



# SUPPLY CHAIN MANAGEMENT THIRUVANANTHAPURAM

## SPECIFICATION Single Phase Energy meter

APPLICABLE TO KSEBL

Rev#0.1

DOC. NO.: **SCM-SPEC/XD/EM**

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

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#### (i) Document Approval & Control Status

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#### (ii) Revision Approval & Control Status

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Date	11-6-2021	11-6-2021	11-6-2021
Signature	<b>Sd/-</b>	<b>Sd/-</b>	<b>Sd/-</b>

#### (iii) Amendments and History

Sec. #	Rev. #	Date	History of Change
<b>Clause 23 Component Specification</b>	<b>0.1</b>	<b>11-6-2021</b>	<b>item no.2 Memory chips – ROHM added</b>



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## 1. PURPOSE

Purpose of this document is to document updates & history, upkeep and publish the specifications related to **Single Phase Energy Meters** 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 **single phase energy meters** used in field by KSEBL

## 3. RESPONSIBILITY

**Executive Engineer(M), 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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### TECHNICAL SPECIFICATION FOR LT SINGLE PHASE STATIC ENERGY METERS WITH LCD, TOD FACILITY AND DLMS COMPLIANCE

- SCOPE:-** This specification covers the Design, Manufacture, Testing and Supply of ISI marked DLMS compliant, LT, AC single phase Static Energy Meters having ToD facility and LCD display with backlit, of rating 5-30A accuracy class 1.0 suitable for measurement of Active Energy (kWh), Apparent Energy (kVAh) and Demand (kW MD & kVA MD) in Single Phase, Two wire system of LT Consumers.
- DEMONSTRATION:-** The purchaser reserves the right to ask for the demonstration of the meter offered at the purchaser's place.
- METER SOFTWARE:-** CMMI- Level III certification.
- 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)	Specified operation range of temperature	:	00C to 550C
4)	Limit of range of operation of temperature	:	100 C to 60 0
5)	Limit of temperature range for storage and transport	:	-100C to 700C
6)	Moderately hot and humid climate, conducive to rust and fungus growth. Relative humidity (%)	:	50-99
7)	Average no. of thunderstorm days/annum (Isoceraunic level)	:	80-100
8)	Average number of dust storm days per annum	:	5
9)	Average number of rainy days per annum	:	120-140
10)	Average number of tropical monsoon months per annum	:	6 months
11)	Annual rain fall	:	10 cms to 150 cms
12)	Seismic level (Horizontal accn)	:	0.30g
13)	Maximum Wind Pressure	:	150kg /sqmt.



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#### 5. APPLICABLE STANDARD:-

- 1) Manual on Standardization of AC Static Electrical Energy Meters, CBIP guide on static energy meters – Specification and testing Research Pub: No.325
- 2) AC Static Watt-hour Meters, Cl.1 &2                      IS: 13779/1999
- 3) Degree of Protection    IS: 12063
- 4) Testing equipment for AC Electrical Energy meter                      IS: 12346
- 5) Terminal Arrangement    IS: 13779
- 6) Testing, Evaluation, Installation and Maintenance of AC Electrical Meter – Code of Practice                      IS: 15707:2006
- 7) Assembling Standard of Electronic components                      ANSI/IPC-A-610
- 8) General requirements, tests & test condition                      IEC-62053-21 for AC static Watt-hour meter with latest amendments on the standards above
- 9) IEC:62056-21/ IS:15959:2011 and its amendments and additions                      Data Exchange/ DLMS

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

1. IS

2. CBIP guide on static Energy meters – Specification and testing Research Publication No.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.

#### 6. CURRENT & VOLTAGE RATINGS:-

- 1) Voltage rating    240V between phase and neutral.
- 2) Voltage variation    +20% to -40%
- 3) Standard Basic Current  $I_b$     5A
- 4) Rated maximum current  $I_{max}$     30 A
- 5) Standard frequency    50Hz  $\pm$  5%



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6) Power Factor: Should work for zero to upf (lag or lead)

#### 7. GENERAL REQUIREMENTS:-

- 7.1. Meter shall bear ISI mark
- 7.2. Meter shall be a multi- parameter energy meter.
- 7.3. The meter should work for Zero to unity PF (lag or lead). The current rating shall be 5-30A. Rated basic current ( $I_b$ ) for L.T. Energy Meters shall be 5A and the maximum continuous current ( $I_{max}$ ) shall be 600% of rated basic current. Meters shall work accurately upto 150% of  $I_{max}$  i.e. 45Amps.
- 7.4. The standard reference temperature for performance shall be 27°C ( $\pm 2^\circ\text{C}$ ). The mean temperature co-efficient should not exceed 0.07%. Temperature rise shall be as per IS 13779/1999 (amended up to date).
- 7.5. Unless otherwise specified, the meter should conform to all applicable clauses of standards specified above.
- 7.6. The meter shall withstand and operate satisfactorily without loss of accuracy under the most hazardous tropical climatic conditions including that specified above.
- 7.7. One Laptop of basic configuration of reputed make with BCS Software shall be supplied to each TMR Division, Thirumala / Pallom / Angamaly / Shornur / Kannur.

#### Laptop Specification(one for each Consignee)

Intel core i3, 7th Gen Processor or higher

3M Cache, 2.30 Ghz or higher

8 GB DDR4 RAM.

1 TB HDD, DVD RW Drive

Integrated Ethernet, Wireless LAN,

Bluetooth, HDMI port, minimum 2 USB port, Windows 10 preloaded(OS)

14" Screen, MS office, Antivirus.

