

# **TECHNICAL SPECIFICATION FOR ISOLATORS**

**400KV SINGLE ISOLATOR WITH 1 EARTH SWITCH**

**400KV SINGLE ISOLATOR WITH 2 EARTH SWITCH**

**220KV SINGLE ISOLATOR WITHOUT EARTH SWITCH**

**220KV SINGLE ISOLATOR WITH EARTH SWITCH**

**220 KV TANDEM ISOLATOR**

**132 KV DOUBLE ISOLATOR WITH EARTH SWITCH**

**132 KV SINGLE ISOLATOR WITH EARTH SWITCH**

**132 KV SINGLE ISOLATOR WITHOUT EARTH SWITCH**

**132 KV TANDEM ISOLATOR**

**33 KV DOUBLE ISOLATOR WITH EARTH SWITCH**

**33 KV SINGLE ISOLATOR WITHOUT EARTH SWITCH**

## TECHNICAL SPECIFICATION OF ISOLATOR:

(Maintenance free Motor Operated Isolator with Motor drive, Rotary Post Insulators & fixed Post Insulators, Base Frame, Clamp & Connectors and all other fitting & fixing complete in all respect with & without Earth switch).

### TECHNICAL PARTICULARS OF 400 kV, 220 kV, 132 kV & 33 KV ISOLATOR

	Type:	400 kV	220 kV	132 kV	33 kV
1	Main switch	horizontal Double end break/center break rotary post insulators	horizontal Double end break rotary post insulators, gang operated		
2	Service	Outdoor			
3	Applicable standard	IS : 9921 / IEC-62271-102			
4	No. of Phases	3 phase			
5	Design Ambient temperature	50° C			
6	Type of operation	Electrically Ganged	Mechanically Ganged		
7	Rated voltage (kV)	In KV	In KV	In KV	In KV
	a) Nominal	400	220	132	33
	b) Maximum	420	245	145	36
8	Rated current (Amps)	3150	2000	1600	1250
9	Short time current for 3 sec. (kA)	63	40/50	40/31.5	25
10	Rated frequency	50 HZ ± 5%			
11	System earthing	Effectively earthed			
12	Temperature rise	As per relevant IS/IEC standards			
13	Lightening Impulse withstand voltage (kVp)				
	(a) Across Isolating distance	1425(+240)	1200	750	195
	(b) To earth	1425	1050	650	170
14	1 minute power frequency withstand voltage				

	a) Across Isolating distance	610	530	315	80
	b) To earth	520	460	275	70
15	Switching Impulse withstand voltage (kVp)				
	a) Across Isolating distance	900(+345)	-	-	-
	b) To earth	1050	-	-	-
16	Max. RIV for frequency between 0.5 MHz and 2 MHz (micro-volt)	1000 at 267kV	1000 at 156kV	500 at 92kV	-
17	Corona Extinction Voltage (kV)	320	-	-	-
18	Operating mechanism				
	a) Isolator	Motor	Motor	Motor	Motor
	b) Earth switch	Motor	Motor	Motor	Manual
19	Auxiliary voltage				
	a) Control & Inter lock	220V DC 80% to 110%			
	b) Motor (AC motor /PMDC ) voltage	3 Phase 415V AC 50Hz/1Phase 230V AC			
	c) Heater, lamp & socket	Single phase 240 V 50HZ			
20	Safe duration of overload				
	150% of rated current	5 minute			
	120% of rated current	30 minute			
21	Minimum creepage distance of insulator (mm)				
22	Mounting structure	Tubular	Tubular / Lattice	Tubular / Lattice	Tubular / Lattice
23	Operating time	Less than 12 secs			
24	Insulator Data				
	a) Bending Strength (kgf)	800	800	800	600
	b) Height (mm)	3650	2300	1500	508
	c) Bottom PCD (mm)	300	254	184	76
	d) No. of holes & hole dia	8x18	8x18	4x18	4xM12
	e) Top PCD	127	127	127	76

