36kV & 12 KV, TRIPLE POLE, DOUBLE BREAK ISOLATOR

1. INTRODUCTION

This chapter covers specification of out door type 36 kV and 12 kV isolators with all the accessories and other basic requirements equipment required for their satisfactory operation.

The isolator shall conform, in all respects to high standard of engineering, design and workmanship. It shall be guaranteed in a manner acceptable to the Owner who will interpret the meaning of drawings and specification and shall have power to reject any work or material, which, in his judgment, is not in accordance therewith.

1.1. APPLICABLE STANDARD

The isolator shall conform to the latest revision of IS 9921. The post insulator shall confirm to IS 2544 and galvanising to IS 2629.

Equipment meeting with the stipulations of equivalent of any other internationally recognized standards, which ensure equal or better quality than the standards listed in the end, shall also be acceptable. In such case the contractor should submit along with his offer, two copies of such standards in authentic English translation, if the language of the standard is other than English.

1.2. GENERAL TECHNICAL REQUIREMENTS

1.2.1. Type of Isolators

The isolators shall be manually operated, triple pole, center-post-rotating, gang operated, double break type. It shall be suitable to be mounted on horizontal or vertical arrangement.

1.2.2. Current Carrying Parts

All current carrying parts shall be made of tinned electrolytic copper. The main contacts shall be silver plated, accurately machined and self aligning type. The fixed contacts shall be spring loaded finger type to provide high contact pressure. The spring shall not be creepy. The arcing contacts shall be made of phosphor bronze and shall have spring assisted operation. The isolator shall have a spring mechanism so as to ensure that speed of opening of contacts is independent of speed of manual operation.

Material of blades and contacts of earthing switch shall be the same as those of main switch moving blade and contacts respectively. Cross sectional area of earthing blades and contacts shall not be less than 50% of cross sectional area of main blades and contacts. Earthing blades shall have the same short time current rating (thermal & dynamic) as that of main switch.
All current carrying parts shall be designed to have smooth surfaces without any sharp points, edges and other corona producing surfaces.

The contact surface shall be wiped during closing and opening operations to remove any oxide deposition on the contacts.

1.2.3. Current Density

Current density to be adopted for all the parts of isolator and terminal connector shall not exceed the following limits:

Blade and other parts - Copper 1.6 A/sqmm
Terminal connectors –Aluminium1.0 A/sqmm

1.2.4. Insulators

The isolator shall be provided with 6 nos. of 24 kV post insulator per pole for 36 kV and 3 nos. of 24 kV post insulator per pole for 12 kV. There will be total of 18 such post insulators in one set of isolator for 36 kV and 9 such post insulators in one set of isolator for 12 kV. These insulators shall conform to latest amendment of IS: 2544 and IS: 5350 (Part-III).

Insulator shall be made of homogeneous and vitreous porcelain of high mechanical & dielectric strength. It shall have sufficient mechanical strength to sustain electrical and mechanical loading on account of wind load, short circuit stresses etc. Glazing of the porcelain shall be uniform, brown or dark brown colour with a smooth surface arranges to shed away rain water. Porcelain and metal parts shall be assembled in such a way that any thermal differential expansion between the metal and porcelain through the range of temperature specified in this specification shall not loosen the parts or create undue internal stresses which may affect the mechanical or electrical strength or rigidity.

The insulator shall be provided with a completely galvanised steel base design for mounting on the support. The base and mounting arrangement of the insulator shall be such that the insulator shall be rigid

and self supporting and no guying or cross bracing between phases shall be necessary.

The insulator unit shall be assembled in a suitable jig to ensure correct positioning of the top and bottom metal fittings relative to one another.

All post insulator stacks, except the central rotating stacks, shall be provided with arcing horns made of 10 mm GI rod.

The puncture voltage shall be greater than dry flash over voltage.

1.2.5. Terminal Connectors

Six bimetallic bolted type terminal connectors shall be provided on the in-coming and out-going sides to directly receive conductors of 10-90 mm diameter without the use of lugs. The connectors shall be suitable for current ratings of 630 Amp in normal operation and 25 K Amp for 3 second. These connectors shall conform to all the test requirements of IS: 5561.

