TECHNICAL SPECIFICATION FOR BIDIRECTIONAL FOUR QUADRANT 10-60AMP WHOLE CURRENT TRIVECTOR STATIC METER FOR SOLAR AND TARRIF METERING

1. SCOPE:

This specification covers the design, manufacture and assembly of static whole current bidirectional four quadrant electronic meter of Class 1.0 accuracy of current range 10-60 Amps for Solar Net Metering and tariff purpose along with other associated component as per requirement given in this specification which is based on IS-13779/99, however meters matching with requirements of IEC-61036/2000,or other international standards which ensure equal or better performance than the standards mentioned above shall also be considered. The meter shall be bidirectional for energy recording.

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

II) It is not the intent to specify completely herein all the details of the design and construction of meter. The meter shall, however, conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing for continuous commercial operation. The meter shall have to be procured from the original manufacturer who is registered vendor of MGVCL or other subsidiaries of GUVNL.

2. STANDARD APPLICABLE:

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

IS 13779/ 1999	Specification of AC Static Watt hour meters, class 1.0 & 2.0.
IEC 61036-2000	Specification for AC static Watt-hour Meters ,Class 1 & 2.
IEC 1036	Static Energy Meters
IEC 62052-11	Electrically Metering equipment (AC) –General Requirement, Test & Test condition
IEC 62053-21	Static Energy Meters for Active Energy
IS 9000 -	Environmental testing
IS 8161 (Draft) -	Impulse wave testing
IS 12346 -	Specification for testing equipment for AC energy meters.
IS 8686 -	w.r.t. High frequency disturbance testing
IS-15707	Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice
CBIP-325	CBIP guide on static energy meter specifications & testing
CEA Notification Dtd: 17/03/2006,04/06/2010, 26/11/2014	on standard for Operation of meters
Government of Gujarat Energy and Petrochemical department	G.R. NO. SLR-11-2015-2442-B DTD 13th August 2015

3. SUPPLY SYSTEM:

3.1 Solid neutral grounded 3 phase, 4 wire 50 Hz. systems
3.2 Reference Voltage:3*240V P-N(+20% and -30%)
3.3 Reference Frequency : 50HZ

4. SYSTEM VARIATIONS:

The electrical quantities are required to be measured with a fine degree of precision, monitor, display and store in non-volatile memory of high precision static demand and energy Tri-vector meters of 1.0 class accuracy for energy audit, load survey, tariff metering and Domestic, Govt. Building Rooftop purposes at the installation of consumers, conforming to latest standard applicable. These meters are required to function accurately within the specified limits of errors under the following conditions of voltage, frequency, current, temperature& climatic condition.

A. Electrical Quantities:

1. Voltage

a)	Phase to Neutral with star connection (but Neutral either solidly grounded or floated)	240 volts (Phase to Neutral) + 20% - 30%

2. Currents.:--10-60 Amp (10 Amp Basic current and Maximum 60 Amp)
3. Frequency :-- 50 Hz. (+) 5% to (-) 5%
4. Power factor: - 0.0 Lag-Unity-0.0 Lead

B. Climatic Condition:

SR.NO.	PERTICULARS	SPECIFIEDREQUIREMENTS
1	MAX. AMBIENT AIR TEMPERATURE	55 Deg. Centigrade
2	MAX. AMBIENT AIR TEMPERATURE IN CLOSED BOX	UP TO 65 Deg. Centigrade
3	MINIMUM AIR TEMPERATURE	0 Deg. Centigrade
4	AVERAGEDAILY AMBIENT TEMPERATURE	25 TO 35 Deg. Centigrade
5	MAX. RTELATIVE HUMIDITY	100 %
6	MAX. ALTITUDE ABOVE MEANSEALEVEL	1000 METERS
7	AVERAGEANNUAL RAIN FALL	700 TO 900 MM
8	MAX. WIND PRESSURE	200 Kg/Sq. MM

5. GENERAL REQUIREMENT:

5.1 The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent, for easy reading of displayed parameters, and observation of operation indicators. The meter base shall not be transparent. The meter casing should not change shape color, size, and dimensions when subjected to 200 hrs. on UV test as per ASTMD 53.

