

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

THREE PHASE FOUR WIRE CT / PT OPERATED 1 AMP
OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR
QUADRANT TOD TRI - VECTOR ENERGY METER
WITH AVAILABILITY BASED TARIFF (ABT) FEATURE



TECHNICAL SPECIFICATION NO.

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1.00 SCOPE:

This specification covers design; manufacture, testing, supply and delivery of ISI mark HT three phase four wire CT / PT operated 1 Amps or 5 Amps fully Static & AMR compatible Four Quadrant TOD Tri - vector Energy Meter with ABT feature, required for HT Consumers' Installations / CPP / IPP / Co – Generation / Wind Mill or as an Interface Meter. The meters shall be suitable for measurement of import & export energies and demand as per Power and ABT tariff requirement for AC balanced / unbalanced loads.

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

2.00 SERVICE CONDITIONS:

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

Environmental Conditions:

(a) Maximum ambient temperature	55 ⁰ C
(b) Maximum ambient temperature in shade	50 ⁰ C
(c) Minimum temperature of air in shade	5 ⁰ C
(d) Maximum daily average temperature	40 ⁰ C
(e) Maximum yearly weighted average temperature	32 ⁰ C
(f) Relative Humidity	10 to 95 %
(g) Maximum Annual rainfall	1450 mm
(h) Maximum wind pressure	150 Kg/m ²
(i) Maximum altitude above mean sea level	1000 mtrs
(j) Isoceraunic level	50 days/year
(k) Seismic level (Horizontal acceleration)	0.3 g

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

3.00 STANDARD TO WHICH METER SHALL COMPLY:

The Meter shall conform to the requirements of IEC: 62056 - 22 / IS: 14697 - 1999 (amended up to date) and other relevant IS specifications including CBIP publication No. 304 amended up to date.

The specifications given in this document supersedes the relevant clauses of IEC 62056 / IS: 14697-1999 (amended up to date) wherever applicable.

The equipment meeting with the requirements of other authoritative standards, which ensures equal or better quality than the standards mentioned above, also shall be considered. In case the Bidder wishes to offer material conforming to the other authoritative standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Copy of such standards with authentic English Translations, shall be furnished along with the offer. In case of conflict, the order of priority shall be – (i) this technical specification, (ii) IS: 14697 / 1999 (amended up to date), (iii) IEC, (iv) other authoritative standards. In case of any difference between provisions of these standards, the provisions of this specification shall prevail.

4.00 GENERAL TECHNICAL REQUIREMENT:

4.01 The meter shall bear ISI Mark / any international standard mark.

4.02 The class of accuracy shall be 0.2s for kWh & kVArh.

4.03 Current & Voltage rating:

The meter shall be suitable for use on 3 phase 4 wire system. The connection diagrams for this system shall be provided on terminal cover.

Rated voltage shall be 63.5 Volts Phase to Neutral.

The voltage range shall be +20% to – 40% of rated voltage.

Rated basic current (Ib) for meter shall be either 1 Amp or 5 Amps as per the need. However the exact rating i.e. 1 Amp or 5 Amps shall be informed at the time of issue of the purchase order.

The maximum continuous current of the meter shall be 2 times (200%) of Ib & the starting current for the meter shall be 0.1% of Ib.

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The meter shall operate with the power drawn from PT secondary circuit without any need of Auxiliary power supply.

4.04 Temperature:

The standard reference temperature for performance shall be 27° C. The mean temperature co-efficient shall not exceed 0.03%.

4.05 Frequency:

The rated frequency shall be 50 Hz ± 5%.

4.06 Power Factor:

Power Factor range: Zero Lag to Unity to Zero Lead & Zero Lead to (-Unity) to Zero Lag.

Average power factor & instantaneous power factor shall be calculated as per Clause No. 11.04 (vii) of this specification.

4.07 KVAh calculations:

In Import mode, the kVAh calculation formula will be as below:

$$\sqrt{\text{kWh Import}^2 + (\text{kVArh Lag Import})^2}$$

In Export mode, the kVAh calculation formula will be as below:

$$\sqrt{\text{kWh Export}^2 + (\text{kVArh Lag Export} + \text{kVArh Lead Export})^2}$$

4.08 Power consumption:

Less than 1 Watt and 4 VA per phase in voltage circuit and 2 VA per phase in current circuit.

5.00 CONSTRUCTION:

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

The meter base & cover shall be made out of transparent / translucent / opaque, unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The meter body shall be type tested for IP51 degree of protection as per IS: 12063 against ingress of dust, moisture & vermin. The meter cover shall be secured to base by means of sealable unidirectional captive screws.

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

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- 5.02 The poly carbonate body of the meter shall conform to IS: 11731 (FV-2 category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 1984 OR IEC PUB 60695-2-12, Ball pressure test as per IEC-60695-10-2 and Flammability Test as per UL 94 or as per IS 11731(Part-2) 1986.
- 5.03 To meet the requirement of terminal connection arrangement, the moulded single terminal block for current & voltage connections shall be provided as per IS: 14697 / 1999 (amended up to date). The termination arrangement shall be provided with an extended type **transparent / translucent / opaque** terminal cover, sealable independently at the bottom of meter approachable from front side to prevent unauthorized tampering. Proper size of grooves shall be provided at bottom of this terminal cover for incoming & outgoing service wires.
- 5.04 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non aging and of tested quality.
- 5.05 All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.
- 5.06 Independent sealing provision shall be made against opening of the terminal cover and front cover. It is necessary to provide unidirectional screws with two holes for sealing purpose. The meter shall be pilfer-proof & tamper- proof.
- 5.07 The **transparent / translucent / opaque** Poly-carbonate base and cover of meter shall be ultra-sonically welded (continuous welding) so that once the meter is manufactured and tested at factory; it shall not be possible to open the cover at site except the terminal cover. The thickness of material for meter cover and base shall be 2 mm (minimum).
- 5.08 The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal over load of live parts in contact with them.
- 5.09 The meter shall be completely factory sealed by providing minimum two (stickers / polycarbonate) seals at diagonally opposite positions except the terminal block cover. The provision shall be made on the meter for at least two (sticker / polycarbonate) seals to be put diagonally by utility. The terminal cover shall be **transparent / translucent / opaque** with one side hinge & sealing arrangement on both sides.

