

## UTTAR GUJARAT VIJ COMPANY LIMITED

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CIN – U40102GJ2003SGC042906

### TECHNICAL SPECIFICATIONS OF SINGLE PHASE 2 WIRE; 5-30 AMP. FULLY STATIC WATT

### HOUR METERS CLASS 1.0 WITH LCD DISPLAY AND FACILITY FOR DATA DOWN LOADING

#### 1. **SCOPE:**

(a) *This specification covers design, engineering, manufacture, testing, inspection and supply of ISI marked A.C. single phase two wire solid state (static) / fully electronic energy meters of accuracy class 1.0 and current rating 5-30 Amps for single phase with back lit LCD display as per requirement given in this specification.*

*The single phase meter should be single phase two wire, two element type with DLMS/without DLMS capable to record and display energy in KWh and demand in KW for single phase two wire A.C. loads respectively for power factor range of Zero Lag-Unity-Zero Lead, as per requirement given in this specification. Meters should record total energy (fundamental energy + harmonic energy) having facility/capability for recording tamper information in LT 1-phase Consumers.*

(b) *It is not the intent to specify completely herein all the details of the design and construction of material. However the material shall conform in all respects in high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the right to reject any work or material which in his judgment is not in accordance therewith. The offered materials shall be complete with all components, accessories necessary for their effective and trouble free operation of the System for energy measurement. 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.*

*The original manufacturer of LT AC Static Energy Meters who is registered vendor shall only quote against this tender. It is mandatory that in case of Indian manufacturer, the offered meter shall be ISI marked and bidder shall have to furnish*

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*valid BIS certification along with the offer and in case of foreign bidder the meter shall comply either BS standard or standard of International Electro technical Commission, I,e, relevant IEC, shall be marked with the same and bidder must furnish valid BS or IEC certification along with the offer, however the meter must comply this specification.*

**2. STANDARD APPLICABLE:**

*While drawing these specifications, reference has been made to following Indian and International Standard specification. In case certain details are not covered in these specifications, the relevant Indian and International Standard shall be applicable .*

*IS 13779 (1999) : A.C. Static Watt hour meter class 1.0 and Class 2.0*

*IS 9000 : Environment testing*

*IS 12346 (1988) : Specification for testing equipment for A.C. Electrical energy meter.*

*CBIP – No.325 : CBIP guide on static energy meter specifications & testing*

*IEC 62052-11 (2003) : Electricity Requirements (AC) General Requirements, Tests and Test conditions for A.C.Static Watt hour meter for active energy Class 1.0 and 2.0.*

*IEC 62053-21 (2003) : A.C.Static Watt hour meter for active energy Class 1.0 and 2.0*

*CEA Regulation on installation and operation of meters Dtd: 17/03/2006.*

**NOTE :** *Unless otherwise specified elsewhere in this specification the meters shall conform to the latest version available of the standard as specified above. If above IS/IEC reports are amended, reference has to be made to Amended IS/IEC/Report up to the date of tenderization.*

**3. SYSTEM VARIATION :**

**3.1 Voltage range : -30% to +20% of ref. voltage**

**3.2 Frequency : 50 Hz +5.0% to -5.0 %.**

**3.3 Temperature & Temp. co efficient: -10 deg. C. to 70 deg.C. with temp. Coefficient as 0.05**

**3.4 Humidity : 95% (some times approaches to saturation)**

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**4. ELECTRICAL REQUIREMENT :**

**4.1 Standard reference voltage : 240V**

**4.2. Standard Basic Current : 5 Amp.**

**4.3 Rated Max. current : 30 Amp. (600% Ib)**

**4.4 Standard frequency : 50 Hz.**

**4.5 Power consumption of voltage circuit : As per IS –13779(1999),  
IEC 62053-21(2003).**

**4.6 Power Consumption of current circuit : As per IS –13779(1999 , IEC 62053-21(2003)**

**4.7 Resistance to Surge voltage of 1.2/50 micro sec : 10 KV Peak**

**5. GENERAL AND CONSTRUCTIONAL REQUIREMENT:**

**The meter shall comply all general and constructional requirements as per IS 13779 (1999), IEC 62053-21(2003) and latest amendment.**

**5.1 Meter shall be designed and constructed in such a way to ensure especially personal safety against electric shock, effect of excessive temperature, safety against spread of fire and protection against solid objects, dust and water etc. All parts, which are subject to corrosion under normal condition, shall be effectively protected. Any protective coating shall not be liable to damage by ordinary handling nor damage due to exposure under normal working condition.**

**5.2 The meter shall be projection type and dust and moisture proof. The meter base & cover shall be made out of unbreakable, high grade, fire resistant, reinforced Polycarbonate material so as to give it tough and non breakable qualities. The meter body shall be type tested for IP 51 degree of protection as per IS 12063 against ingress of dust, moisture & vermin.**

**5.3 Standard terminal block as per IS: 13779/1999 (amended up to date) shall be provided. Moulded terminal block for current and voltage connections conforming to relevant standard to meet the requirement of terminal connection arrangement shall be provided. The termination arrangement shall be provided with a transparent terminal cover and shall be sealable independently to prevent unauthorized tampering.**

**5.4 All insulating materials used in the construction of the meter shall be substantially non hygroscopic, non ageing and of tested quality.**

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**5.5 All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.**

**5.6 The thickness of material for meter body should be 2.0 mm minimum for polycarbonate material.**

**5.7 The meter should have internal Real Time Clock with the back up of a Lithium maintenance free battery of minimum life of Ten (10) years for operation of the time clock. The Real Time Clock shall be based on Quartz crystal timer so as to make it independent of line frequency variations. The clock shall be factory calibrated. The clock accuracy shall not vary more than  $\pm 3$  min per year and it will be temperature compensated from  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ .**

**5.8 The provision shall be made on the Meter for at least two seals to be put by utility user. However the supplier shall have to supply meters dully sealed with two nos of Polycarbonate seals having supplier's logo and serial numbers.**

**5.9 The meter shall be provided with flashing LED to represent the pulse output for testing the meter by suitable testing equipment. The operation indicator must be visible from the front.**

**5.10 It shall be possible to check the accuracy of active energy measurement of the meter in the field by means of LED output. Resolution of the test shall be sufficient to enable the starting current test in less than 10 minutes and accuracy test at the lowest load shall be completed with desired accuracy within 5 minutes.**

**5.11 CURRENT AND VOLTAGE ELEMENTS :**

**The meter should have either one CT & one shunt OR one shunt & one sensor OR two shunts or two CTS, having CTs with adequate magnetic shielding.**

**5.11.1 For Shunt type meters, the single phase meter shall be based on a E-beam shunt in the phase element and a Current Transformer/Shunt/Hall effect sensor in the neutral element. Alternatively, measurements in both the phase and neutral elements may be done using shunts with proper isolation. However, in case of using one CT the same shall be used in neutral element. The short time current rating shall be as per IS: 13779: 1999.**

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- 5.11.2 PT less design is highly preferred i.e. for power supply to PCB, in place of conventional electromagnetic VTS, use of potential divider is preferred.**
- 5.12 The meter shall also be capable to withstand phase to phase voltage (440V) if applied between phase to neutral for minimum 2 hours.**
- 5.13 In meter, power supply unit should be micro control type instead of control transformer type to avoid magnetic influence.**
- 5.14 The RTC battery & the battery for display in case of power failure should be separate. Battery for the display should be such that (a) In case of power failure, even for the period for six months display can be seen by push button and data can be retrieved through battery mode. (b) Meter should have suitable arrangement to show at least "Cumulative Active Energy KWh" permanent or at an interval of 1 minute during power OFF condition of 18 hours without use of push button.**
- 5.15 Display parameters in the meter should not be accessible for reprogramming at site.**
- 5.16 The measurement by meter shall not get influenced by injection of AC chopped signal / DC signal and harmonics on the terminals of the meter. Complete metering system & measurement shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The meter shall meet the requirements for immunity against continuous magnetic induction as per requirement given in clause no.11.5 of this specification.**
- 5.17 The meter should have facility for data retrieval through optical port using CMRI or Laptop PC. Sealing arrangement for Optical port shall be provided.**
- 5.18 The meter shall record and display total forwarded energy including Harmonic energy in following functions. . ( This is special requirement of DISCOM )**
- (a) Voltage and current both in phase**
- (b) Voltage and current both out phase**
- (c) Voltage in phase and current out phase**

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**(d) Voltage out phase and current in phase**

**Above tests shall be carried out at Ref. voltage, 0.5 I<sub>max</sub> and UPF with 10 % 5th harmonics in voltage and 40% 5th harmonics in current.**

**In all above conditions, meter shall record total energy = 1.04 (± 0.008) times of fundamental energy.**

**5.19 Self Diagnostic Features.**

**The meter shall keep log in its memory for unsatisfactory / nonfunctioning of the following**

**(a) Time and date on meter display**

**(b) All display segments on meter display**

**(c) Real Time Clock (RTC) status in meter reading prints out at BCS end**

**(d) Nonvolatile Memory (NVM) status in meter reading prints out at BCS end**

**(e) Battery status**

**5.20 Bidder shall have to submit predefined copies of all the software's, i.e. meter reading software for CMRI, Base computer software for meter data analysis and technical details etc.**

**5.21 The meter shall have provision to be read, in the absence of power. A backup of suitable capacity be included in the circuit which may provide energy for reading the meter display in absence of main power supply .**

**5.22 The meter shall be software calibrated at factory end and shall be supplied with certificate along with dispatch. However modification of calibration should not be possible at site. The meter should not have any form of mechanical adjustments such as trippots potentiometer etc. for calibration. The meter shall be tested, calibrated and sealed at manufacturer's works before dispatch. Further, no modification of calibration shall be possible at site by any means what so ever. .**

**5.23 Meter shall be capable of withstanding switching and transient surges so as to protect the internal meter circuit.**

