

TECHNICAL SPECIFICATION FOR 220KV, 132 KV, 33KV &11KV/110V HT TVR Meters of various ratios, 0.2S class accuracy, 15 min / 30 min. integration with DLMS (CAT-C) Meters

1.0 SCOPE :

This specification covers design, engineering, manufacture, assemble, stage testing, inspection and testing before supply and delivery free at destination stores of 11KV/110V, 10/5A, 33KV/110V, 100/1A, 0.2S class Accuracy 30 Min.IP & 15 Min.IP (CAT-C for Services with DLMS 3 element 4wire CT & PT Operated HT Electronic Trivector Meters and 132 KV/110V 150/1A 0.2S class & 220KV/110 , 200/1A Accuracy 15 Min.IP CAT-C for Services with DLMS meters capable of performing the functions of metering for tariff purpose in all 4 quadrants energy audit, load survey at various H.T. consumers installations. All the meters should have suitable in built network interface hardware for CMRI,RMR (Remote Meter Reading), AMR compatibility to read data through Dial – up, GSM and GPRS modems.

1.1 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 to 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 power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such, components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 STANDARDS:

The equipment shall conform in all respects to the relevant Indian Standard Specification with latest amendments thereto.

Indian Standard	Title	International & Internationally recognized standard
CBIP Technical Report No.88/304 (with latest amendments) CBIP No.325	Specification for AC Static Electrical Energy Meters.	IEC 687/1992 –Static watt hour meters for classes 0.2S & 0.5S
IS 14697, 1999	AC Static Watthour Meters for active energy Meters of Class 0.5S & 0.2S.	
CBIP Technical Report No.111, May, 1997	Specification for Common Meter Reading Instrument	
IS-5133/1969 IEC 0687/1992 Static watt hour meters for classes 0.2S & 0.5S	Specification for Boxes for the Enclosure of electrical accessories (part-II Boxes made of Insulating material)	

IS 15959:2011 (with latest amendments)	Data Exchange for Electricity meter reading tariff and Load Control Companion specification.	
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Equipment conforming to other internationally accepted standards. Which ensure equal or higher quality than the standards mentioned above would also be acceptable. In case the Bidder who wish to offer material conforming to the other standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule, Four copies of such standards with authentic English Translations, shall be furnished along with the offer.

3.0 SERVICE CONDITIONS:

The equipment to be supplied against this Specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Sl. No.	Location	At various Sub-stations in the state of Andhra Pradesh
i)	Max. ambient air temperature (deg.C)	50
ii)	Max. ambient air temperature in a closed (deg.C)	60
iii)	Min. Ambient air temperature (deg.C)	7.5
iv)	Average daily ambient air temperature (deg.C)	35
v)	Max. Relative Humidity (%)	100
vi)	Max. altitude above mean sea level (m)	1000
vii)	Average Annual rainfall (mm)	925
viii)	Max. wind pressure (kg/sq.m)	200
ix)	Isoceraunic level (days per year)	50
x)	Seismic level (Horizontal accn.)	0.10.g.
xi)	Noise Level	45 Db

Moderately hot and humid tropical climate, conducive to rust and fungus growth. The climatic conditions are prone to wide variations in the ambient conditions. Smoke is also present in the atmosphere. Heavy lightning also occurs during June to October.

4.0 PRINCIPAL PARAMETERS :

The material shall conform to the following specific parameters:

Sl. No.	Item	Specification
1.	Type of Installation	To be installed in VCB panels and also in HT Services
2.	System voltage	Secondary voltage:110 V phase to phase (+20%,-30%.)
3.	System frequency	50 Hz +/-5%
4.	No. of phases	Three
5.	System of earthing	Solidly grounded

5.0 TECHNICAL REQUIREMENTS:

5.1 MATERIAL USED:

The meter shall be made out of high quality materials to ensure higher reliability and long life with self extinguishable type polycarbonate meter casing. It should be compact and of reliable design to make it immune to vibrations and shocks in normal transportation and should be capable of withstanding severest stresses likely to occur in actual service. The latest state of the art technology of surface mounting of components

etc., may be used for the purpose. The soldering if any shall be perfect without dry solders. The construction of the meter shall be such as to permit sealing of the meter cover, terminal cover etc. independently to ensure that the internal parts are not accessible for tampering etc. without breaking the seals. The meter window shall be transparent and made out of UV stabilized material so that the window does not turn yellow after some years.

5.2 SUPPLY SYSTEM:

The HT Trivector meters should be suitable on HV & EHV system by using necessary CT and PTs of.

220KV, 132kV & 33KV:

Primary Voltage	220KV	132 kV	33KV
Secondary voltage	110V phase to phase	110V phase to phase	110V phase to phase
Primary current	As specified in the schedule	As specified in the schedule	As specified in the schedule
Secondary current	1 A	1 A	1 A

The meter shall be suitable for

balanced and as well as unbalanced loads at all power factors i.e., Zero lag-Unity-Zero lead.

The meter shall be suitable for three phase three wire systems for balanced and as well as unbalanced loads at all power factors i.e., Zero lag-Unity-Zero lead.

11kV :

Primary Voltage	11 kV
Secondary voltage	110V phase to phase
Primary current	As specified in the schedule
Secondary current	5A

The meter shall be suitable for balanced and as well as unbalanced loads at all power factors i.e., Zero lag-Unity-Zero lead.

The meter shall be suitable for three phase four wire systems for balanced and as well as unbalanced loads at all power factors i.e., Zero lag-Unity-Zero lead.