Carrying case, Four numbers of RJ11 to USB converter cable at least 1 metre length

#### Three year warranty

#### 8. Class of Accuracy:-

- 8.1. The class of accuracy of meter should be 1.
- 8.2. The meter should show the readings having an error less than the limits of permissible percentage for all values of current between 5% of basic current and 150% of the maximum current.
- 8.3. The accuracy shall not drift with time.
- 8.4. 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.



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(While conducting 35 KV spark discharge test, the RS 232 port portion can be excluded from the test point).

8.4.1. At the phase and neutral terminal.

8.4.2. On any connecting wires of the meter (Voltage discharge with 0-10mm spark gap) and At any place in load circuit

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

8.5. 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 (within three months of receipt from KSEBL), during the guarantee period. At any case the overall failure rate of meters should not be more than 2.5% of the quantity supplied. Delay in replacement, will be treated as per the clause specified for replacement of faulty meter.

### 9. Power Consumption:-

9.1. **Voltage Circuit:-** The active & apparent power consumption of voltage circuit including power supply of meter at reference voltage, reference temperature & frequency shall not exceed 1.0 Watt & 4.0 VA.

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

9.3. **Starting Current:-** The meter should start registering the energy at 0.2 % of basic current (Ib)

9.4. **Frequency:-** The rated frequency shall be 50 Hz with a tolerance of  $\pm 5\%$ .

### 10. CONSTRUCTION:-

10.1. The meter base & cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The cover shall be transparent and the base shall be translucent/ transparent/opaque. The Polycarbonate shall conform to IS 11731(FH-1 category) besides meeting requirement of heat- deflection test as per ISO 75, glow wire test as per IS: 11000 ( Part 2/ sec-1) 1984 (as amended upto date).

10.2. The base and cover shall be ultra - sonically welded (continuous welding) so that once the meter is manufactured and tested at factory, it should not be possible to open the cover at site except the terminal cover. Chemical welding /Single mould also allowed.

### 10.3. Meter Seals:-

10.3.1. The Manufacturer shall put one seal ensuring traceability on left or right side of the meter body before dispatch. Polycarbonate or acrylic or Integrated Snap fit seals shall be used. If snap fit seals are used two nos of the same shall be provided on left and right sides of the meter body. Also provide 2 additional seals for optical and meter body.

If the meter is offered in single mould, adequate number of seals shall be provided.





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The manufacturer should supply two other seals for Optical Port and Meter body along with each meter. The seals shall have KSEBL logo on one side and Barcode (Incorporating Serial number) on the other side.

The seal provided by the manufacturer at factory shall be a colored one and the two seals supplied extra shall be colourless. 5% extra colourless seals shall be supplied separately.

- 10.3.2. The seals should have serial numbers. A soft copy (in spread sheet compatible with open office calc/ Microsoft excel) of the serial numbers of the seals against the SI. No. of each meter should be submitted to the consignee along with each lot of supply as mentioned in clause 15. Serial numbers of seals supplied extra shall also be given as extra soft copy.
- 10.3.3. Terminal block (Meter Terminal Cover) shall be provided with separate sealing facility (at least two seals) which can be used by testing/ commercial group of power utility as follows
- (a) One seal at left bottom
  - (b) Next seal at right bottom

**(OR)**

Meter terminal cover shall be hinged to the left / Top side of terminal block and there shall be provision for one seal to be put by utility at the central portion of the Meter terminal cover. The hinge, fixing screws used on terminal cover for fixing and sealing shall be held captive in the terminal cover. Meter terminal cover shall not be detachable without breaking the seal from the sealing screw. Meter can also be made available in a single mould design.

When the meter is mounted on the meter board, no access shall be possible to the terminals without breaking the seals of the terminal.

- 10.3.4. There shall be provision for sealing the optical port also.
- 10.4. The thickness of material for meter body should be  $2 \pm 0.2$  mm.
- 10.5. The manufacturer shall indicate hardness, melting temperature and tensile yield strength of the material used for the manufacture and necessary test certificate of the same shall be furnished.
- 10.6. 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 (IS- 11000 Part II/ Sec-1 1984)..
- 10.7. Every meter shall have three fixing holes, one at the top and two at the bottom. The top hole shall be provided with a special clip at the back of the meter so that holding screw is not accessible to the consumer after fixing of the meters. The lower fixing screws



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shall be provided under the sealed terminal cover. The requisite fixing screws shall be supplied with each meter.

**(OR)**

The housing shall be provided with a keyhole on the top for fixing, which will not be accessible to the outsider after mounting the meter and the terminal cover is sealed. Also the key hole should be so constructed that it shall not affect the degree of ingress protection.

10.8. The meter shall be projection type and dust and moisture proof.

10.9. The meter body shall be type tested for **IP 51** or better degree of protection as per IS:12063 against ingress of dust, moisture & vermin.

#### **10.10 Terminal block, Terminal arrangement and cover:-**

10.10.1. Moulded terminal block for connections conforming to IS:13779/ 1999 (amended up to date) to meet the requirement of terminal connection arrangement shall be provided. The termination arrangement shall be provided with an extended transparent terminal cover as per clause number 6.5.2 of IS:13779 and shall be sealable independently to prevent unauthorized tampering. The terminal cover of the meter shall be fully covered and thickness of the cover **should be  $2 \pm 0.2$  mm**. The moulded terminal block shall be made from best quality engineering plastic confirming to FH of IS:11731 (part I 1986) having adequate insulation properties and Mechanical strength with tinned/ Nickel plated brass inserts for connecting terminals. The terminals screws shall have size not less than M-4 and having 5 to 6 mm head dia. All terminals and connecting screws should be of tinned/ Nickel plated brass materials.