**5.24 The minimum dimensions (WidthxHeightxD<sub>e</sub>pth) of meter with -3 mm tolerance are as under.**

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**Basic Meter Part : 110 mm(W)x 115 mm(H)x 75 mm(D)**

**Terminal Cover with Terminal block : 100 mm(W)x 75 mm(H)x 40 mm(D)**

**Display Window : 50 mm(W)x 20 mm(H)**

**The bidder has to submit the Meter drawing along with the bid accordingly.**

**6. METER WITH POLY CARBONATE BASE & COVER**

**6.1. (a) MATERIALS OF BASE/COVER/TERMINAL COVER:**

- *The construction of the meter shall be suitable for its purpose in all respects and shall be given reasonable assurance of continuous performance in all mechanical, electrical and magnetic adjustments. The construction shall be such that the meter is not prone to produce audible noise in use. The meter cover & terminal cover shall be of injection molded in transparent UV stabilized polycarbonate in a natural transparent colour.*
- *The meter base, cover and terminal block cover (ETBC) shall be injection molded and made of unbreakable high grade flame retardant polycarbonate having good dielectric and mechanical strength to ensure high reliability and long life. The construction of the meter shall be suitable for its purpose in all respects. The meter shall be compact & reliable in design & shall be immune to vibration & shock involved in transportation/handling. The entire design and construction shall be capable of withstanding the severe stresses likely to occur in actual service.*
- *Polycarbonate material of only following manufacturers shall only be used:*

<b>a) GE PLASTICS</b>	<b>LEXAN 943A FOR COVER AND TERMINAL COVER</b>
	<b>LEXAN 503R FOR BASE</b>
<b>b) BAYER</b>	<b>GRADE CORRESPONDING TO ABOVE</b>
<b>c) DOW CHEMICALS</b>	<b>-----do -----</b>
<b>d) MITSUBISHI</b>	<b>-----do -----</b>
<b>e) TEJIN</b>	<b>-----do -----</b>
- *The meter base shall be manufactured from high quality industrial grade material viz. Polycarbonate with 10 % glass filled or better which shall meet following properties to ensure higher reliability and long life of the meter case.*

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**Meter base, cover & terminal cover shall conform to the following:**

<b>Sr No</b>	<b>Test</b>	<b>10% Glass filled for meter base &amp; terminal block</b>	<b>Transparent for meter cover &amp; terminal cover</b>
<b>1</b>	<b>UV ageing for 200 Hrs. as per ASTM : G53(CL No. 9.3)</b>	<b>4 Hours UV at 60° C, 4 Hours condensation at 50° C</b>	<b>4 Hours UV at 60° C, 4 Hours condensation at 50° C</b>
<b>2</b>	<b>Boilingwater test(10MIN)</b>	<b>No softening &amp; whitening &amp; No change in colour, shape, size &amp; dimensions</b>	<b>No softening &amp; whitening &amp; No change in colour, shape, size &amp; dimensions</b>
<b>3</b>	<b>Drop Test from 2 MTRS height-only for casing i.e.base + cover + terminal block + terminal cover, (Without inside assembly)</b>	<b>Shall not crack or break</b>	<b>Shall not crack or break</b>
<b>4</b>	<b>Glow wire test IS:11000 (part 2/SEC-1) 1984 OR IEC PUB,60695-2-12</b>	<b>960 ±15° C (For terminal block)</b>	<b>650 ±10° C (For Terminal cover and meter case)</b>
<b>5</b>	<b>Heat deflection Temp.(HDT) HDT/Ae, 1.8MPa edgew (100mm) As per ISO 75/Ae</b>	<b>132° C</b>	<b>125° C</b>
<b>6</b>	<b>Ball pressure test as per IEC-60695-10-2</b>	<b>125°C +/- 2°C</b>	<b>125°C +/- 2° C</b>
<b>7</b>	<b>Flammability Test (a) As per UL 94 or (b) As per IS 11731(Part-2) 1986</b>	<b>VO FVO</b>	<b>VO FVO</b>
<b>8</b>	<b>Minimum Thickness</b>	<b>2.0 mm</b>	<b>2.0 mm</b>

- **The meter manufacturer has to submit test certificate for materials used from reputed Lab/original supplier's lab. for every lot offered for inspection.**
- **The thickness of casing, base & terminal cover shall be minimum 2.0 mm. Sufficient clearance shall be allowed between terminals. Further, the supporting webs between the two terminals of the terminal block should be sufficiently high to ensure that the two Neighboring terminals do not get bridged by dust or it is not possible to have flash over between adjacent terminals of terminal block.**

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- *The terminals shall be of suitable rating to carry 150% of I<sub>max</sub> and made of electroplated (or tinned) brass. For verification the test will be conducted at V<sub>ref</sub>, 150% I<sub>max</sub>, UPF for two hours. After the test no physical damage should occur & % error should not exceed accuracy class of the meter.*
- *All connection screws and washers should be tinned/nickel plated brass. The terminal screws shall not have pointed end at the bottom. All terminals will have two screws. The terminals shall be properly bound in the insulation. Sufficient clearance can be provided between terminals to avoid possible flash over.*
- *The shunt shall be preferably directly terminated on terminal block without using lug. Alternatively, the termination of current wires on the terminal block should be through lugs and washers of proper size. The loop length of the primary current circuit should be kept minimum.*
- *The embossing/engraving/ permanent marking shall be provided on meter base, meter cover and terminal cover as under – ‘UV STABILISED’. ‘UGVCL’ and manufacturer’s logo/ trade name.*

**(b) METER COVER FIXING ARRANGEMENT:**

*At least two sealing screws of Nickel plated steel shall be provided for proper fixing of meter cover. Each sealing screw shall have two independent sealing holes. Two holes should be provided in the head and Two in the bottom portion, so that two separate seals can be provided. The diameter of the hole shall be 2.0 mm and 1.5 mm for the head and bottom portion respectively. The length of the sealing screw shall be long enough to flush with the ground or any other sealing arrangement which will meet our requirement.*

**(c) METER BASE FIXING ARRANGEMENTS :**

*Meter shall have minimum two fixing holes, one at top & other at bottom. The top screw hole shall be provided on back of the meter so that screw head are not accessible after the meter is fixed. Lower hole shall be provided inside the terminal compartment so as to make them in accessible to an unauthorized*

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*person after terminal cover is fixed.*

***(d) SEALING ARRANGEMENT.***

*The sealing screw used for the meter cover shall be fixed up side down so that these are tightened from the rear. The sealing screw shall be BRASS or Nickel plated steel. In addition to the sealing screws provided for the meter cover, there shall be one or two similar tinned brass or nickel plated steel sealing screw for the terminal cover.*

***(e) INSULATION MATERIALS :***

*All insulation materials used in the construction of meter shall be substantially non hygroscopic.*

***(f) PROTECTION OF PARTS :***

*All parts, which are subjected to corrosion under normal working condition, shall be effectively protected against corrosion due to atmospheric condition. The protection coating shall not be liable to damage by ordinary handling or injuriously affected by exposure to air under normal condition of service in actual practice in Gujarat state.*

***(g) SCREW INSULATION :***

*All electrically live screws shall be of heavily tinned brass or nickel plated steel. All other screws shall be electroplated.*

***(g) TERMINAL BLOCK***

*The terminal block shall be of POLYCARBONATE of FR & glass filled quality & shall fulfill requirements: (as per table given under clause no 6.1 (a)).*

***(h) TYPE OF TERMINAL COVER :***

*The Terminal cover shall be transparent, hinged and extended type & shall enclose terminal compartment except for the provision of conductor entry at the bottom for incoming & outgoing leads.*

***(i) LENGTH AND MATERIALS OF TERMINAL :***

*The length of terminal in the terminal block shall be adequate to have a proper grip of the conductor with the help of the screw.*

*The internal diameter of terminal holes should be 4 to 6 mm. The materials of the*

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*terminals shall be of appropriately plated brass.*

**(j) TYPE OF TERMINALS:**

*The terminals shall be suitable to carry rated continuous maximum current and short time overload current & be made of brass. PC ends shall be provided with lugs.*

**(k) TERMINAL SCREWS :**

*The terminal screws shall be of brass and shall not have a thread sizes less than M4 and less than 5 mm dia. The screws shall not have pointed end of threads.*

**(l) CLEARANCE BETWEEN ADJACENT TERMINALS:**

*The minimum centre to centre clearance between the adjacent terminals shall be 13 mm.*

**(m) THE TOP COVER SHOULD BE ULTRASONICALLY WELDED OR break to open type arrangement**

**6.2 NAME PLATE :**

*The meter shall have name plate beneath the meter cover such that the name plate cannot be accessed without opening the meter cover and without breaking the seals of the meter cover and the name plate shall be marked indelibly. The name plate marking shall not fade with lapse of time.*

*The basic marking on the meter nameplate shall be as under :*

- *Manufacturer's name and trade mark*
- *Type designation*
- *Serial number ( Given By UGVCL)*
- *Month and Year of manufacture*
- *Reference voltage*
- *Rated & Maximum Current*
- *Principal units of measurements (KWH)*
- *Meter constant (imp/kWh )*
- *'BIS' Mark (Applicable for Indian meter manufacturers only)*
- *Accuracy Class of meter (class-1.0).*
- *Purchase Order No. & date*

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- Guarantee period :

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- Bar Code identification shall contain details of (i) The make , (ii) Sr no and (iii) Model/type

### 6.3 PRINTED CIRCUIT BOARD

The fully tested double layered glass epoxy shall be used. The latest technology such as hybrid microcircuit or application specific integrating circuit (ASIC) shall be used to ensure reliable performance. The mounting of components on the PCB shall be SMT (Surface Mounted Technology) Type. The electronic components used in the meter shall be of high quality from world renowned manufacturers and there shall be no drift in accuracy of the meter for at least up to Guarantee period. The make/grade and the range of the components should be from the following list.