5.3 POWER SUPPLY VARIATION:

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

Voltage	-30% to + 20%
Frequency	+/-5%
PF. range	Zero lag-unity-zero lead with recording in both import and modes i.e 0 to 360 degrees

However manufacturer can offer meters which can withstand higher variations

5.4 ACCURACY:

220KV, 132kV & 33KV :

- a) For 220KV , 200/1A & 132 KV, 150/1A & 33KV 100/1A Meters Class of accuracy of meter shall be 0.2S for both active and reactive energies as per CBIP technical report No. 88/304 and CBIP-325 with latest amendments.
The accuracy should not drift with time.
- b) The meter shall be suitable for lag and lead tariff, i.e lag as lag , lead as lead , upf as upf satisfying the formula, $KVAH2 = KWH2 + RKVAH2$ for lagging and leading loads

11kV :

- a) For 11KV, 10/5A Meters Class of accuracy of meter shall be 0.2S for both active and reactive energies as per CBIP technical report No. 88/304 and CBIP-325 with latest amendments. The accuracy should not drift with time.
- b) The meter shall be suitable for lag and lead tariff, i.e lag as lag , lead as lead upf as upf satisfying the formula, $KVAH2 = KWH2 + RKVAH2$ for lagging and leading loads

Note:

- 1) **Baud rate shall be maintained as per IS 15959.**
- 2) **Drift time shall be maintained as per IS 14697.**

5.5 POWER CONSUMPTION:

- i) Voltage Circuits: The active and apparent power consumption in each voltage circuit including power supply of the meter at reference voltage reference temperature and reference frequency shall not exceed 1.5 Watts and 8 VA per phase.
- ii) Current Circuit: The apparent power taken by each current circuit of the meter shall not exceed 1.0 VA/phase at basic current and reference frequency and reference temperature.

5.6a MEASURING PARAMETERS for 11KV :

5.6.1. The meter should be capable of measuring the following electric parameters of poly phase supplies in all the four quadrants at all power factors lagging or leading.

Active energy	kWh/MWh (Import)
Reactive energy	kVArh / MVarh (lag & lead) (Import)
Apparent energy	kVAh/MVAh (Import)
Max. demand with date & time	kVA / MVA (Import)
Power factor	
Elapsed time and raising demand	kVA / MVA
Maximum demand reached so far (reset to reset)	kVA / MVA
MD resent count	kVA / MVA
Cumulative MD	kVA / MVA
Display of No. of MD resets	Previous 12 Nos. MD values with date & time
Recording of missing potential, missing current & reversal of current with date and	

time	
Real time and date	
TOD register	
Phase Voltages (instantaneous)	
Phase Current (instantaneous)	
Tamper and fraud details	
Self diagnostics	
Frequency	
Harmonic content	

NOTE: 1) The parameters KWh, KVARh lag, KVARh lead, KVAh, maximum demand and rising demand with elapsed time, 3 Phase voltages, 3 Phase currents, tamper event if any shall be displayed continuously in cyclic order on the meter to know the above parameters at any instant.

NOTE: 2) Up and Down push buttons (Separate Button) shall be provided on the meter to read the meter parameters manually by pushing the button.

The details of (i) Display Parameters (Auto display in cyclic order) (ii) Display Parameters (Push button) (iii) Readout Parameters (through CMRI / RMR) are specified below:

- i) At the start of each sequence of display LCD healthiness anomaly and real time and date shall be displayed.
- ii) **In the absence of power supply, facility for display of meter reading should be available.**

5.6.2. Display parameter (Auto display) for 11KV:

- i. Active Energy (Import)
- ii. Reactive Energy (Import)
- iii. Apparent Energy (Import)
- iv. Maximum Demand (Occurrence, Date & Time, Import)
- v. Rising Demand with elapsed time
- vi. M.D. Reset Count
- vii. Cumulative M.D.
- viii. Instantaneous Power Factor
- ix. Line Frequency
- x. Self Diagnostic (LCD segment check & battery check)
- xi. Real time & date
- xii. Present status of the tamper (if any)
- xiii. Tamper count
- xiv. Phase association must be indicated. Any abnormalities in connections shall be displayed.
- xv. No. of events of voltage missing, No. of events of current missing, No. of current reversals and No. of events other tampers.
- xvi. Three voltages & Three Currents
- xvii. TOD parameters.
- xviii. *Last 6 months MD*
- xix. *Last 6 months MD reset date (all modes of MD resets).*

5.6.3 Display Parameter (Push Button) for 11KV :

- i. Active Energy (Import)
- ii. Reactive Energy (Import)
- iii. Apparent Energy (Import)
- iv. Maximum Demand (Occurrence, Date & Time)
- v. Elapsed Time & Rise in Demand
- vi. M.D. Reset Count

- vii. Cumulative M.D.
- viii. Previous 12 Nos. M.D. Values with Date & Time
- ix. Instantaneous Power Factor & Average Power factor
- x. Line Frequency
- xi. Real time & date
- xii. Phase Voltages (Instantaneous)
- xiii. Phase Current (Instantaneous)
- xiv. Number of Tamper events (total)
- xv. Self Diagnostic (LCD segment check & battery check)
- xvi. Phase association must be indicated. Any abnormalities in connections shall be displayed.
- xvii. Active Power (kw) (Import)
- xviii. Apparent power (KVA) (Import)
- xix. High Resolution mode parameters
- xx. TOD parameters
- xxi. *CT Ratio*

5.6.4. Read out Parameters with CMRI / RMR / Lap top for 11KV :

- (i) Meter Serial Number, Model & Make.
- (ii) All parameters at clause 5.6.3
- (iii) Energy Registers
- (iv) Billing Registers for last 12 months
- (v) T.O.D. Registers
- (vi) Load Survey Data
- (vii) Tamper & Fraud (all event details with date & time)
- (viii) Self diagnostic details (real time calendar, low battery)
- (ix) Daily kWh readings(Import) and KVAh readings (Import) at 00:00 Hrs. for the past 60 days to be available in the memory.
- (x) Phasor diagram between V (vs) I shall be displayed in CMRI / Laptop.

