SUPPLY CHAIN MANAGEMENT

THIRUVANANTHAPURAM

SPECIFICATION

3 Phase 4 wire CT PT operated HT/EHT static 0.2 S class

Availability Based Tariff Meter

APPLICABLE TO KSEBL	**Rev#0**	DOC. NO.: **SCM-SPEC/XD/ABT Meter**
		EFF. DATE: **31-3-21**

Number of Pages: 27

Technical Committee

1. Chief Engineer- SCM
2. Deputy Chief Engineer -SCM
3. Executive Engineer TMR Thirumala
4. Executive Engineer TMR Pallom
5. Executive Engineer TMR Angamaly
6. Executive Engineer TMR Shoranur
7. Executive Engineer TMR Kannur
8. Executive Engineer(D)-O/o CE-SCM
9. Executive Engineer RITU Kochi

(i) Document Approval & Control Status `

	Compiled by	Verified by	Approved by
Name	**Smt. Suja Maria Paul**	**Sri. Sunil .K.**	**Sri. Sanal Kumar K**
Position	Asst. Executive Engineer (O/o Chief Engineer, Supply Chain Management)	Executive Engineer(D) (O/o Chief Engineer, Supply Chain Management)	Chief Engineer (Supply Chain Management)
Date	20.04.21	20.04.21	20.04.21
Signature	Sd/-	Sd/-	Sd/-

(ii) Amendments and History

Sec. #	*Rev. #*	*Date*	*History of Change*

1. Purpose

Purpose of this document is to document updates & history, upkeep and publish the specifications related to **3 Phase 4 wire CT PT operated HT/EHT static 0.2 S class Availability Based Tariff Meter** in a professional manner.

2. Scope

The Scope of this document is to inform and alert all relevant stakeholders including KSEBL, Public, KSERC etc. regarding the current specifications and historical changes adopted in specifications of **3 Phase 4 wire CT PT operated HT/EHT static 0.2 S class Availability Based Tariff Meter** used in field by KSEBL.

3. Responsibility

Executive Engineer (D), Office of Chief Engineer, Supply Chain Management shall compile and take necessary steps to publish the specification in KSEBL website and shall inform relevant stakeholders regarding updates and revisions.

4. Procedure For Revision

Modifications if any, in the technical Specification will be incorporated as **Revisions** . Any changes in values, minor corrections in pages, incorporation of small details etc. will be considered as Minor Modification. **The Revisions due to minor modifications will be assigned as Rev No. 0.1, 0.2 etc .**

A complete updation of the technical specification will be considered as Major modification. **The Revisions due to major modifications will be assigned as Rev No. 1.0, 2.0 etc .**

All the details regarding the revisions (both minor and major) will be incorporated in "**(ii)-Amendments and history "** above.

The concerned officers, in consultation with the Technical Committee will review and suggest changes required and the revision suggestion will be approved by **Chief Engineer- SCM.** Those who notice any discrepancy or have any suggestion regarding revision , may bring the matter to the attention of Chief Engineer -SCM in writing or through e-mail id: **cescm@kseb.in**

CONTENTS

TECHNICAL SPECIFICATION of ABT METER

1 SCOPE

This specification covers the design, manufacture, testing, supply, reprogramming of CT and PT ratio if necessary and supervision at the time of commissioning of 3 phase, 4 wire, HT / EHT, CT and PT operated, ABT energy meters of accuracy class 0.2 S for both Active and Reactive energy, with TOD registers, DLMS compliant & AMR compatible meters.

2 APPLICABLE STANDARDS

CBIP Guide on Static Energy Meter **-** Specifications & Testing Pub No.325, January 2015.
AC Static Transformer operated Whr and VARhr. Meters ,Cl.0.2 S & 0.5 S
- IS 14697/ 99 Re affirmed 2004/IEC 62016-21
Degree of Protection **-** IS 12063.
Testing equipment for AC Electrical Energy meter**-** IS 12346.
Assembling Standard of Electronic components**-** ANSI/IPC-A-610.
EMC- Testing and measurement techniques, Surge immunity test
- IEC 61000-4-5/ 2001- 04.
Basic environmental Testing procedures for electronic and electric items
- IS 9000 and latest amendments thereof.
Guidelines on Data exchange for electricity Meter reading, Tariff & Load control Companion specification **-** IS 15959

In case of any conflict or discrepancy, the order of precedence shall be

1. IS
2. Manual on Standardization of AC Static Electrical Energy Meters, CBIP 325
3. IEC

In case of any difference between provisions of these standards and the provisions of this specification, the provisions contained in this specification shall prevail.

3 CLIMATIC CONDITIONS

1) Maximum Annual Rainfall (mm) ……	5000
2) Average Annual Rainfall (mm)	3107
3) Average no. of thunderstorm days/annum (Isoceraunic level)	50
4) Average number of dust storm days per annum	5
5) Average number of rainy days per annum ……..	120-140
6) Specified operation range of temperature	0^0 C to 55^0 C
7) Limit of range of operation of temperature	10^0 C to 60^0 C
8) Limit of temperature range for storage and transport ……..	-10^0 C to 70^0 C
9) Relative humidity (%)	50-99
10) No. of months during which tropical monsoon conditions prevail	5
11) Seismic level (Horizontal accn)	0.3 g
12) Maximum Wind Pressure	150 kg sq mt

4 SYSTEM PARAMETERS

1) Voltage rating - 110V between phases and 110/√3 V between phase and neutral
2) Voltage variation **-** +20% to -40%
3) Standard Basic Current Ib**-** 5 A (for HT) and 1A (for EHT)
4) Rated maximum current Imax**-** 200% of Ib
5) Standard frequency **-** 50Hz +/-5%
6) Power Factor **-** should work for zero to UPF (lag and lead)

7) Class of accuracy **-** 0.2S for both kWh & kVArh
8) System of measurement **-** The meter is intended for 3 phase 4wire method under balanced and unbalanced load.
9) Type of installation – Indoor panel or cubicle mounted
10) Earthing system – Solidly grounded

5 GENERAL REQUIREMENTS:-

5.1. Meter shall bear ISI mark
5.2. Deleted**.**
5.3. The standard reference temperature for performance shall be 27^{O}C +/- 2^{0} C. If tests are made at a temperature other than that of reference temperature, the results shall be corrected by applying the appropriate temperature coefficient of the meter.
5.4. Unless otherwise specified, the meter should conform to all applicable clauses of standards specified above.
5.5. The meter should start registering the energy at 0.1 % of basic current.
5.6. The meter shall withstand and operate satisfactorily without loss of accuracy under the most hazardous tropical climatic conditions including that specified above.
5.7. Along with each meter, inside the packing, leaflet/manual of meter which shall strictly match with the specification of the meter supplied shall be provided. It shall include the list of full display parameters with same legends and order as appear in the meter supplied. Also the list of all anomalies/events legends shall be provided as in the meter supplied

5.8 Class of Accuracy:

5.8.1. The class of accuracy of meter should be 0.2S for both kWh and kVARh.
5.8.2. The meter should show the readings having an error within the permissible limits for all values of current between 5% of basic current and of the maximum current for all power factor as stipulated in standards when it is under balanced loads and under reference conditions.
5.8.3. The accuracy shall not drift with time.
5.8.4. The meter shall be able to carry for 0.5 second a current equal to 20 times the maximum current and the variation in percentage error should not exceed 0.1%.
5.8.5. Voltage dips and interruptions shall not produce a change in register of more than 0.002 kWh/0.003 kVAh. In case any drift is noticed in the accuracy of the meter, which is beyond the permissible limits, the concerned meter shall be withdrawn from service and the manufacturer shall supply a new meter within three months from the date of receipt of intimation from KSEBL without any extra cost as a replacement during the guarantee period. Delay in replacement, will be treated as per the clause specified for replacement of faulty meter.
5.8.6. The accuracy of the meter should not be affected with the application of abnormal voltage/frequency generating device.

