagrams** : One  
**Number of sample drawings** : Six

  
(Maroti)

**TEST ENGINEER**



  
(G. Sengupta)  
**ADDITIONAL DIRECTOR**

**AUTHORISED SIGNATORIES**



HIGH POWER LABORATORY  
CENTRAL POWER RESEARCH INSTITUTE,  
P. B.NO. 8066, SADASHIVANAGAR SUB P.O  
PROF. SIR.C.V. RAMAN ROAD, BANGALORE-560 080, INDIA  
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LABORATORY  
Certificate No. T0010  
Sheet No. 2 of 5

**CPRI**

Test Report No. HPL08222

### DESCRIPTION OF SAMPLE TESTED

(As assigned by the manufacturer)

Sample	: Earth switch
Type	: DEE
Designation	: --
Serial number	: 001
Rated voltage	: 245 kV
Rated Normal current	: Not Applicable
Rated Class	: Outdoor
Number of poles	: Three
Rated short-time withstand current	: 40 kA rms
Duration of short-circuit	: 3 Sec.
Rated frequency	: 50 Hz
Operating mechanism	: Motor/ Manual
Type of Termination	: Rigid

(Maroti)  
TEST ENGINEER



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**Certificate No. T0010**  
**Sheet No. 3 of 5**

**CPRI**

Test Report No. HPL08222

## **LIST OF DRAWINGS OF SAMPLE AND PHOTOGRAPHS**

### **Drawings of the sample tested**

The manufacturer has guaranteed that the equipment submitted for the test has been manufactured in accordance with the following drawings. It is verified that these drawings adequately represent the sample tested.

#### Sample drawing numbers

1. 3C6G003 / TTST Rev A
2. 3C6E084 / TTST Rev D
3. 4UC9008 / TTST Rev A
4. 3UCD092 / TTST Rev A
5. 3C6P005 / TTST Rev B
6. 220-SC-A-0104 Rev 1

Total: Six drawings (duly attested)

### **Photographs of the sample tested**

Mounting arrangement before test : 363  
Condition of the contacts after test : 368

Total: Two photographs (duly embossed)

(Maroti)

**TEST ENGINEER**



**HIGH POWER LABORATORY**  
**CENTRAL POWER RESEARCH INSTITUTE,**  
**P. B.NO. 8066, SADASHIVANAGAR SUB P.O**  
**PROF. SIR.C.V. RAMAN ROAD, BANGALORE-560 080, INDIA**  
**PHONE: + 91- (0) 80-23600574, FAX: + 91 (0) 80-23601213**



**NABL ACCREDITED**  
**LABORATORY**  
**Certificate No. T0010**

**CPRI**

Test Report No. HPL08222

Sheet No. 4 of 5

### TEST RESULTS

Type of test : Short-time withstand current test and peak withstand  
Current test on Earth switch.

Test circuit drawing number : CRTL/HPL/1SC30

Sources phases : Two

Sources frequency : 50 Hz

Sample

Number of poles : One

Condition before test : New

Mounting : Earth switch was mounted on its own support and installed  
with its own operating mechanism, simulating actual  
service conditions.

**Test connections**

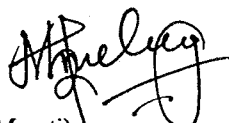
Conductor used : Rigid

Distance of the return conductor : 4 meters

Oscillogram Number	Short time Current (kA peak)	Short time Current (kA rms)	Duration (Secs.)	Condition of Sample during test
HPL08222.S002	103.6	42.1	2.85 sec	No abnormalities
Equivalent to 41.0 kA rms for 3.0 secs.				

Condition of Sample after test : Earth Switch operable on no load.  
No visible damage to contacts.  
No pitting marks on the contacts.

**Remarks: The performance of the earth switch tested complies with the requirement of Clause 6.6 of IEC 62271-102 (2001)**

  
(Maroti)  
TEST ENGINEER



**CPRI**

Test Report No. HPL08222

**HIGH POWER LABORATORY  
CENTRAL POWER RESEARCH INSTITUTE,  
P. B.NO. 8066, SADASHIVANAGAR SUB P.O  
PROF. SIR.C.V. RAMAN ROAD, BANGALORE-560 080, INDIA  
PHONE: + 91- (0) 80-23600574, FAX: + 91 (0) 80-23601213**



**NABL ACCREDITED  
LABORATORY  
Certificate No. T0010  
Sheet No. 5 of 5**

**NOTE**

- a) This is not a certificate of rating. A certificate of rating is not issued as only limited tests as requested by the customer were carried out.
- b) The test results relates only to the items tested
- c) 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 approval of CPRI.
- d) Corrections/ erasings invalidate the test report.
- e) Any anomalies/discrepancies in this test report should be brought to our notice within 45 days from the date of issue.

**Additional information:**

CPRI issues following types of reports / certificates:

- a) Test Report:

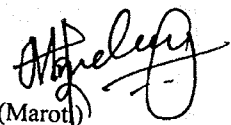
The test report contains the record of the values of test parameters as obtained during testing, the physical condition of the apparatus during / after the test (s) and copy of Oscillogram (s). Test report is issued when partial tests are performed as against the complete test requirement for proving specific ratings.

- b) Sealed Certificate:

The sealed certificate is issued, on request and payment of the prescribed charges thereof only when an apparatus of particular type has satisfactorily passed all the specified ratings compliance with the conditions stipulated in a published National or international standard.

- c) CPRI issues the following type test certificates based generally on STL Guidelines.

- I. Type test certificate of Short circuit performance
- II. Type test certificate of Switching performance
- III. Type test certificate of Temperature Rise Performance
- IV. Type test certificate of Dielectric Performance
- V. Type test certificate of complete type test.

