

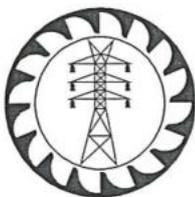
047: 2022

CEB  
SPECIFICATION

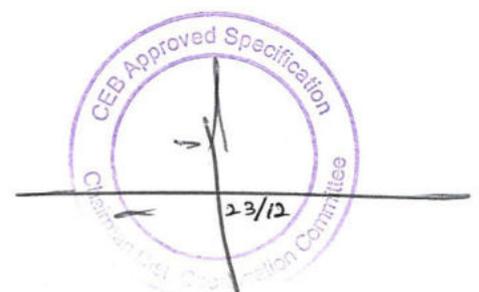
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**MEDIUM VOLTAGE DISCONNECTOR**



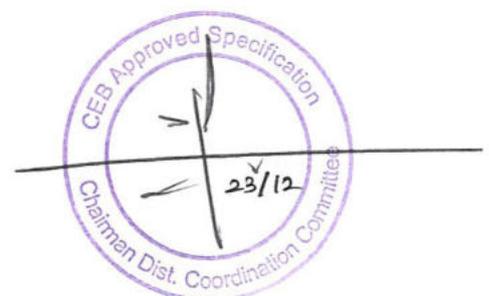
**CEYLON ELECTRICITY BOARD**  
**SRI LANKA**



Eng. J. Mendis  
Addl. GM (D)

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## SPECIFICATION FOR MEDIUM VOLTAGE DISCONNECTOR

### 1.0 SCOPE

This specification covers the general requirements of design, manufacture, testing, supply and delivery of medium voltage 12kV and 36kV Disconnectors for medium voltage overhead distribution networks of the CEB

- (i). 12kV Medium Voltage Disconnector of rated continuous current 630A
- (ii). 36kV Medium Voltage Disconnector of rated continuous current 630A/ 800A

### 2.0 SYSTEM PARAMETERS

(a)	Nominal voltage (U)	11 kV	33 kV
(b)	System highest voltage ( $U_m$ )	12 kV	36 kV
(c)	System frequency	50 Hz	
(d)	Method of earthing	Effectively earthed	Non-Effectively earthed
(e)	System fault level	12.5 kA	16 kA

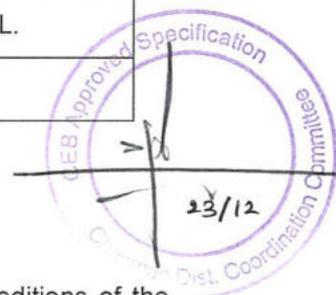
### 3.0 SERVICE CONDITIONS

(i).	Annual average ambient temperature	30 °C
(ii).	Maximum ambient temperature	40 °C
(iii).	Maximum relative humidity	90%
(iv).	Solar Radiation	4.5 kWh/m <sup>2</sup> /day
(v).	Environmental conditions	Humid tropical climate with heavily polluted atmosphere
(vi).	Operational altitude	From M.S.L. to 1900 m above M.S.L.
(vii).	Isokeraunic (Thunder days) level	100 days

### 4.0 APPLICABLE STANDARDS

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

(a)	IEC 62271-102:2013	High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches
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(b)	IEC 62271-103:2011	High-voltage switchgear and controlgear - Part 103: Alternating current switches for rated voltages above 1 kV up to and including 52 kV
(c)	IEC 62271-1:2011	High-voltage switchgear and controlgear – Part 1: Common specifications
(d)	IEC 60273 (1990)	Characteristics of Indoor & Outdoor Post Insulators for Systems with Nominal Voltage greater than 1000V.
(e)	ISO 898-1:2013(en)	Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread
(f)	ISO 898-2:2012(en)	Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes — Coarse thread and fine pitch thread
(g)	BS ISO 1461:2009	Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods
(h)	IEC 60529:2013	Degrees of protection provided by enclosures (IP Code)

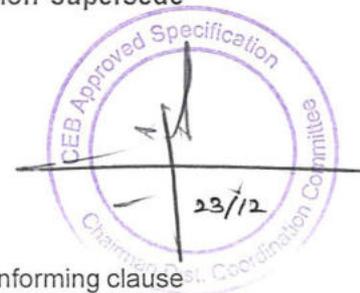
Material conforming to other International Standards which are not less stringent than the Standards stipulated above may be offered. When such alternative Standards are used, reference to such Standards shall be quoted and English language copies of such Standards shall be provided with the offer.

