

PURVANCHAL VIDYUT VITRAN NIGAM LTD., VARANASI

STANDARDS OF SINGLE PHASE & THREE
PHASE METER PROCURED IN PUVVNL,
VARANASI DURING LAST 5 YEARS

TECHNICAL SPECIFICATION FOR SINGLE PHASE TWO WIRE (10-60A) CLASS 1.0 ACCURACY ELECTRONIC ENERGY METERS ALONG WITH METER BOX

1.0 SCOPE:

This specification covers design, engineering, manufacture, assembly, stage testing, inspection and testing before supply and delivery at site/CIP destination (for Indian Bidders) and CIF Indian Port (for foreign Bidders) of Single Phase Two Wire solid state (static) Electronic KWh Energy Meters of accuracy Class 1.0 of current range 10-60A. The meter shall be supplied along with pilfer proof box as per the details given in this specification.

- 1.1 It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to the purchaser, who will interpret the meanings 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 this specification and/or the commercial order or not.

2.0 Standards

- 2.1 The Meters shall conform (for performance and testing thereof) in respects to the relevant Indian/International Standard Specifications with latest amendments thereto unless otherwise specifically mentioned in the specification.

Indian Standard No.	Title	International & Internationally Recognized Standard.
IS: 13779/1993	Specification for AC Static Watt-hour Meters Claus 1&2	IEC62052-11 & 62053-21
IS: 14772:2000	Specification for boxes for the enclosure of electrical accessories	
Reference is made to CBIP Technical Report No., 325 read with latest Amendments.	Specification for AC Static Electrical Energy Meters.	
Reference is also made to CBIP Technical Report No. 111 (Copy enclosed)	Specification for Common Meter Reading Instrument for optical Communication with meter.	
IS 15959	Data exchange for electricity meter, reading, tariff and load control – companion specification	

Equipment conforming to other internationally accepted standards, which ensure equal or higher quality than standards mentioned above would also be acceptable. In case the Bidders who wish to offer material conforming to the other standards, Salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Four copies of such standards with authentic English Translations shall be furnished along with the offer. In case of conflict the order of precedence shall be (i) CBIP Technical Report 88, (ii) IS, (iii) IEC, (iv) Other standards. In case of any difference between, provisions of these standards and provisions of this specification, the provisions contained in this specification shall prevail.

3. Service Conditions:

The meters to be supplied against this specification shall be required to operate satisfactorily and continuously under the following tropical conditions. Meters shall be capable of maintaining required accuracy under hot, tropical and dusty climate.

Location	At Various locations in the state of Uttar Pradesh
Max. Ambient air temperature (deg.C)	50
Max. Ambient temperature in a closed box (deg.C)	60
Max. Ambient air temperature in shade (deg.C)	45
Min ambient air temperature (deg.C)	(-) 5
Average daily ambient air temp. (deg.C)	40
Max. Relative Humidity (%)	95
Max. altitude above mean sea level (m)	2200
Average Annual Rainfall (mm)	1500
Isoceraunic level (days per year)	50
Seismic level (Horizontal accn.)	0.30 g.

Moderately hot and humid tropical climate, conducive to ruse and fungus growth.

4.0 Principal Parameters

4.1 The material shall conform to the following specific parameters.

Sl. No.	Item	Specification
1.	Type of installation	Outdoor in the box
2.	System Voltage	240V, +20% to -40% Phase to neutral
3.	System Frequency	50Hz \pm 5%
4.	No. of phases	Single phase two wire
5.	System of earthing	Solidly grounded

5.0 Technical Requirements:

5.1 Meters shall be rated as follows

(a) Voltage 240 V Phase to Neutral

(b) Current Basic current 10 A, Max. Current 60A

5.2 Supply System :

The meters should be suitable for use on 240 V (Phase to Neutral), single phase two wire systems.

5.3 Power Supply Variation

The extreme supply variation, which an operating meter should withstand without damage and without degradation of its metrological characteristics when it is subsequently operated under its operating conditions.

Voltage -40% to + 20%

Frequency \pm 5%

Power Factor Range Zero lag - Unity - Zero Lead*

However manufacturers can offer meters, which can withstand higher variations.

* The meter shall work over wide PF range and limit of errors with the variation of PF shall be as per IS 13779 with latest amendment thereof.

However, if phase to phase voltage (i.e., 415 volts) is applied for 15th minutes between phase and neutral of the meter, the meter should not get damaged and continue to record correctly within class 1.0 accuracy after restoration of normal supply.

5.4 **Accuracy**

Class of accuracy of the KWh meters shall be 1.0. The accuracy should not drift with time.

5.5 **Power Consumption:**

1- Voltage Circuit: The active and apparent power consumption in each voltage circuit including the power supply of meter of reference voltage, reference temperature and reference frequency shall not exceed 1.0 watts and 4 VA.

2- Current Circuit: The apparent power taken by Current circuit at basic current reference and reference temperature shall not exceed 1VA.

5.6 **Starting Current**

The meter should start registering the energy at 0.2% of basic current.

5.7 **Maximum Current**

The maximum current of the meters is 60A at which the meter support to meet the accuracy requirement. **However Meter should work at 150% of I_{max}.**

5.8 **Measuring Parameters**

(1) Real time and date

(2) Active energy KWh

(3) Maximum demand with date and time with 30 minutes integration period KW.

The meter should also have provision for automatic recording of cumulative KWh at 00.00 hours on the start day of the month for each calendar month and the same should go to memory.

Display of real date & time shall also be provided in auto scroll along with recording in memory.

Note : At the start of each sequence of display LED/LCD healthiness / anomaly shall be displayed.

5.9 **Display parameters & type of Display**

5.9.1 **Auto Scroll Display**

Meter shall be capable of displaying the following parameters. The display of various parameters shall be continuously scrolling after another. The display shall have " ON" time of at least 10 sec. for each measured values for auto display cycling.

1.0 Real time]or Date & Time

2.0 Date

3.0 Active Cumulative Forward Energy (KWh)

4.0 Max. Demand (KW) with 30 minutes integration of the current month with date & time

The display of various parameters shall be continuously scrolling one after another.

5.9.2 **Display Parameters (push button)**

In addition to the auto display mode parameters, the following parameters shall be displayed on pressing the push button as well as downloadable to the BCS through the CMRI.

I Meter serial number.

ii Active cumulative Energy Forwarded reading (KWH) for each calendar month for previous three months.

iii Maximum demand (KW) with 30 minutes integration period of the last three months.

Iv Inst. Voltage for p-n.

V Inst. Current.

Vi Inst. Load (KW).

Vii Billing period count.

Viii Instantaneous power factor.

ix Average P.F. current month.

x Cumulative power ON hours.

xi Cumulative tamper occurrence count.

Xii Tamper Data:

1. Present status of tamper:

a) Voltage related

b) Current related

c) Other tampers (Magnet. ND)

2. Date and time of last tamper occurrence with tamper identification

3. Date and time of last tamper restoration with tamper identification.

The meter shall have a minimum 6-digit backlit liquid crystal display (LCD) or light emission diode display (LED), with another digit for legend. The display of LCD/LED should be bright color. The minimum character height shall be minimum 8 mm. and KWh will be read minimum 6 complete digits as per IS:13779. The display shall be digital type with non-destructive read out. However recording in memory in decimal after six digits will continue.

Dot matrix display shall not be accepted. It shall be possible to display contents of relevant parameters tamper events with another digit displaying legend for identification. The meter should have non-volatile memory (**Read only i.e. one way communication**), so that the registered parameters will not be affected by loss of power. The non-volatile memory should have a minimum retention time of 12 years. It should be possible to retrieve the data from NVM in case meter is burnt/damaged. Battery backup memory will not be considered as NVM.

5.9.3 Meter reading display during power outage:

Provision to read the meter in no power condition shall be made. In case of power failure Auto mode shall not function. The same push button shall be used for displaying the Current KWh, Current month maximum demand KW, Average PF current Month & tamper count shall be displayed. But in any case rechargeable capacitor back up power shall not be used for display under Power off condition. No power shall be consumed from this circuit when mains are available. In case of power failure data downloading for Historical energy, maximum Demand & all the tamper events through CMRI (common meter reading instrument) shall be possible. **Battery life shall be 10 years. To verify that the sample meters are not having capacitor rechargeable battery, the samples will be kept in power off conditions for 48 Hrs and then meters will be checked by pressing the push button and the CMRI shall be done."**

5.9.4 CMRI/BCS REQUIREMENTS

The Common Meter Reading Instrument (CMRI) should be capable of being loaded with user friendly software (MS-DOS 5.0 or higher version compatible) for reading/downloading meter data. Windows based Base Computer Software (BCS) including MS Window 98, Window - 2003 XP, Window XP Professional VISTA or higher updated operating platform or higher operating system.

This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter reading data into user definable ASCII/ XML file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, 12 (Tweleve) Months history , 90 days Load survey & tamper events with snap shots should be convertible to user defined ASCII/ XML file format for integration with third party software. The vendor shall supply necessary base computer software for reading / viewing of meter data and converting to user defined ASCII/ XML files formats. The user shall have the flexibility to select the parameters to be converted into ASCII/ XML file. The vendor shall also supply the necessary CMRI software.

Meter reading through Common meter reading Instrument (CMRI) shall be possible for all make of meters for which CMRI software shall be supplied free of cost which when loaded in CMRI meter reading of the supplied make shall be possible. **"Bidder shall download software in CMRI available during samples testing to prove that their software is compatible with Common meter reading Instrument (CMRI)."**

5.9.5 COMMUNICATION PORT

"Meter CMRI port should essentially be placed at the front side of meter box."

The meter should have a galvanically isolated optical communication port for data communication with CMRI. The port shall be compatible with IEC 1107/ PACT/ ANSI. The meter shall have optical port which should be capable of being hooked to a remote metering device such as modem, etc. for future to enable Automatic meter reading. The Optical Port shall be insensitive to cable orientation for electronic reading **"Refer previous of tenders of PuVVNL discom for LT-TVM and HT-TVM with compliance of DLMS is 15959 and data downloading time mentioned 5-6 minutes with all parameters in specification. In the Single Phase meter, parameters are less hence 3 minutes is adequate time but billing data within one minute. Bidder shall prove communication with all type of available Modems with their meter in front of samples Testing team."** The bidder shall provide meters as per DLMS compliance i.e. meters with open protocol as per IS: 15959 Category "C" for consumer metering.

5.9.6 Self Diagnostic Features :

The meter shall be capable of performing self diagnostic check to monitor integrity of data memory location at all time. The meter shall have indication for unsatisfactory/ non functioning/ malfunctioning of following.

- (i) All display segments on meter display.
- (ii) Real time clock (RTC) status in meter reading print out at B.C.S. (Base Computer Software) end.
- (iii) Non-Volatile Memory (NVM) Status in meter reading print out BCS end.

5.10 Maximum Demand Registration and MD Resets:

Meter shall continuously monitor and calculate the average maximum demand for each demand interval time of 30 minutes and maximum of these in a calendar month shall be stored along with date and time when it occurred. The maximum demand shall automatically reset at 24.00 hrs. or the last date of each calendar month for which minimum 30 years calendar shall be programmed by the manufacturer.

The integration period shall be set as 30 minutes, on real-time basis.

The billing purpose parameters (active forwarded energy, maximum demand in kW) shall be registered and shall be available for a minimum period of last 12 (Twelve) months through BCS .

5.11 General Requirement

Meters shall be designed and constructed in such a way as to avoid introducing any danger in use and under normal conditions, so as to ensure specially.

