



# SUPPLY CHAIN MANAGEMENT THIRUVANANTHAPURAM

## SPECIFICATION

11KV, 630A AB SWITCH

APPLICABLE TO KSEBL	Rev#0	DOC. NO.: <b>SCM-SPEC/XT/11kV,630A AB Switch</b>
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Technical Specification and Evaluation Committee for Transmission Material



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Thiruvananthapuram

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**11KV, 630A AB SWITCH**

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**(i) Document Approval & Control Status**

	<b>Compiled by</b>	<b>Verified by</b>	<b>Approved by</b>
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Date	23/04/2021	23/04/2021	03/05/2021
Signature	<b>Sd/-</b>	<b>Sd/-</b>	<b>Sd/-</b>

**(ii) Amendments and History**

<b>Sec. #</b>	<b>Rev. #</b>	<b>Date</b>	<b>History of Change</b>



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**1. PURPOSE:**

Purpose of this document is to document updates & history, upkeep and publish the specifications related to **11kv, 630A AB Switch** in a professional manner

**2. SCOPE:**

The Scope of this document is to inform and alert all relevant stakeholders including KSEBL, Public, KSERC etc regarding the current specifications and historical changes adopted in specifications of **11kv, 630A AB Switch** used in field by KSEBL

**3. RESPONSIBILITY:**

**The Executive Engineer (T), Office of Chief Engineer, Supply Chain Management** shall compile and take necessary steps to publish the specification in KSEBL website and shall inform relevant stakeholders regarding updates and revisions

**4. PROCEDURE FOR REVISION:**

Modifications if any, in the technical specification will be incorporated as **Revisions**. Any changes in values, minor corrections in pages, incorporation of small details etc. will be considered as Minor Modification. **The Revisions due to minor modifications will be assigned as Rev. No.0.1, 0.2 etc.**

A complete updation of the technical specification will be considered as Major modification. **The Revisions due to major modifications will be assigned as Rev. No.1.0, 2.0 etc.**

All the details of regarding the revisions (both minor and major) will be incorporated in **“(ii)-Amendments and history”** above.

The concerned officers, in consultation with the Technical Committee will review and suggest changes required and the revision suggestion will be approved by **Chief Engineer (SCM)**. Those who notice any discrepancy or have any suggestion regarding revision, may bring the matter to the attention of Chief Engineer (SCM) in writing or through e-mail id:**cescm@kseb.in**



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### TECHNICAL SPECIFICATION

#### 220KV & 110KV CAPACITOR VOLTAGE TRANSFORMER

Doc. #: SCM-SPEC/XT/5MVA Trs.

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#### ANNEXURE I - TECHNICAL SPECIFICATION FOR AB SWITCH 11 KV, 630 A

1) **SCOPE**

The isolating switches specified herein are for installation in the 11kV outdoor switch yard of EHT substation of the Kerala Power Grid and shall conform to the requirement of ISS:9920(Part-I to IV) and its latest amendments. They shall be of 3 pole double break, rotating center post type mounted on channel iron base. They shall be suitable for being mounted on steel/ wooden horizontal. Three numbers single unit 11kV post type insulators shall be provided on each phase. The insulators shall be suitable for a BIL of 75 KVp. Adjustable Arcing Horns (G.I.Rod type) shall be provided on each isolator.

2) **AB SWITCHES**

The 11 kV Air Break Switches are required with two poles in each phase. The AB Switches shall be supplied complete with phase coupling shaft, operating rod and operating handle. It shall be manually gang operated and vertically break and horizontal mounting type.

**The equipment offered by the bidder shall be designed for a normal current rating of 630 Amps and for continuous service at the system voltage specified as under:**

- i) 11 kV AB Switch : 11 kV +10 % continuous 50 C/s solidly grounded earthed neutral system

The length of break in the air shall not be less than 400 mm for 11 kV AB Switches.

The 11 kV AB Switches are required with post insulators. The AB switches should be suitable for mounting on their structure. The mounting structure will be arranged by the bidder. However, the AB Switches shall be supplied with base channel for mounting on the structure which will be provided by the owner. The phase to phase spacing shall be 900 mm in case of 11 kV AB Switches. The length of slot for the conductor shall not be less than 7.5 cm.

3) **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) **POST INSULATORS**

The complete set of three phase AB Switches shall have stacks of post insulators.