  
(Maroti)  
**TEST ENGINEER**

I1  
kA

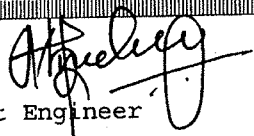
42.1 kA rms

103.6 kA Peak

U1  
V

Duration of Current flow : 2.85 Sec

SCALE  
Each Unit = 10 ms

  
Test Engineer  
CPRI, HPL, Bangalore

HPL08222.S002  
24/09/2008



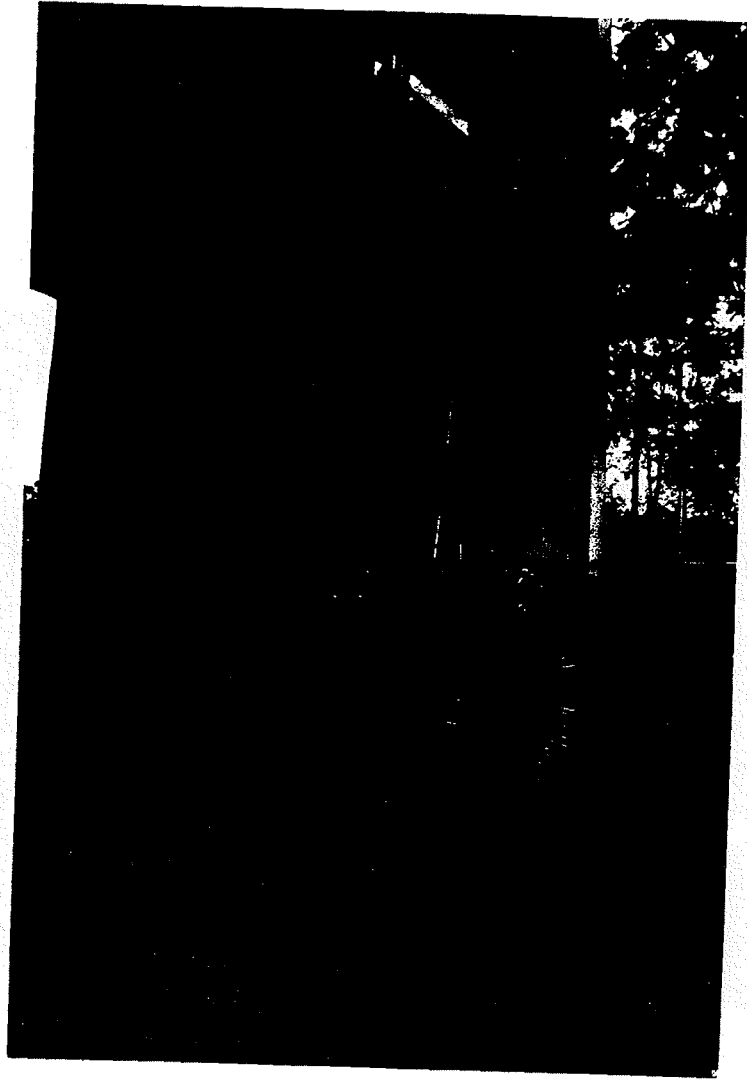
CPRI

HIGH POWER LABORATORY  
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Certificate No.T0010

Test Report No. HPL08222



Photograph No. 363: Mounting arrangement before test

*[Handwritten Signature]*  
Test Report No. HPL08222  
H.P.L. / H.P. L.S  
CPRI  
Bangalore



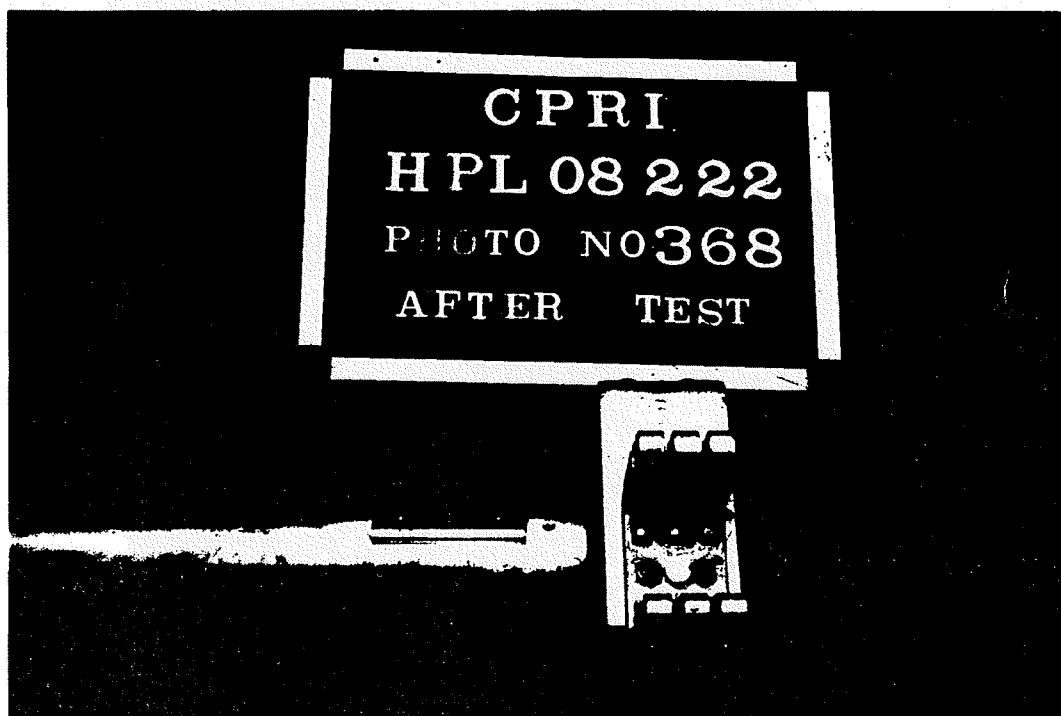
**CPRI**

**HIGH POWER LABORATORY  
CENTRAL POWER RESEARCH INSTITUTE,  
P. B.NO. 8066, SADASHIVANAGAR SUB P.O  
PROF. SIR.C.V. RAMAN ROAD, BANGALORE-560 080, INDIA  
PHONE: + 91- (0) 80-23600574, FAX: + 91 (0) 80-23601213**