- (1) Personnel safety against electric shock
- (2) Personnel safety against effects of excessive temperature.
- (3) Protection against spread of fire.
- (4) Protection against penetration of solid objects, dust and water.
- (5) Anti power saver device be provided.

5.11.1 All the materials used in the manufacture of meters shall be of highest quality. The entire design and construction shall be capable of with standing stresses likely to occur in actual service and rough handling during transportation.

5.11.2 All insulating materials used in the construction of meters shall be non hygroscopic, non aging and of tested quality. The meter shall be designed on Application Specific Integrated Circuit and shall be manufactured using SMT (Surface Mount Technology) components.

5.11.3 The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They should not be ignited by thermic over load of live part in contact with them. Temperature profile in load survey requirement is optional..

5.11.4 The meter shall conform to the degree of protection IS 54 as per IS : 12063 against of dust, moisture and vermin;is.

5.11.5 In case meter gets damaged /burnt the last reading must remain in memory of the meter. If only LCD is damaged, it should be possible to down load the reading through MRI on site or lab. In case meter gets damaged /burnt the last reading must remain in memory of the meter.

5.11.6 The meter shall be supplied with a transparent extended terminal block cover (ETBC).

5.11.7 The meter-base, meter case shall be high Grade UV stabilized Polycarbonate , terminal block and ETBC shall be made of unbreakable, high grade, fire resistant, reinforced, non-flammable, polycarbonate or equivalent high grade engineering plastic.

5.11.8 The meter case shall have one window if it is not fully transparent. The window shall be of transparent, high grade UV stabilized engineering plastic for easy reading of all the displayed values/parameters, and observation of operation indicator. The window shall be welded with the meter cover such that it cannot be removed undamaged without breaking the meter cover seals.

5.11.9 The terminal block shall be made of high grade non-hygroscopic, fire retardant, low tracking, fire resistant, reinforced poly-carbonate or equivalent high grade engineering plastic with terminal holes of minimum dia 8.5 mm and shall be suitable to accommodate the insulation of the conductors, Terminal should be as per requirement of IS-13779. Terminal should be suitable for carrying 60A continuously without damaging the terminals/terminal block. In each terminal there should be at least two screw for secure connection of the conductor. **Terminal block should be fixed with meter body in such a manner that it becomes integral part of the body & in no manner it can be detached from meter body.**

5.11.10 The manner of fixing the conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several

times during the life of the meter shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material. The clearance and creepage distance shall conform to relevant clause of IS 13779:1999/CBIP technical report No.88.

5.11.11 The meter shall be compact in design. The entire construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.

5.11.12 The meter shall have minimum 2 fixing holes, one at top and others at bottom. All the holes shall be such that the holding screw is not accessible to the consumer after fixing the meters. The lower fixing screws shall be provided under the sealed terminal cover.

5.12 Constructional Requirements:

5.12.1 Meter Case and sealing arrangement:

The meter shall have a transparent/ opaque case UV stabilized case made of unbreakable high, fire resistant, polycarbonate with sealed/ snap fit arrangement or break to open feature in such a way that the internal parts of the meter are accessible only after breaking the Meter case. The meter will have transparent/ opaque base & cover or a single molded enclosure with encapsulated design. Meter cover should be physically jointed by ultra sonic welding in such a way that meter cover cannot be opened without breaking. Welding is not applicable for single molded enclosure. In case of breaking of meter cover/case, the cover open tamper will be logged with date & time & cover open or suitable abbreviation would be displayed in other tamper status display. The Meter case shall have two mounting holes. One on top side of meter & other on bottom side beneath the terminal block cover.

5.12.2 Terminal Arrangements

Connecting terminal shall be in the following sequence:-

1. Phase (in) 2. Neutral (in) 3. Neutral (out) 4. Phase (out)

The terminals shall be marked properly on terminal block for giving external connections. A diagram of connections should be provided inside the cover of terminal block. The terminal cover shall be extended such that when it is placed in position it is not possible to approach the connections or connecting wires. The terminals and the screws shall be suitable to carry up to 150% of I_{max} for maximum safety. The terminal shall have a suitable construction with barriers and covers to provide secure and safe connections. The alignment of incoming cable terminals on meter terminal block should be such that it is not directly in-line with the cable hole/gland on the meter box body, so that there is no chance of inserting any wire/cable from the gland hole directly to the incoming terminal on the TB to avoid probability of theft by making direct connection.

5.12.3 Connections diagram

The connection diagram of the meter shall be clearly shown on the name plate and shall be of permanent nature. Alternatively, connection diagram can permanently engraved near the terminal block on the base of the ETBC. In case of any special precautions need to be taken at the time of testing the meter, the same may be indicated along with the circuit diagram.

5.12.4 Output Device

The meter shall have a test output accessible from the front. The meter shall be provided with flashing LED to represent the pulse output for testing the meter as described in CBIP Technical Report No. 88 clause 4.2.2.10.

5.12.5 TIME OF USE MONITORING

The meter shall offer the capability of time of use monitoring for energy. Minimum 2 registers shall be capable of being configured for TOD monitoring for Peak/Off peak hours.

- a) 17.00 to 18.00 Hrs.
- b) 18.00 to 22.00 Hrs.
- c) 22.00 to 23.00 Hrs.
- d) 23.00 to 05.00 Hrs.
- e) 05.00 to 06.00 Hrs.
- f) 06.00 to 08.00 Hrs.
- g) 08.00 to 11.00 Hrs.
- h) 11.00 to 17.00 Hrs

5.12.6 LOAD PROFILE RECORDING

The meter shall be capable of monitoring and recording load profile information for KW demand for every 30 minutes interval for at least 90 days duration.

5.13 Tamper and fraud protection

The meter should have features to prevent/detect common ways of tamper and fraud.

(1) Reversal of line and load terminals.

Even on interchanging the load and line wires the meter shall register accurate energy.

(2) Interchanging of phase and neutral wires.

Even on interchanging the phase and neutral wires the meter shall register accurate energy.

(3) Drawing of current through local earth.

The meter shall register accurate energy even if the load is not terminated back to the meter and instead current is drawn partially or fully through a local earth irrespective of the phase and neutral connections to the meter. The earth indication in the form of LCD display.

(4) Drawing of load by disconnecting Neutral of meter & outgoing Earth:

When neutral is disconnected from both load side and supply side, the meter should record energy as per rated parameters. However, meter shall start registering energy at a current of 1.0 Amps under these tamper conditions.

Common CT technology can be used also as alternate technology to battery technology. However, meter shall start registering energy at a current of 1.0 Amps maximum under tamper condition of neutral missing.

(5) Influence of external High Magnetic Field

The meter shall be capable of recording the following tamper events in memory (minimum 5 each) with date and time stamp along with snapshots of V,I, PF and Kwh implementation as per IS 15959.

-Current reversal

-Magnetic influence in case meter is affected.

-Neutral Disturbance in case meter is affected.

-Neutral missing or single wire

The meter shall also have the capability of functioning even when only single wire is connected (even when neutral wire is removed from both the meter terminals).

(6) Meter Body Opening :

The meter shall also have provision for detection and logging of opening of meter cover. Meter must detect / log with date and time meter body opening tamper, body opening tamper must also be logged in absence of power supply.

(7) D.C. Immunity

The meter should not saturate on passing of direct current, which can cause the meter either to stop recording or record inaccurately as per IS 13779. This test shall be carried in both phase and neutral, Meter shall record accurately within IS-13779 prescribed limits.

(8) The meter shall offer a link less design such that there is no isolation link provided between the current and voltage circuit and hence there is no possibility of tampering with the same.

(9) Application of abnormal voltage/frequency :

The accuracy of the meter should not be affected with the application of chopped signals/DC signals and harmonics, abnormal voltage/frequency such as spark discharge of approximately 35 KV in any of the following manner for 10 minutes : -

- i) On any of the phase or neutral terminals.
- ii) On any connecting wires of the meters.

- iii) Voltage Discharge with 0-10 mm spark gap.
- iv) At any place in load circuit.
- v) Spark on meter body.

Meter can also log the same as tamper event, if effected, with date and time stamping.

(10) Neutral tampering

The meter shall record energy proportional to the current and 240 V when any of the tamper circuits enclosed as annexure are used to tamper energy using a diode or a variable resistance or a variable capacitance energy saving device.

“The measurement by meter shall not get influenced by injection of AC Voltages/ Chopped signal/DC signal/ DC pulse of low frequency and harmonics. The meter should be immured to such Neutral Disturbance. In case the meter accuracy is disturbed under Neutral Disturbance, it should be able to log the event and record energy” and it should start energy recording at reference voltage, at UPF at actual load current

(11) Meter should not get affected and record energy if any kind of tampering is done as per the circuit diagrams mentioned in specification,

- **If the meter display is switched off during single wire operation, the meter should be able to record energy at reference voltage and measured current.**
- **Voltage variation test as per IS 13779 Table 17 (i) is to check errors are in limits when voltage is dipped and Ib (basic current) is flowing through meter**

In case any tamper circuit causes interruption in the power supply of the meter and the metering is constantly disturbed, the meter should be able to log it as an tamper event and deficiency metering will record. Every time the interruption occurs, the progressive energy should be updated on the display.

5.14 Sealing of Meter :

Provisions for proper sealing arrangement should be made on meter to make it tamper proof and avoid mishandling by unauthorized persons. Provision of minimum one seals shall be made.

Provision for all the seals should be made only on front side of the meter body.

The meter shall be permanently affixed to the ETBC base before supply.

5.15 Name Plate Marking:

The nameplate shall be clearly marked/etched/embossed as per clause 7 of IS-13779/1993.

The nameplate shall indicate supplier/purchaser's name, purchase order number & date, month and year of manufacture. The nameplate shall preferably be provided within the meter or in such a manner that it is not exposed to the open and is secured against removal.

5.16 Environmental Aspects:

Meter shall be designed and constructed to be capable of withstanding all severe stresses, vibrations and dusty environments likely to be encountered in actual practice, as the meter will be installed outdoor in boxes. The bidder may indicate special precautions required, if any for such installation.

6.0 Test

6.1 Type Tests

6.1.1 Meter

The Energy Meters offered shall be fully type tested at independent test laboratories by the bidder as per the relevant standards but test reports shall not be more than three(3) year old . The bidder shall furnish type test reports along with the bid. Bid without type test reports shall be treated as non-responsive.

Acceptance Tests.

All acceptance tests as stipulated in the relevant standards shall be carried out by the supplier in the presence of purchaser's representative.

Also the following additional tests shall be carried out on meters from each lot offered for inspection as per CBIP Technical Report 88 on randomly selected samples.

- (i) Magnetic Induction of external origin (AC & DC)
- (ii) Tamper & Fraud Protection as per clause 5.14 of section VII.

Routine Tests :

All routine tests as stipulated in the relevant standards shall be carried out and in addition, tamper and fraud protection tests as per clause 5.13 shall be carried out and routine tests certificates shall be submitted for approval of purchaser.

Test Laboratories :

- (i) National Physical Laboratory (NPL), New Delhi.
- (ii) E.R.T.L. (N), New Delhi.
- (iii) E.R.T.L.(W), Mumbai
- (iv) E.R.T.L. (E), Kolkata
- (v) E.R.T.L. (S), Thiruvananthapuram
- (vi) YMPL, Udaipur
- (vii) Electrical Research and Development Association (ERDA), Vadodara
- (viii) CPRI, BANGLORE/Bhopal

Tests to be conducted:

- (i) Starting Condition Test.
- (ii) Power Consumption Test
- (iii) Repeatability of error test
- (iv) Accuracy Requirements
- (v) Voltage Variation Test (-40% to +20%)
- (vi) Tamper & Fraud Protection Test : Test to prove compliance to clause 5.13.
- (vii) D.C. Immunity Test
- (viii) Test on display parameters (Auto scroll & Push button)
- (ix) Influence of high magnetic field as per CBIP-325 as per relevant clause.