Sr No	Component function	Requirement	Makes and Origin
1	Current Transformers	If the Meter is with one current transformers as measuring elements. The current transformer should withstand for the clauses under 5&9 of IS- 13779 /1999	ORIGIN CONFORMING TO IS-2705 OR RELEVANT STANDARD.
2	Measurement Chips	The measurement or computing chips used in the Meter should be with the Surface mount type along with the ASICs.	USA: Anolog Devices, Cyrus Logic, Atmel, Philips South Africa :SAMES Japan : NEC
3	Shunt Bimetal	E-beam welded shunts shall be provided in the phase element and CT / Shunt / Hall effect sensor may be provided in the neutral. Alternatively, both the current elements (phase & neutral) shall have E-beam welded shunts with proper isolation.	Redbourn Engg /Isabelle/ Shivalik / NCR
4	Quartz Crystal		AVX, VANLONG, ADVANCED CRYSTAL etc

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5	Memory chips	The memory chips should not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. There shall be security isolation between metering circuit, communication circuit & power circuit.	USA: Atmel, National Semiconductors, Texas Instruments, Philips, ST, Japan : Hitachi
6	Display modules	<p>a) The display modules should be well protected from the external UV radiations.</p> <p>b) The display visibility should be sufficient to read the Meter mounted.</p> <p>c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display ( PIN Type).</p> <p>d) It should be trans- reflective STN type industrial grade with extended temperature range.</p>	<p>Display TEK/KCE/RCL Display /Suzhou heng Xiamen instruments/ Veritronics/ Bona- fide/ Jebon VIZ. Hongkong : Genda Singapore: Bonafied Technologies. Korea: Advantek China : Success Japan : Hitachi, Sony. TIANMA,Haijing, Holtek,</p>
7	Communication Modules	Communication modules should be compatible for the optical port for communication with meter reading instruments.	USA: National , Semiconductors HP, Optonica. Holland/ Korea : Phillips Japan : Hitachi Taiwan: Ligitek
8	Optical port	<p>Optical port should be used to transfer the meter data to meter reading instrument.</p> <p>The mechanical construction of the port should be such to facilitate the data transfer easily. The Optical Port should not be adversely affected by influence of electro magnetic field , Static discharge.</p>	USA: National Semiconductors HP Agilent Holland/Korea : Phillips Japan : Hitachi Taiwan: Ligitek

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9	Power supply	The power supply should be with the Capabilities as per the relevant standards. It should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections	SMPS Type or better
10	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Philips, Texas Instruments, Siemens WELWYN, VISHAY DRALORIC, YAGE O, KOA, R OHM, PHYCOMP, FAIRCHI LD, PHILIPS, VISHAY SEMICOND, TEXAS INSTRUMENT, EP COS, OSRAM, INFINION, NATIONAL SEMICOND etc. Japan : Toshiba , Hitachi, Oki, AVZ or Ricon Korea; Samsung
11	Battery	Chargeable maintenance free guaranteed life of 10 years.	Varta, Tedirun, Sanyo or National, Panasonic, Renata
12	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC/ IS standards.	USA : Philips, Dallas, ST, Xicor Atmel, Motorola, Microchip Japan : NEC or Oki. Taiwan :Prolific Technology Inc.

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13	PCB	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	A class vendor
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Note: The makes of components mentioned in tender specifications are only indicative. The bidder can utilize better or equivalent make of components and they have to submit make of above mentioned components in Schedule:B of technical bid. It is mandatory. The list of components shall be provided by the supplier at the time of Proto as well as Lot inspection.

The physical verification of make of components of meter shall be carried out at discretion of company at any stage(sample,proto,lot).

#### **6.4 DISPLAY OF MEASURED VALUE:**

**6.4.1 The 6 Digit LCD display having minimum 10 mm height for all digits shall be provided. The Push Button for Manual scrolling in addition to Auto scrolling with a persistence time of 10 seconds for each parameter shall be provided.**

**6.4.2 The display shall be permanently backlit LCD. It should be visible in daylight. The decimal units shall not be displayed for Cumulative kWh in auto scroll mode. However it shall be displayed in push button mode for high resolution display for testing.**

**The meters shall have bright LCD Electronic display with back lit. The back lit should not glow during power off condition. The LCD shall be of STN (super twisted nematic type) constructing suitably for temperature withstand of 80 °C (storage) & 65 °C (operation) i.e. (i) When the meter is placed over at a constant temperature of 65 °C for a period of 30 minutes, the character of LCD should not deform. (ii) After keeping the meter at a constant temperature of 80 °C for a period of 30 minutes and when restores at normal temperature, LCD display should work satisfactorily. The LCD display should have a wide viewing angle of 120 °C and up to one meter distance, for clear visibility of the display of the meter reading at distance. Large viewing area with large display icons is preferred. The registered parameters shall not be affected by loss of power. The display shall not be affected by electrical and magnetic disturbances. The meter shall make use of nonvolatile memory capable of storing and retaining all the data required to be stores, without the help of any power source or**

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**battery back up and shall have a minimum retention time of 10 years under un-powered condition. Dot Matrix type LCD display is not acceptable.**

**Note : Bidder shall have to submit necessary test certificate regarding LCD of STN (super twisted nematic) type.**

**6.4.3 The single phase meters shall be capable to measure continuously "Total Active Energy KWh" at all loads and power factors i.e. zero lag unity zero lead. The meter should also have provision for automatic recording of cumulative KWh at 24.00 Hrs on the last day of the month for each calendar month and the same should go to memory.**

**6.4.4 [A] On auto scrolling mode following parameters should be scrolled continually.**

- 1) Date**
- 2) Cumulative Active Energy KWh**
- 3) Past Maximum Demand KW (Maxi. recorded during last two reset )**
- 4) Instantaneous voltage**
- 5) Cumulative Active Energy KWh**
- 6) Past Maximum Demand KW (Maxi. recorded during last two reset )**
- 7) Instantaneous phase current**
- 8) Cumulative Active Energy KWh**
- 9) Past Maximum Demand KW (Maxi. recorded during last two reset )**
- 10) Instantaneous neutral current**
- 11) Cumulative Active Energy KWh**
- 12) Past Maximum Demand KW ( Maxi. recorded during last two reset )**
- 13) Instantaneous active load in Kw**
- 14) Cumulative Active Energy KWh**
- 15) Past Maximum Demand KW ( Maxi. recorded during last two reset )**

**[B] PUSH BUTTON. ( Manual ) Scrolling**

**Following parameters one after another through push button should be provided on the meter display.**

- a) LCD segment check**
- b) High resolution display for total active energy ( KWh ) 1.2345 (for**

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- dial test)*
- c) Date and time*
- d) Serial no. of meter (Given by UGVCL)*
- e) Instantaneous voltage*
- f) Instantaneous phase current*
- g) Instantaneous neutral current .*
- h) Instantaneous active load in Kw*
- i) Cumulative total active energy (KWh)*
- j) Present Maximum Demand KW ( since last reset )*
- k) Past Maximum Demand KW ( Maxi recorded during last two resets )*
- l) Total Cumulative Active Energy for each calendar month for previous six months.*
- m) Tamper wise nos. of count with easily interpretable notations.*
- n) Top cover open*

*If the "Top cover open" tamper occur, C-OPEN should only to be displayed during power ON and OFF both conditions. Display should stuck (i.e. No Scrolling of any parameters.). However, meter should record energy continuously & KWH reading shall be access/available by use of Push button. After five minutes again Display should stuck & C-OPEN should only to be displayed on Display.*

*The meter shall be change over to auto scroll mode 5 mins. after manual operation.*

*6.4.5 Meter should have suitable arrangement to show at least "Cumulative Active Energy KWh" permanent or at an interval of 1 minute during power OFF condition of 18 hours without use of push button.*

*6.4.6 The meter should record Total cumulative KWh reading and KW MD at pre-programmed date and time of the month for minimum last TWELVE calendar months and stored in NVM. Meter shall be capable to record & store daily midnight data for cumulative kwh & it should be available in base computer.*

*6.4.7 The energy meter shall continuously monitor and calculate the average maximum demand for each demand for time interval of 30 minutes and maximum of these in a calendar month shall be stored. There shall be NO Resetting button for MD.*

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**30 years calendar shall be programmed by manufacturer.**

**6.4.8 The meter shall be capable to measure and display (I) Cumulative Total (Fundamental+ Harmonics energy) KWh for tariff billing purpose, Instantaneous KW, Instantaneous Voltage, Instantaneous line current, MD KW, time and date.**

**6.4.9 The maximum demand shall automatically be reset at 24.00 hours of the last day of each calendar month. No reset push button shall be provided.**

**6.4.10 Maximum Demand Integration Period: Integration period for KWMD should be of 30 minutes real time based. However the same shall be programmable through CMRI or Laptop for 15/60 minutes with the help of BCS/CMRI software through authenticated password only.**

**6.4.11 The meter shall also be capable of measuring, monitoring and storing in the memory minimum four (4) zones of time of day electrical quantities for pre-specified periods of the day. However since at present the features of TOD energy measurement are not required the provision shall be made so that the same can be programmed through MRI /PC at site as and when required in the future.**

**6.5 OUTPUT DEVICE:**

**6.5.1 The meter shall have suitable blinking LED test out put accessible from the front.**

**6.5.2 The test out put should be suitable for use with sensing probe used with test bench or Electronic Reference Standard Meter.**

**6.5.3 The test output should also work as operating indicator for meter.**

**6.5.4 Output device shall be suitable for optical scanning for test purpose.**

**6.6 Communication Capability / Communication Port :**

**6.6.1 Optical Port :**

**The meters shall have a galvanically isolated optical communication port as per IEC PACT/ ANSI/ IEC 1107/ provided on the front of the meter to facilitate downloading the billing and history data to a CMRI / Base computer. The offered Common Meter Reading Instrument should work as a two way communicating interface between various make static energy meters and a Base Computer station for the purpose of exchange of data. The Meter Reading Instrument shall be capable of interrogating**