5.2 Power supply unit should be micro control type instead of control transformer type to avoid magnetic influence.

5.3 RTC battery & the battery for display (in case of power failure) should be separate.

5.4 Diagnostic Features: RTC, RTC Battery, Non Volatile Memory(NVM) should be available.

5.5 Meter shall be capable of withstanding switching and transient surges of highest level so as to protect the internal meter circuit.

5.6 The facility for reading the meter in absence of power supply shall be provided. This facility shall be powering from a separate internal battery having minimum life of 10 years.

5.7 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 non-volatile memory capable of storing and retaining all the data required to be stores, without the help of any power source or battery backup and shall have a minimum retention time of 10-years under un-powered condition.

6. CONSTRUCTIONAL REQUIREMENT:

6.1 Meter shall be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions. However, the following shall be ensured.

a) Personal safety against electric shock
b) Personal safety against effects of excessive temperature
c) Protection against spread of fire
d) Protection against penetration of solid objects, dust and water

6.2 The meter shall conform to the degree of protection IP 51 of IS:12063/IEC:529 for protection against ingress of dust, moisture and vermin's.

6.3 Meter's Top Cover, Meter Base, Terminal Block and Terminal Cover material should be polycarbonate and it should be fire, heat and ultra violet radiation resistant.

6.4 All parts of the meter should be resisted against mechanical stroke and shake during the transportation

6.5 Meter base cover and terminal block should be injection molded and should not be transparent.

6.6 Meter top cover and terminal cover should be injection molded in transparent natural colour.

6.7 The top cover should be ultrasonically welded or break to open type arrangement

6.8 The meter cover and base shall be suitably shielded with metallic material so as to protect the meter from adverse effect of AC/DC, Permanent Abnormal external magnetic field. The meter shall meet the requirements of CBIP-325with its latest amendment for immunity against continuous magnetic induction.

6.9 The terminal cover shall be extended open type & shall enclose terminal compartment except for the provision of conductor entry at the bottom for incoming & outgoing leads. The terminal block, the ETBC meter cover & meter base shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermic overload of live parts in contact with them. The terminal block shall be of high grade non-hygroscopic, fire retardant, low tracking fire resistant, reinforced poly-carbonate or equivalent high grade engineering plastic which shall form an extension of the meter case and shall have

terminal holes 8.5mm minimum and shall be of sufficient size to accommodate the insulated conductors & meeting the requirement .

6.10 The terminals shall have suitable construction with barriers and cover to provide firm and safe connection of current and voltage leads of stranded copper conductors or copper reducer type terminal ends (thimbles).The 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.

6.11 The terminal screws shall be of brass metal .The screws shall not have pointed end of threads.

6.12 Meter should be prone to produce audible noise while in use.

6.13 The meter base shall be manufactured from high quality Polycarbonate material.

6.14 The thickness of casing, base & terminal cover shall be 2.0 mm +/-0.2mm.

6.15 Creapage and clearance shall be as per relevant standard.

6.16 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.

6.17 The embossing shall be provided on meter base, meter cover, terminal cover and terminal block as ' UV STABILISED' and manufacturer's logo/ trade name.

6.18 Meter shall have 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 person after terminal cover is fixed.

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

6.20 The polycarbonate material of only following manufacturers shall be used:-

a) GE PLASTICS LEXAN 943A FOR COVER AND TERMINAL COVER/
LEXAN 503R FOR BASE & TERMINAL BLOCK
b) BAYER GRADE CORRESPONDING TO ABOVE
c) DDW CHEMICALS -DO-
d) MITSUBISHI -DO-
e) TEJIN -DO-
f) DUPONT -DO-

The meter base shall be manufactured from high quality industrial grade material viz. Polycarbonate with 10 % glass filled which shall meet following properties to ensure higher reliability and long life of the meter base.

