

# SUPPLY CHAIN MANAGEMENT

## THIRUVANANTHAPURAM

### SPECIFICATION

**3 Phase 4 Wire, CT/PT Operated, HT/EHT, Static Energy Meters of Class 0.2S Accuracy along with GPRS Modems**

<b>APPLICABLE TO KSEBL</b>	<b>Rev#0</b>	DOC. NO.: <b>SCM-SPEC/XD/HT EHT Meters with GPRS Modems</b>
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Administered by TMRs | Kannur | Shoranur | Angamaly | Pallom | Thirumala

## TECHNICAL SPECIFICATION

HT EHT meter

Doc. #: SCM-SPEC/XD/EM

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### (i) Document Approval & Control Status

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Signature	Sd/-	Sd/-	Sd/-

### (ii) Amendments and History

Sec. #	Rev. #	Date	History of Change



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### 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 Energy Meters of Class 0.2S Accuracy along with GPRS Modems 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 Energy Meters of Class 0.2S Accuracy along with GPRS Modems 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](mailto:cescm@kseb.in)



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### CONTENTS

1. SCOPE .....	5
2. STANDARD .....	5
3. SERVICE CONDITIONS.....	5
4. CURRENT & VOLTAGE RATINGS.....	6
5. GENERAL REQUIREMENTS.....	6
6. DESIGN AND CONSTRUCTIONAL REQUIREMENTS.....	8
7. OPERATIONAL REQUIREMENTS.....	23
8. CONNECTION DIAGRAM AND TERMINAL MARKING.....	24
9. NAME PLATE DETAILS.....	25
10. DATA COMMUNICATION FACILITIES.....	26
11. LOAD SURVEY.....	27
12. TESTS.....	28
13. ROUTINE AND ACCEPTANCE TESTS.....	29
14. GUARANTEE.....	33
15. QUALITY CONTROL.....	33
16. COMPONENT SPECIFICATION.....	33
GUARANTEE TECHNICAL PARTICULARS.....	36

**TECHNICAL SPECIFICATION FOR THREE PHASE, FOUR WIRE, CT /PT OPERATED, HT/EHT, STATIC ENERGY METER OF CLASS 0.2S ACCURACY**

**1.0) SCOPE:-** This specification covers the design, manufacture, testing and supply of 3 phase, 4 wire, HT CT/PT operated, Uni-directional, accuracy class 0.2S for both Active and Reactive energy, -/5A/-/1A, HT static tri vector meter with TOD register, DLMS compliant & AMR compatible with optical and RS232 port, having ISI Marking, suitable for measurement of active energy kWh, reactive energy kVARh and apparent energy kVAh and kVA MD, kW MD at nominal frequency in the range of 47.5 Hz to 52.5 Hz in balanced as well as unbalanced load conditions. The type of meter shall be surface/base mounted.

**2.0) STANDARDS APPLICABLE:-**

- |    |  |   |
|----|--|---|
| 1) | CBIP Guide on Static Energy Meter-   | - Specifications & Testing Pub No.325, January 2015 |
| 2) | AC Static Transformer operated Whr. And VARhr. Meters ,Cl.0.2S & 0.5S                                    | - IS 14697/ 99 Re affirmed 2004/IEC 62016-21        |
| 3) | Degree of Protection   | - IS 12063  |
| 4) | Testing equipment for AC Electrical Energy meter   | - IS 12346  |
| 5) | Assembling Standard of Electronic components   | - ANSI/IPC-A-610                                    |
| 6) | EMC- Testing and measurement techniques, Surge immunity test   | - IEC 61000-4-5/ 2001- 04                           |
| 7) | Basic environmental Testing procedures for electronic and electric items                                 | - IS 9000 and latest amendments there of            |
| 8) | Guidelines on Data exchange for electricity Meter reading, Tariff & Load control Companion specification | - IS 15959  |

**3.0) SERVICE CONDITIONS:-** The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical 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 <sup>0</sup> C to 55 <sup>0</sup> C   |
| 7)  | Limit of range of operation of temperature                            | - | 10 <sup>0</sup> C to 60 <sup>0</sup> C  |
| 8)  | Limit of temperature range for storage and transport                  | - | -10 <sup>0</sup> C to 70 <sup>0</sup> C |
| 9)  | Relative humidity (%)   | - | 50-99                                   |
| 10) | No. of months during which tropical monsoon conditions prevail        | - | 5                                       |
| 11) | Moderately hot and humid climate, conducive to rust and fungus growth | - |   |
| 12) | Seismic level (Horizontal accn)                                       | - | 0.3 g                                   |
| 13) | Iso-ceramic level (days per year)                                     | - | 50                                      |
| 14) | Maximum Wind Pressure   | - | 150 kg sqmt.                            |

**4.0) CURRENT &VOLTAGE RATINGS:-**

- |    |  |   |   |
|----|--|---|---|
| 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 I <sub>max</sub> | - | 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 or kVArh  |
| 8) | System of measurement                  | - | The meter is intended for 3 phase 4 wire of rating 3x110/√3,5A/1A,50 Hz |

**5.0) GENERAL REQUIREMENTS:-**

- 5.1) Meter shall bear ISI mark with S mark certification.
- 5.2) The standard reference temperature for performance shall be 27<sup>0</sup>C±2<sup>0</sup>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.
- 5.3) Unless otherwise specified, the meter should conform to all applicable clauses of standards specified above.
- 5.4) The meter should start registering the energy at 0.1 % of basic current.

5.5) The meter shall withstand and operate satisfactorily without loss of accuracy under the most hazardous tropical climatic conditions including that specified above.

**5.6) Class of Accuracy:-**

5.6.1) The class of accuracy of meter should be 0.2S for both kWh and kVARh.

5.6.2) The meter should show the readings having an error less 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.

5.6.3) The accuracy shall not drift with time.

5.6.4) 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%.

5.6.5) Voltage dips and interruptions shall not produce a change in register of more than 0.002 kWh/0.003kVAh.

