

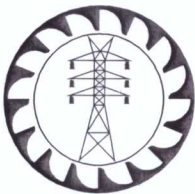
063: 2023

CEB

SPECIFICATION

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**PORTABLE INSTRUMENT  
TRANSFORMER TESTING  
EQUIPMENT**



**CEYLON ELECTRICITY BOARD  
SRI LANKA**



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# SPECIFICATION FOR PORTABLE INSTRUMENT TRANSFORMER TESTING EQUIPMENT

## 1.0 SCOPE

This specification covers the general requirements of supply of Portable Instrument Transformer Testing Equipment for field testing of all types of metering and protection class Current Transformers (CTs), Voltage Transformers (VTs) of ring, bushing type and CT/PT combined unit types, which can be categorized as follows:

- (a) CT Testing Equipment
- (b) VT Testing Equipment
- (c) CT & VT Testing Equipment

**Procurement entity shall prescribe the required type of equipment in the price schedule.**

Portable Instrument Transformer Testing Equipment shall be referred as “test set” in the document.

## 2.0 SYSTEM PARAMETERS

(a)	Nominal voltage (U)	400 V	11 kV	33 kV
(b)	System highest voltage (Um)	415 V	12 kV	36 kV
(c)	System frequency	50 Hz		
(d)	Method of earthing	Effectively earthed	Effectively Earthed	Non-Effectively Earthed
(e)	System fault level	25 kA	25 kA	25 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 61869-1:2007	Instrument transformers - Part 1: General requirements
(b)	IEC 61869-2:2012	Instrument transformers - Part 2: Additional requirements for current transformers
(c)	IEC 61869-3:2011	Instrument transformers - Part 3: Additional requirements for inductive voltage transformers
(d)	IEC 61869-4:2013	Instrument transformers - Part 4: Additional requirements for combined transformers
(e)	IEC 61326-1:2020	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
(f)	IEC 61010-1: 2010 + AMD1 :2016 CSV Consolidated version	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
(g)	IEEE C57.13-2016	IEEE Standard Requirements for Instrument Transformers

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

## 5.0 BASIC FEATURES

### 5.1 Technical Parameters

#### General

(a)	Supply voltage range	220-240V AC
(b)	Frequency	50 Hz
(c)	Output voltage	120V AC
(d)	Output current	0-5 A rms (15A Peak)
(e)	Output power	400VA rms (1500VA Peak)
(f)	Connection	UK standard type "G" plug
(g)	Interface	USB

#### CT Testing

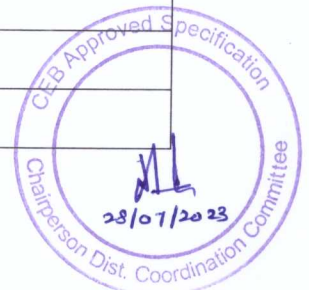
(a)	Standard ratio range	1 - 2000
(b)	Accuracy of the ratio error measurement	± 0.05% (max)
(c)	Phase angle measurement	
	• Accuracy	3 min



	• Resolution	0.1 min
(d)	Measurement of winding resistance	
	• Range	< 30Ω
	• Accuracy	0.1% + 1mΩ
	• Resolution	1mΩ
(e)	Knee point voltage	Up to 4kV

### VT Testing

(a)	Standard ratio range	1 - 350
(b)	Rated Voltage level	8kV – 33kV
(c)	Accuracy of the ratio error measurement	± 0.05% (max)
(d)	Phase angle measurement	
	• Accuracy	3 min
	• Resolution	0.1 min
(e)	Measurement of winding resistance	
	• Range	< 30Ω
	• Accuracy	0.1% + 1mΩ
	• Resolution	1mΩ



### 5.2 Design

- The test set shall be suitable for testing instrument transformers classified under IEC 61869-1, IEC 61869-2, IEC 61869-3 and IEEE C57.13-2016 standards as applicable.
- The CT test set shall be able to test all types of current transformers (metering class at least up to 0.2) for all necessary parameters such as accuracy class, instrument security factor, ratio, polarity, ratio & phase angle errors, winding resistance, excitation characteristics (with knee-point voltage & currents), burden, CT residual magnetism to ensure demagnetization, etc.
- In case of VTs, the test set shall be capable of testing ratio, polarity, ratio & phase angle errors, winding resistance.
- All the tests shall be possible to do with one set up without the necessity of changing leads.
- The CT test set shall be able to test CTs of both 5A and 1A secondary rated current and VT test

set shall be able to test VTs with 110V secondary voltage as applicable. All metering should be auto ranging.