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*with various makes of AC static energy meters when loaded with the corresponding meter's specific software called meter reading instrument programme. The meter reading instrument shall be capable of retrieving data and capable of transferring them to the base computer service centre for energy audit and billing purpose.*

**6.6.2 Meter Reading Instrument (MRI)**

*a. The MRI shall have facility to store maximum nos. of meter's data. The supplier shall indicate nos of meters' data which CMRI could retrieve.*

*b. Further, there should be a facility in CMRI to provide the transfer of meter data to computer through RS 232 or USB port.*

*c. The MRI shall be capable for down loading readings of other makes of meters. The bidder shall give an undertaking to this effect*

*d. The MRI shall have a feature to read multiple meters within the range without pre-programming the meter serial numbers in advance.*

*It shall be responsibility of the meter manufacturer to provide the required software and all the facilities required by the purchaser, to use the MRI for reading and retrieving the data from the meter and to download the data to BC free of cost.*

**6.6.3 Readings to be downloaded with MRI:**

*The meter shall possess a suitable fast reliable communication port for manual / automatic transfer of data from Meter to CMRI. Arrangement in the meter should be such that, in case of failure of power supply, it should be possible to download the data.*

*The MRI shall possess easily replaceable battery and shall be capable of storing data maximum nos. meters at one time. The data transfer rate (from meter to MRI) should be such that the total downloading time (from meter to MRI) shall not exceed 3 Minutes for each meter*

*The CMRI shall possess a specific serial number which cannot be changed. The downloaded data along with date and time stamp of such reading shall remain on CMRI with suitable encryption and it should not be possible to pre-program or manipulate the recorded data on the MRI before downloading the same with the*

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*serial number of MRI on computer. The MRI shall also download the serial number, make of meter, year and month of manufacture of meter. The Supplier shall supply Software (compatible with Windows 2003 and 2007 system and/ or higher) and training, free of cost for the use of software at multiple data collection and billing premises of the utility.*

*After successful downloading of meter data to MRI, an indication on MRI and meter for confirmation of successful data transfer shall be provided. During this period the energy recording should not be affected.*

*Necessary upgrades shall be possible in MRI software and shall be supplied free of cost for downloading simultaneously the existing parameters and any parameters added in future specifications of meters. A copy of operation manual shall be supplied along with each MRI.*

*The Supplier shall provide meter reading protocols free of cost which shall not be complicated and easily understandable by utility officials to introduce compatibility between meters and MRIs of different makes.*

*6.6.4 It should be possible to download the following data from the meter memory through the optical port.*

- i. Serial Number of meter*
- ii. Cumulative total active energy (KWh)*
- iii. Cumulative total Active energy (KWh) for the last 12 calendar months*
- iv. Maximum Demand KW with date & time for last 12 calendar months with 30 minutes integration period*
- v. Maximum Demand KW since last reset*
- vi. Instantaneous voltage*
- vii. Instantaneous phase current*
- viii. Instantaneous neutral current*
- ix. Instantaneous load in Watt/KW*
- x. Daily midnight data for cumulative kwh energy for 12 months*
- xi. The Tamper events like Magnet, Earth load, One line drawl ( neutral missing), neutral Disturbance ( for tamper No. 26 to 28) & reverse current should be*

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*logged with date and time ( Occurrence & Restoration. 20 nos of each event should be recorded.*

*xii. Top cover open tamper indication shall be logged permanently*

*xiii. Status of NVM,RTC,battery & programming count*

**6.7 LED / LCD INDICATORS: Meter should indicate following indicators of size 5 mm.**

*i) LED indicator for Meter calibration (RED)*

*ii) LCD indicator for Current Reverse Indication.*

*iii) LCD indicator for Earth Tamper Indication.*

*iv) LCD indicator for One line drawl ( neutral missing) Tamper Indi.*

*v) LCD indicator magnetic influence Tamper Indication.*

*vi) LCD indicator for top cover open. It should be continuously blinking.*

*The LCD notation must be easily interpretable.*

#### **6.8 SOFTWARES**

**6.8.1 Licensed copies of the following software shall be made available and shall be installed on each HHT or common meter reading instrument (CMRI) and Base computer software (BCS) by the supplier.**

**6.8.2 HHT or Common Meter Reading Instrument (CMRI) Software for reading, downloading meter data... The software shall be user friendly (MSDOS 6.6 or higher version compatible).**

**6.8.3 Windows based user interactive Base Computer Software (BCS) for receiving data from HHT or CMRI and downloading instructions from base computer software to CMRI.**

**6.8.4 Necessary software for loading application program into meter via CMRI.**

**6.8.5 The supplier should ensure that software supplied with this package works properly with HHT or CMRIs of other manufacturers.**

**6.8.6 The downloaded data shall be converted to the ASCII or database file format for easy integration with the existing billing software of GUVNL. It should be user configurable as per selective parameters. It should be group ASCII & scalable.**

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*After successful downloading data either from the meter or MRI, Meter data should be automatic uploaded to BCS without any separate procedure to upload data. Meter List shall be shown on computer Display screen.*

*There shall be provision of filter for finding the particular meter viz. one can find the meter on the basis of date, Month, Sr No, etc.*

#### **6.9 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 data memory location at all time. The meter shall have indication for unsatisfactory /nonfunctioning / malfunctioning of the following:*

*(a) Time and date on meter display*

*(b) All display segments on meter display*

*(c) Real Time Clock (RTC) status in meter reading prints out at BCS end*

*(d) Nonvolatile Memory (NVM) status in meter reading prints out at BCS end.*

*(e) Battery status*

#### **7 ELECTROMAGNETIC COMPATIBILITY AND INTERFERENCE REQUIREMENT**

*The meter shall meet EMI/EMC requirements as specified in the relevant standards and shall also be protected against radiated interference from either magnetic or radio frequency sources. The meter shall be designed in such a way that the conducted or radiated electromagnetic disturbance as well as electrostatic discharge do not damage or substantially influence the meter. The disturbance(s) to be considered are :*

*(i) Harmonics*

*(ii) Voltage dips and short interruptions*

*(iii) Fast transient burst test*

*(iv) External D.C. and A.C. magnetic fields*

*(v) Electromagnetic H.F. fields*

*(vi) Electrostatic discharges & HVHF Field*

*(vii) Radio frequency interference suppression*

#### **8 INSULATION REQUIREMENTS:**

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**8.1 Insulation Resistance.**

*The Insulation resistance between both current circuits and voltage circuit connected together and earth (Frame) shall be more than 5 Mega Ohms.*

**8.2 IMPULSE VOLTAGE:**

*The meter shall withstand 1.2/50 microsecond impulse voltage of peak value 10 KV Peak without any damage in line with Clause 12.7.6.2 of IS 13779:1999. Error at Ib ,Upf before & after will be measured & after the test, variation in % error of the meter shall not exceed 50 % of class of index .*

**8.3 A.C. VOLTAGE:**

*The meter shall withstand 4 KV A.C.Voltage for one minute. This is applicable during lot inspection also.*

**9 ACCURACY REQUIREMENT:**

*9.1 Limits of Error: The meter shall comply all the requirement of limits of error as per IS 13779/99 on all the points mentioned in table no.15 of IS including special test at 0.25 lag & 0.5 lead of UGVCL requirement. % error at 0.25 lag and 0.5 lead is  $\pm 3.5\%$  and  $\pm 2.5\%$  respectively for range from 0.1Ib to I<sub>max</sub> Same tests are to be carried out on neutral circuit also with the procedure and limits as per phase circuits.*

**9.2 Meter Constant:**

*Meter constant shall comply relation between test output and indication in the display with marking on the Name Plate. The manufacturer / bidder shall state necessary number of pulse / count to ensure measuring accuracy of at least 1/10 of the accuracy class at different test points.*

*9.3 Starting: The meter shall start and continue to register at 0.2% of basic current at reference voltage and unity power factor.*

*9.4 Running with no load : This test shall be carried out as per provision of IS 13779/99 or IEC 62053-21 (2003).*

**9.5 Repeatability of error test: ( For Acceptance)**

*Repeatability test at 5% Ib , 10% Ib& Ib at unity power factor as per IS 13779/99 shall be carried out during inspection of lot and the difference of maximum and minimum value should not be more than half of the limit of class of index.*

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**9.6 ELECTRICAL REQUIREMENT:**

**9.6.1 Power Consumption of voltage circuit:** *The power consumption in voltage circuit of meter at reference voltage, reference temperature and reference frequency shall be in accordance with IS –13779 (1999) or IEC 62053-21 (2003).*

**9.6.2 Power Consumption of current circuit:** *The power consumption in each voltage circuit of meter at reference voltage, reference temperature and reference frequency shall be in accordance with IS –13779(1999) or IEC 62053-21 (2003).*

**9.6.3 Auxiliary Power :** *The meter shall draw power for working of electronic circuit from phase & neutral*

**9.6.4 Short Time over current:**

*The meter shall be able to carry short time over current of 30 I<sub>max</sub> for half cycle at rated frequency.*

**9.6.5 Initial start of the meter:** *The meter shall be fully functional within five second after the rated voltage is applied to the meter terminals.*

**9.6.6 INFLUENCE QUANTITIES :**

*The meter shall work satisfactory with guaranteed accuracy as per limit of IS:13779 , IEC 62053-21 (2003) under presence of the following quantities :-*

*(i)External magnetic field (AC,DC,Permanent)*

*(ii)Radio frequency interference*

*(iii)Vibration*

*(iv)Harmonics*

*(v)Voltage fluctuation*

*(vi)Electro static discharge & Electromagnetic high frequency field*

*(vii) DC Immunity*

**Note :**

*The measurement by meter shall not get influenced by injection of AC chopped signal/DC signal and harmonics on the terminals of meter.*