5.6.6) 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 without any extra cost as a replacement (with in one month of receipt from KSEBL), during the guarantee period. Delay in replacement, will be treated as per the clause specified for replacement of faulty meter.

5.6.7) The accuracy of the meter should not be affected with the application of abnormal voltage/frequency generating device such as spark discharge of approximately 35 KV

1) On any of the phases or neutral terminals

2) On any connecting wires of the meter (Voltage discharge with 0-10m spark gap) and

3) At any place in the load circuit

The accuracy of the meter shall be checked before and after the application of above device.

**5.7) Power Consumption:-**

5.7.1) **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.

- 5.7.2. **Current Circuit:** The apparent power taken by current circuit at basic current, reference frequency & reference temperature shall not exceed 1.0 VA/phase.
- 5.7.3. 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.

**6.0) DESIGN AND CONSTRUCTIONAL REQUIREMENTS:-**

- 6.1. Meters shall be designed and constructed in such a way that in normal conditions, working personal safety against electric shock and non-effectiveness of excessive temperature are ensured.
- 6.2. Meters shall be projection type and shall have IP51 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 ageing 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 and display total energy including harmonic 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  $20^{\circ}\text{C}$  at an ambient temperature at  $25^{\circ}\text{C}$  to  $45^{\circ}\text{C}$ .
- 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. Leading PF is to be treated **as lead**. The following energies shall be recorded.

KVAh Import lag Zone 1  
KVAh Import lag Zone 2  
KVAh Import lag Zone 3  
KVAh Import lead Zone 1  
KVAh Import lead Zone 2  
KVAh Import lead Zone 3

KWh Import lag Zone 1  
KWh Import lag Zone 2  
KWh Import lag Zone 3  
KWh Import lead Zone 1

KWh Import lead Zone 2

KWh Import lead Zone 3

**6.6. TOD Timings:-**

- 6.6.1. There shall be 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 assembly parts (CT,PT,RTCs/Crystal,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 with in 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 under go functional testing using computerized 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 base & cover shall be ultrasonically welded and should be continuous and made out of unbreakable, high grade, fire resistant. Polycarbonate material so as to give it tough and non-breakable qualities which is unbreakable, corrosion resistant & inert to chemicals, flame retardant, immune to ultra violet radiation.

6.8.1.2. The meter case and cover should meet UV ageing test as per ASTM standards.

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

6.8.1.4. The top cover and terminal cover shall be transparent.

6.8.1.5. The thickness of material for meter body should be 2mm minimum.

6.8.1.6. Polycarbonate or acrylic or holographic seals shall be used. Lead seals are not permitted at all. The polycarbonate material used shall conform to the test requirement of heat deflection test as per ISO:75 and glow wire test as per the relevant standard.

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.

6.8.1.8. The housing shall be provided with a keyhole on the top for fixing, which will not be accessible to the outsider after mounting and the terminal cover sealed.

6.8.1.9. 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

**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  **$I_{max}$**  continuously and under this condition the temperature at the terminal block shall not exceed 70°C with ambient temperature within operating temperature range as defined by IS 14697.
- 6.8.2.4. Clamping screws should be provided inside the terminal cover and should have metallic sleeve moulded within the block to avoid damage during tightening of the screws.
- 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 °C and pressure of 1.8 MPa.
- 6.8.2.6. The termination arrangement shall be provided with an extended transparent terminal cover as per clause 4.2.2.4.2 of CBIP Manual on standardization of AC static Electrical Energy Meters and shall be sealable independently to prevent unauthorized tampering. The terminal cover of the meter shall be fully covered. Sealing provision shall be made against opening of the terminal cover. It is necessary to provide screws with two holes for sealing purpose.
- 6.8.2.7. The terminals in the terminal block shall be of long socket type suitable for connection of cables with aluminium conductors along with suitable lugs (lugs to be provided by the supplier ) having cross sectional area, with adequate length. Double screw arrangement shall be provided to achieve adequate termination. All terminals and connecting screws and washers shall be of tinned/nickel plated brass material.
- 6.8.2.8. The terminal screws shall have size not less than M –4 and having 5.5mm head dia.
- 6.8.2.9. Meter Terminal Cover shall be provided with separate sealing facility which can be used power utility as follows:
- One seal at left
  - Next seal at right
- 6.8.2.10. The screw shall not have pointed end of threads. The ends of screws shall be such as not to pierce and cut the conductor used. The internal diameter of terminal hole should be 5.5 mm minimum and 8 mm maximum. The holes in the insulating material which form an extension of the terminal holes shall be sufficient in size to accommodate the insulation of 4mm<sup>2</sup> copper conductors.

6.8.2.11. The terminal cover shall be transparent with minimum thickness **2 mm** and the material shall be same as that of meter case. It shall be of extended type and accommodate, in addition to the terminal block, a suitable length of external cable along with its insulation and suitable for wiring from the rear end of the meter board.

6.8.2.12. The fixing screws used on terminal cover for fixing and sealing shall be held captive in the terminal cover. When the meter is mounted on the meter board, no access shall be possible to the terminals without breaking the seals of the terminal. It is necessary to provide screws with two holes for sealing purpose.

6.8.2.13. The terminal block, terminal cover and meter case shall fulfill the test conditions for heat and fire resistance.

6.8.2.14. The clearances and creepage distances of terminal block and those between the terminals and the surrounding parts shall not be less than 3mm. Clearance of minimum 3 mm shall be provided between the incoming and outgoing terminals of the same phase.

**6.8.3. Sealing Arrangement:-**

6.8.3.1 ` The Manufacturer shall put one seal ensuring traceability on left or right side of the meter top cover before dispatch. Polycarbonate or acrylic or holographic seals shall be used. Lead seals are not permitted at all. Provision for sealing by the utility shall also be there.

