**PVVNL-MT/COM/09(s)/23-24**

**TECHNICAL SPECIFICATION FOR SINGLE PHASE TWO WIRE (10-60A) CLASS 1.0 ACCURACY ELECTRONIC ENERGY METERS FOR SOLAR METERING**

**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 |  |
| CBIP-325 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-325, (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 ± 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

**5.2Supply System :**

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

**5.3Power 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 ±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., 440 volts) is applied for 30th 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.

**5.5Power 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 8 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 Imax**.

5.8 **Measuring Parameters**

(1) Real time and date

(2) Active energy KWh (Import)

(3) Active energy KWh (Export)

(4) 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 24.00 hours on the last 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 Import Energy (KWh)

4.0 Active Cumulative Export Energy (KWh)

5.0 Max. Demand Import (KW) with 30 minutes integration of the current month with date & time. The display of various parameters shall be continuously scrolling one after another.

6.0 Max. Demand Export (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 Import reading (KWH) for each calendar month for previous three months.

**iii** Active cumulative Energy Export reading (KWH) for each calendar month for previous   
 three months.

**iv** Maximum Demand Import (KW) with 30 minutes integration period of the last three months.

**v.** Maximum Demand Export (KW) with 30 minutes integration period of the last three months.

**vi.** Inst. Voltage for p-n.

**vii** Inst. Current.

**viii** Inst. Load (KW).

**ix** Billing period count.

**Viii**  Instantaneous power factor.

**ix** Average P.F. current and last month.

**x** Cumulative power ON hours.

**xi** Cumulative tamper occurrence count.

**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 8 mm. KWh will be read upto 6 complete digits only. The display shall be digital type with non-destructive read out. However recording in memory in decimal after six digits will continue.**

|  |  |  |
| --- | --- | --- |
| PARAMETERS | ON DISPLAY | ON BCS |
| KWH (FORWARD) | 6+0 | 6+2 |
| MAX. DEMAND( KW) | 2+2 | 2+2 |

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.

**5.9.3Meter 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 last Month 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 15 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 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, 6 (Six ) Months history , 60 days Load survey & tamper events with snap shots should be convertible to user defined ASCII 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 files formats. The user shall have the flexibility to select the parameters to be converted into ASCII 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 and additionalRJ11 (RS232)/Micro USB (RS232) port.Communication ports shall not be affected by any type of injection/unauthenticated signals. The port shall be compatible with IEC 1107/ PACT/ ANSI and shall be capable of being hooked to a remote metering device such as modem, etc. for future to enable Automatic meter reading. **“For local meter reading, it shall be possible to do entire meter data download within 5 minute (containing instantaneous values, load survey, 6 histories and events) 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.”**

**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 for both import and export mode (active energy, maximum demand in kW) shall be registered and shall be available for a minimum period of last 12 (Twelve) months through BCS.Midnight data (KWH) of last two months shall be provided in MRI.

**5.11General 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 withstanding 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.

**5.11.4** The meter shall conform to the degree of protection IS 51 as per IS : 12063 against of dust, moisture and vermin¡¦s.

**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 cover 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 cover shall have one window if front cover 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 ultrasonically 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 3 fixing holes, one at top and two at bottom. All the three 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.

**5.12Constructional Requirements:**

**5.12.1Meter Case and sealing arrangement:**

The meter shall have a transparent case UV stabilized made of unbreakable high, fire resistant, reinforced polycarbonate which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the Meter Cover seals. The meter cover shall have at least two sealing holes, Meter cover should be physically jointed by ultra sonic welding in such a way that meter cover cannot be opened without breaking. In case the meter is opened by breaking the welding, clear physical evidence shall be visible on the front side. Such an event, both in power-on or power-off condition, shall be permanently recorded in the meter memory and shall be visible as tamper event with date and time of opening on the display of the LCD and can be downloaded though CMRI. The Meter case shall have at least three mounting holes. Two holes for mounting screws on the terminal block sealed beneath the terminal cover and one for hanging screw on the top. Base & cover shall be sealed by unidirectional screws on both side with sealing holes & head screw after tightening shall not be accessible.

**5.12.2Terminal Arrangements**

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 Imax 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.

