



# Kashmir Power Distribution Corporation Ltd.

Office of the Chief Engineer Planning & Procurement,  
PDD Complex Bemina Srinagar,  
Tel: 0194-2493280, 0194-2493281, Email:  
[ceppkpdcl@gmail.com](mailto:ceppkpdcl@gmail.com)

## TECHNICAL SPECIFICATIONS OF

### 11 kV Air Break Switch

Prepared By	Checked by	Checked by	Checked by	Approved by
1. Er. Ruheela Tabasum AEE, Planning Divi.1st. 2.Er.Nusrat Gul AEE, Planning Divi.1st. 3.Tasheen Hakani (JE) 4.Beenish Rashid Kirmani (J E)	Er. Manzoor Ahmad Dar, Executive Engineer, Planning Division 1 <sup>st</sup> KPDCL.	Er. Muzaffar Mukhtar, Shah Superintending Engineer, Planning Circle , KPDCL.	Er., . Muzaffar Mukhtar, Shah Chief Engineer, Planning & Procurement Wing, KPDCL Srinagar	Techno Economic Committee vide No. MD/KPDCL/TS- I/3266-72 Dated : 06. 01 - 2023
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This Tender Specification for procurement of 11kV Air Break(A.B.) Switches with polymeric insulators for Overhead Power Lines may be subjected to the modification by the purchaser as per actual field requirement. Supplier to submit the Guaranteed Technical Particulars (GTP) and Drawings, after the award of the contract, for approval of the purchaser.

## **1. CLIMATIC AND ISOCERAUNIC CONDITIONS (CIC).**

The composite insulators to be supplied against this specification shall be suitable for satisfactory continuous operation under following tropical conditions.

- 1.1 Maximum Temperature of Air in sun : 45 ° C
- 1.2 Maximum Temperature of Air in Shade : 30.6 ° C
- 1.3 Minimum Temperature of Air in shade : - 20 ° C
- 1.4 Average daily ambient Air Temperature : 30° C
- 1.5 Relative humidity : 15% to 90%
- 1.6 Average rainfall per annum : 800 mm
- 1.7 Approx. altitude above mean sea level : 1600 Mtrs
- 1.8 Isoceraunic level (Days/Year) (i.e. Average number of Thunderstorm): 54
- 1.9 Wind Zone : WZ-3
- 1.10 Seismic Zone i.e. SZ-5
- 1.11 Climate: HSZ ( Heavy Snow Zone)
- 1.12 Average Number of Rainy Days Per Year :- 106

## **2. COMMUNICATION AND TRANSPORT:**

The nearest railway station is Jammu on the broad gauge line and is connected to the Divisional Stores by a metal road. The equipment is required to pass en-route through various tunnels on NH-44 (Nandni, Nashri and Jawahar Tunnel). It will be the responsibility of the supplier to ensure timely and proper delivery of the equipment on door delivery basis, at Srinagar, through road transport. The supplier shall also ensure the weights and dimensions of the packages which are suitable to be carried by road transport upto Srinagar.

## **TECHNICAL SPECIFICATION FOR 11 kV AIR BREAK (A.B.) SWITCHES with Polymeric Insulators:**

### **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

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.

The A. B. Switches offered shall be complete with all components necessary for its effective and trouble-free operation along with associated equipment etc.

### **2. APPLICABLE STANDARDS:-**

1. IS 9920 (Part 1 to 4)/1981 with latest Amendment if any.
2. IS 2633/1986 with latest amendment if any and other relevant IS number mentioned in the specification.
3. IS 2544/1973 with latest amendment if any.
4. IEC:61109 with latest amendment if any.

### **3. SYSTEM PARTICULARS**

A	Nominal system voltage	11 kV (rms)
B	Highest System voltage	12 kV (rms)
C	Visible discharge test voltage	9 kV (rms)
D	Normal Frequency	50 HZ
E	Maximum Frequency	51.5 HZ
F	Minimum Frequency	47 HZ
G	Neutral Earthing	Effectively Grounded
H	Number of phases	3

### **4. CURRENT DENSITY:**

Current density to be adopted for all parts of A.B. Switches and terminal connectors shall not exceed the following limits.

