

Annexure-A, Rev-00
Technical Specification of HT Tri-vector meter of
Accuracy Class-0.2s

3 phase, 4 wire, Static and AMR Compatible HT Tri-vector Energy meters for measurement of different electrical parameters, listed elsewhere in the document, including Active energy (KWH), reactive Energy (KVARH), Apparent Energy (KVAH) etc. Meter shall be suitable for 3 Phase 4 Wire solidly earthed system as well as 3 phase 3 wire balanced and un-balanced loads. Meter shall display direct reading without multiplying factor at lowest tap of the CT.

MAJOR TECHNICAL PARTICULARS

Sl. No	Characteristics	REQUIREMENT	Vendor Compliance
1	Meter model	Inform	
2	Accuracy class	0.2s (for both active & reactive) as per IS 14697/1999 with latest amendments	
3	CT, PT ratios	PTR : 11KV/110V CTR:- Item 01-400-200/5-5A Item 02-1800-900/5-5A Item 03- 1200-600/5-5A Item 04- 900-450/5-5A	
4	Power consumption	As per Clause 5.7 of attached PSTCL specification.	
5	Maximum continuous current (%Ib)	2.0Ib Starting and Short time current shall be as per IS 14697/1999	
6	Parameters to display in Auto scroll mode	1. Meter SI No.	
		2. RTC (Date & Time)	
		3. Cumulative Active Energy (kWh/MWh)	
		4. Cumulative Reactive Energy (lag and lead) kVarh/MVarh	
		5. Cumulative Apparent Energy (kVAh/MVAh)	
		6. Instantaneous load (kVA/MVA & KW/MW).	
		7. Instantaneous Power factor PF(Lag/Lead)	
		8. Max. demand of current billing cycle KVA/MVA & KW/MW	
		9. Max demand of previous billing cycle KVA/KVA & KW/MW with resetting date.	
		10. Rising demand with elapsed time (kVA/MVA & KW/MW)	

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		11. Instantaneous Red phase potential Volts	
		12. Instantaneous Yellow phase potential Volts	
		13. Instantaneous Blue phase potential Volts	
		14. Phase sequence - Voltage	
		15. Phase sequence - Current	
7	No of digits of display and height of character	Backlit Liquid Crystal Display (LCD) of minimum 10 mm height and 6 whole digits +1 decimal digits display	
8	P.F. range	0 Lag – UPF – 0 Lead	
9	Variation of voltage at which meter functions normally	-40% to + 20%	
10	Particulars of read out		
	a) Continuous display	As per Sl.No.6 of above.	
	b) manually on display	Two push button modes as per Clause 9.2 & 9.3 of attached PSTCL specification.	
	c) auto display parameters		
	i) Scrolling period	10 Sec.	
	ii) Auto scroll mode	Display shall automatically come back to the auto-scroll mode, if the pushbutton is not pressed for one minute.	
11	Construction of Meter and sealing provision	Polycarbonate as per Clause 14.0 of attached PSTCL specification.	
12	Non-volatile memory retention time in absence of power	10 Years. Meter should have the facility for data downloading during power OFF position. In case of failure of power supply, the meter shall be capable to display the measured quantities through an internal battery in-built in the meter. The battery provided shall have life of not less than 10 years. The battery shall not get damaged or damage the meter even during idle storage of the meter for two years.	
13	Memory capacity for Load survey parameters	Suitable for 70 days data with 30 minutes integration period in line with Clause 11.0 of attached PSTCL	

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		specification.	
14	Communication compatibility	In general as per Clause 7.0 of attached PSTCL specification. And in specific RS-485 Port on MODBUS Protocol and also DLMS port compatible with AMR system.	
15	Tamper and Fraud monitoring feature	As per Clause 16.0 of attached PSTCL specification.	
16	Maximum Demand Integration Period	30 Minutes. Meter should meet Clause 10.0 of attached PSTCL specification	
17	Marking on Meter	The letters PSTCL & "ISI" mark shall be indelibly and clearly marked at the appropriate place of the meters. In addition the words "Property of PSTCL, Purchase Order No. and date (Will be informed during order execution)" shall be either punched or marked indelibly on the name plate.	
18	Meter should confirm to PSTCL standard requirement	Attached PSTCL Spec. MQP-126/2017-18/PR of CE/Metering, PSTCL, Patiala	
19	Inspection at manufacturer works (in addition to Clause 25.0 of attached specification)	Two meters selected from the lot shall be inspected at the works of meter manufacturer to Witness / carryout all the routine tests as per relevant IS.	
20	Sampling	As per Clause 29.0 of attached PSTCL Spec. MQP-126/2017-18/PR of CE/Metering, PSTCL, Patiala is not required, if vendor has already passed the testing as per PSTCL specification. Supporting documents to be enclosed with the offer.	
21	Type tests	As per Clause 26.0 of attached PSTCL Spec. MQP-126/2017-18/PR of CE/Metering, PSTCL, Patiala	
22	Guarantee the satisfactory performance of the meters	For a period of 60 months from the date of commissioning.	

