



SUPPLY CHAIN MANAGEMENT THIRUVANANTHAPURAM

SPECIFICATION

11 kV , 400A AB switch with Polymer Post Insulator

APPLICABLE TO KSEBL

Rev#1..0

DOC. NO.: SCM-SPEC/XH/11kV AB Switch

EFF. DATE: 27/08/2022

Number of Pages: 22

Technical Specification and Evaluation Committee for Distribution Material

(i) Document Approval & Control Status

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TECHNICAL SPECIFICATION

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Rev.#:1.0

Effective Date (27/08/2022)

Chief Engineer (SCM)

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(ii) Amendments and History

Sec. #	Rev. #	Date	History of Change
2	1	27-08-2022	Materials and workmanship- Type and class number added.
3	1	27-08-2022	Standards applicable-IS 9921 replaced with IS/IEC 62271-103. Standards of pollution site severity added.
5.3	1	27-08-2022	1.Adjustable spacing between phases changed.
5.4	1	27-08-2022	Constructional features-1. Dia of operating pipe corrected to value as per IS. 2. 75x40mm MS chanel changed to 75x40x6mm GI channel.
8.1	1	27-08-2022	Type test-Lightning impulse withstand test added as per IS/IEC 62271-103
8.2	1	27-08-2022	Routine test- Clauses replaced as per IS/IEC 62271-103
8.3	1	27-08-2022	Acceptance test-Clauses replaced as per IS/IEC 62271-103
11.ii	1	27-08-2022	Bending strength of polymer insulator- corrected as 6kN

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5.2	1	27-08-2022	Constructional features-Arcing horn.
5.5	1	27-08-2022	Marking- Make of Post Insulator added.
8.5	1	27-08-2022	Sample procedure for acceptance tests-Modification in the clause for insulators of other manufacturer make.
9.1	1	27-08-2022	Type test of Composite post insulator- Reference standards for Mechanical failing load test.
9.1	1	27-08-2022	Type test of Composite post insulator-Reference standards for Radio interference test & Recovery of hydrophobicity test
10	1	27-08-2022	Detailed drawing- Instruction for drawing approval.
16	1	27-08-2022	Terminals – Modification in dimension and arrangement.
18	1	27-08-2022	Operating pipe – Provision of eye bolts included.
19	1	27-08-2022	Operating handle- Rod size included.
20	1	27-08-2022	IS for pad lock included.

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1. PURPOSE:

Purpose of this document is to document updates & history, upkeep and publish the specifications related to **11 kV, 400A Outdoor Type AB switch with Polymer Post Insulator** 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 **11 kV, 400A Outdoor Type AB switch with Polymer Post Insulator** used in field by KSEBL

3. RESPONSIBILITY:

The Executive Engineer (H), 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

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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 FOR AB SWITCHES FOR 11KV, 400A OUTDOORS

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- 1) **SCOPE:-** This specification covers the design, manufacture, testing before dispatch at the manufacture's work, inspection, packing, forwarding, supply and delivery of 11kV, 3phase, 400A, 50Hz, Gang operated type Outdoor No load Air Break Isolator for the KSEB Limited distribution, transformer station and lines application.
- 2) **MATERIALS AND WORKMANSHIP:-**All materials used in the construction of the AB Switches and accessories shall be of the highest quality. List of all vendors who supply raw materials should be submitted along with the Bid. The entire design and construction should be capable of withstanding the severest stresses likely to occur in actual services and capable of resisting rough handling during transport. The workmanship shall be of the highest grade and entire construction in accordance with the best modern practice. All the current carrying parts shall be made of hard drawn electrolytic copper (HDEC) and its area of cross section shall be so that the maximum current density shall be less than 1.3 A/mm². The fixed and moving contacts shall be coated with silver at 40 micron thickness. The AB switch shall be E1,M1,C1 class as per IEC 62271-103 (with latest amendment).
- 3) **STANDARDS APPLICABLE:-**
 - a) Air Break Switch : IS/IEC 62271-103
 - b) For Silicon Composite¹⁶ Polymer insulator : IEC 61109
 - c) Metal fittings for insulators, General requirement & tests. : IS:2486, Part-1
 - d) Insulator fittings : IS:2486, Part-2
 - e) Material for nuts : IS:1367/1980, Part-6
 - f) Quality of Zinc for galvanizing : IS:209/1992
 - g) Uniformity& weight of Zinc coating : IS:2633/1986
 - h) Method of galvanizing all ferrous materials except spring washers & nuts : IS:2633/1986
 - i) Method of galvanizing spring washers : IS:5358/1969
 - j) Testing of spring washers : IS:1573/1986
 - k) Testing of nuts : IS:1367/1980- Part-6
 - l) Mass of zinc coating for nut : IS:1367/1980, Part-13

