WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED

Technical Specification for AC 3 Phase 4 Wire 240V LT Solid State (Static) Whole Current Import - Export Energy Meter of 1.0 Class Accuracy and 5-30A Current Rating with Pilfer Proof Meter Box

1.0 SCOPE

1.1 This scope covers design, engineering, manufacture, testing, inspection andsupply of AC 3 Phase 4 Wire 240V LT Solid State (Static) Whole Current Import – Export EnergyMeter of 1.0 Class Accuracy and 5-30A Current Rating with backlit LCD display used for balanced/unbalanced load in urban / rural area.The meter shall be capable of recording and displaying energy in KWh & demand inKVA, power factor having the range of zero lag-unity-zero lead. Meter shall have facility /capability of recording tamper information & load survey of active energy (both import&export), apparent energy, reactive energy, phase currents, Phase Voltages & Other parameters innon volatile memory.

1.2 It is not the intent to specify completely herein all the details of the design and construction of meter.However the meter shall conform in all respect to high standards of engineering, designand workmanship and shall be capable of performing commercial operation continuously ina manner acceptable to WBSEDCL, who will interpret the meanings of drawings &specification and shall have the right to reject any work or material which in its judgment isnot in accordance herewith. The meter shall be complete with all components,accessories necessary for their effective and trouble free operation for thepurpose mentioned above. Such components shall be deemed to be within the scopeof bidder's supply irrespective of whether those are specifically mentioned or not in this specification or in the commercial order.

2.0 STANDARDS APPLICABLE: Unless specified elsewhere in this specification, the performance & testing of the metersshall conform to the following Indian / International standards, to be read with up-to-date and latest amendments / revisions thereof as on 90 days prior to floating of tender.

Sl.No.	Standard No.	Title
1	IS13779:1999 read withits latest amendments	Specification of AC Static Watt Hour meters, Class 1.0and 2.0
2	CBIP Report No. 325 & its latest amendments, if any	Specification for AC Static Electrical Energy Meters
3	IS 12346 :1988	Specification for testing equipment for AC Static Electrical Energy Meter (latest amendment)
4	IEC687 – 1992	Specification of AC Static Watt Hour meters for active energy (Class 1.0)
5	CBIP Technical Report III	Specification for Common Meter Reading Instrument
6	IS 13410 :1992 withlatest amendment	Specification for Pilfer Proof Meter box suitable for 3 Phase StaticEnergy Meter

3.0 CLIMATIC CONDITIONS :

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions. Meters shall be capable of maintaining required accuracy under hot, tropical and dusty climatic conditions. The meters shall be suitably designed and treated for normal life and satisfactory operation under hot and hazardous tropical climatic conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish which provides suitable protection to them from any injurious effect of excessive humidity.

3.1 Maximum Ambient Air Temperature in shade: 55^0 C
3.2 Minimum Ambient Air Temperature: (-)10^0 C
3.3 Maximum Relative Humidity: 95%(non-condensing)
3.4 Minimum Relative Humidity: 10%
3.5 Height above mean sea level: Up to 3000 meters
3.6 Average number of tropical monsoon per annum: 5 months
3.7 Annual Rainfall: 100 mm to 1500 mm
3.8 Maximum Wind Pressure : 150 Kg/Sqm

4.0 SUPPLY SYSTEM :

System	3 Phase 4 Wire
Rated voltage (V_{ref})	240 V – Phase to Neutral, 415 V – Phase to Phase
Rated Current	Basic current 5 Amps (I_b), Maximum current 30 Amps (I_{max})
Rated Frequency	50 Hz

5.0 POWER FACTOR RANGE: The meter shall be lag only in import mode suitable for full power factor range from zero (lagging) through unity to zero (leading).

6.0 POWER SUPPLY VARIATION: The meter shall be suitable for working with following supply system variations.

System	3 Phase 4 Wire
Specified range of operation	70% to 120% of reference Voltage i.e. 240 Volt
Frequency	50Hz $\pm$5%

7.0 ACCURACY

8.1 Class of accuracy of the meter shall be 1.0.
8.2 Maximum error limit at 1% I_b and UPF shall not exceed $\pm$2%.
8.3 There shall be no drift in accuracy, at least for a period of ten years from the date of supply. In case any drift is noticed which is beyond the permissible limits, the bidder shall have to replace the meter with a new one free of cost.

8.0 POWER CONSUMPTION

9.1 Voltage Circuit: The active and apparent power consumption in the voltage circuit/phase at reference voltage, reference temperature and reference frequency shall be less than 1.5W / 10 VA as per IS 13779.

9.2 Current Circuit: The apparent power taken by current circuit/phase at basic current, reference frequency and reference temperature shall be less than 4 VA as per IS 13779.

9.0 STARTING CURRENT & RUNNING AT NO LOAD

9.1 The meter shall start registering energy at0.2% of basic current at unity power factor and shall be fully functional within five seconds after the rated voltage is applied.

9.2 Running at no load: When 70% & 120% voltage is applied and no current flows in the current circuit, the test output of the meter shall not produce more than one pulse.

10.0 MAXIMUM CONTINUOUS CURRENT :

The maximum continuous current in meters shall be the current at which the meter purports to meet the accuracy requirement of the specification. The same is indicated in table in Supply System Clause of this specification.

11.0 CONSTRUCTION :

11.1 The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc. shall be in accordance with the relevant standards. The meter shall be compact & reliable in design, easy to transport & immune tovibration & shock involved in the transportation & handling. The construction of the meter shall ensure consistence performance under all conditions especially during heavy rains / very hot weathers. The insulating materials used in the meter shall be non-hygroscopic, non-ageing & have tested quality. The meter shall be sealed in such a way that the internal parts of the meter becomes inaccessible and attempts to open the meter shall result in viable damage to the meter cover i.e. break to open type. This is tobe achieved by using continuous Ultrasonic welding on all the four sides of theMeter base and cover or any other technology which is either equally or more efficacious.

11.2 The meter shallcomply latest technology such as Microcircuit or Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB shall compulsorily be Surface Mounted Technology (SMT) type. Power supply component may be of PTH type. The electronic components used in the meter shall be of high quality and there shall be no drift in the accuracy of the meter for at least ten years. The circuitry of the meter shall be compatible with 16 Bit (or better) ASIC with compatible processor and meter shall be based on Digital measuring and sampling technique.

11.3 The meter shall be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized,virgin Polycarbonate casing of projection mounting type. The meter cover shall be transparent / translucent. But the viewing portion shall be transparent for easy reading of displayed parameters, and observation of operation indicators. The meter base may not be transparent, but it shall not be black in colour. The meter casing shall not change in shape, colour, size and dimensions when subjected to 72hrs on UV test as per ASTMD 53.It shall withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75 or as per IEC 60068 -2-5.

11.4 In addition to the above, the meter cover shall be sealable to the meter base with at least 2 nos. bar coded seals bearing the identification marks of the Manufacturer. Suitable arrangement shall be made for fitting/fixing of utility seal at two sides of meter terminal cover in such a manner that any access to the terminal cannot be made possible without removing the seal. There shall also be provision for sealing at the optical port.

11.5 The polycarbonate material of only the following manufacturers shall be used:

11.5.1 **G.E. Plastic :**LEXAN 943A or equivalent like 943, 123R for meter cover & terminal cover / LEXAN 503R or equivalent like 500, 143R for meter base and terminal block.
11.5.2 **BAYER :** Grade corresponding to above
11.5.3 **DOW Chemical : --do--**
11.5.4 **MITSUBISHI : --do--**
11.5.5 **TEJIN : --do--**
11.5.6 **DUPONT : --do—**

12.0 METER CASE AND COVER :

12.1 In case, ultrasonic welding using plate / strip is used, the material of plate / strip shall be same as that of cover and base and the strip. The manufacturer's logo shall be embossed on the strip / plate. The material of the meter body (case and cover) shall be of Engineering Plastic.

12.2 The meter cover shall be fixed to the meter base (case) with Unidirectional Screws, so that the same cannot be opened by use of screwdrivers. These unidirectional screws shall be covered with transparent caps (not required for screw less design), ultrasonically welded with the meter body and the screw covers shall be embedded in the meter body in a groove. The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No.325 including 0.2T AC Magnet, 0.5T Permanent magnet.

13.0 TERMINAL BLOCK AND COVER:

13.1 The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block shall be made from best quality non-hygroscopic, flame retardant material (capable of passing the flammability tests) with nickel plated brass inserts / alloy inserts for connecting terminals. It shallbe rigidly fixed to the base of the meter so that it cannot be separated from the meter base without breaking either the meter base or the terminal block and this fixing arrangement shall be in parallel to the meter base in such a way that it cannot be viewed or approached from any part of the meter without breaking the meter.

13.2 The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor. The screws shall have thread size not less than M4 and head having 6 mm. Diameters. The screws shall not have pointed ends at the end of threads.All terminals and connecting screws and washers shall be of tinned / nickel plated brass material. The terminal shall withstand glow wire test at 960 + 15 ºC and the terminal shall withstand at least 135 ºC.as per IS.

13.3 The internal diameter of terminal hole shall be minimum 9.5 mm and center to center distance is 13 mm. The holes in the insulating material shall be of sufficient size to accommodate the insulation of conductor also.

13.4 The terminal cover shall be transparent re-enforced Polycarbonate, Engineering Plastic with minimum thickness 2.0 mm and the terminal cover shall be of extended type completely covering the terminal block and fixing holes. The space inside the terminal cover shall be sufficient to accommodate adequate length of external cables.