5.6.b MEASURING PARAMETERS for 220KV, 132KV & 33KV :

5.6.5. The meter should be capable of measuring the following electric parameters of poly phase supplies in all the four quadrants at all power factors lagging or leading.

Active energy	kWh/MWh (Import & Export)
Reactive energy	kVARh / MVARh (lag & lead) (Import & Export)
Apparent energy	kVAh/MVAh (Import & Export)
Max. demand with date & time	kVA / MVA (Import & Export)
Power factor	
Elapsed time and raising demand	kVA / MVA
Maximum demand reached so far (reset to reset)	kVA / MVA
MD resent count	kVA / MVA
Cumulative MD	kVA / MVA
Display of No. of MD resets	Previous 12 Nos. MD values with date & time
Recording of missing potential, missing current & reversal of current with date and time	
Real time and date	
TOD register	
Phase Voltages (instantaneous)	
Phase Current (instantaneous)	

Tamper and fraud details	
Self diagnostics	
Frequency	
Harmonic content	

NOTE: 1) The parameters KWh, KVARh lag, KVARh lead, KVAh, maximum demand and rising demand with elapsed time, 3 Phase voltages, 3 Phase currents, tamper event if any shall be displayed continuously in cyclic order on the meter to know the above parameters at any instant.

NOTE: 2) Up and Down push buttons (Separate Button) shall be provided on the meter to read the meter parameters manually by pushing the button.

The details of (i) Display Parameters (Auto display in cyclic order) (ii) Display Parameters (Push button) (iii) Readout Parameters (through CMRI / RMR) are specified below:

- j) At the start of each sequence of display LCD healthiness anomaly and real time and date shall be displayed.
- ii) **In the absence of power supply, facility for display of meter reading should be available.**

5.6.2. Display parameter (Auto display) for 220KV, 132KV &33KV:

- b. Active Energy (Import & Export)
- ii. Reactive Energy (Import & Export)
- iii. Apparent Energy (Import & Export)
- iv. Maximum Demand (Occurrence, Date & Time, Import & Export)
- v. Rising Demand with elapsed time
- vi. M.D. Reset Count
- vii. Cumulative M.D.
- viii. Instantaneous Power Factor
- ix. Line Frequency
- x. Self Diagnostic (LCD segment check & battery check)
- xi. Real time & date
- xii. Present status of the tamper (if any)
- xiii. Tamper count
- xiv. Phase association must be indicated. Any abnormalities in connections shall be displayed.
- xv. No. of events of voltage missing, No. of events of current missing, No. of current reversals and No. of events other tampers.
- xvi. Three voltages & Three Currents
- xvii. TOD parameters.
- xviii. *Last 6 months MD*
- xiv. *Last 6 months MD reset date (all modes of MD resets).*

5.6.3 Display Parameter (Push Button) for 220KV, 132KV &33KV :

- i. Active Energy (Import & Export)
- ii. Reactive Energy (Import & Export)
- iii. Apparent Energy Import & Export)
- iv. Maximum Demand (Occurrence, Date & Time)
- v. Elapsed Time & Rise in Demand
- vi. M.D. Reset Count
- vii. Cumulative M.D.
- viii. Previous 12 Nos. M.D. Values with Date & Time
- ix. Instantaneous Power Factor & Average Power factor
- x. Line Frequency
- xi. Real time & date

- xii. Phase Voltages (Instantaneous)
- xiii. Phase Current (Instantaneous)
- xiv. Number of Tamper events (total)
- xv. Self Diagnostic (LCD segment check & battery check)
- xvi. Phase association must be indicated. Any abnormalities in connections shall be displayed.
- xvii. Active Power (kw) (Import & Export)
- xviii. Apparent power (KVA) (Import & Export)
- xix. High Resolution mode parameters
- xx. TOD parameters
- xxi. *CT Ratio*

5.6.4. Read out Parameters with CMRI / RMR / Lap top for 220KV, 132KV & 33KV :

- a. Meter Serial Number, Model & Make.
- b. All parameters at clause 5.6.3
- c. Energy Registers
- d. Billing Registers for last 12 months
- e. T.O.D. Registers
- f. Load Survey Data
- g. Tamper & Fraud (all event details with date & time)
- h. Self diagnostic details (real time calendar, low battery)
- i. Daily kWh readings(Import) and KVAh readings (Import) KVARH lag KAVRH lead at 00:00 Hrs. for the past 60 days to be available in the memory.
- j. Phasor diagram between V (vs) I shall be displayed in CMRI / Laptop.

5.7 MAXIMUM CURRENT:

The maximum current of the meter is 120% Ib at which the meter purports to meet the accuracy requirements.

The meter should start registration of energy at 0.1% of basic current (Ib).

5.8. DISPLAY:

The meter shall have a minimum 7 digit display of liquid crystal display (LCD) of the best quality with another digit for legend. The minimum character height shall be 9 mm. Provision shall be made to read consumption in either whole units or decimal multiples or submultiples of one unit. The display shall be digital type with non destructive read out. It shall be possible to display content of relevant parameter with another digit displaying legend for identification. The meter should have facility of auto display mode where all parameters automatically scroll within the specified time and a manual mode where the parameters can be read by push button operation. In auto display mode each parameter shall on display for 10 seconds. The display “off” period between two cycles shall not exceed 30 seconds. The register should not roll over in between this duration. The meter should have non volatile memory, so that the registered parameters will not be affected by loss of power. The nonvolatile memory should have a minimum retention time of 12 years.