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m) Copper rods and bars for electrical purposes : IS:613 : 2000

n) Hot dip zinc coating on iron and steel Products : IS:4759

o) Electroplating of Silver for general purpose : IS:1771

p) Pollution site severity : IEC 60815

4) **ATMOSPHERIC CONDITIONS:-** All parts and fittings shall be suitable for use in atmospheric condition given below and shall be inherently resistant to atmospheric corrosion or be suitably protected against corrosion both during storage & in service.

1) Max. Ambient temperature : 56 degree centigrade

2) Min. Ambient temperature : 5 degree centigrade

3) Daily average Ambient temperature : 30 degree centigrade

4) Max. Humidity : 100%

5) Average number of Thunder storm days : 50 per annum

6) Average number of storm per annul : 55 per annum

7) Max. rain fall per annul : 4500mm (approx.)

8) Average rain fall per annul : 3000mm (approx.)

9) Limits of variation of ambient temperature

Over a period of 24 hours : 15 degree peak

10) Wind pressure : 150 kg/sq. meter

11) Altitude : up to 1000m above MSL

5) **CONSTRUCTIONAL FEATURES:-** The A.B.Switches shall have triple pole construction and shall be suitable for horizontal mounting and pantograph type mounted on channel arm base shall be galvanized as per IS 4759 after fabrication. For 11kV A.B.Switch, there shall be three 11 KV Polymeric Insulator/phase having 320 CD mounted on 75 X 40 x 6 mm G.I Channels per phase.

The channel support shall be mounted on a steel frame made of two GI channel supports. The switch shall be manually operated with a locking type arrangement through a 25 mm GI Square rod of 2 meter length and G.I. Pipe of 30 mm internal diameter and 6000 mm 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. For 11 KV Polymeric INSULATORS:

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The Bidder shall submit type test reports as per IEC:61109 from CPRI/ ERDA/KERI/NABL accredited laboratories along with bid.

- 5.2) Male and female contacts shall be prepared from hard drawn electrolytic copper (HDEC) strip as per IS 613 (with latest amendment if any). The chemical composition of copper shall be as under:

Sl.No.	Element	Percent
1)	Copper including silver & oxygen	> 99.900
2)	Bismuth	< 0.001
3)	Lead	< 0.005
4)	Total of all impurities excluding silver and Oxygen (Max.)	< 0.003

Further the contact should be silver plated with thickness of coating not less than 40 Micron as per IS 1771. The arcing horn shall be made of galvanized Iron rod of 10mm diameter and shall have spring assisted operation. The male and female contacts made of HDEC will have to be mounted on the base. The arcing horn should be provided on the 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 on and off operation respectively. The arcing horns shall be connected by bolting properly.

- 5.3) The spacing between the phases shall be adjustable between 600mm to 800mm for 11 KV switch. Total length of square coupling rod shall be 2000 mm for 11 KV class minimum. The GI square rod having outside dimensions 25 mm x 25 mm mm for coupling three phases shall be hot dip galvanized as per IS : 4759.
- 5.4) Vertical operating rods shall comprise of 33.7mm outer diameter GI Pipe of medium class as per IS 1161/1979. Length of the operating pipe shall be 6000 mm without welded joints.
- 5.5) The A.B. Switch shall be provided 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,

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- a) P.O No. and date,
- b) Rated Voltage,
- c) Rated normal current,
- d) Sr. No. of A.B. Switch,
- e) Make of post insulators.
- f) Property of KSEBL etc.

- 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 stainless steel and for sizes 5/8" and above shall be constructed in accordance with IS: 1367 with latest amendment, if any and shall be hot dip galvanized in accordance with IS: 4759 with latest amendment.
(b) The GI square rod and GI Pipe shall also be hot dip galvanized in accordance with the IS: 4759 with latest amendment, if any.
- 5.8) The Switch shall be provided with palm type terminal connector made of HDEC as per clause 16.