- f) The test set shall be fully protected for overload and short circuit.
- g) The test set shall also display ratio errors & phase angle errors as per IEC 61869-2 for CTs and IEC 61869-3 for VTs.
- h) The CT test set shall be able to guess the name plate of the CT by determining the parameters such as CT type, CT accuracy class, CT ratio, knee point, nominal and operating burden, winding resistance, etc.
- i) The test set shall be automatically determined knee-point voltage/ current (with excitation graph plot), instrument security factor (wherever applicable), ratio and phase errors etc.
- j) It shall be possible to overlay a reference excitation graph (As per IEEE C57.13) with a test curve for comparison.
- k) The test set shall be suitable for operation in laboratories, manufacturing plants as well as in high voltage indoor and outdoor substation environment without degradation in accuracy.
- l) The test set shall be micro-processor based & fully automatic, without any need for manual balancing.
- m) It shall be possible to operate the test set as stand-alone device but also be possible to control & operate by external laptop/computer.
- n) Necessary software in CD for data downloading, printing, converting the test results to any other format for this application shall be supplied at no extra cost. Preparing customized test report function should be available.
- o) The test set shall be supplied with all necessary cables & accessories, power cord and instruction manual.
- p) The test set with its accessories is supplied in a sturdy transport case.
- q) Operation manuals shall be provided in both soft and hard copies.
- r) The test set shall have the following features:
  - i. The test shall have a built-in LCD display and readable in bright sunlight. For



operation/ data entry, the test set shall have alpha-numeric keyboard on the front panel.

- ii. The test set shall be light weight and portable for field usage.
- iii. Automatic demagnetization of the CT after the test is required as applicable.
- iv. The test set shall work satisfactorily under live switchyard conditions and results must not be affected by interference.
- v. The test shall have built-in memory for storing at least 1000 tests results. It should be able to download to an external PC/ Laptop. Necessary software shall be supplied.
- vi. The test set shall measure & display the winding resistance at ambient and also should display resistance corrected to 75°C.

### 5.3 Accessories

All accessories which required to perform the tests as applicable to the relevant test set, according to the IEC 61869-1, IEC 61869-2 and IEC 61869-3 shall be supplied.

#### 5.3.1 Accessories for The Test Equipment

- a) Properly insulated coaxial cables to establish primary & secondary side measurement connection and the output connections form the test set. Minimum cable length shall not be less than 9m.
- b) Suitable clamps and sockets required to establish the connection for both test set and instrument transformer ends.
- c) Cables to short other CT links for CT test set
- d) Grounding cables.
- e) Power cord adaptor.
- f) Compact flash card.
- g) USB cable.
- h) Suitable sturdy case for carrying out the test set for the field test and to prevent damage during transit.
- i) Necessary software
- j) Any other accessories which required for performing the tests stated in compliance IEC standards stated in Clause 4.0.
- k) Reference CT for calibration purposes of CT test equipment (with calibration test certificates).
- l) Reference VT for calibration purposes of VT test equipment (with calibration test certificates).
- m) Reference CT & VT for calibration purposes of CT & VT test equipment (with calibration test certificates).



## 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 and testing Portable Instrument Transformer Testing Equipment. The certificate shall be valid throughout the delivery period of this bid. In the event the Portable Instrument Transformer Testing Equipment 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 Portable Instrument Transformer Testing Equipment. 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 Portable Instrument Transformer Testing Equipment conforming standards referred in clause 4.0. The manufacturer shall have supplied Portable Instrument Transformer Testing Equipment to minimum of 10 Electricity Authorities/ Utilities out of which at least 5 are from outside the country of manufacture during last 5 years.