However, in the event of discrepancy, details given in this CEB specification supersede above standards.

## 5.0 BASIC FEATURES

### 5.1 Design

- (i). The Disconnector shall be of three phase types, suitable for outdoor use conforming clause 5 of IEC 62271-102.
- (ii). They shall be used for isolating spur line/ distribution substation/ auto-recloser from the energised section and they shall be of the single side break type/ double break type isolation with manual gang operated mechanism.
- (iii). The disconnector shall have the rated voltage falls into Range I Series I as per clause 4.1 of IEC 62271-102.
- (iv). The continuous current rating and the short time thermal current rating /duration of the Disconnectors shall be as stipulated in clause 5.9.
- (v). Rated supply voltage of closing and opening devices ( $U_a$ ) shall be in accordance with clause 4.8 of IEC 62271-102.



- (vi). Rated supply frequency of closing and opening devices shall be in accordance with clause 4.9 of IEC 62271-102.
- (vii). The Disconnecter Class shall be M1 and the rated mechanical endurance for Disconnecter shall be accordance with clause 4.106 of IEC 62271-102
- (viii). Disconnectors including their operating mechanisms, shall be designed in such a way that they cannot come out of their open or closed position by gravity, wind pressure, vibrations, reasonable shocks or accidental touching of the connecting rods of their operating system.
- (ix). Disconnectors shall permit temporary mechanical locking in both the open and closed position for safety purposes (for example maintenance).

## 5.2 Construction

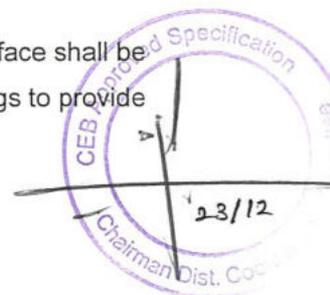
- (i). The construction of disconnecter shall conform to clause 5 of IEC 62271-102.
- (ii). The construction of the whole unit complete with adjustable support brackets, clamp plates, bolts, nuts and washers shall be compact, light weight and robust. The minimum distance between phase centers shall be as stipulated in clause 5.9.
- (iii). The mechanical design and strength of the unit and components shall be able to bear the mechanical forces on the terminals when installed and on operation. They should withstand the electrodynamic forces without reduction of reliability or current carrying capacity of the Disconnectors.
- (iv). The insulators incorporating the breaking arm shall be securely fixed to the phase coupling bar so as to achieve a positive closing or opening operation of the three phases simultaneously.

## 5.3 Insulators

The insulators shall be of solid core post type. They shall be made of high-quality insulating porcelain utilising clean aero-dynamic sheds giving extended creepage distances and excellent performance even under conditions of heavy atmospheric pollution. The total creepage distance and the protected creepage distance shall be as stipulated in clause 5.9 and pollution severity category shall be "d" in accordance with IEC 60815.

## 5.4 Stationary and Moving Contacts

The fixed and moving contacts shall be made out of copper alloy and the contact surface shall be silver plated. The fixed contacts shall be fitted with stainless steel compression springs to provide the required contact pressure.



## 5.5 Terminals

Clamp type terminals, suitable for vertical/horizontal terminal take off, made of aluminium alloy castings shall be provided to accommodate the MV conductor sizes specified in CEB Specification 003 and 010.

