

# **Technical Specification**

**Of**

**12.1/12.65 KV, 50HZ Pole-mounted  
automatically switched capacitor banks  
of 150 kvar**

## 1.0 Scope

This specification describes of 12.1/12.65 KV, 50HZ Pole- mounted automatically switched capacitor banks of 150 kvar with multi layer arrangement upto 300 Kvar rating with all accessories & allied components (like CT, PT, fuse, vacuum switches with control box, structures, clamps & connectors, earth flat, control cable etc.), providing a central monitoring system through Remote Sensing arrangement and Web Portal based client to WBSEDCL for monitoring the same including protection system and guaranteeing improvement of average monthly power factor to level of 0.95 and above in selected 11 KV overhead feeders in different district of West Bengal under WBSEDCL area.

## 2.0 Service Conditions :

a) Maximum Ambient Temperature (° C)	: + 50°C
b) Minimum Ambient Temperature (° C)	: + 4°C
c) Max. & Min Relative Humidity (%)	: 100 & 50
d) Maximum annual rain fall (mm)	: 2000
e) Maximum Wind Pressure (Kg/m sq)	: 150
f) Maximum wind velocity (m/sec)	: 50
g) Isoceraunic Level (days/year)	: 200
h) Maximum altitude above mean sea level (Meter)	: 1000
i) Seismic Level ( Horizontal acceleration)	: 0.3 g

## 3.0 Operating conditions :

a) Nominal System Voltage	: 11 KV
b) Highest System Voltage	: 12 KV
c) Normal frequency	: 50 Hz
d) No. of phases	: 3
e) System fault current	: 18.4 KA for 3.0 sec

## 4.0 Applicable Standards :

Unless otherwise stipulated in the specification, the 12.1/12.65 KV pole mounted automatically switched capacitors shall be comply with the latest version of IS: 9920 for automatic capacitor Switch and IS:13925 (Part-I) for Pole mounted Capacitor Bank.

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## 5.0 Basic Requirements:

- 5.1 The bidder shall conduct survey, measure and submit voltage and power factor of the selected 11KV feeder at the at Sub-Stn end and the extreme tail end and different critical load points of the feeder.
- 5.2 The bidder shall submit design for installation of multi switching capacitor banks of 150kvar each for guaranteeing improvement of average monthly power Factor to a level of 0.95 and above
- 5.3 The capacitor banks are to be automatically operated.
- 5.4. The bidder shall provide a central monitoring system through Remote sensing arrangement of their own and Web Portal based client to WBSedcl for monitoring the same.
- 5.5 Permissible over load:  
  
The maximum permissible overloads with regard to voltage, current and reactive Output shall conform to IS:13925
- 5.6 Power loss:  
  
The power loss in capacitors shall not exceed 0.2 Watt/kvar
- 5.7 Discharge Device:  
  
Suitable discharge device shall be connected across the capacitor units in accordance with the provision of IS:13925. The discharge device shall reduce the residual voltage from the cross value of the rated voltage to 75 Volt or less within 10 minutes after the capacitor is disconnected from the source of supply.
- 5.8 Earth Connection:  
  
The container of each capacitor units shall be provided with suitable earthing terminal.
- 5.9 Protective Fuses:  
  
The capacitors shall be provided with external fuses. It shall be possible to identify the blown off fuse from the outside. The tolerance and the degree of unbalances shall also be indicated as per relevant IS. The manufacturer shall supply a set of external fuses together with fixing accessories and a set of three spare fuse links along with capacitor bank.

## 6.0 General requirements :

- 6.1 The Capacitors shall be of non PCB Type, using polypropylene film as the dielectric.
- 6.2 The containers shall be made from sheet steel of thickness not less than 1.6mm.
- 6.3 The Container shall be hermetically sealed by controlled arc welding process.
- 6.4 The fuse and capacitors cells shall be interchangeable.
- 6.5 The dielectric loss angles (tan delta) shall be less than as per relevant IS

### **A. 11 KV Automatic Capacitor Switches**

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### 1.0 RATED CURRENT:

The standard rated normal current shall be 200 A.

### 2.0 RATED CAPACITIVE SWITCHING CURRENT:

The rated capacitive switching current shall not be less than 50 A.

### 3.0 i) RATED SHORT-TIME CURRENT:

The rated short-time symmetrical current for 1 second shall be 4.5 KA.

### ii) RATED MAKING CURRENT:

The rated making current shall be 6 KA and above.

### 4.0 BASIC IMPULSE LEVEL (BIL):

The rated basic impulse level of switch to earth as also across the open terminals shall be 75 KV.

### 5.0 CONTROL SUPPLY:

The capacitor switch shall be self-powered from the 11KV line, i.e., no AC or DC control supply shall be required to be provided by the Utility for its operation. The source of control supply (auxiliary transformer, etc.) should work satisfactorily with voltage fluctuations on the 11KV line from (+) 10% to (-) 20%.

