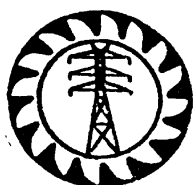


013 : 2009

**CEB
SPECIFICATION**

**MOULDED CASE CIRCUIT BREAKERS
FOR OVERHEAD NETWORKS**



**CEYLON ELECTRICITY BOARD
SRI LANKA**

Specification

for

**MOULDED CASE CIRCUIT BREAKERS
FOR OVERHEAD NETWORKS**

CEB Specification 013 : 2009

CEYLON ELECTRICITY BOARD

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SPECIFICATION FOR MOULDED CASE CIRCUIT BREAKERS FOR OVERHEAD NETWORKS

1.0 SCOPE

This specification covers the manufacture and testing of Moulded Case Circuit Breakers (MCCB) used in the Low Voltage Overhead Distribution system of the CEB to provide overload and short circuit protection for Distribution lines up to Customer Distribution Panel.

2.0 SYSTEM PARAMETERS

(a) Nominal voltage	400/230 V, 3 ph & Neutral
(b) System highest voltage	440/250 V, 3ph & Neutral
(c) System frequency	50 Hz
(d) Method of earthing	Solidly earthed Neutral at substations
(e) System fault current	25 kA

3.0 SERVICE CONDITIONS

(a) Annual average ambient temperature	30 ⁰ C
(b) Maximum ambient temperature	40 ⁰ C
(c) Minimum ambient temperature	15 ⁰ C
(d) Maximum relative humidity	90%
(e) Environmental condition	Humid tropical climate with polluted atmosphere.
(f) Operational altitude	From M.S.L. to 1900 meters above MSL

4.0 APPLICABLE STANDARD

The equipment and components supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof. However the CEB specification shall supersede these standards in the event there is a discrepancy.

a) IEC 60947 – 1 (2004 - 03)	-	Low -voltage switchgear and control gear Part 1: General rules
b) IEC 60947 – 2 (2006 - 05)	-	Low - voltage switchgear and control gear Part 2: Circuit -Breakers

5.0 TECHNICAL REQUIREMENTS

(a) No. of Poles	3 unless otherwise specified in the Price Schedule
(b) Rated insulation voltage	600V
(c) Rated frequency	50 Hz
(d) Rated insulation level :-	
i) Impulse withstand voltage (1.2/50 us peak)	6 kV
ii) Power frequency Dielectric Test Voltage (rms)	2500V
(e) Rated duty	uninterrupted
(f) Creepage distance suitable for	Pollution Degree 3 and suitable for isolation

(g) Circuit breaker ratings

Circuit Breaker Current (Amps) Rated (I_n)	Ultimate Breaking Capacity kA Rated (I_{cu} at 415V)	Service Short Circuit Breaking Capacity kA Rated (I_{cs} at 415V)	Minimum Short Circuit Making Capacity kA (I_{cm})	Standard Power Factor	Utilisation Category
16	15	7.5	$2.0 \times I_{cu}$	0.3	A
32	15	7.5	$2.0 \times I_{cu}$	0.3	A
63	15	7.5	$2.0 \times I_{cu}$	0.3	A
100	25	13	$2.1 \times I_{cu}$	0.25	A
160	25	13	$2.1 \times I_{cu}$	0.25	A
250	25	13	$2.1 \times I_{cu}$	0.25	A
400	35	18	$2.1 \times I_{cu}$	0.25	A
630	50	25	$2.1 \times I_{cu}$	0.25	A
800	50	50	$2.1 \times I_{cu}$	0.25	B
1000	50	50	$2.1 \times I_{cu}$	0.25	B
1250	50	50	$2.1 \times I_{cu}$	0.25	B
1600	50	50	$2.1 \times I_{cu}$	0.25	B

6.0 BASIC FEATURES**6.1 Design**

The circuit breakers shall be of three poles unless otherwise specified in the price schedule, with moulded case design, suitable for operation at a maximum relative humidity of 90% and at maximum ambient temperature of 40 °C.

The case shall be moulded from insulated material possessing high thermal stability and good mechanical strength, able to withstand robust use without fracture or permanent distortion.