10.10.2. Cage clamp design should be provided for terminal blocks.

**(OR)**

Two screws shall be provided in each terminal. The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor with the help of two screws.

10.10.3 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. The holes in the insulating material which form an extension of the terminal holes shall be sufficient in size to accommodate the insulation of 6mm<sup>2</sup> weather proof Al conductor.

10.10.4. 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.

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



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- i. The terminal block, terminal cover and meter case shall fulfill the test conditions for heat and fire resistance.
- ii. The minimum clearance and creepage distance of the terminal block and those between the terminals and the surrounding parts shall not be less than 3mm and 3.2 mm respectively. Rated impulse voltage is 6kV as per Clause 12.7.6.2 of IS:13779 and its latest amendment and the requirement of the impulse voltage test shall also be met.
- iii. All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.

#### 10.11 Real Time Clock:-

- 10.11.1. 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 with latest amendments.
- 10.11.2. RTC shall be pre-programmed for 15 Years Day/ date without any necessity for correction.
- 10.11.3. Maximum drift shall not exceed +/- 420 Seconds per year.
- 10.11.4. The uncertainty of setting initial time shall not be more than  $\pm 30$  seconds from Indian Standard Time as maintained by NPL, New Delhi.
- 10.11.5. The RTC shall have long life (10 Years) non-rechargeable battery.
- 10.11.6. Time & date setting shall only be possible through Common Meter Reading Instrument (CMRI)/ Laptop/PC.
- 10.11.7. Synchronization of Energy Meter and 'RTC' Time/Date shall be possible through password/ Key code enabled command from PC/ Laptop (BCS)/ CMRI.
- 10.11.8. The RTC battery and battery for display in the case of power failure should be separate.

#### 10.12 Test out put device:-

- 10.12.1. The meter shall be provided with flashing LED to represent the pulse output for testing the meter by suitable testing equipment. The operation indicator must be visible from the front.
- 10.12.2. It shall be possible to check the accuracy of active and apparent 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.

**(OR)**



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A single LED output shall be provided for checking the accuracy of active and apparent energy measurement wherein there should be provision for selection of kWh/ kVAh calibration.

#### (OR)

A single LED shall be provided for checking the accuracy of active energy measurement and kVAh reading should be available in high resolution mode.

- 10.13.** The meter shall withstand external magnetic influence from all directions as per CBIP 325 and shall be immune upto the threshold values as specified in Clause 11.5 for DC and permanent magnet and for AC magnet upto 5mT.

Above the threshold values specified Tamper to be logged after 5 minutes of detection of presence of external abnormal magnetic induction/ field/ influence conditions as per CBIP 325, with the meter logging the event with date and time at Reference voltage, (Vref), 100% maximum current (I max ) and UPF. Recovery time shall be 10 seconds.

- 10.14.** One CT (in Neutral circuit) and one shunt (in phase circuit) shall be provided inside the meter. The current whichever is measured as higher either by CT or shunt shall be used for processing. The shunt should be magnanin based and e-beam welded for the construction purpose.

In order to bring reliability, the meter construction shall have the measuring elements like shunt and CT mounted on terminals or base, and ensure that the secondary connections of Shunt directly soldered to PCB and CT secondary wires should be minimized, and soldered to PCB.

- 10.15** The meter shall be capable to withstand phase to phase voltage (440V) if applied between phase to neutral for minimum 5 min.

- 10.16** Power supply unit in the meter should be transformer less to avoid magnetic influence.

- 10.17** Display parameters in the meter should not be accessible for reprogramming at site through any kind of communication except the field programmable parameters mentioned in IS 15959 Table.31. Communication ports provided shall be properly secured by hardware lock (As per IS 15959) as well as software lock High level Security Password (HLS) used to change programmable parameters as defined in IS15959 (Table 31)] to prevent reprogramming. Provision for an external seal by the utility, shall be provided.

- 10.18.** Complete metering system & measurement shall not be affected by any external electromagnetic interference **as per CBIP 325**. The Meter shall meet the requirement of Manual on standardization of AC static Electrical Energy Meters, CBIP 325 with latest amendments. **Also Refer Clause 10.13 and 11.5.**



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**10.19.** 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.

**The test for immunity to Electromagnetic HF fields shall be carried out as per IS:14700/Part-4/sec.13 2008) mentioned under CBIP:325. Test circuit diagram for DC signal and harmonics is mentioned in Annexure-D of IS:13779:1999. Influence quantities and tolerance shall be as per Table -17 of IS 13779:1999 and its subsequent amendments if any.**

**10.20.** The meter shall record and display total energy including Harmonic energy.

**10.21. Self Diagnostic Features:-**

10.21.1. The meter shall display malfunctioning of Real Time Clock battery.

10.21.2. All display segments: LCD TEST display shall be provided for Self Diagnostic Features.

10.21.3. Wire/cable less design:- The PCB must be wireless to avoid improper soldering & loose connection/ contact.

10.21.4. The meter shall be supplied with non-rechargeable battery backup feature for displaying the parameters during power OFF condition. Battery life should be minimum ten years.

10.21.5. Suitable measure shall be taken in Phase and Neutral circuit to achieve solution against external interference/ electrical spikes.

**11. ANTI TAMPER FEATURES:-**

11.1. The meter shall detect and register the energy only in forward direction under any one or combination of following tamper conditions, within the limits of accuracy specified:

- a) Reversal of line and load terminals. It should be recorded and manufacturer specific OBIS codes are not available as per DLMS, appropriate codes shall be provided with approval of KSEBL.
- b) Load through local Earth.
- c) Current through neutral shall be recorded in reverse direction even without voltage.

