HCB ISOLATOR

(Special Type)

April 2025

Engineering Department

WEST BENGAL STATE ELECTRICITY TRANSMISSION COMPANY LIMITED
পশ্চিমবঙ্গ রাজ্য বিদ্যুৎ সংবহন কোম্পানি লিমিটেড
(পশ্চিমবঙ্গ সরকারের একটি উদ্যোগ)

Regd. Office: Vidyut Bhawan, Block – DJ, Sector-II, Bidhannagar, Kolkata – 700091.
CIN: U40101WB2007SGC113474; Website: www.wbsetcl.in

TECHNICAL SPECIFICATION FOR ISOLATOR

Updates for WBSETCL / TECH SPEC / Rev.-0.1

1. The clause 2
   The Indian Standard *"IS 9921"* is removed from the spec.

2. SPECIFIC TECHNICAL PARTICULARS
   Minimum creepage distance of support insulators (mm) (31kV/mm) changed to
   7595, 4495 from 6125, 3625 for Nominal System Voltage (kV) 220, 132 respectively.

(For Main bus side and at Bus-Section of 145KV and 245KV System)

1. SCOPE

This specification covers design, manufacture, testing at manufacturer works of the following type of Isolators:

i) 245 KV, 2000A / 1600A, Horizontal Centre Break (HCB),3 pole gang / single pole (in staggered formation) motor operated isolator with or without earth switch. Where isolators are connected in staggered formation, provision of motor shall be at each pole, for individual pole operation.

ii) 145 KV, 2000 / 1250A Horizontal Centre Break (HCB), 3 pole gang / single pole (in staggered formation) motor operated isolator with or without earth switch. Where isolators are connected in staggered formation, provision of motor shall be at each pole, for individual pole operation.

These isolators shall be complete with provision for electrical/mechanical interlock, with insulators, auxiliary contact switches, position indicating device, base frames, linkages operating mechanism, control cabinet, arcing horns (wherever necessary) etc. and other devices whether specifically called for herein or not.

2. STANDARD :

Disconnecting switches (isolators) covered by this specification shall conform to latest edition of ~~IS:9921 (Part I to Part V)~~ [R0.1] & IEC-129. Porcelain post insulators for the isolators shall conform to IS-2544 and/or IEC:168 as amended up to date except to the extent explicitly modified in this specification. Porcelain post insulators of isolator shall be guided by relevant technical specification of post insulator.

3. I) DEVIATION :

Normally the offer should be as per Technical Specification without any deviation.

II) MODIFICATION :

If any modification felt necessary to improve performance, efficiency and utility of equipment, the same must be mentioned in the 'Modification schedule' with reasons duly supported by documentary evidences and advantages. Such modifications suggested may or may not be accepted, but the same must be submitted along with Pre-Bid Queries. The modifications not mentioned in Schedule will not be considered.

4. GENERAL INFORMATION :

4.1. The disconnecting switches (isolators) shall be installed in the Sub-station at an altitude not exceeding 1000 metres above mean sea level.

4.2. 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.

4.3. Isolators shall be outdoor and off-load type. Earth switch shall be provided on isolator whenever called for.

4.4. The isolator shall be designed for use in geographic and meteorological conditions as given in 'General Technical Specification' chapter.

5. DESIGN CRITERIA :

5.1. 245 KV & 145 KV Horizontal centre break type isolator shall be gang operated through motor from local as well as from remote control panel. There should be provision for mechanical operation by hand of isolator locally. Earth Switch shall be provided on the line side of the isolator and shall be gang operated mechanically by hand.

5.2. 245/145KV staggered Isolator shall be single centre break with provision of motor of each pole for individual operation. Operating mechanism shall be operated from local as well as from remote control panel with master follower scheme to ensure simultaneous operations for all those poles. There shall be provision for local manual operation also.

5.3. For three phase Isolators with motor control operation, the supply of interconnecting cables are under the scope of contractor.

5.4. The moving contacts of 3-phase 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.

5.5. The line side horizontal type isolator for 245/145 KV shall be provided with arcing horn and guiding horn. Other horizontal type isolators shall have guiding horn only.

5.6. Earth switch wherever provided shall be constructional interlocked as well as electrically interlocked so that earth switch can be operated only when the main isolator is open and viceversa.

5.7. The isolator and earth switch of all voltage class shall have interlocking coil and operation can be performed when the interlocking coils are energised. There shall be arrangement for defeating the interlock by hand operated lever when the interlocking coil is defective. The individual interlocking coils shall be suitable for operation from 220 ± 10% Volt DC supply.