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SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR 3 PHASE 4 WIRE CT PT
OPERATED TRIVECTOR ENERGY METER :-

Bidder's to fill the GTP against each point below meeting the above specification requirement including PSTCL standard requirement of PSTCL Spec. MQP-126/2017-18/PR of CE/Metering, PSTCL, Patiala. It is to be noted that below filled GTP will be kept for information and record only, however it is vendor's responsibility to ensure that offered meter meets the above specification requirement. PSPCL shall be read as PSTCL wherever marking, inscriptions etc. are to done as per specification referred to above.

1. Type	
2. Application	
3. Rated Voltage	
4. Rated Current	
5. Frequency	
6. Overload capacity	
7. Minimum starting current in % of base current	
8. Power loss in potential circuit	
9. Power loss in current circuit	
10. Change in error due to	
a. Variation in frequency	
b. Variation in temperature	
c. Variation in voltage	
11. Accuracy Class	
12. Total Weight of meter	
13. Details of case	
14. H.V. withstand	

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15. Insulation Resistance	
16. Standard to which the meter confirm	
17. Type of Energy Registration Mechanism.	
18. MD Reset Mechanism	
19. Insulation Test (Voltage 50Hz for 1Min)	
20. Temperature co-efficient from 10% of rated load to 100 % rated load (5°C to 45°C)	
21. Working range	
Voltage	
Current	
22. Type of load (linear, non-linear, balanced /unbalanced at any P.F.)	
23. Display details	
i. Display Cycle (descriptive in order of display)	
ii. Period of display of each parameter	
iii. Display scroll-lock facility	
iv. Backlit LCDP	
24. Memory	
25. Power on in absence of mains	
26. Tamper data preservation capacity	
27. Load Survey	
a. Parameter Logged	
b. Logging interval	
c. No. of days of Load Survey	

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28. Time of the day Zone	
29. Capability for fraud Prevention & detection	
30. Sealing and Locking Arrangement	
31. Type of communication	
Local- Optical port	
Additional Communication port	
32. Real Time Clock	

Procurement of -/5 Amp, 11KV/110V & -/1 Amp, -/110V DLMS Compliant AC, 3 Phase, 4 wire CT/PT operated fully Static and AMR compatible HT & EHT Tri vector Feeder meters(CATEGORY A) of accuracy class 0.2S

1.0 SCOPE

Design, manufacturing, testing, inspection, supply and delivery of AC, 3 Phase, 4 wire, CT/PT operated fully Static and AMR compatible Tri vector Energy meters for measurement of different electrical parameters, listed elsewhere in the document, including Active energy (KWH), reactive Energy(KVARH), Apparent Energy (KVAH) etc of accuracy class 0.2S **for both active energy and reactive as per IS-14697/1999-latest amendment.** Meter shall be suitable for 3-Phase 4-Wire solidly earthed system as well as 3-phase 3-wire balanced and un-balanced loads.

2.0 APPLICATION

HT & EHT Feeder Meters (Category A)

3.0 APPLICABLE STANDARDS

- a) IS 15959:2011 for DATA EXCHANGE FOR ELECTRICITY METER READING, TARIFF AND LOAD CONTROL-(including amendments, if any).
- b) IS 14697/1999(with latest amendments) specification for AC Static Transformer operated Watt Hour & VAR-Hour meters (class 0.2S)
- c) IS15707 Specification for testing, evaluation, installation & maintenance of AC Electricity meters-Code of Practice
- d) **CBIP-Publication No.325- Static Energy Meter- Specification and Testing.**
- e) IS 12063 for enclosure protection against ingress of dust, moisture & vermin.
- f) IS-9000 for environment testing.
- g) IS-11731 (FH-1 Category) for Polycarbonate cover.
- h) ISO-75 - For test requirement of poly-carbonate cover.
- i) IS-11000 (Part-2/Sec-1), 1984 ---do---
- j) IEC-60695-10-2 ---do---
- k) IS-11731(Part-2) 1986 ---do---

The equipment meeting the requirements of other authoritative standards, which ensure equal or better quality than the standard mentioned above, also shall be considered. In case of conflict related with communication protocol, the IS 15959:2011(including amendments, if any) shall prevail upon. For conflict related with other parts of the specification, the order of priority shall be – i) This technical specification ii) IS 14697/1999 (with latest amendments).

In case of conflicts related with communication protocol, the standard IS:15959(including amendments, if any) shall prevail upon.

Meter should conform to all the applicable standards amended upto the date of issue of this tender enquiry.

4.0 CLIMATIC CONDITIONS

The meter shall be suitable to work satisfactorily under the following conditions:

Minimum ambient temperature	-5°C
Maximum ambient temperature	55°C
Minimum relative humidity	26%
Maximum relative humidity (condensing)	95%
Altitude	Upto 1000 meter above mean sea level

The meter shall withstand and operate satisfactorily without loss of accuracy under the most hazardous climatic conditions specified above. Parts and surface, which are subject to corrosion, shall be provided with protective coating.