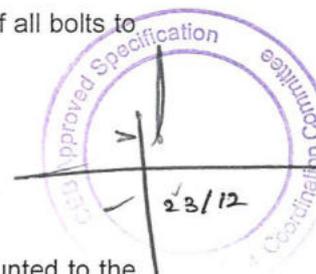
## 5.6 Operating Mechanism

- (i). It shall be suitable for manual operation with padlocking facilities only in the fully opened or fully closed position.
- (ii). The operating mechanism shall be suitable for left hand or right hand mounting of the line post structure. The direction of operation, ON and OFF position shall be clearly and indelibly marked on the disconnector operating mechanism.
- (iii). The phase coupling bar shall be positioned, clamped and secured to the base frame for positive direct drive. The drive lever shall be suitable for vertical mounting. Stainless steel piercing screws shall be provided to secure the lever once positioned and clamped.
- (iv). The vertical drive rod shall be of 8 metre length and facility for extending or reducing the length of the vertical drive rod by 1m shall be provided. Necessary threaded couplings and operating rod guides shall also be supplied with each operating mechanism.
- (v). The complete operating mechanism with operating handle shall be arranged for steady hand operation from ground level. Non ageing and UV treated insulation shall be provided to the holding parts of the operating handle for safety.
- (vi). The bearings of the mechanism shall be of permanently sealed corrosion proof, anti-friction type and free from maintenance.
- (vii). All bolts and nuts to conform to the standard specified. The nuts and heads of all bolts to be of hexagonal type.

## 5.7 Mounting Arrangement

The Disconnector shall be mounted on concrete rectangular poles/circular tubes (mounted to the side of the pole accommodating horizontally aligned lines above disconnector) or gantry structures (Horizontal Mounted, hanged from the steel structure accommodating horizontally aligned lines).

Mounting arrangement shall be agreed upon the delivery without additional cost. All mounting brackets and accessories shall be provided by the supplier.

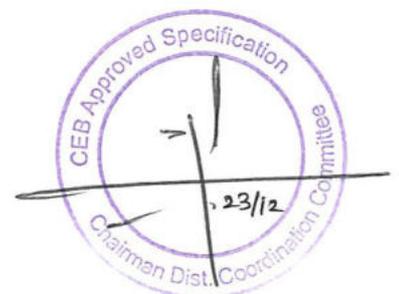


## 5.8 Galvanizing

- (i). All steel components such as the base section, phase coupling bar, drive lever, vertical drive rod, mounting attachments, operating rod guide clamp, operating mechanism, bolts nuts and washers shall be of hot dip galvanized.
- (ii). Except where specified to the contrary all the iron and steel parts shall be galvanized after the processes such as sawing, shearing, drilling, punching, filling, bending and machining.
- (iii). The preparation for galvanizing and the galvanizing itself shall not distort or adversely affect the mechanical properties of the materials
- (iv). Galvanizing shall be applied by hot dip process to comply with BS ISO 1461
- (v). Galvanizing coating thickness shall be in accordance with BS ISO 1461.

## 5.9 Technical Requirement

			12kV	36kV
(i). Rated voltage (Series I)	kV	-	12	36
(ii). Rated frequency	Hz	-	50	50
(iii). Rated continuous current	A	-	630	630 800
(iv). Disconnecter Class		-	M1	M1
(v). Rated short-time withstand current ( $I_k$ )	A	-	As per clause 4.5 IEC 62271-102	
(vi). Rated peak withstand current ( $I_p$ )	A		As per clause 4.6 IEC 62271-102	
(vii). Rated duration of short-circuit ( $t_k$ )			As per clause 4.7 IEC 62271-102	
(viii). Rated short-duration power-frequency withstand voltage				
a. Common value (phase-to-earth)	kV	-	28	70
	(r.m.s. value)			
b. Across the isolating distance	kV	-	32	80
	(r.m.s. value)			



(ix). Rated lightning impulse withstand voltage				
a. Common value (phase-to-earth)	kV	-	75	170
	(peak value)			
b. Across the isolating distance	kV	-	85	195
	(peak value)			
(x). Creepage distance of insulators	mm	-	300	900
			As per clause 5.14 IEC 62271-102	
(xi). Distance between phase centres (min)	mm		600	900

## 6.0 REQUIREMENTS FOR SELECTION

### 6.1 Quality Assurance

The manufacturer shall possess ISO 9001:2015 or latest Quality Assurance Certification for the design, manufacture of Medium Voltage Disconnecter. The certificate shall be valid throughout the delivery period of this bid. In the event the meters are manufactured in a plant under the license of the manufacturer, the manufacturing plant shall possess ISO 9001:2015 or latest Quality Assurance Certificate for manufacturing and testing of Programmable Static Energy Meters. The Bidder shall furnish a copy of the ISO certificate certified as true copy of the original by the manufacturer, along with the offer