5.8. The isolator and circuit Breaker interlocking shall be provided as per scheme to be approved during detailed engineering.

6. DUTY REQUIREMENT :

6.1. Isolator and earth switches 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.

6.2. Earth switch can be capable of discharging trapped charges of the respective lines.

6.3. 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.

6.4. The isolators shall be capable of making/breaking magnetizing current of 0.7A at 0.15 power factor and capacitive current of 0.7A at 0.15 power factor at rated voltage.

6.5. The earth switch wherever provided shall be constructional inter-locked so that earth switch can be operated only when the isolator is in open condition or vice versa. The constructional interlock shall be built in construction of isolator and shall be in addition to the electrical and mechanical interlocks provided in operating mechanism.

6.6. In addition to constructional interlock, isolator and earth switch 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'.

7. MAIN CONTACTS (MALE AND FEMALE):

7.1. The isolators with or without earthing switches shall have heavy duty self-aligning and self–cleaning type high pressure contacts. The high pressure type contacts shall wipe the contact surface during opening and closing without causing any scouring or abrasion on the contact surface.

7.2. The main contacts shall be of silver plated (minimum 20 micron thickness) **copper alloy (Zirconium - Chromium - Cu)** with minimum contact resistance.

7.3. The contacts and other current carrying parts shall 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.

7.4. The male arm and female arm of the horizontal centre break isolator (conventional as well as staggered type) of all voltage classes shall be made from tube of high conductivity hard drawn electrolytic copper / aluminium of required size and thickness. The current density for copper shall be within 1.75A per sq.mm and that of aluminium shall be within 0.75A per sq.mm.

7.5. **No external springs shall be used** to achieve contact pressure. The contacts shall have inbuilt sufficient contact pressure for proper contact and adequate cross-section / surface area to prevent loose contact and excessive heating.

7.6. For uninterrupted current transfer from Isolator Arm to Terminal heads, Tulip contacts are to be used. Terminal heads shall have built-in cover to eliminate deposition of dust & foreign particles.

8. INSULATORS :

8.1. 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.

8.2. 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.

8.3. All iron parts shall be hot dip galvanised. 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.

8.4. Puncture voltage of Insulator shall be greater than dry flashover voltage of respective Isolators.

8.5. 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.

8.6. The cantilever strength (min) of solid core support insulator shall be as specified under 'specific technical particulars'.

9. BASE OF THE ISOLATOR :

Each isolator shall be provided with a complete galvanized steel base with holes and designed to mount on a supporting structure, which shall be rigid, and self-supporting.

10. AUXILIARY SWITCHES :

10.1. All isolator and earthing switches shall be provided with auxiliary switches suitable for 220±10% V DC and continuous current carrying capacity of 10 Amps.

10.2. The contacts of the auxiliary switches shall be used for remote indication of open or close position in the control panel as well as for electrical interlock with other equipment. These contacts shall be housed in a suitable weatherproof cabinet for outdoor use to make it free from dust and prevent ingress of moisture during rain. Degree of protection of the cabinet IP55 as per IS- 13947.

10.3. The number of auxiliary switches shall be determined as per requirement. An indicative number has been specified under specific technical parameters. Make before break and break after break auxiliary switches shall be provided for bus bar differential protection.

11. EARTH SWITCH :

11.1. The Earthing switch shall include the complete operating mechanism and auxiliary contacts.

11.2. The earth switch of 220KV, 132KV system shall be manually operated by hand. The operating handle shall be such that it can easily be operated from standing height from ground. There shall be interlock between contacts of main blades and earth switches so that at one time either main blade or earth switch can be made ON. The earth switches shall be able to carry the same fault current as the main blades of the isolators and shall withstand dynamic stresses.

11.3. The earthing terminal of earth switch shall be able to carry the rated short time current rating for three seconds.

11.4. Earth switch shall be provided with flexible copper braids for connection to earth terminal. These braids shall have the same short time current capacity as the earth blade.

11.5. The frame of each isolator and earthing switch shall be provided with two reliable earth terminals for connection to the earth mat.

11.6. Isolator design shall be such that earthing switch position can be inter change to either side of the structure as per requirement at site.

11.7. Suitable mechanical arrangement shall be provided for de-linking electrical drive for mechanical operation.

11.8. The plane of movement and final position of the earth blades shall be such that adequate electrical clearance are obtained from adjacent live parts in the course of its movement between ON and OFF position.