5.0 GENERAL TECHNICAL REQUIREMENTS

1	TYPE	Procurement of DLMS Compliant AC, 3 Phase, 4 wire CT/PT operated fully Static, Unidirectional and AMR compatible HT & EHT Tri vector Consumer Energy meters(CATEGORY A) of accuracy class 0.2S.
2	FREQUENCY	50HZ \pm 5%
3	ACCURACY CLASS	0.2S (for both active & reactive) as per IS-14697/1999 with latest amendment.
4	SECONDARY VOLTAGE	Suitable for operation from 110V Ph-Ph or 63.5V Ph-N.
5	BASIC CURRENT(Ib)	-/5 Amps & -/1 Amps
6	MAXIMUM CONTINUOUS CURRENT	2.0Ib Starting and Short time current shall be as per IS 14697/1999
7	POWER CONSUMPTION	The active and apparent power consumption in each voltage circuit at reference voltage , reference temperature and reference frequency shall not exceed 1.5W and 10 VA ii) The apparent power taken by each current circuit , at basic current, reference frequency and reference temperature shall not exceed 1.0VA Note: The test procedure shall be strictly in accordance with clause-12.9 of IS-14697/1999(with latest amendments).
8	POWER FACTOR	0.0 lag-Unity-0.0 Lead
9	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro shall be assembled on printed circuit board using surface mounting technology, factory calibration using high accuracy (0.02 class) software based test bench

6.0 POWER SUPPLY VARIATION

The meter shall start and continue to register on application of 0.1% of basic current at Unity P.F., as per relevant standards and shall work satisfactorily up to maximum continuous current of 2 times rated basic current with the following supply system variation:

Voltage: V ref +20 % to – 40%

Frequency: 50 Hz \pm 5%

7.0 COMMUNICATION CAPABILITY

Meter shall be provided with two ports for communication of the measured/collected data as per IS 15959:2011, i.e. a hardware port compatible with RS-485 specifications which shall be used for remote access through suitable Modem (GPRS/GSM/EDGE/CDMA/PSTN/LPR) and an Optical port complying with hardware specifications detailed in IEC-62056-21. This shall be used for local data downloading through a DLMS compliant HHU.

RS-485 port shall be used at Sub-Stations suitable for multi-drop connections of the meter for exporting data to sub-station data logger/DCU/Computer and the remote end server. The port shall support the default and minimum baud rate of 9600 bps.

NOTE: The protocol detail will be provided by the supplier and compatible for remote monitoring.

8.0 PUSH BUTTON & AUTO DISPLAY

The meter shall have at least 6 whole digits +1 decimal digits display, parameter identifier, backlit Liquid Crystal Display (LCD) of minimum 10 mm height, wide viewing angle. LCD shall be suitable for temperature withstand of 70 deg C.

The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10 years. Meter should have the facility for data downloading during power OFF position.

In case of failure of power supply, the meter shall be capable to display the measured quantities through an internal battery in-built in the meter. The battery provided shall have life of not less than 10 years. The battery shall not get damaged or damage the meter even during idle storage of the meter for two years.

9.0 DISPLAY PARAMETERS

The Meter shall have 3 modes of display as mentioned below:

9.1 Mode 1 or Auto Scroll Mode:

Following parameters shall Auto Scroll in this mode with persistence time of 9 or 10 seconds:

- a) Meter Sr. No.

- b) R.T.C. (Date & Time)
- c) Cumulative Active Energy (kWh/MWh)
- d) Cumulative Reactive Energy (lag and lead) kVArh/MVArh
- e) Cumulative Apparent Energy (kVAh/MVAh)
- f) Instantaneous load (kVA/MVA & KW/MW).
- g) Instantaneous Power factor PF(Lag/Lead)
- h) Max. demand of current billing cycle KVA/MVA & KW/MW
- i) Max demand of previous billing cycle KVA/KVA & KW/MW with resetting date.
- j) Rising demand with elapsed time (kVA/MVA & KW/MW)
- k) Instantaneous Red phase potential Volts
- l) Instantaneous Yellow phase potential Volts
- m) Instantaneous Blue phase potential Volts
- n) Phase sequence - Voltage.
- o) Phase sequence- Current.

Display shall automatically come back to the auto-scroll mode, if the pushbutton is not pressed for one minute.

9.2 Mode 2 (Push Button Mode):

Mode 2 shall include all the display parameters as mentioned above under Mode 1 as well as all other parameters as per standard IS 15959:2011 or any other parameter specified explicitly elsewhere in the specification.

9.3 Mode 3(Push Button Mode):

Display Mode-3 shall be for displaying cumulative Energy and maximum demand recorded during TOD slots indicated in this specification. Mode-2 & 3 may be selectable through same push button.

10.0 MAXIMUM DEMAND INTEGRATION

Meter shall monitor demand in KVA& kW during the integration period set and record & display the maximum registered values. The rising demand under the current integration period shall be displayed along with the elapsed time. The integration period shall be 30 minutes. This maximum demand shall correspond to any consecutive 30 minutes for block interval. Integration logic should be such that integration time remains consistent with the real time clock and are set every 30 minutes and should not be linked with the Power ON/OFF. It should be possible to reset MD by the following options:

- a) Local push button
- b) Auto reset at 24:00 hrs at the last day of every month. Auto reset date should be remotely programmable from central data station for change in billing date (on any day of month).