**NABL ACCREDITED  
LABORATORY  
Certificate No.T0010**

Test Report No. HPL08222

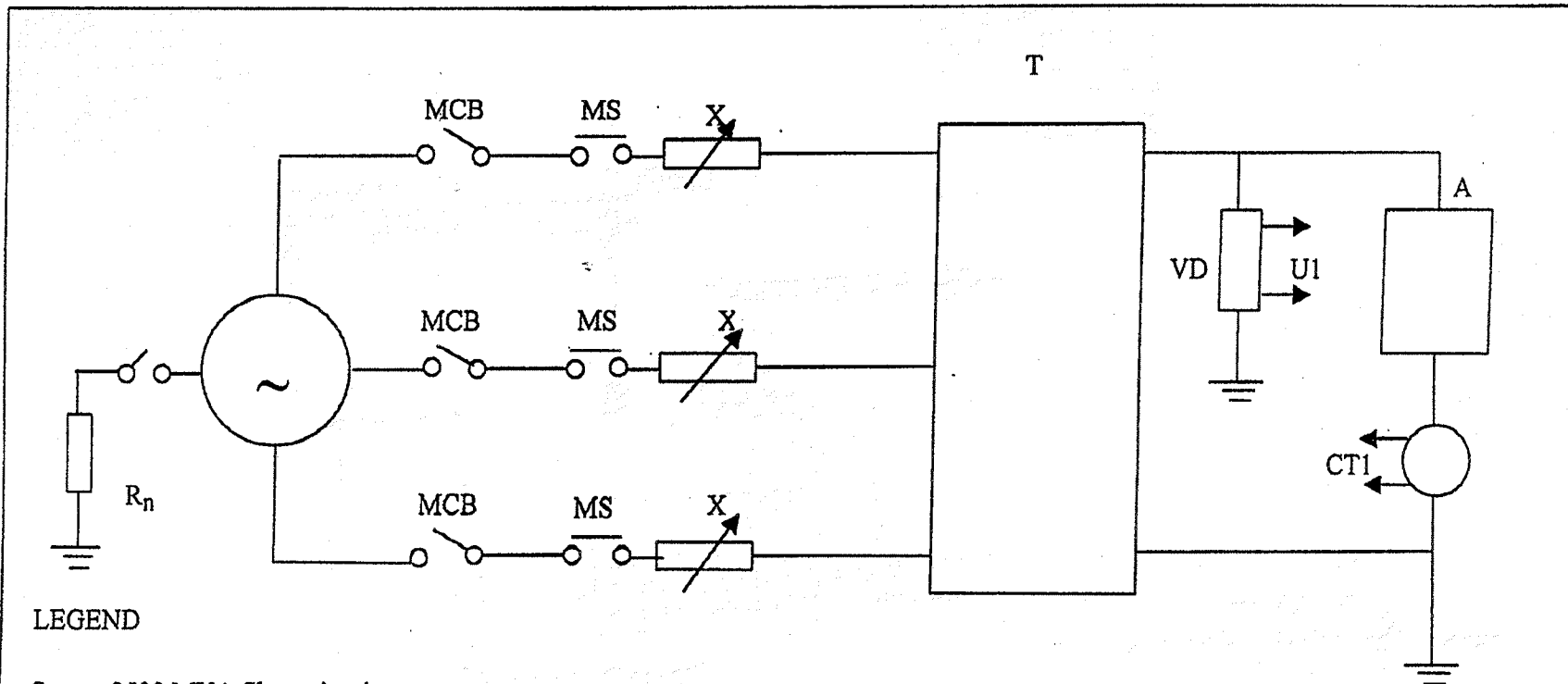


Photograph No. 368: Condition of the contacts after test

*Signature*  
CPRI  
Bangalore



CPRI



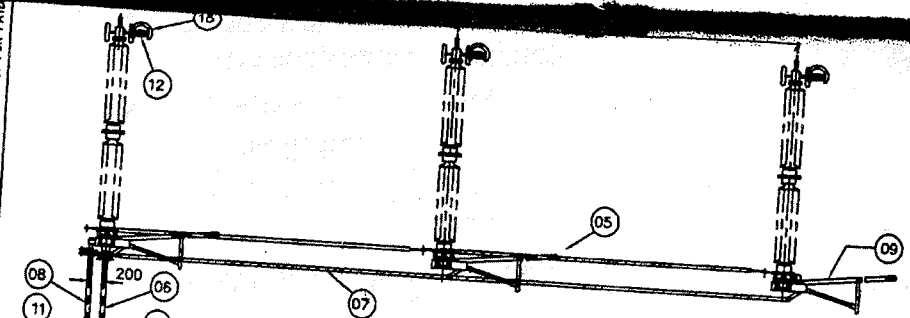
LEGEND

- S 2500 MVA Short circuit generator
- R<sub>n</sub> Generator neutral grounding resistor
- MCB Master Circuit Breaker
- MS Make Switch
- X Variable current limiting reactor
- CT1 Measuring current transformer
- T 300 kA Short Circuit transformer
- VD Voltage divider
- A Apparatus under test

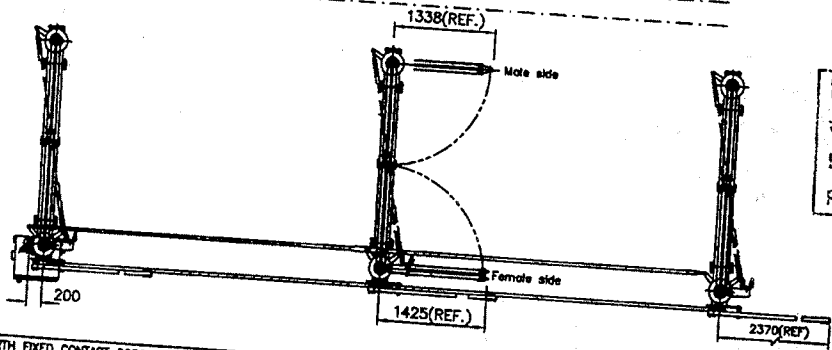
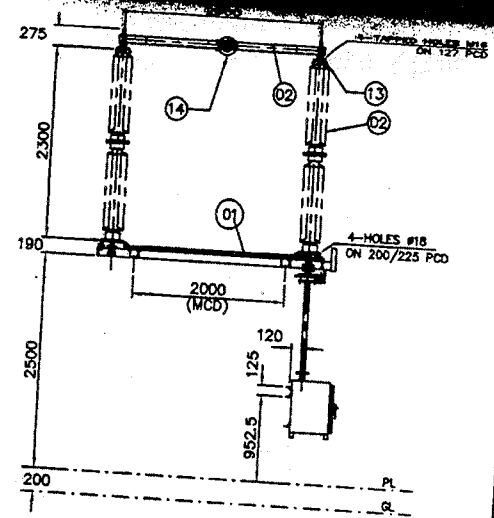
*[Signature]*  
 Test Engineer

CPRI	HIGH POWER LABORATORY BANGALORE
Schematic diagram of test circuit	
Drg. No. CRTL/HPL/ISC30	

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के.पि.अ.सं. द्वारा इस रेखाचित्र का सत्यापन जहाँ जहाँ भी संभव हो सकेगा किया जायेगा वहाँ तक ही सीमित है।  
 THE VERIFICATION OF THIS DRAWING BY CPRI IS LIMITED TO DIMENSIONAL CHECKS ONLY WHEREVER POSSIBLE



रिपोर्ट क्रमांक .....  
 से संबंधित दस्तावेज़  
 Document Pertaining to  
 Report No. HPL08222

*Handwritten Signature*  
 परीक्षण अभियंता / Test Engineer  
 उच्च वोल्ट प्रयोगशाला / H. P. LAB  
 सी. पी. आर. आई. CPRI  
 बेंगलूर / Bangalore

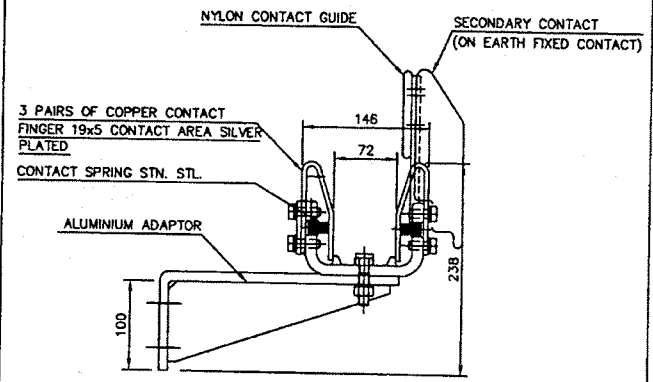
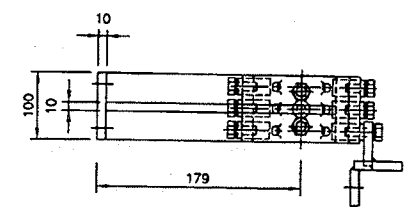
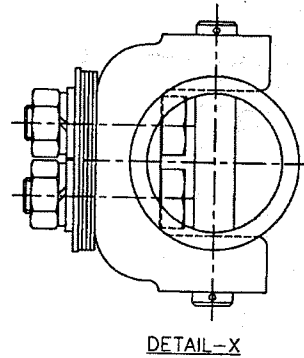
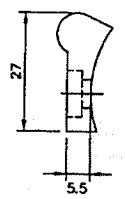
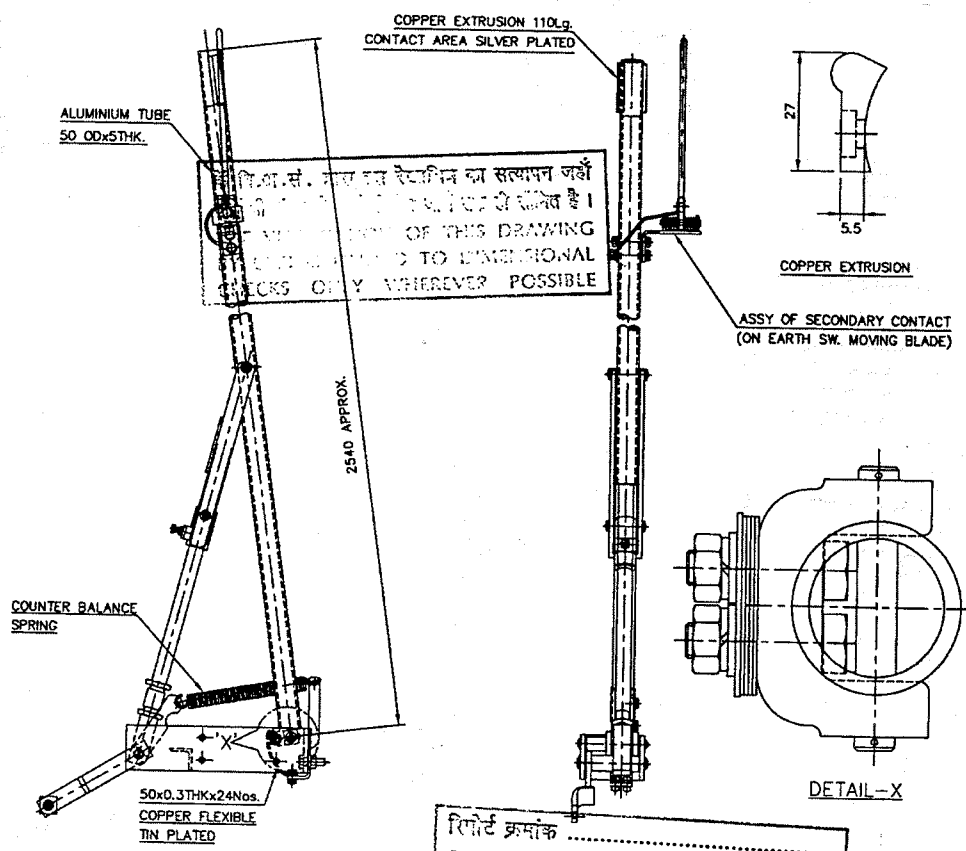
15	EARTH FIXED CONTACT CORONA RING	3
14	CORONA SHIELDS MAIN CONTACTS	6
13	CORONA SHIELD - INSULATOR	6
12	EARTH FIXED CONTACT	6
11	MANUAL OPTG. HANDLE - EARTH	3
10	MANUAL OPTG. HANDLE - MAIN	1
09	EARTH MOVING BLADE	1
08	DOWN OPTG. PIPE HDG - EARTH NB50	3
07	GANG PIPE FOR EARTH HDG NB32	1
06	DOWN OPTG. PIPE HDG - MAIN NB50	2
05	GANG PIPE FOR MAIN HDG NB32	1
04	DISCONNECTOR & EARTH SWITCH OPTG. DRIVE - TYPE - MGB & MOW	2
03	MALE & FEMALE HAMPER ASSEMBLY - Aluminium	1
02	INSULATORS (BROWN - GLAZED)	3
01	BASE ASSEMBLY	8
SL. No.	DESCRIPTION	QTY