5.9. MAXIMUM DEMAND REGISTRATION:

The maximum demand is to be monitored during each demand interval set with 30/15 minutes integration as the case may be and the maximum of these in a month shall be stored. Whenever MD is reset the maximum demand value so registered shall

be stored along with date and time. Under the current integration period, the rising demand should be displayed continuously along with the elapsed time. The registered demand and the number of times of MD reset shall also be displayed and the information stored.

5.10 MD RESET:

The meter should have provision of maximum demand resetting.

- a) Manually by operation of a button which is to be covered and sealing provision available for such cover.
- b) Resetting shall also be possible through a hand held common meter reading instrument (CMRI / Laptop) capable of communicating with the meter.
- c) Auto MD reset facility for 1st of every month at 00.00 DLMS compatible HT TVR Cat-C meters with RS 232 port. MRI data Load survey to be available for at least 60 days

5.11(a) LOAD SURVEY CAPABILITY:

The meter should log the following parameters Three Phase Voltages, Three Phase Currents, KWH Import, KWH Export & KVAH Import, KVAH Export, KVARH (lag) & KVARH (Lead), KVA Import, KW Import and PF , Three phase voltages, Three phase currents for last 60 days in its memory. The meter shall be programmed to record (i) No. of hours supply is available in all three phases (ii) No. of hours supply is available partially in one or two phases and (iii) No. of hours supply is not available in any phase for each day for 60 days memory period. It should be possible to transfer this data on to a base computer station through a DOS based CMRI / Lap top. The base computer shall give complete details of load survey particulars both in numeric data form and in graphic form. Necessary software for invoking the base computer station should be provided.

5.11(b) Quality of Supply:

The meter shall provide date and time stamped profiles of each interruptions along with duration.

5.12 TIME OF DAY TARIFF / DEMAND:

The meter offered shall contain provisions for multiple tariff metering (time of day metering / demand) . The meter offered should have a real time clock based on a quartz crystal with a battery totally independent of power supply. The meter shall be capable of being set in to minimum of 8 time zones (optionally more time zones can be offered) in 24 hours cycle to cover morning and evening on and off peak periods separately TOD register shall be provided for active energy and demand data.

Initially TOD registers for 6 time zones shall be programmed as detailed below to capture kWh, kVAh & kVA and shall be made them to read on **meter display**.

T1: 00.00 hrs. to 06.00 hrs.

T2: 06.00 hrs. to 10.00 hrs.

T3: 10.00 hrs. to 14.00 hrs.

T4: 14.00 hrs. to 18.00 hrs.

T5: 18.00 hrs. to 22.00 hrs.

T6: 22.00 hrs. to 24.00 hrs.

and T0: cumulative month end

Present Month MD, Cumulative MD & Billing MD shall be provided.

and it should be possible for APEPDCL to invoke / change them through the use of CMRI with 2 level password protection and necessary software should be loaded by the meter supplier into the base computer station.

5.13 REMOTE READ OUT FACILITY / COMMUNICATION CAPABILITY:

- (i) The meter shall be provided with a galvanically isolated RS 232 optical communication port (such as IEC-1107 PACT port, ANSI Port, etc.), so that it can be easily connected to a CMRI / Laptop for data transfer or subsequently hooked to remote metering device such as modem etc. The optical communication port shall also have sealing provision. Companies may adopt protocol of their choice but should load the software and the protocol software into base computer station of the APEPDCL. It is the responsibility of the meter manufacturer to provide the software and all the facilities required by the APEPDCL to use the DOS based hand held CMRI / Laptop for reading the meter and generating appropriate reports required by the APEPDCL. The data element size and its over head speed of transmission shall be such that the entire billing data can be transferred within maximum time of 3 minutes.

For remote read out there should be one additional communication port i.e RS 232 port at RJ 11 for 11KV meters

For remote read out there should be two additional communication ports i.e RS 232 and RS 485 port at RJ 11 for 132 KV ,220KV , 33 KV meters.

- (ii)**Software :** The following software shall be made available to interface with hand held meter reading instrument/CMRI / Laptop.

- (a) Software to be resident in hand held terminal/CMRI and laptop for the purpose of reading and programming the specific make(s) of static meters.

- (b) Base computer station software for accepting data from hand held terminal/CMRI, processing, generating reports and down loading instructions from the Base computer station to CMRI / Laptop.

- (c) Dial up software and protocol software for accepting the data from the meter through P&T lines to the base computer station / central computer station, processing and generating appropriate reports. Also the following should be supplied along with meters (i) API (ii) Protocols (iii) Memory maps.

- (iii) **Data Security :** You are responsible for maintaining the security of the data extracted from the meters using manufacturer specific algorithms in the software up to down loading to the base computer station.

The meter shall also have the following technical features

- a) Voltage and current sources will be available from star-star connected P.T. of the system and current transformer of suitable ratio, respectively.
- b) The meter should record and continue to display so long as two potentials are available. The display and recording should have no relevance with reference to the availability of departmental neutral.
- c) The meter shall be suitable for lag and lead tariff, i.e lag as lag , lead as lead , upf as upf satisfying the formula, $KVAH2 = KWH2 + RKVAH2$ for lagging and leading loads
- d) The meter shall be site programmable in case of necessity to use these meters in Import/ Export mode and also TOD features. As and when required TOD parameters must be field invokable.
- e) Each parameter shall be on display for a minimum period of 10 seconds.