	f) No. of holes & hole dia	4xM16	4xM16	4xM16	4xM12
	g) Minimum creepage distance (mm) 25mm/kV	10500	6125	3625	900
25	Bus Bar height from Plinth level (mm)	8000	5900	4600	3700
26	Phase Spacing (mm)	7000	4500	3000	1500
27	Minimum clearances (mm)				
	a) Phase to Phase	4000	2100	1300	320
	b) Phase to earth	3500	2100	1300	320
	c) Sectional clearance	6500	5000	4000	3000
28	Mounting Condition	On Structure			
29	Number of auxiliary switches for main isolator	12NO+12NC	12NO+12NC	12NO+12NC	12NO+12NC
30	Number of Make before break and break after break auxiliary switches	4NO+4NC	4NO+4NC	4NO+4NC	4NO+4NC
31	Temperature rise above ambient temperature of 40 deg C corresponding to maximum continuous current (°C) Silver-faced copper, copper alloy or aluminum alloy	Max temp : 105 Deg C Temp Rise : 65 Deg C As per IS :9921			
32	All Contacts	silver faced copper or electrolytic copper alloy			
33	Rated magnetizing / capacitive current make and break	0.7 Amps at 0.15 PF			

## 1. SCOPE

The scope covers design, manufacture, testing, supply, delivery & supervision of erection, testing and commissioning of motor operated Isolator of rated current capacity as per technical specification enumerated herein for different switchyards of 400/220/132/33 Grid Substations.

## 2. GENERAL INFORMATION:

- 2.1. Isolators are 420/245/145/36 kV class and shall be reliable, satisfactory and trouble free operation at all time as to be integrated in SAS.
- 2.2. Isolators shall be out door and off-load type with three phases suitable for manual as well as local/remote electrical operation.
- 2.3. The Isolators with combined Earth switch shall be provided on isolator whenever specifically mentioned in the price schedule.

- 2.4. The Isolators may be installed in staggered or non-staggered position as per requirement in the Grid sub-stations.
- 2.5. The Isolators with base frame (scope of Isolator manufacturer) shall be fitted on the isolator equipment structures (pipe or lattice type) or gantry beam as beam mounted Isolators. Hence, structural drawings are to be obtained from OPTCL for necessary design of the isolator base frame for its proper erection at site wherever required. The rotation of the Base Insulators of Isolators shall be through double shaft (Pipe) for smooth operation.
- 2.6. Any material or accessories which may not have been specifically mentioned but which is usual and necessary for satisfactory and trouble free operation and maintenance of the equipment shall be within the scope of supply without any extra financial implication.

### **3. DESIGN CRITERIA:**

- 3.1. The isolators shall be horizontal center break (for 400 KV)/double break (for 220, 132, 33 KV) type. The base frame of the Isolator shall be of HDG steel & shall be capable of bearing the wind pressure having its velocity 55 mtrs/sec and also the force generated due to operation & or any electrical short circuit force. The design of the HDG Steel base frame shall be so designed that it should be cable of withstanding all the force at a time. No deformation of the base frame due to any of the reason as mentioned is not acceptable. The size of the base frame shall be so chosen that it shall take the load of Post Insulators, the moving blades, contacts etc and also the force due to the reason as explained.
- 3.2. The isolator including their operating mechanisms shall be designed in a manner such a way that they cannot come out of their open or closed position by gravity, wind pressure, vibrations, reasonable shocks or accidental touching of the connecting rods of their operating system. The mechanism should have preferably dead centre locking arrangement such that it prevents any change in end position due to external force on the arm.
- 3.3. The isolators should be supplied with manual as well as motor operated mechanism. Each three pole isolator will require only one mechanism for 220/132/33 KV & separate mechanism with proper synchronization facility for 400 KV. The coupling GI pipe (rotating shaft) shall be suitable for continuous adaption. No. of such rotating/moving shaft shall be two nos to have smooth operation of Isolator.
- 3.4. Arcing horn/guiding horn/Corona control ring shall be provided in all type isolators.
- 3.5. The moving contacts of 3-phase double/centre break type isolator shall rotate from their fully closed position to fully open position. The break shall be distinct and clearly visible from ground.
- 3.6. It should be suitable for continuous service at the system voltages specified herein. The Isolators shall be suitable to carry the rated current continuously and full short circuit current at site condition without any appreciable rise in temperature. These shall also be suitable for operation at 110% rated (normal) voltage
- 3.7. The Isolators are required to be used on electrically exposed installation and this should be taken into account while fixing the clearance between phases and between phase and earth.

