014 : 1998

CEB
STANDARD

12KV & 36KV AUTOMATIC CIRCUIT SECTIONALISERS

CEYLON ELECTRICITY BOARD
SRI LANKA

Specification

for

12KV AND 36KV AUTOMATIC CIRCUIT SECTIONALISERS

CEB Standard 014 : 1998

CEYLON ELECTRICITY BOARD

No. 50, Sir Chittampalam A. Gardiner Mawatha, Colombo 2.
Sri Lanka

Telephone: 324471-8 Telex : 21368 CE Facsimile: 94-1-449572

CONTENTS

Specification

for

12KV AND 36KV AUTOMATIC CIRCUIT SECTIONALISERS

CEB Standard 014 : 1998

CEYLON ELECTRICITY BOARD

No. 50, Sir Chittampalam A. Gardiner Mawatha, Colombo 2.
Sri Lanka

Telephone: 324471-8 Telex : 21368 CE Facsimile: 94-1-449572

CONTENTS

SPECIFICATION FOR 12KV AND 36KV AUTOMATIC CIRCUIT SECTIONALISERS

1.0 SCOPE

This specification covers the general requirement of design, manufacture and testing of Three Phase Automatic Circuit Sectionalisers for 12KV and 36KV overhead distribution system of the CEB.

2.0 SYSTEM PARAMETERS

(a)	Nominal Voltage	-	11kV	33kV
(b)	System highest voltage	-	12kV	36kV
(c)	System frequency	-	50 Hz.	50 Hz
(d)	Number of phases	-	03	03
(e)	Method of earthing	-	Effectively earthed	Non effectively earthed
(f)	System fault current	-	13.1kA	13.1 kA

3.0 SERVICE CONDITIONS

(a)	Annual average ambient temperature	-	30°C
(b)	Maximum ambient temperature	-	40°C
(c)	Temperature rise due to solar absorption of 1200 W/m²	-	10°C
(d)	Maximum relative humidity	-	90%
(e)	Environmental conditions	-	Humid tropical climate with polluted atmosphere.
(f)	Operational altitude	-	From M.S.L. to 1900M above M.S.L.

4.0 APPLICABLE STANDARDS

The equipment and the components supplied shall be in accordance with the standards specified below or later editions and/or amendments thereof.

a)	IEC 265-1 (1998)	-	High-voltage switches for rated voltages above 1kV and less than 52kV
b)	IEC 694 (1980, 1985)	-	Common clauses for high voltage switchgear and controlgear standards
c)	IEC 71-1 & 71-2 (1976)	-	Insulation Coordination
d)	BS 729 (1971)	-	Hot dip galvanised coatings on iron and steel articles.
e)	ANSI C 37.60,	-	Automatic Circuit Reclosers and Fault Interrupters for AC Systems

5.0 BASIC FEATURES

5.1 General

The Automatic Circuit Sectionalisers shall be of three phase outdoor type suitable for mounting on single concrete pole.

The Sectionalisers will be used in the down stream of the Automatic Circuit Recloser to protect the medium voltage radial / open ring overhead lines by isolating the faulty sections/branches (spurs) of the lines.

The Sectionalisers shall be of the gas insulated circuit breaker type, complete with operating mechanism, protection relays, control module, connections and all other components necessary for installation and operation. It shall be suitable for operation in conjunction with SCADA system which will be installed in the future.

The control requirement of the Sectionaliser will vary according to the type of application and the control module shall be of the programmable type to meet the requirement of the application. The Sectionalisers are required for following applications;

i) Radial lines application

The Sectionaliser will be used In radial lines where the power flows in one direction (forward direction) as there is no feed back arrangement and it will receive power only from up stream and the Sectionaliser is normally in closed position.

ii) Open ring lines application

The Sectionalisers will be used In open ring lines where the power normally flows in the forward direction and in the reverse direction during feed back time (as there will be feed back arrangement). The Sectionaliser will receive power either from up stream or from down stream (from one feeder at any time) and the Sectionaliser is normally in closed position.

iii) Ring Closing application

The Sectionaliser will be used to between two open ring lines and receive power from either side (from two feeders) and the Sectionaliser is normally in open position.

5.2 Design

i) The Sectionlisers shall be of the maintenance free type and be tropicalised in accordance with Clause No. 3.0. Evidence of operational endurance in service, and design features to guarantee maintenance free performance shall be furnished with the offer.

ii) Each Sectionaliser shall have its own self contained operating mechanism, protection relays and self supporting control unit all housed in water and dust-proof cabinets having a degree of protection to IP54. Anti condensation heaters or equivalent means to eliminate the formation of condensation shall be included.

iii) The source side and the load side of the Sectionaliser shall be indelibly marked at a suitable location to provide an easy identification. Surge arrester mounting brackets shall also be provided on either sides.

iv) The Sectionalisers shall have the load making current not less than 400 Amps, fault making current not less than 12kA rms and short time current not less than 12 KA rms as stipulated in the Clause 5.6 below.

v) Auxiliary and tripping supplies shall be an integral part of the Sectionaliser design. Designs which require external low voltage supplies are not acceptable. Batteries if provided should be maintenance free, and have a service life time of a minimum of five years.

vi) The equipment shall be provided with the sensing unit to measure the normal voltage & load current and to identify the fault current during fault, in addition to initiate the tripping operation after the pre-determined number of auto reclosing operations. It shall trip during the auto recloser dead time.

vii) The sensing unit shall be of electronic type and the component used in the unit shall be tropicalised and designed to withstand high humidity and high temperature that may be reached due to direct sunlight. It shall suit to the climatic conditions stipulated in clause 3.0.

viii) By grading the appropriate minimum response time in each control unit and number of operations of the auto-recloser, it shall be possible to operate a number of Sectionalisers in series along a radial feeder, further improving fault localisation.

ix) All three poles of the Sectionaliser shall be operated simultaneously by the operating mechanism. The tripping shall be achieved by stored energy during closing operation and operating handle shall be provided for manual closing.

x) A mechanical position indicator shall be provided to indicate the ON/OFF position of the Sectionaliser. An operation counter shall be provided to positively indicate the number of operations of the Sectionaliser.

xi) All non metal parts including insulating materials of cables shall be able to withstand effects due to ultra violet radiation.

xii) An earthing terminal shall be provided for bonding the Sectionaliser metal work and mounting frame to the local earthing electrodes / galvanized steel mounting structure. The mounting frame shall have a earthing terminal suitable to accommodate two Nos. 5mm dia. to 15mm dia. earthing conductors. The mounting frame shall be suitable for single pole mounting/steel gantry structure mounting

5.3 Bushing Insulator

i) Bushings shall have Universal Clamp type terminals to accommodate copper/aluminium conductors of diameter ranging from 12mm to 20 mm.

ii) The minimum creepage distances of the bushing insulators shall be not less than 900mm for 36kV and 300 mm for 12kV.

5.4 Measurements, Controllers and Protection

i) The measuring, control and protection devices shall be of electronic type and the electronic components shall be tropicalised and designed to withstand high humidity, and high temperatures that may be reached due to direct sunlight as stipulated in Clause 3.0.

ii) The Sectionalisers shall be of the remote control operated type with Remote / Local / Manual control switch to select the required mode of operation. The Sectionalisers shall be provided complete with a Remote Terminal Unit (RTU) that allows the unit to directly interface at the communication level to the CEB SCADA master station.

iii) The Sectionalisers shall be provided with over current, earth fault and sensitive earth fault relays with adjustable tripping time-delay characteristics.

iv) A minimum of four (04) sensing operations to tripping shall be provided and the number and sequence of operations to trip will be selected in the field.

v) The Sectionalisers shall have facilities for measuring the voltage (three phases) on incoming (load) and outgoing (source) sides, and shall have facilities for measuring the current (three phases) on incoming side for monitoring, measuring and control operation purposes. The control panel shall have current and voltage connections for Data Logging purposes.

vi) The control module shall be of the programmable type to carry out the required types of operations for different applications as stipulated below.

a) It shall automatically open during auto-recloser dead time on detection of fault in the down stream (after a pre-determined number of reclosing operations).

b) it can be closed or opened manually/remotely, when there is supply on either side.

c) it can be closed or opened manually/remotely, when there is no supply on either side.

d) it can be closed or opened manually/remotely, when there is supply on one side.

e) The Sectionalisers for ring closing application are normally kept open with the supply on both sides of the bushings. When there is a continuous power failure on one side for 3-10 minutes (Duration adjustable) the Sectionaliser shall be suitable for programming to close manually / remotely / automatically

5.5 Insulation and Interrupting Media

i) The insulation media of the Sectionalisers shall be SF6 and the interrupting media shall be SF6/Vaccum . Gas seals shall be designed to prevent the leakage of gas or ingress of moisture throughout the service life.

ii) Tanks used to enclose the SF6 gas for insulating purposes shall be made of stainless steel and of robust construction based on the design requirements of pressurised enclosures.

In the case of Sectionalisers with SF6 interrupters following safety requirements shall be incorporated;

a) Features to ensure the safe release of internal over pressure exceeding the safe design pressure shall be provided.

b) Devices to protect against mal-operations due to insufficient gas pressure shall also be included.

c) It shall be fitted with appropriate filters sufficient for the life of the equipment to minimise the presence of moisture and SF6 decomposition products.

5.5.1 Contacts

External facilities for monitoring contact erosion shall be incorporated on sealed for life designs. Details of diagnostic check facilities shall be provided to permit evaluation of Sectionaliser maintenance checks in service.

5.6 Technical Requirements

a)	Rated voltage	kV	12	36
b)	Frequency	Hz	50	50
c)	Continuous current rating	A	400	400
d	Rated Short Circuit Making Current RMS	kA	12	12
e)	Short time current (1 second) RMS kA	12	12	
f)	Rated insulation level			
	i) Lightning Impulse withstand voltage (1.2/50 μs) kV peak dry.			
	1) Between earth and terminals of switches (of same phase).	kV	75	170
	2) Across the terminals of open switches.	kV	85	195
	ii) 1 min. power frequency withstand voltage wet.			
	1) Between earth and terminals of switches (of same phase)	kV	28	70
	2) Across the terminals of open switch.	kV	32	80
g)	Minimum number of sequential tripping operations	Nos.	4	4

h)	Operating mechanism	Automatic/Manual / Remote closing & tripping by spring stored energy.
i)	Gas monitoring	Should be provided
j)	Contact erosion indication	Should be provided
k)	RTU facility for future SCADA purposes	Should be provided

5.7 Controllers for Sectionalisers:

a)	Time delay characteristic	Standard or very inverse
b)	Current transformer ratio	400 : 1
c)	Earth fault current setting range	10%-90% of rated CT
d)	Dead time setting range	0.25 to 120 seconds
e)	Reclaim time setting range	Not less than 5 seconds
f)	Sequence co-ordination settings	0.1 to 0.7 seconds
g)	Minimum response time	0.1 to 0.3 seconds

5.8 Galvanizing

i) All iron and steel parts (except stainless steel parts) such as mounting and support brackets, bolts and nuts ,washers etc. shall be galvanized after the process such as sawing, shearing, drilling, punching, filling, bending and machining are completed.

ii) Galvanizing shall be of the hot-dip process to comply with the relevant standard specified.

5.9 Routine Test

The following routine test shall be carried out on all equipment as per IEC 265-1.

i) Power frequency voltage withstand tests on the main circuit
ii) Measurements of resistance of the main circuit
iii) Voltage withstand test on auxiliary and control circuits

Gas leakage check shall be carried out as per relevant standard.

6.0 QUALITY ASSURANCE

The manufacturer shall process ISO 9001 quality assurance certification for the manufacture of Gas Insulation Sectionaliser Circuit Breakers for the plant where the manufacture of the sectionalisers is done.

The Bidder shall furnish a copy of the ISO certificate along with the offer. This document shall be certified as a true copy of the original by the bidder.

7.0 ADDITIONAL REQUIREMENTS

7.1 Rating Plate Markings

A Stainless steel rating plate shall be provided on the lower part of the tank and shall contain the information according to Table III of IEC 265-1

7.2 Spares

List of spares necessary for Ten years of trouble free operation shall be Furnished with the offer. Prices of the spares shall also be indicate.

8.0 INFORMATION TO BE SUPPLIED WITH THE OFFER

The following shall be furnished with the offer.

(a) Catalogues describing the equipment and indicating the model No.

(b) Literature describing the operational features of the equipment.

(c) Constructional features, materials used for components and relevant technical literature.

(d) Overall dimensional drawings of the equipment and mounting arrangement.

(e) Drawing of name plate to scale, incorporating the particulars called for.

(f) The following Certificates of type tests carried out in accordance with the IEC 265-1/ANSI C 37.60; The copies shall be certified as true copies by the Bidder.

- i) Lighting impulse withstand voltage test
- ii) Power frequency (wet) withstand voltage test
- iii) Temperature rise test.
- iv) Making and breaking test or Operating Duty Test.
- v) Short time withstand current test.
- vi) Peak withstand current test.
- vii) Measurements of resistance of the main circuit

(g) Quality Assurance Certification Conforming to ISO 9001.

(h) Completed schedule of particulars (Annexure A)

(i) Documentary evidence shall be furnished to prove that the equipment offered shall have a minimum of 05 years service record. Name of the purchaser, year of purchase and the quantities sold shall be indicated.

Test Certificates and performance curves, based on the type tests conforming to relevant standard shall be supplied along with the offer. The test certificates should clearly identify the equipment concerned, showing the manufacturer's identity, type number and basic technical parameters. The test certificates referred to, shall be issued from an internationally recognized independent testing authority acceptable to the Purchaser. Failure to furnish the particulars requested in Clause 8 shall result in the offer being rejected.

9.0 INSPECTION AND TESTING

9.1 Inspection

The selected Bidder shall make necessary arrangements for inspection by an Engineer appointed by the Purchaser and to carry out in his presence Acceptance/Sample tests on an equipment offered. Routine test report shall be furnished to the Inspector.

