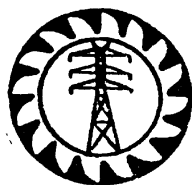


023 : 2006

CEB
STANDARD

12kV & 36kV LOAD BREAK SWITCHES



CEYLON ELECTRICITY BOARD
SRI LANKA

Specification

for

12kV & 36kV LOAD BREAK SWITCHES

CEB Standard 023 : 2006

CEYLON ELECTRICITY BOARD

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SPECIFICATION FOR 12kV AND 36kV LOAD BREAK SWITCHES

1.0 SCOPE

This specification covers the design, manufacture and testing of Load Break Switches (On Load Isolators) for overhead distribution networks of the CEB.

2.0 SYSTEM PARAMETERS

(a)	Nominal Voltage	-	11kV	33kV
(b)	System highest voltage	-	12kV	36kV
(c)	System frequency	-	50Hz.	50Hz
(d)	Number of phases	-	03	03
(e)	Method of earthing	-	Solidly earthed	Non effectively earthed
(f)	System fault level	-	13.0 kA (rms)	13.0 kA (rms)

3.0 SERVICE CONDITIONS

(a)	Annual average ambient temperature	-	30°C
(b)	Maximum ambient temperature	-	40°C
(c)	Maximum relative humidity	-	90%
(d)	Environmental conditions	-	Humid tropical climate with heavily polluted atmosphere.
(e)	Operational altitude	-	From MSL to 1900m above MSL

4.0 APPLICABLE STANDARDS

The equipment and the components supplied shall be in accordance with the latest edition of the standards specified below and amendments thereof.

- | | | | |
|----|----------------------------|---|--|
| a) | IEC 60-265-1 (1998) | - | High-voltage switches for rated voltages above 1kV and less than 52kV. |
| b) | IEC 129 amendment 1 (1984) | - | Alternating Current Disconnecters (Isolators) and earthing switches |
| c) | IEC 694 (1996) | - | Common clauses for high voltage switchgear and controlgear standards |
| d) | IEC 273 (1990) | - | Characteristics of Indoor & Outdoor Post Insulators for Systems with Nominal Voltage greater than 1000V. |
| e) | IEC 71-1 & 71-2 (1973) | - | Insulation Coordination |
| f) | BSEN ISO 1461 : 1999 | - | Hot dip galvanised coatings on iron and steel articles. |
| g) | IEC 60-1 (1989) Part 1 | - | High-voltage test techniques
General definitions and test requirements |

5.0 MINIMUM TECHNICAL REQUIREMENTS

Descriptions		Voltage Ranges		Units
		12	36	kV
i)	Rated Voltage	12	36	kV
ii)	Rated frequency	50	50	Hz.
iii)	Rated continuous current	400	400	A
iv)	Minimum Rated fault making capacity (peak) Duty cycle	12.5	12.5	kA
v)	Rated breaking capacity	400	400	A
vi)	Rated insulation level			
a)	Lightning Impulse withstand voltage (1.2/50 μ s) kV peak wet & dry			

		Voltage Ranges	Units	
		12kV	36kV	
1)	Between earth and terminals of switches (of same phase)	75	170	kV
2)	Across the terminals of open switches.	85	195	kV
b)	1 min. power frequency withstand voltage wet & dry			
1)	Between earth and terminals of switches (of same phase)	28	70	kV
2)	Across the terminals of open switch.	32	80	kV
vii)	Fault making Operations		2 successive making operations at the fault making current stipulated in Section 5 "Minimum Technical Requirement"	
viii)	Rated short time current(peak)/duration	12.5kA/1Sec		
ix)	Rated transformer off load breaking capacity	Equivalent to no load current of a 1250kVA Transformer		
x)	Rated line charging breaking current	10A	10A	
xi)	Total creepage distance	300	900	mm
xiii)	Protected creepage distance	105	315	mm (If applicable)

6.0 BASIC FEATURES

6.1 Design

6.1.1 The Load Break Switches shall be of three phase type, suitable for outdoor use. The operating mechanisms and the unit shall be suitable for pole mounting.