#### **4. DUTY REQUIREMENT:**

- 4.1. The dis-connector shall be of class M2 class having mechanical endurance of 10,000 operating cycle.
- 4.2. Isolators shall be capable of withstanding the dynamic and thermal effect of maximum short circuit current of the system in their closed position. They shall be constructed such that they do not open under influence of short circuit current.
- 4.3. Isolator shall be capable of making/breaking normal current with no significant change in voltage occurs across the terminal of each pole of isolator on account of make / break operation.
- 4.4. The isolators shall be capable of making/breaking magnetizing current of 0.7A at 0.15 power factors and capacitive current of 0.7A at 0.15 power factors at rated voltage.
- 4.5. In addition to constructional interlock, isolator shall have provision to prevent their electrical and manual operation unless the associated and other interlocking conditions are met. Suitable individual interlocking coil arrangements shall be provided. The interlocking coil shall be suitable for continuous operation from DC supply and within a variation range as stipulated in „Specific Technical Parameter“.

#### **5. MAIN CONTACTS (MALE AND FEMALE)**

- 5.1. The dis-connector shall be having main current carrying parts of Aluminum/Electrolytic Copper arm as per standard type tested design of the manufacture to be capable for continuous rated normal current and short time SC Current in accordance with the Standard Technical Parameters.
- 5.2. The Isolator's male and female contact shall be made of silver faced copper or electrolytic copper alloy capable of carrying continuous rated normal current and short time SC Current as per Standard Technical Parameters. The current carrying fingers should be fixed with the main arm without any holding spring attachment to avoid flashing and damage of contact fingers for failure of the holding springs. The main and secondary contact assembly should not use springs for holding contact fingers or maintaining contact pressure.
- 5.3. The contacts and other current carrying parts shall also be so designed that their temperature rise under different operating conditions shall not exceed the value specified in IS: 9921. Temporary rise of temperature due to passage of specified rated short circuit current for all voltage classes shall not cause any annealing or welding of contact surfaces.
- 5.4. The female contacts of the horizontal type isolators shall consist of properly tempered copper strip/electrolytic copper alloy suitable for rated and short time current rating of the respective voltage class. The hard drawn electrolytic copper strips/ electrolytic copper alloy shall be silver plated of minimum 25 micron thickness.
- 5.5. The dimensions of the contacts should conform to the drawing approved during type test. However the current density of the current carrying parts shall not be more than the values specified below.

Current Density in Amps/sq. mm  
**Tubes                      Flats**

<b>Copper:</b>	2.5	2.0
<b>Aluminum:</b>	1.25	1.0

- 5.6. These fixed and moving contacts shall be able to carry the rated current continuously and the maximum fault current without any appreciable rise in temperature. The Isolator blades shall retain their form and straightness under all conditions of operation including all mechanical stress arising out of operation as well as under rated short circuit condition.
- 5.7. The Isolator shall be self-cleaning type so that when Isolator remains closed for long periods in a heavily polluted atmosphere, binding does not occur. No undue wear or scuffing shall be evident during the mechanical endurance tests.

#### **5.8 EARTH SWITCH:**

Line earth switch shall consist of three earthing blades for Isolator which normally rest against the frame when the connected Isolator is in closed position. The earthing blades for three phase shall be mechanically linked to a coupling shaft which shall be capable of being fitted on either side of the Isolator. The earthing blades shall match and be similar to the main switch blades and shall be provided at the hinge; with suitable flexible conductors with terminal lugs for connecting to the station ground bus. The earthing blades shall be operated by a separate mechanism but shall be mechanically interlocked with the main switch so that the earthing blades can be closed only when the main switches are in open position and vice-versa. The earthing blades shall be gang operated and all the three blades will operate simultaneously.

#### **6. BASE;**

- 6.1. Each single pole of the isolator shall be provided with a complete galvanized steel base provided with holes and designed for mounting on existing supporting structure.

#### **7 INSULATORS:**

- 7.1. The insulators to be used shall conform to IS: 2544 and/or IEC-168 and shall be solid core type and shall be homogeneous; free from cavities, tough and impervious to moisture.
- 7.2. Glazing of porcelain shall be uniform brown colour free from blister, burns and other defects which may affect the mechanical and dielectric quality of the insulators.
- 7.3. All iron parts shall be hot dip galvanized. The joints shall be so designed that any thermal expansion of the metal and the porcelain parts shall not be loosened during the whole range of operation.
- 7.4. Puncture voltage of Insulator shall be greater than dry flashover voltage of respective Isolators.
- 7.5. The design of the isolator shall be such that pressure due to the contact shall not be transferred to the Insulators after the main blades are fully closed.
- 7.6. The cantilever strength (min) of solid core support insulator shall be as specified.