1) Meter base & cover and 2) terminal cover shall conform to the following :-

Sr. No	Test	10% Glass filled non-transparent material for meter base & terminal block	Transparent material for meter cover & terminal cover
1	UV ageing for 200 Hrs. as per ASTM : G53(CL No. 9.3)	4 Hours UV at 60° C, 4 Hours condensation at 50° C	4 Hours UV at 60° C, 4 Hours condensation at 50° C
2	Boiling water test(10 MIN)	No softening & whitening & No change in colour, shape, size & dimensions	No softening & whitening & No change in colour, shape, size & dimensions
3	Ball pressure test as per IEC--60695-10-2	125°C +/- 2°C	125°C +/- 2° C
4	Flammability Test (a) As per UL 94 or (b) As per IS 11731(Part-2) 1986	 VO FVO	 VO FVO
5	Glow wire test IS:11000(part 2/SEC-1) 1984 OR IEC PUB,60695-2-12	960 ±15° C (For terminal block)	650 ±10° C (For Terminal cover and meter case)
6	Heat deflection Temp.(HDT) HDT/Ae, 1.8MPa edge(100mm) As per ISO 75/Ae	132° C	125° C
7	Free Fall Test from 2 mtr height without assembly	No crack	No crack

6.21 PCB of meter should be of Glass Epoxy, fire resistance grade FR4,with minimum thickness 1.6 mm.

6.22 DISLAY MODULE:

a. The module should be minimum 7 Digit LCD display of minimum 10 mm height with shall be provided.
b. The display shall be permanently green backlit LCD during power on condition.
c. The LCD shall be of STN (super twisted nematic type) constructing suitably for temperature withstand of 80oC (storage) & 65oC (operation).
d. The LCD display should have a wide viewing angle of 120oC 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.
e. When the meter is placed over at a constant temperature of 65 degree C for a period of 30 minutes, the character of LCD should not deform.
f. After keeping the meter at a constant temperature of 80 degree C for a period of 30 minutes and when restores at normal temperature, LCD display should work satisfactorily.
g. Dot- Matrix type LCD display is not acceptable.

7. CONNECTION DIAGRAM & TERMINAL MARKING:

The connection diagram of the meter shall be clearly shown in inside portion of the terminal cover & shall be of permanent nature. Meter terminals shall also be marked & these markings should appear in above diagram.

8. SEALING OF METER:

8.1 The construction of the meter shall be such as to be sealed independently and prevent unauthorized tampering. Meter should be sealed in such way to prevent unauthorized access. Any attempt for Opening the meter's main cover should not be possible unless by breaking the meter's case.

8.2 All the seals shall be provided on front side only. Rear side sealing arrangement shall not be accepted.

8.3 At least two sealing screws of Nickel plated steel shall be provided for proper fixing of meter cover. Each sealing screw shall have Four independent sealing holes. Two hole 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 accommodate two seals one by supplier and other by utility.

8.4 The sealing required on Meter terminal Cover.

8.5 The sealing required on MD Reset Button.

8.6 The sealing required on communication ports.

8.7 The supplier has to provide two polycarbonate seal having supplier’s Logo and Serial No. both on Male and Female part on meter body. The Sr.no. of Meter and each seals should be different.

8.8 The supplier has to provide two security seals on meter body. The security seals shall be as per ANNEXURE:A

8.9 The supplier must kept records of sealing done at their works.

9. MARKING OF METER & NAME PLATE OF THE METER

The meter terminal marking and mounting arrangement shall be as per Indian Standard/IEC.
The marking on every meter shall be in accordance with IS 13779/1999.

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
Number of phases and wires
Serial number
Month and Year of manufacture
Reference voltage
Basic Current
Maximum Current
Principal unit(s) of measurement KWH, KVarh KVAH

Meter constant (Imp/kWh & KVarh)
'BIS' Mark (Applicable for Indian meter manufacturers only)
Accuracy Class of meter for Active energy & Reactive energy
Bar coding of Serial Number, month & year of manufacture, Meter Make.
BIDIRECTIONAL METER

Meter Sr. no must be on name plate. Unique Alfa-numeric character be given to Meter, numeric part will appear on meter display and Alfa-numeric part will appear in BCS (MRI data) as well as on name plate.

There should be Clear indication on "MD Reset" Push Button, "Up- Scrolling" Push Button and "Down- Scrolling" Push Button so that they can distinguish from each other.