Copper	:	2.00 Amp. / sq.mm.
Aluminum Alloy	:	1.25 Amp. / sq.mm.
Gun Metal Base	:	1.63 Amp/mm <sup>2</sup>

## **5. CONSTRUCTIONAL FEATURES:**

The A.B. Switches shall have triple pole construction and shall be suitable for vertical mounting. For 11 kV A.B. Switch, there shall be three 11 kV Polymeric Insulator having 320 CD mounted on 75 X 40 mm M.S. Channels per phase.

The channel support shall be mounted on a steel frame made of two channel supports. The switch shall be manually operated with a locking type arrangement through a 25 mm Hollow Square coupling rod of 2 mtr length and G.I. Pipe of 40 mm diameter and 6 meter length with operating handle.

**5.1** 11 kV Polymeric Insulators to be used in manufacturing of A.B. Switches should confirm to IEC: 61109 and mentioned therein with latest amendment.

**5.2** Male and female contacts shall be prepared from hard drawn copper strip as per IS 1897/1983 (with latest amendment if any).The chemical composition of copper shall be as under :

<b><u>Element</u></b>	<b><u>Percent</u></b>
1. Copper (Min.) including silver & oxygen	: 99.90
2. Bismuth (Max.)	: 00.001
3. Lead Max.	: 00.005
4. Total of all impurities excluding silver and Oxygen (Max.)	: 00.003

Further the contact should be silver plated with thickness of coating not less than 2.5 Micron. The arcing horn shall be made of galvanized rod of 10mm diameter and shall have spring assisted operation. The speed of breaking of load current shall be independent of the speed of operation. The male and female contacts from electrolytic copper will have to be mounted on the Gunmetal base. The arcing horn should be provided on the G.M. base and they should be made in such a way that they make contact before the male-female contact make the contact and should part only after the male and female contact have completely separated while switching off operation.

Gun Metal chemical composition should be as per IS-10472/1983, Grade-II of Table-I and current density of Gun Metal Base should be 1.63 Amp/mm<sup>2</sup>.

**5.3** The spacing between the phases shall be adjustable between 600mm to 700 mm for 11kV switch. Total length of square coupling rod shall be 2000 mm for 11 kV class minimum. The Hollow square rod for coupling the three phases should be made from square G.I. Pipe having outside dimensions

25 mm x 25 mm and 3 mm thick duly hot dip galvanized as per IS: 2633/1986.

**5.4** Vertical operating rods shall comprise of 32 mm diameter GI Pipe of medium class as per IS 1161/1979. Length of the operating pipe shall be of 6000 mm.

**5.5** The A.B. Switch shall be mounted with an aluminum anodized nameplate to be fixed on base channels with rivet on all poles. It shall carry the following information duly punched or engraved on it manufacturer's name, A/T No. and date, Rated voltage, Rated normal current, rated frequency Sr. No. of A.B. Switch,

- 5.6** Suitable arrangement should be provided to lock the operating handle in 'ON' and 'OFF' position.
- 5.7** (a) Bolts, Nuts, Washers etc. below 5/8" shall be of electro galvanized or nickel plated and for sizes 5/8" and above shall be of hot dip galvanized in accordance with IS: 2633 with latest amendment, if any.  
(b) The Hollow square rod and GI Pipe shall also be hot dip galvanized in accordance with the IS: 2633 with latest amendment, if any.
- 5.8** The Switch shall be provided with palm type terminal connector made of Aluminum Alloy material with bimetallic Plate suitable for Rabbit/dog conductor and also of the same size of the contacts on which they are fixed.
- 5.9** The Polymeric insulators shall be mounted on a tilting base, which shall be made of cast metal with smooth surface. The supplier has to make suitable arrangement for fixing the hollow square rod and connector of vertical rod for smooth and trouble-free operation.

Bearing plate with 2 Nos. brass ring (Bearing Bush) about 6 mm thickness should be provided for phase i.e. total 6 Nos. bearing for 1 set.

## **6 TESTING & INSPECTION:-**

### **6.1 TYPE TEST:-**

The A.B. switches shall be subjected to the following type tests in accordance with clause No. 3 of IS-9920 (Part-IV)/1985.