The case should be stamped with the letters "CEB" for the purpose of identification. The Moulded Case Circuit Breaker shall be of surface mounting type and shall be suitable for mounting in an enclosure for outdoor application. It shall be possible to reverse feed the breaker without any reduction in performance.

The maximum permissible temperature-rise of various components of the breaker shall not exceed the values stipulated in IEC 60947 - 1.

6.2 Construction**6.2.1 Operation Mechanism**

The circuit breaker shall be provided with trip free features for manual ON-OFF operation.

The operating mechanism shall be quick make and break type, with the speed of operation independent of the operator, and mechanically trip free from the operating handle so as to prevent the contacts from being held closed against short circuit and overload conditions.

The operating mechanism shall be constructed to operate all poles of the breaker simultaneously during, opening, closing and tripping conditions.

The breaker shall be operated by a toggle, which shall clearly indicate the 3 positions ON, OFF and TRIPPED.

6.2.2 Contacts

The MCCB shall be of the uninterrupted duty type and the contacts shall be of Silver alloy or Silver faced Copper having high current carrying capacity with good arc resistance property.

6.2.3 Operation

a) Overload Release

Each pole of the MCCB shall be provided with bimetallic Thermal Element or Hydraulic Magnetic or Solid State (electronic) type of overload protection with the tripping time decreasing with increasing tripping current characteristic (inverse time delay). The operating value of overload release shall be independent of ambient air temperature within the limits of 4 °C to 40 °C.

b) Short Circuit Release

An electro magnetic element type or solid state (electronic) instantaneous short circuit protection shall be fitted in each pole assembly affecting immediate tripping of the circuit breaker if the current exceeds the breaking ratings given in table in Clause 5.0.

c) Solid state type trip unit

The solid state trip unit shall be suitable for operation in tropical climate stipulated in Clause 3 above.

It shall be a proven design to provide trouble free operation during the life span of the MCCB.

The solid state type trip unit could not be energized by internally mounted current transformers. It shall not require any external power supply to operate the tripping mechanism.

6.2.4 Terminals

The terminals of the breaker shall be suitable for front connection of cables and insulated phase barriers shall be provided for all poles. Palm type lugs or ferrules for relevant cable shall be provided with the MCCB. These lugs shall be Tinned Copper or Silver plated copper.

a) Breakers of capacities 160A and below:

Cables are to be fixed to the breaker using palm type lugs with nut and bolt. Allen key head bolts are not acceptable.

Breaker Capacity (A)	Cable Size (mm ²)	No. Of Cables
16	10	01
30	10	01
60	16	01
100	70	01
160	70	01

b) Breakers of capacities 250A and above:

To terminate oversize and multiple cables for circuit breakers of capacities of 250A and above, suitable tinned copper extenders or spreaders and insulated phase barriers shall be provided. The standard sizes of the cables and the number of cables to be used with different capacities of circuit breakers are indicated below.

Breaker Capacity (A)	Cable Size (mm²)	No. Of Cables
250	70	02
400	240	01
630	240	02
800	240	02
1000	240	03
1250	300	03
1600	300	03

Cables are to be fixed to the breaker extenders using palm type lugs, nuts and bolts which are necessary to fix the lugs to terminal extenders shall be provided by the supplier. Cable sizes and the type of cable shall be defined in the schedule of prices by the purchaser.

6.2.5 Mounting Bolts

Mounting bolts, required for mounting of the Moulded Case Circuit Breakers to Wooden Boards of thickness not less than 30mm shall be provided.

6.2.6 Rated Short Time Withstand Current

The rated short time withstand current for MCCB above 630A shall be $12I_n$ for 1 Sec. MCCB up to 630A, rated short time withstand current shall be 5kA for 1 Sec.

7.0 QUALITY ASSURANCE

The manufacture shall possess ISO 9001 Quality Assurance Certification for the manufacture of Moulded Case Circuit Breakers for the plant where the manufacture of MCCB is done. The Bidder shall furnish a copy of the ISO certificate certified as true copy of the original by the manufacture, along with the offer.