5.9. POWER CONSUMPTION:-

5.9.1. Voltage Circuit: The active & apparent power consumption of voltage circuit including power supply of meter at reference voltage, reference temperature and frequency shall not exceed 1.0 Watt & 4.0 VA per phase.
5.9.2. Current Circuit: The apparent power taken by current circuit at basic current, reference frequency & reference temperature shall not exceed 1.0 VA/phase.
5.9.3. The apparent and active power consumption of each circuit of a meter at reference voltage/ current mentioned above is for reference frequency and reference temperature

6 DESIGN AND CONSTRUCTIONAL REQUIREMENTS:-

6.1. Meters shall be designed and constructed in such a way that in normal conditions, working personnel's safety against electric shock and non-effectiveness of excessive temperature are ensured.
6.2. Meters shall be projection type and shall have **IP 51** degree of protection.
6.3. Direct Sun rays may be falling on the Energy Meter and it shall be designed to withstand the

temperature.

6.4. Unless otherwise specified, features of meter should be that of insulating encased meter of protective class II as elaborated under CBIP Guide No.325.

6.5 Design

6.5.1. All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non aging and of tested quality.

6.5.2. Parts and surfaces which are subjected to corrosion, shall be provided with protective coating to achieve durable results.

6.5.3. The meter shall have a wireless design.

6.5.4. The meter shall have a Test Output (kWh & kVArh), Operation Indicator. The operation indicator must be visible from the front and test output device shall be provided in the form of LED.

6.5.5. Meter shall be designed with application specific integrated circuit (ASIC) or micro controller, shall have no moving part, electronic components shall be assembled on printed circuit board using surface mounting technology (SMT).

6.5.6. Factory calibration using high accuracy software based test bench shall be used considering the error of standard in over all accuracy as per table 1 of IS 12346.

6.5.7. Assembly of electronic components shall be as per ANSI/IPC-A-610 standard.

6.5.8. Internal power supply circuit shall be designed using highly reliable components. Critical components such as metering ICs (ASIC), Micro controller etc. shall be procured from STACK or IECQ registered suppliers.

6.5.9. The measurement by meter shall not get influenced by injection of high frequency AC Voltage/chopped signal / DC signal and harmonics on the terminals of the meter.

6.5.10. The meter's accuracy shall not be affected at all by magnetic field from all sides of the meter i.e. front, sides, top and bottom of the meter.

6.5.11. Power supply unit in the meter should be transformer less, preferably micro controller type to avoid magnetic influence.

6.5.12. The meter shall record total energy including harmonic energy and record both total and fundamental energy.

6.5.13. The meter shall not generate conducted or radiated noises, which could interfere with other equipment in the system.

6.5.14. While installing the meter, it should be possible to check the correctness of current and voltage connections to the meter with proper polarity. This may be available in the display of the meter for different ways the voltage and current are injected.

6.5.15. Under normal conditions of use, electrical circuits and insulation shall not reach a temperature which might adversely affect the operation of the meter. The temperature rise at any point of the external surface of the meter should not exceed 20^0 C at an ambient temperature at 25^0 C to 45^0 C.

6.5.16. Meter shall withstand an impulse voltage of 10 kV peak. The waveform and the generator characteristics used for testing shall be in accordance with IEC 62052-11, clause 7.3.2.

6.5.17. kVAh measurement should be the vector sum of active and reactive energy even though the vector sum value tends to be the same as arithmetic sum value while calculating the kVAh as above. For apparent energy calculation 'Lag+Lead' tariff shall be adopted.

6.6 TOD Timings:-

6.6.1. There shall have provision for at least 6 (Six) TOD time zones for energy and demand. The number of time zones and timings of these TOD Zones shall be programmable as per the requirement of the utility at site.

6.6.2. Programming facility is to be adequately protected from misuse. Measures for protection incorporated should be elaborated by the manufacturer and it should be fool-proof.

6.6.3. The main control for this change shall be available on the computer located at the base station. If the meter is not connected to a base station computer, it should be possible

to change with a CMRI / Laptop with adequate password protection and also should be able to block the same facility if it is connected to a base station computer.

6.6.4. At present the meter should have set for three time zones such as
a) 6:00 hours to 18:00 hours
b) 18:00 hours to 22:00 hours
c) 22:00 hours to 6:00 hours

Only the above zone wise readings shall be provided in the display wherever required. Other time zones shall be kept disabled.

6.7 Manufacturing Process, Assembly, Testing:-

6.7.1. Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. All inward flow of major components and sub assebly parts (CT, PT, RTCs/Crystals, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification.

6.7.2. Multi-layer 'PCB' assembly with 'PTH' (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits.

6.7.3. SMT component shall be assembled using automatic 'pick-and-place' machines within process 7 stages, Re-flow Soldering oven, for stabilized setting of the components on 'PCB'. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice.

6.7.4. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, is to be minimized to items, which cannot be handled by automatic machine.

6.7.5. Handling of 'PCB' with ICs/C-MOS components is to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided.

6.7.6. Complete assembled and soldered PCB should undergo functional testing using computerised automatic test equipment.

6.7.7. Test points should be provided to check the performance of each block/stage of the meter circuitry.

6.7.8. Testing at intermediate and final stage is to be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

6.8 CONSTRUCTION

6.8.1. Meter Base & Cover:-

6.8.1.1. The meter case and cover should meet UV aging test as per ASTM standards.

6.8.1.2. The manufacturer shall indicate hardness, melting temperature and tensile yield strength of the material and necessary test certificate of the same shall be furnished.

6.8.1.3. The Meter case (base and cover) shall be made of Unbreakable Flame retardant High grade UV stabilized Poly Carbonate with minimum thickness of 2 mm and of good dielectric and mechanical strength.

6.8.1.4. Meter case (base and cover) and extended terminal block cover should be injection moulded in UV stabilized poly carbonate. The meter base shall be opaque. The meter cover and extended terminal block cover shall be kept fully transparent. The moulded meter case should withstand glow wire test as per IS 14697 and heat deflection test as per ISO:75.

6.8.1.5. The meter cover should be ultrasonically/chemically welded with meter base.

6.8.1.6. Polycarbonate or acrylic or holographic seals shall be used. Lead seals are not permitted at all.

6.8.1.7. The meter shall be provided with adequate shielding to withstand external magnetic influence from all directions as per CBIP guide No.325/Jan 2015.

6.8.2. Terminal Arrangement, Terminal Block and Cover:-

6.8.2.1. Terminals may be grouped in (a) terminal block(s) having adequate insulating properties and mechanical strength.

6.8.2.2. The terminal arrangement and connection diagram shall conform to IS: 14697. Terminal arrangement shall be marked on terminals as well as in the connection

diagram. The diagram shall show the phase sequence for which the meter is intended.

6.8.2.3. Terminals shall be designed to carry Imax continuously and under this condition the temperature at the terminal block shall not exceed 70^0 C with ambient temperature within operating temperature range as defined by IS 14697.

6.8.2.4. Clamping screws should be provided along with each meter.

6.8.2.5. The terminal block shall have adequate insulating properties and mechanical strength. The terminal block shall be made from best quality non- hygroscopic, flame retardant polycarbonate material or any other superior industrial plastic material (capable of passing the flammability tests give in IS: 11731) with nickel-plated brass inserts for connecting terminals. The material shall be capable of passing the test given in ISO: 75 for temperature of 135 ^{0}C and pressure of 1.8 MPa.

