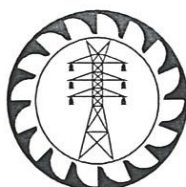


071-3 (B): 2022

CEB

SPECIFICATION

**STATIC ENERGY METER DIRECT CONNECTED
SINGLE PHASE**



**CEYLON ELECTRICITY BOARD
SRI LANKA**



Telephone: +94 11 232 8051

Fax: +94 11 232 5387

Contents

1.0 SCOPE	3
2.0 SYSTEM PARAMETERS.....	3
3.0 SERVICE CONDITIONS	3
4.0 APPLICABLE STANDARDS	3
5.0 BASIC FEATURES.....	4
6.0 REQUIREMENTS FOR SELECTION	8
7.0 INFORMATION TO BE FURNISHED WITH THE OFFER	10
8.0 PERFORMANCE GUARANTEES AND WARRANTY	11
9.0 SAMPLES	11
10.0 PACKING AND LABELING/ MARKING	12
11.0 INSPECTION AND TESTING	12
12.0 ANNEXES	13
Annex A - SCHEDULE OF TECHNICAL REQUIREMENTS AND GUARANTEED TECHNICAL PARTICULARS.....	14
Annex B - Warranty Certificate.....	16
Annex C - Non-Compliance Schedule	17



SPECIFICATION FOR STATIC ENERGY METER DIRECT CONNECTED SINGLE PHASE

1.0 SCOPE

This Specification covers the general requirements of the design, manufacture, operation and testing of Direct Connected Single Phase Static Energy Meter. Meters shall be suitable to be installed in enclosures, which are mounted on walls.

2.0 SYSTEM PARAMETERS

(a)	Nominal voltage (U)	230 V
(b)	System highest voltage (Um)	240 V
(c)	Allowable Voltage Variation	$U \pm 6\%$
(d)	System frequency	50 Hz
(e)	Method of earthing	Effectively Earthed
(f)	System fault level	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 ² /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 62052-11:2020	Electricity metering equipment - General requirements, tests and test conditions - Part 11: Metering equipment
(b)	IEC 62053-21:2020	Electricity metering equipment - Particular requirements - Part 21: Static meters for AC active energy (classes 0,5, 1 and 2)

(c)	IEC 62058-11:2008	Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods
(d)	IEC 62058-31:2008	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)
(e)	IEC 62052-21:2004	Electricity metering equipment (a.c.) - General requirements, tests and test conditions - Part 21: Tariff and load control equipment
(f)	IEC 60529:2013	Degrees of protection provided by enclosures (IP Code)

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

5.0 BASIC FEATURES

The basic features of Single-Phase Metering System (Single phase 2 wire) shall meet following requirements:

- a) Meters shall be capable of measuring Cumulative Import Active Energy (kilowatt-hour, kWh). Active Import energy shall be the sum of absolute values of Import and Export Energy or record them separately as import and export.
- b) The accuracy class shall be **Class 1** or higher for Active Energy (kWh). The power loss shall be in accordance with IEC 62053-21.
- c) The meters shall operate with specified accuracy for power factors in the full range of all quadrants.
- d) The meter shall be of the surface mounting type and shall have terminals at the bottom. The insulation class of the meter shall be class II and rated impulse withstand voltage shall be **12 kV minimum**.
- e) The meters shall have Time of Use (TOU) tariff facility for at least four (4) time bands.
- f) The Meters shall be equipped with a LED/LCD display with a backlight
- g) The meter shall be consisted with an internal Lithium Battery to empower "No Power Reading" facility.