6.2 TECHNICAL SPECIFICATION OF PILFER PROOF METER BOX TO HOUSE SINGLE PHASE ENERGY METER (PUSH TO FIT TYPE)

1. SCOPE:

The fully transparent meter box shall be intended to house one number single-phase electronic energy meter. The meter box complies with IS: 14772:2000 with latest amendment.

2. MATERIAL:

The meter box shall be made of Transparent Polycarbonate material (TPM) which complies following properties:

Meter box shall be weather proof, capable to withstanding temperatures of boiling water for 5 minutes continuously without distortion or softening. It shall withstanding Glow wire test at 650°C as per IS :14772. HDT of Polycarbonate material shall be minimum 120° C (at 1.8 MPa ° C),

3. CONSTRUCTION:

The meter Box shall have roof tapering down to both the sides for easy flow of rainwater. The thickness of the box shall be minimum 2.0 mm on all sides.

The cover should be fitted with base by non-detachable push fit, self locking type arrangement it should have knobs/anchors provided with the cover so that if shut/press fitted once inside the arrangement in the main body of the base, it becomes the part of the box and can not be detached from the base without breakage.

The cover shall rest on the base of box in such a way that any access from outside to the meter is not possible. The cover in closed position should be overlapped on collar of base such that direct entry of screw driver or tool is not possible.

The top cover when opened after installation must have visible cracks/damages to make visible that the meter box has been forcibly opened up.

Minimum one snap Lock fitting arrangements must be made on each side of box. The snap fit arrangement should have adequate barriers (Except for cable entry side) around the sealing arrangement such that any attempt to reach the sealing arrangement is not possible.

There shall be no hinges in the box cover.

Meter Box should be comply with IP - 54. Type test report shall be enclosed along with offer.

All metallic parts would be well protected against corrosion.

Push button arrangement shall be required on the cover of the box to operate the meter display push button from outside the meter box to read the meter display parameters without opening the meter box cover.

The provision for connecting optical probe for meter communication through meter reading instrument without opening the box seal shall be provided. There should be provision of providing meter serial number sticker on box cover and base from inside or **serial number printed / marked on the cover and base of the Meter Box.**

Colour: The front cover of meter box shall be transparent so that connections are visible from outside of the meter box.

Box Mounting: Box shall have minimum 3 nos. holes of 6 mm diameter for fixing the meter box on wall / SMC board.

Cable Entry: Suitable provision for is made available at the bottom side of the meter box bottom for cable inlet & outlet and the same shall be capable of accommodating cable of 16 mm diameter, engineering plastic cable gland shall be provided.

Name plate:

Printed metallic/ laser marked/ engraved/embossed Name plate shall have details of Purchase order No. & Date which shall be embossed/ engraved on the meter box cover.

2. GUARANTEED TECHNICAL PARTICULARS:

The guaranteed technical particulars as detailed in the specification will be guaranteed and a statement of guaranteed technical particulars will be furnished in the format along with the bid.

3. TESTS FOR BOXES:

The following tests are to be conducted on the box at any independent NABL accredited laboratory and test reports shall be submitted within 15 days from the date of order.

- i) Test of material identification
- ii) Test for mechanical strength
- iii) Test for water absorption
- iv) Test for stability at high temperature
- v) Test for withstanding temperature boiling water for 5 minutes continuously for non-distortion or softening of material
- vi) Glow wire test at 650 °C as per IS : 14772

4. ACCEPTANCE TEST

- i. Physical verification of dimensions of the box.
- ii. Compatibility of the box for housing the single phase meter, and ensuring ease of connecting and reading the meter.

5. ROUTINE TEST

The routine test certificates for the following will be furnished for approval of the purchaser.

- i. Physical verification of dimensions of the box.
- ii. Compatibility of the box for housing the meter, and ensuring ease of connecting and reading the meter.

6. INSPECTION :

The inspection shall be carried out by the purchaser's representative during manufacture and before dispatch. The supplier shall keep the purchaser informed in advance, about the manufacturing programme so that arrangement can be made for inspection.

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 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 test. Material shall be dispatched only after getting the dispatch authorization from inspectors representing purchaser, after successful testing.

The Bidder shall afford the inspectors representing the purchaser all facilities without charge, to satisfy him that the equipment is being furnished in accordance with this specification during stage inspection and final inspection.

7.0 Quality Assurance Plan :

7.1 The Bidder shall invariable 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, name 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. List 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. Lists of testing equipment available with the bidder for final testing of equipment specified and test plant limitation. If any, vis-a vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified test requirements.

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

7.3 The Contractor shall operate systems, which implement the following.

i. Hold Point : A stage in the material procurement or workmanship process beyond which work shall no proceed without the document approval of designated individuals or organizations. The purchaser's written approval is required to authorize 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 proceed.

7.4 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 requirements of this specification are followed by the sub-contractors. The Quality Assurance Program of the contractor shall consist of the quality systems and quality plans with the following details.

i. Quality System :

The structure of the organization.

The duties and responsibilities assigned to staff ensuring quality of work.

The system for purchasing, taken delivery and verification of materials.

The system of 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 requirement. 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 program sequence.

The structure of the contractors 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.

8.0 Documentation

8.1 All drawings shall conform to International Standards Organization (ISO) 'A' Series of drawings sheet/ Indian standards Specifications IS :656. All drawings shall be in ink and suitable for microfilming. All dimensions and data shall be in S.I. Units.

8.2 List of drawings and documents:

The bidder shall furnish the following along with bid.

i. Two sets of drawings showing clearly the general arrangements, fitting details, electrical connections etc.

ii. Technical leaflets (user manual) giving operation instructions.

iii. Three copies of dimensional drawings of the box for each quoted item.

8.3 The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the supplier's risk.

8.4 Approval of drawings/work by purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revision of application standards, rules and codes or practices. The equipment shall conform in all respects to high standards of engineering, design workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or materials which in his judgment is not in full accordance therewith.

8.5 The successful Bidder shall within 2 weeks of placement of order, submit three sets of final versions of all the drawings as stipulated in the purchase order for purchaser's approval. The purchaser shall communicate his comments/ approval on the drawings to the supplier within two weeks. The supplier shall, if necessary, modify the drawings and resubmit three copies of the modified drawings for their approval. The supplier shall within two weeks, submit 30 prints and two good quality report copies of the approved drawings for purchaser's use.

8.6 Eight sets of operating manuals/ technical leaflets shall be supplied to each consignee for the first instance of supply.

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

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

9. Packing & Forwarding :

9.1 The equipment shall be packed in suitable for vertical/ horizontal transport as the case may be and suitable to withstand handling 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. Any material found short inside the packing cases shall be supplied immediately by supplier without any extra cost.

9.2 Each consignment shall be accompanied with a detailed packing list containing the following information.

a. Name of the consignment.

b. Details of consignment.

c. Destination.

d. Total weight of consignment.

e. Handling and packing instructions.

f. Bill of Material indicating contents of each package.

9.3 The supplier shall ensure that the packing list and bill of material are approved by the purchaser before dispatch.

9.4 The packing shall be done as per the manufacturer's standard practice; however, he should ensure the packing is such that the material should not get damaged during transit by Rail/Road.

10. Delivery Schedule

The delivery schedule as per the contract.

11. Mandatory Spares & Tools :

The bidder shall give the list for items and shall keep a reasonable stock of the same, during the warranty period.

12. Samples to be supplied by the supplier :

Three nos sample meter of Single phase 10-60 Amp energy meter with one nos. Meter Box alongwith type test report must be submitted within 15 days from the date of opening of tender Part-I.

Sample meters of the firms meeting pre qualifying condition of the tender, shall be tested at any of the Government Lab, as per technical specification and relevant IEC/IS. However right to have meter tested at any Test lab of DISCOM/UPPCL is reserved with purchaser. Date of testing will be informed to the successful bidders. Engineer of the bidder shall come with BCS and CMRI so that tamper information with date & time, load survey and meter readings could be downloaded by CMRI and printout could be taken to verify the internal features also. Part-II will be opened for only those successful bidders whose sample meters will pass in testing as per specification.

Date of testing will be informed to all bidders. Engineer of the bidder shall come with BCS and CMRI so that tamper information with date & time, load survey and meter readings could be downloaded by CMRI and printout could be taken to verify the internal features also.

However place of sample testing will be at the discretion of UPPCL/Discoms.

Part-2 (Price) shall be opened only of those suppliers whose Meter sample are found in order.

13 Guarantee.

Manufacturer shall undertake a guarantee to replace the meters & boxes up to a period of **66 months from the date of supply & 60 months from the date of commissioning**, which are found defective/inoperative at the time of installation, or become inoperative/ effective within guarantee period. These defective/ inoperative meters shall be replaced within one month of receipt of report for such defective/inoperative meters.

14 All the bidder should submit the list of components along with manufacturers name used in meter manufacturing to check the quality and reliability of the meters. Documentary proof supporting above claim is mandatory.