11 kV AB Switches: 3 No. 11 kV Post Insulator per stack The post insulators should conform to the latest applicable Indian standards IS:2544 Specification for Porcelain Post Insulators of compact solid core or long rod insulators area also acceptable. Creepage distance should be

adequate for highly polluted outdoor atmosphere in open atmosphere. The porcelain used for manufacture of AB Switches should be homogeneous free from flaws or imperfections that might affect the mechanical dielectric quality. They shall be thoroughly vitrified, tough and impervious to moisture. The Glazing of the porcelain shall be of uniform brown in colour, free from blisters, burns and other similar defects. Insulators of the same rating and type shall be interchangeable. The porcelain and metal parts shall be assembled in such a manner that any thermal expansion differential between the metal and porcelain parts through the range of temperature variation shall not loose the parts or create undue internal stresses which may affect the electrical or mechanical strength. Cap and base of the insulators shall be interchangeable with each other. The cap and base shall be properly cemented with insulators to give perfect grip. Excess cementing must be avoided.

11 kV Post Insulators should have technical particulars as detailed below:

Sl. No		11 kV
i	Nominal system voltage kV (rms)	11
ii	Highest system voltage kV (rms)	12
iii	Dry Power Frequency one kV minute withstand voltage (rms) in kV	35
iv	Wet Power Frequency one minute withstand voltage (rms) in kV	35
v	Power Frequency puncture kv (rms) voltage	1.3 times the actual dry flash over voltage
vi	Impulse withstand voltage kV(Peak)	75
vii	Visible discharge voltage kV(rms)	9
viii	Creepage distance in mm(minimum)	320

The rated insulation level of the AB Switches shall not be lower than the values specified below:-

Sl. No	Standard declared voltage kV/RMS	Rated Voltage of the AB Switches	Standard impulse with stand voltage (Positive & negative polarity kV (Peak)		One Minute power frequency withstand voltage kV (rms)	
			Across the Isolating distance	To earth & between poles	Across the Isolating distance	To earth & between poles
i	11 kV	12 kV	85 kV	75 kV	32 kV	28 kV



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#### 5) **TEMPERATURE RISE**

The maximum temperature attained by any part of the equipment when in service at site under continuous full load conditions and exposed to the direct rays of Sun shall not exceed 45 degree above ambient.

#### 6) **MAIN CONTACTS**

AB Switches shall have heavy duty self-aligning type contacts made of hard drawn electrolytic copper. The various parts should be accordingly finished to ensure interchangeability of similar components. The moving contacts of the switch shall be made from hard drawn electrolytic copper. The surface of the contact shall be rounded smooth and silver-plated. In nut shell the male and female contact assemblies shall ensure. The fixed contacts shall be silver plated and secured tight by phosphor bronze springs. The fixed contacts shall be made of hard drawn electrolytic copper. The switch blade shall be made of hard drawn electrolytic copper flats with ends silver-plated and the switch contacts shall be of spring loaded jaw type. All current carrying contacts shall be of the multi-type using bolts and nuts of suitable non- rusting, non-magnetic materials with suitable arrangements.

1. Electro-dynamic withstands ability during short circuits without any risk of repulsion of contacts.
2. Thermal withstands ability during short circuits.
3. Constant contact pressure even when the lower parts of the insulator stacks are subjected to tensile stresses due to linear expansion of connected bus bar of flexible conductors either because of temperature variations or strong winds.
4. Wiping action during closing and opening.
5. Fault alignment assuring closing of the switch without minute adjustments.

#### 7) **CONNECTORS**

The connectors shall be made of hard drawn electrolytic copper suitable for ACSR Wolf conductor for 11 kV AB Switches. The connector should be 4-bolt type.

#### 8) **OPERATING MECHANISM**

All AB Switches shall have separate independent manual operation. They should be provided with ON/OFF indicators and padlocking arrangements for locking in both the end positions to avoid unintentional operation. The isolating distances should also be visible for the AB Switches.



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The AB Switches will be supplied with following accessories:

Sl. No	Item	Size of 11 kV AB Switch
i	Operating Rod (GI dia) ISI mark	Length 5.50 meter dia : 25 MM
ii	Phase coupling square rod (GI) ISI mark	Length 1800 mm Size 25 x 25 mm
iii	Hot dip galvanized Operating handle (GI)	1No

The AB Switches shall be capable to resist any chance of opening out when in closed position. The operating Mechanism should be of robust constructions, easy to operate single person and to be located conveniently for local operation in the switch yard. The GI pipe shall confirm to ('B' class or Medium class Blue strip) ISS: 1239-68 and ISI marked by embossing. The vertical down rod should be provided with adequate joint in the mid section to avoid bending or buckling. Additional leverage should be provided to maintain mechanical force with minimum efforts.