6.8.3.2. The seals should have serial numbers. A soft copy (in spread sheet compatible with open office calc/ Microsoft excel) of the No. of the seal against the sl. No. of each meter should be submitted to the consignee along with each lot of supply.

6.8.3.3. The manufacturer shall supply three other seals for (a) sealing meter top cover with meter body left/right (b) optical port and (c) MD rest button. The seals shall have KSEBL logo on one side and serial number with bar code, on the other side. The seals provided by the manufacturer at factory shall be a coloured one and three seals supplied extra shall be colour less. 5% (colour less seals) of the total quantity of seals supplied shall be supplied extra.

6.8.3.4. The polycarbonate seals (to be used by the utility) to be provided along with the meters in each consignment shall be packed separately in a convenient manner in small bunches, each bunch contains 10 nos with serial No. in ascending order easily identifiable during unpacking at site

**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. Facility for adjustment of real time should be provided through CMRI with proper security.

- 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.
- 6.8.4.3. The uncertainty of setting initial time shall not be more than  $\pm 30$  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), lap top 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 232 communication port.
- 6.8.4.7. The RTC battery and battery for display in the case of power failure shall be separate.
- 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 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.
- 6.8.6. Display of Measured Values:-**
- 6.8.6.1. The push buttons for manual scroll mode should be easily accessible from the front side of the meter and projected slightly above its mounting base. It should be possible to scroll Up and Down using push buttons. Separate push buttons shall be provided for upward and downward scrolling.
- 6.8.6.2. The meter shall have 7 digits with +/- indication and legends parameter identifier and Backlit Liquid Crystal Display (LCD). The size of digit should be minimum 10x5mm. The Dot Matrix type LCD is not acceptable. Display legend shall be readable. Backlit with sufficient brightness to view the readings in the day light shall be provided for the display.
- 6.8.6.3. LCD shall be suitable for temperature withstands of 70<sup>0</sup> C.
- 6.8.6.4. The meter should have a nonvolatile memory, so that the registered parameters will not be affected by the loss of power. The non-volatile memory shall have a minimum retention time of 10 years.

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

6.8.6.6. All the displays available in Auto Scroll Mode shall be made available in the Battery Mode.

**6.8.6.7. 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) Real Date and Time
- 5) Instantaneous Phase-Phase Voltages (RY,BY& RB)
- 6) Instantaneous current R phase
- 7) Instantaneous current Y phase
- 8) Instantaneous current B phase
- 9) Frequency
- 10) Instantaneous Signed PF
- 11) Phase sequence voltage & current (in single or consecutive display)
- 12) Instantaneous Signed Active Power in KVA
- 13) Cumulative kWh.
- 14) Cumulative kVAh
- 15) History 1– Billed Average power factor
- 16) History 1 –Cumulative Kwh
- 17) History 1 –Cumulative Kwh Zone 1
- 18) History 1 –Cumulative Kwh Zone 2

- 19) History 1 –Cumulative Kwh Zone 3
- 20) History 1 – Cumulative KVArh lag
- 21) History 1- Cumulative KVArh lag Zone 1
- 22) History 1 - Cumulative KVArh lag Zone 2
- 23) History 1 - Cumulative KVArh lag Zone 3
- 24) History 1-Cumulative KVArh lead
- 25) History 1-Cumulative KVArh lead Zone 1
- 26) History 1-Cumulative KVArh lead Zone 2
- 27) History 1- Cumulative KVArh lead Zone 3
- 28) History 1- Cumulative KVAh
- 29) History1- Cumulative KVAh Zone 1
- 30) History 1-Cumulative KVAh Zone 2
- 31) History 1-Cumulative KVAh Zone 3
- 32) Rising Demand in KVA with date and time
- 33) History 1 Maximum Demand in KVA
- 34) History 1 Maximum Demand in KVA Zone 1
- 35) History 1 Maximum Demand in KVA Zone 2
- 36) History 1 Maximum Demand in KVA Zone 3
- 37) CMD in KVA
- 38) MD reset count
- 39) Present Status of abnormality
- 40) Programmable PT ratio
- 41) Programmable CT ratio



- 42) Cumulative kWh lag
- 43) Cumulative kWh lead
- 44) Current month MD in kVA TOD Zone 1
- 45) Current month MD in kVA TOD Zone 2
- 46) Current month MD in kVA ToD Zone 3
- 47) Average PF lag
- 48) Average PF lead

#### II) Manual Mode - (page 1):-

All display parameters in Auto Scroll Mode shall be provided in this page.  
Additional parameters required in this page.

- 1) Programmed PT ratio
- 2) Programmed CT ratio

#### III) Manual Mode - (page 2):-

- 1) Self diagnostic
- 2) Instantaneous Signed Active power
- 3) Instantaneous Signed Reactive power
- 4) Cumulative kWh ToD Zone 1
- 5) Cumulative kWh ToD Zone 2
- 6) Cumulative kWh ToD Zone 3
- 7) Cumulative kWh
- 8) Cumulative kVAh ToD Zone 1
- 9) Cumulative kVAh ToD Zone 2
- 10) Cumulative kVAh ToD Zone 3

- 11) Cumulative kVAh
- 12) Cumulative kVAh Lag -ToD Zone 1
- 13) Cumulative kVAh Lag -ToD Zone 2
- 14) Cumulative kVAh Lag -ToD Zone 3
- 15) Cumulative kVAh Lag
- 16) Cumulative kVAh Lead -ToD Zone 1
- 17) Cumulative kVAh Lead -ToD Zone 2
- 18) Cumulative kVAh Lead -ToD Zone 3
- 19) Cumulative kVAh Lead
- 20) Current Month MD in kVA- ToD Zone 1
- 21) Current Month MD in kVA- ToD Zone 2
- 22) Current Month MD in kVA- ToD Zone 3
- 23) Maximum Demand in kVA with date and time
- 24) Cumulative MD in kVA
- 25) Present status of PT related tamper
- 26) Present status of CT related tamper
- 27) Present status of other tamper
- 28) Last occurrence tamper ID
- 29) Date & time of last tamper occurrence
- 30) Last restoration tamper ID
- 31) Date & time of last tamper restoration
- 32) CT bypass count
- 33) CT open count