The Polymeric insulators shall be mounted on a vertical base, which shall be made of cast metal with smooth surface. The supplier has to make suitable arrangement for fixing the GI square rod and connector of vertical rod for smooth and trouble-free operation. Roller assembly with side plate and brass bush shall be provided.

- 6) **Current density:** Current density to be adopted for all current carrying parts of AB Switch and terminal connectors shall not exceed the following.

Copper: $< 1.3 \text{Amp/mm}^2$

- 7) **QUALITY CONTROL/ INSPECTION & TESTING PLAN :-** The manufacturers shall assure proper quality control for the manufacture of A.B.Switches, tolerance of +5% in dimensions is allowed except for current carrying parts. The inspection cum testing plan of the offered materials shall be submitted in advance and get approval from KSEBL before manufacturing process.

- 8) **DESIGN TESTS:-**

- 8.1) **TYPE TEST:-** The A.B.Switches shall be subjected to the following type tests in accordance with clause No. 6 of IS/IEC-62271-103 and its latest amendments.

- (i) Temperature rise test.

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- (ii) Peak withstand current test
- (iii) Short time current withstand test
- (iv) Wet power frequency withstand test
- (V) Lightning impulse withstand test.
- (vi) Mechanical endurance test.

The type test certificate should not be more than 10 years old as on due date of opening of tender.

8.2) **ROUTINE TEST:-** The following routine test as outlined in clause No.7 of IS/IEC-62271-103 and its latest amendments 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.

8.3) **ACCEPTANCE TESTS:-**The following acceptance test should be carried out as per IS/IEC-62271-103 and its latest amendments 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.6.2 of IS/IEC-62271-103.
- iv) Measurement of the resistance of the main circuit in accordance with Cl.6.4 of IS/IEC-62271-103.
- v) Test to prove satisfactory operation in accordance with Cl. No.7 of IS/IEC-62271-103.
- vi) Galvanizing test as per IS: 2633 and IS:4759.
- vii) Temperature rise test in accordance with Cl.6.5 of IS/IEC-62271-103.
- viii) 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°K 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

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1)	Silver faced copper contacts	65°C
2)	Terminals of switches intended to be connected by external Conductors by screw or bolt.	65°C

- 8.4) **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.
- 8.5) For the offered lot, the supplier will have to submit acceptance & routine test certificate received from the original manufacturers for the Polymeric insulators used in the manufacture of A.B.Switches. It is preferred that insulators of same make are used in one lot, However, if insulators of different makes are used in one lot of A.B.Switch, then the supplier will have to submit acceptance & routine test certificates received from the respective original manufacturers for the insulators used in respective lot of A.B.Switches. The insulators shall be provided with the make engraved on. The supplier will have to submit chemical composition certificate from the original manufacturer for the HDEC contacts used in A.B. Switches for every lot.
- 8.6) All test and inspection shall be made at the place and cost of manufacturer in presence of Engineer from KSEBL.
- 8.7) Although the samples selected at random by KSEBL from the supplier's work have passed the specified tests and then accepted. The KSEBL reserves the right to test, the materials after receipt at the destination by arranging the testing in any of the KSEBL 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 KSEBL.
- 9) **TYPE TESTS FOR COMPOSITE POLYMER POST INSULATOR:-** The type tests are intended to verify the main characteristics of a composite insulator. The type tests shall be applied to composite insulators, the class of which has passed the design tests.
- 9.1) Following Type test shall be conducted on a suitable number of individual insulator units, components, materials or complete strings:

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Sl. No	Description of type test	Test procedure / standard
1	Lightning impulse withstand voltage test	As per IEC 61109
2	Wet power frequency test	As per IEC 61109
3	Mechanical failing load test	In general accordance with IS 731:1971
4	Radio interference test	CISPR:18-2 Part II
5	Recovery of Hydrophobicity test	STRI Guide :1.92/1
6	Chemical composition test for silicon content	Test method acceptable to the KSEB Limited
7	Brittle fracture resistance test	Test method acceptable to the KSEB Limited.

The Manufacturer shall submit type test reports as per IEC 61109.