10. BOUGHT OUT ITEMS:

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 current transformers as measuring elements.	ANY MAKE OR ORIGIN CONFORMING TO IS-2705 OR RELEVANT STANDARD.
2	Measurement	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
5	Quartz Crystal		AVX, VANLONG, ADVANCED CRYSTAL etc
6	Memory chips	The memory chips should not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Philips, ST, Japan : Hitachi
7	Display modules	a) The display modules should be well protected from the external UV radiations. b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters (refer 3.2 d for Viewing angle). c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). d) It should be trans- reflective HTN or STN type industrial grade with extended temperature range.	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,
8	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
9	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. 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 electromagneticfield, Static discharge..	USA: National Semiconductors HP Agilent Holland/Koread : Phillips Japan : Hitachi Taiwan: Ligitek
10	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	SMPS Type or better

		to faults or due to wrong connections	
11	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, Taxas Instruments, Siemens WELWYN, VISHAY DRALORIC,YAGEO,KOA,ROHM,PHYCOMP,FAIRCHILD,PHILIPS,VISHAY SEMICOND, TEXAS INSTRUMENT,EPCOS, OSRAM,INFINION,NATIONAL SEMICOND etc. Japan : Toshiba , Hitachi, Oki, AVZ or Ricon Korea; Samsung
12	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
13	Battery	Chargeable maintenance free guaranteed life of 10 years.	Varta, Tedirun, Sanyo or National, Panasonic, Renata
14	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.
15	PCB	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	A class vendor

Note: The make of components mentioned above are only indicative. The supplier can utilize better or equivalent make of components.

11. QUANTITIES TO BE MEASURED, DERIVED, MONITORED AND MEMORISED:

11.1 The actual supply wave of related voltages and currents should be sampled out at the rate of minimum 3000 samples per second and should provide integrated values of each actual voltage and current cycle and angle between them. While deriving actual basic Active (cosine part measurable component) and Reactive (sine part measurable component) energies (with respect to relevant voltage wave and current wave) to assess actual contents

of energies persisting / traversing, to have up to-date information for total energy even when highest order of Harmonics is present in supply wave.

11.2 Voltage for all three phase

11.3 Current for all three phase

11.4 Power Factor for all three phase

11.5 Frequency

11.6 MD in (KW)&(KVA)for 30 minutes integration period

11.7 TOD TIMINGS: The meter should have eight time zones, however it should be configured for following four zones.

1 – 7:00 to 11:00 Hrs + 18:00 to 22:00 Hrs – Peak Hr

2 – 22:00 to 06:00 Hrs - Night Hr.

3 – 11:00 to 18:00 Hrs + 06:00 to 7:00 Hrs. - Rest Hr.

4 – 19:00 to 6:00 Hrs. Non Solar Hr.

11.8 Date and Time

11.9 Total Cumulative Import Active Energy: Total Import active energy i.e. with highest order of harmonics.

11.10 Total Cumulative Export Active Energy: Total Export active energy i.e. with highest order of harmonics.

11.11 Reactive energy: Lag & Lead(Four Quadrant)

11.12 Apparent Energy: Vectorial summation of Total Active Energy and Reactive Energy with Lead PF treated as Unity Power Factor(Import & Export Mode)

11.13 Configuration Details:

The following Configuration Details is required to be stored and communicated whenever required

RTC
TOU
MD INTEGRATION PERIOD
PROGRAMMING ATTEMPT

11.14 Self Diagnostics:

The following Self Diagnostics is required to be stored and communicated whenever required.

Real Time Clock (RTC) status
Nonvolatile Memory (NVM) status
Battery status

11.15 Fixed Parameters / information: - Must be kept recorded permanently

I. Meter - make and Sr. No.
II. Prevailing integration period
III. Automatic re setting date and time
IV. Tariff time Zone.
V. Meter voltage and current capacity.

12. DISPLAY PARAMETER:

The meter should have legible LCD with backlit minimum 7digits and automatic in cyclic order display. In case a single display is being used to display the values of various parameters in rotation, it should be possible to display contents of relevant memories continuously in a specified cyclic order. Each of the physical quantities shall remain on the display screen for a time interval of Ten seconds which should be programmable with latitude of one second on either side. While displaying the memories, proper and adequate legible and understandable text identification of each of the quantities being displayed shall be made (like 24 hours, night period, morning peak, evening peak period, and TOD parameters etc.)

