# MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

# THREE PHASE FOUR WIRE CT / PT OPERATED 1 AMPS OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR QUADRANT TOD TRI - VECTOR ENERGY METER AS PER CATEGORY "B" OF IS: 15959/2011 (WITH LATEST AMENDMENTS) WITH AVAILABILITY BASED TARIFF (ABT) FEATURE

TECHNICAL SPECIFICATION NO.

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## 1.00 SCOPE:

This specification covers design; manufacture, testing, supply and delivery of ISI mark HT three phase four wire CT / PT operated 1 Amps or 5 Amps fully Static & AMR compatible Four Quadrant TOD Tri - vector Energy Meter as per Category B of IS: 15959 / 2011 and with latest amendments with ABT feature. The meters shall be suitable for measurement of import & export energies and demand as per Power and ABT tariff requirement for AC balanced / unbalanced loads.

The meter shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

## 2.00 APPLICATION

HT Consumer's Installations (For open access consumer) / CPP / IPP / Co – Generation / Wind Mill/ Solar Generation or as an Interface Meter

### SERVICE CONDITIONS

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

### Environmental Conditions:

| | |
|---|---|
| (a) Maximum ambient temperature | $55^0$ C |
| (b) Maximum ambient temperature in shade | $50^0$ C |
| (c) Minimum temperature of air in shade | $5^0$ C |
| (d) Maximum daily average temperature | $40^0$ C |
| (e) Maximum yearly weighted average temperature | $32^0$ C |
| (f) Relative Humidity | 10 to 95 % |
| (g) Maximum Annual rainfall | 1450 mm |

| | |
|---|---|
| (h) Maximum wind pressure | 150 Kg/$m^2$ |
| (i) Maximum altitude above mean sea level | 1000 mtrs |
| (j) Isoceraunic level | 50 days/year |
| (k) Seismic level (Horizontal acceleration) | 0.3 g |

(l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

## 3.00 STANDARD TO WHICH METER SHALL COMPLY:

IS: 15959 / 2011 (amended upto date) – Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification for Category – "B" Meters;

IS: 14697 / 1999 (amended up to date) – AC Static Transformer operated Watt-hour and VAR-hour Meters, Class 0.2S – Specification;

Amended CBIP Tech Report 325 for AC Static Transformer operated Watt Hour & VAR-Hour Meters (class 0.2S);

IS: 15707 / 2006 Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice;

CEA regulations and MERC guidelines with latest amendments.

The specifications given in this document supersedes the relevant clauses of IS: 14697 / 1999 (amended up to date) wherever applicable.

The equipment meeting with the requirements of other authoritative standards, which ensures equal or better quality than the standards mentioned above, also shall be considered.

In case the bidder wishes to offer material conforming to the other authoritative standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule.

Copy of such standards with authentic English Translations, shall be furnished along with the offer.

In case of conflict related with communication protocol, the IS: 15959 / 2011 – Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification shall prevail upon.

For conflict related with other parts of the specification, the order of priority shall be – (i) this technical specification, (ii) IS: 14697 / 1999 (Amended up to date), (iii) IEC, (iv) other authoritative standards

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

## 4.00 GENERAL TECHNICAL REQUIREMENT:

| | | |
|---|---|---|
| 1) | TYPE | Three Phase, Four wire CT / PT operated 1 Amps or 5 Amps fully Static & AMR compatible Four Quadrant TOD Tri - vector Energy Meter as per Category B of IS: 15959 / 2011 and with latest amendments with ABT feature |
| 2) | FREQUENCY | 50 Hz ±5% |
| 3) | ACCURACY CLASS | 0.2S (for Active Energy 0.2S and for Reactive Energy 0.2S) |
| 4) | PT SECONDARY VOLTAGE | 63.5 V Ph-N |
| 5) | RATED VOLTAGE | 110 V Ph-Ph or 63.5 V Ph-N |
| 6) | VOLTAGE RANGE | +20% to – 40% of rated voltage. |
| 7) | PT RATIO | $\frac{11}{\sqrt{3}}$ kV/$\frac{110}{\sqrt{3}}$ V |
| 8) | CT RATIO | 1 / 1 Amps; 5 / 5 Amps |
| 9) | BASIC CURRENT ($I_b$) | 1 Amp; 5 Amps. |
| 10) | MAXIMUM CONTINUOUS CURRENT ( $I_{max}$ ) | 2 times (200 %) of Ib. |
| 11) | SHORT TIME CURRENT | As per IS: 14697 / 1999. |
| 12) | STARTING CURRENT | 0.1% of Ib. |
| 13) | POWER CONSUMPTION | The active and apparent power consumption, in each voltage circuit, at reference voltage, reference temperature and reference frequency shall not exceed 1 W and 4 VA.<br><br>The apparent power taken by each current circuit, at basic current Ib, reference frequency and reference temperature shall not exceed 2 VA. |

| | | |
|---|---|---|
| 14) | POWER FACTOR | Power Factor range: Zero Lag to unity to Zero Lead to unity<br>Avg. P.F = $\frac{\text{Total( kWh)}}{\text{Total (kVAh)}}$<br>For both Import & Export mode,<br>$kVAh = \sqrt{(Kwh)^2 + (RKVAhlag + RKVAhlead)^2}$<br>**PF shall be up to 3 decimal.** |
| 15) | DESIGN | Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving parts; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.02 class) software based test bench. |
| 16) | POWER SUPPLY | SMPS |
| 17) | ISI MARK | The meter shall bear ISI Mark |
| 18) | TEMPERATURE | The standard reference temperature for performance shall be $27^0$ C. The mean temperature co-efficient shall not exceed 0.03%. |
| 19) | POWER SOURCE | Meter shall be auxiliary powered. The same shall be of range 60-240V AC/DC (± 20 %) or 88-260 V AC/DC (± 20 %). |

## 5.00 CONSTRUCTION:

5.01 The meter shall be projection type suitable for mounting on plane vertical surface, dust and moisture proof.

The meter base shall be opaque & meter top cover shall be transparent. Meter base and cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The meter body shall be type tested for IP51 degree of protection as per IS: 12063 against ingress of dust,

moisture & vermin. The meter cover shall be secured to base by means of sealable unidirectional captive screws.

**NOTE: The meter shall be strictly wall mounted type with front side connections. Panel type meters having rear side connections shall not be accepted.**

5.02 The poly carbonate body of the meter shall conform to IS: 11731 (FV-2 category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 1984 OR IEC PUB 60695-2-12, Ball pressure test as per IEC-60695-10-2 and Flammability Test as per UL 94 or as per IS 11731(Part-2) 1986.

5.03 To meet the requirement of terminal connection arrangement, the moulded single terminal block for current & voltage connections shall be provided as per IS: 14697 / 1999 (amended up to date). The termination arrangement shall be provided with an extended type transparent terminal cover, sealable independently at the bottom of meter approachable from front side to prevent unauthorized tampering. Proper size of grooves shall be provided at bottom of this terminal cover for incoming & outgoing service wires.

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

5.05 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.

5.06 Independent sealing provision shall be made against opening of the terminal cover and meter body cover. It is necessary to provide unidirectional screws for meter body cover and bidirectional screws for terminal cover with two holes for sealing purpose.

5.07 The opaque Poly-carbonate base and transparent front cover of meter shall be ultra-sonically welded (continuous welding) so that once the meter is manufactured and tested at factory; it shall not be possible to open the cover at site except the terminal cover. The thickness of material for meter cover and base shall be 2 mm (minimum).

5.08 The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal over load of live parts in contact with them.

5.09 The meter shall be completely factory sealed by providing minimum two (stickers / polycarbonate) seals at diagonally opposite positions except the terminal block cover. The provision shall be made on the

meter for at least two (sticker / polycarbonate) seals to be provided diagonally by utility. The terminal cover shall be transparent with one side hinge & sealing arrangement on both sides.

5.10 The Push button facility shall be provided for following functions, as brought out elsewhere in this specification.

(a) For TEST MODE (high resolution reading of display)

(b) For ON DEMAND MODE (UP & DOWN Scrolling): Separate two buttons must be provided.

(c) For INTERNAL BATTERY BACKUP (to read meter in case of Power failure)

(d) For MD RESET (with sealing arrangement): Separate independent button to be provided.

(e) For DISPLAY HOLD / UNHOLD (to lock required display parameter)

5.11 The meter shall have test output accessible from the front and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from front. The test output device shall be provided only in the form of blinking LED. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes. The pulse rate of output device (separate blinking LED must be provided for each parameter) which is Pulse / kWh and Pulse / kVArh (meter constant) shall be programmed according to primary values of voltage & current & shall be indelibly provided on the nameplate.

5.12 The meter accuracy shall not be affected by AC / DC magnetic field up to 0.2 Tesla on all the sides of meter i.e. front, sides, top and bottom of the meter as per CBIP publication No. 325 with latest amendments. Under influence of any magnetic field (AC / DC / Permanent) above 0.2 Tesla, if the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping. The energy recorded during such tamper shall be registered in a separate register in addition to main register.

5.13 The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phases & neutral for five minutes without affecting the accuracy.

5.14 In meter, power supply unit shall be micro control type instead of providing transformer and then conversion to avoid magnetic influence.

5.15 Non specified display parameters in the meter shall be blocked and it shall not be accessible for reprogramming at site.

5.16 Complete metering system shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP publication No. 325 with latest amendments.

5.17 Internal CTs, (if provided) are to be provided with magnetic shielding and they shall be tested separately prior to assembly by the meter manufacturer.

5.18 PCB used in meter shall be made by Surface Mounting Technology.

5.19 **REAL TIME INTERNAL CLOCK (RTC)**

The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 seconds per year.

5.20 The clock day / date setting and synchronization shall only be possible through password / key code command from one of the following:

a) Hand Held Unit (HHU), Laptop Computer or Meter Testing Work Bench and this shall need password enabling for meter;

b) From remote server (MDAS) through suitable communication network or Sub-station data logger 'PC'.

The RTC battery & the battery for display in case of power failure shall be separate.

5.21 The meter shall withstand any type of High Voltage upto 35 kV and High Frequency surges which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter. The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 kV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

(i) On any of the phases or neutral terminals

(ii) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)

(iii) At any place in load circuit.

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

5.22 **SELF DIAGNOSTIC FEATURES:**

5.22.1 The meter shall keep log in its memory for unsatisfactory functioning or non-functioning of Real Time Clock battery, also it shall be recorded and indicated in reading file at base computer software.

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

5.23 **METERING PROTOCOL:**

The meter protocol shall be as per Annex E - Category B meters of IS: 15959 / 2011.

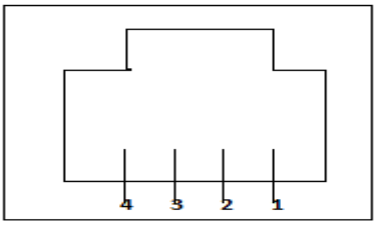
5.24 **COMMUNICATION CAPABILITY:**

The meter shall be provided with three ports for communication of the measured / collected data as per IS: 15959 / 2011, i.e. a hardware port compatible with RS-232 and 485 specifications of RJ - 11 type which shall be used for remote access through suitable Modem (GPRS / GSM / LPR and SCADA) and an Optical port complying with hardware specifications detailed in IEC – 62056 - 21. This shall be used for local data downloading through a DLMS compliant CMRI. RS-232 port or TCP / IP port as required on terminal block is also acceptable. Sealing arrangement for Optical & RS 232 port or TCP / IP port as required shall be provided.
All the ports shall be able to communicate simultaneously

**The minimum requirements for RS-232 based systems are described below:**

i. The interface shall meet all the requirements of RS-232 specifications in terms of Physical media, Network topologies, maximum devices, maximum distance, mode of operation, etc.

ii. RJ 11 type connectors have to be provided to easily terminate the twisted pair.




**PIN DESCRIPTION**

| Pin No | Signal |
|---|---|
| 1 | RTS (Ready To Send) |
| 2 | Ground (GND) |
| 3 | Transmit Data (Tx) |
| 4 | Receive Data (Rx) |

Sealing arrangement for Optical port, RS 232 port, RS 485 port or TCP / IP port as required shall be provided. All ports shall support the default and minimum baud rate of 9,600 bps. Necessary chord for Optical Port of minimum length of 2 metres per meter shall be provided free of cost.

5.25 The meter shall have facility to read the default display parameters during Power supply failure. For this purpose an internal or external battery may be provided.

The internal battery shall be Ni-mh or Li-ion or NI CD maintenance free battery of long life of 10 years. A suitable Push Button arrangement for activation of this battery shall be provided.