The manufacturer shall furnish a list of Authorities/Utilities to whom Portable Instrument Transformer Testing Equipment were supplied during the past 7 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 Tests Certificates

Type Test certificates for EMC, EMI and Ingress Protection shall be furnished with the offer, which are issued by an accredited independent testing laboratory acceptable to the CEB. Test Certificates shall clearly indicate the relevant standard, items concerned, showing the manufacturers identity, type No. /catalogue No. and basic technical parameters.

Following test set functions verifications and functional test reports shall be furnished with the offer:

- a) Verification checks of the test set function as specified parameters of the CT and VT by the test set.
  - i. Ratio error & phase displacement error
  - ii. Winding resistance
  - iii. Excitation curves
  - iv. Knee point voltage





- v. Rated resistive burden
  - vi. Instrument security factor
  - vii. Accuracy limit factor
- b) Functional test reports of the test set as applicable.
- i. Accuracy class
  - ii. Rated resistive burden
  - iii. Ratio error & phase displacement error
  - iv. Winding resistance
  - v. Excitation characteristics
  - vi. Knee point voltage
  - vii. Instrument security factor
  - viii. Accuracy limit factor
  - ix. Composite error

Further, the test set shall be able to perform all the tests as per the standards referred in clause 4.0 as applicable.

#### 6.4 Recalibration

The test set shall be rugged construction, proven design and reliable so that the equipment shall operate within the stipulated error limits for a period of 10 years with re-calibration. Supplier shall facilitate the recalibration services when requested by the purchaser.

### 7.0 INFORMATION TO BE FURNISHED WITH THE OFFER

The following shall be furnished with the offer.

- a) Catalogues describing the equipment and other accessories offered, indicating the type and model number.
- b) Operation and maintenance manual as stipulated in clause 10.0
- c) Complete dimensional drawings
- d) ISO 9001:2015 or latest Quality Assurance Certificate in accordance with clause 6.1.
- e) 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.
- f) Type Test Certificates in accordance with the clause 6.3.
- g) Duly filled and signed 'Annex - A: Schedule of Technical Requirements and Guaranteed Technical Particulars'.
- h) Warranty Certificate
- i) List of deviation (if any)



## 8.0 PERFORMANCE GUARANTEES, WARRANTY AND OTHER REQUIREMENTS

### 8.1 Warranty

Manufacturer shall provide 3 year warranty to CEB for the Portable Instrument Transformer Testing Equipment and accessories from the date of FOB dispatch of the testing equipment to CEB stores. Manufacturer should forward the duly signed Warranty Certificate together with the letter of acceptance of the award.

When the Portable Instrument Transformer Testing Equipment becomes defective within first two years of warranty, they shall be replaced free of charge. If the equipment become defective after two years during the warranty period, it shall be repaired or replaced free of charge.

### 8.2 Training and Knowledge Transferring

The selected bidder shall arrange technical training at site on use of the test set. The venue, date and time shall be agreed between the supplier and procurement entity. The cost of the training shall be borne by the supplier.

## 9.0 SAMPLES

Not applicable

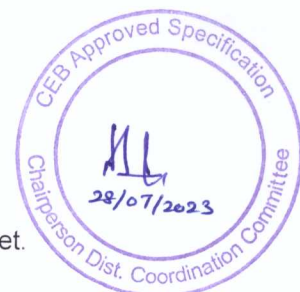
## 10.0 OPERATIONS AND MAINTENANCE

The operation and maintenance manual of the Portable Instrument Transformer Testing Equipment shall be provided with the offer. It should be descriptive, self-explanatory and shall contain following information to enable the client to maintain, service, adjust and operate the test set. The language shall be English.

- a) Table of content
- b) List of illustration
- c) Introduction

Detailed description which shall contain complete and accurate description of the test set including range of features provided as standard, range of optional features, range of settings provided for all features, both standard and optional

- d) Operating principle
- e) Necessary connection diagrams and drawings
- f) Operating instructions of test set and user interface software
- g) Setting and adjustments
- h) Maintenance instructions
- i) Any other information required for the operation and maintenance of the test set.



## 11.0 PACKING AND LABELLING/ MARKING

### 11.1 Packing

Each test set shall be packed separately in suitable packing material to withstand rough handling and carry a label indicating the name of item, model/type No. etc.