- (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) Tests to verify the insulation level including withstand tests at power frequency voltages on auxiliary equipment.
- (iv) Tests to prove satisfactory operation and Mechanical endurance.
- (v) The type test certificate should not be more than 7 years old as on due date of opening of tender.
- (vi) Type test certificate of polymeric post Insulator.

### **6.2 ROUTINE TEST:**

The following routine tests as outlined in clause No.4 of IS: 9920 (Part-4/1985) 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.

### 6.3 **ACCEPTANCE TESTS** :

The following acceptance test should be carried out as per IS: 9920 (P-4/1985) 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 in accordance with Cl. No.4.1 of IS-9920 (p-4).
- iv) Measurement of the resistance of the main circuit in accordance with Cl.4.2 of IS: 9920 (P-4).
- v) Test to prove satisfactory operation in accordance with Cl. No.4.3 of IS 9920 (Part-4).
- vi) Galvanizing test as per IS: 2633.
- vii) Temperature rise test in accordance with Cl.3.2 of IS: 9920 (Part-4) (only on one set of sample for each lot).

The temperature rise shall not exceed the maximum limit specified. The Switch shall be mounted approximately under the usual service conditions and shall be protected against undue heating or cooling. The test shall be made with the rated normal current of 400 Amps for the switch and the rated frequency of 50 cycles. The test shall be made for a period of time sufficient for temperature rise to reach a constant value (variation not to exceed 1(C per hour).

The temperature shall be measured by means of thermocouples only.

The temperature rise measured with the above test shall not exceed, maximum, limits specified under :-

Sr. No.	Name of part	Temperature rise limit at an ambient temperature Not exceeding in C
1.	Silver faced copper contacts	65 <sup>0</sup> C
2.	Terminals of switches intended to be connected by external Conductors by screw or bolt.	65 <sup>0</sup> C

### 7. **Challenge Clause:**

The purchaser reserves the right to have the material, received after inspection by the authorized inspecting officer, again tested for any parameter(s), from approved/NABL accredited testing house/in house technique of the purchaser. The results if found deviating/unacceptable or in non-compliance with the approved DTP'S, the lot shall be rejected and the bidder shall arrange to replace the rejected lot within thirty(30) days of such detection at his cost including to & fro transportation.

**Technical information and Guaranteed Technical information for supply of 11 kV,400Amps  
Air Break Switch suitable for outdoor installation.**

S.No.	Particulars	Confirmation
1	Standard	IS: 9920/1981 (part-I to IV), IS: 2633 & IS: 2544/1973 with latest amendment if any and as per drawing.
2	Rated system voltage –	11 kV
3	Rated frequency -	50 Hz
4	Rated Normal current -	400 Amp
5	No. of Poles -	3
6	Rated lighting impulse withstand voltage KV (Peak):	
	i) To switch connector and earth -	75 kV switch being in closed position.
7	ii) Across the terminals of open switch – 85 KV disconnecter	85 kV disconnecter
	Rated one minute power frequency withstand voltage:	
8	i) To switch connector and earth	28 kV
	ii) Across the terminals of open 32 KV Switch disconnecter.	Yes
9	Rated short time withstand current one second	16 kA
10	Rated peak withstands -	40 kA current
11	Resistance of switch at 20-degree C.	As per cl.4.2 of IS 9920 P- 4/1985 with latest amendment if any
12	Type of mounting	vertical
12	Fixed and moving main contacts:	
	a) Female type of contacts with spring actions on either side and male type	Moving contacts.
	b) Material of contacts	Copper hard drawn grade and chemical composition of copper
	c) Contact shall be silver plated	Silver Plated
	d) Thickness of silver coating (min.) on contacts -	2.5 micron.
	e) Current density of contact -	2 Amp. sq. mm
f) Current carrying capacity -	400 Amp	
13	Terminal connection of :	
	a) Type -	Fixed
	b) Material -	Aluminum Alloy
	c) Current density -	1.25 Amp./sq.mm
14	d) Current carrying capacity -	400 Amps
	Arcing contacts of:	
	a) Type –	Make before & break after
15	b) Material -	MS Galv. of 10 mm dia.
	c) Current carrying capacity -	10 Amps.
15	Bus Polymeric insulator:	
	a) No. of Bus Polymeric insulators per phase	2 Nos. each of 12 KV with creepage distance of each insulator - 320 mm
	b) Material to be used for manufacturing of insulator with class/grade-	silicon 43%