## **8. ARCING HORN AND GRADING HORN**

Suitable arcing horn made of GI shall be provided on the fixed and moving contacts of Isolators if required. The contacts shall be of make before and break after” type.

## **9. ELECTRICAL INTERLOCK / MECHANICAL INTERLOCK**

9.1. The Isolators shall be equipped with electrical interlock for interlocking with the associated circuit breakers. The interlocking scheme shall be approved by OPTCL.

9.2. Suitable mechanical / constructional interlock shall be provided between Isolator and earth switch which should be rigid in construction and properly mounted to ensure reliable operation. In case of Double Isolator with earth switch the earth switch mechanical interlock shall be provided for both the operating arms. Double isolators with or without earth switch shall be provided in the 132 & 33 KV level as the bus arrangements are of a main & a transfer scheme.

## **10. AUXILIARY SWITCHES**

10.1. All isolators shall be provided with 220V DC ( $\pm 20\%$ ) auxiliary switches for remote position indication on the control panel and for electrical inter locking with other equipment.

10.2. The auxiliary switch shall be provided with a minimum of auxiliary contacts-12 normally open and 12 normally closed. 4 sets of MBB contacts shall also be provided besides 12 sets as indicated above.

10.3. The auxiliary switches and auxiliary circuits shall have a continuous current carrying capacity of at least 10 Amps. Auxiliary switches shall not be used as limit switches. Details of make, rating and type of auxiliary switch along with the type test report shall be furnished in the offer.

10.4. The auxiliary contacts should be designed such that, it can be changed from NO to NC and vice versa at site.

## **11. OPERATING MECHANISM:**

11.1. Control cabinet/operating mechanism box shall be made of aluminum sheet of adequate thickness (minimum 3 mm). The enclosure shall be painted with epoxy paint. Powder coated to the Shade no 631 of IS: 5 (for aluminum enclosure).

11.2. The operating mechanism shall be located such that it can be directly mounted on the support structure. There shall be provision of Green colour visible marks on the mechanism box for easy identifying of the earth switch mechanism.

11.3. A position indicator to show the isolator is in ON or OFF position to be provided at a suitable location

11.4 The enclosure of the operating mechanism Box shall conform to the degree of protection IP- 55. ). The mechanism box shall have neoprene gasket hinged door at front with locking facility. All accessories inside the housing shall be easily accessible.

11.5 Linkage mechanism should be in built with **Teflon cup bushing** to accommodate minor misalignment & avoid rust in joints.

11.6 Insulator rotating arrangement should have **sealed double ball bearing** arrangement (bush bearing arrangement is not acceptable).



- 11.7 A Local/Remote selector switch and a set of open/ close push buttons shall be provided on the control cabinet of the isolator to permit its operation through local or remote push buttons.
- 11.8 Provision shall be made in the control cabinet to disconnect power supply through suitable MCBs to prevent local/remote power operation.
- 11.9 The motor shall be an AC motor /PMDC type and should run from 400V/230V AC mains. The motor should have smooth torque/speed characteristics.
- 11.10 Suitable reduction gearing shall be provided between the motor and the drive shaft of the isolator. The mechanism shall stop immediately when motor supply is switched off.
- 11.11 Suitable reduction gearing shall be provided between the motor and the drive shaft of the isolator. The mechanism shall stop immediately when motor supply is switched off. Gear should be of forged material suitably chosen to avoid bending/jamming on operation after a prolonged period of non-operation. Also all gear and connected material should be so chosen/surface treated to avoid rusting. The Gears shall be lubricated for life with graphite or better quality non-drawing and non-hardening type grease.
- 11.12 Manual operation facility (with handle) should be provided with necessary interlock to disconnect motor.
- 11.13 Provision shall be made in the control cabinet to disconnect power supply through suitable MCBs to prevent local/remote power operation. All control switches shall be of MCB/rotary switch type and Toggle/piano switches shall not be accepted.
- 11.14 Only stranded copper conductor (PVC,FRLS) shall be used for wiring. Minimum size of the Conductor for control circuit wiring shall be 2.5 sq.mm Copper.
- 11.15 Suitable anti condensation heaters with the provision of thermostat shall be provided.
- 11.16 Each operating mechanism shall be provided with 1100V grade stud type terminal block of Polyamide material. At least 20% spare terminals shall be provided.
- 11.17 A light fixture suitable for a 240 V CFL tube light shall be provided in each of the tor operated mechanism & shall be door operated type. A 240V, single phase, 50 Hz, 15 amp AC plug and socket shall be provided in the cabinet with ON-OFF switch for connection of hand lamps.

