

**TECHNICAL SPECIFICATION FOR 11KV 200A (TT) AB SWITCHES
WITH SOLID CORE POLYMER TYPE INSULATORS**

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1. SCOPE :-

The specification provides for the manufacture, testing before dispatch, supply and delivery in full shape at destination stores of 3 Phase 11KV 200A Tilting Type Load Break (16A) AB Switches with solid core insulators **Polymer type** and assembly at destination stores for use on the Distribution Transformers, Lines and Substations as per particulars given in the schedule attached.

2. STANDARDS: -

The Switches shall conform in all respect to the IS:1818/1972 , IS: 9920 Parts I to IV (Latest Version), and IS: 9921 Parts-I to IV (Latest version)/ The 11KV 200A (Tilting Type) AB Switches with insulators shall also conform to REC specification No.43 of 1987.

3. CLIMATE CONDITIONS: The climatic conditions under which the equipment shall operate satisfactorily are as indicated in page (13) of General and Financial terms and conditions for supply of materials.

4. RATINGS :

| | | | |
|----|---|---|-----------|
| a) | Number of Poles | : | 3 |
| b) | Nominal System Voltage | : | 11kV |
| b) | Rated Voltage | : | 12 kV |
| d) | Rated impulse withstand Voltage | : | 75 kV |
| e) | Rated frequency | : | 50 Hz. |
| f) | Rated Current | : | 200 A |
| g) | Rated peak short circuit current | : | 25 kA |
| h) | Rated short time current | : | 10 kA |
| i) | Rated maximum duration of short circuit | : | 1 Second. |

5. LIMITS OF TEMPERATURE RISE :

The limits of Temperature rise shall be as given in Table-4 of IS:1818/1972 and the reference conditions mentioned therein.

6.0. CONSTRUCTION : (11 KV 200 A TILTING TYPE LOAD BREAK AB SWITCHES) :

6.1. The AB Switch shall have triple pole construction suitable for assembling with light weight insulators made of high alumina body and for vertical mounting. The phase assembly shall have suitable sheet steel folded in the form of a channel with a plate dimension of thickness 4 mm for mounting two 11kV Solid core insulators. The channel supports shall be mounted on 70 mm square tubular beam. Alternatively the phase assembly shall be mounted on a base channel of 75 x 40 x 6 mm MS HDG. The switch shall be manually operated with rocking type arrangement through a coupling rod of GI 30 mm seamless square (thickness) 2.5 mm of length 1.4 meters (1400 mm). Aluminium Alloy Metal Bush made in two halves (to form 2 Nos. C-Sections) to have firm grip on horizontal square rod, the bush will have 3 Nos. of threaded holes for screwing the bolt on the bush to have firm grip on metal square Rod (6Nos. of suitable bolts to be supplied for the above purpose). The moving insulator base is firmly welded to the clamp and the clamp is fitted to the pipe and locked through a bolt (the bolt is extruded, through a hole into pipe). Each phase will be having 2 clamps made in MS Flat 65x6 mm.

6.2. All current carrying parts shall be made of nickel plated 99.9% electrolytic copper and shall be provided with stainless steel bolts. The arcing horns shall be made of stainless steel rod of 5 mm dia & phosphor bronze sheet of 14 gauge and shall have spring assisted operated. The speed of breaking of load current shall be independent of the speed of operation.

6.3. The spacing between the phases shall be adjustable between 600 mm to 760 mm suitable for mounting on single pole structure.

6.4. The vertical operation pipe shall comprise of 25 mm (nominal bore) GI Pipe B-Class (medium class) as per IS : 1239/1979. Length of the operating pipe shall be 5800 mm. Guide brackets should be fixed to the down pipe. 2 Nos. guide brackets should be fixed / welded to the down pipe.

6.5. Suitable arrangement shall be provided to pad-lock the operating handle in “ON” and “OFF” positions. The position of the operating handle shall be downwards when the switch is in open position and suitable guides (2 Nos.) shall be made out of HDG M.S. angle flat and supplied along with Bolts & Nuts and ferule for sliding vertical operating pipe. The operating handle shall be duly insulated with material such as special compound latex (other than super compound latex the material should be got approval with EPDCL) to ensure safety to the operating personals

6.6. The Switch terminal shall be suitable for accepting bi-metallic clamps on the incoming side to accommodate AAAC / ACSR conductor of sizes 20/34/55 Sq.mm on the outgoing side about a 1 Meter long 3 Nos. jumpers with 30 x 0.6 mm brass sheet with tin plating provided at connecting ends for each phase.