- 34) Neutral disturbance count
- 35) R phase PT Miss count
- 36) Y phase PT Miss count
- 37) B phase PT Miss count
- 38) Magnetic tamper count
- 39) Last cover open date
- 40) Last cover open time
- 41) Power on & off duration
- 42) MD reset counts or bill reset count
- 43) Programme Count
- 44) Connection ok

#### IV. High Resolution Mode(2+5 digits) (Page 3):-

- 1) High Resolution Display Cumulative Forward kWh
- 2) High Resolution Display Cumulative Forward kVArh Lag
- 3) High Resolution Display Cumulative Forward kVArh Lead
- 4) High Resolution Display Cumulative Forward kVAh
- 5) High Resolution Display Cumulative Reverse kWh
- 6) High Resolution Display Cumulative Reverse kVArh Lag
- 7) High Resolution Display Cumulative Reverse kVArh Lead
- 8) High Resolution Display Cumulative Reverse kVAh

#### V. BILLING PARAMETERS (Page 4 ):-

- 1) History 1-Billed average power factor
- 2) History 1- Cumulative kWh

- 3) History 1- Cumulative kWh - ToD zone 1
- 4) History 1- Cumulative kWh - ToD zone 2
- 5) History 1- Cumulative kWh - ToD zone 3
- 6) History 2- Cumulative kWh
- 7) History 2- Cumulative kWh - ToD zone 1
- 8) History 2- Cumulative kWh - ToD zone 2
- 9) History 2- Cumulative kWh - ToD zone 3
- 10) History 3- Cumulative kWh
- 11) History 3- Cumulative kWh - ToD zone 1
- 12) History 3- Cumulative kWh - ToD zone 2
- 13) History 3- Cumulative kWh - ToD zone 3
- 14) History 4- Cumulative kWh
- 15) History 5- Cumulative kWh
- 16) History 6- Cumulative kWh
- 17) History 1- Cumulative kVAh
- 18) History 2- Cumulative kVAh
- 19) History 3- Cumulative kVAh
- 20) History 4- Cumulative kVAh
- 21) History 5- Cumulative kVAh
- 22) History 6- Cumulative kVAh
- 23) History 1- Billing Maximum Demand in kVA (ToD zone 1)
- 24) History 1- Billing Maximum Demand in kVA (ToD zone 2)
- 25) History 1- Billing Maximum Demand in kVA (ToD zone 3)

- 26) History 2- Billing Maximum Demand in kVA (ToD zone 1)
- 27) History 2- Billing Maximum Demand in kVA (ToD zone 2)
- 28) History 2- Billing Maximum Demand in kVA (ToD zone 3)
- 29) History 3- Billing Maximum Demand in kVA (ToD zone 1)
- 30) History 3- Billing Maximum Demand in kVA (ToD zone 2)
- 31) History 3- Billing Maximum Demand in kVA (ToD zone 3)

**Note : All Parameters shall be downloadable for analysis.**

6.8.6.8. 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.

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

6.8.6.10. 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 personals. There shall be provision for sealing the manual reset push button. **Facility shall also be provided for remote MD reset from base station computer with pass word protection.**

6.8.6.11. Integration period for kVA /kW maximum demand shall be of 30 minutes real time based. Provision shall be there to change the integration time for MD to 15 minutes, if required through CMRI and lap top with pass word.

6.8.6.12. 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.

6.8.6.13. kWh, kVAh 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.

6.8.6.14. 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 returns 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.

#### 6.8.7. Anti tamper Features:-

6.8.7.1. The meter shall detect and register the active and reactive energy correctly under change of phase sequence (voltage and current) condition.

6.8.7.2. The meter should work accurately without earth.

6.8.7.3. The meter should work accurately even without neutral.

6.8.7.4. The meter should work in the absence of any one or two phases. It should show the readings accurately for the phases having connection.

6.8.7.5. All the above tampers will be verified at basic current at reference voltage.

6.8.7.6. The potential link shall not be provided on terminal block outside the main meter cover.

6.8.7.7. Visual indication shall be provided to show tamper conditions.

6.8.7.8. The meter shall comply all the test for external AC/DC magnetic field as per CBIP PUB No. 325. Moreover, the magnetic influence test for permanent magnet of 0.5 Tesla 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 IS14697/1999 (amended up to date).

6.8.7.9. In the event the meter is forcibly opened, even by 2mm 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.

6.8.7.10. The meter should be capable of recording the occurrences of a missing potential and its restoration with date and time and last restoration along with total number and duration of such occurrences during the above period for all phases.

#### 6.8.8. Self-diagnostic Tests:-

6.8.8.1. 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) Battery
- d) Self diagnostic (RTC, NVM information) on display

6.8.8.2. All display segments: "LCD Test" display shall be provided for this purpose.

#### 7.0) OPERATIONAL REQUIREMENTS:-

**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 400V.
- 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  $I_b$ .
- 7.6) **Current Reversal: -** The meter shall be capable of detecting and recording occurrence and restoration with date and time of reversal of current with phase identification. It shall possess a current reversal counter.
- 7.7) **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 displayed in the auto mode.

- 7.8) **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.
- 7.9) The metering system shall be provided with adequate magnetic shielding so that any external magnetic field (AC electro magnet 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.
- 7.10) 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
- 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. The firms can make use of spare codes available for other events.

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.

**8.0) 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.



**9.0) 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) CT Ratio
- 17) PT Ratio
- 18) 'S' mark emblem
- 19) TOD timings

20) DLMS Compliant Category C Meter

21) Sign of double square for encased meters of protective class II

22) Property of KSEB Ltd.

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.