6.8.2.6. The termination arrangement shall be provided with high quality metallic cover with screws.

6.8.2.7. The internal diameter of the terminal holes should be minimum 5.5 mm as per CBIP 325, Table 2 and shall be capable of carrying continuous current of $\mathbf{I_{max}}$. The holes in the insulating material of the terminal block shall be of sufficient size to accommodate the insulation of conductors also.

6.8.2.8. The meter terminal block shall have tin-plated brass inserts. The terminal screws shall have flat bottom so as not to pierce the external conductors. All electrically live screws shall be of nickel/tin plated brass.

6.8.3 Sealing Arrangement:-

6.8.3.1. There should be provision for sealing by the utility. Required number of seals with serial number on one side and KSEBL logo on the other side should be supplied along with each meter.

6.8.3.2. The seals should have bar code and serial no. on one side and KSEBL logo on the other side.

6.8.3.3. There shall be provision for sealing the optical port also.

6.8.4. Real Time Clock:-

6.8.4.1. The real time quartz clock (RTC) shall only be used in the meter for maintaining time (IST) and calendar. The time accuracy shall be as per provision of CBIP 325.

6.8.4.2. RTC shall be pre-programmed for 30 Years Day / date without any necessity for correction. Maximum drift shall not exceed +/- 2 Min/year. The crystal should be temperature compensated for temperature range of 0 to 50^0 C when powered by internal battery or supply

6.8.4.3. The uncertainty of setting initial time shall not be more than +/- 30 seconds from Indian Standard Time as maintained by NPL, New Delhi.

6.8.4.4. The RTC shall have long life (10 Years) non-rechargeable battery.

6.8.4.5. Time & date setting shall be possible through Common Meter Reading Instrument (CMRI), laptop or base computer.

6.8.4.6. Synchronization of Energy Meter 'RTC' Time/Date shall be possible through password/Key code enabled command from CMRI and Laptop. There shall be provision for remote time synchronization through optical port and RS 485 communication port.

6.8.4.7. The RTC battery and battery for display in the case of power failure shall be separate. All clock corrections shall be registered in the meter's memory and suitably shown on print out of collected data.

6.8.5. Testing on Site:-

6.8.5.1. The meter shall be provided with separate flashing LED's for active and reactive energy to represent the pulse output for testing the meter by suitable testing equipment. The operation indicator must be visible from the front.

6.8.5.2. It shall be possible to check the accuracy of active/ reactive energy measurement

of the meter on site by means of LED output. Resolution of the test output shall be sufficient to enable the starting current test in less than 10 minutes and accuracy test at the lowest load shall be completed with desired accuracy within 5 minutes.

6.9 OPERATIONAL REQUIREMENTS -GENERAL

6.9.1. Measurement of active energy:-

The active energy (kWh) measurement shall be carried out on 3-phase, 4-wire principle, with an accuracy as per class 0.2 S of IS 14697. In EHT meters (for CT secondary rating 1 A), the energy shall be computed directly in CT and VT/CVT secondary quantities, and indicated in kilo watt-hours. The meter shall compute the net active energy (kWh) during each successive 15 minutes block, and store it in its memory along with plus/minus sign. It shall also display on demand the net kWh sent out during the previous time block, with a minus sign if there is net kWh export.

Further, the meter shall continuously integrate and display on demand the net cumulative active energy. The cumulative/total energy kWh register shall increment in forward register in case of import and reverse register in case of export.

The meter shall be capable of programming the 15 minutes time block to 5 minutes time block at site without any additional cost.

6.9.2. Computation of Average Frequency:-

The meter shall compute the average frequency during each successive 15 minute block and store in its memory and shall be displayed preferably with 2 decimal digits. The average frequency of the previous 15-minutes block shall also be displayed, on demand in Hertz. The accuracy of frequency shall be less than 100 ppm. The meter shall be capable of programming the 15 minutes time block to 5 minutes time block at site without any additional cost.

6.9.3. Measurement of System Voltage:-

The meter shall continuously compute the average of the RMS values of the three line-to neutral VT/CVT secondary voltages as a percentage of 63.51 V, and display the same on demand. The accuracy of the voltage measurement/computation shall be at least 0.2%, or a better accuracy for voltage variation as specified in the IS:14697.

6.9.4. Measurement of Reactive Energy:-

The meter shall also compute the reactive power (VAR) on 3-phase, 4-wire principle and integrate the reactive energy (VARh) algebraically into two separate registers, one for the period for which the average RMS voltage is above 103.0% and the other for the period for which the average RMS voltage is below 97.0%. The limits of error shall conform to IS 14697 for class 0.2 S. The current reactive power (VAR), with a minus/lead sign if negative, and cumulative reactive energy (VARh) readings of the two registers shall be displayed on demand. The readings of the two registers at each midnight shall also be stored in the meter's memory. In EHT meters (1 A) the reactive power and reactive energy transmittal shall be computed in VAR/VARh directly calculated in CT and VT secondary quantities. When lagging reactive power is being sent out, VAR display shall have a plus/lag sign or no sign and VARh registers shall move forward. The cumulative/total energy kVArh register shall increment in forward regiter in case of import and reverse register in case of export.

In HT meters (5 A) all computations, displays and memory storage shall be similar except that all figures shall be one fifth of the actual Wh, VAR and VARh worked out from CT and VT secondary quantities.

6.9.5. Measurement of Power factor:-

The metering system shall be suitable for full power factor range from zero (lagging) through unity to zero (leading). The metering module shall work as an active energy import and export meter along with reactive (lag& lead) meter. Energy measurement should be true four quadrant type.

6.9.6. Harmonic measurement:-

The meter should be capable of measuring fundamental energy as well as total energy,

i.e., fundamental plus harmonics energy up to the 29th harmonic. Total energy should be made available on meter display. The total energy (fundamental plus harmonic energy) and fundamental energy shall be logged in the meter memory and be capable of down loading. However, the percentage total harmonic distortion of current and voltage and individual higher harmonic shall be measured in the meter and downloadable along with other parameters.

6.9.7. Voltage failure indication:-

The three line-to-neutral voltage shall be continuously monitored and in case any of these falls below about 70%, suitable indication shall be provided on meters' front. The time blocks in which such a voltage failure occurs/persists shall also be recorded in the meter's memory.

6.9.8. Power supply:-

The meters shall operate with the power drawn from the VT secondary circuits.

An automatic backup for continued operation of the meter's calendar-clock, and for retaining all data stored in its memory, shall be provided through a long life battery, which shall be capable of supplying the required power for at least 2 years, under meter un-powered condition. The meters shall be supplied duly fitted with the batteries, which shall not required to be changed for at least 10 years, as long as total VT supply interruption does not exceed two years.

6.9.9 Maximum Demand (MD) Registration:-

The maximum demand (apparent/active) shall be computed on fixed block principle. The maximum registered value shall be made available in meter readings. The integration period shall be set as 30 minutes that shall be able to be changed to 15 minutes integration period if required, through suitable high level software/ MRI as an authenticated transaction.

6.9.10 Maximum Demand Reset:-

Following provisions shall be available for MD reset in the meter –

i. Auto reset at predefined date and time (24.00 hrs of the last day of every month)

ii. Authenticated transaction through suitable high level software/ CMRI

iii. Facility shall also be provided for remote MD reset from a base station computer with password protection.

iv. Manual Reset

For EHT meters, all energy values & MD shall be recorded in Mega range and for HT meters, all energy values & MD shall be recorded in Kilo range. CT & PT ratios shall be programmed according to the field requirements.