11.0 LOAD SURVEY CAPABILITIES

Meter shall be capable of storing the following 5 parameters for minimum **last 70 "Power ON"** days for Category A meters with 30 minutes integration period:

- i) RTC (Real Time Clock – Date and Time).
- ii) KVArh lag.
- iii) KVArh lead.
- iv) KVAh
- v) KWH

The meter shall also store power 'ON' time. The meter shall have facilities for transfer/down loading of Data to get complete details in numeric data form and in graphic form.

12.0 SELF DIAGNOSTIC FEATURES

Indications to show the satisfactory performance of the meter shall be provided in the meter. The meter shall have capability to check its circuits for any malfunctioning. If some malfunctioning occurs, the meters should record such malfunctioning. The details of the self-diagnostic feature shall be furnished by the manufacturer/supplier. It should be possible to check correctness of CT & PT connection to meter and polarity for proper functioning.

13.0 TIME OF DAY (TOD) TARIFF

Meter shall have provision of atleast 8 TOD Zones for storing TOD consumption (KWH/KVAH) and Maximum Demand (KW/KVA).

However, presently the timing of TOD zones is required as under:

Zone No.	Timing
1.	00.00- 06.00
2.	06.00 -18.00
3.	18.00 -22.00
4.	22.00 -24.00

The TOD zones shall be programmable as per DLMS standard with proper security.

14.0 CONSTRUCTIONAL REQUIREMENTS, METER COVER & SEALING ARRANGEMENT

14.1 CONSTRUCTION

Meter shall be made of high quality materials/components to ensure high reliability and long life. The meter shall be compact in design. Meter shall be immune to vibration and shocks during transportation and handling. It should also be immune to external

magnetic/ electric fields as per clause 12.8 of IS: 14697/1999 (with latest amendment).

All the terminals for CTs and PTs connections shall be arranged in a row along the meter in the lower side. The terminals shall be moulded/tight fit constructions with barriers and covers to provide secure and safe connections of CTs and PTs through the stranded copper conductors of 2.5mm size. The terminal cover design shall be pilfer proof & extended type and preferably of transparent polycarbonate. The meter cover shall be continuously ultrasonically welded with meter base from all sides. Transparent poly carbonate cover to be used shall be unbreakable. Polycarbonate to be used shall be of high grade which shall conform to IS 11731 (FH-1category) besides meeting the test requirement of heat deflection test as per ISO-75, glow wire test as per the IS-11000 (part 2/SEC-1) 1984 OR IEC PUB,60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test As per UL-94 or As per IS-11731(Part-2) 1986. The casing should be dust & moisture proof to the degree of IP-51 as per IS:12063. Bidder must submit the test certificate to this effect

14.2 SEALING OF THE METER

Proper sealing arrangements shall be provided on the meter to make it tamper-proof. There should be a provision of two (2) seals on the meter body, two (2) seals on the terminals cover, one (1) seal on maximum demand resetting device, one(1) seal on optical port. RS-232terminal should also be sealable.

15.0 ACCURACY

The accuracy of measurement by meter shall be tested in accordance with relevant standards. Provision may be made that once the accuracy is brought within limits, the adjustments should be ceased and it shall not be possible to change the calibration of meters at site.

16.0 TAMPER & FRAUD MONITORING FEATURES

The meter shall work satisfactorily under presence of various influencing conditions like External magnetic Field, Electromagnetic Field, radio Frequency Interference, harmonic distortion, Voltage/Frequency Fluctuations, and electromagnetic High frequency fields etc.

Tamper details shall be stored in internal memory for retrieval by authorised personal through either of the following:

- i. HHU
- ii. Remote access through suitable communication network

16.1 Meter shall record the occurrence and restoration of tamper events along with parameters such as current, voltage, kWh, power factor, event code, date & time for the tampers listed below:

- i) **Phase sequence Reversal:** The offered meter will keep working accurately irrespective of the phase sequence of supply.
- ii) **CTs Polarity Reversal:** meter shall detect and record the tamper of Phase wise CT reversal with date & time of occurrence and restoration/or duration of tamper .
Further in the event of CT polarity reversal, the energy recorded by the affected phase/phases will be added to the Forward energy register.
- iii) **CT open:** Meter shall detect and record the tamper of CT open with date & time of occurrence and restoration/or duration of tamper. CT tamper should be logged in case the current in healthy phase is 10 % of rated current and/or more than it.
- iv) **Missing Potential:** The offered meter will be capable of recording occurrence of missing Potential which is defined as 55 % of V_{ref} or below in one or two phases which can happen due to intentional / accidental disconnection of potential leads, along with the total number of such occurrences for all phases. All such Occurrences and restorations will be recorded with date and time.
- iv) **Over Voltage& Low Voltage:** Meter shall detect & record the incidence of Over voltage in any phase (120% of V_{ref} & above) & Low voltage in any Phase (80% of V_{ref} & below) with date & time of occurrence and restoration/Duration.
- vi) **Over Current:** Meter shall record the incidence of Over Current in any Phase (more than 1.3 times of I_b) with date & time of occurrence and restoration/Duration.
- vii) **Meter Cover Open:** In case meter top cover is opened, the same should be recorded as tamper event with date & time stamping and the meter reading should get blocked and only the words "C-Open" with date & time should appear permanently, on auto display (Mode-1). The other mode of display i.e. mode-2 & mode-3 shall not get blocked. Under this condition meter shall, however, keep recording the consumption, which can be checked from its memory. Cover open tamper should not be re-settable, i.e. once the cover open tamper occurs, the above display should always be there. Cover open tamper should not be activated during the manufacturing process. "Meter Cover Open" tamper must also get logged and preferably displayed even when the power supply is 'OFF'.
- viii) Power OFF will be recorded as an event if it persists for more than 30 minutes. Print out with total number of events occurred can also be taken out by base computer system.