- NOTE:
1. MCD - MOUNTING CENTRE DISTANCE.
  2. HDG - HOT DIP GALVANISED.
  3. G.A. - GENERAL ARRANGEMENT.
  4. OPTG. - OPERATING
  5. PL - PLINTH LEVEL
  6. NB - NOMINAL BORE
  7. GL - GROUND LEVEL

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.

	SCALE 1:60	TITLE : G A OF 245 KV, 2000A CENTRE BREAK DISCONNECTOR WITH SINGLE EARTH SWITCH MAIN - MOTOR & EARTH - MANUAL	DRN. CSN 03.05.07
		S & S POWER SWITCHGEAR LTD., CHINDICHERY - 605111 INDIA	CHD. NVR 03.05.07 APPD. KS 03.05.07
		DRAWING NO.	REV. No.
		3C6G003/TTST	A-

IF IN DOUBT ASK



EARTH FIXED CONTACT  
(SCALE : 1:5)

रिपोर्ट क्रमांक .....  
 के संबंधित दस्तावेज  
 Document Pertaining to  
 Report No. **HP/08222**

*Signature*  
 / Test Engineer  
 H. P. LAB  
 CPRI  
 Bangalore

DIRECT ENTRY EARTH SWITCH

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SCALE	TITLE :	DRN.	CSN	03.05.07
1:10	G.A.OF DIRECT ENTRY EARTH SWITCH AND EARTH FIXED CONTACT ASSY.-245KV	CHD.	NVR	03.05.07
		APPD.	KS	03.05.07
	S & S POWER SWITCHGEAR LTD., PONDICHERY - 605111 INDIA	DRAWING NO.	REV. No.	
		3C6E084/TTST	D-	

REV. NO.	DCN. NO.	CHANGE DETAILS	DATE	PRD.	APPD.
			09.11.08	VJK	SKS
			17.9.08	VJK	SKS
			07.8.07	VJK	SKS

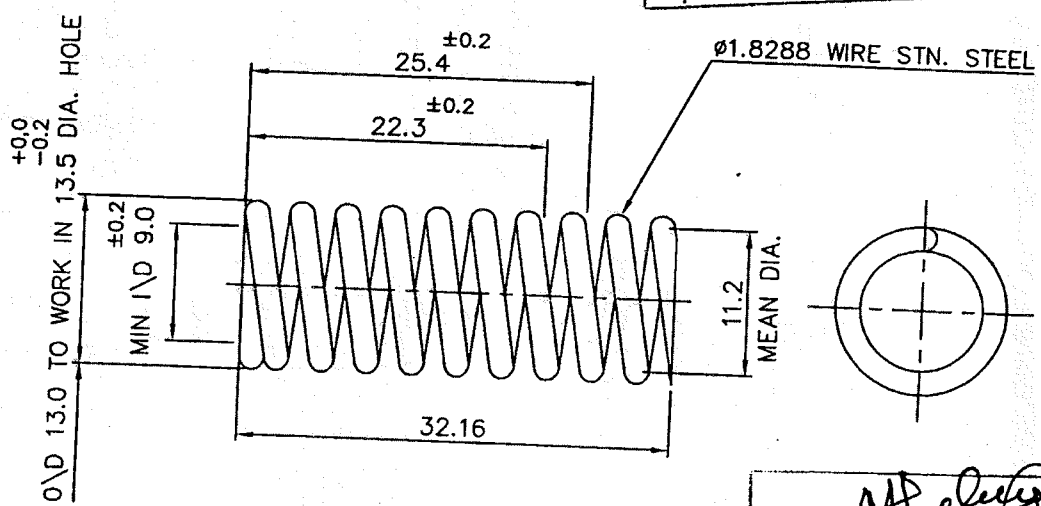
ALL DIMENSIONS ARE IN mm UNLESS SPECIFIED. UNSPECIFIED TOLERANCE

REV. NO.	DCN. NO.	CHANGE DETAILS	IF IN DOUBT ASK		
			DATE	PRD.	APPD.

NOTE: 1. LOAD TOLERANCE  $\pm 10\%$

ಇದರಲ್ಲಿ ಯಾವುದೇ ತಿದ್ದುಪಡಿಗಳಿಗಾಗಿ ಸರ್ವಾಧಿಕಾರಿಗಳಿಗೆ ಅನುಮತಿ ಇರುವುದಿಲ್ಲ.  
 THE VERIFICATION OF THIS DRAWING BY CPRI IS LIMITED TO DIMENSIONAL CHECKS ONLY WHEREVER POSSIBLE

ರಿಸಿರ್ಟ್ ಕ್ರಮಾಂಕ .....  
 ಸೇ ಸಂಪನ್ಮೂಲ ದಾಖಲೆಗೆ  
 Document Pertaining to  
 Report No. HP.2.08.22.2