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- 5.10 The Push button facility shall be provided for following functions, as brought out elsewhere in this specification.
- (a) For TEST MODE (high resolution reading of display)
 - (b) For ON DEMAND MODE (UP & DOWN Scrolling)
 - (c) In case of INTERNAL BATTERY BACKUP if provided (to read meter in case of Power failure)
 - (d) For MD RESET (with sealing arrangement)
 - (e) For DISPLAY HOLD / UNHOLD (to lock required display parameter)
- 5.11 The meter shall have test output accessible from the front and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from front. The test output device shall be provided in the form of blinking LED or other similar devices like blinking LCD. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes. The pulse rate of output device which is Pulse / kWh and Pulse / kVArh (meter constant) shall be programmed according to primary values of voltage & current & shall be indelibly provided on the nameplate.
- 5.12 The meter accuracy shall not be affected by AC / DC magnetic field up to 0.2 Tesla on all the sides of meter i.e. front, sides, top and bottom of the meter as per CBIP publication No. 304 with latest amendments. Under influence of any magnetic field (AC / DC / Permanent) above 0.2 Tesla, if the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping. The energy recorded during such tamper shall be registered in a separate register in addition to main register.
- 5.13 The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phases & neutral for five minutes without affecting the accuracy.
- 5.14 In meter, power supply unit shall be micro control type instead of providing transformer and then conversion to avoid magnetic influence.
- 5.15 Non specified display parameters in the meter shall be blocked and it shall not be accessible for reprogramming at site.
- 5.16 Complete metering system shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic

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fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP publication No. 304 with latest amendments.

- 5.17 Internal CTs, (if provided) are to be provided with magnetic shielding and they shall be tested separately prior to assembly by the meter manufacturer.
- 5.18 PCB used in meter shall be made by Surface Mounting Technology.
- 5.19 The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 years day / date without any necessity for correction. The maximum drift shall not exceed +/- 60 seconds per year.
- 5.20 The clock day / date setting and synchronization shall only be possible through password / key code command from one of the following:
- Hand Held Unit (HHU), Laptop Computer or Meter Testing Work Bench and this shall need password enabling for meter;
 - From remote server through suitable communication network or Sub-station data logger 'PC'.

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

- 5.21 The meter shall withstand any type of High Voltage and High Frequency surges which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter. The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 kV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:
- On any of the phases or neutral terminals
 - On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)
 - At any place in load circuit.

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

5.22 SELF DIAGNOSTIC FEATURES:

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

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

5.23 COMMUNICATION CAPABILITY:

The meter may be provided with two ports for communication of the measured / collected data, i.e. hardware ports compatible with RS 232 specifications (RJ - 11 / RJ - 45 type is also acceptable) which shall be used for remote access through suitable Modem (GPRS / GSM / EDGE / CDMA / PSTN / LPR) and an Optical port complying with hardware specifications detailed in IEC - 62056 - 21. This port shall be used for local data downloading through a CMRI / Laptop computer. RS 232 port or TCP / IP port as required on terminal block is also acceptable. Both the ports shall be able to communicate simultaneously.

However the meter with three ports for communication of the measured / collected data, i.e. hardware ports compatible with RS 232 and RS 485 specifications (RJ - 11 / RJ - 45 type is also acceptable) which shall be used for remote access through suitable Modem (GPRS / GSM / EDGE / CDMA / PSTN / LPR) & SCADA and an optical port complying with hardware specifications detailed in IEC - 62056 - 21 shall be preferred. Two of the above three ports shall be able to communicate simultaneously. (If one port is connected to SCADA, then it should be able to download data for billing purpose through other port without disturbing SCADA communication)

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

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

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

The external battery, if provided, shall be with inductive coupling arrangement. The external battery is to be provided with inbuilt charger, in the ratio of one battery pack per meter.

5.25 Wire / Cable less design:

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

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

6.00 TOD TIMINGS:

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

At present the time zones shall be programmed as below:

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

TIME ZONE "B" ... 06.00 to 09.00 hrs and 12.00 to 18.00 hrs.

TIME ZONE "C" ... 09.00 to 12.00 hrs.

TIME ZONE "D" ... 18.00 to 22.00 hrs.

7.00 DEMAND INTEGRATION PERIOD:

The maximum demand integration period shall be set at 15 minute or 30 minute as per requirement.

8.00 MD RESET:

The meter shall have following MD resetting options.

- i) Automatic reset at the end of certain predefined period (say, end of the month) - This option shall be blocked by default and made programmable through hand held terminal / CMRI for the actual date required.
- ii) Through a hand held terminal (CMRI) capable of communicating with the meter or communication driven reset.
- iii) Manual resetting arrangement with sealing facility.

9.00 ANTI TAMPER FEATURES:

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

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

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- (b) The meter shall continue to work even without neutral.
- (c) The meter shall work in absence of any two phases, i.e. it shall work on any one phase wire and neutral, to record relevant energy.
- (d) If the accuracy of the meter gets affected under the influence of magnetic field more than 0.2 Tesla, then the same shall be recorded as magnetic tamper event with date & time stamping.

10.00 TAMPER EVENTS:

The meter shall have features to detect the occurrence and restoration of the following abnormal events. While recording tamper events, the persistence time for occurrence & recovery shall be 5 minutes & for event persistence, it shall be 5 minutes for potential related events & 15 minutes for current related events. While recording an event, actual occurrence & recovery timings shall be recorded.

10.01 Missing potential:

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

10.02 Potential Unbalance:

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

10.03 Current unbalance:

The meter shall be capable of detecting and recording occurrence and restoration with date and time of current unbalance. (30% or more for 15 minutes) Higher of the 3 phase currents shall be considered as reference for this purpose.

10.04 Current Reversal:

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

10.05 Current Missing:

The meter shall be capable of detecting and recording occurrences and restoration of current below starting current value as a current

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missing event with phase identification for persistence time of 15 minutes. It shall also possess a current missing counter.

10.06 Power ON/OFF:

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

10.07 Low Power Factor:

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

10.08 Neutral Injection:

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

10.09 Cover opening:

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

For above abnormal conditions, the recording of events shall be on FIFO basis. It shall be possible to retrieve the abnormal event data along with all related snap shots data by authorized personnel through the meter optical port with the help of CMRI or remote access through suitable communication network & downloaded the same to the base computer. All the information shall be made available in simple & easy to understand format.

11.00 DISPLAY OF MEASURED VALUES:

11.01 Permanently backlit LCD panel shall show the relevant information about the parameters to be displayed. The corresponding non-volatile memory shall have a minimum retention time of 10 years. In the case of multiple values presented by a single display it shall be possible to display the content of all relevant parameters. When displaying the parameters, the identification of the same shall be provided.

The parameters shall be displayed along with unit as follows:

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1. Energy : kWh, kVArh, kVAh
2. Power : kW, kVA, kVAr
3. Current : A
4. Voltage : V
5. Frequency : Hz
6. Time (RTC) : HH:MM:SS
7. DATE : DD:MM:YYYY
8. Time lapsed for RD : MM:SS
9. THD (Harmonics) : %V & % I (Optional)
10. Cumulative parameter : CUM
11. Last reset parameters : H1

All values of current and voltages shall be displayed as secondary values. Non specified display parameters in the meter shall be blocked and it shall not be accessible for reprogramming at site.

While displaying any parameter, following conventions shall be displayed along with it.

(a)	Right arrow	→	For import mode
(b)	Left arrow	←	For export mode
(c)	Inductance sign		For lagging parameters
(d)	Capacitor sign		For leading parameters
(e)	Characters	R Y B	For indication of R, Y, B phases resp. (These characters will be steady for healthy condition of voltages & currents both. For current absence, the respective character will blink continuously. For voltage absence the respective character will not be displayed.)
(f)	Asterisk sign	*	Will appear & blink for persistence of any abnormality.
(g)	Characters	A B C D	For displaying TIME ZONES of respective parameters. (For indicating present time zone, respective character will blink.)

