

**SECTION-III (PART-A)****TECHNICAL SPECIFICATION OF 12 KV INDOOR TYPE VACUUM CIRCUIT BREAKERS AGAINST TN-2593****1.0 SCOPE :**

This specification covers the design, manufacture, assembly, testing at manufacturer's works before despatch, supply, delivery of 3 pole, 50 Hz, 12 KV switchgear and control gear panels for indoor installation fitted with 12 KV vacuum circuit breakers including voltage transformers, current transformers, metering instruments, protection relays etc. as per schedule of requirement and installation & commissioning by the supplier as per Schedule-III (Part-B). The power system is with neutral solidly earthed. The equipment offered shall be safe, reliable and compact to install. The workmanship shall be of high order. The circuit breaker and protective devices shall be of latest design so as to ensure rapid and efficient interruption of fault current, low arc energy, small arcing time, complete phase segregation and freedom from fire hazards.

**3.1 STANDARDS :**

The circuit breaker/metal enclosed switchgear, Voltage transformers, current transformers and all other equipment shall also comply with the requirement of latest edition of relevant Indian standards. Deviation from the standards and this specification if any, should be brought out in the tender and justified. Voltage transformer and current transformers shall be mounted within the panels. The governing standard shall be :

<b>S. No.</b>	<b>IS/IEC Reference</b>	<b>Specification</b>
1.	IEC-60298	A.C. Metal – enclosed and control gear for rated voltages above 1KV and including 72.5KV
2.	IS-3427	A.C. Metal – enclosed and control gear for rated voltages above 1KV and including 52KV.
3.	IS-8623	Specification for Low Voltage Switchgear and Control gear assemblies.
4.	IS-13118// IEC-62271-100/ IEC-62271-200	Specification for High Voltage AC Circuit Breakers.
5.	IEC-60529	Degrees of Protection.
6.	IS-5578 & 11353	Making and arrangement for switchgear bus bar main connections and auxiliary wiring.
7.	IS-325	Specification for 3 Phase Induction motors.
8.	IS-2629	Recommended practice for not dip galvanizing of iron and steel.
9.	IEC-60137	Bushing for AC Voltages.

10.	IS-3347	Porcelain Transformer Bushings.
11.	IS-5561	Terminal Connectors
12.	IS-3156	Voltage Transformers
13.	IS-2705	Current Transformers
14.	IS-3231	Electric relays for power protection.
15.	IS-13779	Static Energy Meters
16.	IS-8686	Static Protection Relays
17.	IS-1248	Electrical measuring instruments
18.	IS-2099	High Voltage Porcelain Bushings.
19.	IS-10118	Minimum clearances for Outdoor Switchgear.
20.	IEC-60694	Common Clauses for High Voltage Switchgear and Control gear.
21.	IEC-60255 & IEC-61330	Numerical Relays

Equipments conforming to any other internationally accepted standard(s) which ensure(s) equal or better quality than the standard(s) mentioned above would also be accepted. In case the tenderers wish to offer equipment conforming to other standards or alternative offer which tenderer considers advisable by reason of his own manufacturing requirement and experience would be acceptable provided descriptive matter, literature and complete certificates are submitted pointing out that the equipment/devices/arrangements as offered are equal or superior to that required by the accompanying specification with full justification. They shall furnish English translation of the relevant standards where the equipment conforms to any other standards. Salient points of difference between the standards adopted and those mentioned above shall be brought out.

### **3.2 a) PARTICULARS OF SYSTEM :**

- i) Nominal system voltage : 11 KV
- ii) Highest system voltage : 12 KV
- iii) Frequency : 50 Hz
- iv) No. of phases : 03
- v) Neutral earthing : Effectively earthed

### **b) SERVICE CONDITIONS :**

The equipment should operate satisfactorily under the climatic conditions specified in this specification. The reference maximum ambient Air temperature may be taken as 50 Deg. C. as against 40 Deg. C. The permissible temperature rise for various equipments offered should therefore be derated accordingly.

#### **3.2.1 CLIMATIC CONDITIONS:**

- i) Peak ambient air temperature  
in shade.

50 DEG C

- |   |                                  |
|---|----------------------------------|
| ii) Minimum ambient air temperature<br>in shade.                          | (-) 5 DEG C                      |
| iii) Maximum relative humidity  | 95%                              |
| iv) Minimum relative humidity   | 10%                              |
| v) Dust storms are liable to occur<br>from the period from March to July. |                                  |
| vi) Height above mean sea level   | Less than 1000M                  |
| vii) Average number of thunder<br>storm days per annum.                   | 40 Days                          |
| viii) Average annual rainfall   | 10-100 cm<br>(Depending on area) |
| ix) Number of months of tropical<br>monsoon conditions p.a.               | June to Sept.                    |

### 3.3 PRINCIPAL PARAMETERS

#### 3.3.1 CIRCUIT BREAKERS :

- a) Rating and characteristics of circuit breakers :
1. No. of poles : 3
  2. Class : Indoor
  3. Rated voltage : 12 KV
  4. Rated insulation level
  - a) Light-ning impulse voltage : 75 KV (Peak)
  - b) One minute power frequency : As per relevant standards.  
withstand voltage.
  5. Rated frequency : 50 Hz
  6. Rated normal current : 630 A
  7. Short circuit breaking capacity : 16 KA
  8. Short time withstand current : 16 KA for 3 secs.
  9. First pole to clear factor : 1.5
  10. Protection class : IP 5X
  11. Maximum opening time : 5 Cycles
  12. Rated operating sequence : 0-0.3Sec.-CO-3min-CO
  13. Minimum operations at full : 100  
rated short circuit breaking  
current.
  14. Rated Breaking Capacity
    - i) Symmetrical : 16 KA
    - ii) Asymmetrical : As per ISS
  15. Rated making capacity : 2.50x16 KA
  16. Operating Mechanism : Motor operated Spring charged closing  
mechanism or magnetic actuator.
  17. Heater/Lamp/Socket : 240 V A/C
  18. Control Voltage : 110V DC

b) Characteristics of the operating mechanism of Circuit breaker and associated equipment :

i) Method of operation : The circuit breakers shall be equipped with power operated mechanism to operate all the three phases simultaneously using 220/240V universal motors operated spring closing mechanism or magnetic actuator. The circuit breakers shall also be provided with hand operated spring closing mechanism or magnetic actuator. The Circuit Breaker shall have electrical and mechanical tripping arrangements under various conditions. In case of spring closing mechanism no main spring of the mechanism shall be plated, powder coated or given any other treatment so that spring property is not lost.