6.7. All iron parts shall be hot dip galvanized. The pipe shall be galvanized in accordance with IS 4736/19769.

6.8. The fixed contacts shall be of high grade copper and capable of carrying the short circuit current of minimum 10 KA and also capable of carrying rated normal current of the switch continuously with large margin of safety at all times. The contacts shall be nickel plated.

6.9. The moving contacts shall be of HDEC copper flat 30x 6 mm and capable of carrying the short circuit current of minimum 10 KA and also capable of carrying rated current of switch continuously with large margin of safety at all times. The contacts should be spring loaded with stainless steel springs to maintain constant contacts pressure. The contact should be nickel plated. Moving contact cup should be made of 2.5 mm thick of Hard Drawn Electrolytic Copper.

6.10. Both fixed and moving contacts shall be capable of breaking load current of 16 Amps and they shall be fixed with stainless steel bolts.

NOTE: :

11kV 200A (Tilting Type) AB Switches with Square Pipe:

The aluminium clamp moulded as ‘V’ type: But it must be ‘C’ type for having a firm grip on square pipe as specified in the purchase order and specification.

6.11 SWITCH TERMINALS :

The terminal pad shall be made of rolled/ extruded electrolytic grade copper flat having a cross sectional area equal to that of the blade. It shall be so constructed that an intimate contact with the contact element is ensured in case of 11kV 200A. The connector to the switch terminal shall be suitable for ACSR conductor. The Aluminium connectors of appropriate size shall be supplied for each end and for each phase of the switch.

6.12. MECHANICAL STRENGTH:

The isolating switches shall be capable for withstanding the rated mechanical terminal loads and electro magnetic forces, without effecting the operation and current carrying properties. The switches, complete with the operating mechanism should not come out of their own in closed position due to the effect of gravity, wind pressure, vibrations and reasonable shocks. Their construction should be such that they do not open under the influence of the short circuit current.

6.13. LOCKING ARRANGEMENTS:

The AB (Air Break) switches shall be constructed in such a manner to permit pad locking in both open and close position. A pad lock of reputed make shall be provided.

6.14. GALVANIZING:

All ferrous parts should invariably be hot dip galvanised. However, the bolts, nuts, washers, spring washers and split pins, which can be electro-galvanised. The threads of nuts and tapped holes that shall be cut after the galvanization shall be well oiled or greased.

7.0 SUPPLY OF AB SWITCHES WITH SOLID CORE INSULATORS (Polymer type)

Form-13 will only be issued after the supply of AB Switches with insulators only.

7.1. The insulators for the isolating switches shall be of **Polymer type** and shall be in accordance with latest version and relevant IS (IEC: 61109). The assembly of the metal parts and **polymer** shall be in such a manner that the metal and **polymer** part shall not have any deteriorating effect or create undue stresses adversely affecting the mechanical and electrical strength of the unit arising out from any harmful expansion. The insulators shall be of standard make.

7.2. Technical Description of Composite Insulators :

Service condition

The polymer insulators to be supplied shall be suitable for satisfactory continuous operation under conditions as specified below:

| | |
|-------------------------------|-------------------|
| Maximum ambient temperature : | 48 ⁰ C |
| Minimum ambient temperature : | -5 ⁰ C |
| Relative humidity : | 0 to 100% |

(a) Composite Insulators long rod type for tension locations and pin / post type for suspension locations

- (i) The insulators shall be suitable for 3Ph. 50Hz, effectively earthed 11KV O/H distribution system in a moderately/heavily polluted atmosphere.
- (ii) Bidder must be an indigenous manufacturer and supplier of composite insulators of rating 11KV or above or must have developed proven in house technology and manufacturing process for composite insulators of above rating OR posses technical collaboration / association with a manufacturer of composite insulators of rating 11KV or above. The Bidder shall furnish necessary evidence in support of the above along with the bid, which can be in the form of certification from the utilities concerned, or any other documents to the satisfaction of the owner.
- (iii) Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc., and selection in respect of polluted conditions shall be generally in accordance with the recommendation of IEC-60815 / IS : 13134.
- (iv) The length of the composite Insulator shall be 242 mm. The diameter of weather shed shall be 95 mm. IEC tolerance applicable
- (v) Thickness of Silicone sheath housing shall be minimum 3 mm and shall be measurable on the wethersheds.
- (vi) Creepage distance shall be minimum 320 mm.

(b) Dimensional Tolerance of Composite Insulators

The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows in line with-IEC 61109 :

$\pm (0.04d + 1.5)\text{mm}$ when $d \leq 300\text{mm}$

$\pm (0.025d + 6)\text{mm}$ when $d > 300\text{mm}$

Where, d being the dimensions in millimeters for diameter, length or creepage distance as the case may be.