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

11.2. Where neutral is disconnected from the load or from the supply side or both the load and supply side, the meter should record the energy proportionate to the current drawn through the meter (min 40 % Ib for 5-30 A) at reference voltage and unity Power Factor. ± 5% error in recording is admissible.

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



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- 11.4. Visual indication shall be provided to show tamper conditions stated above.  
Date and Time stamping shall be available as per display parameters defined in clause no 12.6
- 11.5. The meter shall comply all the test for external AC/DC magnetic field (except 0.2T for DC & 10mT for AC magnet) as per CBIP 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 13779/ 1999 (amended up to date). **Above the threshold values specified the meter shall be forced to I<sub>max</sub> as specified in Clause 10.13.**
- 11.6. In the event if the meter is forcibly opened even by 2mm displacement of the meter cover from the original condition, the same should be recorded as tamper event with date & time stamping and meter should display that the cover has been tampered. This display shall toggle with the normal display parameters.
- 11.7. The meter should record all the tamper events in FIFO basis along with the total number and duration compartmentalized as mentioned in Clause.11.8.
- 11.8. A total of 330 tamper information/ events should be recorded in FIFO pattern compartmentalized as follows. (As per IS 15959 communication protocol).

**Current Related**

Earth Load tamper	- 50
Reversal of line and load(*)	- 50

**Other Events**

Magnetic tamper	- 49
Neutral missing	- 50
Neutral disturbance	- 30

**Non rollover Event**

Cover open	- 1
------------	-----

**Power off** - 100

**Total - 330**

(\*) - parameters whose OBIS codes are not available e.g. neutral current will be provided by manufacturer with approval of KSEBL.

## 12. DISPLAY OF MEASURED VALUES:-

- 12.1. The information is to be shown continuously on electronic LCD having continuous **GREEN** backlit so as to read easily in low light/ darkness and should be clearly visible from all sides. The meter shall have 6 digits with parameter identifier. The size of digit should be minimum 10x5mm. The decimal units shall not be displayed for Cumulative kWh in auto scroll mode. However it shall be displayed in Push Button Mode-III for high resolution



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display for testing. Parameter identification code shall be displayed and shall be readable. LCD shall be able to be viewed at a wide angle also. The Dot Matrix type LCD is not acceptable.

- 12.2. The push button shall be provided for manual scroll mode and it should be easily accessible for one from the front side of the meter body when the meter is installed. It should be possible to scroll up using the push button. Capacitive touch technologies also may be accepted in lieu of push button if the technology is proven in field for last 3 years.
- 12.3. When the meter is placed in an enclosure at a constant temperature of 65 degree 'C' for a period of 30 minutes the character of LCD should not deform and also when kept at a constant temp of 80 degree for a period of 30 minutes, the LCD should work satisfactorily when restored at normal temperature.
- 12.4. 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.
- 12.5. KVAh measurement should be the vector sum of active and reactive energy, leading PF is to be treated as lead.
- 12.6. Following measuring parameters should be displayed:

**A) Display Parameters MODE I (Auto SCROLL MODE):- (The same parameters should be displayed in Auto Scroll Mode also )**

1	Self Diagnostic LCD Segment Check
2	RTC Battery Check
3	Real time and date
4	Present Status of tamper if any
5	Cumulative kWh
6	Instantaneous Phase Voltage
7	Instantaneous Phase Current
8	Instantaneous Neutral current
9	Instantaneous Power Factor



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10	Instantaneous Active Power (kW)
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**B) Display Parameters MODE II (PUSH BUTTON MODE):-** The meter should be capable of displaying the following parameters using push button.

1	Self Diagnostic LCD Segment Check
2	Meter Serial Number
3	Current Month Average Power factor
4	Supply Frequency
5	Cumulative Forward kWh
6	Cumulative Forward kWh(ToD ZONE1)
	Cumulative Forward kWh(ToD ZONE2)
	Cumulative Forward kWh(ToD ZONE3)
7	Current Month MD In kVA
8	Current Maximum Demand in kVA(ToD ZONE1) with date and time
	Current Maximum Demand in kVA(ToD ZONE2) with date and time
	Current Maximum Demand in kVA(ToD ZONE3) with date and time
9	Cumulative maximum demand in kVA
10	History1:Billed Average Power Factor
11	History1:Cumulative Forward kWh
	History1:Cumulative Forward kWh(ToD Zone1)
	History1:Cumulative Forward kWh(ToD Zone2)
	History1:Cumulative Forward kWh(ToD Zone3)
	History2:Cumulative Forward kWh
	History3:Cumulative Forward kWh
	History4:Cumulative Forward kWh
	History5:Cumulative Forward kWh
History6:Cumulative Forward kWh	
12	Cumulative Apparent Energy(kVAh)
13	Cumulative Apparent Energy(kVAh)-ToD Zone1
	Cumulative Apparent Energy(kVAh)-ToD Zone2
	Cumulative Apparent Energy(kVAh)-ToD Zone3
14	Present Status of tampers
15	Cover open status (*)
	Date of cover open
	Time of cover open
16	Last Occurrence of Tamper
	Date of Last Tamper Occurrence
	Time of Last Tamper Occurrence
17	Last Restoration Tamper ID
	Date of Last Tamper Restoration





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	Time of Last Tamper Restoration
18	Cumulative Tamper Counts
19	Power ON Duration
20	MD reset Counts or bill reset counts
21	Current Maximum Demand in kW(ToD ZONE1) with date and time
	Current Maximum Demand in kW(ToD ZONE2) with date and time
	Current Maximum Demand in kW(ToD ZONE3) with date and time
22	Current Maximum Demand in kW
23	History1:Billing Maximum Demand in kW
	History1:Billing Maximum Demand (ToD Zone1)
	History1:Billing Maximum Demand (ToD Zone2)
	History1:Billing Maximum Demand (ToD Zone3)
	History2:Billing Maximum Demand
	History3:Billing Maximum Demand

(\*) (15) – Cover Open is the only non-rollover tamper which shall be provided against this requirement as per clause 11.6.