All iron part should be hot dip galvanized as per IS 4759-1979 and zinc coating shall not be less than 610 gm/sq.meter. All brass parts should be silver plated and all butts and bolts should be hot dip galvanized.

9) **ARCING HORNS**

It shall be simple and replaceable type. They should be capable of interrupting line-charging current. They shall be of first make and after break type.

10) **BUSH**

The design and construction of bush shall embody all the features to withstand climatic conditions specified so as to ensure dependable and effective operations specified even after long period of inaction of these Air Break Switches. They shall be made from highly polished Bronze metal with adequate provision for periodic lubrication through nipples and vent.

11) **DESIGN, MATERIALS AND WORKMANSHIP**

All materials used in the construction of the equipments shall be of the appropriate class, well finished and approved design and material. All similar parts should be accurately finished and interchangeable.

Special attention shall be paid to tropical treatment to all the equipment, as it will be subjected during service to extremely severe exposure to atmospheric moisture and to long period of high ambient temperature. All current carrying parts shall be of non-ferrous metal of alloys and shall be designed to limit sharp points/edges and similar sharp faces.



The firm should have the following type test certificate. The type test should be from CPRI or equivalent lab:-

1. Test to prove capability of rated peak short circuit current and the rated short time current. The rated short time current should correspond to minimum of 10 K Amp and the peak short circuit current should correspond to minimum of 25K Amps.
2. Lightning Impulse voltage test with positive & negative polarity.
3. Power Frequency voltage dry test and wet test.
4. Temperature rise test
5. Milli volt drop tests
6. Mechanical Endurance test
7. Test to verify Insulation level

The above tests should be performed on the AB Switches, manufactured as per owner approved drawing with the specification. Along with the type test certificate, the certified copy of the drawing (from the testing lab) should also be kept for inspection of our officer. Also the test certificates should not be older than 5 years from the date of opening of tender.

Dimension of 11 kV AB Switches in (Max.) Tolerance 5 %.

Sl.No	Particulars	11 kV AB Switch
i	MS Channel	450x75x40
ii	Creepage distance of Post Insulator	320 mm (Min)
iii	Highest of Port shell	254 mm
iv	Fixed contact assembly	
	i) Base	165x36x8
	ii) Contact	70x30x6
	iii) GI cover	110x44
	iv) Spring	6 Nos

12) **MOVING CONTACT ASSEMBLY**

- |     |                      |              |
|-----|----------------------|--------------|
| i   | Base Assembly        | 135x25x8     |
| ii  | Moving               | 180x25x9     |
| iii | Bush                 | Bronze Metal |
| iv  | Thickness of Grooves | 7            |

**13) CONNECTORS**

- i Connector 60x50x8x(Moving & fix both)

The bidder should provide AB Switches with terminal connectors, set of insulators, mechanical inter works and arcing horns sets. The base channel for the mounting of AB Switches shall also be included in the scope of AB Switches. The operating mechanisms together with down pipe operating handle etc., are also included in the scope of supply.

**14) NORMAL SERVICE CONDITIONS**

A.B. Switches to be supplied against this specifications shall be suitable for satisfy continuous operations under following tropical conditions :

1. Ambient Air Temperature :35<sup>0</sup>C
2. Maximum ambient air temperature :60<sup>0</sup>C
3. Maximum air temp. in shade :40<sup>0</sup>C
4. Minimum air temp. in shade :15<sup>0</sup>C
5. Relative humidity in percentage :100 %
6. Maximum annual rainfall :3000 mm
7. Wind Pressure (Max.) :130 kG/cm<sup>2</sup>
8. Maximum altitude above sea level :0-1000 m

**15) TESTING & INSPECTION**

**15.1 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.

1. Test to prove capability of rated peak short circuit current and the rated short time current. The rated short time current should correspond to minimum of 10K Amp and the peak short circuit current should correspond to minimum of 25K Amps.
2. Lightning Impulse voltage test with positive & negative polarity.
3. Power Frequency voltage dry test and wet test.
4. Temperature rise test
5. Milli volt drop tests
6. Mechanical Endurance test
7. Test to verify Insulation level

**15.2 ROUTINE TEST**

The following routine test 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.