5.26 Wire / Cable less design:

The meter PCB shall be wireless to avoid improper and loose connections/ contacts.

5.27 The data stored in the meter shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10 years.

5.28

i) The meter shall measure, record and display total kWh energy and fundamental energy separately in Import mode.
ii) The meter shall measure, record and display total kVAh energy and fundamental energy separately in Import mode.
iii) The meter shall measure, record and display total kWh energy and fundamental energy separately in Export mode.
iv) The meter shall measure, record and display total kVAh energy and fundamental energy separately in Export mode.

## 6.00 TOD TIMINGS:

There shall be provision for at least 8 (EIGHT) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable by manufacturer only at site / factory.

At present the time zones shall be programmed as below:

TIME ZONE "A" … 00.00 to 06.00 hrs and 22.00 to 24.00 hrs.

TIME ZONE "B" … 06.00 to 09.0 0 hrs and 12.00 to 18.00 hrs.

TIME ZONE "C" … 09.00 to 12.00 hrs.

TIME ZONE "D" … 18.00 to 22.00 hrs.

## 7.00 DEMAND INTEGRATION PERIOD:

MD integration period shall be programmable upto 15 min with sub-inetegration period of 5 min with sliding window method.

## 8.00 MD RESET:

The meter shall have following MD resetting options.

i) Communication driven reset;

ii) Manual resetting arrangement with sealing facility;

iii) Automatic reset at the end of certain predefined period (say, start of the month (on first day at 00:00:00 Hrs) or end of the month (on last day at 24:00:00 Hrs)).

## 9.00 ANTI TAMPER FEATURES:

The meter shall detect and correctly register energy under following tamper conditions:

(a) The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.

(b) The meter shall continue to work even without neutral.

(c) The meter shall work in absence of any two phases, i.e. it shall work on any one phase wire and neutral, to record relevant energy.

(d) If the accuracy of the meter gets affected under the influence of magnetic field more than 0.2 Tesla, then the same shall be recorded as magnetic tamper event with date & time stamping.

(e) The meter shall be capable of detecting and recording occurrences and restoration for reverse current of any one or two phases with date & time of occurrence and restoration

The meter shall be capable of detecting and recording occurrences and restoration for reverse current of any one phase w.r.t. two other forward phase or vice versa. The meter shall record energy

with current available in these phases and average voltage and unity power factor with date & time of occurrence and restoration**.**

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

**Missing potential:**

The meter shall be capable of detecting and recording occurrence and restoration with date and time the case of potential failure and low potential, which could happen due to disconnection of potential leads (one or two). If any of the three line to neutral voltages fall below 70% of reference voltage for continuous 5 minutes, the event shall be recorded with phase identification.

**Potential Unbalance:**

Meter shall also detect and log cases of voltage unbalance (10% or more for 5 Minutes.) with date & time. Higher of the 3 phase voltages shall be considered as reference for this purpose.

**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 15 minutes) Higher of the 3 phase currents shall be considered as reference for this purpose.

**Current Reversal:**

The meter shall be capable of detecting and recording occurrence and restoration with date and time of reversal of current in one or two phases with phase identification for persistence time of 5 minutes. It shall also possess a current reversal counter.

The meter shall be capable of detecting and recording occurrence and restoration with date and time of reversal of current in one phase **w.r.t. two other forward phase or vice versa. . The meter shall record energy with current available in reversed phase and average voltage and power factor of remaining two phases with phase identification with date and time of occurrence and restoration**. It shall also possess a current reversal counter.

**Current Missing:**

The meter shall be capable of detecting and recording occurrences and restoration of current below starting current value as a current missing event with phase identification for persistence time of 15 minutes. It shall also possess a current missing counter.

**Power ON/OFF:**

The meter shall be capable to record power ON/OFF events in the meter memory. All potential failure shall record as power off event. All power OFF events shall be recorded separately. This event shall not have any persistence time for occurrence, recovery & event persistence.

**Low Power Factor:**

The meter shall be capable of detecting and recording occurrences and restoration of LOW PF of 0.5 & below for lag / lead in import as well as export mode.

**Neutral Injection:**

Under influence due to injection of High frequency, High Voltage or High DC Voltage through neutral, if the accuracy of meter gets affected, then the meter shall record the same as tamper event with date & time.

**Cover opening:**

In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper event with date & time stamping and the meter shall continuously display that the cover has been tampered.

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 by authorized personnel through the meter optical port with the help of CMRI or remote access through suitable communication network & downloaded the same to the base computer. All the information shall be made available in simple & easy to understand format.

## 9.01 TAMPER EVENTS

9.01.1 The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. as per relevant IS

9.01.2 The meter shall record the occurrence and restoration of tamper events of current, voltages, kWh, kVAh power factor, event code, date & time etc. listed in Table 32 to 37 of IS: 15959 / 2011

9.01.3 In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper event with date & time stamping as per table 37 of IS: 15959 / 2011 and the meter shall continuously display that the cover has been tampered

9.01.4 The detection of the tamper event shall be registered in the tamper event register. The no. of times the tampering has been done shall also be registered in the meter

9.01.5 Tamper details shall be retrieved by authorized personnel through either of the following

i) CMRI
ii) Remote access through suitable communication network

Minimum 200 numbers of events (occurrences & restoration with date & time) shall be available in the meter memory. The recording of abnormal events shall be on FIFO basis. The un-restored events shall be recorded separately and shall not be deleted till they get recovered (permissible upto 3 months)

All the information of data shall be made available in simple & easy to understand format.

9.02 The threshold values for various tampers are as below.

| **Sr. No.** | **Description** | **Occurrence (With Occ. Time 5 min.)** | **Restoration (With Rest. Time 5 min.)** |
|---|---|---|---|
| 1. | PT link Missing (Missing potential) | < 70% of Vref and current in that phase is > 5% Ib | > 70 % of Vref |
| 2. | Over voltage in any phase | > 115 % of Vref | < 115 % of Vref |
| 3. | Low voltage in any phase | < 70 % of Vref | > 70 % of Vref |

| | | | |
|---|---|---|---|
| 4. | Voltage Unbalance | Vmax - Vmin > 10 % Vmax | Vmax - Vmin < 10 % Vmax |
| 5. | CT Open. | Zero Amps in one or two phases and current in at least 1 phase is > 5% Ib for 15 minutes. | > 5 % Ib for 15 min in the tampered phase for 15 min. |
| 6. | Current Unbalance. (Diff. of phase currents) | > 30 % Iref* for 15 min | < 30 % Iref* for 15 min |
| 7. | Current Bypass | Bypass Current > 50 % Iref* for 15 min | Bypass Current < 30 % Iref* for 15 min |
| 8. | Current Reversal | Immediate in case of reverse of any one phase w.r.t. two phases | Direction of all the currents are same. |
| 9. | Over Current in any Phase | > 120 % $I_b$ | < 120 % $I_b$ |
| 10. | Influence of permanent magnet or AC / DC electromagnet / permanent magnet | Immediate | 1 minute after removal |
| 11. | Neutral Disturbance | -- | -- |
| 12. | Power failure | Immediate | Immediate |
| 13. | Very Low PF | -- | -- |
| 14. | Meter Cover Opening | (2 to 4 mm) Immediate | |

| | | |
|---|---|---|
| | | (Occurrence only) |
| * Higher of 3 phase currents shall be taken as reference for this purpose. | | |

*The energy meter shall capable to record & display all tamper with date and time stamping.

## 10.00 QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for polyphase balanced or unbalanced loads:

a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVAr, frequency etc as per details given in the table below and IS: 15959 / 2011 [AMENDED UP TO DATE].

b) Block Load Profile Parameters such as kVAh / kWh / kVArh (lag / lead) / Maximum Demand (MD) in kW / kVA / power factor / phase and line voltages / currents etc. as per details given in the table below and IS: 15959 / 2011 [AMENDED UP TO DATE].

c) Billing Profile Parameters such as cumulative energy kWh / cumulative kVAh / cumulative energy kVArh, etc. as per details given in the table below and IS: 15959 / 2011 [AMENDED UP TO DATE].

In addition to above the meter shall also record the Name plate details, programmable parameters (readable as profile), occurrence and restoration of tamper events along with the parameters (Table 30, 31 32, 33, 34, 35, 36, 37 & 39 respectively) of IS: 15959 / 2011 [AMENDED UP TO DATE].
Detail of category wise parameters requirement suitable for HT (CT / PT) boundary energy metering is given in following tables of IS: 15959 / 2011[AMENDED UP TO DATE].

| Category B | Parameter group | Annexure Table No. |
|---|---|---|
| HT (CT / PT) ABT Energy Meters | Instantaneous parameters | 24 |
| | Block Load Profile parameters | 25 |
| | Billing Profile Parameters | 26 |

| | | |
|---|---|---|
| | Name Plate details | 30 |
| | Programmable Parameters | 31 |
| | Event Conditions | 32 to 37 |
| All logging parameters for each of the event condition for 3 Φ / 4W | Capture parameters for event (Event Log Profile) | 39 |

## 11.00 DISPLAY OF MEASURED VALUES:

### 11.01 DISPLAY INDICATORS

The supply indication shall be displayed permanently by LCD as a minimum and shall be visible from the front of the meter. In case of non available of voltage to any phase(s), the LCDs of that particular phase shall stop glowing or those particular indicator(s) shall start blinking on the LCD display of meter

11.02 Permanently backlit LCD panel shall show the relevant information about the parameters to be displayed. The corresponding non-volatile memory shall have a minimum retention time of 10 years.

In the case of multiple values presented by a single display it shall be possible to display the content of all relevant memories. When displaying the memory, the identification of each parameter applied shall be possible.

The principal unit for the measured values shall be the kilowatt-hour kWh for active energy, kVARh for reactive energy and kVAh for apparent energy

11.03 The meter shall have minimum 6 digits (with +/- indication), parameter identifier, permanently backlit LCD with wide viewing angle. The size of digit shall be minimum 8x5 mm. The decimal units shall not be displayed in auto scroll mode. However it shall be displayed in push button mode or alternate mode for high resolution display for testing. Auto display cycling push button is required with persistence time of 10 Seconds. LCD shall be suitable for temperature withstand of $70^0$ C; adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

11.04 **INSTANTANEOUS PARAMETERS & DISPLAY OF MEASURED VALUES:**

11.05 **INSTANTANEOUS PARAMETERS**

| SR. NO. | PARAMETERS |
|---|---|
| 1. | Real Time Clock – Date & Time |
| 2. | Current – $I_R$ |
| 3. | Current – $I_Y$ |
| 4. | Current – $I_B$ |
| 5. | Voltage – $V_{RN}$ |
| 6. | Voltage – $V_{YN}$ |
| 7. | Voltage – $V_{BN}$ |
| 8. | Signed Power Factor – R Phase |
| 9. | Signed Power Factor – Y Phase |
| 10. | Signed Power Factor – B Phase |
| 11. | Three phase power factor, PF |
| 12. | Frequency |
| 13. | Apparent Power, kVA-R Phase |
| 14. | Apparent Power, kVA-Y Phase |
| 15. | Apparent Power, kVA-B Phase |
| 16. | Signed active power, kW (+ import; – export)- R Phase |
| 17. | Signed active power, kW (+ import; – export)- Y Phase |
| 18. | Signed active power, kW (+ import; – export)- B Phase |
| 19. | Signed reactive power, kVAr (+ Lag; – Lead)- R Phase |
| 20. | Signed reactive power, kVAr (+ Lag; – Lead)- Y Phase |
| 21. | Signed reactive power, kVAr (+ Lag; – Lead)- B Phase |
| 22. | Cumulative Energy, kWh (Import) |
| 23. | Cumulative Energy, kWh (Export) |

| | |
|---|---|
| 24. | Cumulative Energy, kVAh (Import) |
| 25. | Cumulative Energy, kVAh (Export) |
| 26. | Number of power failures. |
| 27. | Cumulative power failure duration. |
| 28. | Cumulative Tamper Count. |
| 29. | Cumulative billing count. |
| 30. | Cumulative programming count. |
| 31. | Billing date |

In addition to above parameters, phasor diagram shall be plotted invariably at the time of data retrieval.