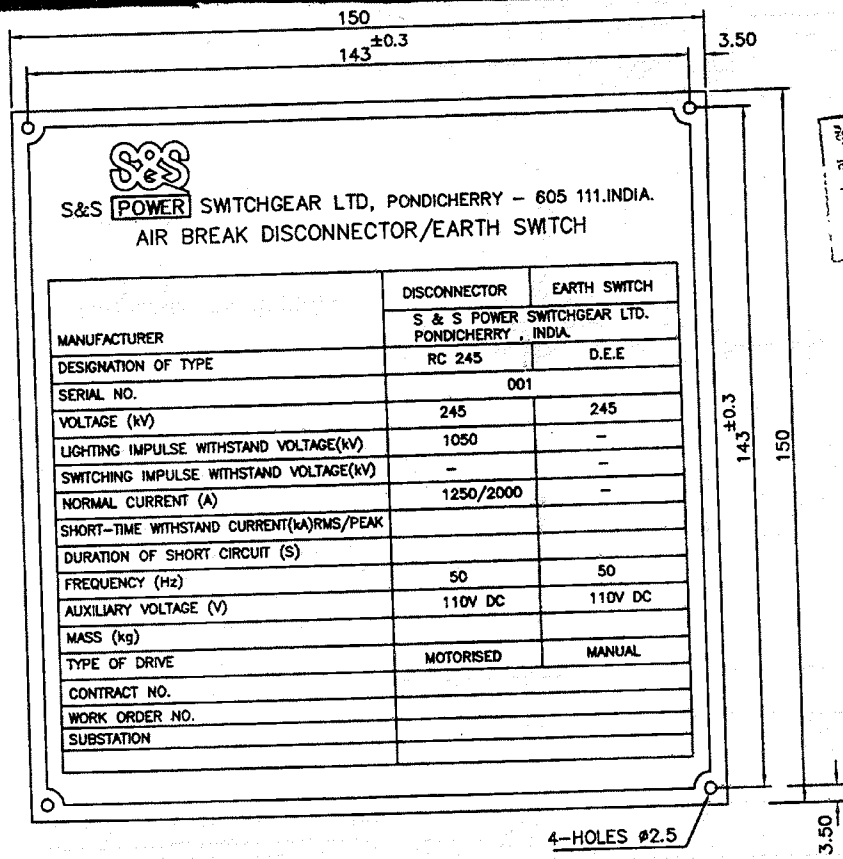
- SPRING DATA:**
- 1. MEAN DIA. : 11.2
  - 2. OUTER DIA. : 13
  - 3. NO. OF ACTIVE TURNS : 7 1/2
  - 4. TYPE : RH., ENDS SQUARED AND GROUND COMPRESSION
  - 5. LOAD AT 25.4 : 7.03 Kg.
  - 6. LOAD AT 22.225 : 10.9 Kg.

*[Signature]*  
 परीक्षण अभियन्ता / Test Engineer  
 उच्च शक्ति प्रयोगशाला / H. P. LAB  
 सी. पी. आर. आई. / CPRI  
 बंगलूरु / Bangalore

	SCALE	TITLE :	DRN.	CSN	03.05.07
	2:1	SPRING	CHD.	VUK	03.05.07
S & S POWER SWITCHGEAR LTD., PONDICHERRY - 605111 INDIA			APPD.	KS	03.05.07
			DRAWING NO.		REV. No.
			4UC9008/TTST		A-



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 नही किया गया है।  
 THE VERIFICATION OF THIS DRAWING  
 BY CEN IS LIMITED TO UNIVERSAL  
 CHECKS ONLY WHEREVER POSSIBLE

रिपोर्ट क्रमांक .....  
 रिपोर्ट Pertaining to  
 Report No. **HP2.08.222**

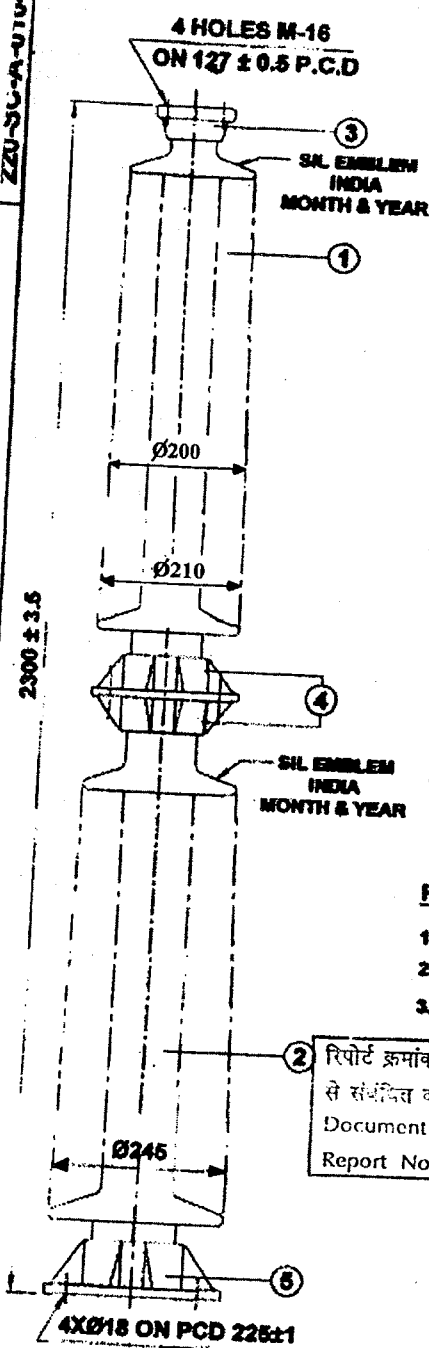
*[Signature]*  
 Test Engineer  
 H. P. LAB  
 CPRI

**NOTE:**  
 COLOUR OF LETTERS, LINES & 3.5mm BORDER : BLACK  
 BACK GROUND : WHITE  
 MATERIAL : ALU.(ANODIZED)  
 THICKNESS : 1.0mm

					SCALE	TITLE : NAME PLATE DETAIL FOR 245KV, 1250/2000A CENTRE BREAK DISCONNECTOR & EARTH SWITCH	DRN.	CSN	13.04.07
					1:1		CHD.	VJK	13.04.07
						APPD.	KS	13.04.07	
						DRAWING NO.		REV. No.	
						S & S POWER SWITCHGEAR LTD., PONDICHERRY - 605111 INDIA		3C6P005/TTST	B-
B-		SERIAL NUMBER 001 ADDED IN THE NAME PLATE DRAWING		18.10.08	CSN	NVR			
REV. NO.	DCH. NO.	CHANGE DETAILS		DATE	PRD.	APPD.			

ZZU-SC-A-0104

2300 ± 3.5



**GUARANTEED TECHNICAL PARTICULARS**

**GENERAL :**

- STANDARDS APPLICABLE : IS 2544 - 1973 / IEC : 60188 - 2001
- TYPE OF INSULATOR : SOLIDCORE POST TYPE
- NO. OF UNITS PER STACK
- MIN. NOM. CREEPAGE DISTANCE
- SHED PROFILES CONFORMS TO IEC 615-1986
- POROUS PARTS HOT-DIP GALVANIZED CONFORM TO IS-2633 - 1986/IEC:60188-2001
- GLAZE COLOUR - BROWN

**MECHANICAL VALUES :**

- ULTIMATE CANTILEVER STRENGTH
- ULTIMATE TORSIONAL STRENGTH
- ULTIMATE TENSILE STRENGTH
- ULTIMATE COMPRESSION STRENGTH

**ELECTRICAL VALUES :**

- NOMINAL SYSTEM VOLTAGE
- HIGHEST SYSTEM VOLTAGE
- DRY POWER FREQUENCY WITHSTAND VOLTAGE
- WET POWER FREQUENCY WITHSTAND VOLTAGE
- LIGHTNING IMPULSE WITHSTAND VOLTAGE (1.2 / 50 µSEC. WAVE)
- DRY POWER FREQUENCY FLASHOVER VOLTAGE
- WET POWER FREQUENCY FLASHOVER VOLTAGE
- IMPULSE FLASHOVER VOLTAGE (1.2 / 50 µ SEC) +VE / -VE WAVE
- VISIBLE (CORONA EXTINCTION) VOLTAGE
- RIV TEST DATA

**PACKING PARTICULARS :**

- NO. OF INSULATORS PER CRATE
- GROSS (PACKED) WEIGHT APPROX.
- PACKED VOLUME

2 रिपोर्ट क्रमांक .....  
से संबंधित दस्तावेज  
Document Pertaining to  
Report No. HP/L 08222

*(Signature)*  
परिष्कार अभियन्ता / Test Engineer  
उच्च शक्ति प्रयोगशाला / H. P. LAB  
सी. पी. जार. जार्ड. / CPRI  
बैंगलूरु / Bangalore

1) 11.07.05 RIV TEST DATA ADDED. 2) 22.07.06. D.A.D ADDED.