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11.02 The meter shall have 8 digits (with +/- indication), parameter identifier, permanently backlit Liquid Crystal Display (LCD) with wide viewing angle. The size of digit shall be minimum 8x5 mm. The decimal units shall not be displayed. However it shall be displayed in push button mode or alternate mode for high resolution display for testing. Auto display cycling push button is required with persistence time of 9 seconds. LCD shall be suitable for temperature withstand of 70^o C; adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

11.03 **DISPLAY PARAMETERS:**

(A) Display parameters in AUTO SCROLLING mode:

Display Check

Unique Identification number of the meter

Date

Time

Phase Sequence of voltage and current

Cum. kWh Import

Rate A kWh Import

Rate B kWh Import

Rate C kWh Import

Rate D kWh Import

Cum. kVArh Import Lag

Cum. kVArh Import Lead

Cum. kVAh Import

Average power factor Import

Rate A Max kVA Import

Rate B Max kVA Import

Rate C Max kVA Import

Rate D Max kVA Import

Cum. kWh Export

Rate A kWh Export

Rate B kWh Export

Rate C kWh Export

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Rate D kWh Export
Cum. kVArh export lag
Cum. kVArh export lead
Cum. kVAh Export
Average power factor Export
Rate A Max kVA Export
Rate B Max kVA Export
Rate C Max kVA Export
Rate D Max kVA Export
Last block avg frequency
Last block net kWh transmitted with +/- sign
Net kVArh High
Net kVArh Low
Phase A Voltage
Phase B Voltage
Phase C Voltage
Phase A Current
Phase B Current
Phase C Current
Instantaneous PF (Lag/Lead)
Demand Reset count
Instantaneous frequency

(B) Display parameters in ON DEMAND / ALTERNATE mode:

Cumulative meter OFF duration
Inst. average percent voltage
Inst. Active power with sign
Inst. Reactive power with sign
Inst. Apparent power with sign
Cumulative Reactive Energy HIGH
Cumulative Reactive Energy LOW
Phase 'A' Voltage THD%

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Phase 'B' Voltage THD%

Phase 'C' Voltage THD%

Phase 'A' Current THD%

Phase 'B' Current THD%

Phase 'C' Current THD%

Last reset Rate A Max kVA Import

Last reset Rate B Max kVA Import

Last reset Rate C Max kVA Import

Last reset Rate D Max kVA Import

Last reset Rate A Max kVA Export

Last reset Rate B Max kVA Export

Last reset Rate C Max kVA Export

Last reset Rate D Max kVA Export

Last reset Date & Time

Cumulative Tamper Count

Cumulative Programming Count

(C) Test mode display:

High Resolution total kWh Import

High Resolution total kVArh Import Lag

High Resolution total kVArh Import Lead

High Resolution total kVAh Import

Rising Demand Import kVA with elapsed time (Simultaneously displayed)

High Resolution total kWh Export

High Resolution total kVArh Export Lag

High Resolution total kVArh Export Lead

High Resolution total kVAh Export

Rising Demand Export kVA with elapsed time (Simultaneously displayed)

All test mode parameters shall have resolution of 4 decimal places.

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NOTE:

- (1) It shall be possible to scroll through the parameters (up & down) manually in all the three display modes.
- (2) The meter display shall return to Auto scrolling Display mode (mentioned above) if the 'Display Hold' is inactive & 'Push button' is not operated for 60 seconds.
- (3) Manual display Hold / Unhold facility shall be provided. The meter shall return to Auto scrolling mode if Unhold activation is not done for 30 minutes.

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

- i) PT Ratio: $11000/\sqrt{3} / 110/\sqrt{3}$ V,
- ii) CT Ratio: 5/5 Amps or 1/1 Amp as the case may be.
- iii) Harmonics shall be filtered out and energies for fundamental frequency only shall be measured and computed.
- iv) Scale MF shall be One (1) invariably.
- v) MD RESET:

The meter shall have following MD resetting options.

- (a) Automatic reset at the end of certain predefined period (say, end of the month) - This option shall be blocked by default and made programmable through hand held terminal / CMRI for the actual date required.
 - (b) Resetting through a hand held terminal (CMRI) capable of communicating with the meter or communication driven reset.
 - (c) Manual resetting arrangement with sealing facility.
- vi) MD Integration Period is 15 Minutes with sub integration period of 5 minutes with sliding window method.
 - vii) Average power factor for current billing period (since last reset) shall be calculated as ratio of kWh & kVAh since last reset for respective mode. It shall be displayed with 3 decimal digits.

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

viii) Billing parameters shall be as shown below:

- (a) Active energy Import & Export. (Total & TIME zone wise)
- (b) Reactive Energy Lag & Lead (Import) (Total & TIME zone wise)

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- (c) Reactive Energy Lag & Lead (Export) (Total & TIME zone wise)
- (d) Apparent Energy Import & Export (Total & TIME zone wise)
- (e) Maximum Demand KVA Import & Export (Total & TIME zone wise)
- (f) Cumulative KVA MD for import & Export.

12.00 RECORDING OF MEASURED VALUES:

The meter shall store the data in different formats given below. Retrieval, processing & printing of this data shall be possible for analysis purpose. The data shall get retrieved through MSEDCL approved Meter Reading Instruments, Laptops / PCs or through remote communication network.

12.01 BILLING HISTORY DATA:

The parameters mentioned in 11.04 (viii), as reproduced below shall be stored in meter memory for latest 12 no. of resets as well as that for the instant of data retrieval. Also, the reset to reset consumption of energies & maximum demands shall be made available.

- 1. Active energy Import & Export. (Total & TIME zone wise)
- 2. Reactive Energy Lag & Lead (Import) (Total & Time zone wise)
- 3. Reactive Energy Lag & Lead (Export) (Total & Time zone wise)
- 4. Apparent Energy Import & Export (Total & TIME zone wise)
- 5. Maximum Demand KVA Import & Export (Total & TIME zone wise)
- 6. Cumulative KVA MD for import & Export.

12.02 ABT BILLING DATA:

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

- 1. Average frequency for each successive 15 min block (00 to 99 for frequency form 48.00 to 52.00 Hz)
- 2. Net kWh transmittal during each successive 15 min block up to second decimal with plus / minus sign.
(PLUS sign when there is net kWh IMPORT to the beneficiary and NEGATIVE sign when there is net kWh EXPORT from the beneficiary.)
- 3. Cumulative kWh transmitted at each midnight in eight digits including one decimal.
- 4. Cumulative kVarh transmitted for Voltage HIGH condition at each

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midnight in eight digits including one decimal.

5. Cumulative kVArh transmitted for Voltage LOW condition at each midnight in eight digits including one decimal.
6. Cumulative kVArh transmitted for Voltage below 70 % condition at each midnight in eight digits including one decimal.
7. Cumulative kVArh transmitted for Voltage between 97% and 103 % condition at each midnight in eight digits including one decimal.
8. The date time blocks of failure of VT supply on any phase as a (*) (Star) mark.