12. OPERATING MECHANISM :

12.1. The operating mechanism shall be motor operated as well as manually operated and shall ensure quick and effective operation. The operating mechanism shall be housed in a weather proof outdoor mechanism box near the base of the isolator.

12.2. Each isolator/pole of isolator and earth switch shall be provided with a manual operating handle at a height of 1000 mm. (approx.) from the base of isolator support structure so that one man can open or close the isolator with ease in one movement while standing at ground level.

12.3. All operating linkages carrying mechanical loads shall be designed for negligible deflection. The isolator and earth switches shall be provided with 'Over Center' device in the operating mechanism to prevent accidental opening due to wind, vibration, short circuit forces or movement of the support structures.

12.4. All rotating parts shall be provided with Sealed Double Ball bearing arrangement at the bottom of Insulators for rotating arrangement of the same. Bearing pressure shall be kept low to ensure long life and ease of operation. Locking pins whenever used shall be rustproof.

12.5. Signaling of closed position shall not take place unless it is certain that the movable contacts have reached a position in which rated normal current, peak withstand current and short time withstand current can be carried safely. Signaling of open position shall not take place unless movable contacts have reached a position such that clearance between contacts is at least 80% of the isolating distance.

12.6. The position of movable main blade of each isolators and earthing switching shall be indicated by a mechanical indicator at the lower end of the vertical rod shaft for the isolator and earthing switch. The indicator shall be of metal and visible from operating level.

12.7. The isolator blades/earth switches shall be in continuous control throughout the entire cycle of operation. The operating rods and pipe shall be rigid enough to maintain control under adverse conditions to withstand all torsional and bending stresses arising from operation. All hinges / movable joints in current carrying parts shall be shunted with flexible copper conductors having adequate length and size to prevent breaking due to repeated operation. Operating rod of main and earth switch shall be pad lockable.

12.8. i) The mechanism box shall have neoprene gasket hinged door at front with locking facility. All accessories inside the housing shall be easily accessible.

ii) The box shall be suitable for mounting on structure as well as on plinth of adequate height.

iii) The Control Cabinet/Operating mechanism box shall be made of 3 mm (min.) thick Aluminium sheet such that it provides adequate rigidity and shall be provided with removable gland plates at the bottom of the box for connection of cables. Space heater with thermostat and switch as well as one 230 Volt combined 5A/15A AC plug with socket and switch shall be provided. Mechanism Box shall have Degree of Protection not less than IP-55 as per IS:13947

iv) Cubicle illumination lamp (LED type) with door switch shall be provided.

v) Suitable reduction gear shall be provided between motor and the drive shaft of the isolator. The mechanism shall stop immediately when motor supply is switched off.

vi) Manual operation facility (with handle) should be provided with necessary interlock to disconnect motor.

vii) Gear should be forged material and suitably chosen (rust free) to avoid bending/jamming on operation after a prolonged non-operation.

12.9. Proper arrangement shall be provided for smooth transfer of rotary motion from motor shaft to the insulator along with stoppers to prevent over travel.

13. EARTHING :

Flexible conductor of adequate section shall be provided at the lower end of the vertical operating shaft for connection to station earthing system. It is for earth switch only. The frame of each Isolator and earthing switches shall be provided with two reliable earth terminals for Connecting G.S. Flat of 50×10mm for all voltage classes

14. SUPPORTING STRUCTURE :

The isolator shall be placed on rigid, self-supporting galvanized supporting structure. The base of the isolator shall be connected to the supporting structure through bolts of proper size as per requirement.

15. COMPLETENESS OF SUPPLY :

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

16. GALVANISING :

All ferrous parts including nuts, bolts, washers and other ferrous parts shall be hot dip galvanised as per relevant IS to withstand at least six dips each of one minute duration in copper sulphate solution of requisite strength except threaded portion which should withstand four dips each of one minute duration.

17. GURANTEE :

Electrical characteristics shall be guaranteed by the bidder. In case of failure of materials to meet the guarantee, WBSETCL shall have right to reject the material. Guaranteed Technical Particulars are to be submitted by successful bidder during detailed engineering alongwith submitted drawings/documents. However format for submission of GTP shall be handed over to intending bidders at the time of sale of tender documents.