ix) Meter should record tamper when there is load difference of 25% lb or above between any two phases provided minimum 10% of lb load is flowing.

x) Meter shall log the actual date and time of occurrence and restoration of tamper. Meter will also log the snap shot of instantaneous data i.e. individual voltages, currents, power factors, kWh etc. along with tamper events. Snapshot for occurrence shall be taken at the end of persistence time of 3 minutes and snapshot for restoration shall be taken at the end of restoration time of 3 minutes after actual removal of tamper. The actual time of occurrence and actual time of removal of tamper or actual duration of tamper will be indicated in the printout. (In case of conflict with any standard, this clause of the specification shall prevail upon)

xi) All tampers except "Cover Open" and "Power Off" will be recorded if the tamper persists for three minutes and restoration after 3 minutes.

xii) In case more than one tamper exists simultaneously then meter will record all the tamper with date and time of occurrence. The list of simultaneous tampers to be checked is as under:

1. Both PT missing.
2. Both CT missing.
3. Both CT reversed.
4. One PT missing, One CT reverse current.
5. One PT missing, Over current.
6. One PT missing, One CT missing.

xiii) The offered meter will record accurately under tamper conditions of neutral disturbance when DC voltage is fed to neutral by installing a diode.

xiv) **At least 350 Nos. tampering events (175 no. occurrence and 175 no. restorations) shall be recorded with date & time.**

NOTE:

- i. Tamper information and readings logged by energy meter, should not be changeable by either Common Meter Reading Instrument or P.C.
- ii. All tamper events shall be recorded with date and time.
- iii. Event wise allocation of **350** tampers in the meters shall be as under:

Event category Description	Tamper Counts
Voltage related events	132
Current related events	134
Power failure related events	50
Transaction related events	10
Other events	20

Non-rollover events	04
Total	350

xv) **Invalid Voltage** : The meter should record tamper if same phase voltage is given to any two phase terminals of the meter and actual current is fed through CT secondary terminals (i.e. CT connections are OK but one phase voltage for meter only is disconnected and not for load and is looped/shorted with any one of the other / remaining two phases) e.g. VR, VR, VB & VN and Ir1-Ir2, Iy1- Iy2 & 1b1-1b2 instead of VR, VY, VB & VN and Ir1-Ir2, Iy1- Iy2 & 1b1-1b2.

Further, CT reversal phenomenon shall be appearing due to phase shift of 120° under these conditions/Tamper. However, in order to avoid any confusion, CT reversal tamper shall not be indicated/logged (i.e. should be blocked) in DDL print outs by the firms for this tamper only (i.e. Invalid Voltage). However, snap shot shall indicate actual values of current.

Snap shot shall be logged as per clause 16(x) & (xi) of Tender Enquiry (i.e. if tamper persists for 3 minutes). The accuracy tests/ dial test shall be performed after logging of this event is confirmed (i.e. after 3 minutes) at the time of testing of sample meters/meters and in that case meter should also record energy accurately under these conditions assuming voltage of all the three phases as Vref, UPF, and actual current flowing through individual phases.

17.0 ABNORMAL VOLTAGE/ FREQUENCY DEVICE TEST:

The accuracy of the meter should not be affected with the application of abnormal voltage/frequency generating device available in ME Labs of PSPCL having spark discharge of approximately 35KV. Meter shall be tested by feeding the output of **abnormal voltage/frequency generating** device to the meter in any of the following manners for a total period of 10 minutes:

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> i . On any of phase or neutral terminals. ii. On any connecting wires of meter. iii. Spark on meter body (including optical port) iv. At any place in load circuit. | } | Voltage discharge with
0-10 mm spark gap. |
|--|---|--|

However, spark on meter body test shall not be conducted on the RS-232 port.

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

During this test i.e. during the application of abnormal voltage/ frequency generating device, display as well as pulse of meters should not be affected.

Abnormal Voltage/ Frequency devices are available at ME Lab, Patiala. Meter will be tested with any of the five devices to be selected randomly out of total devices available with ME Lab, Patiala. However, the firms are at liberty to get their meters tested from ME Lab, Patiala with high voltage/high frequency device before submission of sample meters to this office. In case of successful

bidders, the meters shall be tested at the works during inspection with any of devices available with PSPCL.