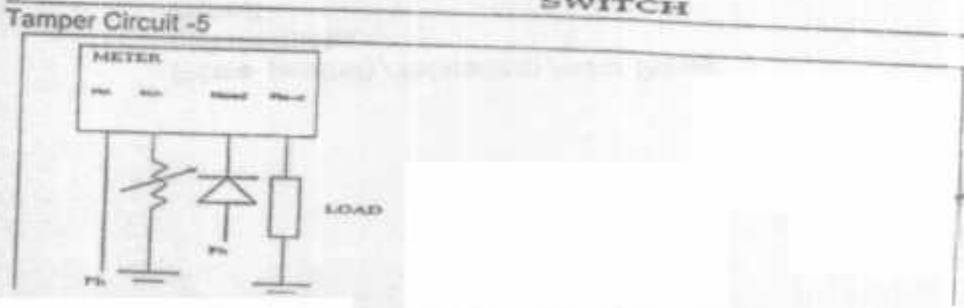
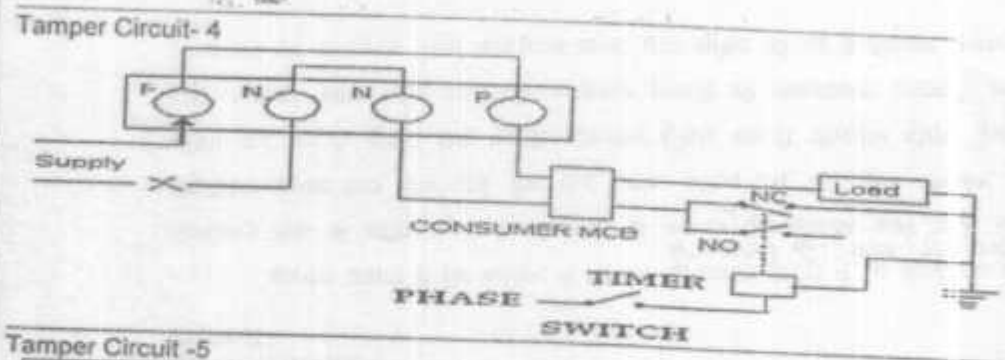
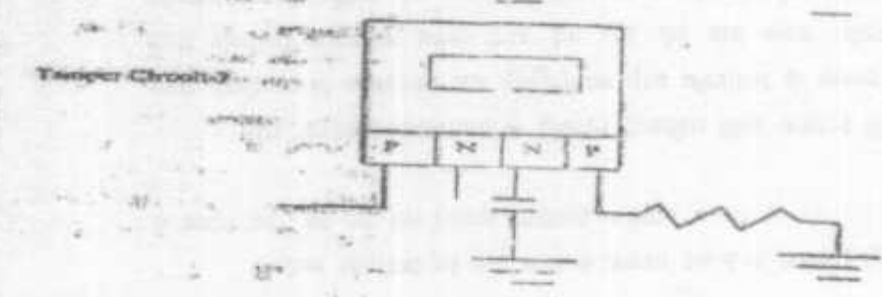
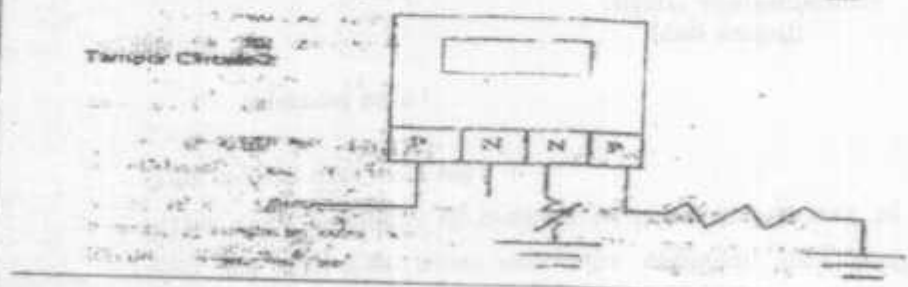
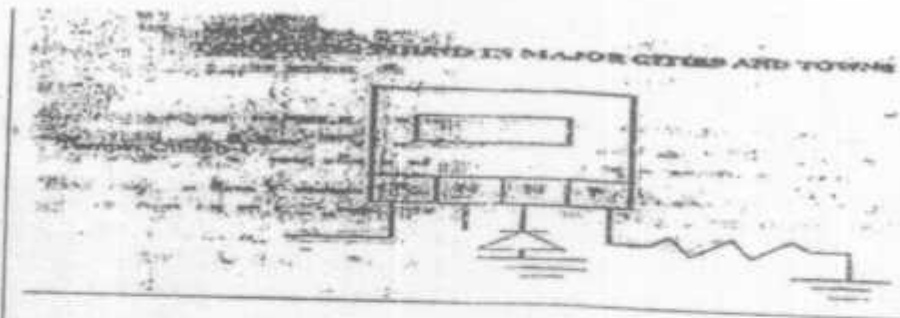
15 General :

- a. Principle of operation of the meter outlining the methods and stages of computation of various parameters starting from input voltage and current signals including the sampling rate if applicable shall be furnished by the bidder.
- b. The bidder shall indicate the method adopted to transform the voltage and current to the desired low values with explanation on devices used such as CT, VT or Potential divider as to how they can be considered superior in maintaining ratio and phase angle for variation of influence quantities during period.
- c. Details of testing facilities.
The manufacturers laboratory 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). The details of testing facilities available for conduction (a) The routine tests and (b) Acceptance tests shall be furnished in a statement. Bids without these details will be treated as Non-responsive. Facilities available if any for conducting type tests may also be furnished.
- d. The bidder shall furnished details of memory used in the meter.

16. Annexure- A & B

Five tamper circuits given for testing in Anx. A and Two tamper circuit given for testing in Anx. B.

However bidder should give their logic also for each tamper circuit.



MODIFIED DRAWING AND DETAILS OF ADDITIONAL 2 NOS TEST

ANNEXURE-B

Test No-1

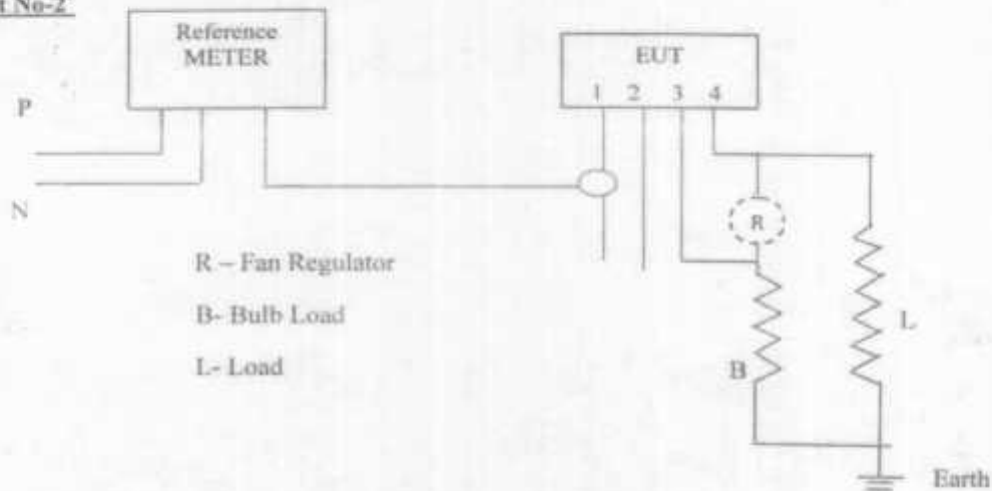
DC components and even harmonics in current circuit

Test procedure as per IS 13779 with additional requirement as below-

Accuracy of the meter shall also be verified at current $5/\sqrt{2}A$, $10/\sqrt{2}A$, $15/\sqrt{2}A$ and $I_{max}/\sqrt{2}A$

Accuracy of meter shall remain within limit given in IS13779,1999

Test No-2



Voltage to meter terminals 1 and 2 and to the reference standard will be fed from same main power supply.

Current in the meter under tests shall be measured in reference standard through clamp-on CT of reference standard.

Current in the load L can be between 5 to 10 A. Resistance of regulator shall be varied from minimum to maximum to vary resultant voltage between terminal 3 and 4. % error at different voltage obtained with the above method shall be reported along with the corresponding voltage between terminal 3 and 4 of the meter and the current in phase ie. Terminal 1 of the meter.

Test shall preferably be carried out at 240 volt measured at p-n of reference standard. If test is carried out at voltage other than 240 V, the % error shall be corrected accordingly.

TECHNICAL SPECIFICATION FOR 3 PHASE, 4 WIRE A.C. STATIC (10-60 Amps) DIRECT CURRENT CLASS 1.0 ELECTRONIC ENERGY METER ALONG WITH METER BOX

1. SCOPE:

I) This specification covers the design, manufacture, assembly, inspection, testing at manufacturers works before dispatch, supply and delivery at site/FOR destination anywhere in " state" of Class 1.0 accuracy static whole current electronic meter of current range 10-60 Amps for tariff purpose along with other associated equipment as per requirement given in this specification.

The meter should be 3 phase 4 wire type suitable for connection to LT 3 x 240V, 3 phase 4 wire systems. The meter shall be suitable for balanced as well as unbalanced load at all power factors i.e. Zero lag-Unity –Zero lead. The meter should be capable to record and display kWh, KVAh and maximum demand in kW& KVA for 3 phase 4 wire AC balanced/unbalanced loads for a power factor range of zero (lagging), unity and zero (leading) as per requirement given in this specification.

II) It is not the intent to specify completely herein all the details of the design and construction of material. The material shall, however, conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing for continuous commercial operation in a manner acceptable to the purchaser, who will interpret the meanings 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 materials shall be complete with all accessories, hardware, software and 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 this specification and/or the commercial order or not.

2. STANDARDS APPLICABLE:

Unless otherwise specified elsewhere in this specification, the performance and testing of the meters shall conform to the following Indian/International Standards and all related Indian/International standards to be read with upto-date and latest amendments/revisions thereof:

Sr. No.	Standard No.	Title
1.	IS 13779/ 1999	Specification of AC Static Watt hour meters, class 1.0 & 2.0.
2.	IS : 9000	Basic Environmental Testing Procedures for Electronic & Electrical items.
3.	IS 12346 (1999)	Specification for testing procedure for electrical and electronic items.

4.	IS 11000 (1984)	Fire hazard testing
5.	IEC 62052-11 (2003)	Electricity Requirements (AC) General Requirements Test and Test conditions for A.C. Static Watt hour meter for active energy Class 1.0
6.	IEC 62053-21 (2003)	A.C. Static Watt hour meter for active energy Class 1.0 and 2.0
7.	IEC 60068	Environmental testing
8.	CBIP Technical Report no. 111	Specification for Common Meter Reading Instrument.
9.	IEC 61036-1996	Specification for AC static Watt-hour Meters, Class 1 & 2.
10.	CBIP Technical Report No. 304 & any amendment thereof.	Specification for AC Static Electrical Energy Meters.
11.	CEA Regulation (2006)	Installation and Operation of meters Dtd: 17/03/2006
12.	IS: 14772/2000:	General requirement for enclosures for accessories for household and similar fixed electrical installation specification.
13.	IS: 15707(2006):	Testing evaluation installation and maintenance of AC electricity meter code of practice.
14.	IS 15959	Data exchange for electricity meter, reading, tariff and load control – companion specification

Meter matching with requirements of other national or international standards which ensure equal or better performance than the standards mentioned above shall also be considered. When the equipment offered by the tenderer conforms to standards other than those specified above, salient points of difference between standards adopted and the standards specified in this specification shall be clearly brought out in the relevant schedule.

3. CLIMATIC CONDITIONS:

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions. Meters shall be capable of maintaining required accuracy under hot, tropical and dusty climate.

a)	Maximum ambient air temperature in shade.	50 Deg. C
b)	Minimum ambient temperature	(-) 5 Deg. C
c)	Maximum relative humidity	95%
d)	Minimum relative humidity	10%
e)	Height above mean sea level	Up to 1000 meters.
f)	Dust storms likely to occur	March to July.
g)	Average number of thunder storm days per annum	50
h)	Average number of tropical monsoon(conditions) per annum	4 months
i)	Average annual rain fall	10 cms to 100 cms.

k)	Seismic level(Horizontal accn)	0.30g
l)	Isoceraunic level (days per year)	40
m)	Average No. of rainy days per annum	60
n)	Maximum Annual Rainfall	750mm
o)	Rainy Months	June to Oct.
p)	Altitude above MSL not exceeding	300 meters
q)	Wind Pressure	126 kg/sq m

The temperature range and relative humidity for performance of meters shall be as per relevant standards.

4. SUPPLY SYSTEM:

Rated voltage (Vref)	3 x 240 V - Phase to Neutral (3 phase 4 wire system) 3 x 415 V - Phase to Phase
Rated current (Ib) (connected through CT)	Basic current 10A (Ib), Maximum current-60 Amps (Imax.)

5. POWER FACTOR RANGE:

The meter shall be suitable for full power factor range from zero (lagging) through unity to zero (leading).

6. POWER SUPPLY VARIATION:

The meter should be suitable for working with following supply system variations:-

Specified operating range	0.8 to 1.1 V ref.
Limit range of operation	0.6 to 1.2 V ref.
Frequency	47.5 Hz to 52.5 Hz (Reference frequency 50)

7. ACCURACY:

Class of accuracy of the meter shall be 1.0. within limit range 0.6 to 1.2 V ref.

8. POWER CONSUMPTION:

8.1. Voltage Circuit: The active and apparent power consumption in each voltage circuit including the power supply of meter at reference voltage, reference temperature and reference frequency shall not exceed 1Watt per phase and 4 VA per phase respectively.

8.2. Current Circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature shall not exceed 1 VA per phase.

9. STARTING CURRENT:

The meter should start registering the energy at 0.2% of Ib and unity power factor in all the 3 Phases.