18. CONTRACT DRAWINGS, CATALOGUE AND MANUAL :

18.1. After placement of Letter of Award (LOA) six (6) copies of various drawings, data and catalogue/manuals as mentioned below shall be submitted for approval as well as for reference as applicable :

i) Dimensional general arrangement drawing with supporting structure showing disposition of all fittings and accessories, electrical parameters, electrical clearances between phases, phase to earth and live parts / terminals to ground etc.

ii) Technical catalogue of isolators explaining the function of various parts, principle of operation etc. iii) Schematic diagram of electrical control and operating system of main isolator and earth switches.

iv) Plan, elevation and sectional views of contact assembly, operating mechanism etc.

v) Transport dimensions with weights.

vi) Foundation and anchor details including dead load and impact load with direction and also point of application. vii) Assembly drawing for erection with part number and schedule of equipment. viii) Name Plate particulars.

ix) Technical particulars and GA drawing of support insulator and operating rod insulator.

19.2 The contractor shall submit four (4) sets of approved drawings & instruction manuals both in hard and soft copy for each type of isolator per sub-station for distribution purpose. The manuals shall clearly indicate the installation methods, checkups and tests to be carried out.

19. TEST AT FACTORY AND TEST CERTIFICATES :

19.1. Following routine tests at manufacturer's works shall be carried out. The contractor shall give at least 15 (fifteen) days advance notice intimating the actual date of inspection and details of all tests that are to be carried out :

i) Power frequency dry test of the main circuit. (May be omitted as per IEC 60694 cl.7.1 subject to dimensional checking as per dimensions shown in type test report).

ii) Voltage test on control and auxiliary circuits. iii) Measurement of resistance of the main circuit iv) Mechanical operation tests.

v) Routine test report for all Isolators is to be submitted along with inspection offer.

20.2 All Acceptance tests at manufacturer's works shall be carried out in presence of representative of WBSETCL as per relevant IS & IEC. on every lot offered for inspection. In addition to above, all routine tests are also to be carried out on each Isolator as per relevant IS & IEC. Selection of samples for acceptance test as well as rejection and retesting shall be guided by relevant IS & IEC. The entire cost of acceptance and routine tests that are to be carried out as per relevant IS shall be treated as included in quoted price of Isolator. Three (3) copies of test reports along with soft copy shall be submitted for approval and adequate extra copies for distribution to site.

20. TEST REPORTS AND TYPE TESTS:

Only type tested Isolator from the maker's list of WBSETCL are to be offered conforming to our technical specification, and relevant IS and IEC. Isolator offered should be of similar type & similar design with ones on which type testing has been carried out as per relevant IS and IEC. Three sets of complete type test reports along with soft copy carried out in Govt. recognized Test House or Laboratory /NABL accredited laboratory shall have to be submitted by successful bidder positively alongwith submission of drawings during detailed Engineering.

Successful bidder may require producing original copies of type test reports at the time of detail Engineering if asked by WBSETCL.

Each type test report shall comply the following information with test result i)

Compete identification, date and serial no .

ii) Relevant drawings as documented with test report. iii) Method of application, Where applied, duration and interpretation of each test.

iv) Bidder shall quote price for carrying out type tests mentioned in the schedule for type test charges on 400KV class isolator so that the same can be carried out as per option of WBSETCL. This price shall be considered for the purpose of evaluation of bids.

SPECIFIC TECHNICAL PARTICULARS

Sl. No.	DESCRIPTION	220 KV	132 KV
1	Nominal System Voltage (KV)	220	132
2	Rated Voltage (KV)	245	145
3	Frequency (Hz)	50	
4	No. of Phases	3-phase	
5	System Neutral Earthing	Effectively Earthed	
6	No of poles	3	
7	Location	Outdoor	
8	Rated Insulation Level		
A	1.2/50 micro-sec. lightning Impulse Withstand Voltage (KVp) i) Between line terminals and ground. ii) Between line terminals with isolator open.	±1050 ±1200	±650 ±750
B	One minute PF withstand voltage (KVrms) i) Between line terminals and ground. ii) Between terminals when isolator is open.	460 530	275 315
9	Rated Normal Current(Amps)	2000/1600	2000/1250
10	Rated Short Time withstand current of Main Contacts and Earth Switch (KA) and duration (for 3 sec) and dynamic current (KAP) of isolator and Earth Switch.	i) 40 for 3 sec. ii) 100 KAP	i) 31.5 for 3 sec. ii) 78.5 KAP
11	Mounting Condition	On Structure	