- f) Load survey **with 30 min./15 min integration** as the case may be for KWH, KVAH Three Phase voltages and R,Y & B currents for 60 days shall be available for the meters.
- g) The meter has to record potential missing only when phase voltage is less than 80% of V_n (nominal voltage) i.e. if the voltage falls below 50.8V.
- h) MD reset button and push button (display parameters) should be provided in different colours.
- i) The phase indicators should flicker only on load but not on no loads which is presently available.

The Meters should also be compatible to Automatic Meter Reading and necessary APIs memory maps & Protocol commands should be provided for the same before claiming the bills.

5.14.TERMINAL ARRANGEMENTS:

The terminals shall be marked properly on terminal block for giving external connections. A diagram of connections should be provided inside the cover of terminal block. The terminal cover shall be extended such that when it is placed in position it is not possible to approach the connections or connecting wires. The terminals and the screws shall be suitable to carry up to 150% of I_{max} safely. The terminals shall have suitable construction with barriers and covers to provide secure and safe connections of Current Transformers and Voltage Transformers leads of stranded copper conductors of 2.5 Sq.mm size.

5.15. TEST TERMINAL BLOCK(TTB) WITH COVER:

A separate TTB is to be provided. The TTB of skew type shall have transparent Polycarbonate cover suitable provision shall be made in the test terminal block for disconnecting the meter for testing purposes and for the purposes of testing the meter, the Screws & bars are to be robust and made up with stainless steel material only and the dimension should not be less than as mentioned in the drawing enclosed. The test terminal block shall have provision for isolating the meter from the instrument transformer secondary connections. Proper arrangements for sealing of test terminal blocks cover are to be made. The test terminal block shall also have extended terminal cover such that when it is placed in position is not possible to approach the connections or connecting wires. The live parts and current terminals shall not be accessible from the rear of TTB to prevent tampering. The terminal cover must be transparent so that the connections are visible.

5.16 SEALING OF METER:

Proper sealing arrangement should be provided on meter to make it tamper proof and avoid mishandling by unauthorized persons. Meter cover shall be provided with minimum of 2 Nos. sealing provision. The meter terminal block and test terminal block. (TTB) with 2 Nos. each sealing screw and one number separate sealing arrangement to the MD reset push button. Separate sealing arrangement for optical port to be used for communication to CMRI should also be provided. The meter should be designed and constructed in such manner to make it pilfer proof once it is sealed.

5.17 ENVIRONMENTAL ASPECTS:

Meter shall be designed and constructed to be capable of withstanding all severe stresses and vibration and dust environments likely to be encountered in actual practice as the meter will be installed outdoor in boxes.

If any special precautions etc. are required as the meters are supposed to be installed in outdoor you may please specify them.

5.18. NAME PLATE MARKING:

The name plate shall be clearly marked etched embossed as per relevant Standards. The name plate shall indicate name of the project, purchaser's name, purchase order number and date, month year of manufacture, DLMS, RS232, RS485 etc. The word "APEPDCL" must be etched on the name plate. The name plate shall be provided in such a manner that it is not exposed to the open and is secured against removal.

5.19 IMMUNITY TO ELECTRO MAGNETIC DISTURBANCE:

The meter shall be designed in such a way that conducted or radiated electromagnetic disturbance as well as electrostatic discharge do not damage or influence the meter. The test report from any standard lab conducting the test as prescribed in the CBIP technical report No. 88 /304 & CBIP-325 and ISS and test result shall be submitted.

5.20 TAMPER AND FRAUD PROTECTION:

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

- a) Phase sequence reversal: The meter should work accurately irrespective of phase sequence of the supply.
- b) i) CT shorting / by passing: The meter must have capability to record shorting / bypassing of one or any phases of the meter with the time and duration.
ii) CT Polarity reversal: The meter should register Energy consumption correctly even though the CT polarities are reversed. The meter shall record such tamper data with Date & Time along with total No. of such occurrences for all phases during the above period.
- c) Missing potential: the meter shall be capable of recording occurrences of missing potential phase wise, and its restoration with date and time along with total number of such occurrences during the above period.
- d) Missing Neutral: The meter shall continue to record accurately even if the neutral of PT supply is accidentally or incidentally disconnected.
- e) External Magnetic Influence: The Meter shall not get influenced by any external permanent / electromagnet(s). The continuous Magnetic Induction of external origin: The value of magneto motive force to be applied as per the stipulations of CBIP Report No. 88/304 & CBIP-325 read with amendments for Static Electronic Energy Meters.

The meter should be capable of recording any attempt of magnetic tamper and store the same in tamper data.

Minimum 200 events (Occurrences and restorations) with date & time of event shall be recorded. Out of 200 Nos. events, 50 Nos. for power failure events and 150 nos. for other tampering events. Event means the occurrence and restorations shall be treated as one event only. The information shall be logged on first in first out basis and total No. of tamper events during the period. All these information, should be available in simple and easily understandable format.

While recording tamper events, fall in 20% of voltage when compared to other phases shall be recorded as “ Voltage failure tamper”.

At the time of occurrence of tamper event (i.e. fall in voltage) energy values in each phase have to be recorded separately.

Meter internal errors are to be displayed with difference codes.

The meter memory should have all the cumulative logs of all the events in days, minutes, sec. so that even status can be analysed after long time also.

5.21.External Magnetic Influence: The meter should have the feature to detect the occurrence & restoration of the event (Ext. magnetic effect). So that the magnetic tamper can be logged for tamper analysis.