10. MAXIMUM CURRENT:

The rated maximum current for the meter shall be 60 Amps (600 % Ib) at which the meter purports to meet the accuracy requirement.

11. GENERAL AND CONSTRUCTIONAL REQUIREMENTS:

- 11.1. Meters shall be designed and constructed in such way so as to avoid causing any danger during use and under normal conditions. However, the following should be ensured.
 - 11.1.1. Personal safety against electric shock
 - 11.1.2. Personal safety against effects of excessive temperature
 - 11.1.3. Protection against spread of fire
 - 11.1.4. Protection against penetration of solid objects, dust and water
- 11.2. All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.
- 11.3. The meters shall be designed with application specific integrated circuit and shall be manufactured using SMT (Surface Mount Technology) components. Power supply and voltage divider circuits may be of PTH technology.
- 11.4. All insulating material used in the construction of meters shall be non-hygroscopic, non-ageing and of tested quality. All parts that are likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.
- 11.5. The meter shall have an operation indication device such as a blinking LED. The operation indicator shall be visible from the front window and capable of being monitored conveniently with suitable testing equipment.
- 11.6. The meter shall conform to the degree of protection IP 51 of IS:12063/IEC:529 for protection against ingress of dust, moisture and vermin.
- 11.7. The meter shall be supplied with a transparent extended terminal block cover (ETBC) with proper sealing arrangement.
- 11.8. The meter shall have seamless ultrasonically welded insulated body, along with unidirectional screws and wall mounted projected type to be fitted with the help of screws.
- 11.9. The meter-base, meter cover, terminal block and ETBC shall be made of unbreakable, high grade, fire resistant, reinforced, non-flammable, polycarbonate or equivalent high grade and good quality engineering plastic.
- 11.10. **NAME PLATE MARKING:**

Every meter shall be provided with a name-plate which shall be clearly marked/embossed as per clause-7 of IS:13779/1999 and . IS:15959. The name plate shall have following markings which shall be indelible, distinct and readable from outside the meter:—

 - (a) Purchase name, Purchase order No. and date with inscriptions or "PROPERTY OF PuVVNL".
 - (b) Manufacturers name, Trade mark and place of manufacturer.

- (c) Designed of type.
- (d) Nature of current and no. of phases and no. of wires for which meter is suitable for.
- (e) The manufacturer's serial no., year of manufactures and warrantee period.
- (f) Reference voltage
- (g) Reference current
- (h) Meter constant (if any)
- (i) Class of accuracy
- (j) Reference temperature
- (k) Transformation ratios of instrument transformers (s) of which account is taken for meter constant.

(l) Bar code

Bar code as per 128 C format shall be provided on the plate inside meter glass. Meter serial number to be written in barcode.

- 11.11. The terminal block, the ETBC and the meter case shall ensure reasonable safety against the spread of fire. They should not be ignited by thermic overload of live parts in contact with them.
- 11.12. The terminal block shall be of high grade non-hygroscopic, fire retardant, low tracking, fire resistant, reinforced poly-carbonate (not Bakelite) or equivalent high grade engineering plastic which should form an extension of the meter case and have terminal holes and shall be of sufficient size to accommodate the insulation of the conductors, meeting the requirement of IS 13779:1993/CBIP technical report- 304
- 11.13. The terminals shall have suitable construction with barriers and cover to provide firm and safe connection of current and voltage leads of stranded copper conductors or copper reducer type terminal ends (thimbles). The terminal cover shall enclose the actual terminals, the conductor fixing screws, the external conductor and their insulation.
- 11.14. The manner of fixing the conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.

Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material. The internal diameter of the terminal holes shall be 8.5 mm minimum, depth of terminal hole shall be 25 mm. The clearance and creepage distance shall conform to relevant clause of IS 13779:1993/CBIP technical report no.-304. Supply side self locking arrangement terminal block also acceptable if provided, to avoid tampers in field.

- 11.15. The meter shall be compact in design. The entire design and construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibration during transportation and handling. Optionally meter body if an integrated encapsulated design shall be acceptable, forecasting the reduction in cover opening chances.
- 11.16 The potential link shall not be provided out side on meter terminal block.

12. SEALING OF THE METER:

Meter cover should be physically joined by ultra sonic welding on both sides in such a way that

meter cover cannot be opened without breaking and shall be physically evident as well as it should be protected through cover open switch. It shall be displayed and as well as recorded in MRI. Reliable sealing arrangement should be provided to make the meter tamper evidence and avoid fiddling or tampering by unauthorized persons. For this, at least two (2) Nos. seals on meter body, one (1) No. seal on meter terminal cover and one (1) No. seal on communication port and scroll push button shall be provided. All the seals should be provided on front side only. Rear side sealing arrangement will not be preferred. The suppliers in their offer should explain the sealing arrangement.

13. CONNECTION DIAGRAM & TERMINAL MARKINGS:

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover. The meter terminals shall also be marked and this marking should appear in the above diagram.

14. SOFTWARE:

Software for reading, down loading data of the meter and TOD programming in the meter, normally resident in the Common Meter Reading Instrument (CMRI), software suitable for MS-DOS 5.0 or higher version.

Windows based Base Computer Software (BCS) for retrieving data from CMRI and downloading instructions from base computer software to CMRI. This BCS should have, amongst other requirements and features and facilities described later in this specification, the facility to convert meter reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner.

Necessary software for loading application program via CMRI serial port.

The following software shall be made available and installed on CMRI & BCS by the firm whose meters are to interface with CMRI without any extra charges. Any future up gradation in both the software shall also be provided free of cost.

- (a) Software to be resident in CMRI for the purpose of reading and programming the specific make(s) of static meters.
- (b) Base computer stations (BCS) software for accepting data for CMRI, processing generating reports and down loading instruction from the BCS to CMRI. The firm will also provide ASCII conversion utility alongwith BCS software for processing of the billing data.
- (c) The firm shall install the above software without any extra cost on call from one of the Test Division located in each of the Zones. The purchaser will arrange these software installations in rest of the existing and future Test Divisions for which necessary softcopies with appropriate licences shall be provided by the firm.
- (d) It should not be possible to re-program the meter at site (write facility through optical port). The meter programming through optical port shall not be acceptable except time of day (TOD) and real time clock (RTC). Provision for programming of TOD and RTC shall necessarily be provided.

- (e) For efficient and speedy recovery of data read through CMRI, view & analysis, a Base Computer Software (BCS) shall have to be supplied having the following features:

The BCS software shall be windows based (windows 98 & all higher version) user friendly. The data transfer shall be highly reliable and fraud proof. Base Computer software shall give all details adequate for analysis and abnormal event data & load surveys parameters. The software shall have the facility to convert all the consolidated information / data of selectable parameters into ASCII format. EDP department of purchaser can generate its own DBF (data base files) to downloaded all the required information into it.

(i) **Platform:**

The BCS shall be executable on MS WINDOWS 98, WINDOWS 98, WINDOWS-2003 XP, WINDOW XP PROFFESIONAL, VISTA, WINDOWS 2007 or higher updated operating platform or higher operating system. The BCS shall be suitable to run on IBM PC or compatible hardware platform.

(ii) **Meter Data Display:**

The software shall show electrical condition existing at the time of reading the meter in tabular forms as well as graphical format (Phase diagram with phase angle)

All the information about energy, maximum demand and their respective TOD register reading, billing register readings shall be shown in a manner which user can easily understand.

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

All the information about abnormality events shall be accompanied with date and time stamping of respective electrical conditions. This information shall be displayed in the sequence in which it happened in cumulative format as well as summary format.

BCS should display the Date and Time for followings - Meter Reading, MRI taken at site and MRI dump in the computer. The software shall be capable of preparing CMRI to read the meter information or time setting of the meter.

(iii) **Support Display:**

There shall be "user friendly" approach for viewing meter data for the reading collected now or for the reading collected in the past. All information about a particular consumer will be sorted out and available at one place so that locating any consumer 's past data is easy. It shall be possible to retrieve/locate data on the basis of either one of the following particulars:

- a) Site 's ID/Numbers.

- b) Meter Sr. No.
- c) Date of meter reading.
- d) Location.

BCS of the bidder should support the supplied meters of its own make

(iv) **The Data Transfer:**

It shall be possible to transfer data to and from CMRI through serial interface.

(v) **Configurability :**

It shall be possible to have selective print out of all available data of the meter. Print out shall not include anything and everything available with the BCS. The software shall support "print wizard" whereby user can decide what to print out.

The use of the software need not revert back to the supplier of the software for modifying the software just to print what he desires.

BCS shall have facility to export data to ASCII or spreadsheet format for integrating with the purchaser's billing system. Here again an "Export wizard" or similar utility shall be available whereby user can select file format, what data to export, the field width selection etc.

(vi) **Security:**

The BCS shall have multilevel 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 configurable of passwords shall be user definable. The software installed on one PC shall not be capable on another PC.

(vii) **Help :**

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

Necessary software for loading application program via CMRI through serial port. Also meter reading data downloading facility directly from meter to laptop with 1 cord per 500 meter shall be provided with desired software.

15. SALIENT FEATURES:

The meters shall have the following additional salient features:-

- 15.1. Meter shall have provision of Phase indicators to show healthiness of individual voltages. In addition to above, phase indicators shall blink in case of connection abnormality persist at meter terminal.
- 15.2. The meter shall have provision of reading in the absence of power through an external source. An inductive coupling arrangement shall be provided so that it should not be possible to damage the circuit of the meter by applying excess voltage directly in the meter. The meter should be powered up using an external battery pack only in absence of power supply to the meter to enable taking of meter readings through display and optical communication port. If any bidder proposes for Internal Battery backup in the meter in case of mains supply failure for meter reading and meter data downloading, no power shall be consumed for this circuit when mains are available to recharge the battery. In case of power failure data downloading for Historical energy, maximum

Demand & all the tamper events through CMRI (common meter reading instrument) shall be possible through battery internal/ external backup. Rechargeable capacitor back up power shall not be used for display under Power absence condition. To verify that the sample meters are not having capacitor rechargeable battery, the samples will be kept in power off conditions for 7 days (168 hrs.) and then meters will be checked by pressing the push button and the CMRI shall be done.”

- 15.3. The meter should work accurately irrespective of phase sequence of the mains supply only in forward direction.
- 15.4 The meter preferably shall have scroll lock facility to lock desired parameter from push button displays parameter.
- 15.5. The meter should remain powered up and functional even when either any two phases or any one phase with neutral is available to the meter.
- 15.6. The meter should continue to record accurately as per prevailing electrical conditions even if the neutral of potential supply gets disconnected.
- 15.7 The meter shall remain powered up and functional on all prevailing tamper practices.

16. DISPLAY OF MEASURED VALUES

Parameters	ON Display	ON BCS
KWH (FORWARD)	7+0	7+0
KVAH (FORWARD)	7+0	7+0
MAX. DEMAND(KW)	3+2	3+2
MAX. DEMAND(KVA)	3+2	3+2
CUMULATIVE MAX. DEMAND	4+2	4+2

- 16.1. The measured value(s) shall be displayed on seven segments, seven digit Liquid Crystal Display (LCD) display unit/register with Backlit, having minimum character height of 8 mm.
- 16.2. The data should be stored in non-volatile memory. The non-volatile memory should retain data for a period of not less than 10 years under un-powered condition. Battery back-up memory will not be considered as NVM. Meter shall have push button or capacitive touch arrangement.
- 16.3. It should be possible to easily identify the displayed parameters through symbols/legend on the meter display itself.
- 16.4. In case of multiple values presented by a single display, it shall be possible to identify each displayed value/parameter through separate symbol/legend to be made available on the display itself.
- 16.5. 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 should not roll over in between this duration.