- 10) **Detailed Drawings:-** The dimensions, clearance and general arrangement of 11 KV A.B. Switches is required to be maintained as per approved Schematic drawing. The supplier has to submit the detailed drawing within 7 days from the date of accepting the purchase order and get approved by the competent authority. The supplier shall have to submit type test certificate showing all the laid type tests mentioned in clause No.8.3 from CPRI/ERDA/KERI/State Government or Central Government owned NABL accredited laboratories along with attested drawings by testing authority along with the offer. The original type test certificate will be verified at the time of pre despatch inspection/ acceptance. The material offered should be identical and as per type tests and approved drawing.
- 11) **OPERATION:-** The switches shall be provided with an operating mechanism, for satisfactory manual operation from ground level and will open or close all the three phases simultaneously. Facility will be provided to lock the operating handle in both the closed and open position. Tinned HDEC Copper strip shall be provided for terminal pad and the current density shall not exceed 1.3 A/mm². The isolators shall be capable of resisting in closed position the dynamic and thermal effects of maximum possible short circuit current. The isolating dis-

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tance of the AB should be at least 310mm. Operation of AB at any point should not result in breaking of any of the insulators due to physical contact with another.

Rated voltage of the insulators in kV rms	Rated lightning impulse withstand voltage		Rated one minute power frequency withstand voltage	
	To earth and between poles	Across the isolating distance	To earth and between poles	Across the isolating distance
12	75 kVp	85 kVp	28 kVp	32 kVp

- i. Insulation to ground, insulation between open contacts and the insulation between phases of the completely assembled isolators switch shall be capable of with standing the dielectric test voltage specified of 32kV. Insulation between open contacts of a pole shall at least be 15% more than the insulation between the live parts of a pole to ground so that any flash over occurs when switch is open, it shall be to the ground.
- ii. The solid core Polymer insulators shall have an minimum bending strength of 6KN and shall conform to IEC 61109 or other internationally recognized standards. The insulators selected shall be for use at normally polluted atmosphere creepage distance of 25mm/KV min. and shall be specifically suited to meet the particular requirements of ultimate torsional strength and cantilever loads which they will be called upon to resist during service the rated voltages. The guaranteed data and particulars of the insulators adopted for the equipment offered by the tenderer should be given.
- iii. The insulating material shall be homogeneous and free from all cavities and flaws. Design of the insulators shall ensure ample insulation, mechanical strength and rigidity for satisfactory operation under site conditions. The design shall also ensure that the losses caused by capacitive currents or conduction through dielectric are minimum and that the leakage due to moist and dirty insulator surface is least. Superficial defects of an area greater than 25 mm^2 (the total defective area not to exceed 0,2 % of the total insulator surface) or of depth greater than 1 mm;
- iv. All the insulators should be interchangeable with each other.

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- v. The mounting base flange of the insulator should be 80mm diameter and with PCD 57mm.
- vi. The top of the insulator should be of 80mm dia and with PCD 57mm.
- vii. The Silicon Composite Polymer insulator shall be sound, free from defects.
- viii. The rated short time withstand current for one second shall be min 16kA and the rated peak withstand current shall be min 40 kA.

All metal caps and supports shall be supported to the composite insulator, where as the blades and contact blocks shall be bolted on the metal parts of insulator thus making the replacement of damaged insulator easy.

12) Isolating Distance: 310 mm minimum.

13) PANTOGRAPH:- The pantograph used shall be of rugged in construction and is made of minimum 20x6mm thick GI strip. The length of the pantograph is 530mm. The pantograph is suitable for carrying flexible braided copper.

14) FLEXIBLE BRAIDED COPPER:- Single flexible braided copper should be of maximum current carrying current density of 1.3 A/mm² (50X6mm minimum) for AB Switch.

15) CONTACTS:- The fixed and arcing contacts horns using GI rods are used for reducing the arcing of main contacts during switching operation.

- i) The fixed and moving contacts shall be silver plated (40 microns) and secured tight by phosphor bronze springs. The fixed contacts shall be made of hard drawn electrolytic copper. Electrodynamics withstands ability during short circuits without any risk of repulsion of contacts.
- ii) Thermal withstand ability during short circuits.
- iii) The minimum contact area of the contact shall be 1800sqmm for 400A Constant contact pressure even when the live parts of the insulator stacks are subject to tensile stresses due to linear expansion of connected bus bar or flexible conductors either because of temperature, variation of strong winds.
- iv) Wiping action during closing and opening.
- v) Self alignment assuring closing of the switch without minute adjustments
- vi) The maximum current density of the contacts shall be 1.3A/mm²

The switch blade shall be made of hard drawn electrolytic copper flats with ends silver-plated (40 microns) and the switch contacts shall be of the spring loaded jaw type. All current carrying contacts shall be of the multi-bolt type using bolts and nuts of suitable non

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rusting, non-magnetic materials with suitable locking arrangements. Size of moving contact shall be suitable area with current density below 1.3Amp/mm².