6.1.2 The item offered shall have a satisfactory service record in countries with tropical climate. The manufacturer shall furnish details of the utilities in which the offered product is in service.

6.2 Construction

- 6.2.1 The construction of the whole unit complete with adjustable support brackets, clamp plates, bolts, nuts and washers shall be compact., light weight and robust.
- 6.2.2 The phase centres shall not be less than 600mm for 12kV and 900mm for 36kV.

6.3 Insulators

- 6.3.1 The solid core type post insulator support shall be of high quality insulating porcelain utilising clean aero-dynamic sheds giving extended creepage distances and excellent performance even under conditions of heavy atmospheric pollution.
- 6.3.2 The total creepage distance and the protected creepage distance (if applicable) shall be as stipulated in Clause 5.0 - Minimum Technical Requirement.

6.4 Stationary and Moving Contacts

- 6.4.1 All castings for fixed and moving contacts, terminal pads shall be of Phosphor Bronze or Hard Drawn Copper or Silver/Nickel coated Electrolytic Copper.
- 6.4.2 The contact surface shall be made out of silver/nickle plated hard drawn copper, and shall be mounted on a Phosphor bronze castings or any other harder metals which does not deteriorate for prolonged electric arc.
- 6.4.3 The stationary contacts shall be backed by stainless steel pre-stressed compression springs with multi finger contacts to provide the required contact pressure, resulting in minimum electrical resistance.

6.5 Terminals

Clamp type terminals, made of phosphor bronze castings and silver/nickel all be provided to accommodate 4mm to 16mm dia. aluminium conductors. Bolt and Nuts shall be of Stainless Steel.

6.6 Load Interruption

- 6.6.1 The load interruption shall take place within the interrupter head without an external arc or flame conforming to IEC 265, Category A. Electronic controlled arc interrupters are not acceptable.
- 6.6.2 The load interruption shall be achieved by providing a parallel circuit for re-directing the load current path from the main isolator contacts at the instant of their separation. The design of the equipment shall allow the replacement of load interrupter head after a specified number of operations. The manufacturer shall indicate the number of load break operation possible without changing the interrupter head.

- 6.6.3 The inner layer of the arcing chamber shall be suitable for generating arc-quenching-gas. The generated deionized gas shall extinguish the arc and be dissipated through a rear exhaust chamber, well clear of the switch.
- 6.6.4 The internal contacts shall be spring loaded and be of such design as to provide a positive and independent tripping action.
- 6.6.5 The interrupter contacts shall not be in the main current path when the main contacts are in a fully closed position.
- 6.6.6 The load interrupter head shall be designed to prevent leakage of water to the arcing chamber (where the control mechanism including the spring for opening and closing is housed) and be made of non corrosive materials.

6.7 Operating Mechanism

- 6.7.1 Manually independent spring loaded closing and opening operations have to be incorporated in the Load Breaker operating system.
- 6.7.2 Operating Mechanisms shall be of Single Break.
- 6.7.3 The drive tube shall be minimum of 8 metre length and a minimum diameter of 25mm. Adjustable rod clamp shall be provided to allow on site adjustment at the bottom of the drive tube. Locking facilities at each end of the drive tube shall be provided. Thickness of the tube shall not be less than 3.0mm.
- 6.7.4 The complete operating mechanism with operating handle shall be arranged for steady hand operation from ground level.
- 6.7.5 The bearings of the rotating mechanism shall be permanently sealed, corrosion proof, be of anti-friction type and shall be free from maintenance.
- 6.7.6 All bolts and nuts to conform to the standard specified. The nuts and heads of all bolts to be of hexagonal type.
- 6.7.7 All steel part shall be hot dip galvanised.
- 6.7.8 The vertical drive tube shall be provided with an Insulator, to withstand the rated voltage at a height of two meters above the operating mechanism for the safety of the operator. This insulator shall be suitable to withstand the operating forces. Guiding support for the driving tube shall be provided to ensure stable operation.