However, no negative tolerance shall be applicable to creepage distance.

(c) Interchangeability

The composite insulators including the end fitting connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC/IS standards.

(d) Corona and RI performance

All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.

(e) Maintenance

The composite insulators offered shall be suitable for use of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

- 7.3. The composite insulators including the end fitting connection shall be standard design of any make conforming to relevant IEC/IS standards.
- 7.4. All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.
- 7.5. The composite insulators offered shall be suitable for use of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.
- 7.6. The composite insulator shall have a core, housing & weather shed of insulating material and steel/aluminum hardware components for attaching it to the support/conductor.
- 7.7. The threads of the tapped holes in the post insulator metal fittings shall be cut after giving anti-corrosive protection and shall be protected against rust by greasing other similar means.
- 7.8. **TESTS:** The insulators shall comply with the relevant IEC/IS (latest version).
- 7.9. **MARKING:** Each insulator shall be legibly and indelibly marked to show the following.
 - a) Name or trademark of the manufacturer
 - b) Month and year of manufacture.
 - c) Minimum failing load in Newtons.
 - d) ISI certification mark, if any.

8.0 TESTS:

8.1. The following tests shall be carried out as per IS: 1818/1972 on complete isolators and their operating devices.

8.1.1. TYPE TEST: The following shall constitute the type tests:

- a) Impulse voltage dry set.
- b) Power frequency voltage dry test on main circuits.
- c) Power frequency voltage wet test on main circuits.
- d) Temperature rise test of the main circuits.
- e) Measurement of the resistance of the main circuits.
- f) Test to prove capability of carrying the rated peak short circuit current and the rated short time current.
- g) Operation test.
- h) Mechanical endurance test.
- i) Load breaking test at 16A : In case of 11kV 200A Tilting type.
- j) Transformer off load Test : Isolators.

Note: All the above tests shall be conducted as per the relevant IS specification and a copy of the test report shall be furnished along with the tender as otherwise tender is liable for rejection.

8.1.2. ROUTINE TEST: The following shall comprise routine test:

- a) Measurement of resistance of the main circuit..
- b) Test to prove satisfactory operation.

The ambient air-condition during the test shall be as specified in IS.

9. MARKING :

- a) AB Switches and their operating device shall provide with the name plates in accordance with the Table-6 of IS: 1818/1972. The nameplate shall be adequate weather and corrosion proof.
- b) The name plate should be fitted in a position where it can be visible in normal service and installation.
- c) If the AB Switch consists of several independent poles, each pole shall be provided with the name plate.
- d) The name plate shall be marked with the following
 - a. Name of manufacturer
 - b. Name of the product
 - c. EPDCL Purchase Order Number & Date
 - d. Manufacturers month & Year
 - e. EPDCL logo shall be embossed on plate and should be completely welded.

10. INSPECTION :

10.1. All routine tests and inspection shall be made at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall afford the inspector representing the purchase all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with this specification.

10.2. The purchaser has the right to have the tests carried out at suppliers cost by an independent agency wherever there is a dispute regarding the quality of supply.

11. PACKING :

The air-break switches shall be delivered suitably packed. Although the method of packing is left to the discretion of the manufacturer, it should be robust for rough handling, that is occasioned during transportation by rail/road.

12. DRAWING :

Two sets of detailed dimensional drawings of each part of the complete air break switches along with operating instructions shall have to be submitted along with tender.

13. GUARANTEED TECHNICAL PARTICULARS :

The Guaranteed Technical Particulars of the air break switches along with insulators shall be given by the bidder as per Sec.-VI.

14. THE SCHEDULE OF REQUIREMENT, DESIRED DELIVERY AND PRICES:

14.1 The Schedule of requirements and desired deliveries are indicated in Section-VII

14.2 The Schedule of prices shall be indicated online in e-procurement.

15.0. GENERAL:

15.1 Any design other than one so specified herein may also be offered. However, the APEPDCL reserves the right to make purchase only according to this specification.

15.2 A fully dimensioned sketch showing the full details of gang operation, fixed and moving contacts should necessarily accompany the tender.