17. METER SERIAL NUMBER:

In addition to providing serial number of the meter on the display unit of the meter and display

plate, the meter serial number shall also be programmed into meter memory for identification through CMRI/meter reading print out.

18. DISPLAY SEQUENCE: PUSHBUTTON MODE DISPLAY PARAMETERS

- a. LCD segment check
- b. Meter serial number
- c. Real time
- d. Date } or Date and Time
- e. KWH Forward
- f. KVAH forward
- g. Meter reading count
- h. Cumulative power-on hours
- i. Current Month Max. Demand (kW).
- j. Prev. Month Max. Demand (kW).
- k. Cumulative max. demand(kw)
- l. Current Month Max. Demand.(KVA) during Peak hours
- m. Prev. Month Max. Demand.(KVA) during Peak hours
- n. Cumulative Max. demand(KVA)
- o. MD reset count
- p. All Phases Voltage (P-N)
- q. All Phases Line Current
- r. Inst. Frequency (Hz)
- s. Power factor
- t. Inst load KW
- u. Inst. Load KVA
- v. Cumulative power on hours reading of predefined date and time of the last two consumption months (BP POH).
- w. Tamper Data:
 - 1. Present status of tamper:
 - a) Missing potential with phase identification
 - b) Current polarity reversal with phase identification
 - c) Current short & open.
 - d) Other tampers(magnet. ND)
 - 2. Date and time of last tamper occurrence with tamper identification
 - 3. Date and time of last tamper restoration with tamper identification.
 - 4. Cumulative tamper count of all types of tampers.

AUTO MODE DISPLAY PARAMETERS

- a) LCD segment check .
- b) Meter serial number
- c) Real time
- d) Date } or Date and Time
- e) KWH Forward
- f) KVAH forward
- g) Current month max. demand (kw)
- h) Prev. Month Max. Demand (kw).
- i) Cumulative Max. demand(kw)
- j) Current month max. demand(KVA)
- k) Previous month max. demand(KVA)
- l) Cumulative max. demand(KVA)
- m) Inst. Load KW
- n) MD reset count
- o) Cumulative tamper count of all types of tampers.

- p) Existing tamper, if any.
- q) Avg. Power factor
- r) Voltage all phase
- s) Current all phase

Each parameter shall be on meter display for 10 seconds and the time between two auto cycles shall not be more than 60 seconds subject to 10% tolerance.

Detailed tamper information as per DLMS should, however, be logged in the meter memory and be capable of downloading to the BCS through the CMRI and be available for viewing at the BCS end.

Note : The TOD wise bill point active energy, and maximum demand though not provided on meter-display, should be logged in the meter memory and be capable of downloading to the BCS through the CMRI and be available for viewing at the BCS end.

19.0 TIME OF DAY (TOD) TARRIF:

- 19.1 Meter should be able to store apparent and active energies (forward) consumption along with maximum demand in KVA for at least different 8 time zones.
- 19.2 Meter shall be able to record and store apparent and active energies, consumption along with maximum demand in KVA during specific peak hours described as following time Zone of register in sequence:—
 - a) 17.00 to 18.00 Hrs.
 - b) 18.00 to 22.00 Hrs.
 - c) 22.00 to 23.00 Hrs.
 - d) 23.00 to 05.00 Hrs.
 - e) 05.00 to 06.00 Hrs.
 - f) 06.00 to 08.00 Hrs.
 - g) 08.00 to 11.00 Hrs.
 - h) 11.00 to 17.00 Hrs.
- 19.3 The starting of display of TOD zones shall be from 17:00 hrs to 18:00 hrs as first slot and last slot as 11:00 hrs to 17:00 hrs.
- 19.4 The meter shall have facility for recording and storing of TOD consumption and maximum demand data on minimum Three Tariff Rates, per day basic.
- 19.5 It should be possible to change the time period for TOD recordings through the portable device or programmable BLOCK installed in the meter itself or manually with proper security at site. The main control for this change shall be available on the computer located at the Metering Office.

20. OUT PUT DEVICE:

The meter shall have a test output accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator, if fitted, must be visible from the front. Test output device shall be provided in the form of LED output device. The relation between test output and the indication on display shall comply with the marking on the name plate (imp per kWh)

21. COMMUNICATION PORT:

The meter shall have facilities for data transfer locally through CMRI and remotely by GSM, CDMA , PLCC and GPRS modems/devices with proper security via an optically isolated communication port using serial communication. It should be possible to configure meter for TOD tariff demand integration period, billing date, real time clock and date etc.

through CMRI locally without any extra cost to PUVVNL, but the same shall be done by the manufacturer only after taking due approval of MD, PUVVNL or his authorized representative. The meters shall have a galvanically isolated optical communication ports as per IEC 1107 so that it can be easily reading instrument for data transfer. The meter shall have additional RJ11 port/micro USB port along with optical port for reading data through CMRI and AMR modem. Communication ports shall not be affected by any type of infection/unauthenticated signals. The baud rate should not be less than 9600 bps and higher baud rate shall be preferred for down loading the data. The complete data shall be downloaded within 5 minutes from meter to CMRI & from CMRI to BCS.

The bidder shall supply software required for local (CMRI) & remote (AMR) connectivity including required training to use the software free of cost. Both the communications port may work simultaneously. Separate communication cords for optical port and RJ11/micro USB port have to be supplied with each meter free of cost duly fitted with meter box with a provision of reading the data without opening the meter box. Also the meter box shall have provision of sealing optical port. RJ11/micro USB port should have sealing provision at the meter body. **The bidder shall provide meters as per DLMS compliance i.e. meters with open protocol as per IS: 15959 Category “C” for consumer metering.**

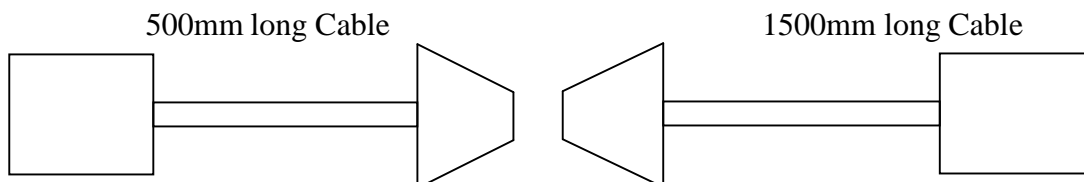
22. SPECIAL REQUIREMENT FOR DISPLAY:

- 22.1 The meter shall have indication for unsatisfactory/non-functioning of the following:—
 - a) Time and calendar
 - b) Real time clock with battery
 - c) All display segments
 - d) Non-volatile memory.
- 22.2 The meter serial number, consumers name and address, C.T. and P.T. ratio and date with time of taking reading shall invariable be available at base computer software.
- 22.3 The meter shall be factory programmed for each and every month for minimum 20 years at the time of manufacture and correctness of 20 years calendar. In addition following parameters should also be factory programmed:—
 - a) Integration period
 - b) Display sequence
- 22.4 The meter shall have provision of reading in the absence of power through an external source. An inductive coupling arrangement shall be provided so that it should not be possible to damage the circuit of the meter by applying excess voltage directly in the meter. The meter should be powered up using an external battery pack only in absence of power supply to the meter to enable taking of meter readings through display and optical communication port. The supplier has to supply one no. Power Pack unit with each lot of 100 nos. of meters without any extra cost in case of external source of supply. In case of internal battery back up for reading and data downloading through MRI in absence of power supply, the battery must be able for a backup time of minimum 7 days (168 hrs) as per Clause 15.2.

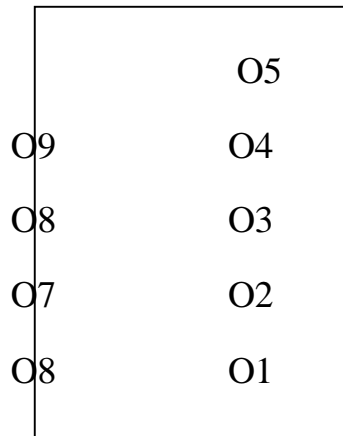
22.5 INTERFACE WITH MS DOS BASED CMRI:

For Physical interface between meter and Common Meter Reading Instruments shall consist of meters optical sensor terminating into a 9 Pin D type male connector with a cable of 500mm + 10mm length with a provision of reading the data without opening the meter box. Also additional RJ11/micro USB port at the meter body shall have sealing provision.

ILLUSTRATION NO.1

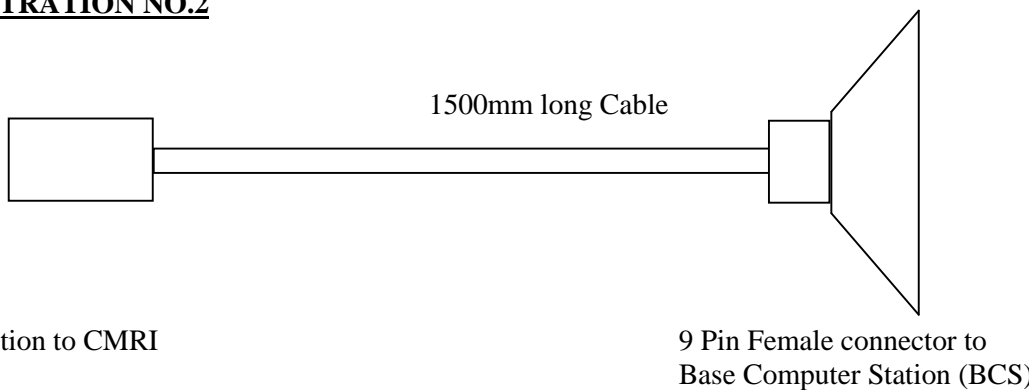


Optical Port for connecting to Meter 9 pin Male 9 pin female Connection to CMRI
 The configuration of 9 Pin D type male connector shall be as given below:



PIN SIGNAL NAME	
01	NC
02	TRANSMIT DATA (TXD)
03	RECEIVE DATA (RXD)
04	NC
05	SIGNAL GROUND (SG)
06	NC
07	NC
08	NC
09	POWER SUPPLY

ILLUSTRATION NO.2



- 22.6 Meter shall invariably be provided with LCD display cycling facility for essential parameters, as envisaged under clause No. 7.0 of the technical specification.
- 22.7 While installing the meter, it shall be possible to check the correctness of the C.T. & P.T. connections to the meter and their polarity with the help of common meter reading instrument.
- 22.8 The meter and related instruments, when installed, shall be constructed in a way offering full protection against contact voltage, other hazards resulting from/or related to the operating principle and the utilization of the equipment. In particular if any metal part accessible while covers are in place, then the base shall be fitted with protective Earth terminal identified by the Earthing symbol ⊥ and connected to all accessible metal parts.
- 22.9 The Static Trivector Meter shall have memory capacity to store followings parameters**
 - 22.9.1 The static tri vector meter shall measure and retain previous 12 months data (month wise) of the KWH and KVAH reading at 2400 hrs. of the last days of each calendar month, along with monthly consumption in kwh and kvAh for each month including current month consumption. Average power factor and maximum demand with date and time of occurrence of that particular month . These parameters shall also be obtainable through common meter reading instrument whenever required of last 12 months.
 - 22.9.2 The meter shall also have memory capacity to measure & retain tampers evident data of 200 events in compartments as per DLMS (treated occurrence & restoration as separate event). Upto 50 events configured in one compartment which will rollover on FIFO basis(except the non roll over events).
 - 22.9.3 The meter shall record three phase voltage, current, power factor separately with KWh and KVAh energy, at the time of each event (except power ON/OFF.)