- 16) **TERMINALS:-** Each isolator shall be provided with terminal connectors (2no. Per phase) shall be suitable for ACSR Raccoon with HDEC and suitable for minimum 120 mm² cable connection. The connecting terminals, (150x50x6 mm tinned copper) shall be provided on both ends such that two nos. cable end sockets/ two nos. crimped conductor ends could be connected by bolting horizontally to the terminals of the AB switch facilitating least contact resistance. Also, the braided copper endings should also connected horizontally to the terminal connectors/ contacts after running over the pantograph without any twist.
- 17) **CONNECTING ROD AND MECHANISM:-** The connecting rod used should have rugged in construction and of 25 mmx 25mm GI square rod. The mechanism connecting the square rod and connecting pipe shall strong enough to carry mechanical loading during switching operations. The central insulator of the AB is suitable for vertical breaking of the contacts through the connecting rod. Roller assembly with side plate and brass bush shall be provided. Provision for fine adjustment for the roller assembly at site should be given.
- 18) **CONNECTING/OPERATING PIPE:-** The Length of down pipe shall be 6000mm and a diameter of 33.7mm(30 mm internal Diameter) class 'B'(medium). No welded joint pipe shall use for this purpose. The nuts shall be provided with One spring washer and Two plate washers. All iron parts including nuts and bolts shall be hot dip galvanized as per the relevant ISS.Two Nos of Eye Bolts of size 50 mm hole dia Shall be supplied for drawing the operating pipes in order to avoid bending of Pipe while the process of operating.
- 19) **HANDLE:-** The operating handle shall be of Galvanized iron rod of Size 19 mm and is insulated with epoxy resin cast compound/heat shrinkable 11kV insulating sleeve after it's fabrication. The insulation thickness provided in the handle shall be 6mm and should have to withstand 15kV minimum.
- 20) **LOCKS AND LOCKING ARRANGEMENT:-**The AB Switches are suitable for locking at both ON and OFF position as per IS using pad lock. The supplier should provide minimum 8mm dia pad lock along with the AB switch having 4 levers minimum as per IS 15275.
- 21) **PACKING:-** The equipment shall be dispatched securely packed in wooden crates suitable for handling during transit by rail / road so as to avoid any loss or damage during transit- Packing with suitable material is to be provided to avoid any damages to the insulator.

The material shall be sent in assembled condition, ready for installation.

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The wooden crates shall be provided with steel hoop and bends for strength and durability to withstand rough handling. The bends shall have descriptive marking of the firm thereon.

It is the responsibility of the manufacturer/ supplier to ensure the delivery of items without any damages to the consumer's store or other designated places mentioned by the customer. The customer can inspect or do any or all acceptance tests at the customer's premise after the delivery. If any failure or damage is noticed, the lot can be rejected fully or partially. Delivery without any damages will be the responsibility of the supplier and if any failure is noticed the lot can be rejected.

The firm shall provide at its cost, lead seal and wire on each wooden crate to facilitate sealing by the inspection authority of KSEB Ltd after acceptance of the lot at manufacturer's premises.

- 22) BRANDING:-** Necessary identification mark as required in the relevant IS specification shall be provided on each product. In addition to the above marking, the word "KSEB Ltd." and supplied on Date/Month/Year has to be indented on each item. This should be done before the material is offered for inspection.