6.9.11. Time Synchronization:-

The time synchronization shall be possible from remote through communication ports of the meter using time synchronization signal received from GPS through modem. Only limited clock (Maximum 1 minute once in a week) adjustment shall be possible at site. When an advance or retard command is given six subsequent time blocks shall be contracted or elongated by ten seconds each. The meter shall not accept another clock correction command for next seven days. All clock correction shall be registered in the meter's memory and shown in the downloaded meter data.

Each meter shall have a unique identification code, which shall be marked permanently on its front, as well as in its memory. This shall be displayed on demand and read remotely through an AMR system.

6.9.12. Data Storage:-

Each meter shall have a non-volatile memory in which the following shall be automatically stored:

i. Average frequency for each successive 15-minute block up to second decimal

ii. Net kWh transmitted during each successive 15-minute block, up to second decimal, with plus/minus sign

iii. Cumulative kWh transmitted at each midnight, in six digits including one decimal.

iv. Cumulative kVARh transmitted for voltage high condition, at each midnight, in six

digits including one decimal.

v. Cumulative kVARh transmitted for voltage low condition, at each midnight, in six digits including one decimal.

vi. Date and time blocks of failure of VT supply on any phase, as a star (*) mark.

The meters shall store all the above listed data in their memories for a period of minimum of 65 (sixty five) days. The data older than 65 (sixty five) days shall get erased automatically (in FIFO).

6.9.13. Communication Capability:-

The meter shall have communication facilities as per IS 15959- 2011 with latest amendments.

The meter shall have **Four communication ports** ie RS 485 and RS 232 for remote communication, Network port (RJ 45, TCP/IP) for time synchronisation and optical port for communication and data downloading. It shall be possible to retrieve online data through the above ports. Physical access to the communication port shall be restricted with sealable shrouding. The ports shall be configurable independently for communication to different systems on different protocols using different communication mediums like GPRS/ GSM, VSAT/FO link, etc. The meter shall have the facility to be connected over a networked environment.

Each meter shall have a galvanically isolated optical port on its front for tapping all data stored in its memory using universal Portable or hand held data collection devices (Common Meter Reading Instrument 'CMRI'). The communication protocol shall be open as per IS 15959. There shall be a log indicating the time stamped for all communication activity of each port. The meter shall support open protocol communication conforming to DLMS/COSEM so that third party data acquisition software from a central control center shall communicate with the meter. A test certificate from an accredited lab in this regard shall be furnished. The Meter manufacturer shall have minimum of CMMI level-3 certification. Login security and encryption methods for sending data remotely shall be as per the standards. The software should have programmable facility to restrict the access to the information recorded at basic security level as per clause 7.3.1 of CBIP Guide 325.

6.9.14. Display Parameters and Type of Display:

6.9.14.1. The meter shall have 7 digits with parameter identifier and bright LCD electronic display with back lit. The size of the digit should be minimum 10 X 5 mm. The non volatile memory should retain data for a period not less than 10 years under un powered condition.

6.9.14.2. LCD shall be suitable for temperature withstands of 70^0 C

6.9.14.3. While displaying zone wise related parameters, proper display indication may be provided for identifying the zones.

6.9.14.4. All the displays available in Auto Scroll Mode shall be made available in the battery mode.

6.9.14.5. The LCD display should have a wide viewing angle of 45^0 to 60^0 cone up to 1 meter distance. For a clear visibility of the display of the meter reading at a distance large viewing area with large icons is preferred.

6.9.14.6. Following measuring parameters should be displayed:

I) Auto Scroll Mode

Auto Scroll Parameters shall be rolled over every 10 seconds each

1. Self Diagnostic
2. Meter Sl. no.
3. LCD Segment Check
4. Anomaly String.
5. Real Date and Time
6. Instantaneous R-Phase Voltage(Phase to neutral voltage)

7. Instantaneous Y-Phase Voltage(Phase to neutral voltage)
8. Instantaneous B-Phase Voltage(Phase to neutral voltage)
9. Instantaneous R-phase Current
10. Instantaneous Y-phase Current
11. Instantaneous B-phase Current
12. Frequency
13. Phase Sequence (Voltage and current) (both should be displayed Simultaneously.
14. Instantaneous Three phase Power Factor with Sign for Lag/Lead
15. Instantaneous signed Active Power(KW)
16. Instantaneous Apparent Power (kVA)
17. Instantaneous signed reactive power(KVAr)
18. Cumulative kWh (Import)
19. Cumulative kWh-ToD Zone 1 (Import)
20. Cumulative kWh-ToD Zone 2 (Import)
21. Cumulative kWh-ToD Zone 3 (Import)
22. Cumulative kWh (Export)
23. Cumulative kWh-ToD Zone 1 (Export)
24. Cumulative kWh-ToD Zone 2 (Export)
25. Cumulative kWh-ToD Zone 3 (Export)
26. Cumulative Net Active Energy (Import-Export)
27. Cumulative KVArh lag while Active Import
28. Cumulative KVArh Lag while Active Export
29. Cumulative KVARh Lead while Active Import
30. Cumulative KVArh Lead while Active Export
31. Cumulative kVAh (Import)
32. Cumulative kVAh (Export)
33. Rising Demand in KVA (Import) with elapsed time
34. Rising Demand in KVA (Export) with elapsed time
35. Maximum Demand in kVA for the current month (Import)
36. Maximum Demand in KVA - TOD - Zone1
37. Maximum Demand in KVA - TOD - Zone2
38. Maximum Demand in KVA - TOD - Zone3
39. Maximum Demand in kVA for the current month (Export)
40. Maximum Demand in KVA - TOD - Zone 1
41. Maximum Demand in KVA - TOD - Zone 2
42. Maximum Demand in KVA - TOD - Zone 3
43. Cumulative Maximum Demand (Import)
44. Cumulative Maximum Demand (Export)
45. Present Status of PT related tamper
46. Present Status of CT related tamper
47. Present Status of other tamper
48. % THD of Voltage harmonics Phase wise (R,Y,B)
49. % THD of Current harmonics Phase wise (R,Y,B)
50. % THD above the threshold value with date and time
51. MD Reset Count
52. Program Count
53. Power ON Time.
54. Programmed PT ratio
55. Programmed CT ratio

II. Push Button Mode (Display 1)

All Auto scroll parameters shall be available in this mode)

III. Push button mode (Display 2)

- Cumulative Reactive Energy for voltage High condition (ie net KVArh when RMS

voltage is $\geq$ 103 % V_n)

- Cumulative Reactive Energy for voltage Low condition (ie net KVArh when RMS voltage is $\leq$ 97 % V_n)
- Last 15 minutes block average frequency in Hz.
- Last 15 minutes block average of active import energy
- Last 15 minutes block average of active export energy
- Last 15 minutes block average of net active (Import-Export) energy

IV. High Resolution Mode(2+5 digits) (Display 3)

- High Resolution Display Cumulative kWh (Import)
- High Resolution Display Cumulative kVArh Lag (Import)
- High Resolution Display Cumulative kVArh Lead (Import)
- High Resolution Display Cumulative kVAh (Import)
- High Resolution Display Cumulative kWh (Export)
- High Resolution Display Cumulative kVArh Lag (Export)
- High Resolution Display Cumulative kVArh Lead (Export)
- High Resolution Display Cumulative kVAh (Export)