Terminal Pads shall be made out of electrolytic copper heavily silver plated (15 microns). The terminal pads shall be suitable for connection to 40x40 mm terminal connector.

1.2.6. Earthing

The frame of each isolator shall be provided with a separate earthing terminal for each phase for connection to an earthing conductor having a clamping bolt of not less than 12 mm dia. The terminal shall be marked with 'EARTH' symbol.

Flexible copper braid connections shall be provided between rotating earth blades and the frame which shall have a cross section of at least 50 sq mm and shall be tinned or suitably treated against corrosion.

The frame of each disconnector and earthing switch shall be provided with two reliable earthing terminals for connecting to earth mat. The connection shall be such that it can carry specified short circuit current.

Clearances:
Phase clearance i.e. centre to centre distance between the insulators of adjacent phases in the assembled position shall be 1500 mm for 33 kV.

Centre to centre distance between adjacent poles of the same phases in the assembled position shall be 485 mm for 33 kV.

All part shall be interchangeable with the similar part of any other phase.

1.3. OPERATING MECHANISM

The vertical operating rod shall comprise of 40 mm NB galvanized steel tube (medium Class) as per IS: 1161. Length of the rod shall depend on the mounting position of the isolator. Operating handle shall be fixed to the support structures (approx. 1 meter above the ground level.). The vertical tube shall be galvanized as per IS: 2544.

The rotating parts i.e. bell crank lever and fork etc. shall be either forged or made of mild steel (cast components are not permitted).

Manual operating mechanism gang operated through hand-operated lever shall be provided for main switch. The isolator shall open when operating handle is pulled downwards and close when the handle is pulled upwards. Adjustable stops shall be provided to stop over turning. Besides counter balance springs shall be provided to prevent impact at the end of travel both in closed and open position. Double ball or roller bearing of best quality shall be provided for the rotating insulators stacks and single bearing for the operating mechanism.

The operating mechanism shall provide quick, simple and effective operation. The design shall be such that one person shall be able to operate the isolator without undue efforts. Isolator operating mechanism should be such that it should not operate by gravity, wind, short circuit, seismic acceleration, vibration, shock, as accidental touching.

The isolator shall be provided with CLOSE/OPEN indicator.

Status of the isolator shall not show as ‘CLOSED’ till its main contacts are not properly closed. Status of the isolator shall not show as ‘OPEN’ till its main contacts are not opened at least 80% of the isolating distance. To avoid operation by the un-authorized person, the isolator shall have a pad lock arrangement both for ‘CLOSED’ and ‘OPEN’ position. The operating handle shall be double earthed to ensure safety of personnel.

1.4. AUXILIARY BOX

The auxiliary cabinet shall be provided with hinged door along with padlocking arrangement. The gaskets, as per section-I (Introduction and general technical requirements) shall be provided to ensure degree of protection at least IP55 as per IS 13947. Main switch operating mechanism shall be equipped with reliable auxiliary switch with 4 NO & 4 NC contacts exclusively interlocking and position indication scheme. Auxiliary switches shall be actuated by a cam or similar arrangement directly mounted on the isolator shaft without any intermediate levers, linkages etc to ensure fool proof operation. The auxiliary switch and auxiliary contacts shall be capable of carrying of 10 Amp current continuously. Quick make and break (QMB) type auxiliary switch shall have snap action built in within the switch.
Suitable mechanism shall be provided in Auxiliary Box to prevent the operation of the isolator when respective breaker is closed.

1.4.1. Terminal and Wiring

The cabinet shall be provided with 1100 volt grade stud type terminal. Auxiliary switch shall be wired up to the terminal block. There shall be at least 20% extra terminals. All wiring shall be carried out with 1100 V grade PVC insulated 2.5 sq. mm copper conductor as per IS: 1554. A removable gland plate with double compression type brass cable glands shall be provided at the bottom for terminating all control cables.

1.5. MOUNTING & MOUNTING ACCESSORIES

1.5.1. Supporting Structures

The support structures also shall be fabricated out of galvanized lattice structure. The support structure shall be suitable for mounting of auxiliary switch cabinet and guides. It shall be designed to withstand short circuit forces, wind pressure, seismic forces etc. along with the operating forces, vibrations, shocks etc. at actual site conditions with adequate factor of safety.