- 22.9.4 Meter shall also store & communicate instantaneous electrical parameters, vector representation as and when meter data downloaded from meter to MRI at BCS end.
- 22.9.5 The meter shall have sufficient memory capacity to store above parameters with defined duration / frequency / numbers of event with FIFO basis. Additional parameter if available High percentage THD of voltage and current shall be recorded as event to monitor quality of supply.
- 22.10 The meter shall be provided with an accurate quartz crystal based real time clock. The maximum drift permissible in the real time clock shall be ± 5 minutes per year for class 1.0S Meters.

23. MAXIMUM DEMAND REGISTRATION AND RESETS:

- 23.1 The meter shall continuously monitor and calculate the average maximum demand for Kw and KVA for each interval of time of 30 minutes and maximum of these shall be stored along with date and time when it occurred.
- 23.2 The meter shall automatically store the 30 minute average demand. At the end of every 30 minutes, the new calculated demand should be compared with previous maximum demand and stored whichever of them is higher. The maximum demand for every calendar month along with the date and time when it occurred should be registered.
- 23.3 The maximum demand shall automatically reset at 24.00 Hrs. of the last date of each calendar Month for which minimum 20 calendar years shall be programmed by the manufacturer at his work.
- 23.4 The meter shall be provided with its own real time clock calendar with built in battery backup and time derived from this clock shall be used for maximum demand intervals. The meter shall display the maximum demand reset count.

24. LOAD SURVEY CAPABILITY & BILLING POINT REQUIREMENTS:

Measure & retain minimum Load Survey data of past 2 months to store average KW, KVA, PF, 3 phase voltage and current parameters of 30 min integration period. It shall be possible to select either demand or energy view at the BCS end.

The load survey data can be downloaded & presented in the form of bar charts as well as in spread sheets. The BCS shall have the facility to give complete load survey data both in numeric and graphic form.

25. BILLING PARAMETERS

The predefined date and time for registering the billing parameters of KWh, KVAh , KVA and kW MD as well as Tamper Count and Power-on hours readings shall be 24:00 Hrs of the last day of every month . All current billing parameters shall be transferred to billing registers.

The above billing data, TOD register's data, load survey data, tamper information data shall all be retrievable through the meter's communication port through a common meter reading instrument (CMRI) and shall be transferred (downloaded) to a PC with windows based software to get complete details in numerical and/or graphic form. The necessary base computer software (BCS) for this purpose shall be provided by the supplier with complete details.

26. SELF DIAGNOSTIC FEATURE:

The meter shall be capable of performing complete self diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of date memory location all the time. The meter shall

have indication for unsatisfactory/nonfunctioning/malfunctioning of the following:-

- a. Time and date and
- b. All display segments as per the requirement under G 19 of IS 14697.
- c. Real Time Clock (RTC)
- d. Non Volatile Memory (NVM)

If possible, the details of malfunctioning should be recorded in the meter memory.

27. TAMPER AND FRAUD PROTECTION

<u>Tamper detection Feature</u>	<u>Occurrence</u>			<u>Restoration</u>		
	<u>Voltage</u>	<u>Current</u>	<u>Occurrence Time</u>	<u>Voltage</u>	<u>Current</u>	<u>Restoration Time</u>
Voltage Failure	< 55% Vbasic	Ignored	5Min	> 55% Vbasic	ignored	2Min
Current Open	Ignored	I _{ph} <2% I _b & CT Bypass >15% I _b & No current reversal in any Ph	5Min	Ignored	I _{ph} >2% I _b or CT Bypass <15% I _b	2Min
Current reversal	V _{ref}	I _{ph} > 10% of I _b & Power factor>0.5 in that phase and current flow in reverse direction	5Min	V _{ref}	10% of I _b & Power factor>0.5 in that phase and current flow in forward direction	2Min
Voltage unbalance	V max-V _{min} >30% V _{ref}	Ignored	5Min	V max-V _{min} < 30% V _{ref}	ignored	2Min
Current Bypass	Ignored	CT Bypass >20% I _b &I _{ph} > 2% I _b (in all phases) & No current reversal in any Ph	5Min	Ignored	CT Bypass < 20% I _b or any I _{ph} < 2% I _b	2Min
Current unbalance	Ignored	I max-I _{min} >30% I _b	5Min	Ignored	I max-I _{min} < 30% I _b	2Min
Magnetic logging	Meter shall record at I _{max} ,Whenever effected by magnetic field. Occurance&resoration within 30 sec					
Neutral disturbance	V _{ph} >1.5 V _{ref}	Ignored	20 Sec	V _{ph} <1.5 V _{ref}	Ignored	20 Sec
	For any abnormal neutral disturbance signal, meter either remains immune or in case the meter functionality is getting affected, neutral tamper will be logged with date and time as an even and meter to record energy (V _{ref} , actual current and UPF will be taken for metering					

Top Cover open	Event will be logged incase of power failure also, "Cover open/legend" message will be activated on display along with date and time. Once the meter cover open display appears on screen, no other reading kwh, kvAh, demand etc should be on display . However the reading shall be available on push button mode. Event is not resettable. Once occurred the event will be there permanently on display					
Low Voltage	55% Vref<Vph<75% Vref	Ignored	5Min	Vph<55% or Vph>75% Vref	Ignored	2Min
Over Voltage	115% Vref<Vph<150% Vref	Ignored	5Min	115% Vref>Vph>150% Vref	Ignored	2Min
Over Current in any phase	Ignored	Iph>120% In	5Min	Ignored	Iph<120% In	2Min
Power Failure event	When all three phases are switched off for 1 minute and more					

- a. The meter shall be capable of recording power and remain functional on all prevailing Tampering practice.
In addition to this, meter should log minimum 10 events for meters authenticated transaction i.e time setting, time zones, Integration period change etc.
- b. Meter cannot be put in dead zone (non functioning zone) either by high voltage discharge (Spark) upto 35KV& by any external high frequency source. Hidden memory fully secured for outer / internal impact compare actual supply parameters & if functionally meter gets changed/change in parameters, the tamper shall be logged and suitable display on meter LCD shall be given. **35KV Spark test** – The meter (without box) shall be capable to withstand 35KV and should be immune if applied on the terminal, optical port and all sides of meter.
- c. **DC Immunity:** The meter shall not saturate on passage of direct current which can cause the meter either to stop recording/record inaccurately. Measurement by meter shall not get influenced by injection of chopped signal/DC signal /DC pulse of low frequency.
- d. **Snap Shots** The meter shall record three phase voltage, current, power factor separately with KWh and KVAh energy at the time of each tamper event (except power on off) with the date and time.
- e. While connecting 3 phase capacitive bank unit to meter, under balance and unbalanced pure capacitive load meter should not log current reversal and should not increment in active energy (at no-load condition).
- f. The meter shall keep working accurately irrespective of the phase sequence of the supply.
 1. Mid night snap shot is required for configured energy (Active, Reactive Lag and lead and Apparent) for last 35 days minimum.
 2. Provision should be there for indication of existing tamper status in the meter preferably providing additional LED on meter body/LCD annunciator which should glow/display incase of tamper existing

28. TAMPER LOGIC:

Properly designed meter tamper logic should be provided. The tamper logic should be capable of discriminating the system abnormalities from source side and load side and it should not log/record tamper due to source side abnormalities.

There shall be minimum five separate compartments for logging of different types of tampers.

Bidder under their offer should explain the logging of various tampers in each compartment.

Once one or more compartments have become full, the last tamper event pertaining to the same compartment will be entered and the earliest (first one) tamper event should disappear. Thus, in this manner each succeeding tamper event will replace the earliest recorded event, compartment wise. Events of one compartment/category should overwrite the events of their own compartment/category only.

Bidders may indicate alternate proposals for the above tamper detection and logging scheme.

Tamper count should increase as per occurrence (not restoration) of tamper events. The total number of tamper counts should also be provided on the meter display as well as at the BCS end.

29. TAMPER PERSISTENCE TIME:

The tamper persistence time for logging/registration of an occurrence of a tamper should be 5 minutes +/- 10 seconds. The persistence time for logging of restoration of tamper should not be more than 120 seconds.

30. ACCURACY REQUIREMENT:

The accuracy of parameters measured by meters shall be tested in accordance with the relevant standards described in clause 2.0 of this specification.

31. ELECTRICAL REQUIREMENT:

The electrical requirement of meters shall be as specified in the relevant standards described in clause 2.0 of this specification.

32. ELECTROMAGNETIC COMPATIBILITY AND INTERFERENCE REQUIREMENT:

The meter shall meet EMI/EMC requirements as specified in the relevant standards described in Clause 2.0 of this specification.

33. MECHANICAL REQUIREMENT:

The meter shall meet the mechanical requirements as specified in the relevant standards described in clause 2.0 of this specification.

34. CLIMATIC INFLUENCE REQUIREMENT:

The meter shall meet Dry Heat/Cold/Damp heat cycle test requirement as per the relevant standards described in clause 2.0 of this specification.

35. MINIMUM TESTING FACILITIES:

The tenderer should have the necessary minimum testing facilities for carrying out the following tests:

1. AC voltage test
2. Insulation resistance test
3. Test of limits of errors
4. Test of meter constant
5. Test of starting condition
6. Test of no load condition

7. Repeatability of error test
8. Test of power consumption
9. ESD Test at 35 KV
10. Tamper conditions - as per this specification

The manufacturer should have duly calibrated RS meter of Class 0.2 accuracy or better. Manufacturer also should possess fully computerized meter test bench system for carrying out the relevant routine/acceptance tests as well as facility to generate test reports for each and every meter tested.

36. Purchaser reserves the right to ask the successful Bidder to carry out complete type testing and anti-tamper feature test on the sample meter from their delivered lot, from any of the below mentioned test laboratories at their own cost, which shall be reimbursed by purchaser on submission of successful type test reports as per IS : 13779 : 1999 (read with latest revision thereof)/CBIP technical report No. 304 with latest revision thereof.

37. TESTS:

The type test reports/certificates/records for all type tests specified having been successfully performed on the type of meter offered shall be submitted with the tender. The bidder shall clearly bring out the deviations from this specification clause by clause whether on account of tests or manufacturing process or features incorporated in the meter. The tender lacking with above information and without supporting test reports for meter meeting the requirement of tests laid in this specification are likely to be rejected.

a) Type Tests:

The Energy meter offered shall be fully type tested at any of the test laboratories mentioned below by the bidder as per relevant standards but test reports shall not be more than three years old from the date of opening of bid. The bidder shall furnish two sets of type test reports along with the bid.

1. NPL, New Delhi
2. ERTL (N), New Delhi
3. ERTL (W), Mumbai
4. ERTL (E), Calcutta
5. ERTL (S), Thiruvananthapuram
6. YMPL, Udaipur
7. E.R.D.A., Vadodara
8. C.P.R.I., Bangalore
9. SAMEER, Madras

b) Acceptance Test :

All acceptance tests as stipulated in the relevant standards shall be carried out by the supplier in the presence of the purchaser's representative.

38. Routine Tests:

All routine tests as stipulated in the relevant standards shall be carried out and routine test-certificates/reports shall be submitted to the purchaser for approval and also placed inside individual meter packing.

39. **Surge Test:** The offered should be capable to withstand surge immunity test as per IEC 62052-11 2003 and amendments thereof. Bidder shall have to submit type test report along with offer for this test also.