## 11.06 DISPLAY PARAMETERS

| S.N. | Default Display Mode |
|---|---|
| A | NORMAL DISPLAY (DEFAULT DISPLAY) |
| 1. | LCD Test |
| 2. | Meter Sr. No. |
| 3. | Real Time Clock – Date & Time |
| 4. | Cumulative Energy – kWh (Import) |
| 5. | Cumulative Energy – kWh - TOD Zone A (TZ1) (Import) |
| 6. | Cumulative Energy – kWh - TOD Zone B (TZ2) (Import) |
| 7. | Cumulative Energy – kWh - TOD Zone C (TZ3) (Import) |
| 8. | Cumulative Energy – kWh - TOD Zone D (TZ4) (Import) |
| 9. | Cumulative Energy – kVArh - Lag (Import) |
| 10. | Cumulative Energy – kVArh – Lag TOD Zone A (TZ1) (Import) |
| 11. | Cumulative Energy – kVArh – Lag TOD Zone B (TZ2) (Import) |
| 12. | Cumulative Energy – kVArh - Lag TOD Zone C (TZ3) (Import) |
| 13. | Cumulative Energy – kVArh - Lag TOD Zone D (TZ4) (Import) |
| 14. | Cumulative Energy –kVArh - Lead (Import) |
| 15. | Cumulative Energy – kVArh – Lead TOD Zone A (TZ1) (Import) |
| 16. | Cumulative Energy – kVArh – Lead TOD Zone B (TZ2) (Import) |
| 17. | Cumulative Energy – kVArh - Lead TOD Zone C (TZ3) (Import) |
| 18. | Cumulative Energy – kVArh - Lead TOD Zone D (TZ4) (Import) |
| 19. | Cumulative Energy – kVAh (Import) |
| 20. | Cumulative Energy – kVAh - TOD Zone A (TZ1) (Import) |
| 21. | Cumulative Energy – kVAh - TOD Zone B (TZ2) (Import) |
| 22. | Cumulative Energy – kVAh - TOD Zone C (TZ3) (Import) |
| 23. | Cumulative Energy – kVAh – TOD Zone D (TZ4) (Import) |

| | |
|---|---|
| 24. | Fundamental Cumulative Energy – kWh (Import) |
| 25. | Fundamental Cumulative Energy kWh TOD Zone A (TZ1) (Import) |
| 26. | Fundamental Cumulative Energy kWh TOD Zone B (TZ2) (Import) |
| 27. | Fundamental Cumulative Energy kWh TOD Zone C (TZ3) (Import) |
| 28. | Fundamental Cumulative Energy kWh TOD Zone D (TZ4) (Import) |
| 29. | Fundamental Cumulative Energy – kVAh (Import) |
| 30. | Fundamental Cumulative Energy kVAh TOD Zone A (TZ1) (Import) |
| 31. | Fundamental Cumulative Energy kVAh TOD Zone B (TZ2) (Import) |
| 32. | Fundamental Cumulative Energy kVAh TOD Zone C (TZ3) (Import) |
| 33. | Fundamental Cumulative Energy kVAh TOD Zone D (TZ4) (Import) |
| 34. | MD – kVA with occurrence date & time (Import) |
| 35. | MD - kVA – TOD Zone A (TZ1) with occurrence date & time (Import) |
| 36. | MD - kVA – TOD Zone B (TZ2) with occurrence date & time (Import) |
| 37. | MD - kVA – TOD Zone C (TZ3) with occurrence date & time (Import) |
| 38. | MD - kVA – TOD Zone D (TZ4) with occurrence date & time (Import) |
| 39. | Cumulative Energy – kWh (Export) |
| 40. | Cumulative Energy – kWh - TOD Zone A (TZ1) (Export) |
| 41. | Cumulative Energy – kWh - TOD Zone B (TZ2) (Export) |
| 42. | Cumulative Energy – kWh - TOD Zone C (TZ3) (Export) |
| 43. | Cumulative Energy – kWh - TOD Zone D (TZ4) (Export) |
| 44. | Cumulative Energy – kVArh - Lag (Export) |
| 45. | Cumulative Energy – kVArh – Lag TOD Zone A (TZ1) (Export) |
| 46. | Cumulative Energy – kVArh – Lag TOD Zone B (TZ2) (Export) |
| 47. | Cumulative Energy – kVArh - Lag TOD Zone C (TZ3) (Export) |
| 48. | Cumulative Energy – kVArh - Lag TOD Zone D (TZ4) (Export) |
| 49. | Cumulative Energy –kVArh - Lead (Export) |
| 50. | Cumulative Energy – kVArh – Lead TOD Zone A (TZ1) (Export) |
| 51. | Cumulative Energy – kVArh – Lead TOD Zone B (TZ2) (Export) |
| 52. | Cumulative Energy – kVArh - Lead TOD Zone C (TZ3) (Export) |
| 53. | Cumulative Energy – kVArh - Lead TOD Zone D (TZ4) (Export) |
| 54. | Cumulative Energy – kVAh (Export) |
| 55. | Cumulative Energy – kVAh - TOD Zone A (TZ1) (Export) |
| 56. | Cumulative Energy – kVAh - TOD Zone B (TZ2) (Export) |
| 57. | Cumulative Energy – kVAh - TOD Zone C (TZ3) (Export) |
| 58. | Cumulative Energy – kVAh – TOD Zone D (TZ4) (Export) |
| 59. | Fundamental Cumulative Energy – kWh (Export) |
| 60. | Fundamental Cumulative Energy kWh TOD Zone A (TZ1) (Export) |
| 61. | Fundamental Cumulative Energy kWh TOD Zone B (TZ2) (Export) |
| 62. | Fundamental Cumulative Energy kWh TOD Zone C (TZ3) (Export) |
| 63. | Fundamental Cumulative Energy kWh TOD Zone D (TZ4) (Export) |
| 64. | Fundamental Cumulative Energy – kVAh (Export) |
| 65. | Fundamental Cumulative Energy kVAh TOD Zone A (TZ1) (Export) |
| 66. | Fundamental Cumulative Energy kVAh TOD Zone B (TZ2) (Export) |
| 67. | Fundamental Cumulative Energy kVAh TOD Zone C (TZ3) (Export) |
| 68. | Fundamental Cumulative Energy kVAh TOD Zone D (TZ4) (Export) |

| | |
|---|---|
| 69. | MD – kVA with occurrence date & time (Export) |
| 70. | MD - kVA – TOD Zone A (TZ1) with occurrence date & time (Export) |
| 71. | MD - kVA – TOD Zone B (TZ2) with occurrence date & time (Export) |
| 72. | MD - kVA – TOD Zone C (TZ3) with occurrence date & time (Export) |
| 73. | MD - kVA – TOD Zone D (TZ4) with occurrence date & time (Export) |
| 74. | Number of MD – kVA reset |
| 75. | Voltage – $V_R$ |
| 76. | Voltage – $V_Y$ |
| 77. | Voltage – $V_B$ |
| 78. | Current – $I_R$ |
| 79. | Current – $I_Y$ |
| 80. | Current – $I_B$ |
| 81. | Instantaneous Signed Power Factor – R Phase (Import/Export) |
| 82. | Instantaneous Signed Power Factor – Y Phase (Import/Export) |
| 83. | Instantaneous Signed Power Factor – B Phase (Import/Export) |
| 84. | Three Phase Power Factor (Instantaneous) |
| 85. | Frequency |
| 86. | Cumulative Billing Count- MD Reset count |
| 87. | Billing Date |
| 88. | Cumulative Programming Count |
| 89. | Cumulative Tamper Count |
| 90. | Meter Cover Opening – Occurrence with date and time. |
| 91. | Rising MD with elapsed time |
| **B** | **ON DEMAND DISPLAY (ALTERNATE MODE)** |
| 1. | LCD Test |
| 2. | Meter Sr. No. |
| 3. | Real Time Clock – Date & Time |
| 4. | The % THD for Import shall have +ve sign and for Export –ve sign.<br>a. Voltage % THD (Instantaneous)<br>b. Current % THD (Instantaneous) |
| 5. | MD – kVA reset count |
| 6. | Last date & time of MD - kVA reset |
| 7. | Current – $I_R$ |
| 8. | Current – $I_Y$ |
| 9. | Current – $I_B$ |
| 10. | Voltage – $V_R$ |
| 11. | Voltage – $V_Y$ |
| 12. | Voltage – $V_B$ |
| 13. | Instantaneous Signed Power Factor – R Phase (Import/Export) |
| 14. | Instantaneous Signed Power Factor – Y Phase (Import/Export) |
| 15. | Instantaneous Signed Power Factor – B Phase (Import/Export) |
| 16. | Three Phase Power Factor (Instantaneous) |
| 17. | Frequency |
| 18. | Average frequency for each successive 15 min block (00 to 99 for frequency form 49.5 to 50.2 Hz) |

| | |
|---|---|
| 19. | Net kWh and kVAh transmittal during each successive 15 min block up to<br>second decimal with plus / minus sign<br>( PLUS sign when there is net kWh and kVAh IMPORT to the beneficiary and NEGATIVE sign when there is net kWh and kVAh EXPORT from the beneficiary) |
| 20. | Cumulative kVArh transmitted for Voltage HIGH condition at each midnight in eight digits including one decimal |
| 21. | Cumulative kVArh transmitted for Voltage LOW condition at each midnight in eight digits including one decimal |
| 22. | Cumulative Billing Count-MD Reset count |
| 23. | Last date and time of MD-kVA reset |
| 24. | Cumulative Programming Count |
| 25. | Cumulative Tamper Count |
| 26. | Meter Cover Opening – Occurrence with date and time. |
| 27. | Apparent Power kVA |
| 28. | Signed Active Power kW<br>(with sign " Import" for Import and " Export" for Export ) |
| 29. | Signed Reactive Power kVAr<br>(with sign " Import" for Import and " Export" for Export ) |
| 30. | Last Tamper Event with date and time. |
| **C) Test mode display:** | |
| 31. | High Resolution total kWh Import (For calibration) |
| 32. | High Resolution total kVAh Import (For calibration) |
| 33. | High Resolution total kVArh Import Lag (For calibration) |
| 34. | High Resolution total kVArh Import Lead (For calibration) |
| 35. | Rising Demand Import kVA with remaining time up to EOI |
| 36. | High Resolution total kWh Export (For calibration) |
| 37. | High Resolution total kVAh Export (For calibration) |
| 38. | High Resolution total kVArh Export Lag (For calibration) |
| 39. | High Resolution total kVArh Export Lead (For calibration) |
| 40. | Rising Demand Export kVA with remaining time up to EOI |
| 41. | Last Block Net kWH and kVAh Energy = (Imp – Exp) |
| 42. | Last Block Average frequency |
| 43. | Last Block Reactive Energy High kVARh (V> 103%) |
| 44. | Last Block Reactive Energy Low kVARh (V< 97%) |

**NOTE:**

(1) It shall be possible to scroll through the parameters (up & down) manually in on demand display mode and test display mode.

(2) In addition to above parameters, phasor diagram shall be plotted invariably at the time of data retrieval

11.07 The meters shall be pre-programmed for following details.

i) PT Ratio: 11000/√3 /110/√3 V,

ii) CT Ratio: 5/5 Amps or 1/1 Amp as the case may be.

iii) Scale MF shall be One (1) invariably.

iv) MD RESET:

MD resetting shall be auto as per clause no. 8.00 (iii). However for testing purpose manual resetting arrangement with resetting facility shall be provided as per clause no. 8.00 (ii) .

v) MD integration period shall be programmable upto 15 min with sub-inetegration period of 5 min with sliding window method.

vi) The display of various parameters in Normal Mode & Alternate mode shall be as per table 24 (except 2) & 26 (except 4 & 5) of Annex D of IS: 15959 / 2011 AMENDED UP TO DATE in the sequence as below. Display other than specified below shall be blocked. The scroll period for auto scroll shall be 10 seconds

vii) Average power factor for current billing period (since last reset) shall be calculated as ratio of kWh & kVAh since last reset for respective mode. It shall be displayed with 3 decimal digits.

Instantaneous PF shall be calculated as ratio of instantaneous kW and kVA.