ii) Number and type of spare, auxiliary switches : Adequate number of spare auxiliary switches/ contacts both of normally open and normally close type but not less than four each shall be provided on the circuit breaker for use in the indication and controlling scheme of the circuit breaker.

iii) Rated supply voltage and rated supply frequency : The rated voltage for the auxiliary supply shall be 240 V, 50 Hz AC supply.

### **3.3.2 DESIGN CRITERIA**

The bidder shall quote 12 KV Indoor VCBs conforming to M-2 Class.

The equipment will be used in high voltage system having characteristics as listed in the specification. The equipment will be installed indoor in a hot, humid and tropical atmosphere.

All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

The maximum temperature in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards and this specification.

The equipment shall be capable of withstanding the dynamic and thermal stresses of listed short circuit current without any damage or deterioration.

The safety clearances of all live parts of the equipment shall be as per relevant standards.

### **3.3.3 CONSTRUCTIONAL FEATURES :**

The circuit breakers shall be triple pole metal clad truck mounted horizontal drawout type enclosed in cubicle made of CRCA sheet steel of minimum 2 mm thickness and shall comply with latest edition of relevant IS. The cubicle/panels shall be vermin proof and dust tight. The cubicle shall be of folded type

construction. Panel width shall be 610 mm.  $\pm$  50 mm. The switchgears and control gear shall be complete with all necessary supporting frame work, nuts and bolts etc. for securing the same to the floor. The operating mechanism shall operate (close/open) all the three phases simultaneously. The operating mechanism, links etc. should be accessible for maintenance. Mechanical safety shutters should be provided between breaker and panel. Engagement and disengagement of auxiliary supply should be automatically linked through the movement of the truck so that in service condition auxiliary supply is automatically made. All six terminals shall brought out of cubicle through appropriate class of cable termination and sealing kits. All the breakers shall be supplied with necessary clamps suitable for appropriate current ratings. Suitable arrangement of earthing the switchgear and control gear panels shall be provided. All the connecting bus bar shall be made of copper for these indoor circuit breakers.

For indoor panels, SWITCHGEAR (circuit breakers, CTs, PTs etc.) and control-gear (relays, C&R panels meters etc.) shall be mounted on the same panel. A set of air insulated electrolytic copper bus bars having maximum current density 1.5 Amp. / mm<sup>2</sup> & minimum cross sectional area 600 mm<sup>2</sup> with PVC sleeves or PVC insulation are to be provided for all indoor switchgear panels. The switchgear panels shall be provided with the arrangement for extending the bus bar and inter-connecting bus bars. Their supports, nuts and bolts etc. will be supplied loose. The region of such inter connection shall normally be blanked on panels. The bus bars should be of electrolytic copper with permissible limits of current density. Size of the bus bar and current density should be specified in the tender. The bus bar conductor shall conform to IS:8034. The bus bar shall be rated for 16KA for 3 Seconds. Painting of panel cubicle shall be epoxy based powder coated. The paint shade of indoor panels shall be shade 631 as per IS-5.

### **3.3.4 VACUUM CIRCUIT BREAKER :**

The three phase vacuum circuit breakers will have three interrupters (one interrupter per phase) mounted on same carriage. The interrupters shall be air insulated in epoxy resin tank or with epoxy resin phase barriers. Each interrupter shall have fixed and moving contacts in sealed envelope having vacuum below 10<sup>-6</sup> torr. The metallic bellow shall permit axial movement of moving contact and act as vacuum seal. The contacts shall have requisite mechanical strength and good electrical and thermal conductivity and shall be made of copper chromium alloy. Complete literature of vacuum bottles shall be furnished with the tender. In order to have safe operation under fetal conditions, the vacuum interrupter should be housed in epoxy pole unit and make of Vacuum Interrupter will be as "BEL, CGL, SIEMENS, ABB, ALSTOM/AREVA, MEGAWIN, TOSHIBA". Any other equivalent make of V.I. shall also be acceptable subject to prior approval of S.E. (MM), JVVNL, Jaipur.

### **3.4 VOLTAGE TRANSFORMERS :**

- |                              |   |       |
|------------------------------|---|-------|
| 1. Highest equipment voltage | : | 12 KV |
| 2. No. of phases             | : | 3     |

3. Insulation level
  - a) Impulse withstand voltage : 75 KVP
  - b) One minute power frequency withstand voltage on :
    - i) Primary winding : As per relevant standards
    - ii) Secondary winding : 2 KV rms
4. Frequency : 50 Hz.
5. Transformation ratio : 11000/110 V
6. Rated output : 30 VA / phase
7. Accuracy class : 0.5
8. Winding connection : Star/Star
9. Rated voltage factor : 1.2 continuous and 1.5 for 30 seconds
10. Type of insulation : Resin cast

VTs shall be provided with HRC type fuses on the secondary side. The VT fuses on primary side shall also be provided with all safety precautions. One of the secondary terminals of the VTs shall be solidly earthed. One number three phase voltage transformer of this rated output will be required for each incoming indoor panel. Voltage transformers should be mounted in the top part of the cubicle for ease of replacement of fuses.