**Sd/-
Chief Engineer (SCM)**

16 SUPPLY CHAIN MANAGEMENT

Thiruvananthapuram


TECHNICAL SPECIFICATION
11 kV , 400A AB switch with Polymer Post Insulator

Doc. #: SCM-SPEC/XH/11kV AB Switch

Rev#:1.0

Effective Date (27/08/2022)

Chief Engineer (SCM)
GUARANTEED TECHNICAL PARTICULARS TO BE FURNISHED BY THE BIDDER (NO COLUMN SHALL BE LEFT UNFILLED)

No	Particulars	Boards Requirement	Specification
1	Makers Name, Address and Brand Name		
2	Applicable Standards	11 KV Outdoor type Air Break switch shall confirming IS/IEC62271-103, IS: 2633 & IS: 2544/1973 with latest amendment if any and as per drawing.	
3	Nominal Operating Voltage kV	11kV	
4	Maximum operating voltage kV	12kV	
5	Frequency Hz	50Hz	
6	Number of phases	3	
7	Type	Outdoor Vertical type	
8	Temperature rise	Within Limits of IS/IEC62271-103	
9	Short time current rating	16kA for1sec	
	Phase to Phase distance mm	760 min.	
10	Phase to pole centre distance mm	460 mm	
11	Minimum isolating distance	310mm	

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12	Fixed Contacts		
a	Type	Spring loaded jaw type	
b	Material	HDE Copper	
c	Surface treatment (plating thickness)	Silver-plated 40Microns	
d	Continuous Current Rating Amp	400	
e	Current density Amp/sq.mm	1.3 A /mm ²	
f	Spring used size and material	16mm dia Spring phosphor bronze	
13	Moving Contacts		
a	Type	Flat	
b	Material	HDE Copper	
c	Size of moving contact	Of Current density 1.3 Amp/sq.mm	
d	Surface treatment (End silver plated or not)	Silver-plated 40Microns	
e	Continuous Current Rating Amp	400	
f	Maximum Current density	1.3 A/mm ²	
14	Number of phases	3	
15	Number of operations which the switches can withstand without deterioration of contacts	1000 numbers	
16	Arcing horn		
a	Material	GI rod	
b	Size	10mm diameter	

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17	Location and type of mechanism	Rocker Type supported with side plates with brass bush	
18	Torque required to operate the switch	As per IS	
19	Details of safety stops provided	To be Provided	
20	Technical particulars of insulators		
a	Material	11kV Composite Polymeric Post Insulator as per IEC:61109	
b	Rated Voltage kV	12	
c	Make and drawing reference	of reputed manufacturer	
d	Maximum shed diameter mm	As per manufacturer standard	
e	Height mm	254 mm	
f	Creepage distance mm	320mm(min)	
g	Bending strength	6kN	
h	Tensile strength	15000N	
i	Torsional strength	200Nm	
j	Compression strength	30kN	
k	Dry power frequency one minute withstand strength kV rms	35	
l	Wet power frequency one minute withstand strength kv rms	35	

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m	Dry power frequency flash over voltage kV rms	70	
n	Wet power frequency flash over voltage kV rms	45	
o	Impulse withstand voltage kV peak		
i)	Positive wave	75kVp	
ii)	Negative wave	75kVp	
p	Impulse flash over voltage kV peak		
i)	Positive wave	75kVp	
ii)	Negative wave	75kVp	
q	Puncture voltage kV	95	
r	Visible discharge test kV	9	
s	Top PCD mm	57	
t	Bottom PCD mm	57	
u	Weight approx	To be provided	
v	Type and material of terminal connectors	Male & Female, Tinned Copper Strip	
w	Rated short time current	16kA for 1s	
x	Rated peak withstand current	40kA	
21	Base channel size	As per specification	
22	Connecting pipe		

16 SUPPLY CHAIN MANAGEMENT

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a	Material	MS HDG	
b	Size, class and length	33.7mm outer dia B class 6000mm	
c	Guide to pipe	As per specification	
23	Handle		
a	Material	MSHDG Rod 19mm	
b	Insulation	Epoxy resin cast compound having insulation thickness 6mm and withstand 15kV minimum	
24	Terminals		
a	Size of connecting flats	150 x 50 x 6mm tinned copper strip	
b	Material	Tinned Copper	
c	Number and size of holes in each terminal	13mm dia 2 holes for accommodating 120 sq.mm cable lug	
25	Braided flexible copper		
a	Tinned or not	Tinned	
b	Size	50x6 mm, current density 1.3 A/sq.mm	
26	Pantographs		
a	Material used	MSHDG	
b	Length	20X6X530mm	

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27	Connecting rod		
a	Size	Square rod 25 mm (25x25-2000(length in mm)	
b	Thickness of galvanization	87 microns	

Sd/-

Chief Engineer (SCM)