## 12.00 BILLING DATA, BILLING HISTORY DATA, ABT BILLING DATA & BLOCK LOAD SURVEY

### 12.01 BILLING DATA

The billing data parameters shall be as per table 26 (except 4 & 5) of Annex D of IS: 15959 / 2011 AMENDED UP TO DATE for category B and is summarized as below.

| Sr. No. | Parameters |
|---|---|
| 1. | Real Time Clock – Date & Time |
| 2. | Cumulative kWh Energy (Import) |
| 3. | Cumulative Energy – kWh - TOD Zone A (TZ1) (Import) |
| 4. | Cumulative Energy – kWh - TOD Zone B (TZ2) (Import) |
| 5. | Cumulative Energy – kWh - TOD Zone C (TZ3) (Import) |

| | |
|---|---|
| 6. | Cumulative Energy – kWh - TOD Zone D (TZ4) (Import) |
| 7. | Fundamental Cumulative Energy – kWh (Import) |
| 8. | Fundamental Cumulative Energy kWh TOD Zone A (TZ1) (Import) |
| 9. | Fundamental Cumulative Energy kWh TOD Zone B (TZ2) (Import) |
| 10. | Fundamental Cumulative Energy kWh TOD Zone C (TZ3) (Import) |
| 11. | Fundamental Cumulative Energy kWh TOD Zone D (TZ4) (Import) |
| 12. | Cumulative kWh Energy (Export) |
| 13. | Cumulative Energy – kWh - TOD Zone A (TZ1) (Export) |
| 14. | Cumulative Energy – kWh - TOD Zone B (TZ2) (Export) |
| 15. | Cumulative Energy – kWh - TOD Zone C (TZ3) (Export) |
| 16. | Cumulative Energy – kWh - TOD Zone D (TZ4) (Export) |
| 17. | Fundamental Cumulative Energy – kWh (Export) |
| 18. | Fundamental Cumulative Energy kWh TOD Zone A (TZ1) (Export) |
| 19. | Fundamental Cumulative Energy kWh TOD Zone B (TZ2) (Export) |
| 20. | Fundamental Cumulative Energy kWh TOD Zone C (TZ3) (Export) |
| 21. | Fundamental Cumulative Energy kWh TOD Zone D (TZ4) (Export) |
| 22. | Cumulative Energy – kVArh – Lag (Import) |
| 23. | Cumulative Energy – kVArh – Lag TOD Zone A (TZ1) (Import) |
| 24. | Cumulative Energy – kVArh – Lag TOD Zone B (TZ2) (Import) |
| 25. | Cumulative Energy – kVArh – Lag TOD Zone C (TZ3) (Import) |
| 26. | Cumulative Energy – kVArh – Lag TOD Zone D (TZ4) (Import) |
| 27. | Cumulative Energy – kVArh – Lead (Import) |
| 28. | Cumulative Energy – kVArh – Lead TOD Zone A (TZ1) (Import) |
| 29. | Cumulative Energy – kVArh – Lead TOD Zone B (TZ2) (Import) |

| | |
|---|---|
| 30. | Cumulative Energy – kVArh – Lead TOD Zone C (TZ3) (Import) |
| 31. | Cumulative Energy – kVArh – Lead TOD Zone D (TZ4) (Import) |
| 32. | Cumulative Energy – kVArh – Lag (Export) |
| 33. | Cumulative Energy – kVArh – Lag TOD Zone A (TZ1) (Export) |
| 34. | Cumulative Energy – kVArh – Lag TOD Zone B (TZ2) (Export) |
| 35. | Cumulative Energy – kVArh – Lag TOD Zone C (TZ3) (Export) |
| 36. | Cumulative Energy – kVArh – Lag TOD Zone D (TZ4) (Export) |
| 37. | Cumulative Energy – kVArh – Lead (Export) |
| 38. | Cumulative Energy – kVArh – Lead TOD Zone A (TZ1) (Export) |
| 39. | Cumulative Energy – kVArh – Lead TOD Zone B (TZ2) (Export) |
| 40. | Cumulative Energy – kVArh – Lead TOD Zone C (TZ3) (Export) |
| 41. | Cumulative Energy – kVArh – Lead TOD Zone D (TZ4) (Export) |
| 42. | Cumulative Energy – kVAh (Import) |
| 43. | Cumulative Energy – kVAh - TOD Zone A (TZ1) (Import) |
| 44. | Cumulative Energy – kVAh – TOD Zone B (TZ2) (Import) |
| 45. | Cumulative Energy – kVAh – TOD Zone C (TZ3) (Import) |
| 46. | Cumulative Energy – kVAh – TOD Zone D (TZ4) (Import) |
| 47. | Fundamental Cumulative Energy – kVAh (Import) |
| 48. | Fundamental Cumulative Energy kVAh TOD Zone A (TZ1) (Import) |
| 49. | Fundamental Cumulative Energy kVAh TOD Zone B (TZ2) (Import) |
| 50. | Fundamental Cumulative Energy kVAh TOD Zone C (TZ3) (Import) |
| 51. | Fundamental Cumulative Energy kVAh TOD Zone D (TZ4) (Import) |
| 52. | Cumulative Energy – kVAh (Export) |
| 53. | Cumulative Energy – kVAh - TOD Zone A (TZ1) (Export) |

| | |
|---|---|
| 54. | Cumulative Energy – kVAh – TOD Zone B (TZ2) (Export) |
| 55. | Cumulative Energy – kVAh – TOD Zone C (TZ3) (Export) |
| 56. | Cumulative Energy – kVAh – TOD Zone D (TZ4) (Export) |
| 57. | Fundamental Cumulative Energy – kVAh (Export) |
| 58. | Fundamental Cumulative Energy kVAh TOD Zone A (TZ1) (Export) |
| 59. | Fundamental Cumulative Energy kVAh TOD Zone B (TZ2) (Export) |
| 60. | Fundamental Cumulative Energy kVAh TOD Zone C (TZ3) (Export) |
| 61. | Fundamental Cumulative Energy kVAh TOD Zone D (TZ4) (Export) |
| 62. | MD – kVA with occurrence date & time ( Import ) |
| 63. | MD – kVA – TOD Zone A (TZ1) with occurrence date & time ( Import ) |
| 64. | MD – kVA – TOD Zone B (TZ2) with occurrence date & time ( Import ) |
| 65. | MD – kVA – TOD Zone C (TZ3) with occurrence date & time ( Import ) |
| 66. | MD – kVA – TOD Zone D (TZ4) with occurrence date & time ( Import ) |
| 67. | MD – kVA with occurrence date & time ( Export ) |
| 68. | MD – kVA – TOD Zone A (TZ1) with occurrence date & time ( Export ) |
| 69. | MD – kVA – TOD Zone B (TZ2) with occurrence date & time ( Export ) |
| 70. | MD – kVA – TOD Zone C (TZ3) with occurrence date & time ( Export ) |
| 71. | MD – kVA – TOD Zone D (TZ4) with occurrence date & time ( Export ) |
| 72. | Cumulative kVA MD (Import) |
| 73. | Cumulative kVA MD (Import) |
| 74. | Reactive Energy high ( V>103 per cent) |
| 75. | Reactive Energy low ( V< 97 per cent) |
| 76. | Cumulative Energy, kvarh, Quadrant I |
| 77. | Cumulative Energy, kvarh, Quadrant II |

| | |
|---|---|
| 78. | Cumulative Energy, kvarh, Quadrant III |
| 79. | Cumulative Energy, kvarh, Quadrant IV |

12.02 **BILLING HISTORY:**

The meter shall have sufficient non-volatile memory for recording history of billing parameters for last 13 months.

12.03 **ABT BILLING DATA:**

Following parameters shall be stored in non volatile memory automatically as ABT DATA.

1. Average frequency for each successive 15 min block (00 to 99 for frequency form 49.5 to 50.2 Hz).

2. Net kWh and kVAh transmittal during each successive 15 min block up to second decimal with plus / minus sign.

(PLUS sign when there is net kWh IMPORT by the beneficiary and NEGATIVE sign when there is net kWh EXPORT from the beneficiary.)

3. Cumulative kWh and kVAh transmitted at each midnight in eight digits

including one decimal.

4. Cumulative kVArh transmitted for Voltage HIGH condition at each midnight in eight digits including one decimal.

5. Cumulative kVArh transmitted for Voltage LOW condition at each midnight in eight digits including one decimal.

6. Cumulative kVArh transmitted for Voltage below 70 % condition at each midnight in eight digits including one decimal.

7. Cumulative kVArh transmitted for Voltage between 97% and 103 % Condition at each midnight in eight digits including one decimal.

8. The date time blocks of failure of VT supply on any phase as a (*) (Star) mark.

The meter shall store all these (1 to 8 above) data in their memory for a period of 10 days. The data older than 10 days shall get erased automatically on FIFO basis.

**NOTE:**

- Net Reactive Energy HIGH =

  = [(Export Lag + Import Lead) - (Import Lag + Export Lead)]

- Net Reactive Energy LOW

  = [(Import Lag + Export Lead) - (Export Lag +Import Lead)]

12.04 **LOAD SURVEY DATA:**

The meter shall have sufficient non-volatile memory for logging load survey data. Interval for load survey shall be 15 minutes or configurable for 5 minutes if required in future. Load survey data shall be logged for last 60 days or more on non-time based basis, i.e. if there is no power for more than 24 hours, the day shall not be recorded. Whenever meter is taken out and brought to laboratory, the load survey data shall be retained for the period of actual use of meter. This load survey data can be retrieved as and when desired and load profiles shall be viewed graphically / analytically with the help of meter application software. The meter application software shall be capable of exporting / transmitting these data for analysis to other user software in spreadsheet format. The load survey data shall be on first in first out basis (FIFO).

The Block Load survey data shall be for specified parameters as per table 25 (except 5 & 6) for 3Φ/4W system of measurement with NEUTRAL as reference point of Annex D of IS: 15959 / 2011 AMENDED UP TO DATE. The specified parameters are as below.

Load survey parameters: (for 15 min block or 5 min block if required in future) (As per recent CEA & SAMAST guidelines)

| **Sr. No.** | **Parameters** |
|---|---|
| 1. | Real Time Clock – Date and Time |
| 2. | Current - $I_R$ |
| 3. | Current – $I_Y$ |
| 4. | Current – $I_B$ |
| 5. | Voltage – $V_{RN}$ |
| 6. | Voltage – $V_{YN}$ |
| 7. | Voltage – $V_{BN}$ |
| 8. | Block Energy – kWh Import mode |
| 9. | Block Energy – kVArh – Lag Import mode |
| 10. | Block Energy – kVArh – Lead Import mode |

| | |
|---|---|
| 11. | Block Energy – kVAh Import mode |
| 12. | Block Energy – kWh Export mode |
| 13. | Block Energy – kVArh – Lag Export mode |
| 14. | Block Energy – kVArh – Lead Export mode |
| 15. | Block Energy – kVAh Export mode |
| 16. | kVA demand (Import). |
| 17. | kVA demand (Export). |
| 18. | kW demand (Import). |
| 19. | kW demand (Export). |
| 20. | kVAr demand (Import). |
| 21. | kVAr demand (Export). |
| 22. | PF (Import) |
| 23. | PF (Export) |
| 24. | Frequency |

12.05 **METER DATA AVAILABLE AT BCS END:**

The programme data shall store & display the programming details of the meter such as four quadrants, programmed CT Ratio & PT Ratio, TOD zone timings, demand reset type & integration and sub-integration period, Load survey parameters with integration period, etc.

12.06 **TAMPER DATA:**

It shall be possible to retrieve the abnormal event data along with all related snap shots data (mentioned at Cl. No. 10.00) through the meter optical port with the help of CMRI/Laptop computer/ remote access through suitable communication network & download the same to the base computer. All the information shall be made available event wise (occurrence & restoration) in simple & easy to understand format.

It shall be possible to retrieve the abnormal event data along with all related snap shots data (mentioned at Cl. No. 10.00) through the meter optical port with the help of CMRI and Laptop computer and remote access through suitable communication network & download the same to the base computer. For downloading abnormal data at site in laptop, communication cord having optical reader & USB port with supporting tools & software should be provided with a lot of 100 meters each. All the information shall be made available event wise (occurrence & restoration) in simple & easy to understand format.

The meter shall keep records for the minimum 200 events excluding power off events (Occurrence + Restoration). For above abnormal conditions the recording of events shall be on FIFO basis; however the

unrestored events stored separately shall not be erased till restoration.

## 13.00 DEMONSTRATION:

The purchaser reserves the right to ask to give the demonstration of the equipment offered at the purchaser's place.

## 14.00 COMMON METER READING INSTRUMENT (CMRI)

14.01 To enable local reading of meters data, a DLMS compliant CMRI shall be provided.

14.02 The CMRI shall be as per specification given in Annex J of IS: 15959 / 2011 AMENDED UP TO DATE.

14.03 It shall be compatible to the DLMS compliant energy meters that are to be procured / supplied on the basis of this specification.

14.04 The CMRI shall be supplied by the meter manufacturer along with the meter free of cost in the ratio of one for each 50 Nos. meters supplied including user manual and a set of direct communication cords for data downloading to the Laptop or PC for each CMRI.

14.05 There shall be a provision for auto power save on CMRI, which shall force the instrument in the power saving mode in case of no-activity within 5 minutes. The data shall not be lost in the event the batteries are drained or removed from the CMRI.

14.06 The CMRI shall have a memory capacity of 8 GB with USB SRAM (Static RAM) with battery backup & upgradeable and BIOS / OS on FLASH / EEPROM Memory of 512 MB.