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

NOTE:

- Net Reactive Energy HIGH =
= [(Export Lag + Import Lead) - (Import Lag + Export Lead)]
- Net Reactive Energy LOW
= [(Import Lag + Export Lead) - (Export Lag + Import Lead)]

12.03 LOAD SURVEY DATA:

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

Load survey parameters: (for 15 min block)

1. kWh Import & Export
2. kVArh lag Import & Export
3. kVArh lead Import & Export
4. kVAh Import & Export

5. Phase wise Avg. Voltages (for 15 min block in power on condition)

6. Phase wise Avg. Current (for 15 min block in power on condition)

7. Average PF Import & Export.

8. Average frequency (Average for 15 min block in power on condition)

12.04 **INSTANTANEOUS DATA:**

The instantaneous data shall store & display the below given parameters at the time of data retrieval.

- Phase wise & average values of Voltages, Currents.
- Phase wise & total powers viz. kW, kVAr, kVA.
- Phase wise & average power factors.

Phasor diagram shall be plotted invariably.

12.05 **PROGRAMME DATA:**

The programme data shall store & display the programming details of the meter such as two quadrants / four quadrants, programmed CT Ratio & PT Ratio, TOD zone timings, demand reset type & integration period, Load survey parameters & integration period, threshold values defined for tamper events etc.

12.06 **TAMPER DATA:**

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

The meter shall keep records for the minimum 360 events excluding power off events (Occurrence + Restoration). For above abnormal conditions the recording of events shall be on FIFO basis; however the unrestored events stored separately shall not be erased till restoration.

13.00 **DEMONSTRATION:**

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

14.00 **COMPUTER SOFTWARE:**

14.01 The following Software shall be supplied by the Meter manufacturer without extra cost.

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- (a) The Resident Software (MS-DOS 5.0 or higher version) in the Meter Reading Instrument (CMRI) or Laptop Computer for data retrieval and programming the meter. Maximum downloading time for complete data from meter to CMRI / Laptop computer shall not be more than 6 min. Also option for downloading selective data shall be made available.
 - (b) Base Computer Software "Windows" based & user friendly for accepting data from all MSEDCL's approved CMRIs / Laptop computers and downloading instructions from base computer to CMRI / Laptop computers. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer as well as CMRI / Laptop computers by any means). The software shall have capability to convert all the data into ASCII format. Maximum downloading time for complete data from CMRI to PC shall not be more than 5 min per meter.
 - (c) Necessary software for loading application program to CMRI / Laptop computers via serial port / USB port.
 - (d) Downloading software shall also be provided so as to install on our Laptop for downloading data directly on Laptop from meter without the use of HHU.
 - (e) Other special application software of the manufacturer for the Meter.
 - (f) The supplier shall provide communication cable of 2 meter length for data communication between meter & CMRI / Laptop computers and between meter & PC.
 - (g) The software provided on laptop or PC shall be compatible to read the data through USB drive and for that purpose a cable (1 No.) of 2 mtr long shall be provided with USB termination. USB being the de-facto standard, this is the requirement.
 - (h) Manufacturer have to depute Hardware Engineers and Software Engineers on call basis, who shall have thorough knowledge of meter hardware / software used for downloading and converting so as to discuss the problems, if any, or new development in the hardware / software with General Manager (IT) / Chief Engineer, Material Specifications Cell, MSEDCL, Prakashgad, Bandra (E), Mumbai – 400 051 without any additional charge.
- 14.02 Meter shall be capable to communicate directly with laptop computer. Base Computer Software shall be suitable for all types of dot matrix, Inkjet & LaserJet printers.

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

14.04 The protocol used in the meter shall have to be provided at the time of supply for the purpose of Automatic Meter Reading System. Confirmation shall be given to that extent in GTP.

The suppliers shall also have to submit the protocol for meters supplied in the past and ensure that protocol corresponds to the type of meter supplied.

The protocol shall be shared with MSEDCL.

In addition to this, the manufacturer shall provide API (based upon MIOS Standard) with proper documentation & demonstration for existing meters as well as to be supplied with this specification.

15.00 CONNECTION DIAGRAM AND TERMINAL MARKINGS:

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking shall appear in the above diagram. The diagram and terminal marking on sticker will not be allowed.

16.00 NAME PLATE AND MARKING:

Meter shall have a nameplate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards.

Meter Serial Number shall be Bar Coded along with numeric number. The size of bar coded number shall not be less than 35x5 mm.

The manufacturer's meter constant shall be marked on the nameplate. Meter serial number & bar code on sticker will not be allowed.

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

- 1) Purchase order No.
- 2) Month and Year of manufacture
- 3) Name of purchaser i.e. MSEDCL
- 4) Guarantee of Five Years
- 5) ISI mark.

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17.00 TESTS:

17.01 TYPE TESTS:

The meter shall be fully type tested as per the relevant standards within 5 years from the date of opening of Tender. The type test reports of the offered meters shall be submitted along with the offer. All the Type Test shall be carried out from laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI Bangalore / Bhopal, ERDA Baroda, to prove that the Meters meet the requirements of the specification. The Tenderers shall also furnish certificate from laboratories where type tested that requisite test facility available in house for that particular test. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost. For this purpose, the tenderer shall quote unit rates for carrying out each type test. However, such unit rates will not be considered for evaluation of the offer. In case the meters is type tested earlier to 5 years from the date of opening of tender, the bidder have to carry out the fresh type tests at their cost before commencement of supply.

17.02 ACCEPTANCE TESTS:

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

17.03 ROUTINE TESTS:

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

17.04 ADDITIONAL ACCEPTANCE TESTS:

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

(a) TRANSPORTATION TEST:

At least 50% of the samples of the meters be tested for error at I_{max} , I_b and 5% I_b at unity power factor and 50% I_{max} and 10% I_b at 0.5 lagging Power Factor besides checking them for starting current. This test shall be conducted on ready to install meter i.e. meter cover ultrasonically welded & sealed. After recording these errors, the meters be put in their normal packing and transported for at

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least 50 km in any transport vehicle such as pick up van, Jeep, etc. on uneven rural roads and then re-tested at all these loads after the transportation. The variation in errors recorded before and after transportation shall not exceed 1% at higher loads and 1.5% at loads below I_b .

(b) OTHER ACCEPTANCE TESTS:

- (i) Meters shall be tested for tamper conditions as stated in this specification.
- (ii) Glow wire testing for poly-carbonate body.
- (iii) Power consumption tests shall be carried out.
- (iv) The meter shall comply all the tests for external AC / DC magnetic field as per CBIP publication No. 304 with latest amendments. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If, during the test, the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping. The energy recorded during such tamper shall be registered in a separate register in addition to main register. After removal of magnet, meter shall be subjected to accuracy test as per IS: 14697 / 1999 (amended up to date). No deviation in error is allowed in the accuracy as per specification.
- (v) The meter shall withstand impulse voltage at 10 kV.