- h) The meters shall have non-volatile memory to store data. The corresponding non-volatile memory shall store both import & export monthly active energy readings. Meters shall have facility to store at least twelve such most recent readings in separate registers.
- i) Meter shall operate within the stipulated error limits throughout the whole life span without any recalibration.
- j) Meter configuration shall be password protected at meter end to prevent unauthorized meter parameter changes.
- k) The meters shall directly display the following data as applicable at the time of reading (calling) when required.
 - 1. Display Test
 - 2. Current Time
 - 3. Current Date
 - 4. Cumulative Total Active Import Energy
 - 5. Cumulative Active Import Energy (Rate 1)
 - 6. Cumulative Active Import Energy (Rate 2)
 - 7. Cumulative Active Import Energy (Rate 3)
 - 8. Cumulative Total Active Export Energy
 - 9. Cumulative Active Export Energy (Rate 1)
 - 10. Cumulative Active Export Energy (Rate 2)
 - 11. Cumulative Active Export Energy (Rate 3)
 - 12. Meter Constant
- l) Meter shall be configurable for parameter changes, time synchronization, tariff etc. Also, it shall be equipped with an Optical Port to test and configure at site.
- m) Software shall be provided along with the meter to facilitate meter configurations and data downloading locally. There shall be no limitations on the number of licenses and their validity.

5.1 General Requirements

5.1.1 Standard Reference Voltages and Frequency

The Meter shall be suitable for operation on 230 V, two wire type low voltage system application with nominal frequency of 50 Hz.

5.1.2 Power Supply Variation

The meter shall be suitable for working with following abnormal system variations.



Specific Range of operation	70% to 120% of the reference voltage
Frequency Range	$\pm 5\%$ of the reference frequency

5.1.3 Standard Basic Current and Maximum Current

The Meter shall be suitable for operation on standard basic current of 5 A and the maximum current shall be 40 A.

5.2 Mechanical Requirements

The meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal working conditions, so as to ensure especially;

- i. Personal safety against electric shock.
- ii. Personal safety against effects of excessive temperature.
- iii. Safety against spread of fire.
- iv. Protection against penetration of solid objects, dust and water.

All parts which are subject to corrosion shall be suitably protected and any protective coating shall not be liable to damage by normal handling.

5.2.1 Case and Window

The meter shall have an insulated case which shall be sealed in such a way that the internal parts of the meter are not accessible to unauthorized persons.

Any non-permanent deformation of the case shall not affect the satisfactory performance of the meter.

The window shall be of transparent material which cannot be removed undamaged, without breaking seals.

5.2.2 Terminal Block

The terminal block shall be made of insulating material and it shall be capable of passing the test stipulated in ISO 75 for a temperature of 135°C and a pressure of 1.8 Mpa. The terminals should accommodate Aluminum or Copper cables cross section up to 10mm². All terminals, screws and nuts shall be tin/nickel plated brass/copper to provide high resistance to corrosion.

5.2.3 Terminal Cover

The wiring terminals shall be protected by a sealable transparent terminal cover and it shall be made of an insulating material. The terminal covers shall be of extended type with easily breakable



knockouts. Provision shall be made to seal the meter cover and terminal cover separately.

5.2.4 Resistance to Heat and Fire

The terminal block, the terminal cover and the meter case shall not be ignited by thermal overload of live parts in contact with them and they shall meet the tests stipulated in Clause 5.1 of IEC 62052-11.

5.2.5 Protection against Penetration of Dust and Water

The Metering equipment shall be suitable for indoor use and conform to the degree of protection of IP51 as per IEC 60529:2013.

5.2.6 Display of Measured Values

The meters shall be provided with a clear Electronic Display (LED/LCD Type) under a viewing panel conforming to the minimum degree of protection of IP 54 and the dimensions of figures shall not be less than 8 mm (Height) and 4mm (Width). Minimum number of digits (Including a decimal) of the display shall be 6.

5.2.7 Date and Time

The meter shall have a calendar clock to provide time and date information and be equipped with a built-in battery backup. Battery life shall not be less than 10 years.

5.2.8 Events & Alarms

The meters shall be capable of detecting and recording occurrence (minimum 100 records) of power failures, power disconnections, tampering attempts, power restoration and other details such as time and date of such occurrences.