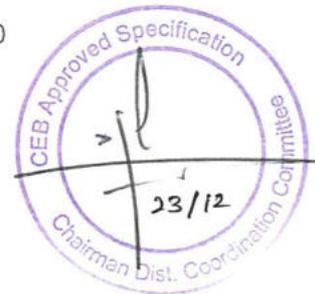
### 6.2 Manufacturing Experience

The manufacturer shall have minimum of 10 years' experience in manufacturing Medium Voltage Disconnecter. The manufacturer shall have supplied Medium Voltage Disconnecter similar to the offered, to minimum of 5 Electricity Authorities/Utilities out of which at least 3 are from outside the country of manufacture during last 5 years.

The manufacturer shall furnish a list of Authorities/Utilities to whom Medium Voltage Disconnecter were supplied during the past 5 years, indicating their names, addresses and contact details clearly. The purchaser reserves the right to communicate with electricity supply authorities/utilities to whom meters have been supplied with regard to the performance of the meters.

### 6.3 Test Certificates

The following Type Test Certificates conforming to relevant standard stipulated in clause 4.0 or any other international standard which is not less stringent, issued by an accredited independent testing laboratory acceptable to the CEB shall be furnished with the offer. Type Test Certificates shall clearly indicate the relevant standard, items concerned, showing the manufacturers identity, type



No. /catalogue No. and basic technical parameters. In case if the submitted type tests are according to any other international standard which is not less stringent than the specified, then the copy of the used standard in English shall be submitted with offer.

Proof of accreditation and accredited scope by a national/ international authority shall be forwarded with the offer. Test certificates shall be complete including all the pages as issued by the testing authority. Type test certificates shall be in English language. Parts of test certificates shall not be acceptable. 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.

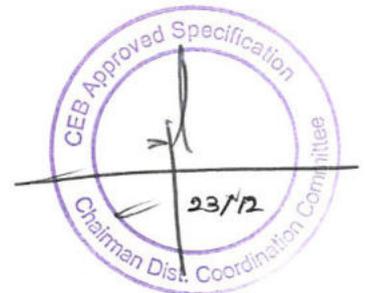
Type Tests for Medium Voltage Disconnecter in accordance with clause 6 of IEC 62271-102 and IEC 62271-1 shall be submitted.

- i. Dielectric tests
  - a. Power-frequency voltage tests
    - i. Wet conditions
    - ii. Dry conditions
  - b. Lightning impulse voltage tests
- ii. Temperature-rise tests
- iii. Measurement of the resistance of the main circuit.
- iv. Short-time withstand and peak withstand current tests
- v. Operating and mechanical endurance tests
- vi. Verification of the protection

## 7.0 INFORMATION TO BE FURNISHED WITH THE OFFER

The following shall be furnished with the offer.

- a) Technical details in English clearly identifying the offered items, but not limited to:
  - i. The Comprehensive catalogues,
  - ii. The dimensional drawings,
  - iii. Schematic diagrams,
  - iv. Calculations, graphs and tables
  - v. Literature describing the operational features
  - vi. Operation manual
  - vii. Mounting conditions
- b) ISO 9001:2015 or latest Quality Assurance Certificate in accordance with clause 6.1.
- c) Manufacturer shall furnish a list of supplies with supplied item, purchaser (specifying address contact persons and contact details, country), year & quantity to prove his manufacturing experience and outside the country sales in accordance with Clause 6.2.
- d) Test Certificates in accordance with the clause 6.3.



- e) Duly filled and signed relevant annexes
- f) 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 accordance to clause 12.1 shall also be furnished with the offer.
- g) Other relevant Technical Details, protection operating curves and Calculations stipulated in clause 9.101 of IEC 62271-102.

Not furnishing above documents and details may result in offer being rejected.

## 8.0 PERFORMANCE GUARANTEES AND WARRANTY

### 8.1 Warranty

Manufacturer should provide CEB a warranty ensuring that Medium Voltage Disconnecter supplied meet the specification and any defected cable shall be replaced without extra cost during the first year after the final delivery to CEB stores.