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

The tests 17.04 (b) (iv) & (v) shall be carried out on one sample from first lot as per procedure laid down in IS: 14697 / 1999 (amended up to date) and CBIP publication No. 304 (with latest amendments) in NABL LAB. The test report shall be got approved from Chief Engineer, MSEDCL, Material Management Cell, 1st Floor, Prakashgad, Bandra (E), Mumbai - 400051 before commencement of supply.

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

(d) ACCEPTANCE TESTS FOR CONFIRMATION OF ABT FEATURE:

- (i) 15 minutes block average frequency registration.
- (ii) 15 minutes block net active power registration.

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- (iii) Net kVArh High registration in all four quadrants when voltage is above 103% of V_{REF} .
- (iv) Net kVArh High registration in all four quadrants when voltage is 103% of V_{REF} .
- (v) Net kVArh registration in all four quadrants when voltage is at V_{REF} .
- (vi) Net kVArh Low registration in all four quadrants when voltage is 97% of V_{REF} .
- (vii) Net kVArh Low registration in all four quadrants when voltage is below 97% of V_{REF} .
- (viii) Test for confirmation of midnight energy banking in power ON & power OFF conditions.

18.00 GUARANTEED TECHNICAL PARTICULARS:

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

19.00 PRE-DESPATCH INSPECTIONS:

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchases.

The manufacturer shall offer to the inspector representing the purchaser all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The Company's representative / Engineer attending the above testing will carry out testing as per IS: 14697/1999 (amended upto date) & this specification and issue test certificate approval to the manufacturer and give clearance for dispatch. The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division and the Executive Engineer Inspection Wing.

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

From each lot (lot means the total number of meters received in a Store out of inspected and approved lot by Executive Engineer, Inspection Wing or purchaser's representative under one approval letter) of meters received at Stores, 5 sample meters shall be drawn and these meters will be tested by our Testing Engineer in presence of Supplier's

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representative jointly for (i) no load condition, (ii) limits of error test (iii) starting & (iv) repeatability of error test and (v) tamper conditions as per this specification. The 5 days advance intimation will be given to the supplier and if the suppliers fail to attend the joint inspection on the date informed, the Testing will be carried out by our Testing Engineer in absence of supplier's representative. If the meters failed in above random sample testing, the lot will be rejected.

21.00 GUARANTEE:

The meter shall be guaranteed for the period of five years from the date of commissioning or five and half year from the date of dispatch whichever is earlier. The meters found defective within the above guarantee period shall be replaced by the supplier free of cost within one month of receipt of intimation. If the defective meters are not replaced within the specified period above, the Company shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier.

22.00 PACKING:

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

22.02 The following information shall be furnished with the consignment:

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

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23.00 QUALITY CONTROL:

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

24.00 MINIMUM TESTING FACILITIES:

Manufacturer shall possess fully Automatic computerized Meter Test Bench System having in built source and load adjustment for carrying out routine and acceptance Tests as per IEC 62056 -22, IS: 14697 / 1999 and CBIP-88.

In addition this facility shall produce Test Reports for each and every Meter. The tenderer shall have the necessary minimum testing facilities for carrying out the following tests.

- (1) A.C. Voltage test
- (2) Insulation Resistance Test
- (3) Test of accuracy requirement
- (4) Test on limits of errors
- (5) Test on meter constant
- (6) Test of starting condition
- (7) Test of no-load condition
- (8) Repeatability of error test
- (9) Test of power Consumption
- (10) Vibration test
- (11) Shock test
- (12) Tamper conditions as per MSEDCL's specification.
- (13) Transportation test as per MSEDCL's specification
- (14) Facility for acceptance tests of ABT features as per Clause No. 17.04 (d)
- (15) Glow Wire Test
- (16) Long Duration Test
- (17) Flammability Test
- (18) The manufacturer shall have duly calibrated RSS meter of class 0.02s accuracy.

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25.00 MANUFACTURING PROCESS, ASSEMBLY, TESTING:

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

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

All inward flow of major components and sub assembly parts (CT, PT, RTCs / Crystal, LCDs, LEDs, power circuit electronic components, etc.) shall have batch and source identification. Multilayer 'PCB' assembly with 'PTH' (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow Soldering oven, for stabilized setting of the components on 'PCB'. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice.

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

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

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

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

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

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

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

26.00 MANUFACTURING ACTIVITIES:

a) Quality shall be ensured at the following stages:

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

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- (ii) At insertion stage all components should under go computerized testing for conforming to design parameters and orientation.
- (iii) Complete assembled and soldered PCB should under go functional testing using Automatic Test Equipments (ATEs)
- (iv) Prior to final testing and calibration, all meters shall be subjected to aging test (i.e. Meters shall be kept in ovens for 72 hours at 55° C temperature and atmospheric humidity under real life condition at it's full load current. After 72 hours meters shall work satisfactory to eliminate infant mortality.
- (v) The calibration of meters shall be done in-house.
- (vi) The bidders shall submit the list of all imported & indigenous components separately used in meter along with the offer.
- (vii) Bought out items:

A detailed list of bought out items which are used in the manufacture of the meter shall be furnished indicating the name of firms from whom these items are procured.

The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

- (viii) List of Plant and Machinery:

Sr. No.	List of Plant and Machinery used for Energy meter Production	
1	Fully automatic testing Bench with ICT for testing link less meters	Routine Testing and Calibration of Meters
2	Semi automatic testing Bench with MSVT	Routine Testing and Calibration of Meters
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meters Class 0.02 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meters

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9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmings and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	resistance network and HMC manufacturing
17	Laser Trimming Machines	trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO - E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meters

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28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meters
30	Short term over Current testing setup	Type testing of Meters
31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meters
33	Composite Environmental testing chambers	Type testing of Meters

27.00 QUALITY ASSURANCE PLAN:

- 27.01 The tenderer shall invariably furnish QAP as specified in Annexure I along with his offer. The QAP shall be adopted by him in the process of manufacturing.
- 27.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.

28.00 COMPONENT SPECIFICATION:

As per Annexure II enclosed.

29.00 SCHEDULES:

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

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

Schedule - 'C' ... Tenderer Experience

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

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SCHEDULE 'C'

TENDERER'S EXPERIENCE

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

Sr. No.	Name of client	Order No. & Date	Qty. Ordered	Qty. Supplied
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NAME OF FIRM _____

NAME & SIGNATURE OF TENDERER _____

DESIGNATION _____

DATE _____

ANNEXURE I

QUALITY ASSURANCE PLAN

- A)** The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.
- i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates:
 - ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.
 - iii) List of manufacturing facilities available.
 - iv) Level of automation achieved and list of areas where manual processing exists.
 - v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
 - vi) List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.
- B)** The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.
- i) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offers.
 - ii) Type test certificates of the raw materials and bought out accessories if required by the purchaser.
 - iii) Quality assurance plan (QAP) with hold points for purchaser's inspection.
 - iv) The quality assurance plan and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.
- C)** The contractor shall operate systems which implement the following:

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- i) Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorise work to progress beyond the hold points indicated in quality assurance plans.
- ii) Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

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

i) The structure of the organization.