5.22 Self diagnostics features:

The meter shall have indications for unsatisfactory / non functioning of the following:

- i) Time and calendar.
 - ii) Real Time Clock Battery
 - iii) All display segments
- And any thing else as necessary.

While installing the meter, it should be possible to check the correctness of Current Transformer, Potential Transformer connections to the meter and their polarity from the functioning of the meter for different voltage injections. For this purpose a suitable software for field diagnosis of the meter connections with the help of meter and meter reading instrument should be supplied. The details of the self diagnostic features shall be furnished by the bidder. Any abnormal connection should be reported on the meter display.

5.23 Flexible shielded cables:

5.23.1. Interface between meter and CMRI / Laptop:-

The interface between a meter and CMRI / Laptop with flexible shielded cable of length $1500\text{ mm} \pm 10\text{ mm}$ having (i) 9 pin D-type female connector with electrical circuit as illustrated in Appendix and (ii) USB connector to facilitate downloading of meter data either on to CMRI (or) Laptop. Both cables shall be supplied along with **every 10 Nos. Meters**. The two ends of the cable shall be stress relieved. The two ends of the cable shall be stress relieved. For remote read out there shall be one RS 232 port on RJ 11 jack.

5.24. SALIENT FEATURES:

The meter shall have the following additional salient features:

It should be possible to check the healthiness of phase voltages by displaying all the voltages on the meter display.

The meter shall have provision to be read through communication port in the absence of power through an external source. An inductive coupling arrangement shall be provided so that it should not be possible to damage the circuitry of the meter by applying excess voltage directly in the meter. The meter should power up using an external battery pack only in absence of power supply to the meter to enable taking of meter readings through display and communication port.

The meter should work accurately irrespective of phase sequence of the mains supply.

The meter should remain powered up and functional even when either of any two phases or any one phase along with neutral is available to the meter.

The meter should continue to record accurately as per prevailing electrical conditions even if the neutral of potential supply gets disconnected.

- a) The meter shall record active energy in forward direction even if one or more CT's are reversed. The current vector direction shall always be considered as positive (import) for the computation of 3 phase active energy which shall be added in the main active energy (import) register.
- b) The meter shall record apparent energy in forward direction even if one or more CT's are reversed.
- c) The maximum demand shall be computed from the main active and apparent energy registers.

5.25. TESTS:

5.25.1 TYPE TESTS:

The equipment offered (i.e., meters where applicable) shall be fully type tested at any accredited national test laboratories by the Bidder as per the relevant standards. The Bidder shall furnish four sets of type test reports along with the bid. **Bids without type test reports will be treated as non responsive.**

Test certificate not more than three years old on the date of bid opening from a recognized accredited national laboratory shall be submitted.

Tests for Trivector Meters : As per CBIP Technical Report No. 88/304 and CBIP-325 (with latest amendments) IEC-687.

5.26 ACCEPTANCE AND ROUTINE TESTS:

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

All routine tests as in the relevant standards shall be carried out and routine test certificates shall be submitted to each consignee while dispatching the material.

The purchaser reserves the right to insist for witnessing the acceptance/routine testing.

5.26.1amendments)

5.26.2 **Tests during manufacture :** The Bidder shall furnish details of tests carried out during the process of manufacture and end inspection by the bidder to ensure the desired quality of the equipment to be supplied.

5.27 ADDITIONAL TESTS :

5.27.1 The purchaser reserves the right of having at suppliers expenses any other tests(s) of reasonable nature carried out at Bidders premises, at site, or in any other place in addition to the aforesaid type, acceptance and routine tests, to satisfy himself that the material comply with the specifications.

5.27.2 In case of failure in any type test, the supplier is required to modify the design of the material and the material shall be type tested again for the modified design,

without any extra cost to the purchaser. No delivery extension shall be given for this additional testing.

5.28 TEST REPORTS / TEST CERTIFICATES:

5.28.1 Record of routine test reports shall be maintained by the Bidder at his works for periodic inspection by the purchaser's representative.

5.28.2 Test certificates of tests conducted during manufacture shall be maintained by the Bidder. These shall be produced for verification as and when desired by the purchaser.

6.0 TEST FACILITIES :

The tests shall be carried out as per relevant Standards and test certificates shall be furnished for approval. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all materials.

NOTE : The Meters used for conducting tests shall be calibrated periodically at reputed Government accredited Test Laboratories and test certificates shall be available at works for verification by purchasers representative.

7.0 INSPECTION:

7.1 The purchaser's representative shall, at all times, be entitled to have access to the works and at all places of manufacture where equipment is offered, and manufactured and the representative shall have full facilities for unrestricted inspection of the bidder's works, raw materials and process of manufacture and conducting necessary tests as detailed herein.

7.2 The Bidder shall keep the purchaser informed in advance of the time of starting and of the progress of manufacture of the offered equipment in its various stages so that arrangements can be made for inspection.

7.3 The supplier shall give 15 days advance intimation to enable the purchaser to depute his representative for witnessing acceptance and routine tests.

7.4 No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the inspection is waived off, by the purchaser in writing.

7.5 The acceptance of any quantity of material shall in no way relieve the Bidder of any of his responsibilities for meeting all requirements of the specification, and shall not prevent subsequent rejection if such material is later found to be defective.

7.6 NOTE FOR FOREIGN BIDDERS :

The bidder shall indicate the name(s) of reputed inspection agencies and the inspection charges clearly for each lot. The inspection charges shall be borne by the supplier. However the purchaser reserves the right to appoint at its cost any inspection agency to carry out the inspection.