**10. TEMPERATURE RISE:**

**(a) Under normal conditions of use, measuring element and insulation shall not reach**

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*a temperature, which might adversely affect the operation of the meters.*

*(b) With each current circuit of meter carrying rated maximum current and with each voltage circuit (and those auxiliary voltage circuits which are energized for periods of longer duration than their normal time constant) carrying 1.25 times the reference voltage, the temperature rise of the respective parts shall not exceed the value given below over and above an ambient temperature of 50°C.*

*(i) Measuring element : 50°C*

*(ii) External surface of the case : 15°C*

**11 TAMPER PROOFING FEATURE:**

*11.1 Meter shall record correct energy under reverse current condition. The indication of such reverse current shall be provided by way of LCD on Display. Also Meter shall record correct energy during interchanging of main and load terminal wires.*

*11.2 Meter shall record correct energy when load is connected to earth instead of neutral. The indication of such event shall be provided by way of LCD on I Display.*

*11.3 Flashing LED pulse output (with meter constant) for testing shall be provided by way of LED on front panel.*

**11.4 : Tamper Conditions :**

*11.4.1 – The meter shall indicate 28 nos. of Tamper conditions illustrated in the attached drawing.*

*11.4.2 - The meter shall record all energy consumed accurately (i.e. accuracy should be +/- 1.0 % ) under 1 to 21 tamper conditions. Testing of tamper conditions no. 22 to 28 and injection of chopped A.C./Pulsating D.C. in neutral will be done at 240 V, actual current & UPF and for these conditions , the accuracy of meter should be (+) 6% to (-) 4% . Also for the tamper condition no 21 the difference of Phase current & neutral current should be preferably 5% , however bidder may specifically quote their logic for this condition. The error of the meter should be measured only after logging of the tamper condition. For all above tamper conditions, meter display should be continuously ON and output pulse should be available.*

*11.4.4 – The all 28 tamper conditions should be tested for maximum three minutes and at Vref , unity pf and at least 1 amp current . All types of tempers must be logged , if tamper persists for one minute. The restoration time should be also one minute.*

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**11.4.5.- The tamper conditions no. 26 to 28 are pertains to neutral disturbance and for these three tamper conditions, neutral disturbance event should be logged.**

**11.4.6 –Top cover open tamper shall be logged permanently.**

**11.5 The working of Meter under different magnetic influence conditions is as under for Active energy.**

- a) Meter must be immune to the continuous D.C. stray magnetic field of  $67\text{mT} \pm 5\%$ . Method for the testing & obtaining magnetic field should be as per CBIP 325 clause No 5.6.2.1, Table : 17 & its notes.
- b) Meter must be immune to the A.C. stray magnetic field of  $0.5\text{mT} \pm 5\%$ . Method for the testing & obtaining magnetic field should be as per CBIP 325 clause No 5.6.2.3, Table : 17 & its notes.
- c) Meter should be immune to the continuous D.C. abnormal magnetic of  $0.2\text{ Tesla} \pm 5\%$ . In case of if it is not immune than Meter should switch over to 100%  $I_{\text{max}}$ , UPF. Method for the testing & obtaining magnetic field should be as per CBIP 325 clause No 5.6.2.2, Table: 17 & its notes.
- d) Meter should be immune to the A.C. abnormal magnetic of  $10\text{mT}$ . In case of if it is not immune than Meter should switch over to 100%  $I_{\text{max}}$ , UPF. Method for the testing & obtaining magnetic field should be as per CBIP 325 clause No 5.6.2.4, Table: 17 & its notes.
- e) Meter should be immune to the A.C. abnormal magnetic of  $0.2\text{ Tesla} \pm 5\%$ . In case of if it is not immune than Meter should switch over to 100%  $I_{\text{max}}$ , UPF. Method of testing & obtaining magnetic field shall be as under.  
The abnormal A.C. magnetic induction emanating from a circular air cored coil (O.D. 200 mm, I.D. 38 mm, Depth 50 mm, 14 SWG, 20000 ampere-turns) producing  $0.2\text{ Tesla} \pm 5\%$  in the central region of its either surface shall be applied successively to all the surfaces of the meter and under the most unfavourable conditions of phase and direction to determine any abnormality under its influence.
- f) Meter should be immune to permanent magnet of 0.5 T of minimum size 70 x70 x 50 mm. In case of if it is not immune than Meter should switch over to 100%  $I_{\text{max}}$ , UPF.

**Tests at above sr. no.(e) & (f) are special requirement of DISCOM and for testing below mentioned test conditions are applicable.**

In the event of logging of presence of abnormal magnetic induction with date and time, the positive variation of error may be beyond the limit of 4% but not exceeding a value (e) as given in Note 3.2 under Table 17 of CBIP 325, corresponding to nominal registration of the meter at reference voltage, 100% maximum current and  $\cos\Phi=1$ .

During the test(s) no abnormality like movement of digits, flickering/ switching on- off of display abnormal heating and perceptible change of error should occur. After the

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test(s) there should not be any permanent change of error exceeding half the accuracy class index at  $I_{max}$ ,  $\cos\Phi = 1$  and 0.5 inductive and at 5%  $I_b$ ,  $\cos\Phi = 1$ .

**NOTE: Persistence time for occurrence and restoration of magnet event is one minute**

**11.6 The meter shall also be capable of withstanding the effects of Harmonics i.e. the test under the influence of quantities as per clause no 11.2 of Table no 17(iii) of IS 13779/99 and IEC 62053-21.**

**11.7 The performance of meter shall not be affected under the influence of external DC/AC and permanent magnetic field of high intensity as mentioned in clause no 11.5. This test shall be carried out in the Factory premises on each lot offered for inspection. If bidder does not have these facility than these tests should be performed on three samples at any accredited laboratory at the cost of bidder. This test shall also be carried out as per cl no 11.5 on tender sample.**

**11.8 The meter shall not be susceptible to spurious signal / voltage (up to 100%) injected on neutral wire of the meter.**

**11.9 The meter shall also be capable of withstanding DC injection and also meter shall not generate conduct or radiated noise, which would interface with the other requirements. The above shall confirm to requirements as per IS 13779/99. and IEC 62053-21.**

**11.10 DC Immunity : The meter should not saturate on passage of direct current which can cause the meter either to stop recording or record inaccurately as per IS:13779 (latest version). The DC injection will be tested on both the phase and neutral circuit. The procedure and limit for both circuits shall be as per phase circuit.**

**11.11 Measurement of total energy.**

**The meter shall record total forwarded energy i.e. fundamental + harmonics to be used for tariff billing purpose for all conditions mentioned in cl.no.5.18. However, The bidders are requested to enclose certificate of proof in this regard from the reputed Govt. approved lab. viz: CPRI, NPL, ERTL, ETDC & ERDA for Indian bidder and for foreign bidder the certificate should be from recognized**

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**Govt. approved lab. of that respective country. Without the certificate, the offer shall not be considered. In case of non availability of separate display the test for fundamental & harmonics, the test should be done by using pulse method.**

**11.12 Dry heat test. This is the special requirement of UGVCL. The test will be conducted as per the clause no.12.6.1 of IS 13779/99. However, instead of meter in non operating condition the test will be conducted keeping the meter in operating condition at basic current at 0.866 lag at 115% of rated voltage. The other conditions of the test will remain same.**

**11.13 Application of abnormal voltage/frequency :**

**Meter should not be affected/or hanged by non standard equipment like jammer. The accuracy of the meter should not be affected with the application of abnormal voltage/frequency such as spark discharge of approximately 35KV in any/all of the following manner for total 10 minutes:**

- i) On any of the phases and neutral terminals**
- ii) On any connecting wires of the meter**
- iii) Voltage discharge with 10 mm spark gap**
- iv) At any place in load circuit**
- v) Spark on meter body.**

**“After the application of spark discharge meter should operate normally and meter should register the correct energy”**

**11.14 Meter shall record the energy at 100% I<sub>max</sub> when magnetic field of beyond limit is applied OR Immune .**

**11.15 Meter shall record correct energy on reference voltage, actual current & unity power factor in absence of neutral, LCD indication of such tamper shall be provided on display & it shall start recording energy at min.1 Amp.**

**12. GUARANTEE:**

**(i) The meters shall be guaranteed against any manufacturing defect or bad workmanship for a period of at least 5 years from the date of commissioning or 5 & 1/2 years from date of supply, whichever is earlier.**

**(ii) The meter found defective within the above guarantee period shall be**

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*replaced /repaired by the supplier free of cost with transportation within one month of the receipt of intimation.*

**13. OTHER CONDITIONS:**

**13.1 Ordered quantity of meter are to be supplied in stipulated time.**

**13.2 The Inspection call shall be given after conducting all acceptance tests and the copy of routine test certificates shall have to be submitted along with each meter to be supplied in lot. Each lot shall be inspected at firm's works prior to dispatch of materials or as the case may be. In case of foreign bidder, necessary testing facilities in India shall be provided by bidder for inspection of lot. The materials shall not be dispatched without inspection.**

**14. DEMONSTRATION:**

*The purchaser reserves the right to ask for the demonstration of the equipment offered at the purchaser's place prior to qualifying the offer or placement of order.*

**15. SUBMISSION OF SAMPLE AND TEST CERTIFICATE:**

**15.1 SAMPLE**

**: The supplier shall have to submit four samples of meter along with bid documents.**

*Please note that the samples submitted shall be tested at third party Govt. Approved lab. at ERDA, or any other Govt. approved /NABL accredited laboratory decided by the company for the following tests as per IS 13779/99, IEC 62053-21 (2003) and as per UGVCL specification, wherever specified.*