5.2.9 Insulation

The insulation of the meters shall withstand an impulse voltage of 12kV peak and Power frequencies withstand voltage shall be 4kV as stipulated in IEC62053-21 Table 5 in clause 7.4.

The protective class of the meters shall be class II.

5.3 Electromagnetic Compatibility

a) Immunity to electromagnetic disturbance

The meters shall be designed in such a way that conducted or radiated electromagnetic disturbance as well as electrostatic discharge do not damage or influence the meter.



b) Radio interference suppression

The meters shall not generate conducted or radiated noise which could interfere with other equipment.

5.4 Accuracy requirements

a) Meter Constant

Flashing light indication shall be available on the front face of the meter which acts as an activity indicator. The meter shall also be provided with a blinking LED which blinks analogous to the active energy metered, for calibration purposes.

The manufacturer shall state the necessary number of pulses to ensure a measuring accuracy of at least 1/10 of the class of the meter at the different test points. Sufficient pulse rates (meter constant) shall be generated at low load condition.

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 Static Energy Meters. 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 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.

Each meter to be tested and calibrated at a meter testing laboratory having ISO/IEC: 17025:2017 and properly sealed. Test reports shall be dispatched to the purchaser before inspection.

The proof documents with regard to the accreditation to the above facility in accordance with ISO/IEC 17025:2017 shall be submitted along with the bid.

6.2 Manufacturing Experience

The manufacturer shall have minimum of ten (10) years experience in the manufacturing of Static Energy Meters conforming the IEC 62053-21. The manufacturer shall have supplied Static Energy Meters 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 meters 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.

If the manufacturer has supplied similar items to CEB for the last (5) years with proven sales records; without any adverse performance records, such manufacturers will be exempted from above requirements.

6.3 Type Tests

Type Test Certificates conforming to the above referred standards 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.

A. The following type test certificates conforming to IEC 62052-11 shall be furnished with the offer.

- a) Test of safety requirements
 - i. Tests related to safety
- b) Test of general requirements.
 - i. Power consumption.
- c) Test of Accuracy Requirement.
 - i. Test of meter constant
 - ii. Initial start-up of the meter
 - iii. Starting current test
 - iv. Test of no-load condition
 - v. Limits of error due to variation of the current
- d) Test for electromagnetic compatibility (EMC) and limits of error due to influence quantities
 - i. Voltage dips and short interruptions
 - ii. Electrostatic discharge immunity test
 - iii. Radiated, radio-frequency, electromagnetic field immunity test
 - iv. Immunity to conducted disturbances, induced by radio-frequency fields



- v. Electrical fast transient/burst immunity test
 - vi. Surge immunity test
 - vii. Power frequency magnetic field immunity test
- e) Tests of immunity to other influence quantities
- i. Voltage variation
 - ii. Self-heating
 - iii. Short time over current
- f) Test of climate influences.
- i. Dry heat test.
 - ii. Cold test.
 - iii. Damp heat cycle test.
 - iv. Protection against solar radiation
- g) Tests of mechanical requirements.
- i. Shock test
 - ii. Vibration test.
 - iii. Terminals – Terminal Block (s)
 - iv. Spring hammer test

- B. The following type test certificates conforming to IEC 62053-21 shall be furnished with the offer.
- a. Impulse voltage test (12kV peak)

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. Name plate drawing to scale, incorporating the particulars called for in clause 10.2
 - vii. Constructional & mounting details with electrical clearances
 - viii. Materials used for components & relevant literature and electrical properties and mechanical properties



- 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) Type Test Certificates in accordance with the clause 6.3.
- e) Duly filled and signed 'Annex - B: Schedule of Technical Requirements and Guaranteed Technical Particulars'.
- f) Other relevant Technical Details, protection operating curves and Calculations.
- g) Certificate for service life as per clause 8.1

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

8.0 PERFORMANCE GUARANTEES AND WARRANTY

8.1 Warranty

Manufacturer shall provide ten (10) years warranty for the meters and accessories from the date of FOB dispatch of the meters to the purchaser. Manufacturer should forward the duly signed Warranty Certificate together with the letter of acceptance of the award. The format of the Warranty Certificate is given in Annex C.