### 3.5 CURRENT TRANSFORMERS :

1. Rated voltage : 12 KV
2. Insulation level
  - a) Impulse withstand voltage : 75 KVP
  - b) One minute power frequency voltage on :
    - i) Primary winding : As per relevant standards
    - ii) Secondary winding : 03 KV rms
3. Frequency : 50 Hz
4. Rated continuous thermal current : 120% of rated primary current
5. Short time thermal rating : 16 KA for 3 Sec.
6. Transformer CTs of ratio 600-400/5-5A for incoming type indoor panel and 200-100/5-5A for outgoing type panel.
7. Rated output/accuracy etc. for CTs.
 

	Core-I	Core-II
a) Rated output	10 VA	10 VA

However VA burden should not be less than suitable for A.C. series trip requirement with shunt trip arrangement.

b) Class of accuracy	5P	0.5 S
c) Accuracy limit factor	15	-
d) Purpose	Relaying	Metering
8. Max. instrument security factor	-	5
9. Type of Insulation	Resin Cast	

12 KV current transformers shall be single phase. The core shall be of high grade non ageing laminated silicon steel of low hysteresis loss and high permeability to ensure high accuracy for both normal and fault current.

- 3.6** The rating of secondary winding shall be 5 Amps. However, the current transformers will have to satisfy the requirement of rated VA burden, class of accuracy, accuracy limit factor and short time thermal rating as have been specified in clause No. 3.5 at all transformation ratio. Magnetization curves corresponding to all secondary taps must be submitted with the tender.

The ratings of current transformers of all classes regarding ratio error, knee point voltage, resistance of secondary winding etc. shall have to be co-ordinated with the requirements of protective relays and protection scheme, without any extra cost.

- 3.7** Before commencement of supplies one panel of each type with circuit breaker, VT etc. will have to be subjected to temperature rise test without extra charges in the presence of our Inspecting Officer. All the type test certificates are also needed to be furnished without which tender is likely to be ignored.

- 3.8** The tenderer shall also furnish along with the tender, complete general arrangement, schematic and outline diagrams indicating the mounting arrangement and position of current transformers, voltage transformer terminal blocks etc. Type of current transformer and voltage transformer employed shall also be clearly stated.

### **3.9 INDICATING AND INTEGRATING METERS/INSTRUMENTS :**

- 3.9.1 All indicating instruments shall be of switchboard type, back connected, suitable for flush mounting and provided with dust and vermin proof cases for tropical use and finished in suitable colour. All instruments shall have practical laboratory means for adjustment of accuracy. The limits of errors for ammeters/voltmeters shall be those permissible for class 1.5 instruments as per IS:1248. The ammeters and voltmeters shall be suitably scaled to indicate the current/voltage for all the rating of current/voltage transformers. A phase selector switch with four/six position shall be used to measure the current/voltage of each phase/line. The meters shall be located at eye level to facilitate observation of readings correctly.

### **3.9.2 A.C. Static HT Trivector Meter :**

3 phase 4 wire A.C. Static H.T. Trivector meter of accuracy class 0.5S for measurement of energy as per latest specification of JVVNL, shall be provided on each 12 KV indoor VCB.

Following makes of HT TVMs are acceptable:

- i) Secure
- ii) L&T
- iii) ABB/Elster
- iv) Schlumberger
- v) Genus Infra
- vi)HPL make

Any other make being procured by Nigam shall also be acceptable.

### **3.10 RELAYS :**

The circuit breaker shall be fitted with shunt trip coil for operation on Numerical three Over Current and one Earth Fault element relay. The coils should be rated for 110VDC operation on station battery.

Three phase protection relays shall be Numerical Over-current & Earth Fault protection having three element for over current and one for earth fault protection. The setting for over-current shall be 50-200% (in step of 10%) and for earth fault element from 10 to 80% (in step of 10%). These relays shall be non directional with selectable curve from all standard 5 IDMT curves. The numerical relays shall have following features:-

- a. Self Diagnosis
- b. Minimum last five abnormal events (with date & time) recording (over current & earth fault) including fault level and phase.
- c. On-line display of current.
- d. Communicable with open Protocol having RS-485 port.

The relay shall be numerical type mounted in flush pattern on the panel board. The relay should be rated for 5 Amp. CT secondary. The relay should conform to IS:3231 & 8686 specifications. The tenders shall furnish the detail in this regard along with the offer.

All the relays shall be provided with test blocks in panel so designed that the relays may be tested in situ. The relays should have provision of testing either through test block or test plug easily accessible by injecting the voltage / current/frequency (as applicable) from external testing instruments /source without first disconnecting/ reenergizing the primary electrical circuit protected by the relays. Facilities for isolating the tripping circuit during such testing shall be also provided.



The requirement of test block shall not be applicable in case of drawout type relays which can be tested by using test plug without removing the relay from its casing.

The testing facilities provided in the relays shall be specifically stated in the bid. Necessary test plug etc. as may be required for proper testing shall be included in the contractor's scope of supply. One test plug with five panels or part thereof are to be supplied.

The technical suitability of relays/schemes may also be examined by Protection Wing & acceptability will be judged appropriately.

The Following makes of Relays are acceptable:-

- a. Areva.
- b. ABB.
- c. Easun Reyrolle
- d. C&S
- e. JVS
- f. SEL
- g. ASHIDA
- h. MEGAWIN
- i. CGL
- j. STELMEC

### **3.11. WIRING :**

All wiring shall be of switch board type consisting of copper conductor of 1.5 Sq. mm. for alarm / annunciation / control circuits and 2.5 Sq.mm. for CT and all other Circuits insulated with polyvinyl chloride insulation suitable for 660 Volt service and in accordance with relevant IS:732. Polyvinyl Chloride used shall have excellent resistance against burning, moisture, oil and vermin and shall be finished with clear colour. Rubber insulated wiring shall not be acceptable. Tenderers shall furnish the details of method being adopted by them for Joint/ Connections.