### 6.0 DESIGN AND CONSTRUCTION REQUIREMENTS:

1. The capacitor switches may be of either single-phase or three-phase construction as per standard design of the manufacturer.
  2. The switch shall be of either vacuum or SF<sub>6</sub> type.
  3. The capacitor switch shall be suitable for outdoor installation and shall have sealed weatherproof type construction.
  4. The capacitor switch shall be provided with a mechanical indicator to show the contact position in open/closed position.
  5. The metallic enclosure of the capacitor switch shall be provided with two earthing terminals (marked with the earth symbol).
  6. The bushings provided on the switch shall be of high quality porcelain and shall have clamp type of terminal to directly receive aluminium conductors up to 10mm dia in both horizontal and vertical directions. The terminal arrangement shall be such as to avoid bimetallic corrosion.
  7. The switch shall be provided with suitable structures for mounting with capacitor and control parameter on the double pole structure
  8. All nuts, bolts and mounting structure shall be hot dip galvanized.
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## 7.0 CONTROL PARAMETER:

The bidder shall maintain all control parameter as per requirement of WBSEDCL.

## 8.0 MARKING

The capacitor switch shall be provided with a name plate legibly and indelibly marked with the following:

- a) Name of the manufacturer
- b) Type, designation and serial number
- c) Rated voltage and current
- d) Rated frequency
- e) Number of poles
- f) Rated short time current (symmetrical)
- g) Rated making current
- h) Rated capacitive switching current

## 9.0. TESTS:

The switch shall be subjected to the following tests in accordance with the IS: 9920 (part-IV):

### 9.1 TYPE TESTS:

- a) Tests to verify the insulation level including withstand tests at power-frequency voltages on auxiliary equipment.
- b) Tests to prove that the temperature rise of any part does not exceed the specified values.
- c) Making and breaking tests
- d) Tests to prove the capability of the switch to carry the rated peak withstand current and the rated short-time current.
- e) Tests to prove satisfactory mechanical operation and endurance.

### 9.2 ROUTINE TESTS:

- a) Power-frequency voltage dry test
- b) High Voltage tests for auxiliary circuits
- c) Measurement of the resistance of the main circuits
- d) Tests to prove satisfactory operation

### 9.3 ACCEPTANCE TESTS:

As per clause no.9.2

9.4 The equipment offered by manufacturer shall comply with general safety regulations.

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## 9.5. TYPE TEST REPORT:

The bidder shall furnish detailed type test reports of the offered Automatic Capacitor Switches for the tests as per relevant IS mentioned in this specification. All these Type Tests shall be carried out at laboratories that are accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) of Government of India. These tests should have been carried out within 5 years prior to the date of opening of this tender.

## **B. 11KV CAPACITOR BANKS**

### 1. RATED VOLTAGE:

The rated voltage of the capacitors shall be 12 KV

### 2.0. RATED OUTPUT:

The standard rated output of a switched capacitor bank shall be 150 KVAR at 12KV rated voltage.

### 3.0. PERMISSIBLE OVERLOADS:

The maximum permissible overloads with regard to voltage, current and reactive output shall conform to IS: 13925 (Part-1).

### 4.0 POWER LOSS:

The power loss in capacitor shall not exceed 0.2 Watt/KVAR (subject to a tolerance of plus 10%).

### 5.0. DISCHARGE DEVICE:

Suitable discharge device shall be connected across the capacitor units in accordance with provision of IS:13925

### 6.0. EARTH CONNECTION:

The container of each capacitor unit shall be provided with suitable earthing terminal clearly marked as ( $\pm$ ). Two nos. of earthings shall be provided to the Capacitor bank structure as per clause no.9.4 of IS:3043. This is under bidder scope.

### 7.0. GENERAL REQUIREMENTS:

7.1 The capacitors shall be of non-PCB type, using polypropylene film as the dielectric.

7.2 The containers shall be made from CRCA sheet of thickness not less than 1.6 mm.

7.3 The container shall be hermetically sealed by controlled arc welding process. The metal flanges of the bushing should be soldered/ welded to the container and

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covered with epoxy compound providing a strong hermetical seal to the container.

7.4 Suitable mounting brackets, as required by the purchaser, shall be welded to the container.

7.5 The outside of the container should have smooth and tidy look and should be coated with weather proof and corrosion-resistant paint of pebble gray shade (RAL 7032).

7.6 Dielectric loss angle (tan delta) shall be less than as per IS: 13925(Part-1)

#### 8.0. COMMUNICATION:

The controller will have remote sensing arrangement to monitor the health of capacitors by the bidder in the arrangement. The bidder shall provide a Web Portal based client to WBSedCL for monitoring purpose. They have to provide SIM & central monitoring system at their own cost & to be maintained at their premises.

#### 9.0 AUTOMATED POWER FACTOR CONTROLLER PANEL FOR POLE MOUNTED CAPACITOR BANK (APFC) ;

9.1 Switching operation shall be with the single phase current & three phase voltage.

9.2 Controller output signal shall be operated under following modes -

- PF/KVAr mode - when PF is below the set value.
- Voltage mode - when system voltage is below the set value.