### **13. DESIGN, MATERIALS AND WORKMANSHIP**

- 13.1. The live parts shall be designed to eliminate sharp points, edges and similar corona producing surfaces, where this is impracticable, adequate rings made out of aluminum tubes shall be provided. Corona shields are not acceptable.
- 13.2. All ferrous metal parts shall be hot dip galvanized, as per IS 2629. All metal parts shall be of such materials or treated in such a way so as to avoid rust, corrosion and deterioration due to continued exposure to atmosphere and rain.
- 13.3. Bolts, screws and pins shall be provided with standard locking device viz. Locknuts, spring washers, keys etc. and when used with current carrying parts, they shall be made of copper silicon or other high conductivity and wear resistant alloys.
- 13.4. The switches should not need lubrication of any parts except at very long interval of five year minimum.

- 13.5. Any fittings, accessories or apparatus which may not have been mentioned in this specification but which are necessary for efficient operation / performance shall deem to be included in the contract.

#### **14. PROTECTIVE COATINGS**

All ferrous parts including bolts, nuts and washers of the switches assembly shall be galvanised to withstand at least six one minute dips in copper sulphate solution of requisite strength except the threaded portions which should withstand four dips.

#### **15. INSULATORS**

- 15.1. Support insulators for all type of isolators shall be of solid core type.
- 15.2. The insulator shall be made of homogeneous and vitreous porcelain of high mechanical and dielectric strength. It shall have sufficient mechanical strength to sustain electrical and mechanical loading on account of wind load, short circuit forces etc. Glazing of the porcelains shall be of uniform dark brown colour with a smooth surface arranged to shed away rain water.
- 15.3. The porcelain shall be free from laminations and other flaws or imperfections that might affect the mechanical or dielectric quality. It shall be thoroughly vitrified, tough and impervious to moisture.
- 15.4. The porcelain and metal parts shall be assembled in such a manner and with such material that any thermal differential expansion between the metal and porcelain parts throughout the range of temperature specified in this specification shall not loosen the parts or create under internal stresses which may affect the mechanical or electrical strength or rigidity. The assembly shall not have excessive concentration of electrical stresses in any section or across leakage surfaces. The cement used shall not give rise to chemical reaction with metal fittings.
- 15.5. The insulator shall be suitable for water washing by rain or artificial means in service condition.
- 15.6. Profile of the insulator shall also conform to IEC-815.
- 15.7. Caps to be provided on top of the insulator shall be of high grade cast iron or malleable steel casting. It shall be machine faced and hot dip galvanized. The holes shall be suitable for bolts with threads having anti corrosive protection. The effective depth of threads shall not be less than the nominal diameter of the bolt. The cap shall be so designed that it shall be free from visible corona and shall have radio interference level within 500 micro volts.
- 15.8. Casting shall be free from blow holes cracks and such other defects.

#### **16. NAME PLATE:**

Isolator, earth switches and their operating devices shall be provided with name plate. The name plate shall be weather proof and corrosion proof. It shall be mounted in such a position that it shall be visible in the position of normal service and installation. It shall carry the following informations duly engraved or punched on it. Name plate shall be bilingual i.e. in English & Oriya.

##### **16.1. Isolator Base**

Name: - OPTCL

Name of manufacturer: -  
Type Designation:-  
Manufacturer's serial No.: -  
Rated voltage: -  
Rated normal current: -  
Rated short time current (rms) and duration: -  
Rated short time peak current (KAP):-  
Weight:-

#### **16.2. Operating Device**

Name - OPTCL  
Name of manufacturer -  
Type Designation -  
Reduction gear ratio -  
AC motor  
i) Rated auxiliary voltage  
ii) Starting current  
iii) Designation of AC motor as per I.S 4722/325  
iv) Starting torque at 80% of supply voltage  
v) Over travel in degrees after cutting off supply Total operating time in seconds  
i) Close operation - Electrical  
ii) Open operation - electrical  
Open operation - manual

**16.3** All components shall be given adequate treatment of climate proofing as per IS: 3202 so as to withstand corrosive and severe service conditions. All metal parts not suitable for painting such as structural steel, pipes, rods ,levers, linkages, nuts and bolts used in other than current path etc. shall be hot dip galvanized as per IS - 2629 Complete details of painting, galvanizing and climate proofing of the equipment shall be furnished in the offer.