The Sequence of the display parameter must be as per **ANNEXURE B.**

13. TAMPER FEATURES & TAMPER LOGIC:

The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Vibrations, Harmonic Distortion, Voltage/Frequency Fluctuations, and Electromagnetic High Frequency Fields etc. The meter shall be immune to abnormal voltage/frequency generating devices and shall record the occurrence and restoration of all tampers and related snapshots as per IS 15959:2011

(a) Potential phase sequence:	Meter should measure/monitor phase rotation and store all variable electrical quantities (active and reactive both) irrespective of rotation of potential phase sequence (i.e. either clockwise or anti-clockwise) accurately within the specified limits of errors.
(b) Potentials/line voltage:	1) Missing Potential (phase wise) As per Annexure C for tamper logics 2) Unbalancing of Voltage (non phase wise) As per Annexure C for tamper logics
(c) Line currents:	1) Current failure /CT Open (phase wise) As per Annexure C for tamper logics 2) Current unbalance (non phase wise) As per Annexure C for tamper logics
(e)Others	1) Influence of Permanent Magnet or AC/ DC Electromagnet As per Annexure C for tamper logics 2) Neutral Disturbance - HF & DC. As per Annexure C for tamper logics
(E) Meter recording	Meter should be immune by application of remote Induction device i.e. radiated spark through jammer circuit.
(h) Power failure	

Note :- The meter must kept recorded all above events distinctly with type, identification and duration period in a roll over/rotational (i.e. FIFO) method and in NO case these tamper data shall be able to set "Zero".

All tamper data shall not be to reset to ZERO. Minimum 400 events are required. i.e.200 Occurrence + 200Restoration (i.e. FIFO or in rotational/roll over method in block).
The Occurrence and Restoration of same tamper must be together with snap values.

14. COMMUNICATION CAPABILITIES AND COMMUNICATION PORTS:

14.1 The meter should be capable to communicate with any make of CMRI, LAPTOP & Remotely i.e. through Modem (Modem can be GSM, GPRS or any other technology).

14.2 Meter should have communication facility via optical port and RS 232 ports both. The meter manufacturer has to submit the pin configuration wiring diagram for this ports.

14.3 The communication baud rate of the meter is 9600 bps or more.

15. MRI (METER READING INSTRUMENT): MRI is capable to read the Meter as and when required.

16. BASE COMPUTER SOFTWARE (BCS):

The supplier has to provide licensed BCS to MGVCL indicating the current version number of software. The BCS has the facility for reading and displaying following parameters. The BCS has user login and password for these. The BCS has facility to create multiple user ids with appropriate authority. The BCS has provision for user defined ASCII file generation. All the report should be exported to PDF, EXCEL etc. The BCS should be capable to communicate with meter through any make of Modem. (Modem can be GSM, GPRS or any other technology).

The BCS has following facilities:

16.1 Instantaneous Data:

The following Instantaneous data for Real Time is required to be stored and display whenever required:

This is real time data. It should display
Instantaneous AC Voltage (Phase to Neutral) all three Phase
Instantaneous AC Current all three Phase with sign +/-
Instantaneous Power Factor all three Phase
Instantaneous Three Phase Power Factor
Instantaneous Power all three Phase with sign +/-
Instantaneous Three Phase Power
Current Total cumulative Import AC Energy
Current Total cumulative Export AC Energy
Real Date and Time.
Total Export Energy during time slot 19:00 to 6:00 Hrs. Non Solar Hr. for Previous billing
All the display parameters as per the Annexure B preferably.