All instruments and Panel wiring shall be of heat resisting and self extinguishing type in compliance with IS. Plastic or porcelain cleats of the limited compression type shall be used for holding wiring runs. All wires shall be suitable for bending to meet the terminal studs at right angles. Metal cases of all apparatus mounted on panels shall be separately earthed by means of copper wire or strips. The following colour scheme of the wiring shall be used as per IS:375.

- a) AC three phase circuits :
  - i) No.1 Phase : Red.
  - No.2 Phase : Yellow.
  - No.3 Phase : Blue

- ii) Neutral Conductor : Black
- iii) Connection to Earth : Green
- b) D.C. circuits : Grey

### **3.12 MIMIC DIAGRAM :**

For indoor panels painted colour bands shall be used for the mimic bus. The mimic diagram shall be on eye level. Equipments such as current transformers, voltage transformers etc. shall be represented by suitable symbols. The colour shall be Red Shade 537 of IS-5.

### **3.13 INDICATING LEDs / LAMPS :**

Indicating LEDs / Lamps shall be provided on the control board to indicate the following:

1. Visual indication of ON and OFF position of each circuit breaker.
2. Trip circuit healthy indication.
3. Auto trip indication for each circuit breaker panel.
4. VT supply indication.

Each lamp body shall be of moulded insulation and shall be able to withstand a high voltage test of appropriate value. All lamps shall be suitable for 240 V AC supply and shall have low power consumption and shall provide a wide angle of illumination of sufficient intensity for comfortable viewing. A glass of appropriate colour shall be screwed into the front of the lamp body. The design of the indication lamps shall be such as to facilitate replacement of burnt lamps. An engraved label indicating the purpose of the lamp shall be provided with each lamp.

### **3.14 TEST TERMINAL BLOCKS :**

Two nos. test terminal blocks shall be provided one for testing of relays and other for testing meters. They shall be of switch board, back connected type for front of panel mounting. The test blocks shall provide complete isolation of meters, instruments, etc. and the arrangement shall be such that testing power could be connected at the test block from any external source or may be taken from the instrument transformers. Provision shall be made for short circuiting current transformers. Suitable sealing arrangement shall be provided in test terminal blocks.

### **3.15 FERRULES :**

Ferrules engraved/printed with the same number, letters or symbols as indicated in the connection and wiring diagram shall be provided on the terminal ends of all wires for identification of circuits for inspection and

maintenance. Ferrules shall be of strong and flexible insulating material with glossy finish to prevent adhesion. They shall be engraved / printed and clearly marked and shall not be effected by dampness. Ferrule numbering shall be in accordance with IS:375. The same ferrule number shall not be used on wires in different circuits on a panel.

### **3.16 SPACE FOR CABLES AND CABLE GLANDS :**

Sufficient space for receiving the cables inside the switch board at the bottom of the cubicles and mounting arrangement for the terminal cable glands shall be provided. Cable gland plates should be above the ground level for the ease of working.

### **3.17 SCHEDULE OF REQUIREMENTS :**

The requirement of circuit breakers shall be as per Clause 3.31. At a particular sub station two or more feeders can be controlled through one breaker depending upon the necessity. Each of these breakers shall be equipped as per clause No. 3.18.

### **3.18 SCHEDULE OF EQUIPMENT :**

#### **Item No. 1 : (INCOMING TYPE)**

#### **12KV/630A Amp. VCB Switchgear panel for indoor installation:**

- |   |        |
|---|--------|
| 1. 12KV/630A Circuit Breaker vacuum type drawout with provisions of manual tripping by means of A control switch/push button.   | 1 No.  |
| 2. Motor Charged Spring operated closing mechanism or magnetic actuator operated device.  | 1 No.  |
| 3. Numerical 3 O/C + 1 E/F relay  | 1 No.  |
| 4. Single phase 12 KV current transformers of ratio 600-400/5-5A suitable for metering and protection. The class of accuracy shall be 0.5 S for metering and 5P15 for protection. Rated burden (output) shall be 10 VA for each secondary winding. Instrument security factor for metering core shall not exceed 5. | 3 Nos. |
| 5. 11000/110 Volts three phase voltage transformers having 30 VA/phase burden and class of accuracy 0.5. The transformer shall be star-star connected.  | 1 No.  |

6. Flush type switchboard mounting pattern 96X 96 sq.mm moving iron/ moving coil AC voltmeter of class 1.5 accuracy suitable for 110 V phase to phase secondary scaled for 0-15 KV. 1 No.
7. Voltmeter phase selector switch to indicate phase to phase and phase to neutral voltage of all the three phases. 1 No.
8. Indicating lamps/LEDs coloured red, amber and blue for PT supply indication. 3 Nos.
9. Arrangement for reception of incoming cable connection alongwith cable termination and sealing kits for 3 C x 300 mm sq. XLPE power cables. 2 Nos.
10. Set of three phase air insulated main electrolytic copper bus bars of 630 A continuous current rating having maximum current density 1.5 Amp./ mm<sup>2</sup> & minimum cross sectional area 600 mm<sup>2</sup> with PVC insulation or sleeves, STC rating 16 KA for 3 sec. 1 No.
11. Mechanical ON/OFF indicator. 1 No.
12. Operating handle for independent manual closing mechanism. 1 No.
13. Red indicating lamp/LED for ON indication. 1 No.
14. Green indicating lamp/LED for OFF indication. 1 No.
15. Auxiliary switch having minimum of 8 contacts 4 normally open and 4 normally closed. 1 No.
16. Flush mounting pattern 96x96 sq.mm. Moving Iron or moving coil ammeter of class 1.5 accuracy for 5 Amps. CT secondary scale 0-400/600 A. 1 No.
17. Ammeter selector switch to indicate phase current in all three phases and with OFF position. 1 No.
18. AC HT Tri vector meter 1 No.