### **17. TESTS**

#### **17.1. Type Tests:**

Isolators offered, shall be fully type tested as per the relevant standards. The Bidder shall furnish one set of the following valid type test reports for their different type of offered Isolators along with the offer. The Purchaser reserves the right to demand repetition of some or all the type tests in the presence of purchaser's representative. For this purpose the Bidder may quote unit rates for carrying out each type test and this will be taken during bid price evaluation, if required. The following type test reports shall be submitted for evaluation purpose. In the absence of any one of the following, the bid is liable to reject.

- a) Short time withstands & peak withstand current test for Isolator.
- b) Power frequency (Dry & Wet), Lightning Impulse dry withstand.
- c) Radio interference voltage (RIV) test
- d) Mechanical endurance Test & Terminal load test
- e) Degree of Protection test (IP-55)
- f) Corona Test (For 400kV Only)

- g) Temperature rise test
- h) Blocked rotor test

During type tests the isolator shall be mounted on its own support structure or equivalent support structure and installed with its own operating mechanism to make the type tests representative. Drawing of equivalent support structure and mounting arrangements shall be furnished for Purchasers approval before conducting the type tests.

The type tests shall be conducted on the isolator along with approved insulators and terminal connectors.

Mechanical endurance test shall be conducted on the main switch as well as earth switch of one isolator of each voltage class for M2 class (10000 operations). as per IEC 62271-102 which shall be tested at any NABL accredited independent laboratory like CPRI/ERDA.

## **17.2. Acceptance and Routine Test:**

All acceptance and routine test as stipulated in the relevant standards shall be carried out by the supplier in presence of Purchasers representative.

Mechanical operation test (routine test) shall be conducted on isolator (main switch and earth switch) at the supplier's works as well as purchasers substation site. Immediately after completion of the routine test, the supplier shall give 20 days advance intimation along with routine test certificates, valid calibration reports from Govt. approved test laboratories for the equipment, instruments to be used during testing for scrutiny by the purchaser to enable him to depute his representative for witnessing the tests. If there will be any discrepancies in the routine test certificates and calibration reports furnished by the manufacturer, then after settlement of the discrepancies only, purchase's representative will be deputed for witnessing the tests. Special tests proposed to be conducted (if decided to conduct) as type test on isolators, are given at Annexure. These special type test charges shall be quoted along with all other type tests as per relevant IEC standard and these charges shall be included in the total bid price. Test certificates of various raw materials and bought out items including but not limited to the following shall be furnished at the time of routine tests.

- a) Chemical analysis of copper along with a copy of excise certificate indicating genuine source of procurement of electrolytic grade copper.
- b) Aluminium extrusions
- c) Aluminium ingots & castings
- d) Fasteners
- e) Insulators
- f) Motor
- g) Gears
- h) Auxiliary switch
- i) Limit switch
- j) Overload / single phase preventer
- k) Interlocking devices
- l) Terminal block

## **18. INSPECTION**

- i) The Purchaser shall have access at all times to the works and all other places of manufacture, where the Isolators, earth switches and associated equipment are being manufactured and the supplier shall provide all facilities for unrestricted inspection of the works of raw materials manufacture of all the accessories and for conducting necessary tests as detailed herein.
- ii) The supplier shall keep the purchaser informed in advance of the time of starting of the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection.
- iii) No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested.
- iv) The acceptance of any quantity of the equipment shall in no way relieve the supplier of his responsibility for meeting all the requirements of this specification and shall not prevent subsequent rejection if such equipment is later found to be defective.

## **19. QUALITY ASSURANCE PLAN**

The Bidder shall invariably furnish following information along with his offer, failing which his offer shall be liable for rejection.