- 1. Insulation resistance test as per IS 13779**
- 2. AC high voltage test method as per IS 13779 but shall be taken at 4 KV for one minute.**
- 3. Impulse voltage test at 10 KV as per cl .no. 8.2 of specification.**
- 4. 35 KV Test as per cl no. 11.13 of Specification**
- 5. Test for influence of AC / DC magnetic field as per cl no. 11.5 of specification.**
- 6. Test for DC injection in both phase and neutral cl no. 11.10 of specification.**
- 7. Dry heat test as per cl no. 11.12 of specification.**
- 8. Test for total energy i.e. fundamental + harmonics as per Cl. No.5.18 of specification.**

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9. ***Test for influence of quantities as per IS 13779***
  10. ***Test of no load condition as per IS 13779***
  11. ***Test of starting condition at 0.2 % of basic current as per specification***
  12. ***Test for limit of error as per cl no. 9.1 of specification***
  13. ***Interpretation of test results, if required***
  14. ***Test for meter constant as per IS 13779***
  15. ***Test of repeatability of error as per cl no. 9.5 of specification***
  16. ***Test of power consumption as per IS 13779***
  17. ***Test of Short time over current test as per IS 13779***
  18. ***Test of terminals for withstanding 150 % I max as per Specification for Two hours***
  19. ***Test for withstanding phase to phase voltage (440V) between phase to neutral for minimum two hours as per cl no. 5.12***
  20. ***Verification of Display parameters, meter dimensions and Functional requirement***
  21. ***Tamper condition tests 1 to 28 as per cl no. 11.4 of specification, top cover open tamper, injection of chopped A.C./Pulsating D.C. in neutral***
- 15.2 ***Sample meters will have to be submitted to ERDA – OR any NABL accredited approved lab ( Decided by UGVCL) for testing of tests mentioned in cl.no.15.1 as per relevant standard and as per tender requirements. In event of failure of the sample during any of the tests the offer will be considered as “REJECTED”. However, the decision of the Company shall be final and binding to all the bidders.***

**16. TYPE TEST CERTIFICATE:**

***The supplier shall have to submit all type test certificates from the Govt. approved/ NABL Accredited laboratory viz. CPRI, ERTL, ETDC, NPL, ERDA etc. for Indian bidder and for foreign bidder the certificate should be from recognized Govt. approved lab. of that respective country, as per IS No.13779 /1999 or IEC 62053:21 as the case may be along with bid. After opening of Technical Bid, no type test certificates shall be accepted. The type tests having been conducted on the sample meters, not older than***

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**7 (seven) years from the scheduled date of opening of the tender. Without above type test certificate the offer shall not be considered. UGVCL reserves right to select randomly one meter from the offered lots for inspection for its type test and if meter during type test found failed then either order placed shall be cancelled and supplier has to collect all the meters at its cost for the supplied meters or shall have to replace all supplied meters at their cost after manufactured and successful type test within time frame given by the UGVCL & in this case cost of the type test will be borne by supplier.**

**17 INSPECTION:**

**A. For Proto type samples**

**Following tests are to be carried out at supplier's works during inspection of Proto type samples. The firm has to assure for testing facility for following tests at the time of offering the inspection call.**

- 1. Insulation resistance test as per IS 13779**
- 2. AC high voltage test method as per IS but shall be taken at 4 KV for one minute.**
- 3. 35 KV Test as per cl no. 11.13 of Specification**
- 4. Test for influence of AC / DC magnetic field as per cl no. 11.5 of specification.**
- 5. Test for DC injection in both phase and neutral cl no. 11.10 of specification.**
- 6. Test for total energy i.e. fundamental + harmonics as per Cl. No.5.18 of specification**
- 7. Test for influence of quantities as per IS 13779**
- 8. Test of no load condition as per IS13779**
- 9. Test of starting condition at 0.2 % of basic current as per specification**
- 10. Test for limit of error as per cl no. 9.1 of specification**
- 11. Interpretation of test results, if required**
- 12. Test for meter constant**
- 13. Test of repeatability of error as per cl no. 9.5 of specification**
- 14. Test of power consumption as per IS**
- 15. Test of terminals for withstanding 150 % I max as per Specification for Two**

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*hours*

- 16. Test for withstanding phase to phase voltage (440V) between phase to neutral for minimum two hours)as per cl no. 5.12*
- 17. Verification of Display parameters, meter dimensions and Functional requirement*
- 18. Tamper condition tests 1 to 28 as per cl no. 11.4 of specification, top cover open tamper, injection of chopped A.C./Pulsating D.C. in neutral*
- 19. Dry heat test at any NABL accredited lab on one proto type sample as per clause no. 11.12 of the specification.*

*B Acceptance tests : The acceptance tests as stipulated in CBIP (with latest amendments)/IS/IEC shall be carried out by the supplier in presence of purchaser's representative at their works. The following tests are to be carried out during regular inspection of each lot offered for inspection.*

- 1. Insulation resistance test as per IS*
- 2. AC high voltage test method as per IS but shall be taken at 4 KV for one minute.*
- 3. 35 KV Test as per cl no. 11.13 of Specification*
- 4. Test for influence of AC / DC magnetic field as per cl no. 11.5 of specification.*
- 5. Test for DC injection in both phase and neutral cl no. 11.10 of specification.*
- 6. Test for total energy i.e. fundamental + harmonics as per Cl. No.5.18 of specification. (5<sup>th</sup> Harmonics)*
- 7. Test for influence of quantities as per IS*
- 8. Test of no load condition as per IS*
- 9. Test of starting condition at 0.2 % of basic current as per specification*
- 10. Test for limit of error as per cl no. 9.1 of specification*
- 11. Interpretation of test results, if required*
- 12. Test for meter constant as per IS 13779*
- 13. Test of repeatability of error as per cl no. 9.5 of specification*
- 14. Test of power consumption as per IS 13779*
- 15. Test of terminals for withstanding 150 % I max as per Specification for two*

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**Hours**

16. **Test for withstanding phase to phase voltage (440V) between phase to neutral for minimum two hours)as per cl no. 5.12**
17. **Verification of Display parameters, meter dimensions and Functional requirement**
18. **Tamper condition tests 1 to 28 as per cl no. 11.4 of specification, top cover open tamper, injection of chopped A.C./Pulsating D.C. in neutral**

**Note :**

**The measurement by meter shall not get influenced by injection of AC chopped signal/DC signal and harmonics. The facility for suitable testing of the same shall be made available for inspecting officer at the time of lot inspection and acceptance testing. Meter should record energy with maximum error of (+) 6% to (-) 4% on Injection of DC (+) ve & DC (-) ve in neutral & injection of chopped AC in neutral. Tests in this respect will be conducted for chopped AC injection & steady DC injection. DC voltage will be rectified from a single phase power supply. Circuit diagrams for testing are enclosed at Annexure II & III. The meter should record energy in above conditions at ref. voltage, actual current & UPF. Also this event should be logged as Neutral Disturbance (ND).**

**During Inspection of each lot offered, the meter shall be tested for acceptance test as per IS 13779 (1999) and as per UGVCL specification. However, this does not relieve the supplier of his responsibility to replace the meter, which are found defective during individual meter testing or found defective in field services.**

**The tests shall be carried out at suppliers works (in case of non availability of facilities for the test specified as above , the test shall be carried out at Govt. Approved Lab. at suppliers cost viz, CPRI, NPL, ERTL,& ERDA.) or mutually agreed upon, during inspection of each lot . Minimum lot to be offered should be 10000 nos. or the ordered total quantity whichever is less. During the lot offered the meter shall be selected at random as per IS 4905 and as per IS 13779/99 (Annexure H). Failure of meter as specified in the criteria of Annex H and failure of any meter in the test specified herein above, the lot shall be rejected.**

**Routine Tests : Each and every meter of the offered lot shall undergo the routine**

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*tests as well as functional tests as per IS:13779/1999 .*

*The firm shall produce Test reports for the following tests for each & every meter in the form of CD with each offered lot.*

*(a) AC High Voltage test*

*(b) Starting and No load tests.*

*(c) Insulation Resistance Test.*

*(d) Limits of error Test.*

**18. TESTING AND MANUFACTURING FACILITIES:**

**TESTING FACILITIES.**

*The Bidder shall have testing facilities for carrying the various tests specified ( as above) for Proto type samples as well as lot inspections to ensure accurate calibration as per IS:13779(1999),IEC 62053-21. Manufacturer should have fully automatic computerized meter test bench with printer & static source for carrying out lot testing during inspection. The firm shall have dust proof & air conditioned assembly & testing hall. Also all the equipment shall be calibrated from Govt. approved/NABL accredited laboratory.*

**MANUFACTURING ACTIVITIES :**

*(A) The bidder shall have own facilities or have assured access through hire, lease or sub contractor of SMT pick & place machine & re flow solder process. However the party should have their own proper quality control system for electronics components provided in PCB Assy. if PCB get done with outside prominent agency.*

*(B) Quality shall be ensured at the following stages:*

*(i) At PCB manufacturing stage, each board shall be subjected to computerize testing bare board testing.*

*(ii) At insertion stage, all components shall undergo computerized testing for conforming to design parameters and orientation.*

*(iii) Complete assembled and soldered PCB shall undergo functional testing using Automatic Test Equipments (ATES).*

*(iv) Supplier has to see that prior to final testing and calibration, all meters shall be*

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*subjected to ageing test (i.e. Meters will be kept in ovens for 72 hours at 55 deg C temperature and atmospheric humidity condition. After 72 hours meters shall work accurately) to eliminate infant mortality.*

*(v) Assembly & testing of meters shall be carried out in dust proof & air conditioned environment.*

*(vi) The bidders shall submit the list of all imported and indigenous components separately used in meter along with the offer.*

*(C) Bought out items.*

*A detailed list of bought out items, which are used in manufacturing of the meter shall be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by them in respect of the bought out items. However, at the time of offering the lot, the list of bought out items should be submitted, components of the make mentioned in the list shall be preferable and due weightage shall be given. UGVCL reserves right to select any of the meters from any of the lot offered and give it to Govt. approved laboratory for conforming the same and if it is differing, the lot /order will be rejected /cancelled as decided by the UGVCL.*