14.07 The manufacturer / supplier shall modify the compatibility of CMRI with the meter and the base computer system due to any change in language or any other reasons at their own cost within guarantee period.

14.08 The CMRI shall be type tested for (a) Tests of Mechanical requirement such as Free fall test, Shock Test, Vibration test, (b) Tests of Climatic influences such as Tests of Protection against Penetration of Dust and Water (IP 6X), Dry Heat test, Cold Test, Damp Heat Cyclic Test, (c) Tests for Electromagnetic Compatibility (EMC), (d) Test of Immunity to Electromagnetic HF Fields and (e) Radio Interference Measurement.

14.09 The equipments offered shall be fully type tested at approved laboratory by National Accreditation Board for Testing and Calibration Laboratories (NABL) as per relevant standards within

last 5 years from the date of opening of tender & the type test reports shall be enclosed with the offer.

## 15.00 COMPUTER SOFTWARE:

15.01 For efficient and speedy recovery of data downloaded through CMRI on base computer, licensed copies of base computer software shall have to be supplied free of cost. This software will be used at number of places up to Division level. As many copies of base computer software as required up to Division level shall be provided by Supplier free of cost even after upgradation of software.

15.02 The meter shall be capable to communicate directly with laptop computer. Base Computer Software shall be suitable for all types of printers such as dot matrix, inkjet, deskjet and laser printers.

15.03 The Base Computer Software shall be "Windows" based & user friendly. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer as well as CMRI by any means). The software shall have capability to convert all the data into ASCII format/XML format as per MIOS. The BCS shall function properly and support Windows 10 new version.

15.04 The Base Computer Software should be password protected.

15.05 The total time taken for downloading Billing, Tamper and Load Survey Data for 60 days shall be less than or equal to 15 minutes.

15.06 Downloading time of only Billing data shall be less than or equal to 60 secs.

15.07 The BCS software shall create one single file for the uploaded data, e.g. if CMRI contains the meter readings of, say, 2,000 consumer meters including with meter reading of boundary energy meters and the said data is uploaded to BCS, then the BCS shall create a single file containing separate records for each consumer meter reading and boundary energy meter reading in ASCII format or XML file as per MIOS for individual meter reading.

15.08 Meter manufacturers should also need to submit Convert API ( API3) as per MIOS universal standard along with Base Computer System free of cost. This API should capable of converting both data i.e. AMR data collected from Read API (API1) and MRI data collected from CMRI.

15.09 Also there shall be a provision to give filenames while creating the file. Alternatively, the file to be downloaded shall be automatically saved with a file number comprising of Real date, time & downloading activity for respective date. For ex., 170817120501 where, 170817 will denote the date, 1205 will denote the time & 01 will indicate the first downloading activity on that date. this will completely overrule the possibility of file to be overwritten.

15.10 As and when the meter manufacturer releases new or latest or advanced versions of meter hardware / firmware / software (such as Base Computer System, API3 etc), the same shall be made available to purchaser immediately on the release date free of cost. The latest version shall support all existing hardware / meters in the field. The meter manufacturer should also provide support for changes and integration of Base Computer System and API3.

15.11 The meter samples shall be tested by our IT Department for the time required for downloading the data as per specifications and as confirmed by the bidder.

15.12 Downloading software shall also be provided so as to install on our Laptop for downloading data directly on Laptop from meter without the use of CMRI.

15.13 The software provided on laptop or PC shall be compatible to read the data from USB drive and for that purpose a sample cable (1 No.) shall be provided with USB termination. USB being the de-facto standard, this is the requirement.

15.14 MSEDCL is procuring large quantity of meters. As such manufacturer have to depute Hardware Engineers and Software Engineers on call basis, who shall have thorough knowledge of meter hardware / software used for downloading and converting so as to discuss the problems, if any, or new development in the hardware / software with Chief Engineer, Testing & Quality Control / Chief General Manager (IT), MSEDCL, Prakashgad, Bandra (E), Mumbai – 400051 without any additional charge.

## 16.00 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 shall appear in the above diagram. The diagram and terminal marking on sticker will not be allowed.

## 17.00 NAME PLATE AND MARKING:

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards. Meter Serial Number shall be Bar Coded along with numeric number. The size of bar code number shall not be less than 35x5 mm. The manufacturer's meter constant shall be marked on the name plate. Meter serial number & bar code on sticker will not be allowed.

The meter shall also store name plate details as given in the table 30 of Annex F of IS: 15959 / 2011 AMENDED UP TO DATE. These shall be readable as a profile as and when required.

In addition to the requirement as per IS, following shall be marked on the name plate.

(i) Purchase order no. & date

(ii) Month and Year of manufacture

(iii) Name of purchaser, i.e. MSEDCL

(iv) Guarantee Five Years

(v) ISI mark

(vi) Category of Meter: **Category B – HT (PT / CT) ABT Energy Meter**. The lettering shall be bold in 3 mm font.

A sticker label containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than 10 in red colour, which reads as " **सावधान !"मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने वीज नोंदणी होणार "**

## 18.00 TESTS:

### 18.01 TYPE TESTS:

The meter offered shall have successfully passed all the type tests described in IS: 14697 / 1999 (amended upto date), external AC / DC / permanent magnetic influence tests as per CBIP Tech Report 325 with latest amendments and this specification and the meter Data Transfer and Communication capability as per IS: 15959 / 2011 AMENDED UP TO DATE.

The type test reports shall clearly indicate the constructional features of the type tested meter. Separate type test reports for each offered type of meter shall be submitted.

The type test certificates as per IS: 14697 / 1999 (amended upto date) shall be submitted along with the offer. The type test certificate

carried out during last three years from the date of opening the tender shall be valid. The Type test certificate of metering protocol as per IS: 15959 / 2011 AMENDED UP TO DATE shall be submitted along with the offer, and the same shall not be more than 36 months old at the time of submission.

The Type test certificate of metering protocol as per - Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification may also be acceptable along with offer for evaluation purpose only.

All the type test including Additional acceptance test as per cl. no. 20.04 & Metering protocol report as per IS 15959 : 2011 shall be got approved from the Chief Engineer, MSEDCL, Testing & Quality Control, Prakashgad, Mumbai before commencement of supply.

All the Type Tests specified in the technical specifications shall be carried out at laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as ERDA, ERTL, CPRI, etc. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix - C of Latest – standardization of AC static electrical energy meters – CBIP publication No. 325 / NPL / CQAL / ERTL / ERDA at the sole discretion of the purchaser at the purchaser's cost. The supplier shall have no right to contest the test results of the third party lab or for additional test and has to replace / take corrective action at the cost of the supplier. For this purpose, the tenderer shall quote unit rates for carrying out each type test. However, such unit rates will not be considered for evaluation of the offer.

Make & type of major components used in the type-tested meter shall be indicated in the QAP.

18.02 **ACCEPTANCE TESTS:**

Criteria for selection for such tests and performance requirements shall be as per IS: 14697 / 1999 (reaffirmed 2004.

ALL acceptance tests as per IS: 14697 / 1999 shall be carried out on the meter.

All acceptance tests as per IS: 11731 (Part-2)/ 1986 shall be carried out on

the meter body, heat deflection test as per ISO:75, glow wire test as per the IS:11000 (part 2/SEC-1) 1984 OR IEC PUB 60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2)/ 1986

18.03 **ROUTINE TESTS:**

All routine tests as per IS: 14697/1999 shall be carried out on all the meters.

18.04 **ADDITIONAL ACCEPTANCE TESTS:**

The following additional tests shall be carried out in addition to the acceptance tests specified in IS: 14697 / 1999 (amended up to date)

(a) **TRANSPORTATION TEST:**

At least 50% of the samples of the meters be tested for error at $I_{max}$, $I_b$ and 5% $I_b$ at unity power factor and 50% $I_{max}$ and 10% $I_b$ at 0.5 lagging Power Factor besides checking them for starting current. This test shall be conducted on ready to install meter i.e. meter cover ultrasonically welded & sealed. After recording these errors, the meters be put in their normal packing and transported for at least 50 km in any transport vehicle such as pick up van, Jeep, etc. on uneven rural roads and then re-tested at all these loads after the transportation. The variation in errors recorded before and after transportation shall not exceed 1% at higher loads and 1.5% at loads below $I_b$.

(b) **OTHER ACCEPTANCE TESTS:**

(i) Meters shall be tested for tamper conditions as stated in this specification.

(ii) Glow wire testing for poly-carbonate body.

(iii) Power consumption tests shall be carried out.

(iv) The meter shall comply all the tests for external AC / DC magnetic field as per CBIP publication No. 325 with latest amendments. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If, during the test, the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping. The energy recorded during such tamper shall be registered in a separate register in addition to main register.

After removal of magnet, meter shall be subjected to accuracy test as per IS: 14697 / 1999 (amended up to date). No deviation in error is allowed in the accuracy as per specification.

(v) The meter shall withstand impulse voltage at 10 kV.

Jammer test for sample meters shall be carried out for immunity at MSEDCL's Testing Division.

The tests 17.04 (b), (i) to (iii) shall be carried out at factory for each inspected lot at the time of pre-dispatch inspections.

The tests 17.04 (b) (iv) & (v) shall be carried out on one sample from first lot as per procedure laid down in IS: 14697 / 1999 (amended up to date) and CBIP publication No. 325 (with latest amendments) in NABL LAB. The test report shall be got approved from Chief Engineer, MSEDCL, Testing & Quality Control, 5th Floor, Prakashgad, Bandra (E), Mumbai - 400051 before commencement of supply.

(c) For influence quantities like voltage variation, frequency variation, voltage unbalance etc. the limits of variation in percentage error will be as per IS: 14697/1999. (amended up to date)

(d) **ACCEPTANCE TESTS FOR CONFIRMATION OF ABT FEATURE:**

(i) 15 minutes block average frequency registration.

(ii) 15 minutes block net active power registration.

(iii) Net kVArh High registration in all four quadrants when voltage is above 103% of $V_{REF}$.

(iv) Net kVARh High registration in all four quadrants when voltage is more than 103% of $V_{REF.}$

(v) Net kVArh registration in all four quadrants when voltage is at $V_{REF}$.

(vi) Net kVARh Low registration in all four quadrants when voltage is less than 97% of $V_{REF}$.

(vii) Net kVArh Low registration in all four quadrants when voltage is below 97% of $V_{REF}$.

(viii) Test for confirmation of midnight energy banking in power ON & power OFF conditions.

## 19.00 GUARANTEED TECHNICAL PARTICULARS:

The tenderer shall furnish the particulars giving specific required details of Meters in schedule `A' attached. The offers without the

details in Schedule `A' stand rejected.

**20.00 PRE-DESPATCH INSPECTIONS:**

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 purchases.

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 / Engineer attending the above testing will carry out testing as per IS: 14697/1999 (amended upto date) & this specification and issue test certificate approval to the manufacturer and give clearance for dispatch. The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division and the Executive Engineer Inspection Wing.

**21.00 JOINT INSPECTION AFTER RECEIPT AT STORES (Random Sample Testing):**

From each lot (lot means the total number of meters received in a Store out of inspected and approved lot by Executive Engineer, Inspection Wing or purchaser's representative under one approval letter) of meters received at Stores, 5 sample meters shall be drawn and these meters will be tested by our Testing Engineer in presence of Supplier's representative jointly for (i) no load condition,(ii) limits of error test (iii) starting & (iv) repeatability of error test and (v) tamper conditions as per this specification. The 5 days advance intimation will be given to the supplier and if the suppliers fail to attend the joint inspection on the date informed, the Testing will be carried out by our Testing Engineer in absence of supplier’s representative. If the meters failed in above random sample testing, the lot will be rejected.

**22.00 GUARANTEE:**

The meter & CMRI supplied shall be guaranteed for a period of 66 months from the date of supply or 60 months from the date of commissioning, whichever is earlier. Bidders shall guarantee to replace free of cost the meters which are found defective / inoperative at the time of installation, or become inoperative / defective during guarantee period. Replacements shall be effected within one month from the date of intimation. If the defective meters are not replaced within the specified period above, MSEDCL shall recover an equivalent

amount plus 15% supervision charges from any of the bills of the supplier.

## 23.00 PACKING:

23.01 The meters & CMRIs shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each meter & CMRI may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning, if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

23.02 The following information shall be furnished with the consignment:

- Name of the consignee.
- Details of consignment
- Destination
- Total weight of consignment
- Sign showing upper/lower side of the crate
- Sign showing fragility of the material.
- Handling and unpacking instructions.
- Bill of Material indicating contents of each package & spare materials.

## 24.00 QUALITY CONTROL:

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification. The team shall be given all assistance and co-operation for inspection and testing at the bidder's works. The tenderer has to give all facilities for carrying out the testing of samples.