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

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

ii) Quality Plans:

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

TECHNICAL SPECIFICATION OF 3 PHASE 4 WIRE CT / PT OPERATED 1 AMP OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR QUADRANT TOD TRI - VECTOR ENERGY METER WITH AVAILABILITY BASED TARIFF (ABT) FEATURE

ANNEXURE II

COMPONENT SPECIFICATION

SN	Component Function	Requirement	Makes & Origin
1.	Current Transformers	The Meters shall be with the current transformers as measuring elements. The current transformer shall withstand for the clauses under 5 & 9 of IS: 13779 / 1999	
2.	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs.	USA: Teridian, Analog Devices, Cyrus Logic, Atmel, Philips, Dallas, ST, Motorola, Texas Instruments, Maxim, Freescale, National Semiconductor, Onsemiconduct ors. Germany: Siemens. South Africa: SAMES. Japan: NEC, Toshiba, Renasas, Hitachi. Austria: AMS. Holland: Philips (N X P)
3.	Memory chips	Memory chips shall not be affected by external parameters like	USA: Teridian, Atmel, Philips,

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		<p>sparkling, high voltage spikes or electrostatic discharges.</p> <p>Meter shall have nonvolatile memory (NVM). No other type of memory shall be used for data recording and programming. (The life of the NVM is highest). There shall be security isolation between metering circuit, communication circuit, and power circuit.</p>	<p>ST, National Semiconductor, Texas Instruments, Microchip, Spansion (Fujitsu), Ramtron.</p> <p>Japan: Hitachi, Renesas.</p> <p>Germany: Siemens</p>
4.	Display modules	<p>a) The display modules shall be well protected from the external UV radiations.</p> <p>b) The display visibility shall be sufficient to read the Meter mounted at a height of 0.5 meter as well as at the height of 2 meters (refer 3.2 d for viewing angle).</p> <p>c) The construction of the modules shall be such that the displayed quantity shall not disturb with the life of display (PIN Type).</p> <p>d) It shall be Tran-reflective HTN or STN type industrial grade with extended temperature range.</p>	<p>Singapore: Bonafied Technologies, Displaytech, E-smart</p> <p>Korea: Advantek, Jebon, Union Display Inc.</p> <p>Hong Kong: Genda</p> <p>China: Success, Truly,</p> <p>Japan: Hitachi, Sony, L & G.</p> <p>Malaysia: Crystal Clear Technology.</p>
5.	Communication Modules	<p>Communication modules shall be compatible for the two ports (one for optical port for communication with meter reading instruments & the other for the hardwired RS-232 port to communicate with various modems for AMR)</p>	<p>USA: Agilent, HP, Fairchild, National Semiconductor, Optonica.</p> <p>Holland: Philips.</p>

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			<p>Korea: Phillips.</p> <p>Japan: Hitachi.</p> <p>Taiwan: Ligitek</p>
6.	Optical port	Optical port shall be used to transfer the meter data to meter reading instrument. The mechanical construction of the port shall be such to facilitate the data transfer easily.	<p>USA: HP, National Semiconductor.</p> <p>Holland: Philips.</p> <p>Korea: Phillips.</p> <p>Japan: Hitachi</p> <p>Taiwan: Ligitek, Everlight</p> <p>Germany: Osram</p>
7.	Power supply	The power supply shall be with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections. It shall not also be affected by magnet	SMPS Type
8.	Electronic Components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	<p>USA: Atmel, National Semiconductor, BC Component, Philips, Texas Instruments, Analog Devices. ST, Maxim, Onsemiconduct ors, Muruta, Kemet, AVX, Freescale, Fox, Intersil, Raltron, Fairchild,</p>

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			<p>Agilent, Diode Inc., Abracon, Honeywell, Sipex Power Integration, Roham.</p> <p>Japan: Hitachi, Oki, AVZ, Ricon, Toshiba, Epson, Kemet, Alps, Murata, TDK, Sanyo, Samsung.</p> <p>India: RMC, VEPL, Incap, KELTRON, PEC, Cermet, Gujarat Polyavx, Prismatic, MFR Electronic Components Pvt. Ltd.</p> <p>Korea: Samsung</p> <p>Japan: Panasonic</p> <p>Germany: Kemet, Vishay, Epcos, Diotech.</p>
9.	Mechanical parts	<p>a) The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc.</p> <p>b) The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting</p>	

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		methods.	
10.	Battery	Maintenance free battery (Ni-mh or Li-ion) of long life of 15 years. Only non-rechargeable battery shall be used for RTC as well as display in absence of Power since the life & Reliability of these are better than the rechargeable batteries.	USA: Varta, Tedirun, Sanyo or National, Maxell, Renata. Japan: Panasonic, Sony. France: Saft. Korea: Tekcell. Germany: Varta.
11.	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS standards.	USA: ST, Teridian, Philips, Dallas, Atmel, Motorola, Microchip. Japan: NEC, Oki, Epson.
12.	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

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SCHEDULE 'A'

GUARANTEED TECHNICAL PARTICULARS (TO BE FILLED ONLINE)

ITEM NAME	THREE PHASE FOUR WIRE CT / PT OPERATED 1 AMP OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR QUADRANT TOD TRI - VECTOR ENERGY METER WITH AVAILABILITY BASED TARIFF (ABT) FEATURE	
SR. NO.	GTP PARAMETERS	GTP VALUES
1.	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TEXT
2.	MAKE AND TYPE OF METER	TEXT
3.	APPLICABLE STANDARD IS AS PER IEC: 62056 - 22 / IS: 14697 /1999 (AMENDED UPTO DATE), CBIP PUBLICATION NO. 304 AMENDED UP TO DATE	BOOLEAN
4.	METER BEARS ISI MARK	BOOLEAN
5.	ACCURACY CLASS OF METER	TEXT
6.	RATED VOLTAGE	TEXT
7.	VOLTAGE RANGE	TEXT
8.	BASIC CURRENT (IB) OF METER	TEXT
9.	MAXIMUM CONTINUOUS CURRENT (IMAX)	TEXT
10.	STARTING CURRENT OF METER	TEXT
11.	SHORT TIME OVER CURRENT	TEXT
12.	CT RATIO OF METER	TEXT
13.	PT RATIO OF METER	TEXT
14.	STANDARD REFERENCE TEMPERATURE OF METER	TEXT
15.	MEAN TEMPERATURE CO-EFFICIENT	TEXT

TECHNICAL SPECIFICATION OF 3 PHASE 4 WIRE CT / PT OPERATED 1 AMP OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR QUADRANT TOD TRI - VECTOR ENERGY METER WITH AVAILABILITY BASED TARIFF (ABT) FEATURE