12	Method of operation Main / Earthing Switch	Motor / Manual	Motor / Manual
13	Number of auxiliary switches for main isolator	10NO+10NC (min.)	10NO+ 10NC (min.)
14	Number of Make before break and break after break auxiliary switches	2NO+2NC (min.)	2NO+2NC (min.)
15	Number of auxiliary Switches in Earth Switch	4 NO+ 4NC	
16	Rated auxiliary AC Supply (Volt)	400/230 V ±10%	
17	Rated auxiliary DC Supply (Volt).	220 ±10%	
18	Minimum creepage distance of support insulators(31mm/KV)[R0.1] (mm)	~~6125~~ 7595	~~3625~~ 4495
19	Phase to phase spacing (mm)	4500	2700
20	Operating Time of isolator and Earth switch.	Less than 12 seconds	
21	Mechanical terminal load for horizontal centre break Isolator i) Straight Load (N) ii) Cross Load (N)	1000 330	500 170
22	Mechanical terminal load for pantograph Isolator iii) Straight Load (N) iv) Cross Load (N)	-	-
23	Rated magnetising / capacitive current make and break	0.7 Amps at 0.15 PF	
24	All Contacts	Silver –plated , minimum 20 micron	
25	Temperature rise above ambient temperature of 50 deg C corresponding to maximum continuous current (ºC)	Within limit as per table IV of IS :9921(Pt. II) - 1982	
26	Cantilever strength of support insulator (Kgf)	600	400
27	Current Density of Copper (Max.) (A/Sq. mm.)	1.75	1.75
28	Current Density of Aluminium (Max.) (A/Sq. mm.)	0.75	0.75

NB : The number of auxiliary switches are indicative. Supplier / manufacturer is to supply required number of auxiliary switches after detailed engineering.

GUARANTEED TECHNICAL PARTICULARS FOR ISOLATORS

(To be filled in and signed by the Bidder)

1	ISOLATOR : GENERAL	
a)	Name of Manufacturer	
b)	Type & Model of the Manufacturer	

c)	Date of Last Type Test	
d)	Type from Operation Point (Like HCB, CR, Pantograph)	
e)	Conforming Standard	
f)	Total Height of the Isolator with structure from Plinth level after complete Erection	
g)	Total weight of the Isolator	
h)	Total weight of the structure after complete Erection	
i)	Material of the Main Blades	
j)	Material of the Main Contacts	
k)	Rated Voltage (KV)	
l)	Maximum Voltage (KV)	
m)	Rated Frequency (Hz)	
2	Insulation Level :	
I.	1.2/50 micro-sec. L.I. withstand voltage	
a)	Between line terminals and ground parts (KVp)	
b)	Between Isolating Arms (KVp)	
II.	One minute Power frequency withstand Voltage (KVrms)	
a)	Between line terminals and ground parts (KVp)	
b)	Between Isolating Arms (KVp)	
3	ISOLATOR CURRENT	
a)	Rated normal current Amps (rms)	
b)	Short time current rating (KA) (3 Sec. for 220KV & below)	
c)	Temperature rise above ambient of 50^{o}C at rated current (^{o}C)	
4	ISOLATOR CLEARANCE	
a)	Clearance between : Phase to Phase (mm)	
b)	Clearance between : Phase to Earth (mm)	
c)	Clearance between Two arms in Open condition (mm)	
d)	Height of the Rotating Insulator (mm)	
5	ISOLATOR DRIVES	
a)	Type of Drive Motor (Like AC Squirel Cage, DC Motor)	

b)	Volatge of Motor Drives	
c)	Provision of Manual Operation (Yes / No)	
d)	Rated auxiliary supply voltage to coil for close & Open Operation	
6	Number and type of auxiliary contacts for	
a)	main blade	
b)	earth switch	
c)	Operating time for closing (secs.)	
d)	Operating time for opening (secs.)	
7	ISOLATOR: SUPPORT INSULATOR	
a)	Name of Manufacturer	
b)	Conforming Standard	
c)	Type & Designation	
d)	Cantilever Strength (Kgf)	
e)	Min.Creepage Distance(mm)	
f)	Weight of Unit (Kg)	
g)	Height of Unit (mm)	
h)	Insulation Level: One minute Power frequency voltage withstand test (KVrms)	
i)	Insulation Level: 1.2/50 micro-sec. Lightning Impulse Voltage withstand test (KVp)	
8	ISOLATORS SPARES	
a)	The isolator spares will be available for total service life. (Yes/ No)	
b)	If offered designed isolator are out of mnufacturing, the manufacturer will arrange spares for total service life (Yes/ No)	