3,4,5	CAP & FLANGE	M.C.I. / S.G.J.	4	HOT - DIP - GALVANIZED
1 & 2	INSULATOR BODY	ALUMINA PORCELAIN KER - 110.2	2	BROWN / GREY GLAZED
SL. No.	DESCRIPTION	MATERIAL	No.OFF	FINISH
CUSTOMER REF.			SCALE	MAT. SEE TABLE
TITLE			NTS	P = 110 A = 130
220 / 245 KV SOLIDCORE POST INSULATOR (C6 - 1050 - CD - 25 mm / KV)			DRAWN	
			CHECKED	
			APPROVED	<i>(Signature)</i>
			DATE	02.05.04
SARAVANA INSULATORS LIMITED			DRG. NO.	REV.
Adminl. Office & Works : Cuddalore Road, P.N. Kuppam, Korhupalli Post Cuddalore Dist. 607 308 Tamil Nadu.			220-SC-A-0104	1

REV. 1 DATE : 22.05.04





Certificate No. : T-0661

# 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



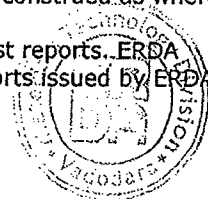
## TEST REPORT

SHEET 01 OF 08

<b>NAME &amp; ADDRESS OF CUSTOMER:</b>  <b>M/s. Aditya Birla Insulators (A Unit of Aditya Birla Nuvo Ltd.) P.O. Meghasar, Taluka-Halol, Dist. Panchmahals Gujarat- 389 330.</b>	<b>REPORT NO.:</b> RP-1314-026211 <b>DATE</b> : 19/03/2014	
	<b>CUSTOMER'S REF. NO. &amp; DATE:</b> 1] E-mail dated 27/02/2014 2] Challan Cum Invoice No. D3006 dated 28/02/2014	
	<b>DATE OF SAMPLE RECEIPT</b> 28/02/2014	<b>DATE OF TESTING</b> 03/03/2014 to 05/03/2014
<b>SAMPLE DESCRIPTION:</b>  <b>245 kV Solid Core Insulators - 2 Stacks Drawing No.: 987382 Rev. No. 0 dated 05/10/2010</b>	<b>SAMPLE IDENTIFICATION:</b>  <b>Embossed on the samples:</b> Stack 01: <b>Top Unit: "ABI INDIA 0114 18940"</b> <b>Bottom Unit: "ABI INDIA 0114 18067"</b> Stack 02: <b>Top Unit: "ABI INDIA 1213 31422"</b> <b>Bottom Unit: "ABI INDIA 1213 17960"</b>  <b>ERDA Sample Code No.:</b> ERDA-00036277 & ERDA-00036278	
<b>TEST DETAILS:</b> 1] Visual inspection 2] Verification of dimensions 3] Temperature cycle test 4] Mechanical failing load test i] Compressive test ii] Tensile test iii] Torsion test iv] Test for deflection under load v] Bending test 5] Galvanising test (Uniformity of Zinc coating & Coating mass) 6] Porosity test	<b>TEST SPECIFICATION:</b>  <b>For Test Procedure &amp; Requirement:</b> 1] IEC: 60168 Edition 4.2 2001-04 2] As per customer's requirement	
<b>REMARKS:</b> As per SHEET 02 OF 08		
 <b>PREPARED BY</b>	 <b>CHECKED BY</b>	 <b>APPROVED BY</b>

- Note:**
1. This report relates only to the particular sample(s) 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 the tests asked for by the customer have been carried out.
  5. In case of any dispute, Vadodara will be the exclusive jurisdiction & shall be construed as where the cause has arisen.

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TM 1373601



Certificate No. : T-0661

## ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

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Fax : +91 (0265) 2638382

E-mail : erda@erda.org

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



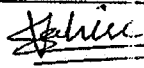
TEST REPORT NO.: RP-1314-026211

SHEET 02 OF 08

DATE : 19/03/2014

### REMARKS:

- 1] Both the samples conform to the requirement of Visual inspection, Verification of dimensions, Temperature cycle test, Mechanical failing load test [Compressive test, Tensile test, Torsion test & Bending test], Galvanising test (Uniformity of Zinc coating & Coating mass) & Porosity test.
- 2] '#' As mentioned in customer's drawing.
- 3] '\*\*' As requirement is not known, remark for conformity has not been given for Test for deflection under load.
- 4] Testing was witnessed by Mr. Sandeep Surve, Sr. Officer, Marketing of M/s. Aditya Birla Insulators.
- 5] Certified drawing has been attached.
- 6] Photograph of samples has been enclosed as per SHEET 08 OF 08.

  
PREPARED BY

  
CHECKED BY



TM 1373602



Certificate No. : 1-0661

# ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

(Accredited by the National Accreditation Board for Testing and Calibration Laboratories, Govt. of India)  
ERDA Road, Makarpura Industrial Estate, Vadodra-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



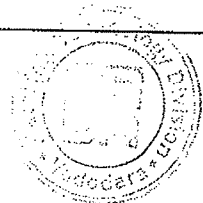
TEST REPORT NO.: RP-1314-026211

SHEET 03 OF 08

DATE : 19/03/2014

Sr. No.	Particular of Tests & Cl. No.	Requirement as per Specification	Obtained Value/ Observation	Remarks
1.	<b>Visual inspection</b> [Cl. No. 5.8] Stack 01          Stack 02	The insulator shall have hard, smooth crack free glaze & it should be free from other defects prejudicial to satisfactory performance in service. The insulator shall be free from physical distortion of shape within tolerance specified.	The insulator had hard, smooth crack free glaze & it was also free from other defects prejudicial to satisfactory performance in service. The insulator found free from physical distortion of shape within tolerance specified. The insulator had brown glaze.  The insulator had hard, smooth crack free glaze & it was also free from other defects prejudicial to satisfactory performance in service. The insulator found free from physical distortion of shape within tolerance specified. The insulator had brown glaze.	Conforms          Conforms
2.	<b>Verification of dimensions</b> [Cl. No. 5.1] Stack 01 Stack 02	As per given drawing No. 987382 Rev. No. 0 dated 05/10/2010	Conforms to drawing Conforms to drawing	Conforms Conforms
3.	<b>Temperature cycle test</b> [Cl. No. 5.4] Stack 01       Stack 02	No crack, no damage to glaze and no loosening of metal parts shall be observed after temperature cycle test & shall pass mechanical failing load test, after temperature cycle test.	No crack, no damage to glaze and no loosening of metal parts was observed after temperature cycle test and passed in mechanical failing load test.  No crack, no damage to glaze and no loosening of metal parts was observed after temperature cycle test and passed in mechanical failing load test.	Conforms       Conforms
<p><i>[Signature]</i> <b>PREPARED BY</b></p>		<p><i>[Signature]</i> <b>CHECKED BY</b></p>		

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Certificate No. : T-0661

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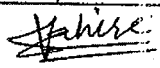
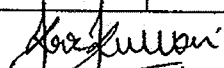
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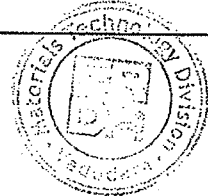