16.	FREQUENCY	TEXT
17.	POWER FACTOR	TEXT
18.	AVERAGE POWER FACTOR & INSTANTANEOUS POWER FACTOR IS CALCULATED AS PER CLAUSE NO. 11.04 (VII) OF THE SPECIFICATION.	BOOLEAN
19.	KVAH CALCULATIONS AS PER SPECIFICATION.	BOOLEAN
20.	POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT	TEXT
21.	POWER CONSUMPTION IN EACH CURRENT CIRCUIT	TEXT
22.	POWER SUPPLY IS SMPS & MICRO CONTROL TYPE	BOOLEAN
23.	KVA MD PROVIDED	BOOLEAN
24.	METER IS PROJECTION TYPE, DUST AND MOISTURE PROOF & SUITABLE FOR MOUNTING ON PLANE VERTICAL SURFACE.	BOOLEAN
25.	METER BODY IS MADE OF TRANSPARENT / TRANSLUCENT / OPAQUE POLY CARBONATE	TEXT
26.	POLY CARBONATE CONFORMS TO IS: 11731 / 1986 (PART-2) (FV-2 CATEGORY)	BOOLEAN
27.	POLY CARBONATE BODY MEETS TEST REQUIREMENT OF (A) HEAT DEFLECTION TEST AS PER ISO 75 > 1500C	BOOLEAN
28.	(b) GLOW WIRE TEST AS PER IS: 11000 (PART 2/SEC-1) 1984 OR IEC PUB 60695-2-12 AT 900°C	BOOLEAN
29.	(c) BALL PRESSURE TEST AS PER IEC--60695-10-2	BOOLEAN
30.	(d) BALL PRESSURE TEST AS PER IEC--60695-10-2	BOOLEAN
31.	(e) FLAMMABILITY TEST AS PER UL 94 OR IS 11731 (PART-2) 1986	BOOLEAN
32.	METER BODY TYPE TESTED FOR IP51 DEGREE OF PROTECTION AS PER IS: 12063 AGAINST INGRESS	BOOLEAN

TECHNICAL SPECIFICATION OF 3 PHASE 4 WIRE CT / PT OPERATED 1 AMP OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR QUADRANT TOD TRI - VECTOR ENERGY METER WITH AVAILABILITY BASED TARIFF (ABT) FEATURE

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

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

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

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69.	METER PROVIDED WITH 2 OR 3 THREE PORTS FOR COMMUNICATION	TEXT
70.	SEALING ARRANGEMENT IS PROVIDED TO COMMUNICATION PORTS	
71.	DEFAULT & MINIMUM BAUD RATE OF ALL PORTS IS 9600 BPS	BOOLEAN
72.	NECESSARY CHORD FOR OPTICAL PORT OF MINIMUM LENGTH OF 2 METRES PER METER IS PROVIDED.	BOOLEAN
73.	INTERNAL NI-MH OR LI-ION OR NI CD MAINTENANCE FREE BATTERY OF LONG LIFE OF 10 YEARS WITH PUSH BUTTON ARRANGEMENT FOR ACTIVATION OF BATTERY OR EXTERNAL BATTERY WITH INDUCTIVE COUPLING ARRANGEMENT WITH INBUILT CHARGER IN THE RATIO OF 1 BATTERY PACK PER METER IS PROVIDED.	TEXT
74.	NON VOLATILE MEMORY (NVM) WITH MINIMUM RETENTION PERIOD OF 10 YEARS IS PROVIDED	BOOLEAN
75.	8 (EIGHT) TOD TIME ZONES FOR ENERGY AND DEMAND ARE PROVIDED	BOOLEAN
76.	PROVISION OF MAXIMUM DEMAND INTEGRATION PERIOD SETTING AT 15 MINUTE OR 30 MINUTE AS PER REQUIREMENT.	BOOLEAN
77.	PROVISION FOR AUTO RESET OF MD AT CERTAIN PREDEFINED PERIOD IS PROVIDED	BOOLEAN
78.	PROVISION TO RESET MD THROUGH HAND HELD TERMINAL (CMRI) CAPABLE OF COMMUNICATING WITH THE METER OR COMMUNICATION DRIVEN RESET IS PROVIDED	BOOLEAN
79.	PROVISION TO RESET MD THROUGH LOCAL PUSH BUTTON IS PROVIDED	BOOLEAN
80.	ALL ANTI TAMPER FEATURES ARE INCORPORATED IN METER AS PER SPECIFICATION	BOOLEAN

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81.	METER LOGS TAMPER EVENTS AS PER SPECIFICATION	BOOLEAN
82.	TAMPER DETAILS ARE STORED IN INTERNAL MEMORY & REGISTERED IN TAMPER EVENT REGISTER	BOOLEAN
83.	PERMANENT BACKLIT LIQUID CRYSTAL DISPLAY (LCD) OF 8 DIGITS (WITH +/- INDICATION) AND MINIMUM 8 MM HEIGHT AND WIDE VIEWING ANGLE IS PROVIDED	BOOLEAN
84.	AUTO DISPLAY CYCLING PUSH BUTTON WITH PERSISTENCE TIME OF 9 SECONDS IS PROVIDED	BOOLEAN
85.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) IS SUITABLE FOR TEMPERATURE WITHSTAND OF 70° C	BOOLEAN
86.	DISPLAY PARAMETERS AS PER SPECIFICATIONS	BOOLEAN
87.	IT IS POSSIBLE TO SCROLL THROUGH PARAMETERS (UP & DOWN) MANUALLY IN ALL THREE DISPLAY MODES.	BOOLEAN
88.	METER DISPLAY RETURNS TO AUTO SCROLLING DISPLAY MODE IF THE 'DISPLAY HOLD' IS INACTIVE & 'PUSH BUTTON' IS NOT OPERATED FOR 60 SECONDS.	BOOLEAN
89.	METER RETURNS TO AUTO SCROLLING MODE IF UNHOLD ACTIVATION IS NOT DONE FOR 30 MINUTES.	BOOLEAN
90.	HARMONICS ARE FILTERED OUT AND ENERGIES FOR FUNDAMENTAL FREQUENCY ARE ONLY MEASURED AND COMPUTED.	BOOLEAN
91.	SCALE MF IS ONE (1)	BOOLEAN
92.	MD INTEGRATION PERIOD OF 15 MINUTES WITH SUB INTEGRATION PERIOD OF 5 MINUTES WITH SLIDING WINDOW METHOD	BOOLEAN
93.	AVERAGE POWER FACTOR WITH 3 DECIMAL DIGITS FOR CURRENT BILLING PERIOD (SINCE LAST RESET)	BOOLEAN