#### C. Display MODE III (HIGH RESOLUTION MODE):-

1. Cumulative forwarded kWh (2+4) digits
2. Cumulative kVAh (2+4 )digits

**TOD Register:-** Total 6 Nos. TOD registers required. 3 ToD time zones with timings as mentioned in the specification should come in display. Other time zones shall not be displayed and shall be made available in display whenever required. Change of time blocks for TOD metering shall be with password enabling from CMRI or from base computer.

Presently there are three numbers of TOD zones as given below (Time block and TOD zones subject to change)

Time zone 1 : 6.00 hrs to 1800 hrs.  
Time zone 2 : 18.00 hrs to 22.00 hrs.  
Time zone 3 : 22.00 hrs to 6.00 hrs.

Cumulative forward kWh shall be displayed for 20 seconds & all other parameters shall be displayed for minimum 6 seconds including LCD check.

The display of the above parameters should appear in the same order as indicated above.



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12.7. The meter should have a non-volatile memory, so that the registered parameters will not be affected by the loss of power.

12.8. The maximum demand shall automatically be reset at 24.00 hours of the last day of each calendar month. No reset push button shall be provided.

Maximum Demand Integration Period: - Integration period for kW/kVA MD should be of 30 minutes real time based. Provision must be there to programme integration period for kW/kVA MD.

12.9. **Switching the Display mode:-**

a) The display mode shall be switched to 'Auto Scroll Mode' if the scroll button is

(i) Not pressed during the last 1 minute (If in the 'Manual Scroll mode')

(ii) Not pressed during the last **30 minute** (If in the 'High Resolution mode')

b) The display mode shall be switched to 'Manual Scroll mode' by pressing the scroll button.

c) The display mode shall be switched to 'Next Mode' if the scroll button is kept pressed for 5 seconds.

**13. DATA COMMUNICATION FACILITIES:-**

13.1. The meter shall have a galvanically isolated infra red optical communication port as per **IS:15959** so as to facilitate downloading meter data through a password regime to CMRI on demand /base computer or to a remote device such as modem.

**Since the meter is DLMS compatible and intended for AMR application RS 232 communication port in the form of RJ11 is needed. RJ11 shall consist of 6 pin count. RJ11 socket with pin configuration from left to right as when the locking notch is positioned below.**

- Pin 1 – No connection
- Pin 2 – Ground
- Pin 3 – PC Tx – Meter Rx
- Pin 4 – PC Rx – Meter Tx
- Pin 5 – Vcc
- Pin 6 – No connection.

13.2. **Readings to be downloaded with CMRI / PC :-**

1. Meter Sr. No & Meter's make
2. Time & date
3. Instantaneous Voltage



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4. Instantaneous Phase current
5. Instantaneous Neutral current
6. Instantaneous load in kW
7. Cumulative Active (forwarded) Energy (kWh)
8. Maximum Demand kW since last reset (MD)
9. Cumulative Active Energy(kWh) for each calender month for previous twelve months history.
10. Maximum Demand in kW with 30 minutes integration period and maximum of these in a calender month for previous twelve months history.
11. Cumulative Tamper count and Tamper duration for each tamper.
12. Any other information if manufacturer propose to record may indicate in their offer OR mutually agreed between purchaser and supplier.
13. ToD wise Cumulative Active (forwarded) Energy (kWh) for previous twelve Months history.
14. ToD wise Maximum Demand kW for previous twelve Months history with Date & time.
15. ToD wise Maximum Demand in kVA for previous twelve Months history with Date & time.
16. Energy Consumed during tamper period

13.3. **Load Survey Requirement:-**The meter shall be capable of storing 30 minutes data for the following parameters for the last 90 days and necessary facility to transfer this data for easy communication to data collection device ie CMRI and PC to get details in both numerical and graphic forms.

- RTC Date & Time
- kWh
- kVAh
- Phase voltage, Phase Current and Neutral current may be provided in the load survey
- Demand in kW

**Demand shall be made available in BCS.**

13.4. The optical port shall be provided with facility for sealing by the utility and any successful attempt to access the meter through the optical port for programming shall be logged in the meter through an audit trail.

13.5. Meter manufacturer shall provide sufficient copies of software required for downloading the information to a user friendly windows/ Linux based operating system of base billing computer system through CMRI, free of cost, for reading and retrieving data from the meter in the PC/ LAPTOP. The meter manufacturer shall make the software to be installed in the CMRI/PC for analyzing the data for report development. The data transfer shall be highly reliable and tamper proof (No editing of the downloaded data shall be possible on base computer by any means).The software shall have the capability to convert all the data into ASCII format.



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13.6. Necessary upgrades of Software shall be supplied free of cost for downloading simultaneously the existing parameters and any parameters added in future specification of meters.

**14. CONNECTION DIAGRAM AND TERMINAL MARKINGS:-** The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking should appear in the above diagram. Stickers of any kind will not be accepted.

**15. NAME PLATE DETAILS:-**

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

- 1) Name of Project:
- 2) Manufacturer's name & trade-mark and place of manufacture.
- 3) Serial number (Serial Number should be in the name plate itself along with other details and should not be on the meter front cover)
- 4) Model or type.
- 5) Number of phases and number of wires for which the meter is suitable.
- 6) Guarantee period.
- 7) Purchaser's name
- 8) Purchase Order No.
- 9) Principal unit in which the meter records.
- 10) Reference voltage & frequency in Hz.
- 11) Basic current and rated maximum current .
- 12) Meter constant (pulse rate of testing signal).
- 13) Reference Temperature
- 14) Class index.
- 15) Month and Year of manufacture
- 16) BIS marking as per statutory requirement
- 17) "DLMS Category -C3" meter.
- 18) Degree of Protection.