19. Auxiliary Relay type VAA 33 or equivalent For transformer protection functions.	1 No.
20. Automatic door CFL with Switch.	1 No.
21. 240V, 80W AC single phase anti condensation heaters with thermostat (0-60 Deg. C) and switch.	2 Nos.
22. Anti pumping contactor.	1 No.
23. Operation Counter.	1 No.
24. Test terminal blocks for metering and relays, 3 phase 4 wire.	2 Nos.
25. Fault trip yellow lamp/LED.	1 No.
26. Trip Circuit healthy indication.	2 Nos.
27. Ground Bus size min. 25 x 6 mm. copper.	1 No.
28. Bell for Alarm	1 No.
29. Hooter for Alarm	1 No.
30. 3 Pin Socket with switch	1 No.
31. 2 Pin Socket with switch	1 No.
32. Auto Trip Lamp	1 No.

**Item No. 2 : (OUTGOING/ FEEDER TYPE)**

**12KV/630A Amp. VCB Switchgear panel for  
indoor installation:**

1. 12KV/630A Circuit Breaker vacuum type drawout with provisions of manual tripping by means of A control switch/push button.	1 No.
2. Motor Charged Spring operated closing mechanism or magnetic actuator.	1 No.
3. Numerical 3 O/C + 1 E/F relay	1 No.
4. Single phase 12 KV current transformers of ratio 200-100/5-5A suitable for metering and protection. The class of accuracy shall	3 Nos.

be 0.5 S for metering and 5P15 for protection. Rated burden (output) shall be 10 VA for each secondary winding. Instrument security factor for metering core shall not exceed

- |   |        |
|---|--------|
| 5. Arrangement for reception of incoming and outgoing cable connection along with cable termination and sealing kits for 3 C x 300 mm sq. XLPE power cables.  | 2 Nos. |
| 6. Set of three phase air insulated main electrolytic copper bus bars of 630 A continuous current rating having maximum current density 1.5 Amp./mm <sup>2</sup> & minimum cross sectional area 600 mm <sup>2</sup> with PVC insulation or sleeves. STC rating 16 KA for 3 seconds. | 1 No.  |
| 7. Mechanical ON/OFF indicator.   | 1 No.  |
| 8. Operating handle for independent manual closing mechanism.   | 1 No.  |
| 9. Red indicating lamp/LED for ON indication.   | 1 No.  |
| 10. Green indicating lamp/LED for OFF indication.   | 1 No.  |
| 11. Auxiliary switch having minimum of 8 contacts 4 normally open and 4 normally closed.  | 1 No.  |
| 12. Flush mounting pattern 96x96 sq.mm. Moving Iron or moving coil ammeter of class 1.5 accuracy for 5 Amps. CT secondary scale 0-150/250 A.  | 1 No.  |
| 13. Ammeter selector switch to indicate phase current in all three phases and with OFF position.  | 1 No.  |
| 14. AC static HT Tri-vector meter   | 1 No.  |
| 15. Automatic door CFL with Switch.   | 1 No.  |
| 16. 240V, 80W AC single phase anti condensation heaters with thermostat (0-60 Deg. C) and switch.   | 2 Nos. |
| 17. Anti pumping contactor.   | 1 No.  |
| 18. Operation Counter.  | 1 No.  |
| 19. Loose Set of 3 phase Air insulated inter connection electrolytic copper bus bars, 630 Amps. rating with PVC insulation with nuts and bolts supports etc. STC rating 16 KA for 3 seconds.  | 1 No.  |

20. Test terminal blocks for metering and relays, 3 phase 4 wire.	2 Nos.
21. Fault trip yellow lamp/LED.	1 No.
22. Trip Circuit healthy indication.	2 Nos.
23. Ground Bus size min. 25 x 6 mm. copper.	1 No.
24. Bell for Alarm	1 No.
25. Hooter for Alarm	1 No.
26. 3 Pin Socket with switch	1 No.
27. 2 Pin Socket with switch	1 No.
28. Auto Trip Lamp	1 No.

**3.19** All equipments shall be complete in all respect. All fittings, accessories or apparatus which may not have been mentioned above but which are usual/necessary for the equipments shall be included for each circuit breaker panel.

### **3.20 OPERATING AND MAINTENANCE INSTRUCTIONS :**

The successful tenderers, on receipt of order shall arrange to despatch immediately 20 sets of the erection/operating and maintenance instruction manuals along with the requisite drawings of the equipments covered by this specification to this office for approval. Two sets of these, one set in English and one in Hindi will also be forwarded to the consignee along with each equipment.

### **3.21 TEMPERATURE RISE :**

The maximum temperature rise of various parts of the circuit breakers when tested under rated conditions shall not exceed the specified values at a peak ambient temperature of 50 deg. c. The breakers may be provided with silver plated contacts if necessary to meet the requirement of IS:13118 where higher temperature rise is permitted with silver plating contacts. The quantity of silver facing shall be such that after carrying out one tenth of the total number of operations specified for the mechanical endurance test, there is still continuous layer of silver on the contacts. The temperature rise of CTs and PTs shall also not exceed the permissible values as per relevant Indian Standards when corrected for max. ambient temperature at site.

### 3.22 NAME/RATING PLATE :

All items of equipment included in this specification shall be provided with rating plates as per relevant standards and in addition with following particulars:-

Name & Address of Supplier	:
Telephone No.	:
Fax No.	:
Date of Despatch	:
Date of Expiry of Warranty	:
Name of Purchaser	:
TN No.	:
Purchase Order No. & Date	:

### 3.23 INSPECTION AND TESTING :

3.23.1 Each equipment shall comply with and shall be subjected to all routine and acceptance tests prescribed in the relevant Indian Standard Specification/IEC.