When the meters become defective within first two years of warranty they shall be replaced free of charge. The meters become defective after two years during the warranty period shall be repaired or replaced free of charge.

CEB shall not remove the meter cover for any purpose such that CEB has the right to claim under warranty in the event of any defect in the meter. Manufacturer shall honour the conditions in the warranty certificate accordingly.

9.0 SAMPLES

One sample of meter with manufacturer's seals, all accessories for remote communication (if requested in the price schedule) and copy of the meter reading software with meter reading cable shall be handed over to the Purchaser along with the offer. The software provided with the sample shall have the full functionality in order to facilitate evaluation of the product.

The sample of the successful Bidder will be retained and the samples of the unsuccessful bidders will be returned once the award is made.



10.0 PACKING AND LABELING/ MARKING

10.1 Packing

Each meter shall be individually packed in a Cardboard Box using bubble wrapping to prevent damage due to rough handling and about 25 meters shall be packed in cardboard boxes. Each packing shall indicate the Type (Single Phase), Rating and Serial Nos. of the meters.

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

The final packing requirements for the overall consignment are given in bid document.

10.2 Identification and Labelling/ Marking

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

- a) Words "Property of CEB" with a mark "W-10Y" shall be marked on the nameplate
- b) A serial number (which will be indicated at the time of placing the order)
- c) Ratings: voltage U_0/U (U_m)/ current / size / capacity
- d) Diagram of connections (this diagram shall also show the sequence for which the meter is intended, preferably inside the meter terminal cover)
- e) Standard adopted
- f) Product type
- g) year of manufacture, manufacturer's name or trade mark
- h) Any other information stipulated in clause 6 of IEC 62052-11 markings stipulated in the standards

11.0 INSPECTION AND TESTING

11.1 Routine Tests

The Routine Test Certificates conforming to the relevant standards (depending on the choice of the applicable standards) shall be furnished for the observation of the Engineer appointed by CEB at the time of inspection.

In addition, the routine test certificates shall be sent with the shipment of meters. Routine tests carried out for all meters and each consignment of meters shall accompany one set of routine test results recorded in tabular form. If the test results are recorded in separate sheets all such sheets pertaining to each consignment shall be bound together as one volume.



11.2 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 procured item and material without any additional cost. Acceptance test reports shall be a part of the shipping document. CEB may waive off the inspection either with the condition of witnessing the acceptance tests by an independent body acceptable to CEB or completely. In such a situation a notice of waive off will be issued in advance to the supplier.

11.3 Acceptance Tests

Unless specified below, visual inspection, dimensional checks, sample tests specified in the relevant standards, selected type tests and the routine tests conducted for the selected sample in addition to the complete routine test reports shall form the acceptance test report.

The following test as per IEC 62058-11 and IEC 62058-31 shall be witnessed by the representative of the Purchaser.

- a) Test of insulation properties.
 - i. A.C. Voltage Test.
- b) Tests of Accuracy requirements.
 - i. Test of Meter Constant.
 - ii. Test of Starting condition.
 - iii. Test of No load condition.
 - iv. Limits of error due to variation of current.
 - v. Limits of error due to influence quantities (Voltage variation, voltage unbalance, harmonics in voltage and current, external magnetic fields).