**15.3 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:-

Sl. 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

**15.4 SAMPLE PROCEDURE FOR ACCEPTANCE TESTS**

One sample (i.e. one set) from each 50 sets or part of it to be selected at random from offered lot for carrying out all acceptance tests mentioned above, except for temperature rise test, which is to be carried out only on 1 sample (i.e. on one set) from the offered lot.

**15.5** For the offered lot, the supplier will have to submit acceptance & routine test certificate received from the original manufacturers for the post insulators used in the manufacture of



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A. B. Switches. It is preferred that insulators of same make are used in one lot. However, if insulators of different makes are use in one lot of A. B. Switch, then the supplier will have submit acceptance & routine test certificates received from the respective original manufacturers for the isolators used in A. B. Switches.

The supplier will have to submit chemical composition certificate from the original manufacturer for the contacts used in A. B. Switches for every lot.

All test and inspection shall be made at the place and cost of manufacturer in presence of Board's Engineer.

Although the samples selected at random by the Board from the supplier's work have passed the specified tests and then accepted. The Board reserved the right to test, the materials after receipt at the destination by arranging the testing in any of the Govt. of India approved laboratories. However, in the event of the samples failing in the test or the materials otherwise found defective, the supplier shall replace such materials at the destination concerned on receipt of intimation from Chief Engineer (SCM).

**16. CURRENT DENSITY:**

Current density to be adopted for all parts of A. B. Switches and terminal connectors shall not exceed 2 Amps/sq.mm for Electrolytic Copper.



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### ANNEXURE II- GUARANTEED TECHNICAL PARTICULARS FOR 11 kV, 630 A STATION CLASS AB SWITCHES

	Particulars	Required by KSEBL	
1	Nominal Operating Voltage (KV)	11	
2	Maximum operating voltage (KV)	12	
3	Frequency (Hz)	50 Hz	
4	No.of phases	3 – Phases	
5	Type	Double Break, Rotating Centre Post, Banging type	
6	Temperature rise	Ambient temp +65 °C	
7	Phase to phase distance (mm)	900 mm	
	<b>Fixed Contacts</b>		
(a)	Type	Spring loaded jaw type	
(b)	Material	HDEC	
(c)	Surface treatment (plating thickness)	15 micron Silver Plated	

(d)	Continuous current rating (A)	630A	
	<b>Moving contacts</b>		
(a)	Type	Flat type	
(b)	Material	HDEC	
(c)	Surface Treatment (End silver plated or net)	15 micron Silver Plated	
(d)	Continuous current rating (A)	630A	
8	No. of poles	3 –Poles	
9	No. of operations which the switches can withstand without deterioration of contacts	1000 Nos min	
10	Arcing horn details	GI rod (8 mm dia)	
11	Location and type of bearing	Below rotating insulator & Thrust bearing type	
12	Torque required to operate the switch	10 Kg.m	
13	Details of safety stops provided	Suitable safety stop will provide to handle	



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14	Technical particulars of insulators		
1	Rated voltage	11 KV	
2	Make and Drawing Reference	GIPL/Genesis/Radiant/RA MA (Subjected to type test report)	
3	Max. shed diameter (mm):	176 mm	
4	Height (mm)	254 mm	
5	Creepage distance (mm)	320 mm	
6	Protected creepage distance(mm)	25 mm/kV	
7	Bending strength	6 KN	
8	Tensile strength	15 KN	
9	Torsional strength	200 N.m	
10	Compression strength	30 KN	
11	Dry. P. F one minute with stand voltage (kV rms)	32 (Across isolating distance)	

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12	Wet . P. F one minute withstand voltage (kV rms)	28 (to earth & between poles)	
13	Dry P. F. flash over voltage (kV rms)	>32	
14	Wet P. F. flashover voltage (kV rms)	>32	
15	Impulse withstand voltage (kV peak)		
	+ve wave	85/75	
	-ve wave	85/75	
16	Impulse flash over voltage (kV peak)		
	+ve wave	>85	
	-ve wave	>85	
17	Puncture voltage (kV)	>110	
18	Visible discharge test (kV)	>=9	
19	Top PCD (mm)	57	
20	Bottom PCD (mm)	57	





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21	Weight (approx.)	4 Kg (Approx)	
22	Type & material of terminal connectors	HDEC suitable for ACSR Wolf conductor	