## 25.00 MINIMUM TESTING FACILITIES:

25.01 Manufacturer shall posses fully computerized Meter Test Bench System for carrying out routine and acceptance Tests as per IS: 14697 / 1999 (amended up to date). In addition, this facility shall produce Test Reports for each and every meter. The bidder shall 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. The list of testing equipments shall be enclosed. The manufacturer shall have the necessary minimum testing facilities for carrying out the following tests:

| **Sr. No.** | **Name of Test** |
|---|---|
| (1) | A.C. Voltage test |
| (2) | Insulation Resistance Test |
| (3) | Test of Accuracy Requirement |
| (4) | Test on limits of errors |
| (5) | Test on meter constant |
| (6) | Test of starting condition |
| (7) | Test of no-load condition |
| (8) | Repeatability of error test |
| (9) | Test of power Consumption |
| (10) | Vibration test |
| (11) | Shock Test |
| (12) | Transportation Test - as per MSEDCL specification |
| (13) | Tamper conditions - as per MSEDCL specification |
| (14) | Glow Wire Test |
| (15) | Long duration test |
| (16) | Flammability Test |
| (17) | The manufacturer shall have duly calibrated RSS meter of class 0.01 accuracy |

25.02 **METER SOFTWARE:**

The Bidders will have to get appraised & obtain CMMI – Level III within one year from date of letter of award

25.03 Notwithstanding anything stated herein under, the Purchaser reserves the right to assess the capacity and capability of the bidder to execute the work, shall the circumstances warrant such assessment in the overall interest of the Purchaser

## 26.00 MANUFACTURING PROCESS, ASSEMBLY, TESTING:

Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry.

The meter shall be made from high accuracy and reliable surface mount technology (SMT) components.

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. Multilayer 'PCB' assembly with 'PTH' (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow 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.

Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards.

Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine.

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

Complete assembled and soldered PCB shall undergo functional testing using computerized Automatic Test Equipment.

Test points shall be provided to check the performance of each block / stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture.

Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

The manufacturer shall submit the list of plant and machinery along with the offer.

## 27.00 MANUFACTURING ACTIVITIES:

a) Quality shall be ensured at the following stages:

(i) At PCB manufacturing stage each board shall be subjected to computerized bare board testing.

(ii) At insertion stage all components should under go computerized testing for conforming to design parameters and orientation.

(iii) Complete assembled and soldered PCB should under go functional testing using Automatic Test Equipments (ATEs)

(iv) Prior to final testing and calibration, all meters shall be subjected to aging test (i.e. Meters shall be kept in ovens for 72 hours at $55^0$ C temperature and atmospheric humidity under real life condition at it's full load current. After 72 hours meters shall work satisfactory to eliminate infant mortality.

(v) The calibration of meters shall be done in-house.

(vi) The bidders shall submit the list of all imported & indigenous components separately used in meter along with the offer.

(vii) Bought out items:

A detailed list of bought out items which are used in the manufacture of the meter shall 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.

(viii) List of Plant and Machinery:

| Sr. No. | List of Plant and Machinery used for Energy meter Production | |
|---|---|---|
| 1 | Fully automatic testing Bench with ICT for testing link less meters | Routine Testing and Calibration of Meters |
| 2 | Semi automatic testing Bench with MSVT | Routine Testing and Calibration of Meters |
| 3 | IR Tester | Insulation testing |
| 4 | HV Tester | Insulation testing |
| 5 | Error calculators | Error testing |

| | | |
|---|---|---|
| 6 | Long duration Running test set ups | Reliability Testing |
| 7 | Reference Meters Class 0.02 accuracy | Error calculation |
| 8 | Ultrasonic welding Machines | Welding of meters |
| 9 | Automatic Pick and Place Machines | Automatic placing of SMT components |
| 10 | Solder Paste Printing Machine | SMT soldering |
| 11 | Soldering Furnace IR reflow | SMT soldering |
| 12 | PCB Scanner | For testing of PCBs |
| 13 | ATE functional tester | For testing of Components |
| 14 | Programmers and Program Loaders | Chip Programming Tools |
| 15 | CAD PCB designing setups | PCB designing |
| 16 | Furnace IR type for Hybrid Micro Circuits | resistance network and HMC manufacturing |
| 17 | Laser Trimming Machines | trimming of resistances for higher accuracy measurement |
| 18 | Wave Soldering Machines | Wave soldering of PCBs |
| 19 | Humidity Chamber | Accelerated testing for Life cycle |
| 20 | Dry Heat Test Chamber | Accelerated testing for Life cycle |
| 21 | Thermal Shock Chamber | Accelerated testing for Life cycle |
| 22 | PRO - E Mechanical Design Stations | Mechanical CAD stations |
| 23 | Spark Erosion Tool fabricating Machine | Tool fabrication and Die manufacturing |
| 24 | CNC wire Cut Tool | Tool fabrication and Die |

| | | |
|---|---|---|
| | Fabrication machine | manufacturing |
| 25 | CNC Milling Machine for composite tool fabrication | Tool fabrication and Die manufacturing |
| 26 | Injection Moulding Machine | Moulding of plastic parts |
| 27 | Vibration testing Machine | Vibration testing of Meters |
| 28 | Glow Wire Test machine | Testing of Plastic Material |
| 29 | Fast transient burst testing setup | Type testing of Meters |
| 30 | Short term over Current testing setup | Type testing of Meters |
| 31 | Magnetic and other tamper testing setups | Tamper Testing |
| 32 | Impulse Voltage Testing Setup | Type testing of Meters |
| 33 | Composite Environmental testing chambers | Type testing of Meters |

## 28.00 QUALITY ASSURANCE PLAN:

28.01 The tenderer shall invariably furnish QAP as specified in Annexure I along with his offer. The QAP shall be adopted by him in the process of manufacturing.

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

## 29.00 COMPONENT SPECIFICATION:

As per Annexure II enclosed.

## 30.00 SCHEDULES:

The tenderer shall fill in the following schedules, which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule - 'A' ... Guaranteed and technical particulars. (As per GTP uploaded on e -tendering site)

Schedule - 'C' ... Tenderer Experience

The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard shall not be entertained. If it is observed that there are deviations in the offer in Guaranteed Technical Particulars, then, such deviations shall be treated as deviations.

## SCHEDULE 'C'

## TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed / under execution for supply of Static TOD Energy Meters by them to whom a reference may be made by purchaser in case he consider such a reference necessary.

| Sr. No. | Name of client | Order No. & Date | Qty. Ordered | Qty. Supplied |
|---|---|---|---|---|

NAME OF FIRM _____

NAME & SIGNATURE OF TENDERER _____

DESIGNATION _____

DATE _____

## ANNEXURE I

## QUALITY ASSURANCE PLAN

**A)** The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates:

ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.

iii) List of manufacturing facilities available.

iv) Level of automation achieved and list of areas where manual processing exists.

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi) List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.

**B)** The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

i) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offers.

ii) Type test certificates of the raw materials and bought out accessories if required by the purchaser.

iii) Quality assurance plan (QAP) with hold points for purchaser's inspection.

iv) The quality assurance plan and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

**C)** The contractor shall operate systems which implement the following:

i) Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorise work to progress beyond the hold points indicated in quality assurance plans.

ii) Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

**D)** The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i) The structure of the organization.

- The duties and responsibilities assigned to staff ensuring quality of work.
- The system for purchasing taking delivery and verification of material.
- The system for ensuring quality workmanship.
- The system for retention of records.
- The arrangements for contractor's internal auditing.

A list of administration and work procedures required to achieve and verify contract's quality requirements these procedures shall be made readily available to the project manager for inspection on request.

ii) Quality Plans:

- An outline of the proposed work and programme sequence. The structure of the contractor's organization for the contract.
- The duties and responsibilities assigned to staff ensuring quality of work.
- Hold and notification points.
- Submission of engineering documents required by the specification.
- The inspection of materials and components on receipt. Reference to the contractor's work procedures appropriate to each activity.
- Inspection during fabrication/ construction.
- Final inspection and test

## ANNEXURE II

## COMPONENT SPECIFICATION

| Sr. No. | Component function | Requirement | Makes and Origin |
|---|---|---|---|
| 1 | Current Transformers | The Meters shall be with the current transformers as measuring elements. | The current transformer shall withstand for the clauses under 5 & 9 of IS: 14697 / 1999 |
| 2 | Measurement or computing chips | The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs. | **USA:** Analog Devices, Cyrus Logic, Atmel, Philips, Teridian. Dallas, ST, Texas Instruments, Motorola, Maxim, National Semiconductors, Freescale, Onsemiconductors<br>**Germany:** Siemens.<br>**South Africa:** SAMES.<br>**Japan:** NEC, Toshiba, Renasas, Hitachi.<br>**Austria:** AMS<br>**Holland:** Philips (N X P )<br>**Taiwan:** Prolific |
| 3 | Memory chips | The memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. There shall be security isolation between metering circuit, communication circuit, and power circuit. | **USA:** Atmel, Teridian, Philips ST, National Semiconductors, Texas Instruments, Microchip, Spanson (Fujitsu), Ramtron.<br>**Japan:** Hitachi, Renasas.<br>**Germany:** Siemens |
| 4 | Display modules | a) The display modules shall be well protected from the external UV radiations.<br>b) The display visibility shall be sufficient to read the Meter mounted at height of 0.5 meter as well as at the | Display TEK/KCE/RCL Display /Suzhou heng Xiamen instruments/ Veritronics<br>**Singapore:** E-smart, Bonafied Technologies, Display Tech,<br>**Korea:** Advantek, Jebon, Union Display Inc., |

| | | | |
|---|---|---|---|
| | | height of 2 meters.<br>c) The construction of the modules shall be such that the displayed quantity shall not disturbed with the life of display (PIN Type).<br>d) It shall be trans-reflective HTN (Hyper Twisted Nematic (120°)) or STN (Super Twisted Nematic (160°)) type industrial grade with extended temperature range. | **Japan:** Hitachi, Tianma, Sony, L&G, Holtek, Haijing.<br>**Malaysia:** Crystal Clear Technology.<br>**Hong kong:** Genda<br>**China:** Success, Tianma |
| 5 | Communication Modules | Communication modules shall be compatible for the two ports (one optical port for communication with meter reading instruments & the other hardwired RS 232 port to communicate with various modems for AMR) | **USA:** HP, Optonica, National Semiconductors,<br>**Holland/Korea:** Phillips<br>**Japan:** Hitachi<br>**Taiwan:** Ligitek |
| 6 | Optical port | Optical port shall be used to transfer the meter data to meter reading instrument.<br>The mechanical construction of the port shall be such to facilitate the data transfer easily. | **USA:** HP, National Semiconductors, Maxim<br>**Holland/Korea:** Phillips<br>**Japan:** Hitachi<br>**Taiwan:** Ligitek |
| 7 | Power supply | The power supply shall be with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections | SMPS Type |
| 8 | Electronic components | The active & passive components shall be of the surface mount type & are to | **USA:** National Semiconductors, Atmel, Philips, Texas |

| | | | |
|---|---|---|---|
| | | be handled & soldered by the state of art assembly processes. | Instruments, BC Component Analog devices, ST, Maxim, Siemens, PHYCOMP, YAGEO, DRALORIC, KOA, WELWYN, OSRAM, Kemet Onsemiconductors, Freescale, Intersil, Raltron, Fairchild, Muruta, Agilent, AVX, Abracon, Sipex, Diode Inc., Honeywell, Power Integration, Fox, Roham **Japan:** Hitachi, Oki, AVZ or Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung, Panasonic **India:** Keltron, Incap, VEPL, PEC, RMC, Gujarat Polyavx, Prismatic, MFR Electronic components Pvt. Ltd., Cermet, CTR. **Korea:** Samsung **Germany:** Vishay, Epcos, Diotech, Kemet, Infineon **Taiwan:** Yageo. |
| 9 | Mechanical parts | (i) The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc.<br>(ii) The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods. | |
| 10 | Battery | Chargeable maintenance free guaranteed life of 10 years. | **USA:** Maxell, Renata **Japan:** Panasonic, Sony, Mitsubishi, Sanyo |

| | | | |
|---|---|---|---|
| | | | **Germany:** Varta, Tedirum<br>**France:** Saft<br>**Korea:** Tekcell, Vitzrocell |
| 11 | RTC & Micro controller. | The accuracy of RTC shall be as per relevant IEC / IS standards. | **USA:** Philips, Dallas Atmel, Motorola, Microchip, Epson, ST, Teridian<br>**Japan:** NEC or Oki. |
| 12 | P.C.B. | Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm. | |