Technical Literature in English language on the installation, calibration, operation and maintenance shall be supplied with each set of test equipment and they shall be descriptive and self-explanatory, complete with necessary connection diagrams and drawings.

### 11.2 Identification and Labelling/ Marking

Every test set shall be marked indelibly, legibly and in a weatherproof and abrasion proof manner as follows:

- a) Serial number (which will be indicated at the time of placing the order) and the warranty period.
- b) Ratings: highest voltage for equipment ( $U_m$ ), rated insulation level, rated frequency ( $f_R$ ), rated output, rated accuracy class and primary and secondary current/voltage.
- c) Diagram of connections
- d) Standard adopted
- e) Product type
- f) year of manufacture, manufacturer's name or trade mark
- g) Any other markings required to perform tests successfully as per standards referred in clause 4.0.

## 12.0 INSPECTION AND TESTING

Depending on the choice of the applicable standards, relevant Routine/Functional Test Certificates conforming to, but not limited to, standards in clause 4.0 shall be furnished for the observation of the Engineer appointed by the CEB at the time of inspection unless CEB waive off the inspection. In addition, the routine test certificates shall be sent with the shipment of the items.

## 13.0 ANNEXES

- Annex – A: Schedule of Technical Particulars – To be filled by the Manufacturer  
 Annex – B: Non - Compliance Schedule



## Annex A - SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS

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

		CEB Requirement	Offered
1.	Name of Manufacturer		
2.	Country of manufacture		
3.	Model No./ Catalogue Ref. No.		
4.	Type	Portable	
5.	Applicable Standards	As per clause 4.0	
6.	<b>Technical Requirements for CT Testing</b>		
	a) Supply voltage range	V	
	b) Resolution of voltage measurements	V	
	c) Current ratio range		
	d) Accuracy of class ratio measurement		
	i. Ratio 1 – 2000A		
	e) Phase angle error measurement		
	i. Accuracy		
	ii. Resolution		
	f) Measurement of winding resistance		
	i. Range		
	ii. Accuracy		
	iii. Resolution		
	g) Rated output measurement		
	h) Knee point voltage		
7.	<b>Technical Requirements for VT Testing</b>		
	a) Standard ratio range		
	b) Rated Voltage level		
	c) Accuracy of the ratio error measurement		
	d) Phase angle measurement		
	i. Accuracy		
	ii. Resolution		
	e) Measurement of winding resistance		
	i. Range		
	ii. Accuracy		
	iii. Resolution		
8.	<b>General Requirements of the Equipment</b>		
	f) Output voltage		
	g) Output current		
	h) Output power	As per clause 3.0 and 5.0	



	i) Operating temperature		
	j) Operating Humidity		
	k) Weight		
	l) Interface		
	m) Display size	mm x mm	
9.	Whether the test set can be automatically determined;		
	a) Accuracy class	Yes	
	b) Ratio & phase errors	Yes	
	c) Knee point voltage/ current (with excitation graph)	Yes	
	d) Instrument security factor	Yes	
	e) Winding resistance	Yes	
	f) Burden measurement	Yes	
	g) CT residual magnetism	Yes	
	h) VT ratio and polarity of CT/ PT combined unit	Yes	
10.	Whether all accessories as per clause 5.3 supplied?	Yes	
11.	Whether the sturdy transport case is provided?	Yes	
12.	Whether the ISO 9001:2015 quality assurance certificate is furnished as per clause 6.1?	Yes	
13.	Whether the documents to prove the manufacturing experience as per clause 6.2 is furnished?	Yes	
14.	Whether the test certificates are provided as per clause 6.3?	Yes	
15.	Whether the recalibration service as per clause 6.4 provided?	Yes	
16.	Whether all information as per clause 7.0 finished with the offer?	Yes	
17.	Warranty for test set and accessories	3 years minimum	
18.	Whether training and knowledge transferring will be provided as per clause 8.2?	Yes	
19.	Whether the operation and maintenance manual as per clause 10.0?	Yes	
20.	Whether packing and labelling/ marking is provided as per clause 11.0?	Yes	
21.	Whether routine test certificates provided as per clause 12?	Yes	
22.	Degree of Ingress protection (IP rating)		

.....  
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