18.0 EFFECT OF ABNORMAL MAGNETIC INDUCTION:

In the event of logging of abnormal magnetic induction with date and time, the meter should record energy equivalent to the product of rated voltage, rated maximum current and unity power factor. Logging of the Abnormal Magnetic induction should be within 30 seconds of the occurrence of the tamper. The restoration time for magnetic tamper shall be within 30 secs after removal of tamper. Date and Time of occurrence of tamper and duration of the tamper will be recorded by the meter. Sensor used for detecting this tamper should be electronic type.

This test shall be performed using 0.5 Tesla permanent magnet and meter should record energy equivalent to the product of rated voltage, rated maximum current and unity power factor at least at one location/place on the meter.

However, at all other points where meter does not record at I_{max} , it should record correct energy as per IS-14697/1999 (With latest amendments).

The actual time of occurrence and either of actual time of removal of tamper or actual duration of tamper will be indicated in the printout.

19.0 The offered meter will record energy accurately under the effect of radiation emitted by mobile phone. We have noted that the test will be carried out by bringing a mobile phone in the close proximity of the meter for 10 minutes when there is an incoming call and will be checked under the following condition:

- a) 10%Ib at UPF
- b) 50%Ib at UPF
- c) Ib at UPF
- d) 120%Ib at UPF

20.0 WORKING ENVIRONMENT

As per IS 14697/1999 **(with latest amendment)** meter to perform satisfactorily under Non Air conditioned environment (with in stipulations of IS)

Meter body will conform to IP51 degree of protection.

The meter shall be suitable designed for satisfactory operation under the hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish, which provided suitable protection to them from any injurious effect of excessive humidity.

21.0 MANUFACTURING PROCESS, ASSEMBLY AND TESTING

Meter shall be manufactured using latest 'state of the art' technology and methods prevalent electronic industry. The meter shall be made from high accuracy and reliable

surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT/RTC/Crystal, LCD, LED, power circuit assembly etc.) shall have batch and source identification. Multilayer 'PCB' assembly with 'PTH' (plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT components shall be assembled using automatic 'pick-and-place' machines, reflow soldering oven, for stabilised setting of the components on PCB. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standards practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering to be minimized to items, which cannot be handled by automatic machines. Handling of 'PCB' with ICs/CMOS components, to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided. Complete assembled and soldered PCB should undergo functional testing using computerized Automatic Test equipment

Fully assembled and finished meter shall undergo 'burn-in' test process for 12 hrs at 55 degree Celsius (Max. temperature not to exceed 60 degree Celsius) under base current (Ib) load condition.

Test points should be provided to check the performance of each block/stage of meter circuitry. RTC shall be synchronised with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard with tractability of source and date.

22.0 PERFORMANCE UNDER INFLUENCE QUANTITIES

The meters performance under influence quantities shall be governed by IS:14697-1999(reaffirmed-2004). The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS 14697/1999(latest version).

23.0 OUTPUT DEVICE

Energy meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from the front and test output device shall be provided in the form of LED. Resolution of the test output device shall be sufficient to enable the starting current in less than 10 minutes

24.0 MARKING OF METERS

The marking of meters shall be in accordance with IS: 14697(with latest amendment).

The meter shall also store name plate details as given in the IS 15959:2011 (including amendments, if any). These shall be readable as a profile as and when required.

The letters PSPCL & 'ISI' mark shall be indelibly and clearly marked at the appropriate place of the meters. In addition the words 'Property of PSPCL, Purchase Order No. and date' shall be either punched or marked indelibly on the name plate.

25.0 INSPECTION AND TESTING

The inspection and testing shall be done as per IS:14697(with latest amendment) & **CBIP-325 report (Latest) for magnetic strength of AC and DC permanent magnet** and this specification. All the meters shall be tested, calibrated and sealed by the supplier at their works before dispatch and all the routine test certificates of individual meters shall be supplied. **Two no. sample meters shall be sealed during inspection from any one lot of offered material and shall be got Type Tested by PSPCL from CPRI/ERTL/ETDC/ERDA/YMPL/Central Electronics Centre, IIT, Chennai/Hi-tech Meter Laboratory, UGVCL, Ahmedabad/Hi-Physix laboratory India Private Ltd., Pune at the cost of supplier. Further, PSPCL may get the sample meters Type Tested from above NABL accredited Labs from the subsequent lots at its own cost. In case of any failure during above Type Tests, the entire lot shall be rejected at the risk and cost of the supplier.**

0.25% meters of the offered lot during inspection of meters shall be checked by physically opening the meter body for ascertaining the strength of ultrasonic welding at the cost of the supplier. The firm shall be fully responsible in case of weak ultrasonic welding.