**19. AUDIT TESTING :**

*From any dispatched lot, eight (8) nos. of meters shall be randomly selected jointly with supplier & sent for audit testing at any NABL Lab. decided by UGVCL & on receipt of test reports acceptability of lot will be decided. Following tests are to be carried out during the audit testing.*

- 1. Insulation resistance test as per IS 13779*
- 2. AC high voltage test method as per IS but shall be taken at 4 KV for one minute*
- 3. Test for influence of AC / DC magnetic field cl no. 11.5 of specification.*
- 4. Test for total energy i.e. fundamental + harmonics as per Cl. No.5.18 of specification*
- 5. Test for influence of quantities as per IS 13779*
- 6. Test of no load condition as per IS 13779*

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7. ***Test of starting condition at 0.2 % of basic current as per specification***
8. ***Test for limit of error as per cl no. 9.1 of specification***
9. ***Test for meter constant as per IS 13779***
10. ***Test of repeatability of error as per cl no. 9.5 of specification***
11. ***Test of power consumption as per IS 13779***
12. ***Tamper condition tests 1 to 28, top cover open tamper, injection of chopped A.C./Pulsating D.C. in neutral (verification on one sample) as per Annexure-II & Annexure-III.***

**20. PRE QUALIFICATION CONDITIONS :**

***Bidder shall have pre-qualification conditions specified as per Annexure I . The bidder shall not be considered if any of the above pre qualification conditions are not met. The bidder shall have to submit this Annexure duly filled and supported by relevant documentary proof for the details furnished.***

**21. QUALITY ASSURANCE:**

***21.1 The manufacturer shall have a comprehensive quality assurance program at all storages of manufacture for ensuring products giving reliable, trouble free performance. The bidder shall furnish with their offer a comprehensive Quality Plan covering all aspects of the design, procurement, assembly, testing etc for purchaser evaluation along with a detailed manufacturing flow diagram. The QP shall also give details of the quality control procedures, documentation, certification available / being practiced by the manufacturer and their major suppliers/ sub suppliers.***

***21.2 The design life of the meter shall be minimum 20 years and to prove the design life the firm shall have at least the following quality Assurance Plan :***

***(i) The factory shall be completely dust proof.***

***(ii) The testing rooms shall be temp. and humidity controlled as per relevant standards.***

***(iii) The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.***

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***(iv) Power supplies used in testing equipment shall be distortion free with sinusoidal, waveforms and maintaining constant voltage, current and frequency as per the relevant standards.***

***(v) During the manufacturing of the meters the following checks shall be carried out.***

***(a) Meter frame dimensions tolerances shall be minimum.***

***(b) The assembly of parts shall be done with the help of jigs and fixtures so that Human errors are eliminated.***

***(c) The meters shall be batch tested on automatic, computerized test bench and The results shall be printed directly without any human errors.***

***21.3 The Bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.***

***(i) Statement giving list of important raw materials, names of sub suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials.***

***(ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.***

***(iii) List of manufacturing facilities available.***

***(iv) Level of automation achieved and list of areas where manual processing exists.***

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

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

***(vii) The manufacturer laboratory must be well equipped for testing of the***

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*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 conducting (a) The routine tests and (b) Acceptance tests shall be furnished with the bid.*

*(viii) Organization structure of the works with details of QA set up in overall work flow.*

*(ix) Copy of system manual showing QAP as actually practiced at works.*

*(x) List of raw materials and critical components (ASIC chip, crystal clock, memory register chip, LCD etc) with their suppliers.*

*(xi) Stage inspection of product before final testing.*

*(xii) Procedure adopted for in situ testing of PCBs, after placement of SMT component, for quantitative parametric variation of tolerance.*

*(xiii) Testing and calibration facility with manpower data of bench operators.*

*(xiv) Sample copies of test certificate of bought out components.*

**22. PACKING:**

*Each meter shall be packed in suitable mode to ensure safe and eco environmental friendly use. The meter shall have in plastic paper cover. 20 to 25 such single phase meter. cases shall be again packed in box having holding hooks of Nylon or any other arrangement. one No. of Meter manual to be provide in each master cartoon box containing 10 to 20 Nos. of meters).*

**24. SCHEDULES :**

*The bidder shall submit the following Schedules (as per standard format) which are part of the specification :*

*Schedule – A: Guaranteed Technical Particulars.*

*Schedule – B : Source of material and place of manufacturing, testing and inspection.*

*.X.X.X.X.X.X.*

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**SCHEDULE -A****GUARANTEED TECHNICAL PARTICULAR OF AC SINGLE PHASE STATIC KWH METER**

<b>Sr.No</b>	<b>Particulars</b>	<b>Min. requirement</b>	<b>As per firm offer</b>
1	Name of manufacturer	-	
2	Standard applicable	IS:13779/IEC:62053-21/ CBIP Tech. Report No.-325	
3	Type /Model no. of Meter	-	
4	Meter with DLMS/ without DLMS		
5	Rating	5-30 Amp.	
	i) Accuracy class	Class-1	
	ii) Rated voltage	240V, -30% to + 20%	
	iii) Rated Current	Ib=5 Amp. I <sub>max.</sub> = 30 Amp.	
	iv) Rated frequency	50 Hz. +/-5%	
	v) Power factor	90 Deg. lag to unity to 90 Deg. lead.	
6	Cut off voltage (at which meter stop working)	-50% or less of rated voltage	
7	Relative humidity	95% (some times approaches to saturation)	
8	Ref. Temperature	27 deg. C.	
9	Temperature range of operation	-10% deg. C to 70 deg.C.	
10	Drift in accuracy of measurement with time	No Drift in accuracy in measurement with time	
11	i) Continuous current rating (Amp.)	30 Amps	
	ii) Running with no load & at 115% voltage	No creeping	
12	Short time over current for one half cycle at rated frequency.	30 I <sub>max.</sub>	
13	Starting current (min) at which meter shall run & continue to run.	0.2% of I <sub>b.</sub>	
14	Power loss at rated frequency & reference temperature		

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	a) Current Circuit at rated current.	As per IS-13779/IEC 62053-21(2003)	
	b) Voltage circuit at rated current	As per IS-13779 /IEC 62053-21(2003)	
15	Type of material used		
	a) Meter cover - Material	Polycarbonate	
	b) Meter base-Material	Polycarbonate with 10 % glass filled or better	
	c) Terminal Block – Material	Polycarbonate	
	d) Terminal cover - Material	Polycarbonate	
	e) Screw I) Material ii) Size	Nickle Plated – Brass M-4 with head of 5mm dia.	
16	Center to Center clearance between adjacent terminals	13 mm (minimum)	
17	Transducers		
	i) Input ( Cl. No. 5.11.)	CT/shunt ( in phase) and CT/Shunt/hall sensor (in neutral)	
	ii) Output	LCD display (Backlit) with NVM.	
18	Fixing/sealing arrangement		
	i) Fixing of meter	2 fixing holes (one at top & one at bottom under terminal block)	
	ii) Sealing of meter cover to Base	2 nos., tightening from rear	
	iii) Sealing of terminal cover	One	
19	Type of hinged un detachable terminal cover	To be mentioned	
20	Performance of meter in tamper conditions ( 28 Conditions)		
	i) Phase-neutral interchanged	Should work within specified accuracy and shall record correct energy	
	ii) Main & load wire are interchanged	-do-	
	iii) Load is not terminated back to meter & current is drawn through local	-do-	

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	earth fully or partially		
	iv)Indication on above tamper conditions	LCD indication	
21	Suitability of meter to sustain over voltage i.e .phase to phase voltage injected between phase & neutral.	Should sustain	
22	Size of calibration LED & Colour	5 mm for Meter calibration <b>(Red)</b>	
22-A	LCD indicators for different tamper conditions as per Cl no. 6.8	1. Reverse Current 2. Earth tamper 3. Neutral Missing 4. Magnet tamper 5.Top cover open	
23	Meter constant (Impulse / kwh)	To be specified by supplier	
24	Electromagnetic compatibility (EMI/EMC severity level)	As per IS 13779/99	
25	Effect on accuracy of external magnetic field & harmonics	Should work within accuracy as per specification	
26	Effect of accuracy in tamper conditions	Should work within accuracy.	
27	Fixing arrangement of name plate	Metallic/non metallic name plate riveted in front	
28	Approximate weight of meter	To be mentioned	
29	Minimum Dimensions of meter (with -3 mm tolerance)		
	Basic Meter Part	110 mm(W)x 115 mm(H)x 75 mm(D)	
	Terminal Cover with terminal block	100 mm(W)x 75 mm(H)x 40 mm(D)	
	Display Window	50 mm(W)x 20 mm(H)	
29	Type of Mounting	Projection type	
30	Manufacturing activity (Cl. No.18)		
	i)Whether mounting of components on PCB shall be SMT type	SMT type and ASIC technology	
	ii)Whether quality assurance plan submitted	Required to submit	

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31	Testing facility ( Cl no. 18 of specification)	Confirmed by the bidder	
32	a. Whether offered meter type tested as per IS:13779/99 or IEC 62053-21 and as per the requirement of specification. (indicate name of laboratory / Ref. of report no. and date.  b. Certificate for (DC influence test of 0.5 tesla and total energy test i.e. fundamental + harmonics) is enclosed or not?	<b>Name of Lab.      Type Test Report</b>	<b>Ref. of page no.of offer</b>
33	Guarantee (cl.no.12 of specification)	Confirmed by the bidder	
34	BIS license No.& date with its validity for ISI certification mark on meter	To be mentioned	
35	ISO accreditation no. & date with its validity	To be mentioned	
<b>36</b>	<b>Past experience</b>	<b>Copies of order to be enclosed</b>	
	<b>Type of meter      Order No. &amp; date      Quantity      Name of SEB/Power utility</b> i) Order received up to date of submission of offer ii) Quantity supplied up to date of submission of offer (Note – Copy of order be enclosed specifically indicating rating of meter) <b>In qualification criteria qty. mentioned in the order shall only be considered.</b>		
37	Other parameters/features not covered in the above GTP	Shall conform to specification of IS-13779/IEC:62053-21 & CBIP technical report No-325	
38	Tamper Conditions as per Specification	Must be fulfilled	

Certified that all the information / parameters indicated above exist in the meter offered by us and shall stand all the tests specified above within the variation of current / voltage frequency and climatic conditions specified therein.