8.0 QUALITY ASSURANCE PLAN :

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) The structure of organization.
- ii) The duties and responsibilities assigned to staff ensuring quality of work.
- iii) The system of purchasing, taking delivery and verification of materials.
- iv) The system for ensuring quality of workmanship.
- v) The quality assurance arrangements shall conform to be relevant requirements of ISO 9001 or ISO 9002 as appropriate.
- vi) 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 test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates.
- vii) Information and copies of test certificates as in (vi) above in respect of bought out accessories.
- viii) List of manufacturing facilities available.
- ix) Level of automation achieved and list of areas where manual procession exists. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
- xi) Lists of testing equipment available with the bidder for final testing of equipment specified and test plant limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified test requirements.

The successful Contractor shall within 30 days of placement of order, submit following information to the purchaser.

List of raw materials as well as bought out accessories and the names of sub suppliers selected from those furnished along with offers.

Type test certificates of the raw materials and bought out accessories if required by the purchaser.

Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plan and purchasers hold points shall be discussed between the purchaser and Contractor before the QAP is finalized.

The Contractor shall submit the routine test certificates of bought out accessories and central excise asses for raw material at the time of routine testing if required by the purchaser and ensure that the quality assurance requirements of specification are followed by the sub-contractor.

The quality assurance programme shall give a description of the quality system and quality plans with the following details.

A) Quality System :

The structure of the organisation.

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

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

The system for ensuring quality workmanship.

The system for control of documentation.

The system for the retention of records.

The arrangement for the contractor's internal auditing.

A list of administration and work procedures required to achieve and verify contract's quality requirements. These procedures shall be made readily available to the purchaser for inspection on request.

B) Quality Plans :

An outline of the proposed work and programme sequence.

The structure of the contractors organization for the contract.

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

Hold and Notification points.

Submission of Engineering documents required by the Specification.

The inspection of materials and components on receipt.

Reference to the contractors work procedures appropriate to each activity.

Inspection during fabrication/Construction.

Final inspection and test.

9.0 DOCUMENTATION:

9.1 All drawings shall conform to International Standards Organization (ISO) 'A' series of drawings sheet/India Standards Specifications IS :656. All drawings shall be in ink and suitable for micro filming. All dimensions and data shall be in S.I. Units.

9.2 LIST OF DRAWINGS AND DOCUMENTS:

The bidder shall furnish the followings along with bid:

- i) Two sets of drawings showing clearly the general arrangements, fitting details, electrical connections etc.
- ii) Technical leaflets (users manual giving operating instructions.)
- iii) Dimensional drawings of the box for each quoted item.

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

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

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

9.6 *The successful bidder shall furnish a sample of box duly mounting the meter, TTB where applicable within two weeks of clear purchase order along with type tests*

certificates as per Clause 6.1.3. Supplies shall commence only after approval of these.
– **This clause is deleted.**

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

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

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

9.7.3. CDs containing protocol Software and RMR enabling software in 2 sheets shall be furnished.

10.0 PACKING & FORWARDING:

The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Any material found short inside the packing cases shall be supplied immediately by supplier without any extra cost.

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

- a) Name of the consignee.
- b) Details of consignment.
- c) Destination.
- d) Total weight of consignment.
- e) Handling and packing instructions.
- f) Bill of Material indicating contents of each package.

10.3 The supplier shall ensure that the packing list and bill of materials, are approved by the purchaser before dispatch.

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

10.5 The marking on each package shall be as per the relevant Standards and shall also contain "APEPDCL", PO reference, Name of the supplier, make, meter type and meter serial No., DLMS.

11.0 QUANTITY AND DELIVERY REQUIREMENTS:

The quantity and delivery requirements are indicated in Annexure 2

12.0 SUPERVISION SERVICES: NIL

The purchaser will arrange for unloading of the consignments.

12.1 MANDATORY SPARES & TOOLS:

The bidder shall give the list of spares required for the equipment along with price list for them & shall keep a reasonable stock of the same during the warranty period. The bidder shall indicate the sources of spares like battery packs, interfacing cables in India and also mention the service agencies.

13.0 SAMPLE:

7 Nos. sample meters with Test terminal blocks of 11kV / 110V, 10/5A, 0.2S class with MD integration 30 min. (for Cat-C for Feeders) with DLMS shall be supplied with the tender technical bid.. Tender received without samples as above are liable for rejection. The samples may be subjected to various tests as per CBIP technical report No. 88/304 & CBIP-325 (with latest amendments) / IEC 1036 / IS , IS 14697, IS-15959 wherever applicable & tamper and fraud protection tests as per specification. The samples shall comply with the specification.

14.0 TECHNICAL DEVIATIONS :

Any deviation in Technical Specification as indicated in Annexure-3 shall be specifically and clearly indicated in the enclosed Technical deviation format as per Annexure-5. .

15.0 GUARANTEE:

- 15.1. The material should be guaranteed for satisfactory operation for a period of 5 years from the date of receipt of material at destination stores by the consignee in good condition. During the guarantee period if the meter while in its normal operation is found defective, it shall be replaced by the supplier with a new meter free of cost with in 15 days. If the meter is not replaced within 30 days of intimation the supplier should note that the guarantee period will be extended to that extent by the number of days delayed beyond 30 days. If the tenderer does not replace within 180 days the cost of the meter(s) will be recovered from the existing bills/ future bills/ Bank Guarantees available APEPDCL.

For the purpose of ensuring 5 years guarantee meter may be sealed at manufacturer's premises and despatch in sealed condition after inspection by the APEPDCL representative.

15.2 GUARANTEED TECHNICAL PARTICULARS

The Bidder shall furnish the guaranteed Technical Particulars as per enclosed Annexure-III-A for HT ELECTRONIC TRIVECTOR METERS used in meters and submit the same with the Tender.