16.2 Billing Data or Energy:

The following Billing data for last 12 reset with TOD Zones is required to be stored and display whenever required:

Current Total cumulativeImportACEnergy,CurrentTotalcumulativeExportACEnergy,CurrentNetAC Energy Reading with date and time
For twelve Last resets Total cumulative Import AC Energy, Total cumulative Export AC Energy (Cumulative as well as TOD Zone Wise)

Current cumulative Reactive AC Energy (Kvarh lag) Reading with date and time
For twelve Last resets cumulative Reactive AC Energy (Kvarh Lag) Reading with date and time.(Cumulative as well as TOD Zone Wise)

Current cumulative Reactive AC Energy (Kvarh lead) Reading with date and time
For twelve Last resets cumulative Reactive AC Energy (Kvarh Lead) Reading with date and time. (Cumulative as well as TOD Zone Wise)

Current cumulative Apparent AC Energy (Kvah) Reading with date and time
For twelve last resets cumulative Apparent AC Energy (Kvah) Reading with date and time. (Cumulative as well as TOD Zone Wise)

Current Maximum Demand in KW(Import as well as Export) with date and time
For twelve Last resets Maximum Demand in KW(Import as well as Export) with date and time. (Cumulative as well as TOD Zone Wise)

Current Maximum Demand in KVA(Import as well as Export) with date and time
For twelve Last resets Maximum Demand in KVA(Import as well as Export) with date and time. (Cumulative as well as TOD Zone Wise)

16.3Load Survey Data:

The following load survey parameters data for 62 days (power on days only) with 15(e.g. 09:30 to 09:45) minutes integration is required to be stored and displayed whenever required: The load survey should be in tabular format and graphical format. The software should show the parameters as per daily, weekly, monthly requirement.

Date and Time
Average AC Voltage for all three phase (Power On time only)
Average AC Current for all three phase (Power On time only)
Average Power factor for all three phase (Power On time only)
Block Total cumulative Import AC Energy
Block Total cumulative Export AC Energy
Block Energy for Total Reactive Energy (KVarh lag)
Block Energy for Total Reactive Energy (KVarh lead)
Block Energy for Total Apparent Energy (KVAH)
Average Maximum Demand in KW and KVA.

16.4Tamper Information:

The following Tamper Information data is required to be stored and displayed whenever required

The meter should record 400 such events (200 occurrence+ 200 Restoration). The tamper events shall be recorded in FIFO/Roll Over basis.

Snap Shots (numerical values) of voltage, current, power factor and energy (kWh) readings as well as the date and time of logging of the occurrence and restoration of tamper events.

16.5Configuration Details:

The following Configuration Details is required to be stored and displayed whenever required.

RTC
TOU
MD INTEGRATION PERIOD
PROGRAMMING ATTEMPT

16.6Self Diagnostics:

The following Self Diagnostics is required to be stored and displayed whenever required.

Real Time Clock (RTC) status
Nonvolatile Memory (NVM) status
Battery status

16.7All Data:

The above all data 16.1 to 16.6 is required to be stored and displayed at BCS whenever required with single selection.

17. PROGRAMMING:

17.1 Meter has capability to change the date and time (RTC), TOD Timings, and MD integration period (for any period from 1 to 60 minutes), Maximum Demand auto reset date and time, load survey parameter and interval timing, Change in display parameter.

17.2 The programming should be done through CMRI,LAPTOP and Remotely through Modem with authenticated passwords.

17.3 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 tri-pots 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.**

18. SUBMISSION OF METER AND TEST CERTIFICATE:

18.1 The consumer shall have to submit **Meter** and BCS Software to read the meter. Please note that the Meter submitted shall be tested at MGVCL NABL accredited laboratory for the following tests as per IS 13779:99, IEC 62053-22 and as per MGVCL specification.

18.2 The testing plan is as per ANNEXURE D

18.3 Meter will have to be submitted to MGVCL NABL accredited approved lab for testing of tests mentioned in specifications. In event of failure of the Meter during any of the tests, the Meter will be considered as "REJECTED". However, the decision of the MGVCL shall be final and binding to the consumer.

19. TYPE TEST CERTIFICATE:

The supplier shall have all type test certificates from the Govt. approved laboratory viz: CPRI, NPL, ERTL, ETDC & ERDA for Indian supplier and for foreign supplier 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. Type test should not be older than 3 years. The supplier shall have also the type test certificate of AC/DC magnetic influence test & total energy test harmonics test as per IEC 62053-21 clause no: 8.2.1 &Table :8 shall on the same rating of meter

20. ROUTINE TEST:

Meter shall undergo the routine tests as well as functional tests as per IS:13779/1999 . The supplier shall produce Test reports for the following tests,

20.1 AC High Voltage test
20.2 Insulation Resistance Test.
20.3 Starting current Test
20.4 No load Test.
20.5 Limits of error Test.