9.2 Acceptance/Sample Test

The following Acceptance/Sample tests as per IEC 265-1 shall be witnessed by the Purchaser.

i) Dielectric withstand tests.

ii) Making and breaking tests.

iii) Short time withstand and peak withstand current tests.

iv) Measurements of resistance of the main circuit

v) Temperature-rise tests.

The Control unit calibration checks, wiring and operating checks shall be carried out to verify whether the equipment is fully conforming to the Clause 5.0

Failure of the above Acceptance Test shall result in the purchaser rejecting the goods.

10.0 TECHNICAL LITERATURE AND DRAWINGS

i) All relevant drawings, hand-books etc. required for installation, operation (programming), and maintenance of the equipment, shall be supplied with the equipment.

ii) A set of Spare Parts manual and technical details of the equipment and components shall be supplied with the equipment.

iii) These documents constitute apart from the equipment supplied and shall be listed with the equipment supplied to make sure that the documents are shipped along with the equipment.

iv) The information provided should include essential circuit diagrams, general arrangement and detailed drawings of the installation, make mention of special material where used and include schedules of lubricants and all ball and roller races employed on the Plant. The drawings and diagrams, may be reduced to a convenient size, should be bound into the volume and not inserted into cover pockets.

11.0 ANNEXURE

A - Schedule of Particulars - To be filled by the Bidder

ANNEXURE A

SCHEDULE OF PARTICULARS
(To be fill by the Bidder for each type and voltage rating)

				11kV 33kV
1)	Manufacturer's Name and country of origin			-
2)	Class Designation (Catalogue ref. No.)/Applicable standard			-
3)	Type			
	i)	Indoor/out door		-
	ii)	Insulation media		
	iii)	Interrupting media		-
	iv)	mounting		-
	v)	Remote/manual		-
4)	Rated Voltage		kV	-
5)	Continuous current rating		A	-
6)	Rated frequency		Hz	-
7)	Type, Size and Material of Terminal Clamps			-
8)	Temperature rise for			
	i)	Contact	°C.	-
	ii)	Terminals	°C	-
9)	Making current		A	-
10)	Short time current rating (1 Sec.)		kA	-
11)	Fault making current rating (peak)		kA	-
12)	Rated insulation level			
	i)	Lightning Impulse withstand voltage (1.2/50 μs) kV peak dry		
		a) Between earth and terminals of switches (of same phase)	kV	-
		b) Across the terminals of open switches.	kV	-

	ii)	1 min. power frequency withstand voltage wet.		
		a) Between earth and terminals of switches (of same phase)	kV	-
		b) Across the terminals of open switch.	kV	-
13)	Total creepage distance .		mm	-
14)	Galvanizing thickness		mm	-
15)	Whether the Type Test Certificates conforming to Clause 8.0 furnished		Yes/no	-
16)	Number of sequential tripping operations to lockout			-
17)	Whether the auxiliary/tripping supply is integral part of the equipment		Yes/No	-
18)	Life span of the battery		Years	-
19)	Whether the electronic components used are of tropicalised type		Yes/No	-
20)	Whether a mechanical ON/Off position indicator and operation counter provided		Yes/No	-
21)	Whether the RTU is provided as per Clause 5.4 ii)		Yes/No	-
22)	Whether the following relays with adjustable tripping time-delay characteristics are provided			
	i)	Over current relay	Yes/No	-
	ii)	Earth fault relay	Yes/No	-
	iii)	Sensitive earth fault relay	Yes/No	-
23)	Whether the incoming and outgoing sides of the Sectionalisers are having three phase voltage measuring/monitoring facilities		Yes/No	-
24)	Whether the incoming side of the Sectionalisers are having three phase current measuring facilities.		Yes/No	-
25)	Whether the surge arrester mounting brackets are provided on either sides of the Sectionaliser		Yes/No	-
26)	Whether the control (cabinet) panel is having provision to measure the voltage & current and Data Logging		Yes/no	-
27)	Protection category of control cabinet			-

28)	Whether the Sectionaliser can be programmed as per clause 5.4 above.	Yes/No	-
29)	Whether external facilities for monitoring contact erosion are incorporated on sealed for life designs.	Yes/No	-
30)	Tripping time delay characteristic		-
31)	Earth fault current setting range	% of rate CT	-
32)	Dead time tripping setting range	Seconds	-
33)	Reclaim time setting range	Seconds	-
34)	Sequence co-ordination settings	Second	-
35)	Minimum response time	Second	-
36)	Whether the quality assurance certification furnished	Yes/No	-
37)	Whether the Specified Type test certificates furnished	Yes/No	-
38)	Whether the specified routine tests will be carried out as per IEC 265-1.	Yes/No	-
39)	Whether the specified acceptance tests will be carried out as per IEC 265-1.	Yes/No	-

.....

Seal and Signature of the Manufacturer and date

Section-3