13.5 The terminals and all connecting screws will be of suitable material capable of withstanding a current of 150% of I_{max} for two hours, continuously and the meter shall be capable of providing phase to neutral protection up to 433 V for 1(one) hours.

14.0 MARKING OF THE METER :

The marking on the meter shall be in accordance with relevant clauses of IS 13779.The basic marking on the meter nameplate shall be as follows. Allother markings as per IS shall also be there.

14.1 Manufacturer’s name & trade mark
14.2 Type Designation
14.3 No. of phases & wires
14.4 Serial number (Size not less than 5mm)
14.5 Month & year of manufacture
14.6 Reference Voltage
14.7 Rated Current
14.8 Operating Frequency

14.9 Principal unit(s) of measurement

14.10 Meter Constant (imp/kwh)

14.11 Class index of meter

14.12 "Property of WBSEDCL"

14.13 Purchase Order No. & Date

14.14 Guarantee (Guaranteed for a period of 5 ½ years from the date of delivery)

14.15 BIS marking

14.16 Place of manufacture

14.17 Barcode for meter serial no. in alpha numeric form, date of manufacture, current rating of the meter and PO reference, readable by single layer barcode reader.

14.18 The reference temperature if different from 27 ^{0}C.

14.19 The sign of Double Square for insulating encased meters.

15.0 CONNECTION DIAGRAM AND TERMINAL MARKING: Every meter shall be indelibly marked with a diagram of connection. For this polyphase meters, this diagram shall also show the phase sequence for which the meter is intended. It is permissible to indicate the connection diagram by an identification figure in accordance with relevant standards. The marking of meter terminals shall appear on this diagram.

16.0 DISPLAY OF MEASURED VALUES :

16.1 The meter shall have alphanumeric display with at least 7 full digit with LCD backlit display, having minimum character height of 10 mm. The data shall be stored in nonvolatile memory. The non-volatile memory shall retain data for a period of not less than 10 years under unpowered condition. Battery back-up memory will not be considered as NVM.

16.2 It shall be possible to easily identify the single or multiple displayed parameters through symbols / legend on the meter display itself or through display annunciation which shall be self explanatory and symmetric.

16.3 In addition to provide Serial Number of the meter on the display plate, the meter serial no. shall also be programmed into meter memory for identification through communication port for CMRI / laptop / meter reading printout.

16.4 Visibility of display in poor light conditions is an important criterion. STN or TN or any better type of advanced LCD to be used. Proper legends for the displayed parametersto be provided (Factory programmable). Back lit provided for clear visibility shall be uniform throughout all part of the LCD.

16.5 The meters shall have auto-display mode for pre-selected parameters. Push-Button mode of display shall display all parameters and it shall have priority over auto mode. The meter shall give clear message on display to indicate that the meter has experienced tampers and the nature of tamper with date and time of first occurrence, last occurrence and last restoration, if the Last tamper status is not restored, then meter will indicate first occurrence, last restoration and last occurrence.

16.6 Connection check, Phase sequence and self diagnosticshall give clear message on display. The meter shall have a test output **(**blinking **LED)** accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device shall be provided in the form of one common LED for active and reactive energy with the provision of selecting the parameter being tested (separate LED may also be used with proper separation).

17.0 DISPLAY SEQUENCE: The meter shall display the required parameters in two different modes as follows. Display sequence for both auto and Push button must be maintained, no interchange in sequence or display parameter will be accepted. All the display shall have proper legend to identify the same.

17.1 Auto Display Mode:The following parameters shall be displayed in auto cycle mode, in the following sequence.

17.1.1 LCD test
17.1.2 Meter serial number
17.1.3 Real Date (dd mm yy)
17.1.4 Real Time (hh mm ss)
17.1.5 History1 Cumulative Active Import Energy (upto 24:00 hrs of last day of last month).
17.1.6 History1 Cumulative Active Export Energy (do)
17.1.7 Cumulative Active Import Energy
17.1.8 Cumulative Active Export Energy
17.1.9 Instantaneous Phase Voltages
17.1.10 Instantaneous Phase Currents
17.1.11 History 1 Power Factor
17.1.12 History 1 MD KVA (Import)
17.1.13 History 1 MDKVA (Export)
17.1.14 Cumulative Billing Count
17.1.15 Cumulative Tamper Count
17.1.16 Cover Open Information with date and time

17.2 Push Button mode: In addition to the auto display mode parameters, the following parameters shall be displayedon pressing the push button i.e. all display of auto mode and the display as per following.

1. LCD test
2. Meter serial number
3. Real Date (dd mm yy)
4. Real Time (hh mm ss)
5. Rising Apparent Demand with elapsed time (both import and export)
6. History1 Cumulative Active Import Energy (upto 24:00 hrs of last day of last month)
7. History 1 TOD wise KWh (Import)

8. History1 Cumulative Active Export Energy (do)
9. History 1 TOD wise KWh (Export)
10. History1 Cumulative Reactive Import Energy(Lag) (do)
11. History1 Cumulative Reactive Export Energy(Lag) (do)
12. History1 Cumulative Reactive Import Energy (Lead) (do)
13. History1 Cumulative Reactive Export Energy (Lead) (do)
14. History1 Cumulative Apparent Import Energy (do)
15. History1 Cumulative Apparent Export Energy (do)
16. Cumulative Active Import Energy
17. TOD Wise Cumulative Active Forwarded Energy Import(up to date Zone 1, 2, 3)
18. Cumulative Active Export Energy
19. TOD Wise Cumulative Active Forwarded Energy Export (up to date Zone 1, 2, 3)
20. Cumulative Reactive Energy Lag both import & Export, (upto date)
21. Cumulative Reactive Energy Lead both import & Export, (upto date)
22. Cumulative Apparent Energy both import & Export (upto date)
23. History 1 MD KVA (Import)
24. History 1 MD KVA (Export)
25. Present Month Active and Apparent Demand both import & Export with Date and Time.
26. Cumulative Active Demand both Import & Export since manufacture
27. Cumulative MD KVA (Import) since manufacture.
28. Cumulative MD KVA (Export) since manufacture.
29. Cumulative Billing Count.
30. Cumulative Tamper Count.
31. Cover Open Information with Date and Time.
32. Instantaneous Phase Voltages
33. Instantaneous Phase Currents
34. Instantaneous Neutral Current* i.e. Actual Current flowing through the Neutral*.
35. History 1 Average Power Factor.
36. Instantaneous Net Power Factor.
37. Inst. Power Factor – Phase Wise
38. Avg. Load Factor (Previous Month)
39. Instantaneous Active Power
40. Instantaneous Apparent Power
41. Instantaneous Frequency
42. Present Tamper Status (PT/CT/Others)
43. First Occurrence with Date & Time
44. Last Occurrence with Date & Time
45. Last Restoration with Date & time
46. History 1 Power Off hours.
47. Power Off Hours of Present Month
48. Cumulative Power failure in hour: minute from the date of manufacturing.
49. High resolution display both Import & Export for KWh, KVARH (Lag & Lead) and KVAH (minimum 2+4)
50. High resolution display both for Import & Export for KWh, **Phase wise** (minimum 2+4)
51. Phase Sequence check.
52. Connection check
53. Self Diagnosis.

17.3 Power OFF Mode Display:

17.3.1 Meter Serial No.
17.3.2 Real Time
17.3.3 Date
17.3.4 History1 Cumulative Active Import Energy (upto 24:00hrs of last day of last month)
17.3.5 History1 Cumulative Active Export Energy (do)
17.3.6 History 1 KVA (Import)
17.3.7 History 1 KVA (Export)
17.3.8 History 1 TOD wise KWh (Import)
17.3.9 History 1 TOD wise KWh (Export)
17.3.10 History 1 TOD wise KVAh (Import)
17.3.11 History 1 TOD wise KVAh (Export)
17.3.12 Cumulative Billing Count
17.3.13 Cumulative Tamper Count
17.3.14 Cumulative Active Import Energy
17.3.15 Cumulative Active Export Energy

17.4 Display for Auto and manual mode must be listed by two headers:

17.4.1 "Auto Display Mode"
17.4.2 "Push Button Mode" (Parameters shall be pasted in front of the PP Box**)**

17.5 Display: Other requirements:

17.5.1 Each parameter shall be on meter display for 10 secand the time gap between two auto display cycles shallbe 30 sec.
17.5.2 The register shall be able to record and display starting from zero, for a minimum of 1500 hours, the energy corresponding to rated maximum current at reference voltage and unity power factor. The register shall not roll over in between this duration.
17.5.3 High resolution display can be given in separate mode and its registers required in display min 2+4 digits (for kWh) after decimal in case of Energy.
17.5.4 No decimal is required for main KWh, KVAh, KVarh (lag & lead) display.Push button mechanism shall be of high quality and shall provide trouble free service for a long span of time. Up and Down scrolling facility shall be there for Push Button Mode.

