

Document Title	Specification for 11 kV AB switch (400 A & 200 A)	
Document No.	ENG-ELC-011	Issue Date: 01-05-2022
Revision No.	00	Page 1 of 16
Prepared by: Ranjan Kumar Sahoo	Reviewed By: Priya Kumar Sharma	Issued By: Mahendra Kumar Pandey

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1. SCOPE

This specification covers design, manufacturing, testing at manufacturer's works, inspection, packing & delivery of 11 KV Air Break Switch with accessories for out-door installation for use on transformer centers and tap line in Southern Odisha. Aforesaid item(s) shall include loading and unloading at anywhere in Odisha.

It is not the intent to specify completely herein all the details of design and construction of Air Break Switches. However, AB Switches will conform in all respects to high standards of engineering design and workmanship and shall be capable of performing in continuous Commercial operation up to the supplier's guarantee, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any material, which in his judgment i.e. not in accordance with the specifications/drawings.

The A. B. Switches offered shall be complete with all components necessary for its effective and trouble-free operation along with associated equipment etc. such components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in the specification and/or in order or not. Also similar parts particularly removable ones shall be inter-changeable.

2. APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian, International Standards and shall conform to the regulations of the local authorities:

Ref. IS	Description
IS 9920 (part-I to V)	Specification for helically formed fittings for Overhead lines up to 33 kV
IS 2633 (Part 1)	Method for testing uniformity of coating on zinc coated
IS 2544	Porcelain post insulators for systems with nominal voltage greater than 1000 V olts [ETD 6: Electrical Insulators and Accessories]
IEC 61109	Insulators for overhead lines - Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V - Definitions, test methods and acceptance criteria

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IEC 60168:1994+AMD1: 1997+AMD2:2000 CSV	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V
IS 9530	Recommended practice for silver plating
IS 5925	Recommended practice for silver plating for general engineering purposes
BS 2816	Testing of silver plating thickness
IS 1239	GI pipe('B' class or Medium class)
IS: 5561	Electrical Power Connectors

3. CLIMATIC CONDITIONS OF THE INSTALLATION

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temp	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	95%
5	Average Annual Rainfall	1500 mm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPSODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed upto 300 Kmph. The atmosphere is generally laden with mild acid, dust in suspension during the dry months, and is subjected to fog in cold months.

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4. GENERAL TECHNICAL REQUIREMENTS

SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE	
		400 Amps AB Switch	200 Amps AB Switch
1	Rating of AB Switch	400 Amps AB Switch	200 Amps AB Switch
1.a	Reference standards (latest amend.)	IS 9920, IEC 129, IEC 61109, IS 1239	
2	Installation	Outdoor	Outdoor
3	Suitable for Mounting	Horizontal Rotating Type	
4	Type	3 Pole	3 Pole
5	Service Voltage	11 kV	11 kV
6	Rated Voltage	12 kV	12 kV
7	Rated Frequency	50 Hz	50 Hz
8	Current Carrying Capacity	400 Amps	200 Amps
9	Rated short time current	16 kA for 1sec	16 kA for 1sec
10	Rated peak withstand current	40 kA	40 kA
11	Rated main active load breaking capacity	10 Amp	10 Amp
12	Rated line charging breaking capacity	2.5A	2.5A
13	Rated Transformer off load breaking Capacity	6.3A	6.3A
14	One minute power frequency withstand voltage Dry	35kV RMS	35kV RMS
15	One minute power frequency withstand voltage Wet	35kV RMS	35kV RMS
16	Dry flashover Voltage	55kV	55kV
17	Power Frequency puncture withstand voltage	1.3 times of actual dry flashover Voltage	
18	Visible Discharge Voltage	9kV RMS	
19	1 Minute Power Frequency withstand voltage between pole and earth	28kV	28kV
20	1 Minute Power frequency withstand voltage across the isolation distance	32kV	32kV
21	Impulse withstand voltage for positive and negative polarity (1.2 / 50) micro second wave)		
a	Across Isolating distance	85kV Peak	85kV Peak
b	To earth and between poles	75kV Peak	75kV Peak
22	No. of Post Per Pole (Polymeric, IEC 61109)	2	2
23	Total No. of post	6	6
24	Minimum Creepage Distance	320 mm	320mm
25	Phase to Phase Clearance	760mm	760mm
26	Isolation Distance in switch open condition	380mm	380 mm
27	Vertical clearance from Top of Insulator cap to mounting channel	254mm (min)	254mm (min)