**5.12.4Output 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.

**5.12.5TIME 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.

**5.12.6 LOAD PROFILE RECORDING**

The meter shall be capable of monitoring and recording load profile information for KW (Import & Export) demand for every 30 minutes interval for at least 45 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. The reverse indication in the form of LCD icon or LED shall be switched on.

**(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 of 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 tampers 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. Meter should be capable to give pulses for at least one minute to take accuracy which can be ascertained by pressing push button**.

**(5) Influence of external High Magnetic Field**

Meter shall be offer compliance to requirements of CBIP-325 and its amendments for tampering using external magnets and meter should record energy at Imax during that condition.

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.

-Current reversal

-Magnetic influence in case meter is affected.

-Neutral Disturbance in case meter is affected.

-Neutral missing

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. In case of meter body opening display of “Cover open” anunciator must appear permanently so that at the time of meter reading it must come in notice. However cover open “date & time” should appear in push button mode.

**(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 neutral disturbance tamper with date and time and shall also record at Imax, if effected, when ever such signals are injected in Meter.

**(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 along with recording of Energy at Imax& record the event as tamper, 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 at Imax” Threshold value should also be provided by the suppliers for variable resistance tampering below which it should switch over to 240 v.**

**(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 shall be carried out at even without actual load.**

**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 add fraud energy. 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 at least two seals shall be made. Besides the above, on each of the left and right side, the manufacturer shall provide an unbreakable Polycarbonate Seal with unique serial number embossed on it. The seal will be supplied with high rise in moulding with manufacturer’s name/logo.

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 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 five(5) 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 -325 on randomly selected samples.

(i) Shock test

(ii) Vibration test

(iii) Magnetic Induction of external origin (AC & DC)

(iv) 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) CPRI

(ii) ERDA

(iii) ERTL

**Tests to be conducted:**

(i) Starting Condition Test.

(ii) Power Consumption Test

(iii) Repeatability of error test

(iv) Accuracy Requirements

(v) Voltage Variation Test (-30% to +20%)

(vi) Tamper & Fraud Protection Test : Test to prove compliance to clause 5.14 of section VII.

(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 - 51. 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 out side 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 provide. It shall have independent sealing arrangement. There should be provision of providing meter serial number sticker on box cover and base from inside.

**Colour**:

The front cover of meter box shall be transparent so that connections are visible from out side of the meter box.

**Box Mounting:**

Box shall have minimum 3 nos. holes of 6 mm diameter for fixing the meter box on wall / wooden 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 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 Annexure-II 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 submit 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 O 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 purchase 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 hall 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 curing 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**. Handing 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 approval 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 tentative delivery schedule shall be six months form the date of signing of 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 no sample meters with seals, one no Meter box and strips for HDT test are to be submitted along with type test report with the offer which shall be tested at **reputed NABL accredited Labs like CPRI, Bangalore/CPRI, Bhopal/ERDA, Vadodara at supplier cost.**

The details of HDT strips are as follows:

**1.** **Flat Wise :** Length x Width x Thickness in mm : 78 to 82 x 9.8 to 10.2 x 3.0 to 4.2 mm, No. of Strips : 5 nos.

**2.** **Edge Wise :** Length x Width x Thickness in mm : 110 to 130 x 9.8 to 15 x 3.0 to 4.2 mm, No of Strips : 5 Nos.

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, of 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.