**10.0) 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) Energy meter shall have a galvanically isolated optical communication port with proper cover & sealing facility in front of the meter for data transfer to or from a hand held CMRI and LAPTOP and a nother port for remote reading and both the ports conforming to IEC62056-21)as per below details.

a) LOCAL COMMUNICATION PORT:- The energy meter shall have a galvanically isolated IEC 1107 optical communication port with proper cover & sealing facility located in front of the meter for data transfer to or from a hand held Data Collection Device. This port shall also be used for remote data reading through modem. sealing provision should be available for optical port. It shall be possible to download the data through CMRI on power off condition and such that the battery shall be of adequate capacity. The optical port shall have a physical cable locking mechanism for properly securing the cable of an external communication device.

b) REMOTE COMMUNICATION PORT:- Meter shall have an additional communication port (RS 232) in the form of RJ11 port to interface external modem for remote data collection through GSM/GPRS communication modem. RS 232 (RJ11) port shall be preferably located under the terminal cover. Both the ports will support communication on DLMS and should be accessible through a DLMS compliant HHU. Provisions for sealing both the ports are to be made available.

- 10.4) **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.
- 10.5) **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.
- 11.0) LOAD SURVEY:-**
- 11.1) Load survey parameters required are listed below:-
1. Real Time clock date and time.
  2. Kwh
  3. KVAh
  4. KVArh Lag
  5. KVArh Lead
  6. Maximum Demand
  7. Phase wise voltage and Current
  8. PF
- 11.2) Load survey parameters shall be available for minimum 90 days.
- 11.3) The logging interval for load survey shall be 30 minutes. Load survey data shall be logged for the last 62 days on time basis. This load survey data can be retrieved using CMRI/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 parameters shall be 0.01 kWh.
- 11.4) **Billing History and Load survey:-** The meter shall record the history of billing parameters, Cumulative kWh, Cumulative kVarh lag, kVarh lead Cumulative KVAh and PF at the time of reset and kVA MD, for last 12 months.
- 11.5) **TREND:-** The downloaded meter data shall be able to construct trend during the load survey period as listed below.
- (1) Energy
  - (2) Voltage (R,Y,B)

(3) Current (R,Y,B)

(4) P.F

(5) Demand

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.

**12.0) 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 1/5<sup>th</sup> 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 1/5<sup>th</sup> 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. 304, CBIP, July 2008 and if it is not mentioned in the above manual, then to IS14697/1999 (amended up to date) or CBIP Guide No.325.

12.8) The meter communications shall be tested with KSEB Ltd approved modems during acceptance test/routine test

### 12.9) Type Tests:-

- 12.8.1) Meter shall be fully type tested as per IS 14697/1999 (amended up to date), Manual on Standardization of AC Static Electrical Energy Meters, Pub. No. 325.
- 12.8.2) 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.
- 12.8.3) The Type Test Reports shall clearly indicate the design and constructional features of the type tested meters.
- 12.8.4) Separate Type Test Reports for each offered type of meters shall be submitted.
- 12.8.5) 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.
- 12.8.6) Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.
- 12.8.7) Type test certificates rather than type test reports are preferred.
- 12.8.8.) 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 opening tender. If the type test certificate/ reports are not with in the valid period, the offer shall be rejected.
- 12.8.9) 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.

### 13.0) ROUTINE AND ACCEPTANCE TESTS:-

- a) Meters shall pass the entire acceptance and routine tests, as laid down under IS14697 and also additional acceptance tests as prescribed in this specification.
- b) Following routine tests are to be conducted on every product:
- 1) AC Voltage Test
  - 2) Insulation Resistance Test
  - 3) Test on limits of error

- 4) Test of meter constant
- 5) Test of starting condition
- 6) Test of no load condition

An acceptance test shall be carried out under the reference voltage, rated frequency and  $\cos \Phi$  ( $\sin \Phi$ ) = 1 for active (reactive) energy meters 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  $1/5^{\text{th}}$  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:

- 1) AC Voltage Test
- 2) Insulation Resistance Test
- 3) Test on limits of error
- 4) Test of meter constant
- 5) Test of starting condition
- 6) Test of no load condition
- 7) Repeatability of error test
- 8) Test of power consumption

d) **Other acceptance tests:-**

- (i) Tamper conditions as stated in this specification
- (ii) Glow wire testing for poly carbonate material
- (iii) 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 0.5T 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).

- (iv) The meter shall withstand impulse voltage at 10 Kv peak and impulse voltage test is to be carried out on selected samples.
- (v) Vibration test.
- (vi) Fully assembled and finished meter shall undergo burn in test process for 12 hrs at 55<sup>0</sup> C (maximum temperature not to exceed 60<sup>0</sup> C under base current (Ib) load condition).
- (vii) KSEBL has a meter data acquisition software (MDAS) currently running in Linux (CentOS release 6.4) platform, which is already acquiring the meter data of different DLMS meters currently installed in KSEBL. Sample meter/ modem of bidders would be tested using this MDAS application of KSEBL, regarding
  - a. Communication of meter data on pre defined frequency as well as “on-demand basis” (instantaneous parameters, billing parameters etc.)
  - b. MD reset/time synchronization 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, depending upon the size of the lot and the desired acceptance quantity level.

- a) No load condition & starting condition:- While accepting the meters the number of sample meters will be taken out from the lot for testing (lot means the total number of meters received in a Store out of inspected and approved lot by purchaser’s representative under one approval letter) depending upon the size of the lot and will be taken random from the lot in accordance with the following table.

Lot size	Number of meters to be selected at random
Upto 300	8
301 to 500	13
501 to 1000	20
1001 and above	32

Selection of number of sample meters by the consignee per lot for testing is subject to vary as per the latest IS on sampling.

If the number of defectives found in the sample of 32 is less than or equal to 1, the lot will be considered. If the number of defectives is greater than or equal to 4, the lot will be rejected. If the number of defective is 2 or 3 a further sample of 32 meters will be

taken and subjected to the tests. If the number of defectives in two samples combined is less than 4, the lot will be considered as conforming to the tests, otherwise rejected.