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE	
28	Copper contacts Temp in Air should not exceed	65Degree	65 Degree
29	Size of fixed contacts (Copper Type Electrolytic with silver plated)	80mmx50mmx8mm	70mmx35mmx6mm
30	Size of Moving contacts (Copper Type Electrolytic with silver plated)	220mmx50mmx8mm	220mmx35mmx6mm
31	Moving Contact supporting Angle	50mmx50mmx5mm	45mmx45mmx5mm
32	Size of rods used for arcing horns	10 mm	10 mm
33	Insulation for tinned Copper braid/rope	Polyolefin, (RSFR-H) type	Polyolefin, (RSFR-H) type
34	Copper Flexible BRAIDED Tape - 320mm Long, Tined plated with Brass Nut, bolt & Washers	450gm /Mtr	450gm /Mtr
35	Minimum size*Length of Coupling Hot Dip GI Solid Pipe for Phase coupling pipe, B Class (Nominal Bore)	25mm Dia &1800 mm long	25mm Dia &1800mm long
36	Operating Down Pipe, B class (IS 1239) (Nominal bore)	32mm Dia & 7Mtr Long (one piece)	32mm Dia & 7Mtr Long (one piece)
37	Temperature Rise Limit (w.r.t ambient temp) - Tinned Copper contacts - Terminals - Metal Parts	50°C 40°C 40°C	50°C 40°C 40°C
38	Bearings	4 nos. self-lubricating bearing to be provided with grease nipple including 4 th bearing being a thrust bearing.	
39	Locking arrangement	Provision for pad locking at both 'ON' & 'OFF' Position	
40	Earth Terminal	M12 Bolts with nuts and flat washer shall be provided at base channel as earthing Terminal.	
41	'T' Connection	The T connection provided on the channel having 'moving contact' shall be G.I Nut & bolt at the bottom end to facilitate replacement of this unit only during requirements & avoid entire change of arm.	
42	'I' bolt	The I bolt shall be longer with 75 mm thread.	
43	Mounting Channel HDG 86 microns	75x40x4.8 mm Length 480 mm min. (C/C slotted hole 18x 36 mm- 250mm)	
44	Connectors	Connectors shall be of hard drawn electrolytic copper or brass. The connector should be of 4 bolted type and suitable for 80- 100 sqmm AAC conductor. Or SOCKET: Two no. of bimetallic copper sockets shall be used at both ends suitable for 80-100 sqmm AAC conductor.	

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SL. NO.	TECHNICAL PARTICULARS	DESIRED VALUE
45	Marking/Engraving	TPSODL, Serial No., Manufacture's name or trademark, Month & Year of Manufacturing.

5. GENERAL CONSTRUCTIONS/REQUIREMENTS

- The Air break switch shall be outdoor type, rotating type gang operated and shall be suitable for horizontal installation having 2 no. of polymeric post insulators per phase.
- The Rotating type operating mechanism shall be suitable for manual operation from ground level and shall be designed in such way that all the three phases shall open and close simultaneously in smooth way.
- The air break switch shall be with the arcing horns, the sizes of the rods used for the arcing horns would be 10mm for 400 A and 8mm for 200 A AB switch of M.S. Hot dip galvanized.
- The current carrying connectors should be two-bolt type having nuts and bolts, with spring washer and plane washer.
- Each joint shall be provided with one plane and one spring of not less than 2mm thickness.
- Connectors shall be of H D electrolytic copper.
- The minimum cross section for fixed contact shall be 400 sq.mm for 400 Amp AB Switch and 200 sq.mm for 200 Amp AB Switch.
- Tinned Copper braid/rope shall be insulated by Polyolefin (RSFR-H) type to prevent animal electrocution. It shall be 320 mm long minimum and shall weigh 450 G/M. It shall be punched at both ends.
- All ferrous parts shall be hot dip galvanized with heavy coating after proper surface treatment as per standards. Coating thickness shall not be less than 86micron at any point.
- All Copper parts shall be silver plated as per relevant standards and coating thickness not less than 10 microns at any point.
- Equipment grounding shall be provided by bidder at two points with terminals. .
- All the nut bolt used must be Hot dip Galvanized and of size not less than M10.
- A rigid base of galvanized steel channel of size approx.75x40x4.8 mm Length 480 mm min. (C/C slotted hole 18x 36 mm- 250mm shall be provided with clamps and bolts for Horizontal mounting firmly on steel structure.
- Each member of the switch shall be free from Rust, sharp edges, burr and any kind of deformation.
- The phase coupling rod, operation rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operation mechanism with 'ON' & 'OFF' positions shall be provided.
- The operation rod shall be medium gage of 32mm diameter nominal bore G.I. pipe single length 7 meters. The phase coupling rod for gang operation shall be of medium gauge 25mm dia &2100 mm length nominal bore G.I. pipe.

Technical particulars	400 Amps AB Switch	200 Amps AB Switch
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Switching Blades	It shall be made out of electrolytic copper with silver plated. The approximate size shall be 250mm x50 x 8mm for 11 KV. The switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.	It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mm X 35X 6mm. The Switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.
Fixed Contacts	The fixed jaw type female contacts (80x50x8)mm for 11 KV shall be made of electrolytic copper (minimum 95 % copper composition) duly electroplated controlled by phosphorus bronze/Stainless Steel high pressure spring housed in robust G.I. Cover. It is essential that provision shall be made in fixed female contacts to take the shock arising from the closing of moving contact blade without the same being transmitted to the post insulator.	The Fixed Jaw type female contacts of size (70x35x6) mm shall be made of electrolytic copper(minimum 95% copper composition) duly silver coated controlled by phosphorous bronze/Stainless steel high pressure spring housed in robust G.I. Cover. It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of move contract blade without thesame being transmitted to the post insulator.
Terminal Connectors	Terminal connectors for both movable and fixed should be of copper flats of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 80 mm x 50 x 8 mm and the size of movable connector shall be size 80 x 50 x 8 mm with machine finishing duly silver plated with 2 nos. of 3/8" stainless steel bolts, nuts, plain washers & spring washers should be provided along with 2 nos solder less bimetallic sockets for each connector suitable up to 80- 100 mm ² AAA conductor.	Terminal connectors shall be robust in design. The size of fixed connector shall be (65 X 35 X 6 mm) and size of movable connector shall be of (65 X 35) X (65 X 35) X 6mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95% copper composition with 2 nos. 12mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2nos.bimetallic solder less sockets suitable up to 80-100 mm ² conductor.

6. MARKING

Below parameters should be embossed on SS sheet of thickness 1mm with black background.

It should be riveted on MS channel of AB switch:

1. Rated Voltage
2. Manufacturer's Name
3. Month/Year of Manufacture
4. Serial Number
5. PO no.
6. Rated normal current in Amps Amps
7. Rated one second short-time current in

7. TESTS CERTIFICATE

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7.1 Type Test

The A.B. switches shall be subjected to the following type tests in accordance with clause No. 6 of IS-9920 (Part-1)/2002.

- (i) Tests to prove that the temperature rise of any parts does not exceed the values specified in part-2 of this standard.
- (ii) Tests to prove the capability of the switch to carry the rated peak withstand current and the rated short time current.
- (iii) Measurement of the resistance of the main circuit.
- (iv) Tests to prove the ability of the switch to make and break the specified currents.
- (v) Tests to verify the insulation level including withstand tests at power frequency voltages on auxiliary equipment if any. Di-electric tests include impulse withstand tests, power frequency voltage withstand tests, and power frequency voltage withstand tests.
- (vi) Tests to prove satisfactory operation and Mechanical endurance.
- (vii) Tests to prove the integrity of the external insulation under conditions of the air pollution.

Note 1: The type test certificate should not be more than 5 years old as on due date of opening of tender.

Note 2: Type test certificate of polymeric post Insulator shall be submitted and shall be issued from CPRI/ERDA or Government lab only.

7.2 Acceptance Tests

The following acceptance test should be carried out as per IS: 9920 (P4/1985) on number of samples selected from the offered lot.

- (i) Visual Inspection.
- (ii) Checking of Dimensions (of all parts as per the approved drawing).
- (iii) Power frequency voltage dry test.
- (iv) Measurement of the resistance of the main circuit.
- (v) Test to prove satisfactory operation
- (vi) Galvanizing test as per IS: 2633.
- (vii) Temperature rise test.

7.3 Routine Tests:

Supplier shall provide a control plan, which will be implemented on AB switches. Routine test reports should be submitted by the manufacturer with inspection call.

The following routine tests as outlined in clause No.4 of IS: 9920 (Part4/1985) shall be carried out by the manufacturer on each unit to check certain essential requirements.

- i) Power frequency voltage dry tests.
- ii) Measurement of the resistance of the main circuit.
- iii) Test to prove satisfactory operation.

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The tenderer shall clearly indicate what testing facilities are available in the works of manufacturer & whether facilities are adequate to carry out all Acceptance & Routine Tests. These facilities should be available to TPSODL's representative if deputed or carry out or witness the tests in the manufacturer works.

8. TESTS

Along with the bid, the bidder must submit Type Test Reports on Ab switches as per this technical specification, carried out within last five years from the date of opening of techno-commercial bid of the tender from CPRI/ERDA labs only. Otherwise the tender may be rejected.

9. PRE DISPATCH INSPECTION

The Material shall be subject to inspection by a duly authorized representative of the TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall always grant free access to the places of manufacture to TPSODL's representatives when the work is in progress. Inspection by the TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPSODL. Following documents shall be sent along with material

- a. Test reports
- b. MDCC issued by TPSODL
- c. Invoice in duplicate
- d. Packing list
- e. Drawings & catalogue
- f. Guarantee / Warrantee card
- g. Delivery Challan
- h. Other Documents (as applicable).

10. INSPECTION AFTER RECEIPT AT STORES

The material received at TPSODL store will be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to Project Engineering department.

11. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process/ manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect

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is found by the Purchaser up to a period of at least 12 months from the date of commissioning or 24 months from the date of last supplies made under the contract whichever is later, (the time scale of 12/24 months could be enhanced subject to mutual agreements). Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for 'free replacement' for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12. PACKING

Bidder shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.

13. TENDER SAMPLE

Bidder shall submit the sample of material with the offer (in case of first supply to TPSODL).

14. QUALITY CONTROL

The bidder shall submit with the offer Quality Assurance Plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections. The bidder shall ensure that the material supplied is as per the Guaranteed Technical Particulars as specified in the specifications.

15. MINIMUM TESTING FACILITIES

Bidder shall have adequate in-house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards.

16. MANUFACTURING ACTIVITIES

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be

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submitted within 15 days from the release of the order.

17. SPARES, ACCESSORIES AND TOOLS

Not applicable.

18. DRAWINGS AND DOCUMENTS

Following documents shall be prepared based on TPSODL specifications and statutory requirements with complete BOM and shall be submitted with the bid:

- a. Completely filled in Technical Particulars.
- b. General description of the equipment and all components including brochures.
- c. Type test Certificates
- d. Experience List.

After the approval of the contract, four (4) copies of the drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval and shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy of all the drawing, GTP, test certificates shall be submitted after the final approval of the same to the purchaser.

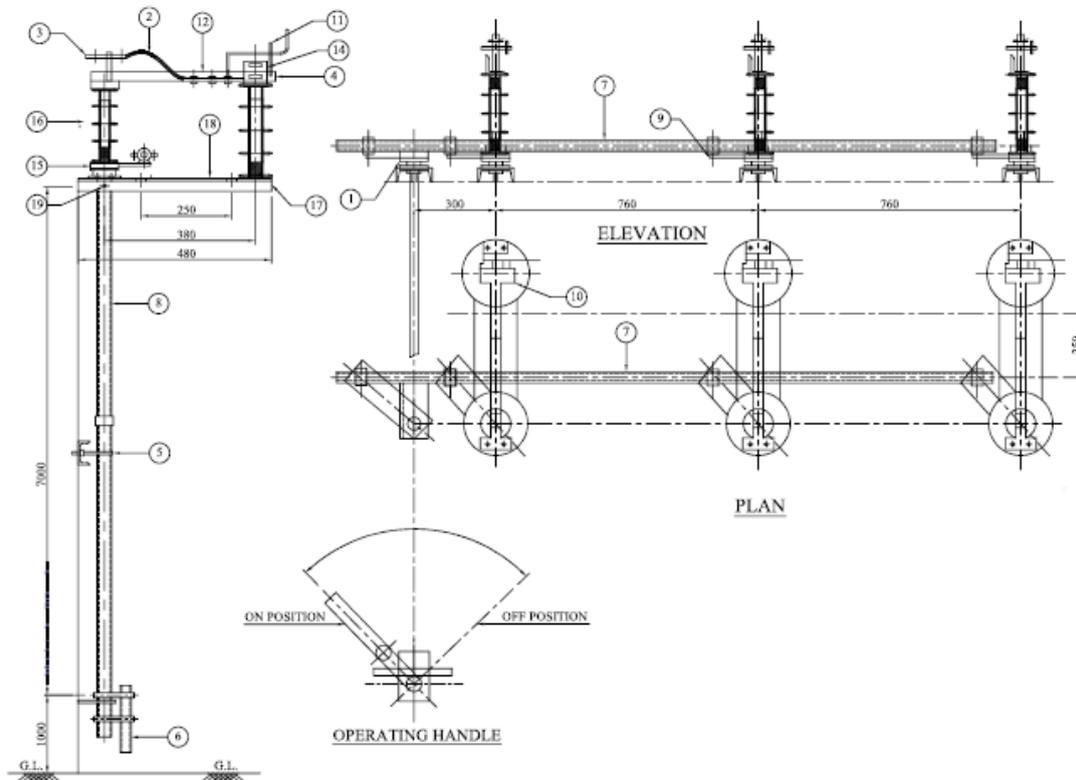
Following Drawings/Documents shall be submitted after the award of the contract.

S. No	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	Manual/Catalogues/drawings for all components.		√	
3	Technical details and test certificates.		√	√
4	Installation Instructions		√	√
5	Transport/shipping dimension drawing		√	√
6	QA & QC Plan	√	√	√
7	Routine, Acceptance and Type test Certificates	√	√	√

All the Documents and Drawings shall be in English Language.

Instruction Manuals: Bidder shall furnish two (2) soft copies (CD) and four (4) hard copies of nicely bound manual (in English Language) covering erection and maintenance instructions and all relevant information pertaining to the main equipment as well as auxiliary devices.

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Indicative drawing of 11 KV 400 A and 200 A AB Switch

19. GUARANTEED TECHNICAL PARTICULARS

The GTP is to be furnished by the Bidder in following format.

SL. NO.	TECHNICAL PARTICULARS	OFFERED VALUE(TO BE FILLED BY BIDDER)	
		400 Amps AB Switch	200 Amps AB Switch
1	Rating of AB Switch	400 Amps AB Switch	200 Amps AB Switch
1.a	Reference standards (latest amend.)	IS 9920, IEC 129, IEC 61109,IS 1239	
2	Installation		
3	Suitable for Mounting		
4	Type		
5	Service Voltage		
6	Rated Voltage		
7	Rated Frequency		
8	Current Carrying Capacity		
9	Rated short time current		
10	Rated peak withstand current		
11	Rated main active load breaking capacity		
12	Rated line charging breaking capacity		
13	Rated Transformer off load breaking Capacity		
14	One minute power frequency with stand voltage Dry		

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SL. NO.	TECHNICAL PARTICULARS	OFFERED VALUE(TO BE FILLED BY BIDDER)	
15	One minute power frequency withstand voltage Wet		
16	Dry flashover Voltage		
17	Power Frequency puncture withstand voltage		
18	Visible Discharge Voltage		
19	1 Minute Power Frequency withstand voltage between pole and earth		
20	1 Minute Power frequency withstand voltage across the isolation distance		
21	Impulse with stand voltage for positive and negative polarity (1.2 / 50) micro second wave)		
a	Across Isolating distance		
b	To earth and between poles		
22	No. of Post Per Pole (Polymeric, IEC 61109)		
23	Total No. of post		
24	Minimum Creepage Distance		
25	Phase to Phase Clearance		
26	Isolation Distance in switch open condition		
27	Vertical clearance from Top of Insulator cap to mounting channel		
28	Copper contacts Temp in Air should not exceed		
29	Size of fixed contacts (Copper Type Electrolytic with silver plated)		
30	Size of Moving contacts (Copper Type Electrolytic with silver plated)		
31	Moving Contact supporting Angle		
32	Size of rods used for arcing horns		
33	Insulation for tinned Copper braid/rope		
34	Copper Flexible BRAIDED Tape - 320mm Long, Tined plated with Brass Nut, bolt & Washers		
35	Minimum size*Length of Coupling Hot Dip GI Solid Pipe for Phase coupling pipe, B Class(IS 1239)(Nominal Bore)		

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SL. NO.	TECHNICAL PARTICULARS	OFFERED VALUE(TO BE FILLED BY BIDDER)	
36	Operating Down Pipe, B class (IS 1239)(Nominal Bore)		
37	Temperature Rise Limit (w.r.t ambient temp) - Tinned Copper contacts - Terminals - Metal Parts		
38	Bearings		
39	Locking arrangement		
40	Earth Terminal		
41	'T' Connection		
42	'I' bolt		
43	Mounting Channel HDG 86 microns		
44	Connectors		
45	Marking/Engraving		

20. SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

SL. No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Signature
Designation