15.3 GENERAL:

- a) Principle of operation of the meter, outlining the methods and stages of computation of various parameters starting from input voltage and current signals including the sampling rate if applicable shall be furnished by the bidder.
- b) The bidder shall indicate the method adopted to transform the voltage and current to the desired low values with explanation on devices used such as CT, VT or Potential divider as to how they can be considered superior in maintaining ratio and phase angle for variation of influence quantities during its service period.

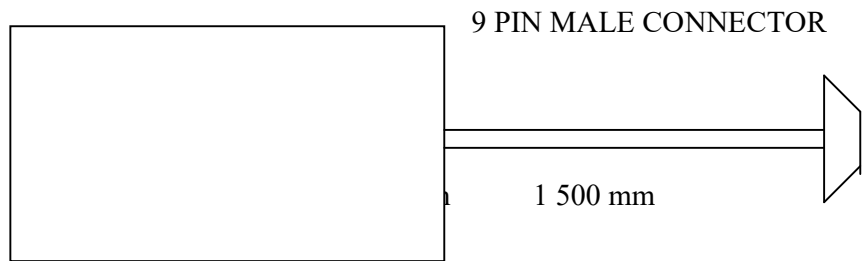
c) The bidder shall furnish details of memory used in the meter.

a. Details of testing facilities:

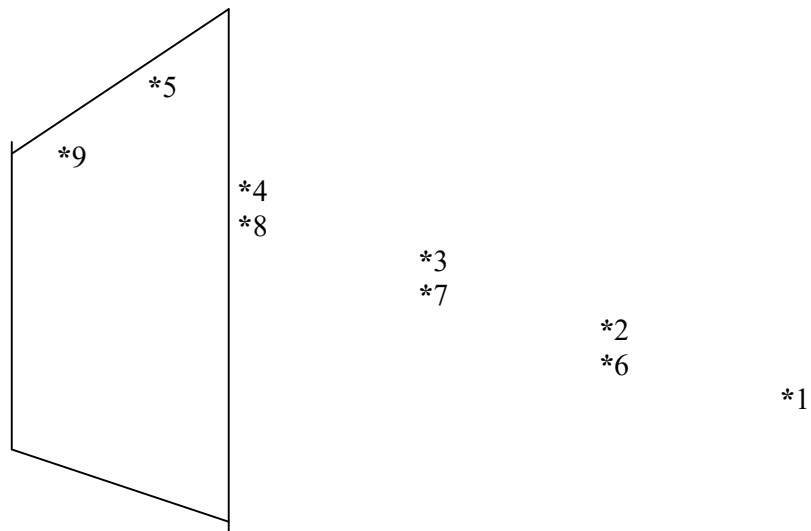
The manufacturer laboratory must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice). The details of testing facilities available for conducting (a) The routine tests and (b) Acceptance tests shall be furnished in a statement. Bids without these details will be treated as non responsive.

APPENDIX

DIAGRAM SHOWING THE 9 PIN CONNECTOR



RS 232C 9 PIN D TYPE MALE CONNECTOR



PIN FUNCTION LISTING:

PIN	SIGNAL NAME
01	NC (Not Connected)
02	Transmit Data TXD
03	Receive Data RXD
04	NC
05	Signal Ground (SG)
06	NC
07	NC
08	NC
09	Power supply (+4.75 V to +12.5 V)

ACRONYMS

Reference Abbreviations	Name and Address
IEC	International Electro Technical Commission Bureau Central de la Commission Electro Technique International, Rue de verembe Geneva, Switzerland.
ISO	International Organization for Standardization, Danish Board of Standardization Aurehoegyej – 12, DK – 2900, Heel prup, DENMARK.
ISS	Indian Standard Bureau of Indian Standards Nanak Bhavan, 9, Bhadur Shah Zafar Marg, NEW DELHI – 110002, INDIA.
CBIP	Central Board of Irrigation and Power, Malcha Marg, Chankyapuri, NEW DELHI – 110021, INDIA.
CT	Current Transformer
PT	Potential Transformer
Deg. C	Degrees centigrade
Max	Maximum
Accn.	Acceleration
db	Decibels
MD	Maximum Demand
TOD	Time off day
Min.	Minimum
CMRI	Common Meter Reading Instrument

For the purpose of ensuring 5 years guarantee meter may be sealed at manufacturer's premises and despatch in sealed condition after inspection by the APEPDCL representative.



GUARANTEED TECHNICAL PARTICULARS FOR HT TVR TRACTION METERS

Sl. No.	Characteristics	
1.	Maker's name and country	
2.	Type of meter/ model	
3.	Standards to which the meter conform	
4.	Accuracy class	
5.	Power consumption for phase Voltage circuit	
	Current circuit	
6.	Parameters measured	
7.	P.F. Range	
8.	Overload capacity	
9.	Variation of voltage at which meter functions normally	
10.	Minimum starting current	
11.	Dynamic range	
12.	MD reset provisions	
13.	Display of cumulative MD	
14.	Display of MD resets along with date and time	
15	No. of digits of display; and height of character	
16	Particulars of readout a) Continuous display b) Manually on display c) Auto display i) Parameters ii) Scrolling period iii) Display of period between two Cycles d) With CMRI/MRI/ Laptop	
17.	a) Meter terminal block having sealable extended terminal corner b) Test terminal block (TTB) with sealable extended cover c) Connection diagram inside the terminal cover d) Maximum safe current the terminals and screws shall carry	
18.	Non volatile memory retention time in absence of power	
19	Details capacity (kB)	