**14All 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.

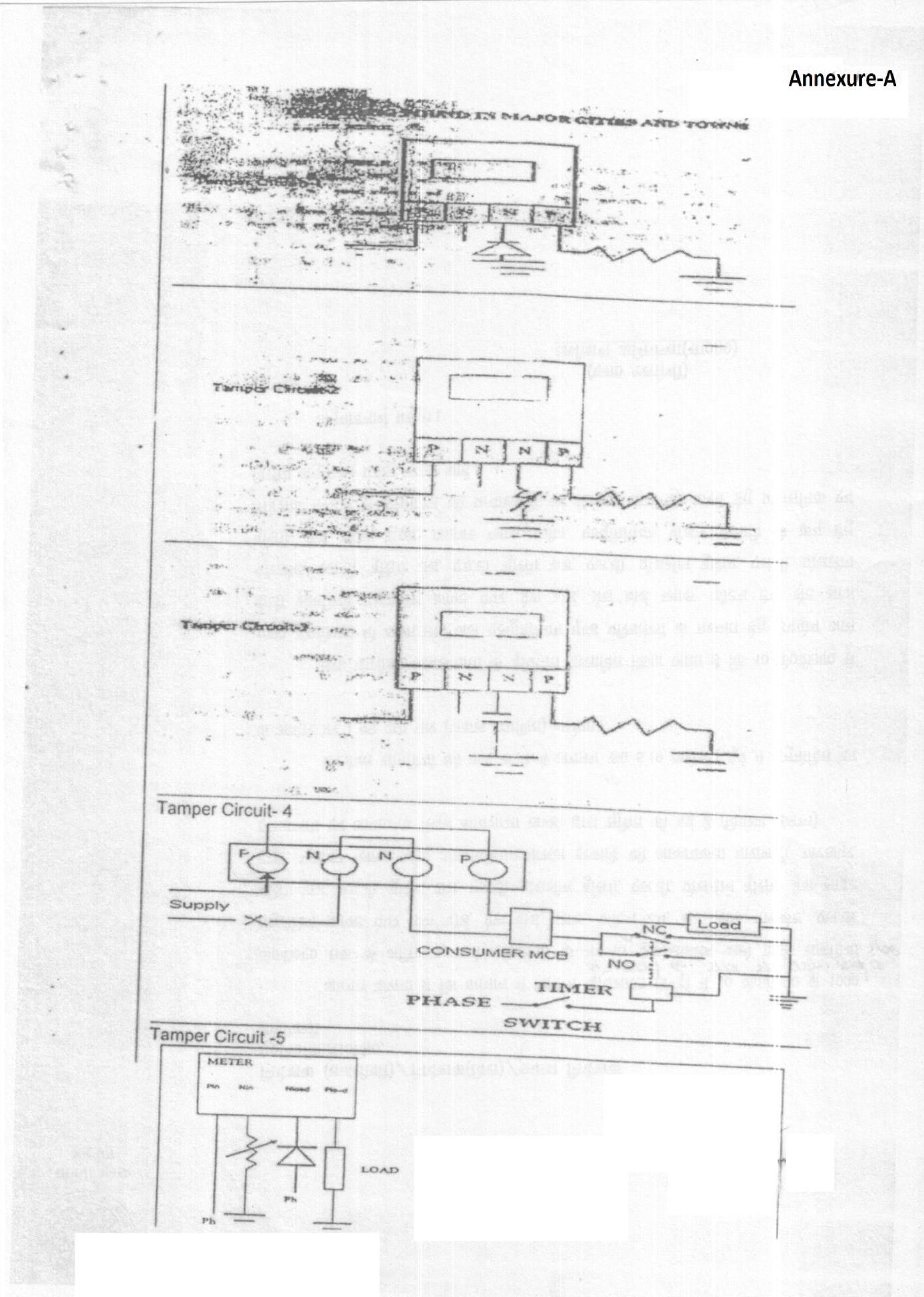
The manufacturers laboratory must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice). The details of testing facilities available for conduction (a) The routine tests and (b) 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.