V. Billing Parameters (Display 4)

1) History1:Cumulative KWh (Import)
2) History1: Cumulative kWh - TOD Zone1 (Import)
3) History1: Cumulative kWh - TOD Zone2 (Import)
4) History1: Cumulative kWh - TOD Zone3 (Import)
5) History1: Cumulative KWh (Export)
6) History 1: Cumulative kWh - TOD Zone1 (Export)
7) History1: Cumulative kWh - TOD Zone2 (Export)
8) History1: Cumulative kWh - TOD Zone3 (Export)
9) History1: Cumulative Net Active Energy (Import-Export)
10) History 1: Cumulative KVArh Lag (Import)
11) History 1: Cumulative KVARh Lag (Export)
12) History 1: Cumulative KVArh Lead (Import)
13) History 1: Cumulative KVArh Lead (Export)
14) History1: Maximum Demand in KVA (Import)
15) History1: Maximum Demand in KVA - TOD Zone1 (Import)
16) History1: Maximum Demand in KVA -TOD Zone2 (Import)
17) History1: Maximum Demand in KVA- TOD Zone3(Import)
18) History 1: maximum Demand in KVA (Export)
19) History1: Maximum Demand in KVA - TOD Zone1 (Export)
20) History1: Maximum Demand in KVA -TOD Zone2 (Export)
21) History1: Maximum Demand in KVA- TOD Zone3 (Export)
22) History1: Cumulative kVAh (Import)
23) History 1: Cumulative KVAh - TOD Zone 1 (Import)
24) History1: Cumulative KVAh - TOD Zone 2(Import)
25) History 1: Cumulative KVAh - TOD Zone 3 (Import)
26) History1: Cumulative KVAh (Export)
27) History 1: Cumulative KVAh - TOD Zone 1 (Export)
28) History1: Cumulative KVAh - TOD Zone 2(Export)
29) History 1: Cumulative KVAh - TOD Zone 3 (Export)
30) History1: Average Power Factor (Import)
31) History 1: Average Power Factor (Export)
32) History 2 :Cumulative KWh (Import)
33) History 2: Cumulative KWh (Export)

34) History 2: Cumulative KVArh Lag (Import & Export)
35) History 2: Cumulative KVARh Lead (Import Export)
36) History 2: Cumulative KVAh (Import)
37) History 2: Cumulative KVAh (Export)
38) History 2: Maximum Demand in KVA (Import)
39) History 2: Maximum Demand in KVA (Export)
40) History 3 : Cumulative KWh (Import)
41) History 3: Cumulative KWh (Export)
42) History 3: Cumulative KVArh Lag (Import)
43) History 3: Cumulative KVARh Lead (Import)
44) History 3: Cumulative KVAh (Import)
45) History 3: Cumulative KVAh (Export)
46) History 3: Maximum Demand in KVA (Import)
47) History 3: Maximum Demand in KVA (Export)

6.9.15. The meter body shall be type tested for IP51 degree of protection as per IS:12063 against ingress of dust, moisture & vermin. Dust proof window of transparent material (toughened) glass or UV stabilized poly carbonate) shall be provided to permit a clear view of the display. The fixing arrangement shall be such that the window glass cannot be removed without breaking the seal.

6.9.16. There shall be provision for locking and unlocking of any desired display parameter in all the modes by the user.

6.9.17. The maximum demand shall automatically be reset at 24:00 hours of the last day of each calendar month. Manual reset push button shall be provided to reset the meter at any time by the utility personnel. There shall be provision for sealing the manual rest push button.

6.9.18. The meter shall be supplied with battery backup feature for displaying the parameters during power OFF condition. Battery life shall be minimum fifteen years. Battery backup shall be provided internally. While taking reading in battery mode, the battery push button need not be pressed continuously. The meter should continue in battery mode while taking reading using UP/DOWN scroll key. Once the push button is released, the parameter shall be displayed for a sufficient duration for taking readings without any interruption.

6.9.19. kWh, kVArh and kVAh should have high resolution display to facilitate testing with desired accuracy within reasonable time. It shall be possible to read these high resolution values using CMRI.

6.9.20. Manual scroll mode shall be selectable from any point during the auto scroll mode. If no manual keys are pressed for 5 minutes the display shall automatically return to auto scroll mode. When manual key is pressed the display mode shall go to the manual mode with the same display parameter in auto mode from where the push button is pressed.

6.9.21. Anti tamper Features:-

The meter shall detect and register the active and reactive energy correctly in both directions under the following conditions:

- Change of phase sequence when that of voltage and current are changed simultaneously.
- The meter should work accurately even without neutral.
- The meter should work in the absence of any one or two phases. It should show the readings accurately for the phases having connection.
- All the above tampers will be verified at basic current at reference voltage.
- Visual indication shall be provided to show tamper conditions stated above.
- The meter shall comply all the test for external AC/DC magnetic field as per CBIP PUB No. 325 with latest amendments. Moreover, the magnetic influence test for

permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out, by putting the magnet on the meter body. After removal of magnet, meter shall be subjected to accuracy test as per IS 14697/1999(amended up to date).

- In the event the meter is forcibly opened, even by 2 mm displacement of the meter cover, same should be recorded as tamper event with date & time stamping and the meter should continuously display that the cover has been tampered. This display shall toggle with the normal display parameter.

8. **Tamper logic conditions:**

Sl No.	Tamper Name	Occurrence condition	Restoration condition	Persistence time for occurrence (Logging)	Persistence time for restoration (Logging)
1	Missing potential	Any phase voltage (Vx) falls below 70% of Vref irrespective of any other phase voltages (Vref = 63.5 V)	If Vx > or = 70% of Vref	5 minutes	3 minutes
2	Voltage unbalance	(Vmax-Vmin) > 20% of max of 3 phase voltages	(Vmax-Vmin) < 20% of max of 3 phase voltages	5 minutes	3 minutes.
3	Neutral disturbance	Any phase voltage is more tha 150% of Vref	When all the phase voltages are below 150% of Vref	5 Minutes	3 Minutes
4	Current missing/ Current open	When any phase Iph < 1% of Ib	Iph > 1% of Ib	5 Minutes	3 Minutes
5	Current unbalance	(I max- I min) > 30% of max of 3 phases of currents	(I max- I min) < 30% of max of 3 phases of currents	5 Minutes	3 Minutes
6	Current reversal	Reversal of current in any phase	Normal connection	5 Minutes	3 Minutes
7	Magnetic tamper	Either meter records at Imax as per CBIP 325 or shall not get influenced by magnetic field.	Not influenced by magnetic field.	Immediate	Immediate
8	Cover open tamper	When top cover is opened even by 2 mm displacement	Non roll over tamper	Immediate	-
9	Wrong phase association	Voltage and current sequence are different	Voltatge and current sequence are the same	5 Minutes	2 Minutes

6.9.22. Self-diagnostic Tests:-

6.9.22.1. The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location at all time. The meter shall have indication for unsatisfactory/non

functioning/malfunctioning of the following:
a) Time and date on meter display
b) All display segments (all alpha numeric) on meter display
c) RTC Battery
d) Non-Volatile Memory

7 OPERATIONAL REQUIREMENTS- EVENTS

Abnormality of Events:-The meter should have features to detect the occurrence and restoration of the following abnormal events:

7.1. Missing potential and potential imbalance:- The meter shall be capable of detecting and recording occurrence and restoration with date and time the cases of potential failure (one phase or two phases) and low potential, which could happen due to disconnection of potential leads (one or two), even at zero current. Meter shall also detect and log cases of voltage unbalance (20% or more for 5 Minutes.) Higher of the 3 phase voltages shall be considered as reference for this purpose. The meter shall log as missing potential event if the respective voltage is <70 % of V ref.