## 9.0 SAMPLES

One sample shall be furnished for Medium Voltage Disconnecter for 630A rating. In case of 800A, sample shall be furnished within one month of notification

## 10.0 SPARES

Not applicable

## 11.0 PACKING AND LABELING/MARKING

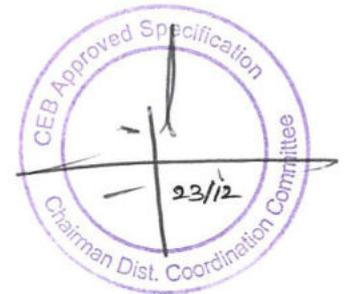
### 11.1 Packing

The Medium Voltage Disconnecter shall be suitably packed in biodegradable material (cardboard boxes) to prevent damage during transport, handling and storing and carry a label indicating the name of item, model/type No. etc.

### 11.2 Identification and Labelling/Marking

Every meter testing equipment shall be provided with a Name - plate incorporating the following minimum information as applicable:

- a) Words "Property of CEB" with warranty period shall be marked on the nameplate.
- b) Nameplate shall be with accordance to subclause 5.10 of 62271-102 with following mandatory information and optional information.



- I. Mandatory information
  - i. Manufacturer
  - ii. Designation of type
  - iii. Serial number
  - iv. Year of manufacture
  - v. Rated voltage ( $U_r$ )
  - vi. Rated lightning impulse withstand voltage ( $U_p$ )
  - vii. Rated normal current ( $I_r$ )
  - viii. Rated short-time withstand current ( $I_k$ )
  - ix. Rated filling pressure for insulation and/or operation
- II. Optional information
  - i. Rated duration of short-circuit (if  $t$  is different from 1s)
  - ii. Mechanical endurance class of disconnectors
  - iii. Mass

## 12.0 INSPECTION AND TESTING

### 12.1 Routine tests

The following routine tests as per clause 7 of IEC 62271-102 and IEC 62271-1 shall be carried out on all the Medium Voltage Disconnector and routine test report shall be made available for the observation of the inspector at the time of inspection.

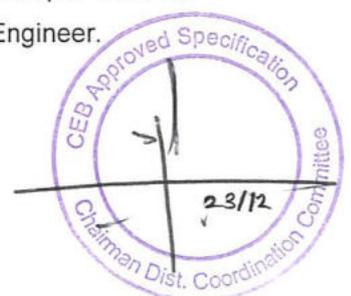
- i. Dielectric test on the main circuit
- ii. Measurement of the resistance of the main circuit
- iii. Design and visual checks
- iv. Mechanical operating tests

### 12.2 Inspection

The successful bidder shall make necessary arrangements for inspection by an Engineer appointed by the CEB and also to carry out in his presence necessary acceptance tests on equipment and material. CEB may waive off the inspection with the condition of witnessing the acceptance tests by an independent testing authority acceptable to CEB. In such a situation a notice of waive off will be issued in advance to the supplier.

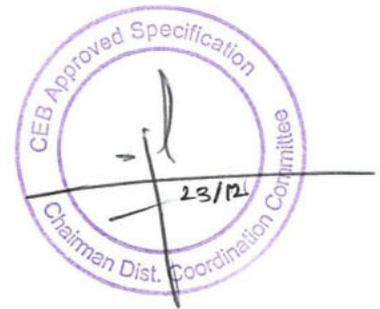
### 12.3 Acceptance tests

Visual inspection, dimensional checks, sample tests specified in the relevant standards and the routine tests specified in clause 12.1 conducted for the selected sample in addition to the complete routine test reports shall form the acceptance test report. The Acceptance/Sample tests for Disconnector as per IEC 62271-102 and IEC 62271-1 shall be witnessed by the Engineer.