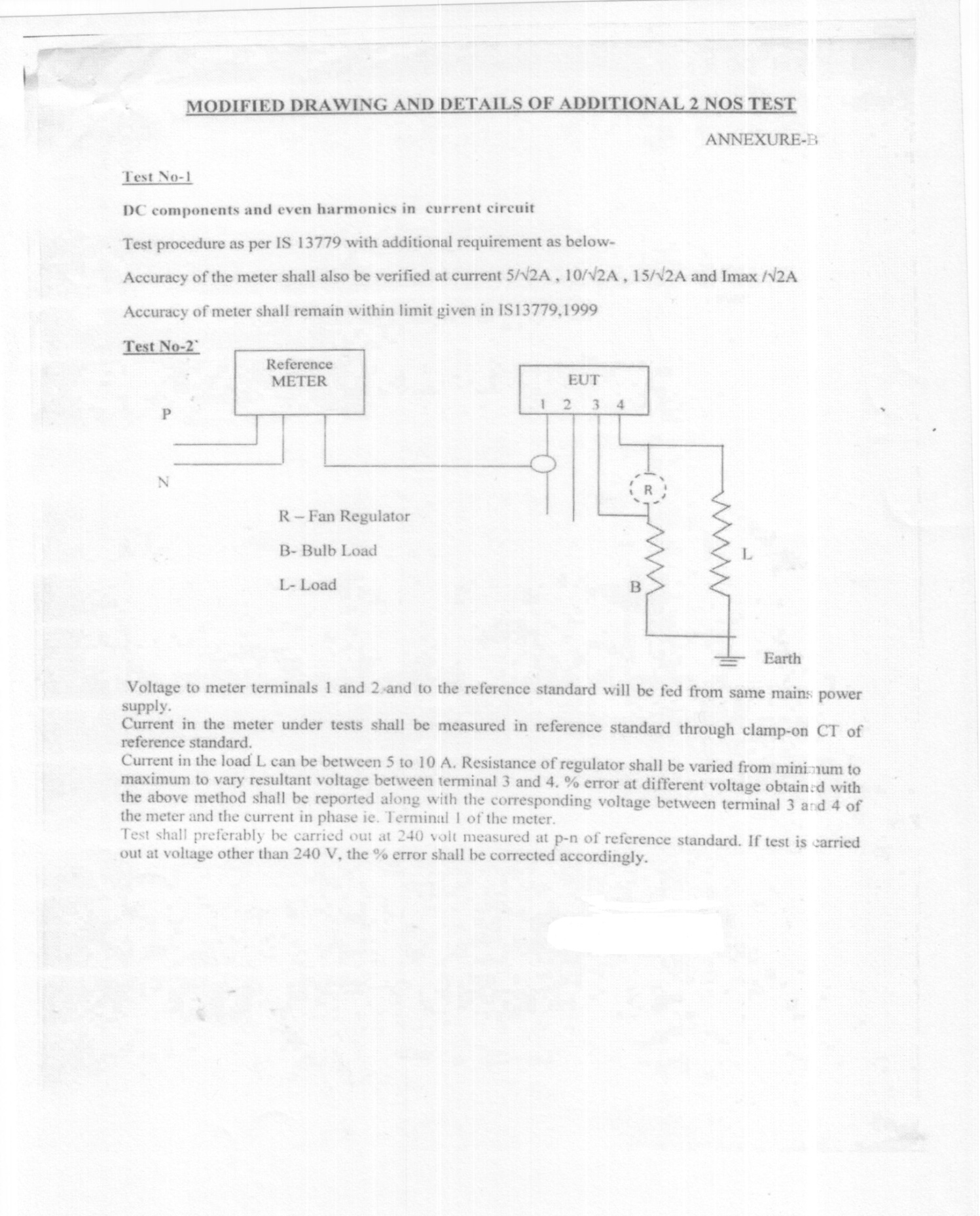
**d.** The bidder shall furnished details of memory used in the meter.