1.6. PAINTING, GALVANIZING AND CLIMATE PROOFING

All interiors and exteriors of enclosures, cabinets and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, grease and other foreign materials. After cleaning two coats of zinc oxide primer shall be given by suitable stoving and air drying etc. Colour of the final paint shall be epoxy light grey outside and white inside.

Paint inside the metallic housing shall be of anti-condensation type and the paint on outer surfaces shall be suitable for out door condition.

Hot dip Galvanisation with heavy coating shall be done after completion of the fabrication and should be capable of preventing corrosion in view of severe climatic conditions.

1.7. TESTING

The contractor shall test the isolator as per IS: 9221. Immediately after finalization of the Programme of type/acceptance/routine testing, the Supplier/Contractor shall give three weeks advance intimation to the Owner, to enable him to depute his representative for witnessing the tests.

The equipment offered should be fully type tested.

In case these type tests are older than seven years, the entire type test as per relevant standard shall be carried out by the Contractor in presence of Owner's representative.

In order to make type test representative, all type tests must be carried out by erecting disconnector on its foundation and after fitting the actual operating mechanism of the disconnector and using normal insulators to be used in real case.

1.7.1. Type Tests

i) Dielectric Test (Impulse and 1 minute Wet Power Frequency Withstand Voltages)
ii) Temperature Rise Test (for Contacts & Terminals)
iii) Rated Short Time Current & Rated Peak Withstand Current Tests
iv) Operation & Mechanical Endurance Tests

1.7.2. Routine Tests

i) Power Frequency Voltage Dry Test on Isolator
ii) Measurement of Main Contact Resistance
iii) Operating Test
iv) Power Frequency Voltage Test on Auxiliary Circuit.

1.7.3. Additional Tests

To be conducted as per referred standards by the contractor

Sl. No.	Name of Test	Relevant Standard
1	Test on Insulator	IS 2544, IEC 168
2	Test on terminal connectors	IS 5561
3	Test on Galvanized components	IS 2623
4	Operation tests on operating mechanism & interlocks	IEC 129/IS 9921
5	Mechanical Endurance tests on auxiliary switches	

1.8. TECHNICAL PARAMETERS

Sl. No.	Parameter	Unit	Requirements for (33kV)	Requirements for (11kV)
1	Rated Freq.	Hz.	50	50
2	System Neutral Earthing		Solidly earthed	Solidly earthed
3	No. of phase(poles)	No.	3	3
4	Temp. rise	Deg. C	As per standards IS/IEC	As per standards IS/IEC
5	Safe duration of overload	Minutes		
	a) 150 % of rated current		5	5
	b) 120 % of rated current		30	30
6	Rated voltage	KV rms	36	12
7	Type of isolator (AB)		DBCR	DBCR
8	Rated normal current	Amps.	630	400
9	Rated short time withstand current for 3 second	KA rms	25	25
10	Rated peak current	KA peak	63	63
11	Rated short circuit make current	KA peak	63	63
12	Derating factor		unity	Unity
13	Basic Insulation Level			
	1) Lightning Impulse withstand voltage			

Sl. No.	Parameter	Unit	Requirements for (33kV)	Requirements for (11kV)
	a) Pole to earth & between poles	KV peak	170	75
	b) Across isolating distance	KV peak	195	85
	2) Rated power freq. withstand voltage			
	a) Pole to earth & between poles	KV rms	70	28
	b) Across isolating distance	KV rms	80	32
14	Min. creepage distance (The protected creepage distance shall not be less than 50% of total)	mm	900	300
15	Phase to phase spacing for installation	mm	1500	900
16	**Min. clearances**	mm		
	a) Phase to earth		430	AS per IE rule
	b) Between rotating post and fixed post on one phase		485	AS per IE rule
17	Height of centre line of terminal pad above ground level	mm	3700	3700
18	Special Requirements: Isolator main switch (MS) shall be required to make or break the line charging current when no significant change in voltage occurs across the isolating distance on account of make or break. The isolator required is not with “Turn and twist mechanism”. It must be rotating type.			