21. BIS MARK- Meters must have ISI marking.

ANNEXURE A

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 someone 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.

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 along-with 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 someone 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 someone 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.

ANNEXURE B

MODEWISE LIST OF PARAMETERS TOBE DISPLAYED ON STATIC TVM

There should be Three Modes for displaying parameters.

MODE – 1

Mode-1 Should be displayed in auto mode as well as push button.

Up and Down facility is required for viewing display parameter.

Sequence	Name of Parameters
1.	Meter Sr. No.
2.	R-Phase Voltages
3.	Y-Phase Voltages
4.	B-Phase Voltages
5.	R-Phase Current WITH sign
6.	Y-Phase Current WITH sign
7.	B-Phase Current WITH sign
8.	Frequency
9.	Voltage and current phase sequence
10.	Instantaneous PF (resultant of all the three phase)
11.	Instantaneous KW (Total of all the three phase) WITH sign
12.	RTC – Date, day and Time.
13.	Rising demand in KW with elapse time
14.	Cumm. TOTAL IMPORT KWH
15.	Cumm. TOTAL EXPORT KWH
16.	Cumm. KVARH (lag) (With respect to export KWH)
17.	Cumm. KVARH (lag) (With respect to import KWH)
18.	Cumm. KVAH derived from vectorial summation of Total(i.e. Fundamental+Harmonics) Active export and Reactive (lag only) energy.
19.	Cumm Total Import KWH Time Zone 1 i.e Peak hours
20.	Cumm Total Import KWH Time Zone 2 i.e Night hours
21.	Cumm Total Import KWH Time Zone 3 i.e Remaining hours
22.	MD Import KW for present billing period
23.	Present MD in Import KW for Time Zone 1 i.e Peak Hours
24.	Present MD in Import KW for Time Zone 2 i.e Night hours
25.	Present MD in Import KW for Time Zone 3 i.e Remaining hours
26.	MD Import KW for last billing period
27.	Billing MD in Import KW for Time Zone 1 i.e Peak Hours
28.	Billing MD in Import KW for Time Zone 2 i.e Night hours
29.	Billing MD in Import KW for Time Zone 3 i.e Remaining hours
30.	MD Export KW for present billing period
31.	Present MD in Export KW for Time Zone 1 i.e Peak Hours
32.	Present MD in Export KW for Time Zone 2 i.e Night hours
33.	Present MD in Export KW for Time Zone 3 i.e Remaining hours
34.	MD Export KW for last billing period
35.	Billing MD in Export KW for Time Zone 1 i.e Peak Hours
36.	Billing MD in Export KW for Time Zone 2 i.e Night hours
37.	Billing MD in Export KW for Time Zone 3 i.e Remaining hours
38.	Present MD in Export KW for Time Zone 1 i.e Peak Hours
39.	Cumulative MD in Import KW
40.	No. of Reset count
41.	No. of Total tamper count
42.	Cumulative Programming count
43.	Anomaly / circuit check in meter display
44.	Display check

NOTE: Following readings are repeated after every parameters in Auto Mode Only.

Cumm. TOTAL IMPORT KWH
Cumm. TOTAL EXPORT KWH
Cumm. Kvarh Lag(Quadrant 1)(Q1)
Cumulative MD in Import KW

MODE – 2

Mode-2 is with Push Button Mode

1	Average power factor for last billing period
2	Instantaneous load in KVA
3	Instantaneous load in KVAR
4	Total Voltage failure tamper count (Phase wise)
5	Total Current failure tamper count (Phase wise)
6	Total Voltage unbalance tamper count
7	Total Current unbalance tamper count
8	Total High Voltage count
9	Total Low Voltage count
10	Total neutral disturbance count
11	Total magnet temper count

MODE – 3

Separate High Resolution registers for testing purpose.