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**SCHEDULE – B****SOURCE OF MATERIAL AND PLACES OF MANUFACTURING, TESTING AND INSPECTION**

Sr. No	Item part	Name of manufacturer	Place of manufacturer	Place of testing and inspection	Source of procurement of material not manufactured
1	Current Transformers				
2	Measurement Chips				
3	Shunt Bimetal				
4	Quartz Crystal				
5	Memory chips				
6	Display modules				
7	Communication Modules				
8	Optical port				
9	Power supply				
10	Electronic components				
11	Battery				
12	RTC & Micro controller.				
13	PCB				

**Note: Supplier should ensure that components of above mentioned make shall be utilized in tender sample & prototype samples. It is also ensured that in entire supply of meters, make of components shall not be differed from make used in proto type sample.**

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SIGNATURE OF BIDDER

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**ANNEXURE-I****PRE QUALIFICATION CONDITIONS FOR SINGLE PHASE STATIC METERS**

Sr.No.	Particulars	Remarks
1	Bidders must have produced/ executed order of tendered item to any SEBS/power utility company in last 3 years. The bidder should submit the order copies along with their Bid as evidence.	Yes/No
2	Bidders must have valid ISI license	Yes/No
3	Bidder preferably possesses ISO 9001 certification.	Yes/No
4	Bidder shall be manufacturer of static meters. Offer from traders / agents are not acceptable	Yes /No
5	Bidder shall have ISI license for similar design product and/or type test certificate for all the type tests as per IS-13779 or IEC-62053 from International or from Indian Govt. approved lab	Yes/No
6	Bidder shall have to submit type test report for total energy test and AC/DC magnetic field as per specifications clause no.5.18 and 11.5. respectively from Govt. approved lab.	Yes/No
7	Bidders shall have dust free & air conditioned environment for assembly as well as testing.	Yes/No
8	Bidders shall have automatic computerized test bench for lot testing of meters and oven for ageing test. The document evidence is to be attached along with the bid.	Yes/No

SEAL &amp; SIGNATURE OF BIDDER

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**BIDDERS ARE REQUESTED TO READ THE FOLLOWING AS THE PART OF TENDER TECHNICAL SPECIFICATIONS DOCUMENT.**

[A] As per tender technical specification and tender document if tender sample (s) shall have to be submitted the following conditions are mandatory.

[1] The sample (s) submitted shall have ISI marking as well as relevant IS Number.

[2] The Sample (s) not complying the above condition shall not be tested and shall be rejected and no further correspondence shall be make in this regard.

[B] At the end of the tender technical specification, following paragraph should be added and read as under.

The material supplied shall be conforming to Indian Standard Specification (except DLMS compliance, if any) and also with ISI marking and even after inspection of the lot, if the material received at site is found without ISI marking , the lot shall be rejected and no further correspondence shall be entertained in this regard.

**[C] Security Seal**

In addition to 2 Nos. of polycarbonate seals, further 2 Nos. of tamper proof void seals are to be provided on the Meter body in such a way that both the side covers shall be sealed by the tamper proof void seals. The tamper proof void seals to be provided on Meters shall be as per the following specification:

[1] Size of the seal -- 3 x 1 inches.

[2] The seal should be digitally printed on white VOID film having UV destructive inks printed with thermal resin ribbon technology.

[3] The seal should be water proof and should withstand all the weather conditions. The seal should have adhesive of sufficient strength to avoid peeling off under extreme temperature and environmental conditions.

[4]The seal should be sticker type seal and applied on both the side of the Meter which connects the body and the box.

[5]If some one lifts the seal, "VOID" impression should be transferred on the meter and if this is applied back, "VOID" impression should be readable from the surface of the seal.

[6]The disturbed portion of the seal should glow under UV light if the seal is disturbed from any part.

[7]Barcodes of serial numbers should be printed on the seals and the barcodes should be readable with a barcode scanner.

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[8]The seals should have continuous variable serial numbers along with security codes of last three digits of serial numbers printed in black and the same serial numbers alongwith code of serial numbers shall also be printed in a vertical semi circular shape which should be visible only under Ultra-violet (UV) light.

[9]Two security cuts should be given on the seal on both the sides, and if some one tries to lift the seal it should tear off from the security cuts. The security cuts should be made with a computer controlled plotter which should put the security cuts on the same position on each seal.

[10]The name of the supplier and supplier logo along with the security warning or any other information in any language as given by the company should be printed on the seal.

[11]There should be a provision of incorporating officers' signature on the seal as given by the company.

[12]If some one tries to remove the seal by allying heat, the printing should get disturbed and the shape of the seal should change if more heat is applied.

The seals to be used for sealing of Meters are to be fixed after inspection is over.

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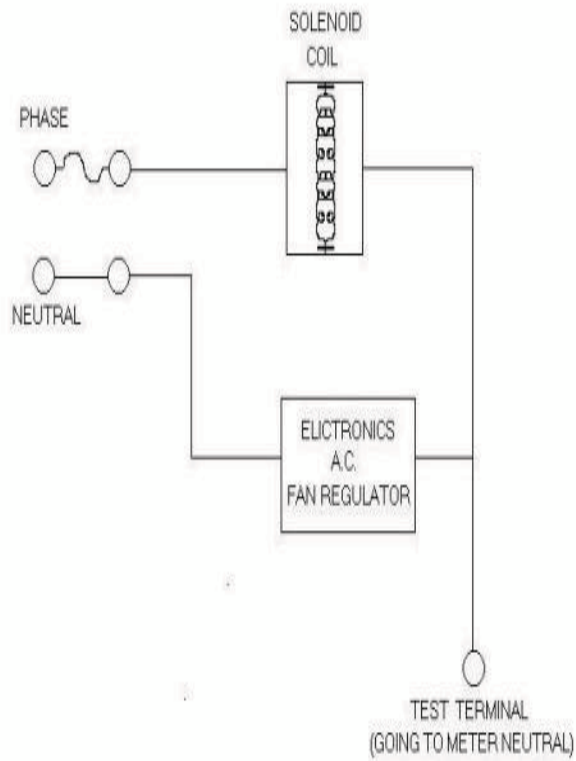
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ANNEXURE-II



CIRCUIT DIAGRAM FOR TEST JIG TO INTRODUCE CHOPPED A.C. IN NEUTRAL

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**ANNEXURE-III**

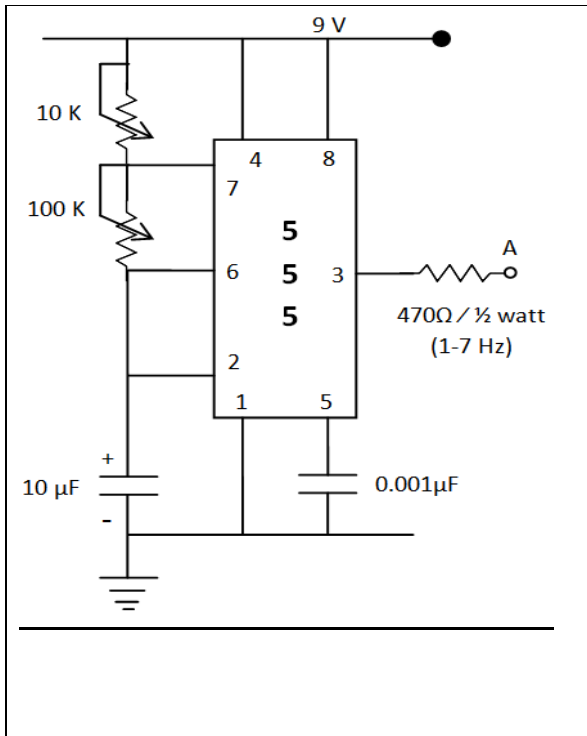


Fig. 1

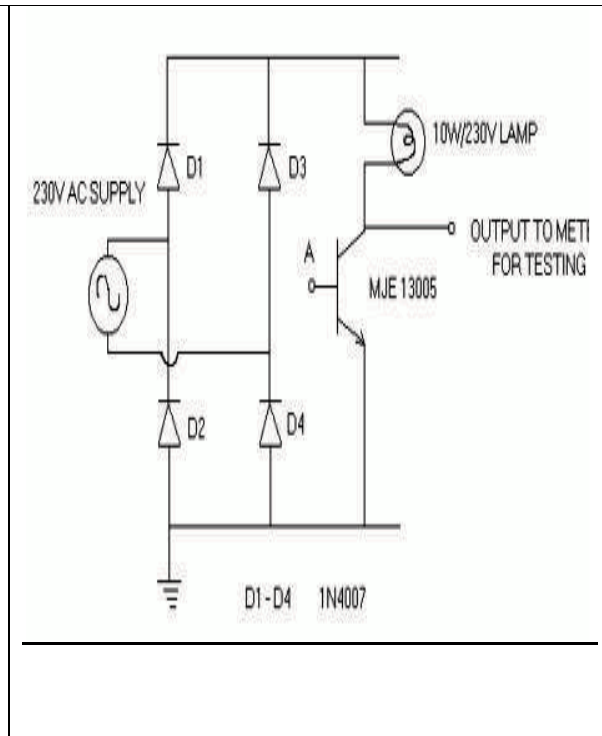


Fig. 2

**CIRCUIT DIAGRAM FOR DC PULSATING SIGNALS IN NEUTRAL**

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