15.3 A neat dimensioned sketch showing the details of the switch should accompany the tender.

15.4 *The Tenderer shall submit relevant type test certificates along with the tender. If the type test report is not enclosed with the tender, such tenders are liable for rejection.*

BILL OF MATERIALS

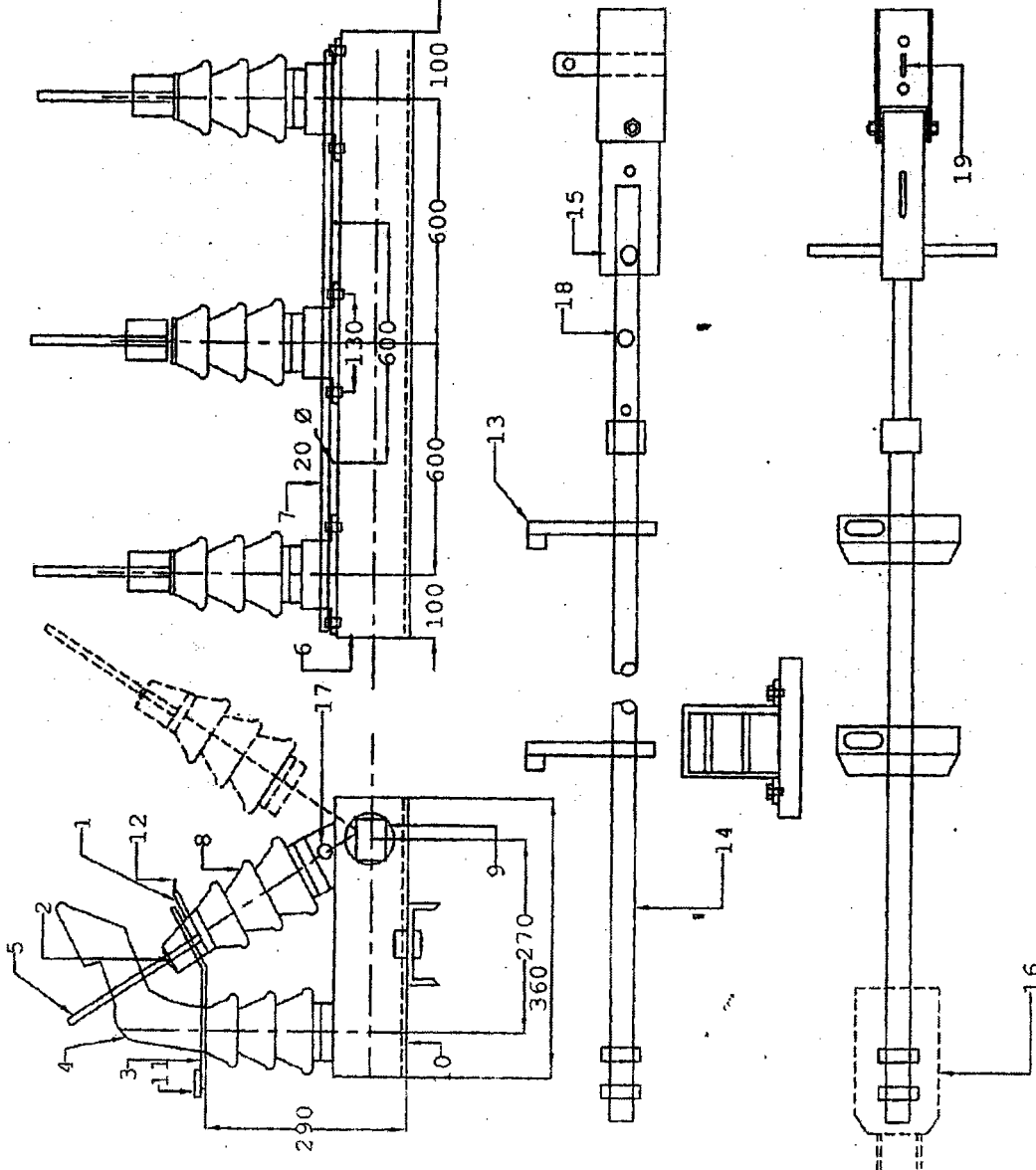
| | | |
|-----------------------------|---------|----------------------------|
| 1. Jumper Pad | 3 nos | 30x6 mm HDEC flat |
| 2. Moving contact | 3 nos | 25mm THICK HDEC sheet |
| 3. Fixed contact | 3 nos | 30x6 HDEC Flat |
| 4. Arcing horn FC | 3 nos | 14 SWG P.B. Sheet |
| 5. Arcing horn MC | 3 nos | 5mm Dia. St. Steel rod |
| 6. Base-phase fixing | 1 nos | channel 75x40x1400mm MSHDG |
| 7. Phase coupler pipe | 1 no | 30x30Ssqmm GI pipe 1400mm |
| 8. Insulator | 6 nos | Registered Vendor of EPDCL |
| 9. Aluminium Bush | 3 nos | provided |
| 10. Phase channel | 3 nos | 4mm MSHDG 360x80x40 mm |
| 11. Terminal connector | 3 no | Alu. for Mink conductor |
| 12. Flexible jumper | 3 no/ph | 30x1000x0.6 Brass |
| 13. Guide | 2 nos | MS angle HDG 40 x 40 mm |
| 14. Operating pipe | 1 nos | 25Dia.class B 5.8M long |
| 15. Bottom operating mech. | | MSHDG provided |
| 16. Top operating mechanism | | MSHDG provided |
| 17. Phase stopper | | MSHDG provided |
| 18. Earthing terminal | | GI provided |
| 19. Locking arrangements | | Provision for pad locking |