#### 3.23.2 TEST OF 11KV INDOOR CIRCUIT BREAKER :

##### i) ROUTINE/ACCEPTANCE TESTS:

The following acceptance and routine tests shall be got conducted in presence of purchaser's representative as per stipulation of the relevant standards, on each unit.

- a) One minute power frequency voltage withstand dry test on main circuit.
- b) Voltage withstand test on control & auxiliary circuits.
- c) Measurement of the resistance of main circuit.
- d) Mechanical operating test as per M2 class.
- e) Design and visual checks.
- f) Any other tests not specified above but covered as per amendment/ latest edition of relevant IS/IEC.

##### ii) Inspection & tests on control gear :

In addition to the above tests at 3.23.2(i) above specified by IEC, the following shall also be performed at manufacturer's works in presence of purchaser's representative after completely assembling the breaker.

- a) Checking wiring of circuits and their contacts.
- b) Insulation resistance of complete wiring, circuit by circuit with all equipment mounted on the panels.
- c) Checking and operational protective schedule and instruments meters.
- d) Checking of phase faults between R&Y, Y&B and B&R phases. Breaker should trip under all three conditions.



**iii) Temperature Rise test on One No. Breaker in the first offered lot shall also be done in the presence of the purchaser's representative.**

**iv) TYPE TESTS :**

The following type tests shall be conducted on the offered material as per relevant standards:-

- a) Dielectric tests.  
Lightning Impulse Voltage Test.  
One Minute Power Frequency Test(Dry).
- b) Short time with stand current and peak withstand current test.
- c) Basic short circuit duties test.
- d) Single phase short circuit test.
- e) Mechanical Operation Test.
- f) Out of phase making & breaking test.
- g) Capacitive Current Switching Test.
  - i) Cable Charging Test.
  - ii) Single Capacitor Bank Current Switching Test.
- h) Measurement of resistance of main circuit.
- i) Temp.rise test.
- j) IP-5X test (for cubicle/control cabinet).
- k) Any other type tests not specified above but covered as per amendment / latest edition of relevant IS/IEC

The 12 KV Indoor vacuum circuit breaker offered shall be fully type tested as per relevant standards.

The bidder must furnish type test reports along with bid as per the Qualification Requirement of the Tender Specification.

Where permitted in the relevant standard, a test specimen for type test may be a representative sub-assembly/ a representative functional unit. An individual type test is acceptable for a change of constructional detail, for any change in the design/type of type test report and the design/type of offered against this specification, if the manufacturer can demonstrate and purchaser is satisfied that this change does not influence the result of the individual type test. The bidder may bring out in their offer all such changes made in components, materials, design etc. as the case may be. The purchaser will interpret the meanings of drawings and specifications and shall have the power to accept/reject any type test report which in his judgment is/is not in a manner acceptable to him. **The decision of Purchase Committee in this matter shall be final and binding to all.**

3.23.3 The type test reports of Circuit Breakers, Current Transformers, Potential Transformers, Relays, meters etc. shall be complete in all respect alongwith

oscillographic records, photographs etc. in respect of all type tests as per relevant ISS/IEC.

The type test certificates should be in respect of specific make and type / rating of the Circuit Breakers/ instruments, transformers etc. intended to be supplied and not in respect of the breakers etc. manufactured by their foreign collaborators if any.

Necessary data with test reports to show capability of circuit breaker to withstand number of full level short circuit faults be also furnished. Complete literature must be sent with the tender.

3.23.4 Routine & acceptance test as per relevant standard shall be carried out on each equipment covered by this specification in the presence of purchaser's representative. If so desired by the purchaser all test reports shall be submitted and got approved from the purchaser before despatch of the equipment. Before commencement of supplies one panel of each type complete with Circuit Breaker, VT etc. will be subjected to temperature rise test in the presence of our Inspecting Officer.

### **3.23.5 INSPECTION AND TESTS OF CONTROL GEAR :**

All the tests (as mentioned at Clause 3.23.2(i)) and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture/ before despatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be defective. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance/ routine testings of the bought out items.

The Bidder shall give 15 days advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

### **3.25 TECHNICAL PARTICULARS :**

3.25.1 The tenderers shall furnish the guaranteed technical & other particulars of the equipments offered in the proforma appended at Schedule-V. Tenders not accompanied with such details are liable to be ignored.

Make of various equipments should be clearly stated. Words like reputed, equivalent etc. shall not be accepted. Alternative makes of equipments should not be more than two in the order of preference.

### **3.25.2 INTER CHANGEABILITY :**

All similar materials and removable parts of similar equipments shall be interchangeable with each other.

### **3.26 OPTIONAL SPARES:**

The tenderer shall furnish list of recommended optional spares that will be required for breakers alongwith their total and unit prices.

### **3.27 TITLE PLATES:**

A title plate bearing the name and purpose of each panel shall be fixed on the top of each control as well as relay panel.

### **3.28 FAULT / TROUBLE ALARM SCHEME :**

The automatic trip of the Circuit Breaker due to operation of protection relays shall be indicated by sounding of a hooter. All non-trip alarms shall be indicated by an alarm bell.

### **3.29 PERFORMANCE WARRANTY PERIOD :**

The performance warranty period shall be **5 (Five) years** from the date of receipt of equipment along with its all accessories.

The amount of performance security shall be **five percent** of the amount of supply order in case of procurement of goods and services. In case of Small Scale Industries of Rajasthan it shall be **one percent** of the amount of quantity ordered for supply of goods and in case of sick industries, other than Small Scale Industries, whose cases are pending before the Board of Industrial and Financial Reconstruction (BIFR), it shall be **two percent** of the amount of supply order, which is required to be valid for 5 years.