17.6 Besides other details the following parameters shall be available in BCS through downloaded data.

17.6.1 History 1 TOD wise KWh (Import)
17.6.2 History 1 TOD wise KWh (Export)
17.6.3 History 1 TOD wise KVAh (Import)
17.6.4 History 1 TOD wise KVAh (Export)

17.6.5 History 1 TOD wise MD in KVA (Import)

17.6.6 History 1 TOD wise MD in KVA (Export)

17.6.7 TOD Wise Cumulative Active Forwarded Energy both import & Export (up to date Zone 1, 2, 3)

17.6.8 TOD Wise Cumulative Apparent Energy both import & Export (up to date Zone 1,2,3)

17.6.9 Cumulative Active and Apparent Demand (both Import and Export) may be available at BCS end data

18.0 ANTI TAMPER FEATURES : The meter shall have the following anti-tamper features:

18.1 The meter shall be capable of recording energy correctly at Import as well as Export mode. If any phase current flows in forward direction, the meter shall register energy in phase-wise Import counter as well as in cumulative Import counter and if phase current flows in reverse direction, it shall register energy in phase-wise Export counter as well as in cumulative Export counter. Simultaneous Import & Export in different phases shall be allowed and this will not be treated as any Tamper event.

18.2 The meter shall work correctly irrespective of phase sequence of supply. (There must be an indication in display & down loaded data).

18.3 The meter shall work correctly even in absence of neutral as per IS13779. For reference voltage V_{ref} between 70% to 50 %, accuracy must be maintained within + 4%.

18.4 Meter shall record energy within maximum error of + 4% on injection of DC, pulsating DC (7-10 Hz), chopped AC in Neutral along with logging of ND tamper. In case tamper event is not logged, i.e, meters areimmune to neutral disturbance, accuracy of the meters must not be affected.Maximum chopping for AC injection will be 25% to 30% at peak end.

18.5 The registration shall not be affected more than + 4% if high frequency (55Hz to 100Hz) or low frequency (45Hz to 30 Hz) AC signal w.r.t. earth is applied to the meter neutral. Meters which are immune or will maintain better accuracy, will bepreferred.

18.6 The meter shall be immune to Electro Static Discharge or Sparks of 35 KV (approx) induced by using frequency-generating devices having very high output voltage.

Tests in this respect will be conducted by using commonly available devices and during spark discharge test, spark will be applied directly at all vulnerable points of the meter for a period of 10 minutes (at an interval of 1minute (approx) between two consecutive strokes) and meter shall maintain accuracy after the test under this condition. Accuracy will be checked during and after application of spark discharge Test. Meter shall record correctly within the specified limits of errors. Beyond 35 KVthe meter shall record tamper if not immune.

18.7 The meter shall be capable of recording occurrence and restoration with date and time in respect to the following tamper events:

18.7.1 Power failure (Tamper count not to be increased) - as per tamper logic 1(i)
18.7.2 Invalid Voltage- as per tamper logic 2(i)
18.7.3 Missing Potential (phase wise) —as per tamper logic 2(ii)
18.7.4 High Voltage – as per tamper logic 2(iii)
18.7.5 Voltage Unbalance – as per tamper logic 2(iv)
18.7.6 Phase wise CT Open- as per tamper logic 3(i)
18.7.7 CT Unbalance - as per tamper logic 3(iii)
18.7.8 Over Current - as per tamper logic 3(iv)
18.7.9 Neutral Disturbances (If it is logged) - as per tamper logic 4(ii)
18.7.10 Magnetic Disturbances - as per tamper logic 4(iii)

18.8 Threshold Values of all above occurrence and restoration are attached herewith.Snapshot values of Phase Voltage, Phase Current &Phase wise Power Factor, Active Energy value during occurrence & restoration to be provided in all the above mentioned tamper conditions in BCS with date and time. (In Event logging Snapshots shall be considered when the actual phenomenon occurred). The logging time for recording occurrence and restoration of all tamper events except Magnetic & Neutral Disturbance tamper, shall be 5 min. Magnetic tamper shall appear instantaneously, Neutral Disturbance within 3 min.

18.9 All authenticated commands shall be Base Computer Software(BCS) controlled. All transactions with meter shall be date and time logged, in the downloaded data (Last 12 month's transactions).

18.10 Properly designed meter tamper logic shall be provided and clearly explained in the bid. The tamper logic shall be capable of discriminating the system abnormalitiesfrom source side and load side and it shall not log/record tamper due to any source side abnormalities. More than one tamper *CT related/ PT related/ others* shall not be logged at a time. A minimum of 300 events (one event means either occurrence or restoration) of all types of tamper with date & time stamping shall be available in meter memory compartment wise. The logging will be on FIFO basis. The events will be divided into three compartments like *CT related (148 Events), PT related (88 Events) and others (64 Events)*.

18.11 Meter shall have a continuous and clear indication in its display if top cover is removed / opened and even re-fixed (non rollover) and only cover open must be logged in BCS without any restoration. COVER OPEN tamper is to be displayed after every parameter displayed in Auto Display Mode.

18.12 Measurement of Harmonics:The meter shall be capable of measuring fundamental energy as well total energy i.e., fundamental plus harmonics energy. Total energy shall be made available on meter display and the same shall be used for billing purpose. Provision for measuring fundamental energy shall be kept for utilization in future. The total energy and fundamental energy shall be logged in the meter memory and be capable of downloading to the BCS through the CMRI and be available for viewing at the BCS end separately.

19.0 RESETTING OF MAX. DEMAND:

19.1 The meter shall be capable of recording the Apparent MD with integration period of 15 minutes (programmable). MD reset shall be through each of the three means:

19.1.1 Automatic resetting at preset date & time (at present it will be at 00.00 hrs of the first day of the month)

19.1.2 Manually i.e., by push button.

19.1.3 Through authenticated command from MRI or through Remote Communication.

19.2 The means by which the reset has been done shall be made available to downloaded data.Facility to invoke any of the above through authenticated MRI command shall be provided at BCS. MD reset button shall have proper sealing arrangement.

19.3 There shall be separate Push button for scrolling display (up and down) and MD reset. If only two Push buttons are used minimum 20 sec pressing is required for MD reset.

20.0 LOAD SURVEY: The meter shall be capable of recording load survey for the following parameters for a period of minimum 60 days - subject to availability of all parameters listed below with 15 minutes integration period.

20.1 Energy in KWh &KVAh, (Import & Export mode shall be shown clearly)

20.2 Demand in KVA and KW, (Import & Export mode shall be shown clearly)

20.3 Current – phase-wise

20.4 Voltage – phase-wise

21.0 The NVM shall not require any additional battery backup to retain the data in case of power failure, for upto 10 years and the data storage shall be independent of batterybackupunit.The life of the RTC battery in circuit condition shall be minimum 10 years in case ofpowerfailure.Itshall be possible to transfer this data to base computer software through MRI/Laptop or RMR. The data so obtained shall be displayed in both graphical &numeric form in the BCS. The BCS with all details is to be provided by the supplier at no extra cost.

22.0 TIME OF DAY FACILITIES : The meter shall have facilities to record Active, Apparent Energies and MD in at least 8 zones. The time zones shall be user programmable through authenticated MRI/Laptop/RMR command. Necessary software for the same is to be provided by the bidder.At present TOD timings will be programmable as follows:

22.1 TOD 1: 06:00 Hrs to 17:00 Hrs.

22.2 TOD 2: 17:00 Hrs to 23:00 Hrs.

22.3 TOD 3: 23:00 Hrs to 06:00 Hrs.

23.0 METER READING DURING POWER OFF: Itshall be possible to read the meter-display visually and with MRI/Lap top in absence of input voltages with the help of internal battery backup. In case of external battery the arrangements shall be such that hands free operation is possible. In case of external battery 10 years guarantee must be given for external battery/power pack. Separate battery shall be used for this purpose(Not RTC or processor battery). In case of Lithium battery rating shall be more than 500mAh.

24.0 SELF DIAGNOSTIC FEATURES: The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time. If possible, the details of malfunctioning shall be recorded in the meter memory. The bidder shall furnish the details of self-diagnostic capability feature, viz Memory status (NVM) and Battery status, RTC Status etc. and it shall be in display.

25.0 IMMUNITY TO ELECTRO MAGNETIC DISTURBANCE: The meter shall be designed in such a way so that external electromagnetic field or electrostatic discharges do not influence the performance of the meter as per IS 13779.

26.0 TECHNICAL SUPPORT, MANUALS &TRAINING: Extensive technical support, detailed technical literature (shall supply with each meter at the time of packing) & training is to be provided by the manufacturer. Supply of External Battery Packs if required to be provided by the manufacturer and shall be clearly offered in their bids.

27.0 INFLUENCE QUANTITIES : The meter shall work satisfactory with guaranteed accuracy as per limit provided in IS: 13779(clause No.9.2.1 and 11.2) under presence of the following quantities:

27.1 Electromagnetic field
27.2 External magnetic field
27.3 Radio frequency interference
27.4 Vibration
27.5 Voltage variation (70% - 120% of Vref.) in 0.5 lag and upf both in 5% and 100% of I_b
27.6 Frequency variation (+/-) 5% of 50 Hz in 0.5 lag and upf both in 5% and 100% of I_b

28.0 COMMUNICATION CAPABILITY:

28.1 The meter shall have a galvanic isolated Optical Port as per IEC 1107/ANSI/PACT so that it can be easily connected to a handheld Common Meter Reading Instrument (CMRI)/Laptop/PC for data transfer. The optical port shall be provided with proper sealing arrangement so that its cover can't be opened without breaking its seal.

28.2 A Serial Port (RS232 or RJ11) shall also be provided inside the terminal cover to enable automatic meter reading through Modem, if required in future. The Serial Port shall be housed inside the meter terminal cover so that it can't be accessed without opening the sealed terminal cover.