7.2. Neutral Disturbance:- Meter shall record the event when any phase voltage is more than 150% of V_{ref}. Meter shall immune to DC voltage disturbance of 400 V.

7.3. Current unbalance:- The meter shall be capable of detecting and recording occurrence and restoration with date and time of current unbalance (30% or more for 5 minutes).Higher of the 3 phase currents shall be considered as reference for this purpose.

7.4. Power OFF :- The meter shall be capable to record power OFF events in the meter memory. For this, the meter shall keep records for minimum 125 events (Occurrence +Restoration).

7.5. Current Missing:- The meter shall be capable of detecting and recording occurrences and restoration of current missing in any one or two phases of current, with date & time of occurrence and restoration if the respective phase current falls below 1% of Ib.

7.6. External Magnetic Influence :-The performance of meter shall not be affected under the influence of external DC/AC and permanent magnetic field of high intensity as mentioned in CBIP 325 and record the influence of abnormal magnetic field with date and time in the memory. The event shall also be displayed in the auto mode.

7.7. Wrong phase association indication on display :- Display of proper indication shall be shown in case of wrong phase association. The persistence and restoration time for tamper logging shall be 5 minutes and 2 minutes respectively.

7.8. The metering system shall be provided with adequate magnetic shielding so that any external magnetic field (AC electromagnet or DC magnet) applied on the metering system shall not affect the proper functioning and recording of energy as per error limits prescribed by CBIP Guide 325.

7.9. The meter shall keep records for the minimum 500 events of abnormality (occurrence + restoration). For above abnormal conditions, the recording of events shall be on FIFO basis. It shall be possible to retrieve the abnormal event data along with all related snap shots data through the meter optical port with the help of CMRI &downloaded the same to the base computer. All the information shall be made available in simple & easy to understand format compartmentalized as follows:

Compartment No.1 - 150 events of potential related
Compartment No.2 - 150 events of current related
Compartment No.3 - 50 other events (Neutral Disturbance & Magnetic Tamper)
Compartment No.4 - 125 events of power failure
Compartment No.5 - 24 events of transaction related changes
Compartment No.6 - 1 event of cover open.

Tamper events shall be logged in accordance with IS 15959 for the events
for which OBIS codes are available. For other events code provided by KSEBL shall be used. The tamper which has occurred earlier and not yet restored shall be logged in a separate register and to be shown in the downloaded meter data.

8 Connection Diagram and Terminal Marking:-

8.1. Every meter shall be indelibly marked with a connection diagram showing the phase sequence for which it is intended and shall be clearly shown on the inside portion of the terminal cover and shall be of permanent nature. In case any special precautions need be taken at the time of testing the meter, the same may be indicated along with the circuit diagram.

8.2. Meter terminals shall also be marked and this marking should appear in the above diagram.

8.3. Stickers of any kind will not be accepted in this regard

9 NAME PLATE DETAILS:-

9.1. Every meter shall have a name plate clearly visible and indelible and distinctly marked in accordance with relevant standards. The following information shall appear on a nameplate inside the meter.

1) Manufacturer's name & trade-mark and place of manufacture.
2) Serial number.
3) Designation of type.
4) Number of phases and number of wires for which the meter is suitable.
5) Guarantee period.
6) Purchaser's name
7) Purchase Order No.
8) Principal unit in which the meter records.
9) Reference voltage & frequency in Hz.
10) Basic current and rated maximum Current.
11) Meter constant (pulse rate of testing signal).
12) Reference Temperature
13) Class index.
14) Month and Year of manufacture
15) BIS marking as per statutory requirement
16) TOD timings
17) DLMS Compliant Category B Meter
18) Sign of Double Square for encased meters of protective class II
19) Property of KSEBL.

9.2. The Meter Serial No. shall be Bar Coded along with numeric No. The size of Bar Code shall not be more than 35 X 5 mm.

9.3. Stickers in any case will be not accepted for name plates.

10 DATA COMMUNICATION FACILITIES:-

10.1. Data architecture and communication protocols shall enable easy multi-vendor exchange of data without usage of any converting/translating equipment. For this, the data structure adopted within the energy meter shall be on an internationally acceptable method. The data structure/coding details shall be furnished to the Owner. All necessary software required for down loading the information to a user friendly Windows'/LINUX based operating system of Base billing computer system through CMRI shall be furnished in required number of copies (On CD) without any additional cost to the purchaser.

10.2. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer by any means).The software shall have capability to convert all the data into ASCII format.

10.3. METER READING DURING POWER OFF:-It should be possible to read the meter display visually and with MRI in absence of input voltages with help of battery backup.

10.4. DATA DOWNLOADING CAPABILITY:- Meter shall support a minimum baud rate of 9600 on optical port. It shall be possible to read selective data from the meter as specified in the companion standard**.**

11 LOAD SURVEY & BILLING HISTORY:-

11.1 The meter shall be capable of storing 15 minutes time block data for the following parameters for the last 65 days.

1. Real time clock Date and Time
2. KWh (Import & Export)

3. Net Active Energy
4. KVAh (Import & Export)
5. KVArh Lag (Import & Export)
6. KVArh Lead (Import & Export)
7. Maximum Demand (Import & Export)
8. Current & Voltage (avg of 15 min period) phase wise
9. Average Frequency for each successive 15 minutes block
10. KVArh High and KVArh Low.

11.2. The logging interval for load survey shall be 15 minutes. Load survey data shall be logged for the last 65 days on time basis. This load survey data can be retrieved using CMRI and Laptop/ any suitable equipment as and when desired and load profiles shall be viewed graphically and analytically with the help of meter application software. Whenever meter is taken out and brought to laboratory, the Load Survey data shall be retained for the period of actual use of meter. The meter application software shall be capable of exporting /transmitting these data for analysis to other user software in spreadsheet format. The resolution for load survey shall be 0.01.

11.3. Load survey parameters shall be available for minimum 65 days.

11.4. Billing History:- The meter shall record the history of following billing parameters for the last 12 months.

1. TOD wise cumulative kWH (Import & Export)
2. TOD wise cumulative kVarh lag (Import & Export)
3. TOD wise cumulative kVarh lead (Import & Export)
4. TOD wise cumulative kVAh (Import & Export)
5. PF (Import & Export)
6. MD in kVA (Import & Export)

11.5. TREND:- The downloaded meter data shall be able to construct trend duringthe load survey period as listed below.

a) Energy (KWh,KVArh and KVAh) - Import & Export
b) Average Voltage (R,Y,B)
c) Average Current (R,Y,B)
d) Average P.F (Import & Export)
e) Demand in KVA (Import & Export)

11.6. All data downloaded shall be easily convertible to printable format and be able to save as PDF. Trend during the load survey period shall be available in printable format.

11.7. The number of pages in the report should be minimum and shall cover all the details mentioned above.

12 Tests

12.1. The meter shall be tested with its base and cover in position; all parts intended to be earthed shall be earthed.

12.2. Before any test is made, the circuits shall have been energised for a time sufficient to reach thermal stability but not less than one hour.

12.3. The connection shall be done as marked on the diagram of connections.

12.4. All tests are to be carried out under reference conditions as specified in IS:14697/1999 unless otherwise specified.

12.5. During the tests for accuracy requirements, proper repeatability conditions shall be maintained. During type tests, repeatability at any test point determined on the basis of three readings at short intervals, shall be better than 1/2 of the limit of percentage error under reference conditions. Manufacturer shall state the necessary number of pulses/ pulse counts for maintaining the repeatability condition.