Mode-3 is with Push Button Mode

Sequence	**Name of Parameters**
1	High Resolution display for KWH(Import)**(12.34567)**
2	High Resolution display for KWH (Export) **(12.34567)**
3	High Resolution display for KVARH-Lag**(12.34567)**
4	High Resolution display for KVAH**(12.34567)**

Note: -

1. In the meter display especially for the consumption of time zone the peak, night and rest word may please be incorporate with the display.
2. Push button for up and dawn scroll should be provided and all buttons should clearly marked its function.
3. Any parameter can be locked for 15 Minutes, after that scrolling of auto mode will be start.

ANNEXURE C

Sr No	Type of Tamper	Requirement	Tamper Logics / Conditions & (Occurrence &Restoration) Persistence Time					
			Occurrence			Restoration		
			Voltage	Current	Persist Time	Voltage	Current	Persist Time
1	Voltage Failure	Phase wise	Vx< 40% of Vref irrespective to any other phase voltage	Ix > 10% of Ib	15 Minutes	Vx> 75% vref irrespective to any other phase voltage		5 **Minutes**
2	Current Failure	Phase wise	All voltages > 75 % of Vref.	Ir or Iy or Ib< 2% of actual max. current and any one phase has value > 10% Ib	15 Minutes		Ir or Iy or Ib> 2% of actual max. current and any one phase has value > 10% Ib	5 **Minutes**
3	Voltage Unbalance	-	(Vmax - Vmin) > 10% of max Voltage of 3 phase voltages and all voltages > 60% of Vref .	Ix > 10% of Ib For at least any one phase	15 Minutes	(Vmax-Vmin) <10% of max voltage of 3 phase voltages		5 **Minutes**
4	Current Unbalance	-	All voltages > 75 % of Vref.	(Diff. of Actual Max current & Actual Min current) > 30 % of Actual maximum current and all phase has value greater than 10% Ib	15 Minutes		(Diff. of Actual Max current & Actual Min current) < 30 % of Actual maximum current	5 **Minutes**
5	Magnetic Influence	-		When magnet influence start affecting the accuracy, meter should start recording at Imax Amp and in Import Mode only	1 Minute		When magnet influence stop affecting the accuracy, meter should start recording at actual load	1 Minute

Note: For tamper logics, following points shell be taken in consideration

1. During Voltage failure Tamper, Voltage Unbalance tamper shall not be logged.

2. During current failure Tamper, Current Unbalance tampers shall not be logged.

3. During power failure duration, if any tampers persisting, those tampers shall not get recovered until it meets the logic for restoration and duration of respective tamper shall be from occurrence of that tamper irrespective of power failure duration.

4. For tamper events logging, snap shot data i.e. voltage, current, power factor, active energy register reading (Total Kwh) & date & time should be corresponds to starting of occurrence and starting of restoration.

5. Snap shot of date and time should be available for occurrences and restorations of events.

ANNEXURE D

TESTING OF METER

1. Insulation resistance test as per IS:13779: 1999
2. AC high voltage test method as per IS:13779: 1999 but shall be taken at 4 KV for one minute.
3. Test for limit of error as per IS:13779: 1999 with balance and unbalanced load and on active energy and reactive energy.
4. Interpretation of test results, if required.
5. Test for meter constantIS:13779: 1999.
6. Test of starting condition at 0.4 % of basic current as per IS:13779: 1999.
7. Test of no load condition as per IS:13779: 1999.
8. Test of repeatability of error as per IS:13779: 1999.
9. Test of power consumption as per IS:13779: 1999.
10. Test for total energy i.e. fundamental + harmonics as per IEC 62053-21.
11. Test for influence of quantities i.e .Voltage and frequency variation test and10% of 3rd harmonics, Reverse Phase Sequence, Voltage Unbalance as per IS:13779: 1999.
12. Test for influence of AC / DC& Permanent magnetic field as per CBIP 325.
13. Tamper condition tests with tamper logics as per Annexure C .
14. Test of Short time over current test as per IS:13779: 1999.
15. 35 KV Test as per 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 of the following manner for total 10 minutes:

    i) On any of the phases and neutral terminal
    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"
16. Verification of Display parameters and Functional requirement.