TEST REPORT NO.: RP-1314-026211

SHEET 04 OF 08

DATE : 19/03/2014

Sr. No.	Particular of Tests & Cl. No.	Requirement as per Specification	Obtained Value/ Observation	Remarks
<b>4. Mechanical failing load test after temperature cycle test</b>				
i.	<b>Compressive test</b> [Cl. No. 5.2.7]  Stack 01 Top Unit	The insulator shall withstand minimum compressive load of 27000 kgf#	Withstood	Conforms
			Withstood	Conforms
ii.	<b>Tensile test</b> [Cl. No. 5.2.6] (After Compressive test)  Stack 01 Top Unit	The insulator shall withstand minimum tensile load of 13000 kgf#	Withstood	Conforms
			Withstood	Conforms
iii.	<b>Torsion test</b> [Cl. No. 5.2.5] (After tensile test)  Stack 01 Top Unit	The insulator shall withstand minimum torsion load of 500 kgf.m#	Withstood	Conforms
			Withstood	Conforms
 <b>PREPARED BY</b>		 <b>CHECKED BY</b>		



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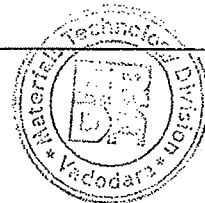
Certificate No. : 1-0661

TEST REPORT NO.: RP-1314-026211

SHEET 05 OF 08

DATE : 19/03/2014

Sr. No.	Particular of Tests & Cl. No.	Requirement as per Specification	Obtained Value/ Observation	Remarks
iv.	<b>Test for deflection under load##</b> [Cl. No. 5.3] (After Torsion test) Stack 01 i] 20 % of Bending load (i.e. 160 kgf) ii] 50 % of Bending load (i.e. 400 kgf) iii] 70 % of Bending load (i.e. 560 kgf)  Stack 02 i] 20 % of Bending load (i.e. 160 kgf) ii] 50 % of Bending load (i.e. 400 kgf) iii] 70 % of Bending load (i.e. 560 kgf)	*	Deflection observed 16 mm  25 mm  35 mm  Deflection observed 18 mm  28 mm  39 mm	*
v.	<b>Bending test</b> [Cl. No. 5.2.4] (After Test for deflection under load) Stack 01 Top Unit  Stack 02 Top Unit	The insulator shall withstand minimum bending load of 800 kgf#	Withstood & further load was increased and sample broke at bending load of 1279.8 kgf (12.55 kN)  Withstood & further load was increased and sample broke at bending load of 1019.7 kgf (10.00 kN)	Conforms  Conforms
 <b>PREPARED BY</b>		 <b>CHECKED BY</b>		



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TEST REPORT NO.: RP-1314-026211

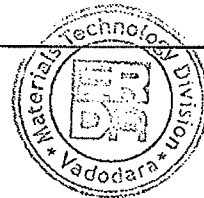
SHEET 06 OF 08

DATE : 19/03/2014

Sr. No.	Particular of Tests & Cl. No.	Requirement as per Specification	Obtained Value/ Observation	Remarks
<b>5. Galvanising test</b>				
i.	<b>Uniformity of Zinc coating</b> [Cl. No. 5.7 & As Per customer's req.] On metal component: Stack 01	No deposition of Copper shall be observed after dipping in Copper Sulphate solution for 4 dips, one minute each.		
	Top Unit			
	i) Top Flange		No Copper deposition was observed.	Conforms
	ii) Bottom Flange		No Copper deposition was observed.	Conforms
	Bottom Unit			
	i) Top Flange		No Copper deposition was observed.	Conforms
	ii) Bottom Flange		No Copper deposition was observed.	Conforms
	Stack 02			
	Top Unit			
	i) Top Flange		No Copper deposition was observed.	Conforms
	ii) Bottom Flange		No Copper deposition was observed.	Conforms
	Bottom Unit			
	i) Top Flange		No Copper deposition was observed.	Conforms
	ii) Bottom Flange		No Copper deposition was observed.	Conforms
<b>PREPARED BY</b>		<b>CHECKED BY</b>		

PREPARED BY

CHECKED BY



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Certificate No. : 7-0661

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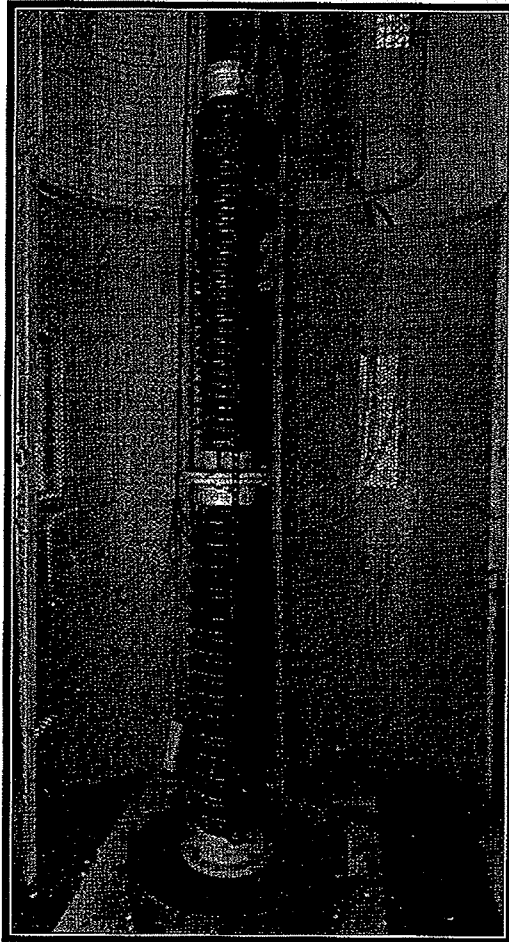


TEST REPORT No.: RP-1314-026211

DATE : 19/03/2014

SHEET 08 OF 08

## Photograph of samples



*[Signature]*

PREPARED BY

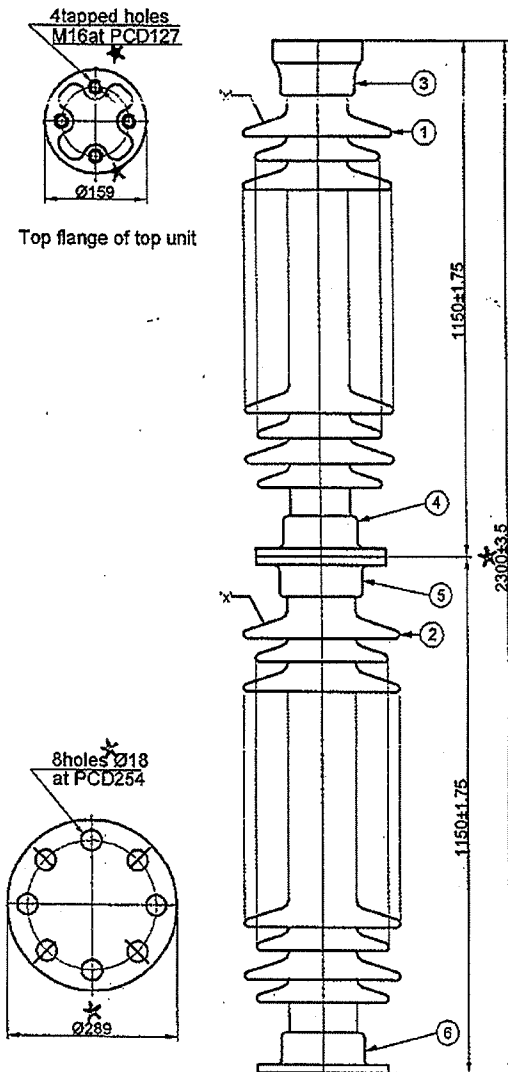
*[Signature]*

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TM 1373608



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REV.	DATE	DESCRIPTION

**TECHNICAL DATA**

Applicable Standards IS:2544, IEC:60168, IEC:60273, IEC:60815

**DIMENSIONS**

Height	mm	2300±3.5
Min. Creepage Distance	mm	6125*
Protected Creepage Distance	mm	2600
Dry arcing distance	mm	1945
Heavy Polluted	Level III (Heavy Polluted)	