15.2. The Meter Serial No. shall be Bar Coded along with numeric No. The type of Bar Code shall be "Code 128".

15.3. Stickers in any case will not be accepted.

15.4. All the details of the meter should be delivered in soft copy (excel or .csv format) for the meters supplied to each TMR as per MDCC at the time of delivery along with the test report. After completion of Supply, the details of all meters in soft copy (excel or .csv format) shall be forwarded to the O/o Chief Engineer (SCM).

**16. MANUFACTURING ACTIVITIES:-** The manufacturer shall submit the list of plant and machinery along with the offer.

16.1. The meter should employed with latest technology such as Hybrid Micro circuit or Application Specific Integrating Circuit (ASIC) to ensure reliable performance.



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1. Meter should be manufactured using SMT (Surface Mount Technology) components and by deploying automatic SMT pick and place machine and reflow solder process.
  2. The loops/ wired joints must be avoided on PCB. Further, the Bidder should own or have assured access (through hire, lease or sub-contract, documentary proof shall be attached with the offer) of above facilities. All inward flow of major components and sub assembly parts (CT, PT, RTCs/ Crystal, LCD and ToD facilities, LEDs, Power Circuit electronic components etc) shall have batch and source identification.
  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.
  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.
  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. Quality should be ensured at the following stages:
    - > At PCB manufacturing stage, each board shall be subjected to computerized bare board testing.
    - > At insertion stage, all components should undergo computerized testing for conforming to design parameters and orientation.
    - > Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipments (ATEs).
- 16.2. Test points should be provided to check the performance of each block/stage of the meter circuitry.
- 16.3. 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.
- 16.4. The PCB shall undergo 'burn in' for a period of 72 hours at  $70 \pm 2^{\circ}\text{C}$  under non operating condition.
- 16.5. The calibration of meters shall be done in-house on a computerized testing bench having stabilized power supply.
- 16.6.
  1. The factory shall be completely dust proof.
  2. The testing rooms shall be temperature and humidity controlled as per relevant Standards.
  3. The testing and calibrating equipment should be automatic and all test equipment shall have their valid calibration certificates
  4. Should have duly calibrated Electronic reference standard meter of class 0.1 or better accuracy.
  5. Power supplies used in testing equipment shall be distortion free with



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sinusoidal waveforms and maintaining constant voltage, current and frequency as per the relevant Standards.

6. Should have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly without human intervention.

16.7. The supplier should submit the list of all (imported as well as indigenous) components to be used in meter, separately along with the supply. List of makes of components is attached herewith as a guide line.

(1) Bought out items:- A detailed list of bought out items which are used in the manufacturing of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

(2) Critical components such as metering Ics(ASIC), Micro Controller etc shall be procured from STACK or IECQ registered suppliers.

#### 17. (a) Tests:-

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

17.2. 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.

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

17.4. All tests are to be carried out under reference conditions as specified in IS 13779/1999 unless otherwise specified. Permissible tolerances will be as mentioned in the table.

17.5. During the tests for accuracy requirements, proper repeatability conditions shall be maintained.

17.6. 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.

17.7. 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 325 to make allowances for such uncertainty.

17.8. 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 then to IS 13779/1999 (amended up to date) or CBIP 325 with latest amendments.

#### 17.9. A. Type Tests:-



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1. Meter shall be fully type tested as per IS 13779/1999 (amended up to date), Manual on Standardization of AC Static Electrical Energy Meters, CBIP 325 with latest amendments.
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.
3. The Type Test Reports shall clearly indicate the design and constructional features of the type tested meters.
4. Separate Type Test Reports for each offered type of meters shall be submitted.
5. All the Type Tests shall have been carried out from Laboratories such as CPRI, Bhopal, ERDA, ERTL (East) or equally reputed and accredited by the National Testing and Calibration Laboratories (NABL) of Govt. of India to prove that the meters meet the requirements of the specification.
6. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.
7. Type test certificates rather than type test reports are preferred.
8. KSEBL will be doing the field test on samples and also as field acceptance test by random sampling. Communication capability of the meter shall be ensured in the field as well as during the sample acceptance test by KSEB Ltd.

Lists of tests to be carried are as follows:

#### 17.10. Tests on Insulation Properties:-

- a) Impulse Voltage Test
- b) AC Voltage Test
- c) Insulation Resistance Test

#### 17.11. Impulse Voltage Test:-

- a) AC Voltage Test
- b) Insulation Resistance Test

#### 17.12. Tests on accuracy requirements:-

- a) Test on limits of error
- b) Test of meter constant
- c) Test of starting condition
- d) Test of no load condition
- e) Repeatability of error test
- f) Test of ambient temperature influence
- g) Test of influence quantities

#### 17.13. Tests on electrical requirements:-

- a) Test of power consumption
- b) Test of influence of supply voltage
- c) Test of influence of short time over currents
- d) Test of influence of self heating
- e) Test of influence of heating
- f) Test of abnormal voltage condition

#### 17.14. Test for Electromagnetic Compatibility:-

- a) Test of immunity to electrostatic discharge
- b) Fast Transient burst test
- c) Test of immunity to electromagnetic HF fields

- d) Test of immunity to conducted disturbances induced by RF fields
- e) Test of immunity to damped oscillatory waves
- f) Test of immunity to surge
- g) Radio interference suppression