Successful bidder shall attend the complaint within 30 days from the date of receipt of complaint. The date of receipt of complaint shall be treated as the date of **E-mail/ FAX of complaint** by the field officer/ stores/ Purchaser. If the supplier fails to attend the complaint within 30 days from the date of receipt of

complaint intimated by the field officer/ purchaser then penalty @1/4% per week or part thereof for first 4 weeks in case delay is exceeds more than 4 weeks then @1/2% per week or part thereof shall be charged for entire delay, subject to a maximum of 5% of the breaker. This penalty will be in addition to the penalty leviable delay in delivery mentioned in purchase order.

**In case firm fails to attend the complaint within 120 days from the date of intimation, the cost of the VCB shall be withheld from firm's financial hold.**

Further to this, in case of emergency, breaker can be get rectified by the sub-divisional officers/ M&P officers (as authorized by Nigam) at the risk & cost of the supplier firm, by obtaining quotation from three firms, for same item/equipment, meeting the general requirement of specification. The rectification of breaker means satisfactory performance report duly signed by the sub-divisional officers/ M&P officers (as authorized by Nigam) i.e. in-charge of 33/11 KV Sub-Station.

### **3.30 Delay in Delivery of Inspected Material at Store :**

If the material are not delivered within 7 days at same station, 14 days for station within State and 20 days by the suppliers situated outside the State from the date of receipt of the Dispatch Instructions. Charges shall be recovered @ Half Percent per week or part thereof (for actual delay in receipt), maximum upto 3% of the Dispatch Instructions consignment value (Ex-works). This will be in addition to Clause No.1.24(1) of GCC.

### **3.31 QUANTITY: 12 KV INDOOR VACUUM CIRCUIT BREAKERS -**

**a) Incoming Type : 10 Nos.**  
**b) Outgoing Type : 20 Nos.**

The quantity as indicated above is approximate and may be increased or decreased to any extent at the time of finalisation of this tender enquiry.

### **3.32 MAKE AND TYPE OF BOUGHT OUT ITEMS :**

3.32.1 The following make of bought out items will be acceptable to department :

S.No.	Name of Item	Make
1.	Indicating Instrument (Analog type)	AE/IMP/MECO
2.	Indicating Instrument (Digital type)	AE/IMP/MECO
3.	Control Switch for Circuit Breaker/Trip Transfer.	ALSTOM/RECOM/SWITRON/ KAYCEE
4.	Selector Switch for Voltmeter/Ammeter	SWITRON/KAYCEE/RECOM
5.	Semaphore Indicator	ALSTOM/DAV IND./ER

6.	Indicating Lamp	ALSTOM/TEKNIC/ VAISHNO/DAV
7.	Annaunciator	MINILEC/YESHMUN/ INSTALRAM/PROTON/ JVS/PRADEEP/ALAN
8.	Push Button	TEKNIC/VAISHNO/ESSEN
9.	A.C. Hooter/Bell	TARGET/INDUSTRIAL HOOTER/ALAN/JVS
10.	D.C. Hooter	TARGET/INDUSTRIAL HOOT ER/ALAN/JVS
11.	Heater	SOFIA/ELTER/AIREX KAYCEE
12.	Link Type test terminal block for testing of TVM	IMP/CAPITAL
13.	CFL Tube	PHILIPS/CROMPTON/BAJAJ
14.	2 Pin/3 Pin socket with Switch (5/15A)	ISI MARK

The other makes of all bought out items shall be acceptable if it is of "ISI Marked" or type tested for which bidder shall furnish attested Photostat copies of ISI Certificate/type test reports not older than **Five years** for the respective make offered, subject to prior approval of SE(MM), JVVNL, Jaipur.

3.32.2 Make / type of each relay, indicating instruments, integrating instruments, control switches, selector switches, indicating lamps, semaphore indicators, enunciator scheme, bell, hooter etc. shall be clearly and invariably indicated in the GTP (Guaranteed Technical Particulars), bill of material and unit price list. Only specific make accessories shall be indicated. The word "EQUIVALENT/REPUTED MAKE" will not be given for consideration.

### **3.33 BILL OF MATERIAL :**

The firm shall furnish the bill of material for Indoor VCB Panel separately.

### **3.34 OPTIONAL SPARES :**

The bidder shall also furnish list of recommended optional spares that will be required for Breakers alongwith their total and unit prices. However, the prices of optional spares will not be considered for bid evaluation.

### **3.35 PAYMENT:-**

100 % (Hundred percent) payment of each consignment shall be made along with taxes & duties by the concerned Sr. Accounts Officer/ Accounts Officer (CPC), subject to furnishing of **Bid Security** in terms of relevant clause of GCC and Bank Guarantee of 10% cost of breaker towards satisfactory installation & commissioning of breaker. The Bank Guarantee of 10% cost of breaker shall be released on production of satisfactory Installation & Commissioning certificates from the Nodal Officer and deposition of penalty towards delay in Installation & Commissioning of Breaker.

However, successful bidder may furnish Bank Guarantee equivalent to 10% amount of breakers towards successful Installation & Commissioning and in such case, no payment from the supply bills shall be deducted.

However, if intimation of site is not conveyed to the supplier by the Nigam upto one year of receipt of material in store, retention amount of supply of VCB/ BG of 10% cost of breaker, may be released.

### **3.36 PROTO TYPE SAMPLE:-**

One Proto Type 12 KV Indoor VCB conforming to various requirements of technical specification along with subsequent modifications made, has to be supplied by the successful bidder within two months of placement of detailed purchase order for our inspection & approval. The offer for inspection of subsequent material shall be entertained only after approval of proto type VCB and successful bidder will have to complete the entire ordered quantity within six months of approval of proto type VCB. Prior to supply of prototype VCB, the detailed drawings, Bill of Material & protection scheme shall be got approved.