### 13.0 ANNEXES

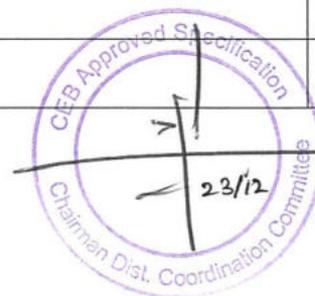
- Annex – A1: SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS (For 12kV Medium Voltage Disconnecter)
- Annex – A2: SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS (For 36kV Medium Voltage Disconnecter)
- Annex – B: NON-COMPLIANCE SCHEDULE



**Annex A1 - SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS (For 12kV Medium Voltage Disconnecter)**

(CEB Requirements shall be filled by the procurement entity and information of the offer shall be filled by the manufacturer)

		Offered
1.	Name of the Manufacturer	
2.	Country of the Manufacture	
3.	Model No./ Catalogue Ref. No.	
4.	Applicable Standards	
5.	Type	
	a) Outdoor/ Indoor	
	b) Double break/ single break	
	c) Side break/ vertical break	
6.	Disconnecter Class	M1
7.	Rated Voltage	kV
8.	Rated Frequency	Hz
9.	Rated continuous current	A
10.	Rated short-time withstand current ( $I_k$ )	kA/sec
11.	Rated peak withstand current ( $I_p$ )	A
12.	Rated duration of short-circuit ( $t_k$ )	sec
13.	Rated short-duration power-frequency withstand voltage	
	a) Common value (phase-to-earth) (r.m.s. value)	kV 28
	b) Across the isolating distance (r.m.s. value)	kV 32
14.	Rated lightning impulse withstand voltage	
	a) Common value (phase-to-earth) (r.m.s. value)	kV 75
	b) Across the isolating distance (r.m.s. value)	kV 85
15.	Creepage distance of insulators	mm 300 (As per clause 5.14 IEC 62271-102)
16.	Whether insulators are as per clause 5.3?	
17.	Dimensions of operating rod/ pipe (vertical)	
	(a) Diameter	mm
	(b) Length	mm
	(c) Thickness	mm
18.	Distance between phase centre	mm
19.	Separation between open contacts	mm
20.	Material of	
	a) Fixed contacts and contacts coating	



	b) Moving contacts and contacts coating		
	c) Fixed contacts compression springs		
21.	Applicable range of sizes of conductors to the terminals	mm	
	Galvanizing		
22.	a) Thickness	mm	
	b) Weight per square metre	g/m <sup>2</sup>	
23.	Whether the galvanized components are treated to prevent formation white rust?		Yes/ No
24.	Whether operating rod provided with threaded couplings and guides?		Yes/ No
25.	Whether the facility for locking for operating mechanism in fully open or fully closed position is provided?		Yes/ No
26.	Whether the "ON" and "OFF" position and direction of operation of the operating mechanism is clearly marked?		Yes/ No
27.	Whether the operating mechanism provided with earthing terminals		Yes/ No
28.	Whether the bearing of the operating mechanism are sealed, corrosion proof, anti-friction type and maintenance free type		Yes/ No
29.	Whether the bolts and nuts are hexagonal type		Yes/ No
30.	Whether the holding part of the operating handle is insulated		Yes/ No
31.	Power frequency withstand voltage of the operating handle insulation	V	
32.	Total weight	kg	
33.	Whether type test certificates are submitted as per clause 6.3?		Yes/ No
34.	Whether the entire Test Certificates in accordance with clause 6.3 furnished with the offer?		Yes/ No
35.	Whether a certified copy of ISO 9001:2015 or latest furnished with the offer?		Yes/ No
36.	Whether the Routine tests as per clause 12.1 is carried out by the manufacturer?		Yes/ No
37.	Whether the information requested in clause 7 furnished with the offer?		Yes/ No
38.	Whether packaging and labelling are in accordance with clause 11?		

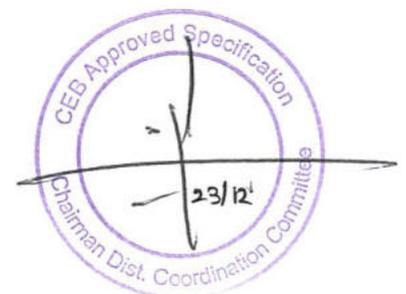
.....  
Signature of the Manufacturer and seal

.....  
Date

I/We certify that the above data are true and correct

.....  
Signature of the Bidder and seal

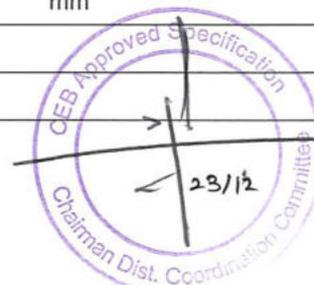
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**Annex A2 - SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS (For 36kV Medium Voltage Disconnecter)**