8.0 MANUFACTURING EXPERIENCE

Manufacturer should have a minimum of ten years experience for manufacturing of MCCB. The manufacturer should submit proof documents such as supply records, the name of the purchasers, quantity sold, and the year of sale to prove that they have supplied the MCCB to minimum of five customers internationally during last five years.

9.0 ADDITIONAL REQUIREMENT

9.1 Routine Tests

The following routine tests as per IEC 60947 shall be carried out on all the MCCB and routine test report shall be made available for the observation of the inspector at the time of inspection.

- a) Mechanical operation tests
- b) Dielectric Tests
- c) Verification of the calibration of releases
- d) Temperature rise test

9.2 Rating Plate Markings

Each Circuit Breaker shall be marked in a durable manner with the following data as stipulated in IEC 60947-2 and shall be visible and legible when the circuit breaker is installed.

- a) Rated current
- b) Suitability for isolation, with symbol
- c) Indication of the open and closed positions

Ultimate breaking capacity (I_{cu}) for various values of the rated operational voltage (U_e) shall be recorded on the device.

The following data should be marked externally on the breaker and they need not visible when the breaker is installed.

- a) Manufactures identification (Name or Trade Mark);
- b) Type designation or serial number;
- c) Number and Year of the standard adopted;
- d) Utilisation category
- e) Rated operational Voltage and Frequency;
- f) Rated service short-circuit breaking capacity
- g) Rated ultimate short-circuit breaking capacity
- h) Rated short-time withstand current/duration

9.3 Packing

The MCCB shall be suitably packed in biodegradable material (cardboard boxes) to prevent damage during transport, handling and storing.

9.4 Storing

The moulded case circuit breakers of different current ratings shall be stored according to the serial number and rating in batches of 100 separately so as to select breakers for acceptance inspection and testing as per Clause 11 by random sampling method.

10.0 INFORMATION TO BE SUPPLIED WITH THE OFFER

The following shall be furnished with the offer.

- a) Catalogues describing the equipment and indicating the model number and the literature describing the operational features of the equipment.
- b) Constructional features, materials used for components and relevant technical literature and complete dimensional drawings.
- c) Completed Schedule of Guaranteed Technical Particulars. (Annex-A)
- d) Quality Assurance Certificate conforming to ISO 9001 as stipulated in the Clause No. 7.0.
- e) A list of names and addresses of ten leading purchasers outside the country of manufacture to whom the manufacturer has supplied the MCCB of similar type and design quoted. Give dates and details of such sales made during the last 05 years.
- f) The Characteristics
 - I) The tripping time-current characteristics curves covering both thermal and magnetic current settings for each type of circuit breaker offered.
 - II) If over-current and instantaneous releases are of static type, then the manufacture shall furnish evidence that the components used are tropicalised, (suitable for the climatic conditions stipulated in Clause 3.0 above) and the field tests on the equipment have been satisfactory.

- III) Discriminating table indicating proper co-ordinating shall be submitted.
- g) Type test certificates for;
 - I) Verification of constructional requirements
 - II) Verification of temperature-rise
 - III) Verification of dielectric-properties
 - IV) Verification of making and breaking capacities
 - V) Verification of short-circuit breaking and making capacities
 - VI) Verification of operating limits
 - VII) Verification of operational performance
 - VIII) Verification of degree of protection of enclosed equipment

The Test Certificates referred to above shall be issued from a recognised Independent Testing Authority acceptable to the CEB.

Test Certificates, Performance Curves and Tables etc., of the Type Test performed shall conform to the standard specified, at a reference frequency of 50 Hz where applicable.

The Test Certificates should clearly identify the equipment concerned, showing the manufacturer's identity, Type No. and basic technical parameters.

Failure to furnish the information/particulars requested for in Clause 10.0 and the sample as per Clause 11 will result in the offer being rejected.

11.0 SAMPLE

One sample shall be furnished for MCCB offered in the range up to 630 Amp.

In case of 800 Amps and above, sample shall be furnished within one month of notification.