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	IS CALCULATED AS RATIO OF KWH & KVAH SINCE LAST RESET FOR RESPECTIVE MODE.	
94.	INSTANTANEOUS PF IS CALCULATED AS RATIO OF INSTANTANEOUS KW AND KVA.	BOOLEAN
95.	BILLING PARAMETERS AS PER SPECIFICATION	BOOLEAN
96.	BILLING HISTORY DATA IS STORED IN METER MEMORY FOR LATEST 12 NO. OF RESETS AS WELL AS FOR THE INSTANT OF DATA RETRIEVAL.	BOOLEAN
97.	RESET TO RESET CONSUMPTION OF ENERGIES & MAXIMUM DEMANDS IS MADE AVAILABLE	BOOLEAN
98.	ABT BILLING DATA PARAMETERS ARE STORED IN NON VOLATILE MEMORY AUTOMATICALLY AS ABT DATA FOR A PERIOD OF 10 DAYS ON FIFO BASIS	BOOLEAN
99.	PROVISION FOR LOAD SURVEY DATA FOR EVERY 15 MINUTES AND FOR PREVIOUS 60 DAYS OR MORE FOR SPECIFIED PARAMETERS ON NON-TIME BASED BASIS ON FIRST IN FIRST OUT BASIS (FIFO)	BOOLEAN
100.	IT IS POSSIBLE TO RETRIEVE ABNORMAL EVENT DATA ALONG WITH ALL RELATED SNAP SHOTS DATA THROUGH METER OPTICAL PORT WITH CMRI OR LAPTOP COMPUTER OR REMOTE ACCESS THROUGH SUITABLE COMMUNICATION NETWORK & DOWNLOAD THE SAME TO THE BASE COMPUTER ON FIFO BASIS.	BOOLEAN
101.	METER KEEPS RECORDS FOR THE MINIMUM 360 (OCCURRENCE + RESTORATION) EVENTS EXCLUDING POWER OFF EVENTS ON FIFO BASIS.	BOOLEAN
102.	ALL THE COMPUTER SOFTWARE IS PROVIDED	BOOLEAN
103.	MAXIMUM DOWNLOADING TIME FOR COMPLETE DATA FROM CMRI TO PC IS NOT MORE THAN 5 MIN	BOOLEAN
104.	COMMUNICATION CABLE OF 2 METER LENGTH FOR DATA COMMUNICATION BETWEEN METER & CMRI / LAPTOP COMPUTERS AND BETWEEN METER & PC IS	BOOLEAN

TECHNICAL SPECIFICATION OF 3 PHASE 4 WIRE CT / PT OPERATED 1 AMP OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR QUADRANT TOD TRI - VECTOR ENERGY METER WITH AVAILABILITY BASED TARIFF (ABT) FEATURE

	PROVIDED.	
105.	1 CABLE OF 2 MTR LONG IS PROVIDED WITH USB TERMINATION	BOOLEAN
106.	METER IS CAPABLE TO COMMUNICATE DIRECTLY WITH LAPTOP COMPUTER.	BOOLEAN
107.	BASE COMPUTER SOFTWARE IS SUITABLE FOR ALL TYPES OF DOT MATRIX, INKJET & LASERJET PRINTERS	BOOLEAN
108.	MANUFACTURER AGREES TO PROVIDE & SHARE PROTOCOL USED IN METER FOR AMR WITH MSEDCL	BOOLEAN
109.	MANUFACTURER AGREES TO SUBMIT THE PROTOCOL FOR METERS SUPPLIED IN PAST & ENSURES THAT PROTOCOL CORRESPONDS TO THE TYPE OF METER SUPPLIED.	BOOLEAN
110.	METER PROTOCOL REPORT NOS. & DATES	TEXT
111.	MANUFACTURER AGREES TO PROVIDE API (BASED UPON MIOS STANDARD) WITH PROPER DOCUMENTATION & DEMONSTRATION FOR EXISTING METERS AS WELL AS TO BE SUPPLIED WITH THIS SPECIFICATION.	BOOLEAN
112.	PERMANENT NATURE METER CONNECTION DIAGRAM IS CLEARLY SHOWN ON INSIDE PORTION OF TERMINAL COVER WITH MARKING ON METER TERMINALS IN THE ABOVE DIAGRAM.	BOOLEAN
113.	METER HAS CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL & INDELIBLY & DISTINCTLY MARKED WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE WITH SIZE OF BAR CODED METER SERIAL NUMBER NOT LESS THAN 35X5 MM ALONGWITH NUMERIC NUMBER & ADDITIONAL REQUIREMENT AS PER SPECIFICATION.	BOOLEAN
114.	WHETHER METER IS TYPE TESTED	BOOLEAN

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115.	TYPE TEST REPORT NOS. & DATES	TEXT
116.	ALL ACCEPTANCE & ROUTINE TESTS, AS PER IS: 14697 / 1999 AMENDED UPTO DATE & THIS SPECIFICATION ARE CARRIED OUT ON METER	BOOLEAN
117.	TRANSPORTATION TEST IS CARRIED OUT	BOOLEAN
118.	ALL ACCEPTANCE TESTS FOR CONFIRMATION OF ABT FEATURE ARE CARRIED OUT.	BOOLEAN
119.	METER IS GUARANTEED FOR A PERIOD OF FIVE YEARS FROM THE DATE OF COMMISSIONING OR FIVE AND HALF YEAR FROM THE DATE OF DISPATCH WHICHEVER IS EARLIER.	BOOLEAN
120.	IN HOUSE TESTING FACILITY IS AVAILABLE FOR (A) A.C. VOLTAGE TEST	BOOLEAN
121.	(b) INSULATION RESISTANCE TEST	BOOLEAN
122.	(c) ACCURACY REQUIREMENT	BOOLEAN
123.	(d) TEST ON LIMITS OF ERRORS	BOOLEAN
124.	(e) TEST ON METER CONSTANT	BOOLEAN
125.	(f) TEST OF STARTING CONDITION	BOOLEAN
126.	(g) TEST OF NO-LOAD CONDITION	BOOLEAN
127.	(h) REPEATABILITY OF ERROR TEST	BOOLEAN
128.	(i) TEST OF POWER CONSUMPTION	BOOLEAN
129.	(j) VIBRATION TEST	BOOLEAN
130.	(k) SHOCK TEST	BOOLEAN
131.	(l) TAMPER CONDITIONS AS PER MSEDCL SPECIFICATION	BOOLEAN
132.	(m) FACILITY FOR ACCEPTANCE TESTS OF ABT FEATURES AS PER CLAUSE NO. 17.04 (d).	BOOLEAN

TECHNICAL SPECIFICATION OF 3 PHASE 4 WIRE CT / PT OPERATED 1 AMP OR 5 AMPS FULLY STATIC AMR COMPATIBLE FOUR QUADRANT TOD TRI - VECTOR ENERGY METER WITH AVAILABILITY BASED TARIFF (ABT) FEATURE

133.	(n) TRANSPORTATION TEST	BOOLEAN
134.	(o) GLOW WIRE TEST	BOOLEAN
135.	(p) LONG DURATION TEST	BOOLEAN
136.	(q) FLAMMABILITY TEST	BOOLEAN
137.	(r) MANUFACTURER HAS DULY CALIBRATED RSM OF CLASS 0.02 ACCURACY	BOOLEAN
138.	MANUFACTURING PROCESS, ASSEMBLY, TESTING & MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION	BOOLEAN
139.	MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION	BOOLEAN
140.	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	BOOLEAN
141.	QUALITY ASSURANCE PLAN AS PER SPECIFICATIONS IS ENCLOSED	BOOLEAN
142.	COMPONENT SPECIFICATION AS PER SPECIFICATION	BOOLEAN