12.6. Uncertainty of measurement of percentage error shall not exceed 1/2 of the limit of percentage error for the given test point at reference conditions. If the uncertainty exceeds this limit, all the limits of percentage errors shall be reduced as described in CBIP 'manual on standardization of AC static energy meters' to make allowances for such uncertainty.

12.7. Unless otherwise specified, procedure for carrying out tests and the results of those tests

shall conform to the relevant clause in Manual on Standardization of AC Static Electrical Energy Meters, Pub. No. 325 CBIP and if it is not mentioned in the above manual, then to IS 14697/1999 (amended up to date) or CBIP Guide No.325.

12.8. The meter communications shall be tested with KSEBL approved modems during acceptance test/routine test.

12.9 Type Tests:-

12.9.1. Meter shall be fully type tested as per IS 14697/1999 (amended up to date), CBIP Guide No.325

12.9.2. Requirement of results and the procedure for conducting tests which are not specifically mentioned in this document shall be same as that mentioned in the manual on Standardization of AC Static Electrical Energy Meters, Pub. No. 325.

12.9.3. The Type Test Reports shall clearly indicate the design and constructional features of the type tested meters.

12.9.4. Separate Type Test Reports for each offered type of meters shall be submitted.

12.9.5. All the Type Tests shall have been carried out from Laboratories such as CPRI, ERDA, ERTL (East) or equally reputed and accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India to prove that the meters meet the requirements of the specification.

12.9.6. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

12.9.7. Type test certificates rather than type test reports are preferred.

12.9.8. Type test certificate/ reports shall be submitted along with the offer and the same shall not be more than 24 months old on the date of tender. If the type test certificate/ reports are not with in the valid period, the offer shall be rejected.

12.9.9. In case the test certificate / reports partially is/ are not meeting the requirement tests are to be carried out at no extra cost in owners presence. The same should be assured at the time of bidding.

13 Routine and Acceptance Tests:-

a) Meters shall pass the entire acceptance and routine tests, as laid down under IS 14697 and also additional acceptance tests as prescribed in this specification.

b) Following routine tests are to be conducted on every product:

i) AC High Voltage Test
ii) Insulation Resistance Test
iii) Test on limits of error
iv) Test of meter constant
v) Test of starting condition
vi) Test of no load condition

An acceptance test shall be carried out under the reference voltage, rated frequency and Cos Φ (Sin Φ) = 1 for active (reactive) energy meter at 5% of rated current. Six error tests are to be carried out successively in the load condition at intervals of 5 minutes. The variation in meter error expressed by the difference between the maximum and minimum of the errors so obtained in all these error tests shall not exceed the value corresponding to 1/2 of the limit of percentage error at the test points.

c) Following acceptance tests are to be carried out on selected samples from a lot:

i) AC High Voltage Test
ii) Insulation Resistance Test
iii) Test of limits of error
iv) Test of meter constant
v) Test of starting condition
vi) Test of no load condition
vii) Repeatability of error test
viii) Test of power consumption

d) Other acceptance tests:-i) Tamper conditions as stated in this specification

i) Tamper condition as stated in this specification
ii) Verification of ABT features.

iii) Special Tests – Voltage Variations, Frequency Variations, Harmonic test
iv) Glow wire testing for poly carbonate material
v) The meter shall comply all the test for external AC/DC magnetic field as per CBIP PUB No.325 with latest amendments, moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out, by putting the magnet on the meter body. After removal of magnet, meter shall be subjected to accuracy test as per IS:14697/1999(amended up to date).
vi) The meter shall withstand impulse voltage at 10 kV peak and impulse voltage test is to be carried out on selected samples.
vii) Vibration test.
viii) Fully assembled and finished meter shall undergo burn in test process for 12 hrs at 55 ^{0} C (maximum temperature not to exceed 60 ^{0} C under base current (Ib) load condition.
ix) KSEBL has a meter data acquisition software (MDAS) currently running in Linux (Cent OS release 6.4) platform, which is already acquiring the meter data of different DLMS meters currently installed in KSEBL. Sample meter of bidders would be tested using this MDAS application of KSEBL, regarding

a. Communication of meter data on predefined frequency as well as "on-demand basis" (instantaneous parameters, billing parameters etc.)

b. MD reset/time synchronisation from MDAS application. All the required software components for receiving meter data and converting this meter data into CDF formats will have to be provided by the bidders.

13.1 Normal Sampling Plan:- For acceptance test, meters shall be selected at random from the lot as per Clause 12.2.2.1 (ANNEX E) of IS 14697, depending upon the size of the lot and the desired acceptance quantity level.

13.2 Pre-dispatch Inspection:-

13.2.1. All Acceptance tests and Inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase.

13.2.2. The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The Company's representative(s) / Engineer(s) attending the above testing will carry out testing on suitable number of meters as per sampling procedure mentioned in this document and additional acceptance test as per this specification on samples and issue test certificate approval to the manufacturer and give clearance for dispatch.

13.2.3. All the meters offered for inspection shall be in sealed condition. The seals of sample meters taken for testing & inspection will be opened & resealed after inspection.

13.2.4. KSEBL have the right to ask the supplier to furnish new type tests certificates of sample meters at suppliers cost, at any time after the completing supply of 50% of the ordered quantity. The sample for these tests will be selected from the quantity meters already supplied. If the selected meters fail in type tests KSEBL have the right to cancel the purchase order.

13.3 Inspection after Receipts at Store:-

13.3.1. While accepting the meters at TMR Divisions, the number of sample meters will be taken out from the lot for testing, depending upon the size of the lot and will be taken at random from the lot in accordance with sampling plan given in clause 13.1. If the sample/s selected, does not conform to the tests, lot will be rejected and no compensation will be given.

Physical verification:- The sample meters shall be verified for conformity of physical requirements such as RTC fail, push button fail, tamper indications, display fail, discrepancy in display, pulse fail, battery back ups, damaged body/ cover / terminal cover, non matching screws and threads, improper holes in sealing screws etc.

13.3.2. No. of re-submission & rejection at each TMR:-The supplier shall be permitted to replace rejected lot only once in each lot in each TMR. Further rejection of replaced

quantity will lead to deduction of the same quantity from the purchase order quantity If the total deducted quantity is more than 20% of the ordered quantity, the KSEBL reserves the right to cancel the purchase order and to blacklist the firm.

14 Guarantee

14.1. The Three Phase, four wire, HT/EHT, CT/PT operated ABT Meter should be guaranteed for a minimum period of five years from the date of acceptance .

14.2. The meter should have a design life not less than ten years.

14.3. The meter found defective within the above guarantee period shall be replaced by the supplier free of cost, within three months from the date of receipt of intimation.

14.4. The intimation shall be either by hand or by registered post / courier with proper acknowledgment.

14.5. If defective meters are not replaced within the specified period as above, the Board shall recover an amount equivalent to the cost of meter plus 15% supervision charges from any of the bills of the supplier. The amount so deducted will be refunded once the faulty meter is replaced after deducting the supervision charges.