**MECHANICAL VALUES**

Carrier Strength	kgf.	800
Torsional Strength	kgfm	500
Tension Strength	kgf	13000
Compression Strength	kgf	27000

**ELECTRICAL VALUES**

Nominal System Voltage	kV	220
Highest System Voltage	kV	245
P.F. Withstand Voltage	Dry kV	510
	Wet kV	460
P.F. Flashover voltage	Dry kV	625
	Wet kV	570
Impulse Withstand Voltage	+ve/-ve kVp	1050
Impulse Flashover Voltage	+ve kVp	1210
	-ve kVp	1450
Corona extinction voltage	(min.) kV	156
Switching impulse withstand voltage	kVp	NA
P.F. Puncture Voltage	Puncture proof	

**RIV TEST**

Test voltage to ground	kV	156
Max. RIV at 1000KHz	µV	500

**PACKING DETAILS**

Net Weight (approx)	Kg	155
---------------------	----	-----

**Notes:-**

Shed profile meets all the requirements of IEC:60815  
 Name of Mfg., trade mark, month & year of Manufacture., Sr.no. to be marked at "X"  
 All ferrous parts to be hot dip galvanized as per IS:2633, IS:4759  
 Galvanized Thickness shall be - Avg. 86 micron minimum.  
 Intermediate interconnecting Nut, Bolt & Washers (Galvanized) shall be supplied, in case of Multiunit stacks.  
 View of actual metal part / porcelain may vary from the view shown in the drawing.  
 Colour of glazed BROWN / GREY  
 Top & Bottom PCD shall be provided as per Customer's Requirement.  
 Standard PCD's used are Ø127 mm for Top & Ø 254 mm for Bottom Fitting.

Test Report No. RP-1314-026211  
 Date 19/03/2014  
 Product 245KV solid core post insulators - 2 stacks  
 Verified By [Signature]  
 Verification Of this Drawing by LRDA is limited to relevant dimensional checks verified dimensions are marked with \*

SR NO.	DESCRIPTION	DRG. No.	WEIGHT	MATERIAL	QTY.	REMARKS
9	Spring washer M16			SS Galv	4	
10	Flat washer M16			MS HDG	8	
7	Hex. bolt & nut M16X60			MS HDG	4	
6	Bottom flange			SGI-HDG	1	
5	Intermediate flange-2			SGI-HDG	1	
4	Intermediate flange-1			SGI-HDG	1	
3	Top flange			SGI-HDG	1	
2	Porcelain shell II			Porcelain	1	
01	Porcelain Shell-I			Porcelain	01	

TITLE	DRN	Gpandtal	05/10/2010	PROJECTION
245KV. SOLID CORE INSULATORS	CKD	DBC	05/10/2010	
	APD	DBC	05/10/2010	
REF:- TYPE TEST	ALL DIMENSIONS ARE IN mm.			SCALE: NTS
Drg. No.			Rev.No.	


Grey :2	980038
Brown:1	987382
Finish Code	
Product code	

**ADITYA BIRLA INSULATORS**  
 HALOL - INDIA



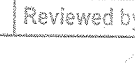
987382

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POWERGRID CORPORATION OF INDIA LIMITED, ±800kV, 6000MW HVDC Raigarh – Pugalur Terminals Station Name : Raigarh							Doc No : WO2973/TTRS/95 Rev 01 Date : 10.02.2018	
Type Test Summary Reports for 95kV DC Disconnectors and Earthing Switches								
Sl. No.	Test requirements	Value requested	Test report Number	Date of test	Tested value	Tested equipment	Status/Notes	Remarks
1	Power frequency voltage withstand test dry	-	-	-	-	-	Not applicable	-
2	Lightning impulse withstand test	644kV	43/1/2007- HV/4368/S&S	21.08.2007	1050kVp	RC245	-	Submitted for approval.
3	Wet DC withstand test	141kV				-		Test to be conducted at CPRI Hyderabad
4	Switching impulse withstand voltage	-	-	-	-	-	Not applicable for this rating.	-
5	Partial discharge test	-	-	-	-	-	Disconnectors are provided with air insulations and it is all supported with porcelain insulators. There is no organic materials are used. Hence not applicable.	-
6	Test on auxiliary and control circuit	2kV for One Minute	003EATDIP15S0091	01.04.2015	2kV for One Minute	MGB		POWERGRID Approval received vide letter ref: CC/ENGG/ER/BGCL/AIS/145&3 6KV ISO/TTR dated 20.10.2015
7	Radio interference voltage (RIV) test	-	-	-	-	-	Not applicable	-
8	Measurement of the resistance of the main	-						Test to be conducted at SSPSE Puduchery facility.


 पावर गिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड  
 POWER GRID CORPORATION OF INDIA LIMITED  
 ± 800kV, 6000MW HVDC Terminals Associated With HVDC Bipolar Link Between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)

Approved in Category : **I** | **II** | **III** | **IV**

Checked by	Verified by	Reviewed by
Signature : 		
Date : 10/9/18		

Cat II

POWERGRID CORPORATION OF INDIA LIMITED,  
±800kV, 6000MW HVDC Raigarh – Pugalur Terminals  
Station Name : Raigarh

Doc No : WO2973/TTRS/95 Rev 01  
Date : 10.02.2018

**Type Test Summary Reports for 95kV DC Disconnectors and Earthing Switches**

Sl. No.	Test requirements	Value requested	Test report Number	Date of test	Tested value	Tested equipment	Status/Notes	Remarks
9	Temperature rise test	2316amps						Test to be conducted at SSPSE Puducherry facility.
10	Short time and peak withstand current test	For Main Switch	7.2 kA 18kAp	HPL07179	06.09.2007	40kA 100kAp	RC245	Submitted for approval.
		For Earth Switch	7.2 kA 18kAp	HPL08222	06.01.2009	40kA 100kAp	RC245	POWERGRID Approval received vide letter ref:C/ENGG/CORE/S&S/ISOLATORS dated 10.03.2011
11	Operating and mechanical endurance test	For Main Switch	M2 for DS	8112431725-100-SS-01	20.05.2015 to 27.05.2015	M2	RC245	Submitted for approval.
		For Earth Switch	M0 for ES	8108276112-100-KPS-04	26.09.2011 to 28.09.2011	-	RD245	Even though the test conducted with double break isolator. The earth switch design is common hence this report is valid. Submitted for approval.
12	Operation under severe ice conditions	-	-	-	-	-	-	Not Applicable
13	Locked blade test on close and open positions	-	-	-	-	-	-	Test will be conducted by blocking the main drive linkages during customer inspection.
14	IP 55 Test on operating mechanism box	IP55	003EATDIP15S0091	01.04.2015	IP55	MGB	Same is applicable for Manual operating mechanism also.	POWERGRID Approval received vide letter ref: CC/ENGG/ER/BGCL/AIS/145&36KV ISO/TTR dated 20.10.2015
15	Electromagnetic compatibility test	-	-	-	-	-	-	Not applicable since there are no electronic components in our equipment