28.3 The downloading time for billing & tamper data shall not be more than 5 minutes.

28.4 The stored data in the meter shall be available through CMRI even when the display of the meter is not available.

28.5 No alteration shall be possible without authenticated commands set by the BCS after scheduling the meters. Moreover, no alternation shall be possible using CMRI only, i.e. the control has to be with the BCS as well.

28.6 Date in the meter shall be reset only through commands from the CMRI or Laptop. Correction of RTC time, change of TOD timings etc. shall be done through CMRI or Laptop utilizing authenticated command set by BCS.

28.7 Billing parameters shall be factory programmable.

28.8 The BCS shall have multi-level password for data protection & security.

28.9 Bidder has to submit CMRI software (.exe format) also at the time of sample meter testing.

28.10 Infrared communication port is not acceptable.

29.0 BASE COMPUTER SYSTEM & SOFTWARE REQUIREMENTS:

29.1 The Common Meter Reading Instrument (CMRI) shall be loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading and/or downloading meter data.

29.2 Windows (Windows 7.0 or higher version) based Base Computer Software (BCS) shall be provided for receiving data from CMRI and downloading instructions from BCS to CMRI.

29.3 The data stored in the meters memory including defrauded energy shall be available on the BCS.

29.4 Only one BCS shall be provided for downloading data andauthenticated command from CMRI/ Laptop.

29.5 The BCS shall have facility to convert meter reading data into user definable ASCII file format so that it can be integrated with the billing system or any other third party software. The user shall have the flexibility to select the parameters to be converted into ASCII file.

29.6 All the data available in the meter including energy, MD etc. with date and time stamp, new TOD time zones and historical data shall be available in BCS after down loading.

29.7 The bidder shall supply the necessary CMRI software during sample meter testing.

29.8 The bidder has to supply the meter reading protocol and API free of cost. The bidder shall indicate the relevant standard to which the protocol is compliant.

29.9 Transfer of data from the meter to CMRI & then to the BCS shall be easily executed.

29.10 Any change or up gradation of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost.

29.11 The same software shall be capable of preparing CMRI to read the meter information or to reconfigure the meter for change of TOD timings and / or time setting of the meter etc. The

exhaustive online help shall be available with the software so that user can use all the features of the software by just reading the help contents.

29.12 In BCS 12 months data for KWH, KVAH, MD in KW and in KVA (Total and TOD wise) , Average Load Factor, Average Power Factor may be available for both Import and Export mode of operation.

30.0 GENERAL REQUIREMENTS:

30.1 GUARANTEED TECHNICAL PARTICULARS: The bidder shall furnish all the necessary information as desired in the Schedule of Guaranteed Technical Particulars and data, appended with this Specification. If the bidder desires to furnish any other information in addition to the details as asked for, the same may be furnished against the last item of this Annexure– I.

30.2 TECHNICAL DEVIATIONS: Any deviation in Technical Specification as specified in the Specification shall be specifically and clearly indicated in the Schedule of deviation format.

30.3 TESTS :

30.3.1 **Type Testing of Meter:** The offered meters shall be type tested at any NABL accredited laboratory in accordance with IS 13779 and CBIP Report 325 with their latest amendments. The type test report shall not be more than 3 (three) years old. A copy of the Type Test results shall be enclosed with the offer. If there is any modification in the design / parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer may be liable to be rejected.Type Test Certificate from any NABL accredited Lab shall only be considered.Type test certificate shall contain the following information clearly:

30.3.1.1 Type of display or LCD
30.3.1.2 Class of accuracy
30.3.1.3 Meter constant
30.3.1.4 Type of meter

30.3.2 **Acceptance tests:** The acceptance tests as stipulated in CBIP / IS (with latest amendments) shall be carried out by the supplier in presence of purchaser's representative.In case of failure of Meters as specified in Recommended Sampling Plan of IS-13779, the entire lot will be treated as rejected. Also the following additional tests are to be carried out on one meter randomly selected from each lot

offered for inspection / acceptance testing. In case of failure of any single meter the entire lot will be rejected.

30.3.2.1 Magnetic induction of external origin (AC & DC)
30.3.2.2 Tamper & Fraud protection, as per relevant Clause of this specification.
30.3.2.3 Test of endurance upto120%of I_{max}, for two hours, followed by verification of limits of error.
30.3.2.4 Verification of internal components.
30.3.2.5 Dry Heat Test under Test of Climatic Influences in IS 13779: 1999 of one meter from the offered lot is to be arranged by the supplier at any NABL accredited laboratory, at his cost.

30.3.3 **Routine Tests :**Each and every meter of the offered lot shall undergo the routine tests as well as functional tests as per IS: 13779/1999, CBIP Report 325 and after sealing the meters, the manufacturers will have to submit the routine test report of all the meters as well as a statement showing seal Sl. Nos. against each meter Sl.No. of offered lot in soft copy (MS WORD or EXCEL format), to the Chief Engineer(Procurement and Contract) and the Chief Engineer(DTD), along with offer letter for acceptance test.

30.4 TEST FACILITIES: The tests for equipment / instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all equipments / instruments.

30.5 The standard meters used for conducting tests shall be calibrated periodically at any NABL Accredited Test Laboratories and test certificates shall be available at Works for verification by purchasers' representative.

30.6 The manufacturer shall have at least the following testing facilities to ensure accurate calibration:-

30.6.1 AC high voltage test
30.6.2 Insulation test
30.6.3 Test of no load condition
30.6.4 Test of Starting condition
30.6.5 Test on Limits of error (Automatic Testing facility with ICT)
30.6.6 Power loss in voltage and current circuit
30.6.7 Test of Repeatability of error
30.6.8 Test of meter constant
30.6.9 Test of magnetic influence (As per CBIP 325 & Permanent Magnet)

30.7 INSPECTION:

30.7.1 The purchaser may carry out the inspection at any stage of manufacture. The manufacturer shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective. All acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase. The Bidder shall provide all reasonable facilities without charge to the inspector, to satisfy him that the equipment is being furnished in accordance with this specification.

30.7.2 The supplier shall keep the purchaser informed in advance, about the manufacturing programme for each lot so that arrangement can be made for inspection. The purchaser reserves the right to insist for witnessing the acceptance / routine testing of the bought out items. The supplier shall give 15 days for local supply / 30 days in case of foreign supply advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

30.7.3 The purchaser reserves the right to get type test any meter, for meter casing etc. from any of the offered lots, reserve at any destination stores.

31.0 SUBMISSION OF SAMPLE METER:

31.1 The bidder will submit his sample Meters in sealed casing / cartoon along with relevant Meter documents (**As per Annexure-IV)**, within the specified period as mentioned in NIT, to the Office of the Chief Engineer (DTD), Abhikshan, Sec-V, Salt Lake, Kolkata-91.

31.1.1 While submitting the samples and required documents as per Annexure-IV, the bidder shall submit three numbers of sealed meters as per the specifications stated herein before, 2 nos. ultrasonic welded and 1 no without welding and another dummy meter case (for checking ultrasonic welding) and one P.P. Box.

31.1.2 They shall also submit one prototype of meter base and cover (with body screw caps) properly welded.

31.1.3 The date of testing of sample meters will be intimated to the bidders by CE(DTD) and during such test other bidders will also be allowed to witness the testing. Sample submission and Test procedure may be changed due to emergency requirement.

Onthe date of testing of sample meters of a particular bidder, he shall come prepared with the following.

31.1.3.1 BCS (as per specification)

31.1.3.2 CMRI compatible with BCS and loaded with CMRI software and laptop compatible with BCS.

31.1.3.3 Modem and accessories for testing the remote meter reading.

31.1.3.4 Any other accessories required for observing the performance and capabilities of the meters.

32.0 QUALITY ASSURANCE PLAN: The design life of the meter shall be minimum 20 years and to prove the design life the firmshall have at least the following quality Assurance Plan.

32.1 The factory shall be completely dust proof.

32.2 The test rooms shall be temperature and humidity controlled as per relevant standards.

32.3 The test and calibrating equipmentsshall be automatic and all test equipment shall have their valid calibration certificates.

32.4 Meter will be tested (in case of lot test) in fully automatic test bench with ICT. No. human intervention will be allowed during test.

32.5 Power supplies used in test equipment shall be distortion free with sinusoidal wave forms and maintaining constant voltage, current and frequency as per the relevant standards.

33.0 THE CHECKS TO BE CARRIED OUT DURING MANUFACTURING OF THE METERS:

33.1 Meter frame dimensions tolerances shall be minimal.

33.2 The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.

33.3 The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.

34.0 INFORMATION TO BE FURNISHED WITH THE BID: The Bidder shall invariably furnish the following information along with the bid, failing which thebid shall be liable for rejection. Information shall be separately given for individual type ofmaterial offered.

34.1 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 tests normally carried out on raw materials.

34.2 Information and copies of test certificates in respect of bought out accessories.

34.3 List of manufacturing facilities available.

34.4 Level of automation achieved and lists of areas where manual processing exists.

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

34.6 List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, vis-à-vis type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in schedule of deviations.

34.7 The list of components used in the meter.

34.8 A detailed list of bought-out items, which are used in the manufacturing of the meter indicating the name of firms from whom these items are procured. The details of quality assurance procedures followed in respect of the bought-out items.

34.9 The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter.

34.10 The facility available if any for conducting type test.

34.11 Principle of operation of the meter, outlining the methods and stages of computation of various parameters starting from input voltage and current signals including the sampling rate, if applicable.

34.12 The relevant documents regarding the procurement of polycarbonate material.

35.0 LAB FACILITY: The laboratory of manufacturer must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice).

36.0 MANUFACTURING ACTIVITIES:

36.1 All the materials, electronics and power components, ICs used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy. The manufacturer shall use Application Specific Integrated Circuit (ASIC) or Micro controller for metering functions.

36.2 The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and re flow solder process. The electronic components used in the meter shall be of high quality and there shall be no drift in the accuracy of the meter at least up to 10 years.

36.3 Further, the Bidder shall own or have assured access (through hire, lease or sub-contract) of the mentioned facilities. The PCB material shall be of glass epoxy FR-4 grade conforming to relevant standards.

36.4 All insulating materials used in the construction of meters shall be non-hygroscopic, non-ageing and tested quality. All parts that likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating. Quality shall be ensured at the following stages.

36.4.1 At PCB manufacturing stage, each board shall be subjected to bare board testing.

36.4.2 At insertion stage, all components shall undergo testing for conforming to design parameters and orientation. Complete assembled and soldered PCB shall undergo functional testing using test equipments (testing jig).

36.5 Prior to final testing and calibration, all meters shall be subjected to accelerated ageing test to eliminate infant mortality, i.e., meters are to be kept in ovens for 72 hours at 55 deg Centigrade temperature & atmospheric humid condition. After 72 hours meters shall work correctly. Facilities / arrangement for conducting ageing test shall be available with the manufacturer.

36.6 The calibration of meters shall be done in-house.

37.0 DOCUMENTATION:

37.1 Twenty sets of operating manuals shall be supplied to the office of the CE (DTD) for distribution at sites.

37.2 One set of routine test certificates shall accompany each dispatch consignment.

37.3 The acceptance test certificates in case pre-dispatch inspection or a routine test certificate in cases where inspection is waived shall be approved by the purchaser.

38.0 GUARANTEE:

38.1 The Meters and Pilfer Proof Meter Boxes shall be guaranteed arising out of faulty design,materials, bad workmanship for a period of **5½ years** from the date of supply.

38.2 Life of battery used for the meter shall be guaranteed for 10 years.

39.0 REPLACEMENT OF DEFECTIVE METERS AND PILFER PROOF METER BOXES: The meters /Pilfer Proof. Meter Boxes declared defective within the above guarantee period by the WBSEDCL shall be replaced by the supplier up to the full satisfaction of the WBSEDCL at the cost of supplier within one month on receipt of intimation. Failure to do so within the time limit prescribedshall lead to imposition of penalty of twice the cost of meter. The same may lead to black listing even, as decided by WBSEDCL. In this connection the decision of WBSEDCL shall be final.

40.0 PACKING & FORWARDING:

40.1 The equipment shall be packed in cartons / crates suitable for vertical / horizontal transport as theCasemay be, and suitable to withstandhandling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.

40.2 The packing shall be done as per the standard practice as mentioned in IS 15707: 2006. Eachpackage shall clearly indicate the marking details (for e.g, manufacturer's name, Sl. Nos. of meters inthe package, quantity of meter, and other details as per supply order). However, the suppliershall ensurethe packing is such that, the material shall not get damaged during transit.

41.0 COMPONENT SPECIFICATIONS: The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED / LCD etc., which are PTH type. All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy. The Components used for manufacture of meter shall be of high quality and the bidders shall confirm component specification as specified below in Annexure-III Bidders shall compulsorily fill Annexure-I, Annexure-II & Annexure-III for technical qualification.

Sl. no.	**Component Function / Feature**	**Requirement**	**Make / origin**
1	Current Element	E-beam /spot welded CT shall beprovided in the phase element and in theneutral with proper isolation.	Any make or origin conforming to IS-2705
2	Measurement /computing chips	The Measurement / computing chips usedin the meter shall be with the Surfacemount type along with the ASICs.	USA:AnalogDevices,AMS, Cyrus Logic, Atmel, SAMES, Texas Instruments,Teridian;Japan: NEC,Freescale,Renesas;Holland: Phillps
3	Memory chips	The memory computing chips shallnotbe affected by the external parameterslike sparking, high voltage spikes orelectrostatic discharges.	USA: National SemiConductor, Atmel,SAMES, TexasInstruments, Teridian,ST, Microchip; Japan: Hitachi,OKI,Freescale, Renesas; Holland / Korea:Phillps
4	Display modules	The display modules shall be well protectedfrom the external UV	Singapore: Bonafied Technologies; Korea: Advantek;

		radiations. The displayshall be clearly visible over an angle of atleast a cone of 70o.The construction of themodulesshall be such that the displayedquantityshall not disturbed with the life ofdisplay. The display shall be TN typeindustrial grade with extended temperature range	Japan : Hitachi, SONY,Hijing,Truly Semiconductor; Chaina: Tianma
5	Communication modules	Communication modules shall be compatible for the RS 232 ports	USA: NationalSemiconductors, HP,ST, Texas Instruments,Agilent, Avago;USA / Korea: Fairchild;Holland/ Korea: Philips;Japan: Ligitek, Hitachi, Germany: Siemens,Tiwan: Everlight,
6	Optical port	Optical port shall be used to transfer themeter data to meter reading instrument. Themechanical construction of the port shallbesuch to facilitate the data transfer easily.	USA: NationalSemiconductors, TexasInstruments, HP,Agilent, Avago,Germany/USA :Osram;Japan: Hitachi, ,21; Germany:Siemens;Holland / Korea:Philips; Tiwan:Everlight,
7	Power Supply	The power supply shall be with the capabilities as per the relevant standards. Thepower supply unit of the meter shall not beaffected in case the maximum voltage of thesystem appears to the terminals due to faults ordue to wrong connections.	As specified.
8	Electronic components	The active & passive components shall be ofthe surface mount type & are to be handled &soldered by the state of art assemblyprocesses.	USA: NationalSemiconductors,Atmel, Phillips, TexasInstruments, ST,Onsemi; Japan: Hitachi, Oki,Toshiba. Freescale; Korea: Samsung.
9	Mechanical parts	The internal electrical components shall be ofelectrolytic copper &shall be protected fromcorrosion, rust etc. The other mechanical components shallbeprotected from rust, corrosion etc. by suitableplating / painting methods.	N.A.
10	Battery	Lithium-ion with guaranteed life of 10 years	Renata, Panasonic,Varta, , Sanyo, National,Tadiran, Sony,Duracell,Tekcell,Mitsubishi,EVE, SAFT , XENO
11	RTC / Micro controller	The accuracy of RTC shall be as per relevantIEC / IS standards	USA: Dallas, Atmel,Motorola, NEC,TeridianRenesas,

			TexasInstruments, ST, Microchips,Epson; Holland / Korea:Philips;Japan: NEC, OKI,Hitachi, Mitsubishi,Freescale,
12	Pilfer Proof Meter Box	Technical specification given in separate sheet	Thermosetting Plastic

TECHNICAL SPECIFICATION FOR PILFER PROOF METER BOX (SINGLE DOORTYPE & WITHOUT CUT OUT) SUITABLE FOR3 PHASE WHOLE CURRENT (5-30)AIMPORT – EXPORT STATIC ENERGY METER.

1.0 SCOPE :

1.1. This scope covers the manufacture and supply of Pilfer Proof Moulded Meter Boxsuitable to house 3-Phase Static Energy Meters. The Meter Box shall be suitable for wallmounted type.

1.2. Technical requirement and standard:- The meter box shall be made out of hot pressed moulded,unbreakable, high grade, fire retardant thermosetting plastic e.g. glass fibre reinforcedpolyester SMC (Sheet Moulding Compound) as per S1 grade of IS) 13410, or Glass ReinforcedPolyester Dough Moulding Compounds as per Grade D1 of IS 13411, with flame retardantproperties having good di-electric & mechanical strength. The Top cover of the Meter Box shallbe as per enclosed drawing with provision of separate window arrangement as shown. Thematerial must be U.V. stabilized to ensure that the Meter Box shall not change in colour,shape, size, dimension when subjected to 200 hrs. of U.V. Ageing Test. The Meter Box shallhave top tapered surface / round corners to prevent stay of rain water at the top of the MeterBox.

1.3. The Meter Box shall be capable of withstanding the mechanical, electrical and thermal stressas well as the effects of humidity which are likely to be encountered in service. At the sametime the same shall ensure the desired degree of safety. The plastic material used shall beadequately stabilized against detrimental effect of light and weather. The surface appearanceof the moulded parts must be smooth, non-porous and homogeneous, free of ripples, defectsand marks. No fillers of fibersshall be visible at any place. The Box shall comply in allrespect with the requirement of latest Amendments of I.S. 13410-1992 Specification for“General, requirements for enclosures for accessories for fixing electric installations.”Applicable degree of protection shall be I.P. 42 or better. The SMC material which will be usedby bidder for this moulded Meter Box conforms to Relevant IS/13410-1992 with latestamendment.

1.4. The Enclosures shall generally comply with the provision of IS 14772 or IEC 695. Theenclosures shall be suitable for outdoor application. The enclosure shall be with goodworkmanship.Soft neoprene/nitrile rubber gaskets shall be provided all round wherever required forprotection against entry of dust and water. The gasket shall confirm to Type-III as per IS-11149. The enclosure shall comply with IP-54 degree of protection.The Enclosures shall be off-white/admiral grey/Ivory or as specified by the owner.

2.0 GENERAL CONSTRUCTIONAL REQUIREMENT :

2.1. Dimension: Length - 400 mm, Breadth - 300 mm, Height - 200 mm.Thickness of the enclosure shall not be less than 2 mm on all sides including door. Theenclosure shall have 4 mm thickness of the tongue and groove area.Thereshall be a minimum 30mm clearance on all sides from the meter surface (projected)except the bottom side which shall be minimum 75 mm from the lower edge of terminalblock.Meter mountings inside the meter box will be such that the meter base support inside boxshall be preferably raised by about 10 +/- 2 mm for each items for each of working. Fixingarrangement of meters and other equipment to the base of the meter box shall be as perprovision of the drawing and as per the specification.

2.2. Viewing Window:A viewing window (175 x 85 mm with tolerance of 5 mm or as per requirement of the owner) made up of scratch andbreak resistant, UV resistant, transparent Polycarbonate / toughened glass shall be providedon the door for reading the meter without inconvenience. The minimum thickness of theviewing window shall be 4.0 mm. The window shall be securely fixed with meter enclosurefrom inside Suitable neoprene gasket shall be provided so that there shall not be any ingressof moisture through this window into the meter box.

2.3. Hinges:A minimum of 2 nos. brass/stainless steel hinges on each door shall be provided inside theenclosure. The hinges of the door shall be concealed and they shall be fixed to the flangesprovided on the body and cover of the enclosure in such a manner that the door opens by aminimum of 120 degrees.

2.4. Locking Arrangement: The cover shall be fitted with base and shall be of concealed hinges. It shall have someknobs provided with covers. The covers are to be fixed on the base of Meter Box in such away that any access from outside is not possible. There shall be provision of padlocksimultaneously with holes for sealing arrangement covering the top of the Meter Box. The doorshall be provided with SS latch or U clamp similar cable entry holes shall be provided in thebottom of the Meter Box as per the drawing enclosed and the intermediate partition plates.

2.5. Sealing Arrangement: The meter box shall have provision for minimum 2 nos. seals to make it fully tamper proof.

2.6. Arrangement for Inlet & Outlet Cable Entry: Two (2) nos. circular holes having 40 mm dia shall be provided at the bottom of the Meter Boxfor inlet and outlet of armoured aluminium cables. High grade double compression MS cableglands fixed on both sides by check nuts are to be provided for securely fixing the cable at thebottom of meter box. A suitable arrangement like clamping nut may be provided with the glandso that opening dia can be reduced to the size of Cable.

2.7. Base and cover details: The cover shall be made overlapping type having collars on all 4(four) sides. The cover of theMeter Box shall be provided with Gasket of sufficient size to completely fit in the grooves of thebase. The gasket shall be made of high quality neoprene rubber. The base of the Meter Boxmust have a groove to hold the Gasket and the overlap of the top cover with base must beminimum 6 mm.

2.8. Fixing arrangement of Meter Box: For fixing the Meter Box to wall or wooden board, 4 no. holes (two top side holes to bekeyholes) of minimum 4 mm dia shall be provided at the four corners of meter cup-board. Themeter is to be installed in the Meter Box and the Box in assembled condition shall haveprovision to fix it on wall. The 4 no. self threaded screws of min. size of 4 mm dia and 25 mmlong shall be provided with each Meter Box.

2.9. **Marking / Embossing:**The following information shall be clearly & indelibly embossed on the cover and base of the Meter Box or printed on metallic plate and duly revetted on the box cover. The top & bottom corner of Meter Box Sl.No. shall be same forthe particular Meter Box.

2.9.1. Property of WBSEDCL
2.9.2. Name / Brand name of Manufacturer
2.9.3. Meter Box Sl. No. (Embossed on both the base & covers of Meter Box)
2.9.4. Sign of danger

2.10. Drawing: Detailed dimensional drawing showing clearly the dimensions & material for Meter Box andits constructional features have been furnished with the tender specification which is bindingon the part of the manufacturer.

3.0 SUBMISSION OF SAMPLE:

3.1. Bidder shall submit a sample Meter Box as per our specification (or, as available withBidder, however in the event of order it will be as per Specification before first inspection)along with the sample meter to the office of the Chief Engineer, (DTD), AbhikshanBhavan,Sector-V, Salt Lake, Kolkata-91 on the date specified in NIT.

3.2. Submission of sample meter box as per size available with the bidder but conforming to ourspecification towards its quality is acceptable. Type testing including material identification(IR Spectrometry test) of one meter box manufactured as per specification is to beconducted at any NABL accredited laboratory/CIPET by the supplier at their own cost afterplacement of order. For type testing the meter box will be selected from the first offered lot ofmeter with meter box. If the type test results are not found satisfactory, the offered lot ofmeter along with meter box will be rejected.

4.0 TESTING:

4.1. Type Test: The Meter Box offered shall be type tested as per relevant I.S. standards andthe Technical Specification stated below :The bidder must furnish type test report including material verification of the offered /samplemeter box from any NABL/Govt. approved laboratory as available with them along withtechnical bid without which the offer will not be considered. Type test report shall not bemore than 5 (five) years old.

4.2. Acceptance Test: The acceptance test as indicated in the enclosed table (Annexure-V) shall be carried outat the time of inspection of the offered material.

4.3. Routine Test: The routine tests as indicated in the enclosed table (Annexure-V) shall be carried out androutine test certificates / reports shall be submitted to the purchaser's inspection office

atthe time of inspection of the offered material enclosed table (Annexure-V) shall be carriedout at the time of inspection of the offered material.

5.0 GUARANTEE:

5.1. The Pilfer Proof Meter Box shall be guaranteed against any manufacturing defects arisingout of faulty design or bad workmanship or component failure for a period of 5 ½ years fromthe date of supply.The meter box found defective within the above guarantee period shall be replaced by theSupplier free of cost within one month of the receipt of intimation of failure/defect. Defectivemeter box are to be replaced by new one with new sl. nos. as allotted by C.E (DTD).

5.2. Replacement of defective Meter Box : The Meter Box declared defective by the WBSEDCL shall be replaced by the supplier up tothe full satisfaction of the WBSEDCL at the cost of supplier as per terms of GCC within 60(sixty) days from the date of intimation by the purchaser. Failure to do so within the time limitprescribed shall lead to imposition of penalty of twice the cost of meter box. The same maylead to black listing even, as decided by WBSEDCL. In this connection the decision ofWBSEDCL shall be final.

6.0 INSPECTION: The inspection will be carried out as per inspection & testing clause of General Conditions ofContract (GCC).

7.0 GUARANTEED TECHNICAL PARTICULARS: The bidder shall furnish all the necessary information as per Annexure-VI – GuaranteedTechnical Particulars. If the bidder desire to furnish any other information in addition to thedetails as asked for, the same may be furnished.

ANNEXURE-I		
GUARANTEED TECHNICAL PARTICULARS OF AC THREE PHASE FOUR WIRE, L.T. STATIC, WHOLE CURRENT (5-30)A IMPORT EXPORT ENERGY METER WITH LCD DISPLAY		
Sl. No.	**Item Description**	**Manufacturer's Particulars**
1.	Name of manufacturer	
2.	Type (Model No.), name & number	
3.	Standard Applicable	IS: 13779/1999, IS:12346/1988,IS: 14434/1998, CEA regulation no. 502/70/CEA/DT&D dt.17.03.06 and CBIP technical report no.325 with its latest amendment as on date.
4.	Rating	
(i)	Accuracy Class	Class 1.0
(ii)	Rated Voltage	240V Ph to Neutral (+20% to -30%)
(iii)	Rated current	I_b-5 Amp, I_{max}- 30 Amp
(iv)	Rated frequency	50 Hz ± 5%
(v)	Power factor	0 lag to unity to 0 lead
(vi)	Minimum saturation current	Bidders to specify
(vii)	Meter Constant (imp / KWH)	
5. (i)	Maximum. Continuous current rating (Amp.)	30 Amps
(ii)	Continuous current rating of terminals for two hours	45 Amps
(iii)	Running with no load & (-)70% to 120 % voltage	No creeping
6.	Short time over current for 10 mili seconds	30 I_{max} for one half cycle at rated frequency
7.	Starting current at which meter shall run & continue to run	0.4% of I_b at rated voltage and unity power factor
8.	Power loss at rated frequency & reference temperature	
(a)	Current circuit at rated current	Less than 4 VA per phase
(b)	Voltage circuit at rated current	Less than 1.5W / 10VA per phase
9.	Type of material used	
(a)	Base	High impact strength, non-hygroscopic, fire retardant, fire resistant, UV stabilised poly carbonate (Lexan 503R or equivalent). Meter base with LEXAN 500R/143R may be accepted subject to verification.
(b)	Meter cover	High impact strength, non-hygroscopic, fire retardant, fire resistant, UV stabilized transparent poly carbonate (Lexan 943A or equivalent)

(c)	Terminal Block	Material High impact strength not hygroscopic, fire retardant, fire resistant, UV stabilized poly carbonate (Lexan 503R or equivalent) Barrier of adequate size shall be provided between phase and neutral. Terminal block with LEXAN 500R/143R may be accepted subject to verification.
(d)	Terminal cover	High Impact strength, non-hygroscopic, fire retardant, fire resistant, glass reinforced poly carbonate (Transparent)& non detachable with hinging arrangement (Lexan 943A or equivalent). Terminal cover with LEXAN 143 may be accepted subject to verification.
(f)	Screw	
	(i) Material	Tin/Nickel-plated Brass
	(ii) Size	As per relevant IS Standards
10.	Internal diameter of Terminal Hole	Min. 9.5 mm
11.	Centre to Centre clearances between adjacent terminals	13 mm
12.	Transducers	
(i)	Input	C T provided in phase element and in the neutral. Voltage: Potential divider (PT less)
(ii)	Output	LCD
(iii)	CT - no. of turns	Bidders to specify
13.	Type of Register	LCD suitable for operation up to 60°C
(i)	No. of Digits	7 (integer only)
(ii)	Size of Numerals	10.0 X 5 mm (minimum)
14.	Display	
(i)	On up and down Scroll Mode & Auto display mode	Both required
(ii)	Type of push button	Spring loaded push button to be provided on top cover of meter to read parameters.
15.	Reading on power off condition	Meter shall be able to display reading during power outage with backup power through the push button provided on the meter. All data down loading facility shall be provided in power off condition.
16.	Battery of Real time clock	
(i)		It shall be Lithium-ion battery having at least 10 years of life
(ii)		The drift in time shall not exceed +/- 3 minutes per year
17.	Fixing/sealing arrangement	
(i)	Fixing of meter	3 fixing holes (one at top & two at bottom under sealable terminal cover). The top fixing screw shall not be accessible after meter is fixed to Pilfer Proof Meter Box base.

(ii)	Sealing of meter cover to Base	At least, two fixing screws for fixing meter cover with the meter base shall be provided. Each Screw shall have two holes one for fitting/fixing of manufacturer's seal and the other for utility seal. The arrangement shall be in such manner that any access to the working part of the meter body will not be possible without breaking/ tampering / removing the said seals. Suitable arrangement shall be made for fitting/fixing of utility seal at two sides of meter terminal cover in such a manner that any access to the terminal cannot be possible without removing the seals. There shall also be provision for sealing at the optical port. The meter cover shall be permanently fixed to the base by ultrasonic welding or by any other technology which is either equally or more efficacious so that cover cannot be opened without breaking, i.e. the meter shall be break to open type. Meter shall have an indication in its display if top cover is removed.
18.	Type of hinged undetectable terminal cover	Terminal cover shall be hinged.
19.	Performance of meter in tamper conditions	
(i)	Input and output Terminals interchanged	Shall work within specified accuracy
(ii)	Change of phase sequence	Shall work within specified accuracy
(iii)	Phase current reverse	Shall work within specified accuracy
(iv)	Indication of above tamper condition	LCD / LED indication.
20.	Suitability of meter to sustain over voltage i.e. phase to phase voltage injected between phase & neutral	Shall sustain
21.	Electromagnetic compatibility (EMI / EMC severity level)	As per IS 13779: 1999
22.	(i) Effect on accuracy of external electromagnetic interference of electrical discharge, external Magnetic field	Shall work within accuracy as per latest IS& CBIP report -325 with latest amendment.
	(ii) Current reversal, Neutral disturbance & Magnetic tamper logging in memory	Meter shall log last 300 events with date and time
23.	Effect on accuracy under tamper conditions / influence conditions	Shall work within accuracy specified in IS: 13779 / 1999, and CBIP tech. Report 325. Error beyond +/- 4 % will not be acceptable for conditions not specified in IS: 13779 / 1999 & CBIP tech. Report 325.

24.	Drift in accuracy of measurement with time	No Drift in accuracy in measurement with time
25.	Name plate details	It shall cover all the details as prescribed in relevant Clause of tech spec.
26.	Approximate weight of meter	Bidders to specify
27.	Type of mounting	Projection type
28.	Calibration	Meter shall be software calibrated at factory & there shall not be any mechanical form of calibration, such as, mechanical preset / trim port / potentiometer etc. so that any adjustment in calibration is not possible after freezing the meter constant.
29.	Manufacturing activity	
	(i) Mounting of components on PCB shall be SMT type	SMT type and ASIC technology
	(ii) Compliance to assurance	To be complied
30.	Testing facility	
(i)	Fully automatic computerized meter test bench with print out facility shall be available	Must be available
(ii)	Make and Sl. No. of Test bench with calibration validity	Bidders to specify
(iii)	Accuracy of ESS duly calibrated	Bidders to specify
(iv)	Following in house testing facility shall be available:	
	(i) AC high voltage test	Must be available
	(ii) Insulation test	Must be available
	(iii) Test of no load condition	Must be available
	(iv) Test of Starting condition	Must be available
	(v) Test on Limits of error	Must be available
	(vi) Power loss in voltage and current circuit	Must be available
	(vii) Test of Repeatability of error	Must be available
	(viii) Test of meter constant	Must be available
	(ix) Power loss in voltage & current circuit	Must be available
	(x) Test of Magnetic influence	Must be available
31.	Whether offered meter type tested as per ISS 13779 / 1999 Table-20 for all the following tests (indicate name of laboratory / Reference of report No. & date.)	Relevant Clause of GeneralRequirement.
(i)	Vibration test	12.3.2

(ii)	Shock test	12.3.1
(iii)	Spring Hammer test	12.3.3
(iv)	Protection against penetration of dust and water	12.5
(v)	Test of resistance to heat & fire	12.4
(vi)	Power consumption	12.7.1
(vii)	Influence of supply voltage	12.7.2
(viii)	Voltage dips and interruptions	12.7.2.1.
(ix)	Short time over current	12.7.3
(x)	Influence of self heating	12.7.4
(xi)	Influence of heating	12.7.5
(xii)	Impulse voltage test	12.7.6.2
(xiii)	AC high voltage test	12.7.6.3
(xiv)	Insulation test	12.7.6.4.
(xv)	Radio Interferencemeasurements	12.9.5
(xvi)	Fast transient burst test	12.9.4
(xvii)	Electrostatic discharge	12.9.2
(xviii)	Immunity to electro-magnetic H.F. field	12.9.3.
(xix)	Test for meter constant	12.15
(xx)	Test of starting conditions	12.14
(xxi)	Test of no load condition	12.13
(xxii)	Ambient temp. influence	12.12
(xxiii)	Test of influence quantities	12.11
xxiv)	Interpretation of test results	12.16
(xxv)	Repeatability error test	12.17
(xxvi)	Dry heat test	12.6.1
(xxvii)	Cold test	12.6.2
(xxviii)	Damp heat cycle test	12.6.3
(xxix)	Test of influence of immunity to Earth fault	12.8
(xxx)	Limits of error	11.1
32.	Guarantee period of meter	5-1/2 years from the date of supply. Guarantee period shall be printed on the nameplate
33.	BIS license	
33.1	BIS license No. &dt.with its validity for ISI certification mark on offered meter.	Bidders to specify.
33.2	Details of meter design for which	Bidders to specify.

	above BIS certification has been obtained: -	
(i)	Ratio of I_b to I_{max}	
(ii)	Material of meter body	
(iii)	Type of energy registering counter	
(iv)	Type of technology (Digital/Analog)	
(v)	Grade of printed circuit Board material	
(vi)	Type of assembly of component used (SMT)	
(vii)	Meter constant (Imp / KWh)	
(viii)	Auxiliary power circuit (with PT or PT less)	
(ix)	Current circuit (CT / Shunt combination or only shunt)	
(x)	Accuracy class	
34.	Other parameters / features not covered in the above GTP	Conform to specification of IS 13779: 1999 & CBIP technical report No.325 (with its latest amendment).

Annexure - II
Pre-Qualification Conditions for Three Phase Static Meters

Sl. No.	Particulars	Remarks
1	Bidders must have valid BIS certification for the offered meter.	Yes / No
2	Bidder preferably posses ISO 9001 certification	Yes / No
3	Bidder shall be manufacturers of static meters having supplied Static 1-ph or 3-phase meters with memory and LCD display to Electricity Boards / Utilities in the past 2 years	Yes / No
4	Bidder has Type Test certificate for the Type of offered meter not more than 3 (three) years old	Yes / No
5	Bidders shall have dust free, static protected environment for manufacture, assembly and Testing.	Yes / No
6	Bidder shall have automatic computerized test bench for lot testing of meters.	Yes / No
7	Bidder has facilities of Oven for ageing test.	Yes / No
8	Bidder shall submit certificate for immunity against magnetic influence of 0.2 T AC. & 0.5 T DC. from a NABL accredited Laboratory, for the same type	Yes / No

	of meter as offered.	

Annexure – III

Sl. No.	**Component Function / Feature**	**As per Requirement**	**Make / origin**
1	Current Element		
2	Measurement / Computing chips		
3	Memory chips		
4	Display modules		
5	Communication modules		
6	Optical port		
7	Power Supply		
8	Electronic components		
9	Mechanical parts		
10	Battery		
11	RTC / Micro controller		

ANNEXURE – IV

Sl. No.	*LIST OF DOCUMENTS TO BE SUBMITTED DURING SAMPLE SUBMISSION*			
1	*Attested copy of type test reports from NABL accredited laboratory*			
2	*Attested copy of BIS certificates of the same type of meter submitted as sample*			
3	*Attested certificates as regards material used for meter case, cover & terminal block.*			
4	*Annexure – II as per tender documents*			
5	*Annexure – III as per tender documents*			
6	*Operating manual of the meter submitted*			

ANNEXURE – V

LIST OF TESTS TO BE CARRIED OUT ON MOULDED SHEET MOULDED COMPOUND METER BOXES

Sl no.	**Name of Indian Standard / equivalent international**	**Clause Ref.**	**Test requirement**	**Test particulars**		
				Type	Routine	Acceptance
1.	IS : 14772		Marking	T		A
2.	As per Co.'s Drg.	Clause 9	Dimensions	T	R	A
3.	IS : 14772	Clause 9	Protectionagainstelectricshock	T	R	A
4.	IS : 14772	Clause 02	Construction	T	R	A
5.	IS : 14772	Clause 02	Resistance toageing, to humidcondition, to ingress of solidobject and toharmful ingress of water	T		
6.	IS : 14772	Clause 02	Mechanicalstrength	T		
7.	IS : 14772		Resistance toheat	T		
8.	IS : 14772		Resistance totracking	T		
9.	IS: 8620/1996		Test forresistancetoheat& fire. Glowwire test at 650^0C as per cl.4 to10 of IEC 695-2-1.	T		
10.	IS:13411		Heat deflectiontemp.(Min.1500C.)	T		
11.	IS :4249		SelfExtinguishingproperty of spiritburner test.	T		
12.	IS / ASTM		Melting point-180^0C (Min)	T		
13.	IS :8623/1993	(Part-1) 18.2.2.2	Verification of dielectricproperties,insulation test with 500V DCMegger.	T		
14.	CIPET/IR Spectrometry		Materialidentification	T		
15.	IS :13411/1992		Test for waterabsorption (Max. 0.35%)	T		

Note: Applicable degree of protection shall be IP 42 or better.
Legend: T=Type Test, R=Routine Test, A=Acceptance Test

ANNEXURE –VI

GUARANTEED TECHNICAL PARTICULARS OF THREE PHASE METER BOX:

Sl. No.	Item Description		Manufacturer's Particular
1.	Name & address of manufacturer		
2.	Material		Thermosetting Plastic
3.	Grade of Material		SMC / DMC Ref. Standard IS : 13410 – 1992
4.	Properties ofmaterialformeter box		
a)	HeatDeflectionTemperature (Ref. Std.IS: 13411)		150 deg C (minimum)
b)	Exposure toflame (Ref. Std..IS: 4249)		Self-extinguishing
c)	MeltingPoint (Ref. Std.IS:13360)		Shall not melt above 180°C
d)	TensileStrength (MPa)		50 Mpa (minimum)
e)	Flexural Strength (MPa)		90 Mpa (minimum)
f)	Modulus ofElasticity(MPa)		2000 Mpa (minimum)
g)	IZod impact strength notched 230°C		8 KJ/Sq M (minimum)
5.	Constructional features of the box		
(a)	Clear inside dimensionsof Meter Box		Refer Drawing
	i.	Height	400 mm
	ii.	Width	300mm
	iii.	Depth	200 mm
	iv.	Rust&Verminproofing	Neoprene Rubber Gasket NRG
(b)	a)	Material of transparent cover	Toughened Glass / transparent polycarbonate with Rubber gasket
	b)	Size of opening/viewing	175mm x 85 mm with tolerance of 5 mm
	c)	Min. thickness of cover	2 mm
	d)	Fixingmethod	Fixed from inside with rubber gasket
(c)	SealingArrangement		Holes for wire seal (2 Nos.)
(d)	Wire entry		MS / Aluminum glands fixed on both side / bottom side by check nuts to be provided.
(e)	Colour of MeterBox		Grey / Off-White
(f)	Meter mountingarrangement		Suitable for mounting of any make of meter (broadly as per the drawing)

(g)	Box mounting arrangement	4 nos. holes
(h)	Hinges	2 nos. Concealed hinges or better arrangement
(i)	Incoming& outgoing cable holes	2 Nos, holes having 40mm dia and bottom entry. High grade double compression MS / Aluminium Cable glands fixed on both sides by check nuts to be provided.

ANNEXURE –VII

TESTING:

1. Sample selected from first lot shall be tested at Govt. approved independent test house forcompliance of performance parameters as given in GTP including material identification to be carried out by CIPET/IR Spectrometry.
2. The test report shall be submitted to WBSEDCL before completion of order.
3. Inspection of each lot, sampling plans for test: 1 nos. selected randomly from lot for testingat works.

Sl. no.	Test Requirement for moulded meter box	Reference Standards
(a)	Marking	IS:14772
(b)	Dimensions & construction	IS:14772
(c)	Heat Deflection Temperature (Min. 150°C)	IS:13411
(d)	Spirit Burner Test (Self Extinguishing)	IS:4249
(e)	Melting Point (Does Not Melt up to 400 deg. C.)	IS:13360

Tamper Logic

A. Import Mode:

Sl. No.	Parameter	Occurrence	Restoration
1	**Power Related Tamper:**		
i)	Power Failure	i. All Phase Voltages < 30% of V_{ref} ii. Phase Current <5% of I_b	i. Any Phase Voltage >40% of V_{ref} ii. Phase Current Ignored
	Logging Time	After 5 min	Immediate
2	**Voltagge Related Tamper:**		
i)	Invalid Voltage (UI)	i. All Phase Voltages >60% & <115% of V_{ref} ii. Angle difference of any two Phases > ±10 ° iii. Current Ignored	i. All Phase Voltages >60% & <115% of V_{ref} ii. Angle difference of two Phases < ±10 ° iii. Current Ignored
	Logging Time	After 5 min	After 5 min
ii)	Missing Potential (Logging Phase Wise) (UF_r)	i. Any Phase Voltage <30% of V_{ref} & Current >10% of I_b ii. Other Phase Voltages >40% & <115% of V_{ref}	i. Logged Phase Voltage >40% V_{ref} & Current >10% of I_b ii. Other Phase Voltages >40% & <115% of V_{ref}
	Logging Time	After 5 min	After 5 min
	This is Phasewise Tamper		
iii)	High Voltage (UH)	i. Any Phase Voltage >115% of V_{ref} ii. Current Ignored	i. All Phase Voltages <115% of V_{ref} ii. Current Ignored
	Logging Time	After 5 min	After 5 min
iv)	Voltage Unbalance (UU)	i. All Phase Voltages >70% & <115% of Vref ii. (V_{max}-V_{min})>30% of Vref iii. All phase Current > 10% of I_b	i. All Phase Voltages >70% & <115% of Vref ii. (V_{max}-V_{min})<30% of V_{ref} iii. Current Ignored
	Logging Time	After 5 min	After 5 min
3	**Current Related Tamper:**		
	Phasewise Tamper:		
i)	CT Open (Logging Phase wise) (Io_b)	i. $I_{residual}$ >20% of I_b ii. Phase Current <2% of I_b iii. Line Current ignored iv. All Phase Voltages >70% and <115% of V_{ref}	i. $I_{residual}$ <20% of Ib ii. Phase Current >2% I_b iii. Average Phase Current >10% of I_b iv. All Phase Voltage >70% and <115% of V_{ref}
	Logging Time	After 5 min	After 5 min
ii)	Over Current (IH)	i. Any Phase Current >150% of I_{max} ii. All Phase Voltage >70% and <115% of V_{ref}	i. All Phase Currents <150% of I_{max} ii. All Phase Voltage >70% and <115% of V_{ref}
	Logging Time	After 5 min	After 5 min

Sl. No.	Parameter	Occurrence	Restoration
4	**Other Tampers:**		
i)	Low PF (LP)	i. All Phase Currents>10% of I_b ii. Average PF<0.3 iii. All Phase Voltages >70% and <115% of V_{ref}	i. All phase currents > 10% I_b ii. Average PF>0.3 iii. All Phase Voltages >70% and <115% of V_{ref}
	Logging Time	After 5 min	After 5 min
ii)	Nutral Disturbance (nd)	Frequency < 45 Hz or > 55 Hz	Frequence is between >=45Hz or or <=55Hz
	Logging Time	After 3 min	After 3 min
iii)	Magnet (nt)	Whenever the Meter functionality gets affected on account of presence of any magnetic field, meter shall log it as an event and start recording at I_{max} if does not remain immune. In Tamper Snap Shot I_{max} must be shown (either occurance or restoration), with Date and Time stamp. If meter detects magnetic tamper in "Export" mode, the energy increment shall be made in Import mode as per V_{ref}, I_{max} and UPF.	
	Logging Time	Instantaneous	Instantaneous
iv)	Cover Open	On Removal of meter cover the meter will lock Cover Open Event with Date and Time stamp. It must be reflected in Auto Display mode .	No restoration shall be allowed without due authorization
	Logging Time	Immediate	

Sl. No.	Parameter	Occurrence	Restoration
B	**Export Mode**		
1	Neutral Disturbance and Magnet	In Export Mode, meter recording must not start at I_{max}. Under any circumstances, if meter logs Neutral Disturbance or Magnetic Field Tamper event and starts recording at I_{max} then it will log in Import Register instead of Export Register.	
	Logging Time	Bidder choice	Bidder choice
	Manual Resetting of Maximum Demand:		
	When Reset Button is pressed within an Integration Period, Rising Demand will not reset to Zero. The Demand will be registered for the entire Integration Period and will be logged as Current Max. Demand at the end of the Integration Period.		