- b) Tests of insulation resistance, Ac voltage test, Test of power consumption:- Tests of insulation resistance, Ac voltage test, Test of power consumption, test of meter constant/registration, limits of error and interpretation of test results and adjustment.

From the sample of meters which have been drawn according to above clause 'a' and those that have passed all test of a sample of 8 meters shall be tested, all of which shall pass for conformity to these tests. If any one of the meters fails the whole lot shall be declared not conforming to the requirements of these test.

- c) Test of repeatability of Error:- Above tests shall be carried out on 3 samples selected from above meters under clause 'b' and shall be tested for repeatability of error test separately. If any one of the meters fails the whole lot shall be declared not conforming to the requirement of these tests.

### **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) KSEB 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 KSEB 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 resubmission & 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 KSE Board reserves the right to cancel the purchase order and to blacklist the firm.

**14.0) GUARANTEE:-**

14.1) The Three Phase, four wire, HT/EHT, CT/PT operated meters with LCD and ToD facility and modem should be guaranteed for a minimum period of five years from the date of acceptance .

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

14.3) The meter/modem found defective within the above guarantee period shall be replaced by the supplier free of cost, within one month 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/modem 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.

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

**15.0) 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.

**From the component specification list only reputed manufacturers may be included. Others may be excluded.**

**16.0) COMPONENT SPECIFICATION:-**

Sl. No. Component Function	Requirement	Makes
1) Measurement or computing chips	The measurement or computing chips used in the Meter should be with the 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 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.  HTN – Hyper Twisted Nematic (120°)  STN – Super Twisted Nematic (160°)	Japan : Hitachi, Sony.  L&G, Haijing Tinma (China)  TEXAS

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 for display both rechargeable and non rechargeable battery may be used. 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)**

**GTP of Energy Meter.**

Sl.No	PARTICULARS	HT METER	EHT METER
1	Type	Static ,Three Phase,4 Wire,-/5A, 11kV/110VHT CT/PT operated static, meter with LCD and ToD facility for unbalanced load current. Model -	Static ,Three Phase,4 Wire,-/1A, -/110V HT CT/PT operated static, meter with LCD and ToD facility for unbalanced load current. Model -
2	Standard/s to which the meter conforms	IS-14697, CBIP-325 for magnetic properties and IS-15959 for communication protocol.	IS-14697, CBIP-325 for magnetic properties and IS-15959 for communication protocol.
3	Guarantee Period from the date of first Installation	5 years	5 years
4	Rated Voltage:	3 x 63.5 v (P-N) or 110 V (P-P)	3 x 63.5 v (P-N) or 110 V (P-P)
5	Basic Current(Ib):	5 A	1 A
6	Maximum Current(I <sub>max</sub> )	10 A (200% of Ib)	2 A (200% of Ib)
7	Frequency Range:	50 Hz +/- 5%	50 Hz +/- 5%

8	Power Factor Range	0 Lag - Unity - 0 lead	0 Lag - Unity - 0 lead
9	ISI mark	Provided	Provided
10	Minimum Starting Current	0.1% of Ib	0.1% of Ib
11	Accuracy class for kWh and kVARh	Class 0.2S	Class 0.2S
12	Test Output device	Provided in the form of RED LED's for kWh & kVARh.	Provided in the form of RED LED's for kWh & kVARh
13	Operation indicator	Provided	Provided
14	Power consumption in voltage and current circuit	Less than 1.0 W per phase and less than 4 VA per phase in voltage circuit & less than 1 VA in current circuit.	Less than 1.0 W per phase and less than 4 VA per phase in voltage circuit & less than 1 VA in current circuit.
15	Limits of error at all Power factor of unity/0.5 at multiples of rated currents	Complied as per IS-14697	Complied as per IS-14697
16	Change in error due to Variation in frequency	Complied as per IS-14697	Complied as per IS-14697
	Variation in Temperature	Complied as per IS-14697	Complied as per IS-14697
	Variation in Voltage	Complied as per IS-14697	Complied as per IS-14697
	Variation in current	Complied as per IS-14697	Complied as per IS-14697
	Due to single phase current	Complied as per IS-14697	Complied as per IS-14697

17	One minute Power frequency withstand Voltage	Complied as per IS-14697	Complied as per IS-14697
18	Compliant to EMC & EMI	Complied as per IS-14697	Complied as per IS-14697
19	Basic insulation level: Impulse withstand Voltage	Complied as per IS-14697	Complied as per IS-14697
20	Current rating of the terminal	Complied as per IS-14697	Complied as per IS-14697
21	External Magnetic Influence	Complied as per IS-14697	Complied as per IS-14697
22	Maximum size of cable, which can be connected at terminals	Complied as per tender conditions.	Complied as per tender conditions.
23	Terminals to be bi-metallic and suitable for Aluminum / Copper Cables	Complied	Complied
24	Maximum number of ToD zones that can be programmed and are programmed	6 TOD zones can be programmed. 4 Zones and 3 tariffs as per the specification pre programmed.	6 TOD zones can be programmed. 4 Zones and 3 tariffs as per the specification pre programmed.
25	Integration period for MD that is programmed and can be programmed	30 minutes. Programmable to 15 minutes as per IS-15959	30 minutes. Programmable to 15 minutes as per IS-15959
26	Whether programming of ToD and MD integration period can be done in the field using CMRI or Laptop	Yes. Possible with the help of HLS password.	Yes. Possible with the help of HLS password.