40 SAMPLE METERS:

Bidders are required to submit three no sample meters with meter Box & seals within fifteen days from date of opening of tender bid part-I which shall be tested at one of the test lab of UPPCL/PUVVNL/any Discom of UPPCL. Date of testing will be informed to all bidders. Engineer of the bidder shall come with BCS and CMRI so that tamper information with date & time, load survey and meter readings could be downloaded by CMRI and printout could be taken to verify the internal features also.

OR

Meter samples can be tested in any of the following test Laboratories in the presence of UPPCL/Discom authorized representative and Firm representative on the cost of suppliers

- (i) National Physical Laboratory (NPL), New Delhi.
- (ii) E.R.T.L. (N), New Delhi.
- (iii) E.R.T.L.(W), Mumbai
- (iv) E.R.T.L. (E), Kolkata
- (v) E.R.T.L. (S), Thiruvananthapuram
- (vi) Electrical Research and Development Association (ERDA), Vadodara
- (vii) CPRI, BANGLORE/ Bhopal

However place of sample testing will be at the discretion of UPPCL/PUVVNL.

Part-2 (Price) shall be opened only of those suppliers whose Meter sample are found in order.

41. TECHNICAL SPECIFICATION OF PILFER PROOF METER BOX TO HOUSE THE THREE PHASE WHOLE CURRENT ENERGY METER

The offered meter box is to house one number three-phase four-wire energy meter. The meter box shall comply with IS: 5133/IS14772 (Part-II).

41.1 MATERIAL

The meter box shall be made of high grade Engineering Plastic with following properties

- a. UV Stabilized
- b. HDT - $120^{\circ}\text{C}\pm 10^{\circ}\text{C}$.
- c. UL rating – UL94 (Flame Retardant)
- d. It shall be capable of withstanding temperatures of boiling water for 5 minutes continuously without distortion or softening.
- e. It shall also be capable of withstanding Glow wire test at 650°C as per IS 14772:2000
- f. It shall be environment friendly and easily recyclable.

41.2 CONSTRUCTION:

- (i) **Meter box** shall have a roof tapering down to both sides for easy flow of rainwater.
- (ii) The thickness of the box shall be not less than 2.5 mm in the load bearing side (i.e. back side of the box) and other sides, doors and the roof shall not be less than 2.0 mm.
- (iii) The overall dimensions of the box shall be such that a minimum side clearance should be maintained in between meter & side wall of meter box. Minimum 10 mm clearance from left, right side and top, 10 mm from front and back side will be maintain in between meter and box surface
- (i) Box cover shall have minimum 1 nos. snap to fit type arrangement on each side of box. The snap fit arrangement should have adequate barriers) except for cable entry side.).

- (v) Self rubber gasket for protection from ingress of dust and water shall be provided on all around the box.
- (vi) For sealing the box cover with base minimum 2 nos. sealing hole shall be provided.
- (vii) The box shall be made of transparent polycarbonate material conforming to IS 14434 or equivalent.
- (viii) Each meter box base shall have only 3 nos. round holes for fixing of meter box in the board. There shall be no key hole.
- (ix) Meter box should comply with IP-51.
- x. For cable entry , suitable circular holes fitted with engineering plastic/hope glands shall be provided at the bottom of the box for cable inlet and outlet . The internal diameter of the gland shall be such as to accommodate the 18-27 mm outer diameter cable.
- (xi) Purchase order No. date and purchaser's name shall be provided on metallic name plate in such a manner that it shall not be removed easily. Name of manufacturer shall be embossed on meter box cover.
- (xii) Push button shall be provided on the cover of meter box to operate the meter pushbutton without opening the meter box cover.
- (xiii) Arrangement for meter reading through meter reading instrument should be provided on meter box cover to read the meter without opening the meter box.
- (xiv) Drawing of offered meter box should be enclosed along with bid.
- (xv) (xvi) Meter serial no. shall also be engraved/embossed on meter box base & cover by lazer printing from inside.

43. TESTS:

43.1 Type Tests:

The type test report at following features of the meter box conducted by any NABL accredited laboratory should be enclosed with the offer as per IS :5.33/IS 14772

- i) Test of material identification i.e., (as specified in per Clause No.40.1 of this specification.)
- ii) Test for mechanical strength
- iii) Test for water absorption.
- iv) Test for stability at high temperature.
- v) Test for withstanding temperature of boiling water for 5 minutes continuously for non-distortion or softening of material.
- vi) Glow wire test at 650°C as per clause 5.2.4 of CBIP Technical Report No.88 read with amendments.

43.2. Acceptance & Routine Tests:

43.3 Acceptance Tests:

The following shall constitute acceptance test for box:

- i. Physical verification of dimensions of the box.
- ii. Compatibility of the box for housing the meter for ensuring ease of connections and reading the meter.

43.4 Routine Tests:

Following Routine test certificates shall be furnished for approval.

- i. Physical verification of the box.

44 Sample Meter Box :

Bidder shall submit 1 Nos.(one) sample meter box along with sample meters as per details in clause no. 39 of tech. specification for verification of requirement of specifications.

Summary of General Technical Requirement:

Sr. No.	Description	Requirement
1	Type of Meter	Three phase four wire whole current 10-60 Amp. Direct connected energy meter
2.	Accuracy Class of Meter	1.0
3.	Basic Current (I _b) & Rated Maximum current (I _{max})	I _b = 10 Amp.; I _{max} = 60 Amp.
4.	Reference conditions for Testing the performance of the meter	V _{ref} = 240 V±1%, Frequency = 50Hz ±5% Temperature = 27°C ±2°C (if the test are made at the temp. other than reference temp. the results shall be corrected by applying Mean Temp. Coefficient 0.05)
5.	Operating Voltage	Meter shall be operational with required accuracy from 0.6 to 1.2 V ref.
6.	Operating Frequency	50Hz ±5%
7.	Power Consumption	Voltage circuit: Max. 1W and 4 VA Current Circuit: max. 1VA
8.	Starting Current	40mA (0.2% of I _b) at unity p.f.
9.	Short time over current	3000 Amp for 0.01 sec (30 I _{max} for one half cycles at rated frequency)
10.	Influence of heating	Temp. rise at any point of the external surface of the meter shall not exceed by more than 20K with an ambient temp. at 45°C
11.	Rated Impulse withstand voltage	10 kV (shall be applied ten times with one polarity & then repeated with the other polarity and minimum time between each impulse to be 3sec.)
12.	AC withstand voltage for 1 min.	4kV
13.	Insulation resistance a) Between frame & current, voltage circuit connected together. b) Between each current (or voltage circuit) & each and every other circuit	5M ohm 50 M ohm
14.	Mechanical	Meter shall be in compliance with clause 12.3 of IS 13779

	Requirements	
15.	Resistance to heat and Fire	The terminal block, terminal cover and Meter case shall ensure safety against spread of fire. They should not be ignited by thermal overload of live parts in contact with them as per clause 6.8 of IS 13779.
16.	Protection against penetration of dust and water	Degree of Protection: IP 51 as per IS 12063, but without suction in the meter
17.	Resistance against Climatic influence	Meter shall be in compliance with Clause 12.6 of IS 13779
18.	Electromagnetic Compatibility (EMC)	Requirements shall be as per CBIP technical report no. 304 and any amendment thereof.
19.	Accuracy requirements	Meter shall be in compliance with clause 11 of IS 13779
20.	Power factor range	Zero lag to zero lead.
21.	Energy measurement	Fundamental energy + Energy due to Harmonics
22.	Connection Diagram	The connection diagram for the system shall be provided on terminal cover.
23.	Self Diagnostic feature	The meter shall have indication for un satisfactory/ non-functioning of, <ul style="list-style-type: none"> i) Time and calendar ii) Real Time Clock iii) RTC battery iv) Non Volatile Memory
24.	Initial start up of meter	Meter shall be fully functional within 5 sec. after reference voltage is applied to the meter terminals.
25.	Internal diameter of the terminal holes and Dept of terminal hole.	8.5 mm (Minimum) 25 mm
26.	Clearance between adjacent Terminals	10 mm (Minimum)
27.	Sealing arrangement	(a) Two no. on Body of the meter (b) One no. on the Terminal cover of the meter (c) Sealing arrangement to be scroll push button. (d) Optical Port
28.	Provision of reading in the absence of power	An inductive coupling arrangement shall be provided so that it should not be possible to damage the circuit of the meter by applying excess voltage directly in the meter. For Internal Battery backup meter reading and meter data downloading, no power shall be consumed for this circuit when mains are available to recharge the battery.
29.	Scroll Lock provision	Scroll lock provision preferred for the permanent display of selected parameter.

30	Display character Height	Minimum 8 mm LCD with backlit type
31	Display sequence in Push Button	<ul style="list-style-type: none"> a. LCD segment check b. Meter serial number c. Real time d. Date } or Date and Time e. KWH Forward f. KVAH forward g. Meter reading count h. Cumulative power-on hours i. Current Month Max. Demand (kW). j. Prev. Month Max. Demand (kW). k. Cumulative max. demand(kw) l. Current Month Max. Demand.(KVA) during Peak hours m. Prev. Month Max. Demand.(KVA) during Peak hours n. Cumulative Max. demand(KVA) o. MD reset count p. All Phases Voltage (P-N) q. All Phases Line Current r. Inst. Frequency (Hz) s. Power factor t. Inst load KW u. Inst. Load KVA v. Cumulative power on hours reading of predefined date and time of the last two consumption months (BP POH). w. Tamper Data: <ul style="list-style-type: none"> 5. Present status of tamper: <ul style="list-style-type: none"> a) Missing potential with phase identification b) Current polarity reversal with phase identification c) Current short & open. d) Other tampers(magnet. ND) 6. Date and time of last tamper occurrence with tamper identification 7. Date and time of last tamper restoration with tamper identification. <p style="margin-left: 40px;">Cumulative tamper count of all types of tampers..</p>

32.	Display sequence in Auto Button	<ul style="list-style-type: none"> a) LCD segment check . b) Meter serial number c) Real time d) Date } or Date and Time e) KWH Forward f) KVAH forward g) Current month max. demand (kw) h) Prev. Month Max. Demand (kw). i) Cumulative Max. demand(kw) j) Current month max. demand(KVA) k) Previous month max. demand(KVA) l) Cumulative max. demand(KVA) m) Inst. Load KW n) MD reset count o) Cumulative tamper count of all types of tampers. p) Existing tamper, if any. q) Avg. Power factor r) Voltage all phase s) Current all phase
33.	TOD zone & Timing	8 zones and timing as per the clause no. 19.2.
34.	Optical Communication Port	As per IEC1107/ANSI/PACT
35.	Load Survey	As per Technical specification Clause no. 24
36.	Billing parameter	The predefined date and time for registering the billing parameters of KWh, KVAh , KVA and kW MD as well as Power-on hours readings shall be 24:00 Hrs of the last day of every month for twelve months.
37.	Tamper and Fraud Protection	<ul style="list-style-type: none"> a) Missing Potential b) Current Polarity Reversal c) Current Short (Bypass) & Open d) Magnetic interference e) Cover open . f) High voltage and high frequency. g) Neutral Disturbance h) DC immunity
38.	Snap Shorts of Tamper details	The meter shall record three phase voltage, current, power factor separately with KWh and KVAh energy at the time of each event (except power on/off) with the date and time Mid night snap shot is required for configured energy (Active, Reactive Lag and lead, Apparent) for last 35 days.
<u>39(i)</u>	<u>Data down loading</u>	<u>Maximum 5 minutes from meter to CMRI and from CMRI to BCS.</u>
<u>39(ii)</u>	<u>Data transfer/communication speed</u>	<u>Maximum 5 minutes from meter to CMRI and from CMRI to BCS.</u>