- (i) Names of sub suppliers for raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in presence of Supplier's representative, copies of test certificate
- (ii) Information and copies of test certificates as in (i) and (ii) above in respect of bought out accessories.
- (iii) List of manufacturing facilities available
- (iv) Level of automation achieved and list of areas where manual processing still exists.
- (v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
- (vi) List of testing equipment with calibration certificates from Govt. approved test house available with supplier for final testing equipment and test plant limitation if any, vis-à-vis the type, special acceptance and routine test specified in the relevant standards.

These limitations shall be very clearly brought out in the specified test requirements.

The supplier shall within 30 days of placement of order, submit following information to the purchaser.

- i) List of raw material as well as bought out accessories and the names of sub-suppliers selected from the lists furnished along with offer.
- ii) Type test certificates of the raw material and both bought out accessories.
- iii) Quality Assurance Plan (QAP) with hold points for purchaser's inspection.

## **20. DOCUMENTATION**

20.1. All drawings shall conform to relevant international standards organisation (ISO). All drawings shall be in ink and suitable for micro filming. All dimensions and data shall be in S.I. Units.

20.2. List of Drawings and Documents

The Bidder shall furnish four sets of following drawings / documents along with his offer.

- a) General outline and assembly drawings of the dis-connector operating mechanism, structure, insulator and terminal connector.
- b) Sectional views and descriptive details of items such as moving blades, contacts, arms contact pressure, contact support bearing housing of bearings, balancing of heights, phase coupling pipes, base plate, operating shaft, guides, swivel joint operating mechanism and its components etc.
- c) Loading diagram.
- d) Drawings with structure for the purpose of type tests.
- e) Name plate.
- f) Schematic drawing.
- g) Type test reports.
- h) Test reports, literature, pamphlets of the bought out items and raw material.

**20.3.** The supplier shall within 2 weeks of placement of order submit four sets of final versions of all the above said drawings for Purchaser's approval. The purchaser shall communicate his comments / approval on the drawings to the supplier. The supplier shall, if necessary, modify the drawings and resubmit four copies of the modified drawings for Purchaser's approval within two weeks from the date of comments. After receipt of approval the supplier shall within three weeks submit 5 prints and soft copies in two CD of the approved drawings for purchaser's use.

**20.4.** Six sets of the type test reports, duly approved by the Purchaser shall be submitted by the supplier for distribution, before commencement of supply. Adequate copies of acceptance and routine test certificates, duly approved by the Purchaser shall accompany the dispatched consignment.

**20.5.** The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the supplier risk.

## **21. INSTRUCTION MANUALS:**

**21.1.** Five copies of the erection, operation and maintenance manuals in English are to be supplied for each type of Isolator one month prior to despatch of the equipment. The manual shall be bound volumes and shall contain all drawings and information required for erection, operation and maintenance of the Isolator including but not limited to the following particulars.

- (a) Marked erection prints identifying the component parts of the Isolator as shipped with assembly drawings.
- (b) Detailed dimensions and description of all auxiliaries.
- (c) Detailed views of the insulator stacks, metallic, operating mechanism, structure, interlocks, spare parts etc.

## **22. PACKING AND FORWARDING.**

The equipment shall be packed in crates suitable for vertical / horizontal transport, as the case may be and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the following information:

- (a) Name of the consignee.
- (b) Details of consignment.
- (c) Destination.
- (d) Total weight of consignment.
- (e) Handling and unpacking instructions.
- (f) Bill of material indicating contents of each package.

The supplier shall ensure that the bill of material is approved by the purchaser before dispatch.

### **23. SUPERVISION OF ERECTION, TESTING & COMMISSIONING (ET&C).**

Purchaser proposes to utilize the services of the supplier for supervision of testing and commissioning of the equipment being supplied by him, if it is required. For this purpose, the supplier should make available the services of trained personnel (Engineers) who shall correct in the field, any errors or omissions in order to make the equipment and material properly perform in accordance with the intent of this specification. The Engineer shall also instruct the plant operators in the operation and maintenance of the commissioned equipment. The supplier shall be responsible for any damage to the equipment on commissioning the same, if such damage results for the faulty or improper ET&C. Purchaser shall provide adequate number of skilled / semi skilled workers as well as general tools and equipment and cranes required for equipment erection, at his own expenses. Apart from the above, the Purchaser shall not be responsible for providing any other facilities to the supplier. Special tools if required for erection and commissioning shall be arranged by the supplier at his cost and on commissioning these shall be supplied to the purchaser free of cost for future use.