27	If so, whether the facilities are having adequate security and if so, detail it.	HLS (Using High Level Security password as per IS-15959)	HLS (Using High Level Security password as per IS-15959)
28	ToD wise kWh and kVAh	Provided	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?	Complied	Complied
30	Terminal Block material	Poly carbonate	Poly carbonate
31	Material for meter base and cover and whether the cover is transparent	poly carbonate & meter cover is transparent	poly carbonate & meter cover is transparent
32	Material for terminal cover and whether the cover is transparent	Transparent poly carbonate	Transparent poly carbonate
33	Resistance to Heat and Fire	Complied as per IS-14697	Complied as per IS-14697
34	Details of meter case	Poly carbonate	Poly carbonate
35	Degree of protection against dust and water	Complied to IP 51	Complied to IP 51
36	Details of alpha-numeric LCD display	7 segment, 8 digit STN LCD display	7 segment, 8 digit STN LCD display
37	Display parameters available in auto scroll mode and display time of each parameter	Provided as per the specifications.	Provided as per the specifications.

38	Display parameters available in manual scroll mode and display time of each parameter	Provided as per the specifications.	Provided as per the specifications.
39	High resolution display parameters	Provided as per the specifications.	Provided as per the specifications.
40	No. of digits in the display	8 digits including decimal points.	8 digits including decimal points.
41	Tamper protection features:	Provided as per the specifications.	Provided as per the specifications.
	12. Voltage failure		
	12. Current Unbalance	Provided as per the specifications.	Provided as per the specifications.
	12. Current bypass	Provided as per the specifications.	Provided as per the specifications.
	12. Magnetic Logging	Provided as per the specifications.	Provided as per the specifications.
	12. Any other	Other parameters rovided as per the specifications.	Other parameters provided as per the specifications.
42	Whether test output provided	Yes. In the form of RED LED	Yes. In the form of RED LED.
43	Meter & Terminal Cover sealing	Provided as per the specifications.	Provided as per the specifications.
44	Date of issue of Type Test Certificate/report		
45	Issuing authority of type test certificate/ reports		
46	Whether any changes in design	No	No



	from that type tested		
47	Whether all type tests were conducted and all are on same design	Yes	Yes
48	Whether meter is designed with ASIC or microcontroller	Meter designed with micro-controller	Meter designed with micro-controller
49	List of bought out items which are used in the manufacturing of the meter	Attached with the offer	Attached with the offer
50	Standard followed in Assembly of electronic components	ANSI / IPC - A - 610	ANSI / IPC - A - 610
51	Suppliers of metering ICs and microcontrollers	As per the component list of specification.	As per the component list of specification.
52	Whether the suppliers are STACK or IECQ registered suppliers	Yes	Yes
53	State of art technology used in the manufacturing and assembly	SMD & PTH	SMD & PTH
54	Provision for testing sub-assembled cards	Available with our vendors	Available with our vendors
55	Details of volatile memory used	RAM inside the controller & Non volatile memory used for data retention and programming	RAM inside the controller & Non volatile memory used for data retention and programming
56	Whether terminal cover is an extended transparent terminal cover	Yes. Complied as per tender specifications.	Yes. Complied as per tender specifications.

57	Minimum clearance and creepage distance of the terminal block and those between the terminals and the surrounding parts	Complied as per IS-14697	Complied as per IS-14697
58	Whether RTC is pre-programmed	Yes	Yes
59	Life of RTC battery	Minimum 10 years in absence of power.	Minimum 10 years in absence of power.
60	Maximum drift of RTC per year	Complied as per IS-14697	Complied as per IS-14697
61	Way of synchronisation of Energy Meter and 'RTC'	Using optical port as per IS-15959	Using optical port as per IS-15959
62	Life of Battery for display parameters	10 years	10 years
63	Whether meter terminals are marked	Yes	Yes
64	Connection diagram is provided and whether it is a sticker?	Embossed on terminal cover	Embossed on terminal cover
65	Name plate details and whether meter serial number and bar code is given in the name plate	Provided as per the specifications.	Provided as per the specifications.
66	Meter base and cover jointing method	Ultra-sonic welding	Ultra-sonic welding
67	Method adopted to transform voltage and current to the desired low values	Voltage divider for voltage reduction and current transformer for current reduction	Voltage divider for voltage reduction and current transformer for current reduction
68	Details of factory programmable	As per IS 15959	As per IS 15959

	parameters		
69	Details of user programmable parameters	As per IS 15959	As per IS 15959
70	Data communication facilities	One optical port and separate RS-232 port	One optical port and separate RS-232 port
71	Whether All necessary software for down loading the information through CMRI will be supplied without any additional cost?	Yes Complied	Yes Complied
72	Whether Energy meter have a galvanically isolated optical communication port as per IEC 62056-21?	Yes Complied	Yes Complied

Sd/-  
**Chief Engineer (SCM)**

**Detailed Technical Specification for GPRS Modems for AMR System**

1. **Scope:** The modem should be able to communicate with all makes of DLMS complaint DTR/HT-LT Consumer/Border/Feeder meters by using the RS232 protocol.

The modem should have an on-line tamper detection feature through which modem will continuously poll the meter for any new tamper and in case of any tamper event, should send the event to the server and also to a set of pre- programmed mobile numbers as an SMS alert. It should also send real time outages to the server and other configured bile numbers. Modem should have a provision to collect and send all the billing data from meters.

There should be Auto restart feature using hardware Watch Dog Timer (WDT) in case modem fails to respond. There should be comprehensive self-diagnosis feature which will create log file. There should be a provision for an interface with PC/laptop to interact with the modem.

Modem should have a program over the air (POTA) feature which will reduce the manual field visits. There should be provision to reprogram modem firmware remotely from the server.

A RS232 Serial Link supporting up to 115,200 bauds with an auto-bauding option should be provided. The modem should use meter supported baud rate to read meter data and should use maximum network supported baud rates to push the data to server.

It should have a configurable scheduled meter read and data transmit feature to enable grouping of the meters so that the loading on the server is equally distributed from all the field installed modems. It should have selective on-demand meter read feature through which server can send an on demand request to modem to read the selective parameters from the meter. Modem should also return Instantaneous Parameters when it receives on demand SMS request.