## SCHEDULE 'A'

## GUARANTEED TECHNICAL PARTICULARS (TO BE FILLED ONLINE)

| **ITEM NAME** | **THREE PHASE FOUR WIRE CT / PT OPERATED 1 AMP OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR QUADRANT TOD TRI - VECTOR ENERGY METER AS PER CATEGORY "B" OF IS: 15959/2011 (WITH LATEST AMENDMENTS) WITH AVAILABILITY BASED TARIFF (ABT) FEATURE** | |
|---|---|---|
| **SR. NO.** | **GTP PARAMETERS** | **GTP VALUES** |
| 1. | MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS | TEXT |
| 2. | MAKE AND TYPE OF METER | TEXT |
| 3. | APPLICABLE STANDARD IS AS PER IS: 14697 /1999 (AMENDED UPTO DATE), IS: 15959 / 2011 AMENDED UP TO DATE, CBIP TECH REPORT 325 AMENDED UP TO DATE, IS: 15707 / 2006 (YES/NO) | BOOLEAN |
| 4. | METER BEARS ISI MARK | BOOLEAN |
| 5. | ACCURACY CLASS OF METER | TEXT |
| 6. | RATED VOLTAGE | TEXT |
| 7. | VOLTAGE RANGE | TEXT |
| 8. | BASIC CURRENT (IB) OF METER | TEXT |
| 9. | MAXIMUM CONTINUOUS CURRENT (IMAX) | TEXT |
| 10. | STARTING CURRENT OF METER | TEXT |
| 11. | SHORT TIME OVER CURRENT | TEXT |
| 12. | CT RATIO OF METER | TEXT |

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| 13. | PT RATIO OF METER | TEXT |
| 14. | STANDARD REFERENCE TEMPERATURE OF METER | TEXT |
| 15. | MEAN TEMPERATURE CO-EFFICIENT | TEXT |
| 16. | FREQUENCY | TEXT |
| 17. | POWER FACTOR | TEXT |
| 18. | AVERAGE POWER FACTOR & INSTANTANEOUS POWER FACTOR IS CALCULATED AS PER CLAUSE NO. 4.00 (14) OF THE SPECIFICATION. | BOOLEAN |
| 19. | KVAH CALCULATIONS AS PER SPECIFICATION. | BOOLEAN |
| 20. | POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT | TEXT |
| 21. | POWER CONSUMPTION IN EACH CURRENT CIRCUIT | TEXT |
| 22. | POWER SUPPLY IS SMPS & MICRO CONTROL TYPE | BOOLEAN |
| 23. | KVA MD PROVIDED | BOOLEAN |
| 24. | METER IS PROJECTION TYPE, DUST AND MOISTURE PROOF & SUITABLE FOR MOUNTING ON PLANE VERTICAL SURFACE. | BOOLEAN |
| 25. | METER BODY IS MADE OF OPAQUE POLY CARBONATE | TEXT |
| 26. | POLY CARBONATE CONFORMS TO IS: 11731 / 1986 (PART-2) (FV-2 CATEGORY) | BOOLEAN |
| 27. | POLY CARBONATE BODY MEETS TEST REQUIREMENT OF<br>(A) HEAT DEFLECTION TEST AS PER ISO 75 > 1500C | BOOLEAN |
| 28. | (b) GLOW WIRE TEST AS PER IS: 11000 (PART 2/SEC-1) 1984 OR IEC PUB 60695-2-12 AT 900$^0$C | BOOLEAN |
| 29. | (c) BALL PRESSURE TEST AS PER IEC--60695-10-2 | BOOLEAN |
| 30. | (d) BALL PRESSURE TEST AS PER IEC--60695-10-2 | BOOLEAN |

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| 31. | (e) FLAMMABILITY TEST AS PER UL 94 OR IS 11731 (PART-2) 1986 | BOOLEAN |
| 32. | METER BODY TYPE TESTED FOR IP51 DEGREE OF PROTECTION AS PER IS: 12063 AGAINST INGRESS OF DUST, MOISTURE & VERMIN. | BOOLEAN |
| 33. | WHETHER TYPE TEST REPORT FOR IP51 DEGREE OF PROTECTION IS ENCLOSED | BOOLEAN |
| 34. | TYPE TEST REPORT NO. OF IP51 & DATE | TEXT |
| 35. | METER COVER SECURED TO BASE BY SEALABLE UNIDIRECTIONAL CAPTIVE SCREWS. | BOOLEAN |
| 36. | PHYSICAL WATER ABSORPTION VALUE OF METER BODY | TEXT |
| 37. | THERMAL HDDT VALUE OF METER BODY | TEXT |
| 38. | TENSILE STRENGTH OF METER BODY | TEXT |
| 39. | FLEXURE STRENGTH OF METER BODY | TEXT |
| 40. | MODULUS OF ELASTICITY OF METER BODY | TEXT |
| 41. | IZOD IMPACT STRENGTH OF METER BODY NOTCHED AT 23°C | TEXT |
| 42. | MOULDED SINGLE TERMINAL BLOCK FOR CURRENT & VOLTAGE CONNECTIONS IS PROVIDED AS PER IS: 14697 / 1999 (AMENDED UP TO DATE) | BOOLEAN |
| 43. | TERMINAL COVER OF METER IS EXTENDED TYPE & PROVIDED WITH HINGES AND IS SEALABLE INDEPENDENTLY | BOOLEAN |
| 44. | PROPER SIZE OF GROOVES PROVIDED AT BOTTOM OF TERMINAL COVER FOR INCOMING & OUTGOING SERVICE WIRES | BOOLEAN |
| 45. | INDEPENDENT SEALING PROVISION IS MADE AGAINST OPENING OF TERMINAL COVER AND FRONT COVER | BOOLEAN |

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| 46. | UNIDIRECTIONAL SCREWS WITH TWO HOLES FOR SEALING PURPOSE ARE PROVIDED ON METER BODY | BOOLEAN |
| 47. | POLY-CARBONATE BASE AND COVER IS ULTRA-SONICALLY WELDED (CONTINUOUS WELDING) | BOOLEAN |
| 48. | THICKNESS OF MATERIAL FOR METER COVER & BASE IS 2 MM MINIMUM | BOOLEAN |
| 49. | PROVISION TO PUT AT LEAST TWO SEALS BY UTILITY | BOOLEAN |
| 50. | PUSH BUTTONS ARE PROVIDED AS PER SPECIFICATION | BOOLEAN |
| 51. | OUTPUT DEVICE FOR TESTING OF METER IS BLINKING LED OR OTHER SIMILAR DEVICE WITH CONSTANT PULSE RATE | BOOLEAN |
| 52. | METER CONSTANT IS INDELIBLY PRINTED ON THE NAME PLATE OF THE METER | BOOLEAN |
| 53. | METER ACCURACY NOT AFFECTED BY AC / DC MAGNETIC FIELD UPTO 0.2 TESLA | BOOLEAN |
| 54. | UNDER INFLUENCE OF ANY MAGNETIC FIELD ABOVE 0.2 TESLA, IF THE ACCURACY OF THE METER GETS AFFECTED, THE SAME IS RECORDED AS MAGNETIC TAMPER EVENT WITH DATE & TIME STAMPING &. THE ENERGY RECORDED DURING SUCH TAMPER ISREGISTERED IN A SEPARATE REGISTER IN ADDITION TO MAIN REGISTER. | BOOLEAN |
| 55. | METER IS CAPABLE TO WITHSTAND AND DOES NOT GET DAMAGED IF PHASE-TO-PHASE VOLTAGE IS APPLIED BETWEEN PHASES & NEUTRAL FOR FIVE MINUTES WITHOUT AFFECTING ACCURACY. | BOOLEAN |
| 56. | POWER SUPPLY UNIT IS MICRO CONTROL TYPE | BOOLEAN |
| 57. | NON SPECIFIED DISPLAY PARAMETERS ARE BLOCKED AND SHALL NOT BE ACCESSIBLE FOR | BOOLEAN |

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| | REPROGRAMMING AT SITE. | |
| 58. | COMPLETE METERING SYSTEM DOES NOT AFFECTED BY EXTERNAL ELECTROMAFNETIC INTERFERRENCE | BOOLEAN |
| 59. | CTS ARE PROVIDED WITH MAGNETIC SHIELDING AND ARE TESTED SEPARATELY PRIOR TO ASSEMBLY | BOOLEAN |
| 60. | PCB USED IN METER IS MADE BY SURFACE MOUNTING TECHNOLOGY & IS WIRELESS | BOOLEAN |
| 61. | NON - RECHARGEABLE & PRE-PROGRAMMED FOR 30 YEARS DAY / DATE WITHOUT ANY NECESSITY FOR CORRECTION REAL TIME QUARTZ CLOCK (RTC) IS USED IN METER FOR MAINTAINING TIME (IST) AND CALENDAR. | BOOLEAN |
| 62. | MAXIMUM DRIFT OF RTC | TEXT |
| 63. | CLOCK DAY / DATE SETTING AND SYNCHRONIZATION IN RTC ARE POSSIBLE THROUGH PASSWORD / KEY CODE COMMAND FROM HAND HELD UNIT (HHU), LAPTOP COMPUTER OR METER TESTING WORK BENCH OR FROM REMOTE SERVER THROUGH SUITABLE COMMUNICATION NETWORK OR SUB-STATION DATA LOGGER 'PC'. | BOOLEAN |
| 64. | RTC BATTERY & BATTERY FOR DISPLAY IN CASE OF POWER FAILURE IS SEPARATE. | BOOLEAN |
| 65. | METER WITHSTANDS HIGH VOLTAGE & HIGH FREQUENCY SURGES WHICH ARE SIMILAR TO THE SURGES PRODUCED BY INDUCTION COIL TYPE INSTRUMENTS WITHOUT AFFECTING THE ACCURACY OF THE METER | BOOLEAN |
| 66. | ACCURACY OF METER IS NOT AFFECTED WITH APPLICATION OF ABNORMAL VOLTAGE / FREQUENCY GENERATING DEVICE SUCH AS SPARK DISCHARGE OF APPROXIMATELY 35 KV | BOOLEAN |

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| 67. | SPARK DISCHARGE OF APPROXIMATELY 35 KV CARRIED OUT AS PER SPECIFICATION | BOOLEAN |
| 68. | METER LOGS UNSATISFACTORY OR NON FUNCTIONING OF RTC BATTERY | BOOLEAN |
| 69. | METERING PROTOCOL AS PER ANNEX E - CATEGORY B METERS OF IS: 15959 / 2011 AMENDED UP TO DATE (YES/NO) | |
| 70. | DEFAULT & MINIMUM BAUD RATE OF RS 232 & OPTICAL PORTS IS 9600 BPS (YES/NO) | |
| 71. | METER PROVIDED WITH 3 THREE PORTS FOR COMMUNICATION | TEXT |
| 72. | SEALING ARRANGEMENT IS PROVIDED TO COMMUNICATION PORTS | |
| 73. | NECESSARY CHORD FOR OPTICAL PORT OF MINIMUM LENGTH OF 2 METRES PER METER IS PROVIDED. | BOOLEAN |
| 74. | INTERNAL NI-MH OR LI-ION OR NI CD MAINTENANCE FREE BATTERY OF LONG LIFE OF 10 YEARS WITH PUSH BUTTON ARRANGEMENT FOR ACTIVATION OF BATTERY IN THE RATIO OF 1 BATTERY PACK PER METER IS PROVIDED. | TEXT |
| 75. | NON VOLATILE MEMORY (NVM) WITH MINIMUM RETENTION PERIOD OF 10 YEARS IS PROVIDED | BOOLEAN |
| 76. | 8 (EIGHT) TOD TIME ZONES FOR ENERGY AND DEMAND ARE PROVIDED | BOOLEAN |
| 77. | PROVISION OF MAXIMUM DEMAND INTEGRATION PERIOD SHALL BE PROGRAMMABLE UPTO 15 MINUTES. | BOOLEAN |
| 78. | PROVISION FOR AUTO RESET OF MD AT CERTAIN PREDEFINED PERIOD IS PROVIDED | BOOLEAN |
| 79. | METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: 15959 / 2011 AMENDED UP TO DATE & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED (YES/NO) | |