12.0 INSPECTION, SAMPLING AND TESTING

12.1 Inspection

The successful Bidder shall make necessary arrangements for pre-shipment inspection by inspecting engineers sent by the CEB or by an authority acceptable to the CEB to carry out the necessary acceptance tests of the equipment offered.

12.2 Selection of Test Samples

The number of moulded case circuit breakers to be selected by random sampling method for acceptance inspection and testing shall be as indicated below.

	No. of units	No. of Batches	No. of samples to be selected
a)	Less than 100	1	3
b)	100-500	5	4
c)	500-1000	10	6
d)	1000-1500	15	8
e)	Above 1500	above 15	10

12.3 Acceptance/ Sample Tests

The following Tests as per IEC 60947 shall be witnessed by the inspecting Engineers.

- a) Mechanical Operation tests
- b) Calibration of releases
- c) Temperature rise tests
- d) Dielectric tests.

13.0 TECHNICAL LITERATURE AND DRAWINGS

All relevant drawings, technical literature, product catalogue, hand-books etc. required for installation, operation and maintenance of the equipment shall be supplied with the equipment. Routine test report shall also be supplied with the equipment.

14.0 ANNEX

- A- Schedule of Guaranteed Technical Particulars.
- B- Non Compliance Schedule

ANNEX – A**SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS
(Shall be furnished for each rating)**

1	Name of manufacture and country of origin		
2	Applicable standard		
3	No. of Poles		
4	Rated Frequency	Hz	
5	Rated insulation voltage	V	
6	Rated continuous operating current	A	
7	Type;		
	i) Utilization Category A or B		
	ii) Standard or Current limiting type		
	iii) Duty, uninterrupted	Yes/ No	
8	Rated Short Circuit making capacity	kA	
9	Ultimate Short Circuit breaking capacity at specified power factor, 415V AC	kA	
10	Service Short Circuit breaking capacity at specified power factor, 415V AC	kA	
11	Rated short time withstand current for 1 Sec.	kA	
12	Total fault clearing time	ms	
13	Type of over current release		
14	Type of short circuit release		
15	Current setting range of short circuit release	kA	
16	Whether the operating value of the overload release is independent of the ambient air temperature within the limits of 4 °C to 40 °C	Yes/ No	
17	Whether the solid state trip unit is of the tropicalised type	Yes/ No	
18	Rated insulation level;		
	a) Impulse withstand voltage (1.2/50 peak)	kV	
	b) Impulse withstand voltage across the open contacts (1.2/50 peak)	kV	
	c) Power frequency withstand voltage across the open contacts	kV	
19	Material of contacts		
20	Clearance between open contacts	mm	
21	Useable as a Isolator	Yes/ No	
22	Creepage distance	mm	
23	Type of Moulded insulating material		
24	Clearance between phases	mm	
25	Overall dimensions		
	Height	mm	
	Length	mm	
	Width	mm	
26	Mean Service life		
	I) No. of operations at rated current		
	II) No. of operations at rated S/C current		
27	Applicable cable size (for terminals)	mm ²	
28	Bolts provided with the terminals/ extended bar for	Yes/ No	

	clamping incoming and outgoing cable sockets.		
29	No. of bolts provided (with the terminals/ bars)		
30	Whether the extenders or spreaders are provided for breakers above 250 Amps ratings	Yes/ No	
31	Whether the insulated phase barriers are provided	Yes/ No	
32	Whether the operating toggle clearly indicates the following a) ON position b) OFF position c) TRIPPED position	Yes/ No Yes/ No Yes/ No	
33	Whether the operating mechanism is of I) Independent manual type II) Trip free type	Yes/ No Yes/ No	
34	Whether the Quality Assurance Certification conforming to ISO:9001 is furnished	Yes/ No	
35	Net weight		

.....
Seal and Signature of the Manufacture

.....
Date

Annex B

Non Compliance Schedule

On this schedule the bidder shall provide a list of non compliances with this specification, documenting the effects that such non compliance is likely to have on the equipment's life and operating characteristics. Each non- compliance shall be referred to the relevant specification clause.

Clause No.	Non Compliance

Seal & Signature of the Manufacturer/Bidder

Date: