WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED

Technical Specification for AC 3 Phase 4 Wire 132kV/$\sqrt{3}$ /110V/$\sqrt{3}$ Solid State (Static) Category B type Import - Export Energy Meter of 0.2S Class Accuracy

1.0 SCOPE

This scope covers design, engineering, manufacture, testing, inspection andsupply of AC 3 Phase 4 Wire **132kV/$\sqrt{3}$ /110V/$\sqrt{3}$**Solid State (Static) Import – Export EnergyMeter of **0.2S** Class accuracy with backlit LCD display used for balanced/unbalanced load.The meter shall be capable of recording and displaying energy in**MWh**& demand in**MVA**, 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.

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	IS 14697 (1999):	ac Static Transformer Operated Watt hour and Var-hour Meters
2	**IEC 62053-22 with latest amendments**	Electricity Metering Equipment (A.C.) - Particular Requirements - Part 22: Static Meters for Active Energy (Classes 0.2S and 0.5S)
3	CBIP Report No. 325 along with its latest amendments, if any	Specification for AC Static Electrical Energy Meters
4	CBIP Technical Report No. **111**	Specification for Common Meter Reading Instrument
5	IS 12346 :1988	Specification for testing equipment for AC Static Electrical Energy Meter (latest amendment)
6	**IS 9000**	Basic Environmental Testing Procedures for Electronic & electrical Items
7	IS-15959:2011	Data Exchange for Electricity Meter Reading Tariff & Load Control - Companion Specification

3.0 CLIMATIC CONDITIONS

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

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)

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3.4 Minimum Relative Humidity: 10%
3.5 Maximum altitude above mean sea level(MSL) : 3000 m
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

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.

4.0 ELECTRICAL SPECIFICATIONS

Class of Accuracy	0.2S
Type Of Meter	3 Phase 4 Wire
PT Ratio	(132/√3) kV / (110/√3)V
Rated PT secondary voltage (V_{ref}))	110 V (P-P), 110/√3 V (P-N) with variation -40% to +20%
CT Ratio	200/1A
Rated Current (I_b)	1A
Maximum Current (I_{max})	120% of I_b
Starting Current	0.1% of I_b at upf
Rated Frequency	50 Hz ±5%
Power Factor Range	From Zero lagging through Unity to Zero leading. In Import mode Meter shall be lag only.
Power Loss	Voltage Circuit : <= 1.5W/8VA Current Circuit: <= 1VA
Resistance to surge voltage of 1.2/50 µSec	8kV peak (minimum)
Test Voltage at 50 Hz for 1 min	2kV rms
Clock Time Accuracy	Maximum ±2 min drift per annum

5.0 TEMPERATURERISE

IS 14697 shall have to be followed to ascertain that under normal condition of use, winding and insulation shall not reach a temperature, which might adversely affect the operation of the meters.

6.0 ACCURACY

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 meter has to be recalibrated / replaced by a new one by the supplier.

7.0 RUNNING AT NO LOAD

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.

8.0 CONSTRUCTION

8.1 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.

8.2 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.

8.3 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.

8.4 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.

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

8.5.1 **G.E. Plastic :** LEXAN 943A or equivalent, like 943, 123R, 143 for meter cover & terminal cover / LEXAN 503R or equivalent like 500, 143R, 500R for meter base and terminal block

8.5.2 **BAYER:** Grade corresponding to above

8.5.3 **DOW Chemical: --do--**

8.5.4 **MITSUBISHI : --do--**

8.5.5 **TEJIN: --do--**

8.5.6 **DUPONT: --do—**

8.6 **METER CASE AND COVER**

8.6.1 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.

8.6.2 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.

8.7 **TERMINAL BLOCK AND COVER**

8.7.1 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.

8.7.2 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.

8.7.3 The internal diameter of terminal hole shall be minimum 5.5 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.

8.7.4 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.

9.0 MARKING OF THE METER

Every meter shall have a nameplate clearly visible, indelible and distinctly marked in accordance with relevant Standards.The following information shall appear on an external plate attached to the meter cover:

9.1 Manufacturer's name or trade mark & place of manufacture
9.2 Designation of type
9.3 Number of phases & wires
9.4 Serial number of meter
9.5 Month & year of manufacture
9.6 Principal unit(s) of measurement
9.7 PT Ratio
9.8 Basic current and rated maximum current
9.9 CT Ratio
9.10 Reference frequency in Hz
9.11 Meter Constant (impulse/MWh)
9.12 Class index of meter
9.13 Reference temperature
9.14 "Property of WBSEDCL"
9.15 Purchase Order No. & Date
9.16 Guarantee (Guaranteed for a period of 5 ½ years from the date of supply)
9.17 BIS marking
9.18 The sign of Double Square for insulating encased meters
9.19 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
9.20 Firmware version

10.0 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.

11.0 DISPLAY OF MEASURED VALUES

11.1 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.

11.2 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.

11.3 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.

11.4 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.

11.5 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.

11.6 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).

12.0 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.

12.1 **Auto Display Mode**:In this mode, the below listed parameters shall be displayed in the following sequence:

12.1.1 LCD Test
12.1.2 Meter Serial Number
12.1.3 Real Time &Date (DD/MM/YYYY)
12.1.4 Rising Apparent Demand with elapsed time while Active Import
12.1.5 Rising Apparent Demand with elapsed time while Active Export
12.1.6 No. of Power Failures
12.1.7 Cumulative Active Import Energy (Cumulative sign/legend must be given)
12.1.8 Cumulative Active Export Energy
12.1.9 Cumulative Reactive Energy – Quadrant-I
12.1.10 Cumulative Reactive Energy – Quadrant-II
12.1.11 Cumulative Reactive Energy – Quadrant-III
12.1.12 Cumulative Reactive Energy – Quadrant-IV
12.1.13 Cumulative Apparent Forward Energy (Active Import) (5+3 in MWh as per CT Ratio)

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12.1.14 Cumulative Apparent Forward Energy (Active Export)
12.1.15 Apparent Forward Maximum Demand (Active Import) (4+3 in MVA as per CT Ratio)
12.1.16 Apparent Forward Maximum Demand (Active Export)
12.1.17 Inst. Secondary Voltages – Phase-wise (P-N)
12.1.18 Inst. Secondary Currents – Phase-wise
12.1.19 Signed Inst. Power Factor – Phase-wise
12.1.20 Inst. Net Power Factor
12.1.21 Inst. Apparent Power
12.1.22 Signed Active Power in MW
12.1.23 Signed Reactive Power in MVAR
12.1.24 Frequency
12.1.25 Cumulative Billing Count
12.1.26 Cumulative Tamper Count
12.1.27 Cumulative Power Off Hours since manufacturing
12.1.28 Power **OFF** Hours of present month
12.1.29 Phase Sequence & Phase Correspondences of Voltage & Current
12.1.30 Connection Check
12.1.31 Self Diagnosis

12.2 **Push Button mode:Over & above the parameters of Auto Display Mode, t**he following parameters shall be displayedon pressing the push button.The meter display shall return to auto display mode (mentioned above) if the 'push button' is not operated approx. more than 6 seconds.

12.2.1 History 1 Cumulative Active Forward Import Energy
12.2.2 History 1 Cumulative Active Forward Export Energy
12.2.3 History 1 Cumulative ApparentForward Import Energy
12.2.4 History 1 Cumulative ApparentForward Export Energy
12.2.5 History 1 Apparent MD while Active Import with Date & Time
12.2.6 History 1 Apparent MD while Active Export with Date & Time
12.2.7 Cumulative Apparent MD (Import)
12.2.8 Cumulative Apparent MD (Export)
12.2.9 Last Billing Date & Time
12.2.10 History 1 Average Power Factor
12.2.11 Battery Status
12.2.12 Present Tamper Status(PT/CT/Other)
12.2.13 First Tamper Occurrence with Date & Time
12.2.14 Last Tamper Occurrence with Date & Time
12.2.15 Last Tamper Restoration with Date & Time
12.2.16 Cover Open Information with Date & Time
12.2.17 High Resolution Cumulative Forward Active Energy (Import) (2+5 in MWh)
12.2.18 High Resolution Cumulative Forward Active Energy (Export)
12.2.19 High Resolution Cumulative Forward Reactive Energy – Quadrant-I
12.2.20 High Resolution Cumulative Forward Reactive Energy – Quadrant-II
12.2.21 High Resolution Cumulative Forward Reactive Energy – Quadrant-III
12.2.22 High Resolution Cumulative Forward Reactive Energy – Quadrant-IV
12.2.23 High Resolution Cumulative Forward Apparent Energy (Import)
12.2.24 High Resolution Cumulative Forward Apparent Energy (Export)

12.3 **Following** data shall have to be made available in data downloaded through BCS
12.3.1 TOD wise Cumulative Active Forward Energy (Import)
12.3.2 TOD wise Cumulative Active Forward Energy (Export)
12.3.3 TOD wise Cumulative Apparent Forward Energy (Import)

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12.3.4 TOD wise Cumulative Apparent Forward Energy (Export)
12.3.5 TOD wise Apparent MD (Import) with Date & Time
12.3.6 TOD wise Apparent MD (Export) with Date & Time
12.3.7 TOD wise History 1 Cumulative Active Forward Energy (Import)
12.3.8 TOD wise History 1 Cumulative Active Forward Energy (Export)
12.3.9 TOD wise History 1 Cumulative Apparent Forward Energy (Import)
12.3.10 TOD wise History 1 Cumulative Apparent Forward Energy (Export)
12.3.11 TOD wise History 1 Apparent MD (Import) with Date & Time
12.3.12 TOD wise History 1 Apparent MD (Export) with Date & Time

13.0 POWER OFF MODE DISPLAY

The following parameters shall be displayed in Power OFF mode:

13.1 Meter Serial No.
13.2 Real Date &Time
13.3 History 1 Cumulative Active Forward Energy (Import)
13.4 History 1 Cumulative Active Forward Energy (Export)
13.5 History 1 Cumulative Apparent Forward Energy (Import)
13.6 History 1 Cumulative Apparent Forward Energy (Export)
13.7 History 1 Apparent MD while Active Import
13.8 History 1 Apparent MD while Active Export
13.9 Cumulative Billing Count
13.10 Cumulative Tamper Count
13.11 Cumulative Active Import Energy
13.12 Cumulative Active Export Energy

14.0 DISPLAY: OTHER REQUIREMENTS

14.1 List of parameters for Auto, Push Button & Power OFF mode must have the following headers:
14.1.1 "Auto Display Mode"
14.1.2 "Push Button Mode"
14.1.3 "Power OFF Mode"

14.2 Each parameter shall be on meter display for 10 secand the time gap between two auto display cycles shall be 30 sec.

14.3 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.

14.4 Push button mechanism shall be of high quality and shall provide trouble free service for a long span of time.

14.5 Up and Down scrolling facility shall be there for Push Button Mode.

15.0 ANTI TAMPER FEATURES

The meter shall have the following anti-tamper features:

15.1 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 and if phase current flows in reverse direction, it shall register energy in Export counter. Simultaneous Import & Export in different phases shall be allowed and this will not be treated as any Tamper event.

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

15.3 The meter shall work correctly even in absence of neutral. For reference voltage Vref between 70% to 120 %, accuracy must be maintained within permissible limits as per IS.

15.4 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.

15.5 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.

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

15.6.1 Power failure (Tamper count not to be increased) - as per tamper logic
15.6.2 Invalid Voltage- as per tamper logic
15.6.3 Missing Potential (phase wise) —as per tamper logic
15.6.4 High Voltage – as per tamper logic
15.6.5 Voltage Unbalance – as per tamper logic
15.6.6 CT Open- as per tamper logic
15.6.7 CT Bypass/ CT Short - as per tamper logic
15.6.8 CT Unbalance - as per tamper logic
15.6.9 Over Current - as per tamper logic
15.6.10 Neutral Disturbances (If it is logged) - as per tamper logic
15.6.11 Magnetic Disturbances - as per tamper logic

15.7 Threshold Values of all above occurrence and restoration are provided with in annexed tamper logic sheet.

15.8 The logging time for recording occurrence and restoration of all tamper events except magnetic & neutral disturbance tamper, shall be 5 minutes. Magnetic tamper shall appear instantaneously and neutral disturbance within 3 minutes. However, it shall be programmable.

15.9 Snapshot values of Phase Voltage, Phase Current &Phase wise Power Factor, Active Energy value during occurrence & restoration shall have to be provided in all the above mentioned tamper conditions in BCS with date and time.(In Event logging Snapshots shall be considered to be reflection ofthe actual phenomenon occurred).

15.10 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).

15.11 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).

15.12 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.

16.0 INFLUENCE QUANTITIES

The meter shall work satisfactory with guaranteed accuracy as per limit provided in IS: 14697 under presence of the following quantities:

16.1 Electromagnetic field
16.2 External magnetic field
16.3 Radio frequency interference
16.4 Vibration
16.5 Harmonic wave form
16.6 Voltage fluctuation
16.7 Frequency variation
16.8 Electromagnetic high frequency field
16.9 Electrostatic discharge

17.0 IMMUNITY TO ELECTRO MAGNETIC DISTURBANCE

The meter shall be designed in such a way so that external electromagnetic field upto 0.5Tesla or electrostatic discharge upto 35kV either shall not influence its performance ,i.e, the meter shall remain immune to it, or, if not so, it shall log event and shall record energy with I_{max}.

18.0 MEASUREMENT OF HARMONICS

The meter shall be capable of measuring fundamental as well total energy i.e., fundamental plus harmonics energy. Total energy shall be made available on meter display. Provision for utilizing measuredfundamental energyshall be kept for future use. Both total and fundamental energy shall be logged in the meter memory and shall have provision for downloading to the BCS through the CMRI and shall be available for viewing at the BCS end separately.

19.0 MAXIMUM DEMAND & ITS RESETTING

19.1 The meter shall be capable of recording the Apparent MD with integration period of 15 minutes (programmable).
19.2 The meter shall also record MD at preset dated and time.
19.3 MD reset shall be through each of the three means:
  19.3.1 Automatic resetting at preset date & time (at present it will be at 00.00 hrs of the first day of every month)
  19.3.2 Manually i.e., by using push button
  19.3.3 Through authenticated command from CMRI or through Remote Communication command

<u>Facility to invoke any of the above through authenticated CMRI command shall be provided.</u>

19.4 The means by which the reset has been done shall be made available indownloaded data.
19.5 MD reset button shall have proper sealing arrangement.
19.6 There shall be separate Push button for scrolling display (up and down) and MD reset. If only two Push buttons are used minimum 30 sec pressing is required for MD reset.

20.0 LOAD SURVEY

The meter shall be capable of recording load survey (both in import & export mode) of Active Energy, Reactive Energy, Apparent Energy, Active Demand, Apparent Demand, Phase wise Current , Phase wise Voltage & Power Factor for a period of minimum 45 days for 15 minute integration period in both tabular as well as graphical format.

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20.1 Active & Apparent Energy in MWh&MVAh (Import & Export mode shall be shown clearly)
20.2 Reactive Energy in MVARH (Import & Export mode shall be shown clearly)
20.3 Demand in MVA and MW, (Import & Export mode shall be shown clearly)
20.4 Current – phase-wise
20.5 Voltage – phase-wise
20.6 Power Factor

It shall be possible to transfer this data to BCS directly from meter or through CMRI or MODEM or through GSM/CDM/GPRS communication. The data so obtained shall be displayed in both graphical & tabular format in BCS.

21.0 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 meter supplier.At present TOD timings will be programmable as follows:

21.1 TOD 1: 06:00 Hrs to 17:00 Hrs.
21.2 TOD 2: 17:00 Hrs to 23:00 Hrs.
21.3 TOD 3: 23:00 Hrs to 06:00 Hrs.

22.0 METER READING DURING POWER OFF

In absence of input voltages, with the help of internal battery or external battery pack meter data shall be displayed in power off mode. It shall also be possible to read & download data using CMRI / Laptop. In case of external battery pack battery the arrangements shall be such that hands free operation is possible. In case of external battery 10 years guarantee must be given for the external battery 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.

23.0 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 in memory location. The details of malfunctioning shallhave to be recorded in the meter memory. The bidder shall furnish the details of self-diagnostic capability features,viz Memory (NVM) status, Battery status, RTC Status etc. and it shall have to be made available in display.

24.0 COMMUNICATION CAPABILITY:

24.1 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.
24.2 The optical port shall be provided with proper sealing arrangement so that its cover can't be opened without breaking its seal. In case sealing arrangement is not there, access through authentication shall have to be ensured.
24.3 A Serial Port (RS485 or **RJ11**) shall have to 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.
24.4 The stored data in the meter shall be available through CMRI/Laptop even when the display of the meter is not available.
24.5 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.
24.6 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.

24.7 Billing parameters shall be factory programmable.

25.0 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 free of cost.

In case external battery packs are required for the offered meters, those are to be provided by the manufacturer and shall have clear mention in offered bids.

26.0 BASE COMPUTER SYSTEM & SOFTWARE REQUIREMENTS

26.1 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.

26.2 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.

26.3 The bidder shall supply the necessary CMRI software and BCS during sample meter testing.

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

26.5 The data stored in the meter memory including **defrauded energy** shall be available on the BCS.

26.6 BCS shall give all details pertaining to billing and load survey data.

26.7 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.

26.8 The meter condition details shall also be transferred into the BCS including abnormal voltage & current conditions, tamper events etc.

26.9 Facility to view data incorporating external multiplying factor due to installed CT & PT shall have to be provided in BCS.

26.10 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.

26.11 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.

26.12 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.

26.13 In BCS twelve months' data for MWh, MVAh, MD in MVA (total & TOD wise), average load factor, average power factor in both import & export mode must be available.

26.14 Six copies of BCS shall be provided for downloading data and issue of authenticated command from CMRI/ Laptop.

26.15 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.

26.16 Meter Data Display:

26.16.1 The BCS shall show electrical conditions existing at the time of reading the meter in tabular forms as well as in graphical format(phasor diagram)

26.16.2 All the information shall be shown in a manner which user can understand easily.

26.16.3 All the load survey data shall be available in numerical as well as graphical format. It shall also be possible to view this data in daily, weekly and monthly formats. The load survey graph shall also show values where the cursor/pointer is placed for selected or all parameters.

26.16.4 All the information about tamper events shall be accompanied with date & time stamping along with the "Snapshot"(details) of the respective electrical conditions. This information shall be displayed in the sequence in which it happened, in cumulative format as well as summary format. The cumulative format shall segregate a particular tamper information and summary report should show count of tamper occurrence and the duration for which meter remained under tamper condition.

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26.17 Support Display: There shall be user-friendly method for viewing current and stored history meter data. All information about a particular consumer shall be segregated and available at one place so that locating any consumer's past data is easy. It shall be possible to locate/retrieve data on the basis of one of the following particulars:

i. Consumer ID
ii. Meter Serial No.
iii. Date of Meter Reading
iv. Location

26.18 Data Transfer: It shall be possible to transfer the data to & fro from CMRI through serial interface. Facilities for adjustment of RTC of meter, changing of Tariff requirements, TOD timings, Billing Dates, MD integration period, Energy Definitions etc. through CMRI by authenticated transactions, controllable through BCS shall be provided. Transaction directly through CMRI without BCS control shall not be acceptable.

26.19 Configurability: It shall be possible to get selective print out of all the available data of the meter. Print out shall not include anything and everything available with the BCS. The software shall support "Print Wizard" or similar utility whereby user can decide what to print out. The user of the software need not revert back to the supplier of the software for modifying the software just to print what he desires.

It is very important that the BCS has the feature to export available data to ASCII or spreadsheet format for integrating with the WBSEDCL's billing system. Here again an "Export Wizard" or similar utility shall be available whereby user can select file format (for ASCII or for spreadsheet), what data to export, the field width selection (whether 8 characters or 10 characters, to include decimal point or not, number of digits after decimal point) etc.

26.20 Security**:**The BCS shall have multi level password for data protection and security. The first level shall allow the user to enter the system. The different software features shall be protected by different passwords. The configuration of passwords shall be user definable. The software installed on one computer shall not be copy-able on to another computer.

26.21 Help:The exhaustive on-line Help should be available with the software so that user can use all the features of the software by just reading the Help contents.

27.0 GENERAL REQUIREMENTS

27.1 **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.

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

27.3 **TESTING :**

27.3.1 **Type Testing of Meter:** The offered meters shall be type tested at any NABL accredited laboratory in accordance with relevantIS 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:

27.3.1.1 Type of display or LCD
27.3.1.2 Class of accuracy
27.3.1.3 Meter constant
27.3.1.4 Type of meter

27.3.2 **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-14697, 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.

27.3.2.1 Magnetic induction of external origin (AC & DC)
27.3.2.2 Tamper & Fraud protection, as per relevant Clause of this specification.
27.3.2.3 Test of endurance upto 150% of I_{max}, for two hours, followed by verification of limits of error.
27.3.2.4 Verification of internal components.
27.3.2.5 Dry Heat Test under Test of Climatic Influences in relevant IS of one meter from the offered lot is to be arranged by the supplier at any NABL accredited laboratory, at his cost.

27.3.3 **Routine Tests :**Each and every meter of the offered lot shall undergo the routine tests as well as functional tests as per IS: 14697/1999, 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.

27.4 **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.

27.5 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.

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

27.6.1 AC high voltage test
27.6.2 Insulation test
27.6.3 Test of no load condition
27.6.4 Test of Starting condition
27.6.5 Test on Limits of error (Automatic Testing facility with ICT)
27.6.6 Power loss in voltage and current circuit
27.6.7 Test of Repeatability of error
27.6.8 Test of meter constant
27.6.9 Test of magnetic influence (As per CBIP 325 & Permanent Magnet)

27.7 **INSPECTION:**

27.7.1 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.

27.7.2 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.

27.7.3 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.

28.0 SUBMISSION OF SAMPLE METER

28.1 The bidder will submit his sample Meters in sealed casing / cartoon along with relevant Meter documents (**As per Annexure-IV)**, on any working day, from 11.00 A.M. to 04.00 P.M. on weeks days & from 11.00 A.M. to 01.00 P.M. on Saturday within the specified period of submission latest by 01.00 P.M. on the last day of submission of bid to the Office of the Chief Engineer (DTD), Abhikshan, Sec-V, Salt Lake, Kolkata-91. The bidder will be given a receipt, jointly signed by the bidder and DTD officials, mentioning the samples and papers submitted by the bidder as per check list.

28.1.1 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 no. ultrasonic welded and 1 no. without welding and another dummy meter case (for checking ultrasonic welding).

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

28.1.3 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.

28.1.3.1 BCS (as per specification)

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

28.1.3.3 Modem and accessories for testing the remote meter reading

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

29.0 QUALITY ASSURANCE PLAN

The design life of the meter shall be minimum 10 years and to prove the design life the firmshall have at least the following quality Assurance Plan:

29.1 The factory shall be completely dust proof.

29.2 The test rooms shall be temperature and humidity controlled as per relevant Standards.

29.3 All test equipment shall have their valid calibration certificates.

29.4 Meter shall be tested in fully automatic test bench with ICT and results shall be printed directly without any human errors.

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

30.0 THE CHECKS TO BE CARRIED OUT DURING MANUFACTURING OF THE METERS

30.1 Meter frame dimensions tolerances shall be minimal.

30.2 The CT coil shall be made totally encapsulated and care shall be taken to avoid ingress of dust and moisture inside the coil.

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

31.0 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).

32.0 MANUFACTURING ACTIVITIES:

32.1 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.

32.2 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.

32.3 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.

32.4 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.

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

32.4.2 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).

32.5 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.

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

33.0 DOCUMENTATION:

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

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

33.3 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.

34.0 GUARANTEE

34.1 The Meters shall be guaranteed for a period of **5½ years** from the date of supply.

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

35.0 REPLACEMENT OF DEFECTIVE METERS

The metersdeclared 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.

36.0 PACKING & FORWARDING

36.1 The equipment shall be packed in cartons / crates suitable for vertical / horizontal transport as theCase may 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.

36.2 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.

37.0 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:Analog Devices,AMS, Cyrus Logic, Atmel, SAMES, Texas Instruments,Teridian;Japan: NEC,Freescale,Renesas;Holland: Phillps
3	Memory chips	The memory computing chips shall notbe 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 radiations. The displayshall be clearly visible over an angle of atleast a cone of 70o.The construction of themodules shall be such that the displayedquantity shall not disturbed with the life ofdisplay. The display shall be TN typeindustrial grade with extended temperature range	Singapore: Bonafied Technologies; Korea: Advantek; 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 shall besuch 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 shall beprotected 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,

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