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| 80. | A DLMS COMPLIANT CMRI AS PER ANNEX J OF IS: 15959 / 2011 AMENDED UP TO DATE IS PROVIDED (YES/NO) | |
| 81. | PROVISION FOR AUTO POWER SAVE IS MADE ON CMRI (YES/NO) | |
| 82. | CMRI HAS A MEMORY CAPACITY OF 8 MB SRAM (STATIC RAM) WITH BATTERY BACKUP & UPGRADEABLE AND BIOS / OS ON FLASH / EEPROM MEMORY OF 256 KB (YES/NO) | |
| 83. | CMRI OFFERED IS FULLY TYPE TESTED AT APPROVED NABL LABORATORY FOR<br>(a) TESTS OF MECHANICAL REQUIREMENT SUCH AS FREE FALL TEST, SHOCK TEST, VIBRATION TEST (YES/NO) | |
| 84. | (b) TESTS OF CLIMATIC INFLUENCES SUCH AS TESTS OF PROTECTION AGAINST PENETRATION OF DUST AND WATER (IP 6X), DRY HEAT TEST, COLD TEST, DAMP HEAT CYCLIC TEST (YES/NO) | |
| 85. | (c) TESTS FOR ELECTROMAGNETIC COMPATIBILITY (EMC) (YES/NO) | |
| 86. | (d) TEST OF IMMUNITY TO ELECTROMAGNETIC HF FIELDS (YES/NO) | |
| 87. | (e) RADIO INTERFERENCE MEASUREMENT (YES/NO) | |
| 88. | TYPE TEST REPORT NOS. & DATE OF CMRI (YES/NO) | |
| 89. | BASE COMPUTER SOFTWARE IS "WINDOWS" BASED & USER FRIENDLY (YES/NO) | |
| 90. | LICENSED COPIES OF BASE COMPUTER SOFTWARE ARE SUPPLIED FREE OF COST. | |
| 91. | NO EDITING IN TRANSFERRED DATA IS POSSIBLE ON BASE COMPUTER AS WELL AS CMRI BY ANY MEANS (YES/NO). | |
| 92. | DOWNLOADING SOFTWARE IS SUBMITTED TO INSTALL ON OUR LAPTOP / PC FOR DIRECTLY DOWNLOADING DATA FROM METER WITHOUT THE USE OF CMRI (YES/NO) | |
| 93. | SOFTWARE PROVIDED ON LAPTOP/PC IS COMPATIBLE TO READ DATA FROM USB DRIVE (YES/NO) | |
| 94. | PROVISION TO RESET MD THROUGH HAND HELD TERMINAL (CMRI) CAPABLE OF COMMUNICATING | BOOLEAN |

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| | WITH THE METER OR COMMUNICATION DRIVEN RESET IS PROVIDED | |
| 95. | PROVISION TO RESET MD THROUGH LOCAL PUSH BUTTON IS PROVIDED | BOOLEAN |
| 96. | ALL ANTI TAMPER FEATURES ARE INCORPORATED IN METER AS PER SPECIFICATION | BOOLEAN |
| 97. | METER LOGS TAMPER EVENTS AS PER SPECIFICATION | BOOLEAN |
| 98. | TAMPER DETAILS ARE STORED IN INTERNAL MEMORY & REGISTERED IN TAMPER EVENT REGISTER | BOOLEAN |
| 99. | PERMANENT BACKLIT LIQUID CRYSTAL DISPLAY (LCD) OF 8 DIGITS (WITH +/- INDICATION) AND MINIMUM 8 MM HEIGHT AND WIDE VIEWING ANGLE IS PROVIDED | BOOLEAN |
| 100. | AUTO DISPLAY CYCLING PUSH BUTTON WITH PERSISTENCE TIME OF 10 SECONDS IS PROVIDED | BOOLEAN |
| 101. | BACKLIT LIQUID CRYSTAL DISPLAY (LCD) IS SUITABLE FOR TEMPERATURE WITHSTAND OF $70^0$ C | BOOLEAN |
| 102. | DISPLAY PARAMETERS AS PER SPECIFICATIONS | BOOLEAN |
| 103. | IT IS POSSIBLE TO SCROLL THROUGH PARAMETERS (UP & DOWN) MANUALLY ON DEMAND DISPLAY MODE AND TEST DISPLAY MODE | BOOLEAN |
| 104. | METER SHALL BE AUXILIRY POWERED | BOOLEAN |
| 105. | HARMONICS ARE FILTERED OUT AND ENERGIES FOR FUNDAMENTAL FREQUENCY ARE ONLY MEASURED AND COMPUTED. | BOOLEAN |
| 106. | SCALE MF IS ONE (1) | BOOLEAN |
| 107. | MD INTEGRATION PERIOD SHALL BE PROGRAMMABLE UPTO 15 MINUTES WITH SUB INTEGRATION PERIOD OF 5 MINUTES WITH SLIDING | BOOLEAN |

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| | WINDOW METHOD | |
| 108. | AVERAGE POWER FACTOR WITH 3 DECIMAL DIGITS FOR CURRENT BILLING PERIOD (SINCE LAST RESET) IS CALCULATED AS RATIO OF KWH & KVAH SINCE LAST RESET FOR RESPECTIVE MODE. | BOOLEAN |
| 109. | INSTANTANEOUS PF IS CALCULATED AS RATIO OF INSTANTANEOUS KW AND KVA. | BOOLEAN |
| 110. | BILLING PARAMETERS AS PER SPECIFICATION | BOOLEAN |
| 111. | BILLING HISTORY DATA IS STORED IN METER MEMORY FOR LATEST 12 NO. OF RESETS AS WELL AS FOR THE INSTANT OF DATA RETRIEVAL. | BOOLEAN |
| 112. | RESET TO RESET CONSUMPTION OF ENERGIES & MAXIMUM DEMANDS IS MADE AVAILABLE | BOOLEAN |
| 113. | ABT BILLING DATA PARAMETERS ARE STORED IN NON VOLATILE MEMORY AUTOMATICALLY AS ABT DATA FOR A PERIOD OF 10 DAYS ON FIFO BASIS | BOOLEAN |
| 114. | PROVISION FOR LOAD SURVEY DATA FOR EVERY 15 MINUTES (OR CONFIGURABLE FOR 5 MINUTES IF REQUIRED IN FUTURE) AND FOR PREVIOUS 60 DAYS OR MORE FOR SPECIFIED PARAMETERS ON NON-TIME BASED BASIS ON FIRST IN FIRST OUT BASIS (FIFO) | BOOLEAN |
| 115. | IT IS POSSIBLE TO RETRIEVE ABNORMAL EVENT DATA ALONG WITH ALL RELATED SNAP SHOTS DATA THROUGH METER OPTICAL PORT WITH CMRI **AND** LAPTOP COMPUTER **AND** REMOTE ACCESS THROUGH SUITABLE COMMUNICATION NETWORK & DOWNLOAD THE SAME TO THE BASE COMPUTER ON FIFO BASIS. | BOOLEAN |
| 116. | METER KEEPS RECORDS FOR THE MINIMUM 200 (OCCURRENCE + RESTORATION) EVENTS EXCLUDING POWER OFF EVENTS ON FIFO BASIS. | BOOLEAN |
| 117. | ALL THE COMPUTER SOFTWARE IS PROVIDED | BOOLEAN |

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| 118. | MAXIMUM DOWNLOADING TIME FOR COMPLETE DATA FROM CMRI TO PC IS NOT MORE THAN 5 MIN | BOOLEAN |
| 119. | **SEPARATE** COMMUNICATION CABLE OF 2 METER LENGTH **EACH** FOR DATA COMMUNICATION BETWEEN METER & CMRI, **METER & LAPTOP COMPUTER** AND BETWEEN METER & PC IS PROVIDED. | BOOLEAN |
| 120. | 1 CABLE OF 2 MTR LONG IS PROVIDED WITH USB TERMINATION | BOOLEAN |
| 121. | METER IS CAPABLE TO COMMUNICATE DIRECTLY WITH LAPTOP COMPUTER. | BOOLEAN |
| 122. | BASE COMPUTER SOFTWARE IS SUITABLE FOR ALL TYPES OF DOT MATRIX, INKJET & LASERJET PRINTERS | BOOLEAN |
| 123. | MANUFACTURER AGREES TO PROVIDE API (BASED UPON MIOS STANDARD) WITH PROPER DOCUMENTATION & DEMONSTRATION FOR EXISTING METERS AS WELL AS TO BE SUPPLIED WITH THIS SPECIFICATION. | BOOLEAN |
| 124. | METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: 15959 / 2011 AMENDED UP TO DATE & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED (YES/NO) | |
| 125. | OF METER AS “CATEGORY B– HT (PT / CT) BOUNDARY METER” IN 3 MM BOLD FONT IS MARKED ON NAME PLATE (YES/NO) | |
| 126. | PERMANENT NATURE METER CONNECTION DIAGRAM IS CLEARLY SHOWN ON INSIDE PORTION OF TERMINAL COVER WITH MARKING ON METER TERMINALS IN THE ABOVE DIAGRAM. | BOOLEAN |
| 127. | METER HAS CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL & INDELIBLY & DISTINCTLY MARKED WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE WITH SIZE OF BAR CODED METER SERIAL NUMBER NOT LESS THAN 35X5 MM ALONGWITH | BOOLEAN |

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| | NUMERIC NUMBER & ADDITIONAL REQUIREMENT AS PER SPECIFICATION. | |
| 128. | NAME PLATE WITH SIZE OF BAR CODED METER SERIAL NUMBER NOT LESS THAN 35X5 MM ALONGWITH NUMERIC NUMBER & ADDITIONAL REQUIREMENT AS PER SPECIFICATION | BOOLEAN |
| 129. | WHETHER METER IS TYPE TESTED | BOOLEAN |
| 130. | TYPE TEST REPORT NOS. & DATES | TEXT |
| 131. | ALL ACCEPTANCE & ROUTINE TESTS, AS PER IS: 14697 / 1999 AMENDED UPTO DATE & THIS SPECIFICATION ARE CARRIED OUT ON METER | BOOLEAN |
| 132. | TRANSPORTATION TEST IS CARRIED OUT | BOOLEAN |
| 133. | METER & CMRI ARE GUARANTEED FOR A PERIOD OF 66 MONTHS FROM THE DATE OF SUPPLY OR 60 MONTHS FROM THE DATE OF COMMISSIONING, WHICHEVER IS EARLIER (YES/NO) | |
| 134. | GUARANTEE TO REPLACE METERS / CMRI FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD (YES/NO) | |
| 135. | FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE | |
| 136. | ALL ACCEPTANCE TESTS FOR CONFIRMATION OF ABT FEATURE ARE CARRIED OUT. | BOOLEAN |
| 137. | METER IS GUARANTEED FOR A PERIOD OF FIVE YEARS FROM THE DATE OF COMMISSIONING OR FIVE AND HALF YEAR FROM THE DATE OF DISPATCH WHICHEVER IS EARLIER. | BOOLEAN |
| 138. | IN HOUSE TESTING FACILITY IS AVAILABLE FOR<br>(A) A.C. VOLTAGE TEST | BOOLEAN |

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| 139. | (b) INSULATION RESISTANCE TEST | BOOLEAN |
| 140. | (c) ACCURACY REQUIREMENT | BOOLEAN |
| 141. | (d) TEST ON LIMITS OF ERRORS | BOOLEAN |
| 142. | (e) TEST ON METER CONSTANT | BOOLEAN |
| 143. | (f) TEST OF STARTING CONDITION | BOOLEAN |
| 144. | (g) TEST OF NO-LOAD CONDITION | BOOLEAN |
| 145. | (h) REPEATABILITY OF ERROR TEST | BOOLEAN |
| 146. | (i) TEST OF POWER CONSUMPTION | BOOLEAN |
| 147. | (j) VIBRATION TEST | BOOLEAN |
| 148. | (k) SHOCK TEST | BOOLEAN |
| 149. | (l) TAMPER CONDITIONS AS PER MSEDCL SPECIFICATION | BOOLEAN |
| 150. | (m) FACILITY FOR ACCEPTANCE TESTS OF ABT FEATURES AS PER CLAUSE NO. 17.04 (d). | BOOLEAN |
| 151. | (n) TRANSPORTATION TEST | BOOLEAN |
| 152. | (o) GLOW WIRE TEST | BOOLEAN |
| 153. | (p) LONG DURATION TEST | BOOLEAN |
| 154. | (q) FLAMMABILITY TEST | BOOLEAN |
| 155. | (r) MANUFACTURER HAs DULY CALIBRATED RSM OF CLASS 0.02 ACCURACY | BOOLEAN |
| 156. | MANUFACTURING PROCESS, ASSEMBLY, TESTING & MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION | BOOLEAN |
| 157. | MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION | BOOLEAN |

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| 158. | FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE | BOOLEAN |
| 159. | QUALITY ASSURANCE PLAN AS PER SPECIFICATIONS IS ENCLOSED | BOOLEAN |
| 160. | COMPONENT SPECIFICATION AS PER SPECIFICATION | BOOLEAN |