In case if there is delay in furnishing of proto type VCB by the firm for our inspection beyond 60 days, the delivery schedule shall be reduced by the number of days for which above delay was occurred. Further, in case successful bidder does not get its proto type approved within one year from the date of receipt of detailed Purchase Order or initial contractual delivery period whichever occurs earlier, then in such case it will be treated as failure of supply of material on part of the firm and action as per the provision of P.O. will be initiated.

The proto type sample shall be inspected by a team of two officers including one from M&P Wing.

If the bidder has already got approved Proto type sample in the previous tender with similar specification of the instant tender, furnishing of fresh proto type sample is not required.

**3.37 ADDITIONAL ORDER**

Repeat orders for additional quantities, upto 50% of original ordered quantities, may be placed by the Nigam, on the same rates, terms and conditions given in the contract.

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**SECTION -III (PART-B)****1 SCOPE**

This specification is intended to cover the installation & commissioning of 12 KV Indoor Type Vacuum Circuit Breaker, complete in all respect at various 33/11 KV Sub-Stations under Jaipur Discom.

**2.0 INSTALLATION & COMMISSIONING OF BREAKER**

The 12 KV Indoor Type Vacuum Circuit Breaker supplied shall be installed & commissioned by the successful bidder, at various 33/11 KV Sub-Stations under Jaipur Discom. The name of 33/11 KV Sub-Stations shall be intimated at the time of despatch instructions/ after receipt of material in stores.

**3.0 ACTIVITY**

The following main activities are to be carried out by the supplier for installation & commissioning of 12 KV Indoor Type Vacuum Circuit Breaker:-

- a) Foundation of Bolts along with grouting.
- b) Installation & Commissioning of Breaker.
- c) Laying & connecting of 11 KV Cable from Transformer/ main bus bar to indoor breaker (11 KV Power cables shall be supplied by the Nigam)
- d) Connection of Earthing of breaker from the earth mesh of the GSS)

All the petty items like nut, bolt, washers, gasket, etc. required during installation & commissioning shall be in the scope of installation & commissioning. **The M.S. Earthing & Foundation bolts required for Installation & Commissioning shall be provided in a packet and shall put up in each breaker.**

**4.0 CIVIL FOUNDATION WORK:-**

The foundation work for installation of 12 KV Indoor Vacuum Circuit Breaker will not involve any civil work, however, grouting of foundation bolts will be in the scope of supply.

**5.0 INSTALLATION & COMMISSIONING OF BREAKER**

Installation & commissioning of 12 KV Indoor Type Vacuum Circuit Breaker complete with accessories including use of special tools & conducting all pre-commissioning tests before energisation shall be carried out by the supplier.

The agency should engage team of experienced Engineers & skilled staff for the purpose of Installation & Commissioning of 12 KV Indoor Type Vacuum Circuit Breaker.



Mainly following pre-commissioning tests shall be carried out:-

- a) Visual inspection.
- b) Cleaning
- c) Testing of relays/ CTs/PTs.
- d) Testing of current circuitry by primary injection
- e) Testing of breaker by primary injection.
- f) IR value.
- g) Checking of various equipments viz. Ammeter, Voltmeter, Energy meter etc. and alarms/ flags/ trip circuit healthiness etc.

#### 6.0 **NODAL OFFICER:**

The concerned Assistant Engineer(M&P)/Feeder Manager shall be the Nodal officer for supervision of installation & commissioning of 12 KV Indoor Type Vacuum Circuit Breaker.

#### 7.0 **WORK COMPLETION SCHEDULE**

The Installation & Commissioning including transportation of 12 KV Indoor Type Vacuum Circuit Breaker shall be completed within 30 days from the date of receipt of intimation of location of 33/11 KV Sub-Stations where the supplied breakers are to be installed. The concerned JVVNL officer shall give intimation to the firm only after transporting the breaker to Sub-Station.

#### 8.0 **DELAY IN WORK COMPLETION:**

In case of delay in Installation & Commissioning of breaker beyond 30 days from the date of intimation to the supplier about the site ( the date of receipt of intimation shall be treated as the date of FAX/ 3 days from the date of despatch of letter about intimation of site by the field officer/ stores/ Purchaser), Only 50% payment towards installation & commissioning charges of breaker will be payable and in case the supplier fails to complete installation & commissioning of the breaker within 60 days, no payment towards installation & commissioning will be payable and breaker will be installed & commissioned by the Nigam itself and penalty towards non-installation of breaker @ 10% cost of breaker shall be levied.

#### 9.0 **PAYMENT:-**

The payment shall be released on production of satisfactory installation & commissioning report of VCB duly verified by the Nodal Officer.

The payment shall be released by Sr.A.O. (CPC) on production of satisfactory installation & commissioning report of 12 KV Indoor VCBs duly verified by the concerned Assistant Engineer of M&P Wing.

While issuing the Installation & Commissioning Report, the nodal officer should ensure that activities as per clause No. 3.0 of Schedule-III (part-B) have been completed by the supplier.

**10.0 PRICES:**

Installation & Commissioning charges shall be on FIRM price basis. In the price schedule, the bidder shall quote separately the prices for supply of 12 KV Indoor Vacuum Circuit Breaker, Installation & Commissioning charges inclusive of all type of taxes & service charges, if any and cost of Civil Works per breaker.

Work Contract Tax (WCT), if applicable, shall be borne by the Nigam.

**11.0 Security bank Guarantee towards Installation & Commissioning:**

Successful bidders shall furnish Bank Guarantee equivalent to 10% cost of breaker, towards successful installation & commissioning, which should be initially valid for a period of one year and if bidders fail to carry out installation & commissioning work of breaker in time, Nigam may invoke their Bank Guarantee.

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