**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.**





GUARANTEED TECHNICAL PARTICULARS OF FOR 1 PHASE 2 WIRE (10-60A) ACCURACY CLASS 1.0 ELECTRONIC ENERGY METER

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Particulars** |  | **Bidders Data** |
| ***1*** | ***2*** |  | ***3*** |
| **1** | Maker's Name | : |  |
| **2** | Make | : |  |
| **3** | Type of Meter/Design designation | : |  |
| **4** | State the year since the design is in vogue | : |  |
| **5** | Standard to which meters conforms | : |  |
| **6** | Class of accuracy | : |  |
| **7** | Rated Current (Amp) | : |  |
| **8** | Rated Maximum current as percentage of basic current | : |  |
| **9** | Rated voltage (volts) | : |  |
| **10** | Rated frequency (Hz) | : |  |
| **11** | Specified operating voltage range | : |  |
| **12** | Limit voltage range of operation | : |  |
| **13** | Reference temperature | : |  |
| **14** | Temperature range of operation  a. Specified operation range  b. Limit range of operation  c. Limit range for storage and transport | :  :  : |  |
| **15** | Relative humidity   1. Annual mean 2. For 30 days these days being spread in a natural manner over the years. 3. Occasionally on other days | :  :  : |  |
| **16** | Power consumption   1. Power consumption in voltage circuit at rated current    1. Active in watts    2. Apparent in VA.   b) Power consumption in current (in VA) at rated current | :  :  : |  |
| **17** | Current that mater is capable of carrying continuously without injury to the meter (Amp.) | : |  |
| **18** | Short time over current capability of the meter | : |  |
| **19** | Percentage minimum current which will start the meter and continue to run thereafter at rated voltage and unit power factor of basic current (% of basic current) | : |  |
| **20** | Type of material along with its thickness or dimensions (in mm.) and details of the important components parts of the meter   1. Case 2. Terminals covers 3. Terminals | :  :  : |  |
| **21** | 1. Size of terminals holes (in mm.) 2. Whether Display Character Height is 10 mm, specify Height in mm. | : |  |
| **22** | No. of earthing terminals provided on the body of the meter, if any | : |  |
| **23** | Whether toughened glass window is provided. | : |  |
| **24** | Whether inductive coupling arrangement to power meter in the absence of power supply provided. | : |  |
| **25** | Meter constant (if any) | : |  |
| **26** | Tamper & Fraud Protection details  State whether as per specification or not?   1. Whether tamper information/ logic have been provided as per specification 2. Whether meter is tamper proof against influence of high magnetic field as per CBIP report 325 and latest amendment. | :  :  : |  |
| **27** | 1. Display type (LCD) 2. No. of digits in display |  |  |
| **28** | 1. Are the parameters as specified in clause of specification available on display 2. Specify other parameters/qty. which may be available on display without any extra cost. |  |  |
| **29** | 1. Is the meter capable of measuring and storing the data as per technical specification. 2. Other information in memory available through CMRI without any extra cost |  |  |
| **30** | 1. Specify, tamper data available on the display of the meter 2. Specify tamper data available through CMRI 3. Whether optical port is compatible with SANDS/ Analogic make CMRI or not |  |  |
| **31** | (i) Details of self diagnostic available as per tech. specification   1. On display, if any 2. On memory   (ii) Whether meter is having Authenticated billing code feature. |  |  |
| **32** | Ceiling arrangement (specify)  Whether ceiling at the following has been provided:-   1. Body of the meter 2. Terminal cover of the meter 3. Ceiling arrangement to be scroll push button. 4. Optical Port | : |  |
| **33** | Overall dimensions of the meter (with tolerance)   1. Height (mm) 2. Width (mm) 3. Depth (mm) | : |  |
| **34** | Total weight of the meter (kg.) with tolerance | : |  |
| **35** | State whether –   1. Load survey capabilities of 60 days have been provided as per technical specification. 2. Time of day zones have been provided or not. | : |  |
| **36** | (1) Meter case transparent as per technical specification.  (2) Meter case is ultrasonic welded.  (3) Terminal Plate cover transparent.  (4) Meter body opening tamper available or not |  |  |

# GUARANTEED TECHNICAL PARTICULARS FOR 1 PHASE METER BOX

|  |  |  |
| --- | --- | --- |
| **S.N** | **Characteristics** | **Bidders Particulars** |
| 1. | Manufacturer’s Name |  |
| 2. | Material used for box body |  |
| 3. | Color of Box  Cover  Base |  |
| 4. | Dimensions of box (L x W x H) |  |
| 5 | Clarence from Meter surface :  Left , Right side : 20 mm  Bottom : 75 mm  Front & back : 10 mm  Top : 35 mm |  |
| 6. | Thickness of Meter box  - Back side (load bearing side) : 2mm  - All other sides : 2mm |  |
| 7. | Display Push Button operating arrangement at cover of the box |  |
| 8 | Provision for Meter reading through CMRI without opening the Box cover. |  |
| 9. | Sealing arrangement  Meter Box  Meter reading port |  |
| 10. | Material withstanding temperature  - Boiling water Test  - Glow wire test at 650 deg. C |  |
| 11. | Inlet & Outlets |  |
| 12. | Suitable for outdoor installation  - IP Class : |  |