NOTES

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| 1. All dimensions are in mm. |
| 2. All ferrous parts not dip galvanised. |
| 3. All contacts ends nickel plated |
| 4. Manufacturing tolerance +/- 5% |

11 KV 200 Amps Load Breaking Type AB Switch
(2 Insulator Version)

| | | |
|-----------|---------------|---------------------|
| SCALE | N.T.S. | DRAWN BY |
| TOLERANCE | +/- 5 MM. | CHECKED BY SRINIVAS |
| DATE | | APPROVED BY |
| DRG. NO. | SHEW 05/13-14 | |



ANNEXURE - I**SECTION – VI****GUARANTEED TECHNICAL PARTICULARS FOR AIR BREAK SWITCHES :**

| Sl. No. | Details | Guaranteed Technical Particulars |
|---------|---|----------------------------------|
| 1. | Air break switches | 11kV 200A Tilting Type |
| a. | Name of manufacturer. | |
| b. | Whether single break or double break. | |
| c. | No. of Poles. | |
| d. | Frequency. | |
| e. | Voltage rating | |
| f. | Current rating in Amps. i) Normal. ii) Maximum | |
| g. | Temperature rise of the following at full rated current in O.C over ambient temperature. i) Copper contacts with coating. ii) Terminals of switches intended to be bolted to the external conductors. iii) Metallic parts acting as springs. | |
| h. | Whether contacts are silver coated or tin coated along with thickness of coating in mm. | |
| i. | Voltage drop across terminals of poles. | |
| j. | Short-time current and duration. | |
| k. | Material of fixed contact. | |
| l. | Material of moving blade. | |
| m. | Material of terminal connector. | |
| n. | Type, diameter and length of operating handle. | |
| o. | Material of arcing horns. | |
| p. | Size and length of base mounting channel. | |
| q. | Whether the Air-break switch is complete with all accessories. | |
| r. | Whether dimensional drawing is enclosed with the tender. | |
| s. | Minimum clearance between phases (The centre distance between the insulators of adjacent phases in the assembled position of switch). | |
| t. | Centre to Centre distance between insulators of the consecutive poles of the same phase in the assembled position of switch (in mm). | |
| u. | Whether mechanical interlock has been provided for arcing switches. | |
| v. | Type of bearings use in: i) Rotating insulator stack. ii) To earth and between poles. | |
| w. | Impulse withstand voltage with 1/50 Ms wave positive and negative polarity. i) Across isolating distance. ii) To earth and between poles. | |
| x. | One minute power frequency withstand voltage (RMS) across Isolating distance to earth and between poles i) To earth between poles ii) Across Isolating Distance | |

| | | |
|-----|--|--|
| II | PARTICULARS OF INSULATORS | |
| | | |
| a) | Type of insulators | |
| b) | Name of manufacturer of insulators | |
| C) | Height of the insulator | |
| d) | Diameter of the largest shell | |
| e) | No. of units per stack | |
| III | ELECTRICAL CHARACTERISTICS. | |
| a) | Flash over voltage | |
| b) | Dry power frequency | |
| C) | Wet power frequency | |
| d) | Impulse voltage of 1/50 micro-seconds (+ve) | |
| e) | Impulse voltage of 1/50 micro-seconds (-ve) | |
| f) | Withstand voltage | |
| 3. | Power frequency puncture withstand voltage of unit | |
| 4. | Mechanical characteristics: | |
| | a) Cantilever strength upright | |
| | b) cantilever strength under hand | |
| | c) Torsional strength | |
| | d) tensile strength | |
| 5. | General Characteristics | |
| | a) Minimum creepage distance | |
| | b) weight of complete unit | |
| 6. | Standard to which insulator conforms. | |
| | a) Minimum creepage distance | |
| | b) weight of complete unit | |
| 7. | Standard to which insulator conforms: | |