(CEB Requirements shall be filled by the procurement entity and information of the offer shall be filled by the manufacturer)

				Offered
1.	Name of the Manufacturer			
2.	Country of the Manufacture			
3.	Model No./ Catalogue Ref. No.			
4.	Applicable Standards			
5.	Type			
	a) Outdoor/ Indoor			
	b) Double break/ single break			
	c) Side break/ vertical break			
6.	Disconnecter Class		M1	
7.	Rated Voltage		kV	
8.	Rated Frequency		Hz	
9.	Rated continuous current		A	
10.	Rated short-time withstand current (Ik)		kA/sec	
11.	Rated peak withstand current (Ip)		A	
12.	Rated duration of short-circuit (tk)		sec	
13.	Rated short-duration power-frequency withstand voltage			
	a) Common value (phase-to-earth) (r.m.s. value)		kV	70
	b) Across the isolating distance (r.m.s. value)		kV	80
14.	Rated lightning impulse withstand voltage			
	a) Common value (phase-to-earth) (r.m.s. value)		kV	170
	b) Across the isolating distance (r.m.s. value)		kV	195
15.	Creepage distance of insulators	-	mm	900 (As per clause 5.14 IEC 62271-102)
16.	Dimensions of operating rod/ pipe (vertical)			
	(a) Diameter		mm	
	(b) Length		mm	
	(c) Thickness		mm	
17.	Distance between phase centre		mm	
18.	Separation between open contacts		mm	
19.	Material of			
	a) Fixed contacts and contacts coating			



	b) Moving contacts and contacts coating		
	c) Fixed contacts compression springs		
20.	Applicable range of sizes of conductors to the terminals	mm	
	Galvanizing		
21.	a) Thickness	mm	
	b) Weight per square metre	g/m <sup>2</sup>	
22.	Whether the galvanized components are treated to prevent formation white rust?		Yes/ No
23.	Whether operating rod provided with threaded couplings and guides?		Yes/ No
24.	Whether the facility for locking for operating mechanism in fully open or fully closed position is provided?		Yes/ No
25.	Whether the "ON" and "OFF" position and direction of operation of the operating mechanism is clearly marked?		Yes/ No
26.	Whether the operating mechanism provided with earthing terminals		Yes/ No
27.	Whether the bearing of the operating mechanism are sealed, corrosion proof, anti-friction type and maintenance free type		Yes/ No
28.	Whether the bolts and nuts are hexagonal type		Yes/ No
29.	Whether the holding part of the operating handle is insulated		Yes/ No
30.	Power frequency withstand voltage of the operating handle insulation	V	
31.	Total weight	kg	
32.	Whether type test certificates are submitted as per clause 6.3?		Yes/ No
33.	Whether the entire Test Certificates in accordance with clause 6.3 furnished with the offer?		Yes/ No
34.	Whether a certified copy of ISO 9001:2015 or latest furnished with the offer?		Yes/ No
35.	Whether the Routine tests as per clause 12.1 is carried out by the manufacturer?		Yes/ No
36.	Whether the information requested in clause 7 furnished with the offer?		Yes/ No
37.	Whether packaging and labelling are in accordance with clause 11?		

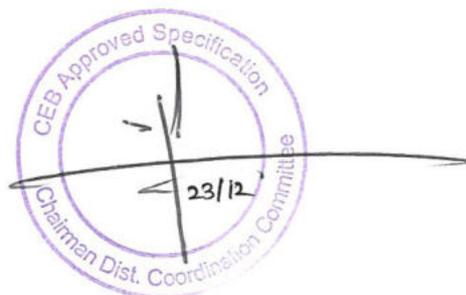
.....  
Signature of the Manufacturer and seal

.....  
Date

I/We certify that the above data are true and correct

.....  
Signature of the Bidder and seal

.....  
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 life and operating characteristics. Each non-compliance shall be referred to the relevant specification clause.

Clause No.	Non-Compliance

.....  
Signature of the Manufacturer

.....  
Date

I/We certify that the above data are true and correct

.....  
Signature of the Bidder and seal

.....  
Date