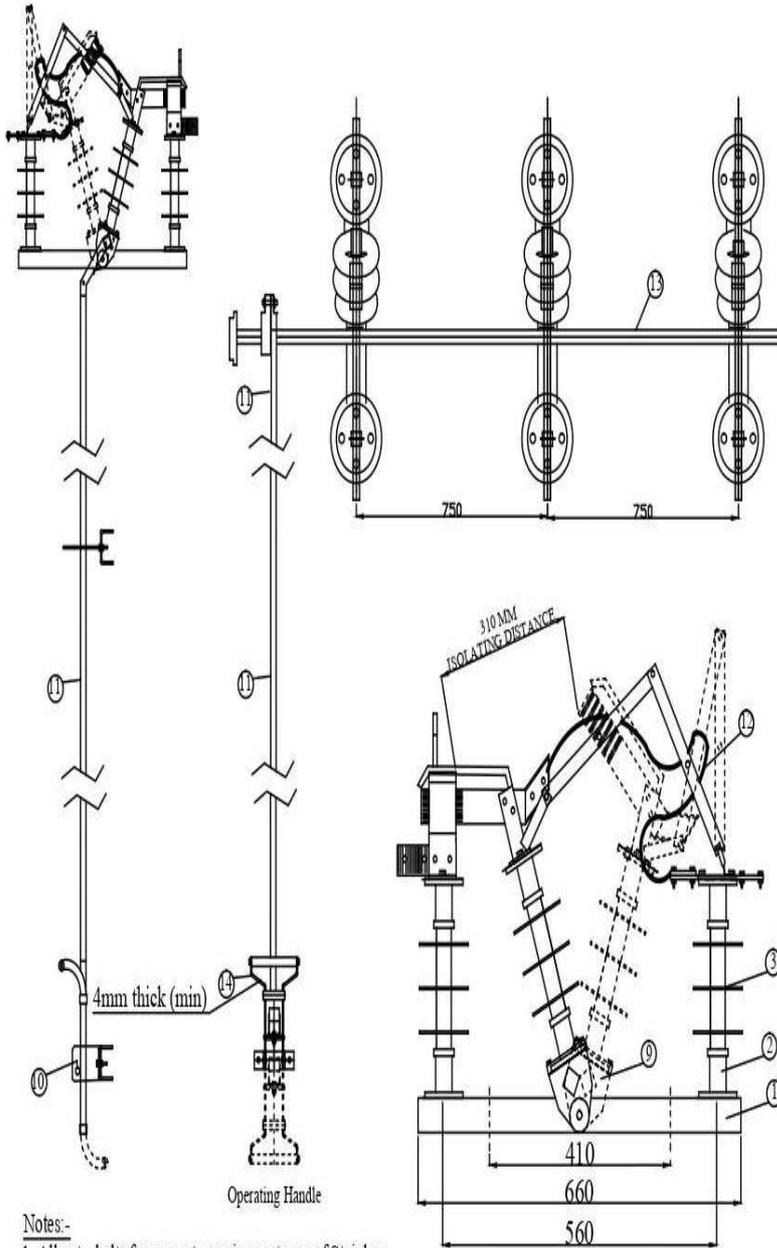
16	Method of galvanizing for bolts, Nuts, washers etc.	
	i) size below 5/8" –	Electro galvanized or nickel plated
	ii) Size 5/8" and above	Hot dip galvanized as per IS: 2633.
	iii) hollow square rod having outside dimensions -	25 mm x 25 mm x 3 mm thick and 2000mm long duly hot dip galvanized as per IS:2633.

**Technical information and Guaranteed Technical information for supply of 11 KV,200Amps  
Air Break Switch suitable for outdoor installation.**

S.No.	Particulars	Confirmation
1	Standard	IS: 9920/1981 (part-I to IV), IS: 2633 & IS: 2544/1973 with latest amendment if any and as per drawing.
2	Rated system voltage –	11 kV
3	Rated frequency -	50 Hz
4	Rated Normal current -	200 Amp
5	No. of Poles -	3
6	Rated lightning impulse withstand voltage KV (Peak):	
	i) To switch connector and earth -	75 kV switch being in closed position.
7	ii) Across the terminals of open switch – 85 KV disconnecter	85 kV disconnecter
	Rated one minute power frequency withstand voltage:	
7	i) To switch connector and earth	28 kV
	ii) Across the terminals of open 32 kV Switch disconnecter.	Yes
8	Rated short time withstand current one second	16 kA
9	Rated peak withstands -	40 kA current
10	Resistance of switch at 20-degree C.	As per cl.4.2 of IS 9920 P- 4/1985 with latest amendment if any
11	Type of mounting	vertical
12	Fixed and moving main contacts:	
	a) Female type of contacts with spring actions on either side and male type	Moving contacts.
	b) Material of contacts	Copper hard drawn grade and chemical composition of copper
	c) Contact shall be silver plated	Silver Plated
	d) Thickness of silver coating (min.) on contacts -	2.5 micron.
	e) Current density of contact -	2 Amp. sq. mm
	f) Current carrying capacity -	200 Amps
13	Terminal connection of :	
	a) Type -	Fixed
	b) Material -	Aluminum Alloy
	c) Current density -	1.25 Amp./sq.mm
14	d) Current carrying capacity -	200Amp
	Arcing contacts of:	
	a) Type –	Make before & break after
14	b) Material -	MS Galv. of 10 mm dia.
	c) Current carrying capacity -	10 Amp.
15	Bus Polymeric insulator:	

	a) No. of Bus Polymeric insulators per phase	2 Nos. each of 12 kV with creepage distance of each insulator - 320 mm
	b) Material to be used for manufacturing of insulator with class/grade-	silicon 43%
16	Method of galvanizing for bolts, Nuts, washers etc.	
	i) size below 5/8" –	Electro galvanized or nickel plated
	ii) Size 5/8" and above	hot dip galvanized as per IS: 2633.
	iii) hollow square rod having outside dimensions -	25 mm x 25 mm x 3 mm thick and 2000mm long duly hot dip galvanized as per IS:2633.

# 11KV Air Break Switch 400/ 200 Amp



**Notes:-**

1. All nuts, bolts for current carrying parts are of Stainless steel only. Plain & spring washers are provided.
2. All nuts, bolts, washers used for assembly for non current carrying parts are H.D. Galvanised.
3. All ferrous parts are H.D. Galvanised.
4. Copper parts are heavily tinned.
5. All dimensions are in mm.
6. Riveting For MS support- 8mm

SR. No.	Description	Qty	Material	Specification
1	Base Channel	3	MS HD Galvanised 75 X 40 X 5mm	IS 2062
2	Base of Post Insulator	9	SGCI / MCI / Forged Steel / AL. Alloy	As per specification
3	Post Insulator	9	Polymer	IEC 61109
4	Connector	6	Tinned Copper	As per specification
5	Arcing Horns	6	MS HD Galvanised 8mm	As per specification
6	Fixed Contact	3	Electrolytic Hard Drawn Tinned Copper	As per specification
7	Moving Contact	3	Electrolytic Hard Drawn Tinned Copper	As per specification
8	MS Supporters strip with spacer	3	MS HD Galvanised	IS 2062
9	CI Roller / MS HDG	3	Cast Iron / MS HD Galvanised	As per specification
10	Locking Arrangement	1	MS HD Galvanised	IS 2062
11	Operating Pipe Vertical 6 mtr. 32mm OD Class B	1	GI Pipe	IS 1239
12	Flexible Copper Braided Tape	3	Tinned Copper	As per specification
13	Operating Horizontal (Solid) Square Rod	1	GI 25 x 25 Sq. mm	As per IS
14	Operating ON / OFF Handle	1	MS HD Galvanised	

# 11KV Air Break Switch 400/ 200 Amp