Should be capable of operating on Three phase supply drawn from the Meter input itself as well as on single phase supply. Auxiliary Power supply will not be acceptable. The operating voltage range for the modem should be 63 V AC P-P to 440 V AC P-P, so that the modem can be used on both HT & LT Trivector Meters. Modem should also be capable of operating on single phase 230 V, 50 Hz power supply. The modem should have the capacity to withstand surges according to Indian standards. Maximum Power Output should be 2 W at 900 MHz (Class 4) and 1W at 1800 MHz (Class 1). VA Burden of the Modem should not exceed 3.5 VA during data communication. Should withstand surge voltages up to 6KV and as per IEC61000-4-5. Modem should be capable for continuous working for 24 hours every day under field conditions, even when enclosed in Metering Cubicles at Consumer sites.

It should have built-in Li-ion battery with super capacitor or some other arrangement so as to obtain sufficient battery back up.

Modem should be a compact model that can be housed in a polycarbonate/engineering plastic/Metallic enclosure. The modem should comply with IP51 degree of protection. Size of modem should be such that it can be fixed inside meter box and modems should have the capability for mounting arrangement on meter box side. Modem should withstand vibration of 2g and shock of 40g

The Modem should be supplied with power cable, High Gain antenna with co-axial cable of suitable length, RS 232 connecting cable with suitable connector (RJ11, DB9, optical) for meter side, mounting adopter etc.

2. **Sealing:** The modem should cover and body should have arrangement for sealing. In addition to this, the SIM card holder cover should also have arrangement for sealing. Sim should be inserted in modem without opening the cover of modem.
3. **Antenna:** The Modem should have flexible external high gain antenna (with gain more than 3 Dbi) to enable placement of the antenna at the location of strongest signal inside the Metering Cubicle. RF functionalities should comply with the GSM phase II/II+ compliant, EGSM 900/GSM 1800 recommendation.

4. **Outage Notification:** In the event of an outage, the modem should be able to initiate separate call or send SMS / notification to a particular IP, predefined number to notify the outage event with date and time of occurrence and restoration.

The Modem should act in such a way that the commands received from Data acquisition server to meter and meter to data acquisition server are transmitted without any changes in data. Data collection from meter should take place only after connection is established between Data acquisition server and Meter.

The Modem should be capable of operating with SIMs of local GPRS/GSM Service provider in the area. Data enabled SIM card will be provided by the utility and monthly SIM charges will be borne by the utility. The modem should accept the standard SIM Card. Modem should be suitable for long duration data transmission and should be protected from external interference of systems working at different bands. There should be a provision to seal SIM card slot/cover to avoid unauthorized access. Modem should be Dual Band modem capable of operating at 900 and 1800 MHz GSM transmission. Modem should support both Data and SMS transmission. Modem should support hot swapping of SIM cards. SIM interface should be a 3V Interface in accordance with GSM 11.12 phase 2. Modem should have a SMA Antenna connector to interface with external antenna of required gains.

5. **Sensitivity:-**

GSM 900 : <-100 dBm

GSM 1800 : <-100 dBm

6. **Data Features:-** Modem should use standard AT Command set (GSM 07.05, GSM07.07) for settings of the modem. TCP/IP stack access via AT commands
7. **Internet Services:** TCP, UDP, HTTP, FTP, SMTP, POP3
8. **CSD Data transmission features :-** Data circuit asynchronous, and non transparent upto 14.4 Kb/s V.110 USSD Support.
9. **GPRS Data transmission features :-** GPRS Class B Multi slot class 12 or class B Multi slot class 10
10. **Packet channel support :** PBCCH
11. **Coding Schemes:** CS1 to CS4 compliant with SMG32 (Release97)
12. Deleted
13. Deleted
14. **SMS Features:** - Text and PDU

Point to point (MT/MO) Cell broadcast



# SUPPLY CHAIN MANAGEMENT

Thiruvananthapuram  
Administered by TMRs | Kannur | Shoranur | Angamaly | Pallom | Thirumala

## TECHNICAL SPECIFICATION

HT EHT meter

Doc. #: **SCM-SPEC/XD/EM**

Rev.#: 0

Effective Date 10-12-2021

**15. Environmental Specifications :-** The Modem shall meet the following environmental specifications : Storage Temperature : -20 degrees to +70 degree Celsius

Operating Temperature: -10 degrees to +60 degree Celsius

Humidity:- 95% RH ( Non – Condensing)

**16. Operational Indicator :-** The Modem should have separate LED indications sufficiently visible from outside, for transmit data, receive data, carrier detects and Power ON, etc. to indicate Power on position and to indicate the availability of signal at the place of installation.

Modem should have facilities for time synchronizing the meter with Head End System or Server/Network time by passing the required commands to meter.

As prequalification, field test will be done to ensure communication with the selected meters.

Plug-n-play installation with automatic meter detection for all DLMS meters.

Modem should comply with IEC61000-4-2 for Electrostatic Discharge standards and IEC61000-4-4 Fast Transient Burst.

Sd/-  
**Chief Engineer (SCM)**

### GTP of GPRS Modem

1	Modem type	GPRS Modem
2	Modem make	AMITECH
3	Guarantee Period from the date of first Installation	5 Years
4	Operating voltage	63 V AC P-P to 440 V AC P-P
5	Frequency range	50 Hz
6	Degree of protection against dust and water	IP 51

7	Whether online tamper detection feature provided.	Complied
8	Whether Auto restart feature using hardware watch dog timer provided	Complied
9	Whether program over the air feature provided.	Complied
10	Ports provided	RS 232 Port provided
11	Baud rate	9600
12.	Type of built in battery provided	Complied as per Specification
13	Details of antenna supplied	3 dB
14	Sensitivity of modem	Complied as per Specification
15	Supported Internet services	Complied as per Specification
16	CSD data transmission features	Complied as per Specification
17	GPRS data transmission features	Complied as per Specification
18	Packet channel support	PBCCH : Complied, for GPRS only
19	Coding schemes	Complied as per Specification
20	SMS features	Complied as per Specification

Sd/-  
**Chief Engineer (SCM)**