12.0 ANNEXES

- Annex – A: Schedule of Technical Particulars – To be filled by the Manufacturer
- Annex – B: Warranty Certificate
- Annex – C: 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)

No.	Parameter	CEB Requirement	Quoted Specification
1)	Name of Manufacturer	-	
2)	Country of manufacture	-	
3)	Model Number /Catalog Reference Number of the Meter	-	
4)	Accuracy Class of Active Power	Active energy (kWh) $\pm 1\%$	
5)	Connection Type - Single Phase	1 Phase 2 wire, Direct connected	
6)	Applicable Standards as per clause 4.0	Yes	
7)	Standard Basic Current - Single phase (I_b)	5A	
8)	Rated Maximum Current- Single phase	40A	
9)	Reference voltage - Single phase	230V $\pm 6\%$	
10)	Reference Frequency	50Hz ± 0.5	
11)	Starting Current of Meter	0.004 I_b	
12)	Whether accuracy limit of the meter within the specified range under the abnormal system variations specified in clause 5.1.2	Yes	
13)	Power consumption (Clause 7.1.2 of IEC 62053-21)	Voltage Circuit	2W _{Max} , 10VA _{Max}
		Current Circuit	4 VA _{Max}
14)	Temperature rise as per Clause 7.2 of IEC 62052-11	25K _{Max}	
15)	Type of display	LED/LCD	
16)	Number of digits	6(with one decimal)	
17)	Minimum Size of display digit	8 X 4 mm	
18)	Type of Meter and Terminal Base	Bottom connected	
19)	Material of the Meter cover and Terminal cover	-	
20)	Size of conductor that can be connected to the Terminals	Minimum 16mm ²	
21)	Degree of protection of the meter Body	IP51	
22)	Degree of protection of the meter Display	IP54	



23)	Whether the Type Test certificate furnished in complete form, from recognized testing authority as per clause 10.0 (k), (Indicate the deviations if any.)	Yes	
24)	Whether the meters conforming to the Clause 5.0 (Indicate the deviations if any)	Yes	
25)	Whether the Certificate of quality Assurance Conforming to ISO 9001:2015 or latest furnished	Yes	
26)	Whether the Blinking LED analogues to the watt-hour consumption provided	Yes	
27)	Guaranteed life span of meter / Years	Minimum 10 years	
28)	Guaranteed meter accuracy, years without servicing	Minimum 10 years	
29)	Guaranteed life span of battery / Years	Minimum 10 years	
30)	Warranty for meters and accessories	Minimum 10 years	
31)	Whether the Acceptance/sample Tests as per Clause 9.3 will be carried out by the Manufacturer	Yes	
32)	Indicate the additional features available in the offered meter. (Attach a separate sheet.)	-	
33)	Detailed technical literature of the system architecture provided	Yes	
34)	Detailed technical literature of the meter provided	Yes	

.....
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 - Warranty Certificate

General Manager,
Ceylon Electricity Board,
50, Sir Chittampalam A Gardiner Mawatha,
Colombo 2,
Sri Lanka.

.....(hereinafter called the Manufacturer) shall make good by repair or, at our option by replacement, defects which, under proper use and in accordance with any instruction issued by us, as appeared in the contract of our supply or manufacture within a period of not more than Hundred and Twenty (120) months after the original FOB dispatch date (When the meters become defective within first two years of warranty they shall be replaced free of charge. The meters become defective after two years during the warranty period shall be repaired or replaced free of charge.) Provided that:-

- a) All meters having Serial Nos. FromTo
Supplied by the Manufacturer for the CEB Tender No is
Handled, installed and commissioned in a manner as agreed to by the Manufacturer and the Ceylon Electricity Board and operated at the designed normal operating conditions at all times for which it was intended.
- b) We are notified of the alleged defect first coming to the purchaser's notice and within the warranty period.
- c) The defective meter(s) is /are returned promptly to our Agent in Sri Lanka free of charge if we so require and we shall return new or repaired meter(s) free of charge to the original contract delivery point unless otherwise arranged within 03 months period from notification.
- d) Any unauthorized handling; repairs or alteration to the meter(s) shall invalidate this warranty.
- e) If it is found that the meter has been mishandled, neglected and / or modified in any way during the storage period, the warranty in general will become null and void.

The warranty applied only to goods and services carried out by the Manufacturer or with the Manufacturer approval.

Yours faithfully,

.....
Signature of the Bidder and seal / Date

.....
Signature of the Manufacturer and seal / Date



Annex C - 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