14.6. At any case the overall failure rate of meter should not be more than 2.5% of the Quantity supplied.

15 Quality Control:-The purchaser has a right to send a team of experienced engineers for assessing the progress of manufacturing and quality at any time. The team should be given all assistance and cooperation **for inspection and testing at the bidder's works.**

16 Training:- Training programme shall be arranged by the selected suppliers.

17. Components Specification:

Sl No	Component Function	Requirement	Makes
1	Measurement or computing chips	he measurement or computing chips used in the Meter should be Surface mount type.	USA: Anolog Devices, Cyrus Logic, Atmel, Philips Dallas, ST Germany:Siemens Texas Japan : NEC Freescale Renesas
2	Memory chips	The memory chips should not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. Meter shall have non volatile memory (NVM). No other type of memory shall be used for data recording and programming. (The life of the NVM is highest) There shall be security isolation between metering circuit, communication circuit, and power circuit.	USA: Atmel, National Semiconductors, Texas Instruments, Philips, ST, Japan : Hitachi Germany: Siemens
3	Display modules	a) The display modules should be well protected from the external UV radiations. b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 to 2m from ground level (refer 3.2 d for Viewing angle). The LCD and ToD facility display should have wide viewing angle of 45 degree to 60 degree cone up to 1m distance c) The construction of the modules should be such that the displayed quantity should not	Japan : Hitachi, Sony. L&G, Haijing Tinma (China) TEXAS

		be disturbed with the life of display (PIN Type). d) It should be trans-reflective HTN (HTN – Hyper Twisted Nematic (120°)) or STN (STN – Super Twisted Nematic (160°)) type industrial grade with extended temperature range.	
4	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA : National Semiconductors, Atmel, Philips, Texas Instruments, BC Component Japan : Hitachi, Oki, AVZ Samsung Japan : Panasonic Germany : Vishay
5	Battery	Only non rechargeable battery should be used for RTC and display. The RTC battery and battery for display in the case of power failure should be separate.	USA : Maxell Japan,Indonesia : Panasonic,Sony, Germany : Varta France : Saft Elegance Vitzro Tekcell

Sd/-

Chief Engineer (SCM)

GUARANTEED TECHNICAL PARTICULARS

Sl.No	PARTICULARS	
1	Type	3P4W HT/EHT, 0.2s ABT Meter
2	Standard/s to which the meter conforms	IS 14697, CBIP -325 (FOR MAGNETIC PROPERTIES & is 15959(FOR COMMUNICATION PROTOCOL)
3	Guarantee Period from the date of first Installation	IS 14697, CBIP -325 (FOR MAGNETIC PROPERTIES & is 15959(FOR COMMUNICATION PROTOCOL)
4	Rated Voltage:	5 YEARS FROM THE DATE OF ACCEPTANCE OF LAST CONSIGNMENT AS PER TENDER SPECIFICATIONS
5	Basic Current(Ib):	As per technical specification
6	Maximum Current(Imax)	As per technical specification
7	Frequency Range:	As per technical specification
8	Power Factor Range	As per technical specification
9	ISI mark	Provided
10	Minimum Starting Current	As per technical specification
11	Accuracy class for kWh and kVARh	As per technical specification
12	Test Output device	As per technical specification
13	Operation indicator	PROVIDED
14	Power consumption in voltage and current circuit	As per technical specification
15	Limits of error at all Power factor of unity/0.5 at multiples of rated currents	As per technical specification
16	Change in error due to Variation in frequency Variation in Temperature Variation in Voltage Variation in current Due to single phase current	 As per technical specification As per technical specification As per technical specification As per technical specification As per technical specification

17	One minute Power frequency withstand Voltage	As per technical specification
18	Compliant to EMC & EMI	As per technical specification
19	Basic insulation level: Impulse withstand Voltage	As per technical specification
20	Current rating of the terminal	As per technical specification
21	External Magnetic Influence	As per technical specification
22	Maximum size of cable, which can be connected at terminals	As per technical specification
23	Terminals to be bi-metallic and suitable for Aluminum / Copper Cables	As per technical specification
24	Maximum number of ToD zones that can be programmed and are programmed	AS PER IS 15959 AND TENDER SPECIFICATIONS
25	Integration period for MD that is programmed and can be programmed	As per technical specification
26	Whether programming of ToD and MD integration period can be done in the field using CMRI or Laptop	YES
27	If so, whether the facilities are having adequate security and if so, detail it.	Yes
28	ToD wise kWh and kVAh	PROVIDED
29	Whether phase wise kVAR, KW & KVA, overall pf, MD reset count, frequency, time & date , RTC battery health parameters are available in data collection?	YES.
30	Terminal Block material	As per technical specification
31	Material for meter base and cover and whether the cover is transparent	As per technical specification
32	Material for terminal cover and whether the cover is transparent	As per technical specification
33	Resistance to Heat and Fire	As per technical specification
34	Details of meter case	POLYCARBONATE METER CASE PROVIDED
35	Degree of protection against dust and water	As per technical specification
36	Details of alpha-numeric LCD display	As per technical specification
37	Display parameters available in auto scroll mode and display time of each parameter	As per technical specification
38	Display parameters available in manual scroll	As per technical specification

	mode and display time of each parameter	
39	High resolution display parameters	As per technical specification
40	No. of digits in the display	EIGHT DIGITS INCLUDING DECIMALS
41	Tamper protection features -Voltage failure	As per technical specification
	Current Unbalance	As per technical specification
	Current bypass	As per technical specification
	Magnetic Logging	As per technical specification
	Any other	AS PER SPECIFICATION
42	Whether test output provided	YES.
43	Meter & Terminal Cover sealing	As per technical specification
44	Date of issue of Type Test Certificate/report	To be provided
45	Issuing authority of type test certificate/ reports	To be provided
46	Whether any changes in design from that type tested	NO
47	Whether all type tests were conducted and all are on same design	YES
48	Whether meter is designed with ASIC or microcontroller	ASIC
49	List of bought out items which are used in the manufacturing of the meter	ATTACHED SEPERATELY
50	Standard followed in Assembly of electronic components	ANSI/IPC-A-610
51	Suppliers of metering ICs and microcontrollers	AS PER ATTACHED COMPONENT LIST
52	Whether the suppliers are STACK or IECQ registered suppliers	YES
53	State of art technology used in the manufacturing and assembly	Yes
54	Provision for testing sub- assembled cards	Yes
55	Details of volatile memory used	AS PER SPECIFICATION
56	Whether terminal cover is an extended transparent terminal cover	YES.
57	Minimum clearance and creepage distance of the terminal block and those between the terminals and the surrounding parts	AS PER TECHNICAL SPECIFICATION

58	Whether RTC is pre-programmed	YES
59	Life of RTC battery	10 YEARS
60	Maximum drift of RTC per year	+/- 2 MINUTES
61	Way of synchronisation of Energy Meter and 'RTC'	As per technical specification
62	Life of Battery for display parameters	AS PER SPECIFICATION
63	Whether meter terminals are marked	YES
64	Connection diagram is provided and whether it is a sticker?	PROVIDED. EMBOSSED ON THE TERMINAL COVER
65	Name plate details and whether meter serial number and bar code is given in the name plate	As per technical specification
66	Meter base and cover jointing method	Ultrasonic welding
67	Method adopted to transform voltage and current to the desired low values	ANALOG TO DIGITAL CONVERSION
68	Details of factory programmable parameters	As per technical specification
69	Details of user programmable parameters	As per technical specification
70	Data communication facilities	As per technical specification
71	Whether All necessary software for down loading the information through CMRI will be supplied without any additional cost?	YES
72	Whether Energy meter have a galvanically isolated optical communication port as per IEC 62056-21?	Yes
73	Average frequency computation period	AS PER TECHNICAL SPECIFICATION
74	Data storage - 65 days minimum for load survey and billing data for minimum 1 year provided	As per technical specification
75	Whether reprogramming of time block from 15 minutes to 5 minutes will be provided at site without any additional cost.	As per technical specification

Sd/-

Chief Engineer (SCM)