### **24. QUATITITY AND DELIVERY REQUIREMENTS:**

The scope of supply shall include a supply of 2.5% extra quantity of galvanized bolts, nuts, washers, split pins, cotter pins and such other small loose items free of cost.

### **25. STANDARDS:**

STANDARD	DESCRIPTION
IEC 62271-1	HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR PART 1 COMMON SPECIFICATIONS
IEC 62271-102	HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR PART 102 ALTERNATING CURRENT DISCONNECTORS AND

	EARTHING SWITCH
IS 9921 PART 1 -PART 5	SPECIFICATION FOR ALTERNATING CURRENT DISCONNECTORS ( ISOLATORS ) AND EARTHING SWITCHES FOR VOLTAGES ABOVE 1000 V
IEC 60694	IEC 60694 COMMON SPECIFICATIONS FOR HIGH- VOLTAGE SWITCHGEAR AND CONTROLGEAR STANDARDS
IS 2544	SPECIFICATIONS FOR POST INSULATOR

### GUARANTEED TECHNICAL PARTICULARS

*(To be filled in & signed by the bidder)*

**NAME OF THE BIDDER:**

**SL. No.**

**DESCRIPTION**

**ISOLATOR**

**1**

**ISOLATOR : GENERAL:**

1.01

Name of Manufacturer

1.02

Type & Model of the  
Manufacturer

1.03

Date of Last Type Test

1.04

Type from Operation Point (Like  
HCB, CR, Pantograph)

1.05

Conforming Standard

1.06

Total Height of the Isolator with  
structure from Plinth level after  
complete Erection

1.07

Total weight of the Isolator

1.08

Total weight of the structure after  
complete Erection

1.09

Material of the Main Blades

1.10

Material of the Main Contacts

1.11

Whether spring is used in the  
main or secondary contact  
assembly

1.12

Rated Voltage (KV)

1.13

Maximum Voltage (KV)

1.14

Rated Frequency (Hz)

**2**

**INSULATION LEVEL : 1.2/50**

**MICRO-SEC. L.I. WITHSTAND**



	<b>VOLTAGE:</b>
2.01	Between line terminals and ground parts (KVp)
2.02	Between Isolating Arms (KVp)
2.03	One minute Power frequency withstand Voltage (KVrms)
2.03.1	Between line terminals and ground parts (KVp)
2.03.2	Between Isolating Arms (KVp)
<b>3</b>	<b>ISOLATOR CURRENT:</b>
3.01	Rated normal current Amps (rms)
3.02	Short time current rating (KA) (1 Sec. for 400KV & 3 Sec. for 220KV & below)
3.03	Temperature rise above ambient of 50oC at rated current (oC)
<b>4</b>	<b>ISOLATOR CLEARANCE:</b>
4.1	Clearance between : Phase to Phase (mm)
4.2	Clearance between : Phase to Earth (mm)
4.2	Clearance between Two arms in Open condition (mm)
4.5	Height of the Rotating Insulator (mm)
<b>5</b>	<b>ISOLATOR DRIVES:</b>
5.1	Type of Drive Motor (Like AC Squirrel Cage, DC Motor)
5.2	Voltage of Motor Drives
5.3	Provision of Manual Operation (Yes / No)
5.4	Rated auxiliary supply voltage to coil for close & Open Operation
<b>6</b>	<b>NUMBER AND TYPE OF AUXILIARY CONTACTS FOR :</b>
6.1	Main blade
6.2	Earth switch
6.3	Operating time for closing (secs.)
6.4	Operating time for opening (secs.)
<b>7</b>	<b>ISOLATOR: SUPPORT INSULATOR:</b>
7.1	Name of Manufacturer
7.2	Conforming Standard
7.3	Type & Designation
7.4	Cantilever Strength (Kgf)
7.5	Min. Creepage Distance(mm)
7.6	Weight of Unit (Kg)
7.7	Height of Unit (mm)
7.8	Insulation Level: One minute Power frequency voltage withstand test (KVrms)

- 7.9 Insulation Level: 1.2/50 micro-sec. Lightning  
Impulse Voltage withstand test (KVp)
- 8**
- 8.01 **ISOLATORS SPARES:**  
The isolator spares will be available for total  
service life. ( Yes/ No)
- 8.02 If offered designed isolator are out of  
manufacturing, the manufacturer will  
arrange spares for total service life ( Yes/ No)