9.3 Automatic control unit shall instantly switch off of a capacitor banks (multi banks) in the following contingencies occurring

- Voltage increased by 10% above the rated voltage of 11 KV.
- When supply goes off.
- When PF is leading and falls below unity lead PF.

9.4 Switching ON operation will take place after a period of 10 minutes. The switching OFF operation of relevant steps will be instantaneous.

9.5 Mode of communication to WBSedCL - Bidder's choice.

#### 10.0 MARKING:

The capacitors shall be provided with a rating plate and terminal markings as stipulated in IS:13925.

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## 11.0. TESTS:

The capacitors shall be subjected to following tests in accordance with IS: 13925(Part-1).

### 11.1 TYPE TESTS:

- a) Thermal Stability test
- b) Capacitance and Tan delta test at elevated temperature.
- c) AC Voltage test between terminals and container
- d) Lightning impulse voltage test between terminals and container
- e) Short Circuit Discharge test
- f) Physical Verification

### 11.2 ACCEPTANCE TESTS:

As per clause no.12.3 of IS: 13925(Part-1)

### 11.3 ROUTINE TESTS:

As per clause no.12.1 of IS: 13925(Part-1)

## 12.0 TYPE TEST REPORT:

The bidder shall furnish detailed type test reports of the offered capacitors for the tests as per relevant IS mentioned in this specification.

All these Type Tests shall be carried out at laboratories that are accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) of Government of India. These tests should have been carried out within 5 years prior to the date of opening of this tender.

## 13.0 The equipment offered by manufacturer shall comply with general safety regulations.

## 14.0 DOCUMENTATION:

Bidder shall furnish following drawings & documents along with bid.

32.1 Dimensional drawings of items offered indicating all fittings.

32.2 Relevant catalogues

32.3 GTP as per Schedule-I, II

32.4 Bill of material as per Schedule-III

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## SCHEDULE: I

### GUARANTEED TECHNICAL PARTICULARS FOR 11KV CAPACITOR SWITCH UNIT (To be furnished by the Manufacturer)

Sr. No.

- 1 Name of the Manufacturer.
  - 2 Type of 11 KV Switch unit Construction
  - 3 Indian Standard according to which the 11 KV Switch are manufactured & tested.  
(IS-9920)
  - 4 Nominal Rated Voltage in KV
  - 5 Rated Line Current in Amp.
  - 6 Rated Capacitive Switching Current in Amp
  - 7 Rated Short Circuit Current
  - 8 Rated Making Current
  - 9 Rated Frequency (50 Hz)
  - 10 Basic Insulation Level KV RMS / KV Peak
  - 11 Mechanical/Electrical Endurance Test
  - 12 On/Off Indication ( Manual/Electrical)
  - 13 Over Current /Over Voltage Protection
  - 14 Power Factor Controller
  - 15 Current Transformer Rating/Nos.
  - 16 Voltage Transformer Rating
  - 17 Whether Type Test Submitted as per IS:9920
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## SCHEDULE: II

### GUARANTEED TECHNICAL PARTICULARS FOR 11 KV CAPACITOR BANK (To be furnished by the Manufacturer)

Sr. No.	Particulars
1.	Name of the Manufacturer.
2.	Type of capacitor cells
3	Indian Standard according to which the capacitor cells are manufactured & tested. (IS-13925 (Part-I) 1998)
4.	Name of the insulating materials used in the capacitor cells with class / grade etc.
5.	Nominal System Voltage in KV.
6.	Rated Voltage of capacitor cells in kV.
7.	Rated capacity of three phase capacitor cells at rated Voltage (150 KVAR)
8.	Rated Frequency of capacitor cells (50 Hz)
9.	Power loss in capacitor (in Watts)
10.	Whether Suitable internal discharge device provided or not
11.	Whether suitable external earthing terminal provided or not
12.	Protective Fuses as per clause
13.	Thickness of the CRCA container sheet of capacitor cell
14.	Size of the capacitor cell
15.	Net weight of capacitor cell
16.	Whether Type test reports of the specification are submitted
17.	Any other particulars which the bidder may like to give

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SCHEDULE: III

BILL OF MATERIAL

BILL OF MATERIALS  
(TO BE FURNISHED BY BIDDER)

The following equipments /materials with suitable ratings listed below but not limited to, as per approval of WBSEDCL shall be supplied per 11KV feeder:

Sl. No.	Descriptions	Quantity
1.	Capacitor Unit with Reactor, 1ph/3ph	03/1set
2.	Capacitor switch with control transformer	01
3.	Fuse with cut out	03
4.	Automatic power factor control unit	01
5.	11KV CT	01
6	11KV PT	01
7.	Copper conductor	As reqd.
8.	Racks/mounting Str.	As reqd.
9.	Al. Earth Flat	As reqd.
10.	Cu. Control cable	As reqd.