6.8 Galvanizing

- 6.8.1 Unless otherwise specified all iron and steel parts shall be galvanised after the sawing, shearing, drilling, punching, filling, bending and machining operations.
- 6.8.2 All Iron Steel components shall be Hot Dipped Galvanized as per BSEN ISO 1461 : 1999 and treated with Sodium Dichromate or Preton W20 solution immediately after galvanizing to prevent the formation of white rust.

The preparation for galvanizing and the galvanizing itself shall not distort or adversely affect the mechanical properties of the material.

All components shall be effectively galvanized to consist of a galvanized coating of mean thickness 85 μm and minimum local coating thickness 70 μm .

The galvanizing coating on all items shall be smooth, continuous, uniform and free from flux, stains and holes shall be free from nodules of spelte.

- 6.8.3 All galvanized items shall be treated with Sodium Dichromat solution after galvanizing to prevent the formation of white rust.

6.9 Rating Plate

The rating and data of the load break switch shall be engraved or embossed on a weather and corrosion proof metal plate. The rating plate containing the following information shall be positioned at the base supporting frame of the post insulator and shall be prominently visible.

- a) Manufacturer's Identification (Trade Mark)
- b) Country and Year of Manufacture.
- c) Number and the Year of the standard adopted.
- d) Designation of Type, Class etc.
- e) Rated voltage and frequency (kV & Hz)
- f) Rated 1 minute power frequency withstand voltage (kV) wet.
- g) Rated lightning impulse withstand voltage (kV) dry.
- h) Rated continuous current (A)
- i) Rated short circuit making current (kA)
- j) Rated short time (1 sec.) current (kA)
- k) Total net weight (kg.)
- l) Serial No. **CEB / LB /**

6.10 Packing

Each unit shall be securely and individually packed in a wooden box suitable for overseas shipment to a tropical country and to withstand rough handling. Each packing shall contain a copy of Installation Instruction and Erection Drawings and Maintenance Instruction in English Language.

Each packing shall be clearly marked with the following;

- a) Name of Item :-
- b) Rated Voltage :-
- c) Rated Current :-

- d) Manufacturer's Name and Identification mark. :-
- e) Country of Origin :-
- f) Gross weight :-
- g) Serial No. **CEB / LB /**

7.0 INFORMATION TO BE SUPPLIED WITH THE OFFER

7.1 The following shall be furnished with the offer.

- a) Particulars requested in annexure - A.
- b) Constructional features and materials used for components
- c) Separate explanatory drawings and dimensions of operating mechanisms; movable and stationary contacts; clamping terminals.
- d) Overall dimensional drawings
- e) Drawing of Rating plate to scale incorporating the particulars called for.
- f) The following Certificate of Type Tests, from a recognized Independent Testing Authority acceptable to the Purchaser.
 - 1) In accordance with IEC 694 : 1996
 - i) Dielectric tests
 - ii) Temperature-rise tests
 - iii) Measurement of the resistance of the main circuit.
 - iv) Short time withstand amount and peak withstand current tests.
 - v)
 - 2) In accordance with IEC 265-1
 - v) Making and Breaking Tests.
 - vi) Mechanical Endurance Test.

g) Supply Record

Bidder shall have at least 10 years proven experience in manufacturing 36kV Load Break Switches. Supply Record indicating the sales of Load Break Switches (including CEB) for last 10 years shall be furnished indicating quantities and year of sale.

7.2 Test Certificates furnished shall be based on the Type Tests conform to the relevant standard. The Test Certificates shall clearly identify the equipment showing the manufacturer's identity, Type No. and basic technical parameters, and shall be from a recognized Independent Testing Authority acceptable to the Purchaser.

7.3 **Failure to furnish the particulars requested in clause 7.0 will result in the offer being rejected.**

8.0 QUALITY ASSURANCE

Manufacturer shall possess ISO 9001:2000 quality assurance certificate for the design and manufacture of 36kV Load Break Switches at the plant where the manufacture is done. Certified copy of the ISO certificate shall be furnished.

9.0 TECHNICAL LITERATURE & DRAWINGS

The selected Bidder shall supply along with the equipment all relevant drawings with dimensions, technical literature, hand books etc., in order to facilitate easy installation, faultless operation and maintenance.