**17.15. Test of Climatic Conditions:-**

- a) Dry heat test
- b) Cold test
- c) Damp heat cycle test

**17.16. Tests of Mechanical Requirements:-**

- a) Vibration Test
- b) Shock test
- c) Spring Hammer Test
- d) Test of protection against penetration of dust and water (Degree of Protection)
- e) Test on resistance to heat and fire

**17.17. Routine and Acceptance Tests:-**

**1.** Meters shall pass the entire acceptance and routine tests, as laid down in Manual on Standardization of AC Static Electrical Energy Meters, CBIP 325 and also additional acceptance tests as prescribed in this specification. (3 to 8 meters from a lot more than 1000 will be selected randomly in the factory and will be tested for tamper events)

**2. Following routine tests are to be conducted on every product:**

- a) AC Voltage Test
- b) Insulation Resistance Test
- c) Test on limits of error
- d) Test of meter constant
- e) Test of starting condition
- f) Test of no load condition

**3. Following acceptance tests are to be carried out on selected samples from a lot:**

- a) No load and starting conditions tests
- b) AC Voltage Test
- c) Insulation Resistance Test
- d) Test on limits of error
- e) Test of meter constant
- f) Repeatability of error test
- g) Test of power consumption

**4. Other Acceptance Tests:-**

- a) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440V between phase and neutral without damage / problems,
- b) Tamper conditions as stated in this specification,
- c) Glow wire testing for polycarbonate material.

**17.18. 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.





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(a) No load condition & starting condition:- While accepting the meters at TMR Divisions, 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.

**If any lot fails, test at factory or at any TMR, normal sampling plan will be adopted at TMRs and double sampling plan will be adopted for test at factory for all future samples. It is specified below.**

17.19. **Double 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.

Double sampling plan for normal inspection given in IS: **13779** shall be followed unless otherwise specified.



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Generally applicable sampling plan is given below.

Lot size	sample	Sample size	Cumulative sample size	Acceptance No.	Rejection No.
281 to 500	1st	32	32	0	2
	2nd	32	64	1	2
501 to 1200	1st	50	50	0	3
	2nd	50	100	3	4
1201 to 3200	1st	80	80	1	3
	2nd	80	160	4	5
3201 to 10000	1st	125	125	2	5
	2nd	125	250	6	7

- 17.20. All sample of meters selected will be tested for no load condition, starting condition and limits of error.
- 17.21. For limits of error, minimum six metrological points as per table 15 & 16 of IS 13779 shall be selected and one point will be considered as one characteristic test. Any meter failing in any one of these tests shall be treated as non-conformity.
- 17.22. If the number of non-conforming meters found in the sample is less than or equal to acceptance number, the lot shall be considered to be conforming to these tests.
- 17.23. If the number of non-conforming meters is in between acceptance and rejection numbers, a further sample of meters will be taken and subjected to these tests. If the number of non-conforming meters in two samples combined is less than acceptance number of the second sample, the lot shall be considered as conforming to these tests, otherwise rejected.
- 17.24. From the sample meters passed the above mentioned three tests, a sample of at least 13 meters shall be tested for insulation resistance, AC Voltage and meter requirement of these tests.
- 17.25. After passing 17.23 Test for repeatability of error and power consumption shall be carried out on five samples that passed tests for no load condition, starting condition and limits of error. If any of the meters fails in any of these two tests, the whole lot shall be declared not conforming to the requirements of these tests and the lot shall be rejected.



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- 17.26. **Only on samples passed test of repeatability error and power consumption, additional acceptance tests are to be carried out. All meters should pass all these tests; otherwise the lot will be rejected.**

#### A. Pre dispatch Inspection

- 17.27. 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.
- 17.28. 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 that have passed all the tests mentioned in clauses **17.16 c** and **d** and issue test certificate / approval to the manufacturer and give clearance for dispatch.
- 17.29. All the meters offered for inspection shall be in sealed condition.
- 17.30. KSEBL have the right to ask the supplier to furnish new type test certificates of sample meters, in accordance with clause 17.9 **e**, at suppliers cost, at any time after completing supply of 50% of the ordered quantity. The sample for these tests will be selected from the quantity of meters already supplied. If the selected meters fail in type tests, KSEBL have the right to cancel the purchase order.

#### B. Inspection after Receipts at Store

- 17.31. If required testing as per clause 17.18 (Normal sampling plan) will be done at TMRs. Physical inspection and sealing also will be done at TMRs. If requested in writing the Deputy Chief Engineer (SCM) may permit the suppliers representative to witness the test at TMRs.
- 17.32. If the sample/s selected, does not conform to the tests, lot will be rejected and no compensation will be given.
- 17.33. 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. "On physical verification, if the samples selected vide clause No. 17.17 **a** are found to be defective, then, the clause No.17.20 should be read as "all sample of meters selected will be tested for no-load condition starting condition, limits of error and physical conditions."



## SUPPLY CHAIN MANAGEMENT

Thiruvananthapuram

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

### TECHNICAL SPECIFICATION

#### Single Phase Energy meter

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Rev.#: 0.1

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17.34. **Acceptance of Material:-**A maximum period of 15 days will be required for verification and acceptance of the material by the consignee. damages/ defects, if any, noticed will be intimated to you.

Internal Components of the meters will be verified for conformity with component specification of this order, by opening one meter from random lot supplied. The lot shall be rejected if the components of the meter does not conform to the specification.

Final acceptance of meters will be made only after conducting tests by the purchaser and the lot not satisfying the tests will be rejected.

**18.00. 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 KSEB Limited reserves the right to cancel the purchase order and to blacklist firm.