Also see Clause no. 22 of Schedule-E

26.0 TYPE TESTS

Bidder shall furnish along with the offer type tests reports as per IS: 14697/1999(with latest amendment) (for each ratio -/5 Amp & -/1 Amp of accuracy class as per specification) and IS:15959(including amendments, if any) issued by one of CPRI/ERTL/ETDC/ ERDA/YMPL/Central Electronics Centre, IIT, Chennai/Hi-tech Meter Laboratory, UGVCL, Ahmedabad/Hi-Physix laboratory India Private Ltd., Pune to prove that meters meet these requirements specification. Bidders shall also submit, along with offer, Type Test Certificates of high quality Reinforced Polycarbonate or equivalent High Grade Engineering Plastic material used for meter housing material i.e. base/cover/terminal cover from any Govt. approved Laboratory. Reports for type tests conducted in manufacturer's own laboratory and certified by testing institute shall not be acceptable. These tests must not have been conducted earlier than two years from the original scheduled date of bid opening (Part-I & II). The purchaser reserves the right to demand repetition of some or all the type tests in the presence of purchaser's representative free of cost. In case type test certificate are not enclosed with the offer then the offer shall be rejected. **The tenderer shall also submit valid DLMS compliant certification (Category- A), as per Indian Standard IS 15959, of the offered meters along with tender.**

In addition to these, the tenderers shall submit valid ISO 9001:2008 certification for meter manufacturing, ISO 27001:2005 for information security management system & ISO 14001:2004 for environmental management system at the time of opening of Tender (i.e part- I & II of Tender).

Routine/Acceptance tests and inspections shall be carried out at the place of manufacture. The bidder shall give the list of test for which testing facilities with the manufacturer are not available and submit the proposal of carrying out the same at reputed test Laboratories. The manufacturer shall provide the Inspector/representative of the purchaser all reasonable facilities, without charge, to satisfy him that the equipment offered is in accordance with this specification. It shall be responsibility of the supplier to arrange such tests and purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Firm should have BIS certificate for meters similar to offered meter at the time of submission of offers.

27.0 ACCEPTANCE & ROUTINE TESTS

Criteria for selection for such tests and performance requirements shall be as per IS 14697(with latest amendment)

Additional acceptance shall include Surge withstand (SWC) for 6kVp as per IEC62052-11, Lightning impulse test and HF disturbance test as per IS 14697. One sample meter per order from one of the offered lot shall be subjected to these specific tests. Meters subjected to these tests shall not be used after tests

Accuracy tests shall be performed at the beginning and at the end of the acceptance after tests.

28.0 QUALITY ASSURANCE

The manufacturer shall have a comprehensive quality assurance program at all stages of manufacture for ensuring products giving trouble free performance. Details of the bidder's quality assurance and test set up shall be furnished with the bid. A detailed quality assurance program shall be finalized with the successful bidder during the award stage. Bidder shall furnish following information along with the bid:

- i. Organization structure of the manufacture and his main sub suppliers(PCB, SMT cards, CT/PT with details of QA set up, overall workflow)
- ii. Copy of system manual showing 'QAP'(Quality assurances Plan) as actually practiced during manufacturing and final testing
- iii. List of raw material and critical components(ASIC chip, crystal clock, memory register Chip, transformers, optical ports etc.) with their suppliers
- iv. Stage inspection of product before final testing
- v. Procedure adopted for 'in-situ' testing of PCBs, after placement of surface mounted components for quantitative parameters variations of tolerance by self or sub contractor

- vi. Testing and calibration facility, date of calibration of test bench, manpower data of bench operators
- vii. Sample copies of test certificate of bought out components

29.0 SAMPLE:

Firms shall submit samples as per Pre-qualification requirement and supply software details/ OBIS codes of parameters in order to examine acceptability of their products. The tender of the firm shall only be opened if sample meters as detailed below are submitted. In case order is placed on a firm, the meters shall be supplied as per the sample & the specification. In case of external battery, the bidders shall supply one no. external battery along with the sample meters.

The bidders shall have to demonstrate the reading of meter data at the Base Computer Station at Patiala, in the existing AMR network of PSPCL, for ascertaining compatibility as per IS 15959:2011. Part-III (Price Bid) of only those bidders shall be opened whose meters shall be complying with the above requirements.

30.0 CALIBRATION AT SITE

It shall not be possible to change calibration of meters at site.

31.0 OPERATION MANUALS

The supplier shall supply free of cost with each meter a detailed operating and maintenance manual and software to the purchaser for use.

32.0 PACKING

The meters shall be properly packed in shockproof packing to ensure their safe arrival at destination.

33.0 SUPPORT SERVICES

In addition to the supply of meters and equipment the supplier would be required to extend supports services as under:-

The supplier shall provide meters along with software for data transfer to base computer through HHU/Direct down loading of data to lap-top computer/direct transmission media i.e. telephone line, cellular phone, wireless etc. with auto-dialer feature and shall assist in converting the same into data base in the base computer. The software should have feature to give command to reset the MDI through base computer.

Supplier shall generate analysis report for the Board, based on the data retrieved from the meters, so as to reflect on the following parameters for enabling the purchaser to take necessary corrective actions for future:-

- i. Load profiles.
- ii. Tamper analyses data and any other such useful information.
- iii. Violations (for consumer meters).

- iv. The computer software (Windows based preferably) should have suitable interface to transfer the billing Data to billing software on line through LAN or through floppy etc. for processing/printing out the energy bills. The computer software should be able to convert the data received from the meter into database so that further processing of the output is possible.
- v. The successful bidder shall be required to impart free of charge practical training to purchaser's staff at the place of installation so as to equip them for use of the meters, HHU, software including data off loading and report generation.