10.0 INSPECTION AND TESTING

10.1 Inspection

The selected Bidder shall or make necessary arrangements for inspection by an Engineer of the CEB and also to carry out in his presence necessary routine /sample tests of the materials and equipment, offered.

10.2 Routine Tests

The following routine tests conforming to IEC 694 shall be carried out during the Manufacture. Extra copies of these Test Certificates shall also be supplied with the equipment.

- i) Power frequency voltage withstand tests
- ii) Measurements of the contact resistance
- iii) Mechanical operating test

10.3 Acceptance Tests

Following acceptance shall be witnessed by the CEB Engineer.

- i) Dielectric Tests
- ii) Measurement of the contact resistance.
- iii) Mechanical Endurance Test
- iv) Making and Breaking Test
- v) Fault Making Test

Annex - A**GUARANTEED TECHNICAL PARTICULARS
(This form shall be completed by the Manufacturer)**

12kV

36kV

1.	Manufacturer's Name & country of manufacture	-	
2.	Number and the year of Standard adopted	-	
3.	Designation of		
	i) Type (Rocking/Rotating)	-	
	ii) Category	-	
4.	Catalogue No. (Model No.)	-	
5.	Rated Voltage	kV	-
6.	Rated Frequency	Hz	-
7.	Rated continuous current	A	-
8.	Rated short circuit making capacity	kA	- (Indicate the number of fault making operations)
9.	Rated breaking capacity	A	-
10.	Rated insulation level		
	a) Lightning Impulse withstand voltage (1.2/50 μ s) kV peak wet & dry		
	i) Between earth and terminals of switches (of same phase)	kV	-
	ii) Across the terminals of open switches	kV	-
	b) 1 min. power frequency withstand voltage wet & dry		
	i) Between earth and terminals of switches (of same phase)	kV	-
	ii) Across the terminals of open switches	kV	-

11.	Puncture Voltage	kV	-
12.	Power frequency flash over voltage	kV	-
13.	Rated short time current/duration	kA/sec	-
14.	Rated mainly active load breaking capacity	kA	-
15.	Rated close loop breaking capacity	kA	-
16.	Rated transformer off load breaking capacity	A	-
17.	Rated line charging breaking capacity	A	-
18.	Rated Cable charging breaking capacity	A	-
19.	Number of load breaking operations that could be done without replacement of interrupter head/contacts		
	i) Full load (400 A)	Nos.	-
	ii) Half load (200 A)	Nos.	-
	iii) Quarter load (100 A)	Nos.	-
20.	Number of specified short circuit making operations that could be performed without replacement of interrupter head/contacts	Nos.	-
21.	Type of operating mechanism		
22.	Dimensions of operating rod		
	i) Diameter	mm	-
	ii) Length	mm	-
	iii) Thickness	mm	-
23.	Number of Load breaking head per phase	Nos.	-
24.	Number of insulators per phase	Nos.	-
25.	Total Creepage distance (phase to earth)	mm	-
26.	Protected Creepage distance	mm	-
27.	Phase Centre	mm	-
28.	Separation between open contacts	mm	-
29.	Terminal Sizes (indicate the range of sizes of conductors that could be accommodated)		-

- | | | |
|------|--|-----------|
| 30. | Type of mounting (single pole/double pole) | - |
| 31. | Net weight | kg. - |
| 32. | Whether the following Type test Certificates as per IEC 694 furnished. | |
| i) | Dielectric tests | Yes/No.- |
| ii) | Temperature-rise tests | |
| iii) | Measurement of the resistance of the main circuit | Yes/No.- |
| iv) | Short-time withstand and peak withstand current tests | Yes/No.- |
| 33. | Whether the following Type test Certificates as per IEC 265-1 furnished. | |
| i) | Making and Breaking Tests | Yes/No. - |
| ii) | Fault Making Tests | Yes/No. - |
| ii) | Mechanical Endurance Test | Yes/No. - |

.....
SIGNATURE AND SEAL OF THE MANUFACTURER

.....
Date

lbswitch