**19.00. GUARANTEE:-**

19.1. Single Phase Static Energy meters with LCD and ToD facility should be guaranteed for a minimum period of five years from the date of acceptance of last part of the consignment by the KSEB Limited.

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

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

19.4. If defective meters are not replaced within the specified period as above, the KSEB Limited 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.

19.5 At any case the overall failure rate of meter should not be more than 2.5% of the quantity supplied

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

**21.00. Minimum Testing Facilities Required at Manufacturer's End:-** The following Manufacturing and testing facilities shall be available.

- a) The factory shall be completely dust proof.
- b) The testing rooms shall be temperature and humidity controlled as per relevant Standards.



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- c) The testing and calibrating equipment should be automatic and all test equipment shall have their valid calibration certificates.
- d) Should have duly calibrated Electronic reference standard meter of class 0.1 or better accuracy.
- e) Power supplies used in testing equipment shall be distortion free with sinusoidal waveforms and maintaining constant voltage current and frequency as per the relevant Standards.
- f) Should have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly without human intervention
- g) Manufacturer should have sufficient number of standard reference meters & test benches so as to do the quality testing in proportion to their production capacity.
- h) The manufacturer should have Glow Wire Testing facility

21.1. Manufacturer should possess fully computerized Meter Test Bench System for carrying out all routine and acceptance Tests as per IS 13779/1999 (amended upto date) including additional acceptance tests specified in this document. Routine test reports for each and every meter and acceptance test reports for samples selected shall be generated and submitted for the approval of lot. The list of testing equipment available in manufacturer's premise shall be intimated at the time of bidding. One copy of test report, approved data sheet and operating manual shall be despatched with the meter.

#### 22.00. Quality Assurance Plan:-

22.1. The Supplier shall invariably follow QAP adopted by him in the process of manufacturing as specified in Annexure-I along with his offer.

22.2. **Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.**

Sl. No.	List of Plant and Machinery used for Energy Meter Production	
1)	Fully automatic testing Bench with ICT/MSVT for testing linkless meters	Routine Testing and Calibration of Meters
2)	IR Tester Insulation testing	Insulation testing
3)	HV Tester	Insulation testing
4)	Error calculators	Error testing
5)	Long duration Running test set ups	Reliability Testing
6)	Reference Meters cl <b>0.1</b> accuracy	Error calculation
7)	Ultrasonic welding Machines	Welding of meters
8)	PCB Scanner	For testing of PCBs
9)	Humidity Chamber	Accelerated testing for Life cycle



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10)	Magnetic and other tamper testing setups	Tamper Testing
11)	Dry Heat Test Chamber	Accelerated testing for Life cycle
12)	Thermal Shock Chamber	Accelerated testing for Life cycle
13)	Glow Wire Test machine	Testing of Plastic Material
14)	Short term over Current testing setup	Type testing of Meters
15)	Composite Environmental testing chambers	Type testing of Meters

#### 23.00. The Component Specification:-

SI. 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 Renesas, ADESTO, <b>ROHM</b>
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.	Japan : Hitachi, Sony. L&G, Haijing Tinma (China) , TEXAS RCL, Yeboo, Truly Semiconductors



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		<p>c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type).</p> <p>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.</p> <p>HTN – Hyper Twisted Nematic (120°) STN – Super Twisted Nematic (160°)</p>	
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.	<p>USA : National Semiconductors, Atmel, Philips, Texas, Instruments, BC, Component</p> <p>Japan : Hitachi, Oki, AVZ , Samsung, Panasonic</p> <p>Germany : Vishay, NXP, Murata, AVX, ROHM, Yageo, Kernet, Onsemi, Epcos</p>
5)	Battery	Only non rechargeable battery should be used for RTC as well as display in absence of Power since the life & Reliability of these are better than the rechargeable batteries. The RTC battery and battery for display in the case of power failure should be separate.	<p>USA : Maxell, Japan, Indonesia : Panasonic, Sony, Germany : Varta</p> <p>France : Saft, Elegance, Vitzro, Tekcell, Mitsubishi, Eterncell, <b>EVE</b></p>

**CHIEF ENGINEER (SCM)**



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### GUARANTEED TECHNICAL PARTICULARS

1) a)	Maker's Name	
b)	Type/ Model	
2)	Standard applicable	
3)	Guarantee Period	
4)	Class of accuracy	
5)	Electronic display with No. of digits and decimals of display	
6)	Name of IC chips used in the meter	
7) a)	Material of meter case	
b)	Thickness of meter case	
8)	Basic current $I_b$	
9)	Rated Voltage	
10)	Frequency Range	
11)	Power Factor Range	
12)	ISI mark	
13)	Maximum current $I_{max}$ .	
14)	Starting current (minimum as % of $I_b$ )	
15)	Manufacturing technology	
16)	Meter base and cover jointing method	
17)	Maximum size of cable which can be	





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	connected at terminals.	
18)	Details of LED Indications provided.	
	i) With LED indication	
	ii) LED/LCD indication for Line load reversal indication	
	iii) LED/LCD indication for No phase or No Neutral	
	iv) LED/LCD indication for Earth loading	
19)	Whether the terminal cover is hinged	
20)	-Do- transparent	
21)	Material used for meter base and cover	
22)	Material used for terminal block	
23)	Power consumption in	
	a) Voltage circuit at rated voltage	
	b) Current circuit at $I_b$	
24)	Anti tamper features provided	
25)	Specify the overall dimensions of the meter (Approx)	
26)	Total weight of the meter	
27)	NV memory retention time in absence of power	
28)	Details of battery backup provided	
29)	Any additional facility provided	