34.0 MISCELLANEOUS

- a. Meter should work properly in the event of removal of neutral according to electrical conditions and connection in case of 3 phase 4 wire connection and measure energy/parameters according to electrical conditions and connections as per IS:14697/1999(with latest amendment).
- b. The registration of reactive and apparent energy at leading/lagging power factor shall be as follows:-
 - i) Reactive energies shall be stored in a separate registers.
 - ii) Apparent energy shall be equated as per given formula considering the reactive energy lead as zero.

$$\text{Apparent Energy} = \sqrt{[\text{Active Import Energy}]^2 + [\text{Reactive Energy (Lag)}]^2}$$

The sample will be provided as per this Protocol. However, PSPCL reserves the right to change this protocol without any financial implication to PSPCL.

- c. The day/date setting and synchronization shall only be possible once in a year subject to maximum of **180 secs.** through password/key code command from one of the following: Remote server through suitable Communication network/ PC/Substation data logger.
- d. The software provided by the meter manufacturer for base computer should have the provision for entering meter CT ratio, meter PT ratio, line CT ratio & line PT ratio. Also its software shall be capable of multiplying the meter data with whole number or fractional number arising due to non-matching of meter CT/PT ratio and line CT/PT ratio. Further the base computer software shall have a feature for filtering the load survey data with reference to time slot of the day.
- e. The manufacturer should also submit complete technical write up along with literature of tri-vector meters.
- f. Provision should be made for recording cumulative daily energy (in KWH & KVAH) at 00:00 Hours, for the purpose of energy auditing for last 70 (seventy) **"Power ON"** days.
- g. Blinking LED and High resolution display for testing active and reactive energy should be available and meter constant should be invariably printed on the dial plate. The testing pulse should be homogenous and manufacturer should state necessary number of pulses counts (s) to ensure measurement and accuracy of at least 1/10th of class of meters at different test point.

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- h. Maximum Demand History data should be available for last 12 calendar months, all the MDI registers should be with date and time stamping. Cumulative energy (kWh & KVAH) at 00.00 Hrs shall also be available in the memory for last 12 calendar months.
- i. Meter shall be suitable for mounting on Simplex type vertical panel with front door.

35.0 CERTIFICATES

Following Certificates will be furnished by the bidders in their offer that:

- i. Their meters are capable of recording of **350** tamper events.
- ii. Their meters are capable of recording of minimum **last 70"Power ON"**days load survey for CAT-A meters.
- iii. RTC Drift shall be within (+/-)**180** seconds per year.
- iv. Software takes care of 29th Feb of the leap year.
- v. Meter will not be affected by Abnormal Voltage/ Frequency Device as per clause-17 of specification.

36.0 EMPANELMENT OF FIRMS

Technically suitable firms shall be empanelled for private sale of meters to consumers/prospective consumers of PSPCL against this tender enquiry as per terms & conditions of PSPCL, given as under:

- i. Empanelment for private sale of meters to consumer/perspective consumers of PSPCL shall be done on L-1 Ex-works prices with 10% profit margin plus applicable taxes and duties extra as applicable.
- ii. Empanelment of the firms for these meters made earlier shall be treated as cancelled.
- iii. Firms shall write on the nameplate the words "Private sale under PSPCL Jurisdiction".
- iv. This office can de-empanel any firm due to bad performance, change in specification of meters and Over-charging from the consumer than the fixed M.R.P. etc. within the empanelled period.
- v. The firms shall be eligible for private sale during the month only after delivering the said material to PSPCL for the month as per delivery schedule of Purchase Order if order is placed on them.
- vi. To ensure the quality of material, the firms will get meters inspected in suitable lots by a team of two officers of PSPCL as per terms & conditions of this spec. MQP-126/2017-18/PR.
- vii. 100% testing of all the meters sold in private market shall be carried out at firm's premises before installation in feeders.
- viii. The Private Sale of meters shall be allowed without any cut-off date unless otherwise withdrawn.

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This specification is a guideline, for Trivector metering features. However, the Tenderers should offer the meter as per standards bringing out clearly the all-technical features provided in their Trivector meters.

**Dy.CE/HQ-cum-Metering
PSPCL, Patiala**

PQR, Rev-00- (Trivector Meter)

Annexure-1

1. Past Performance

The Bidder shall have supplied at least 10% of the total quantity covered under this enquiry as on the date of techno-commercial bid opening of this enquiry

Document required: Bidder to furnish unpriced P.O or Invoice copy or relevant documents in support of supply.

2. Experience Criteria

The offered type of meters should be in successful operation for at least 2 year in last 7 years as on the date of techno-commercial bid opening date of this enquiry.

Document required: Bidder to furnish MOM with customer/ Site or Customer email/ letter or any customer document for commissioning status

3. Organizational Capability:

The Bidder shall have service support set-up for providing product repair/ rectification in India.

Bidder to furnish set-up details along with an undertaking in respect of above.

Arvind Kumar
Dy. Manager / SWE