

SECTION-III (Part-A)

TECHNICAL SPECIFICATION FOR 12 KV OUTDOOR VACUUM CIRCUIT BREAKER KIOSKS AGAINST TN-2121.

1.0 SCOPE

This specification is intended to cover the design manufacture, assembly, testing at manufacturer's works, supply, delivery of 12 kV Vacuum Circuit breaker Kiosks with current transformers, Potential transformers, protection relays, metering instruments etc. Complete with all accessories and Installation & Commissioning by the supplier as per Schedule-III (Part-B) for efficient & trouble free operation (Separate price for Installation & Commissioning and Civil works).

- 1.1 It is not the intent to specify completely herein all details of the design and construction of equipments. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation upto the Bidder's guarantee in a manner acceptable to the Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which in his judgment is not in accordance therewith. The offered equipment shall be complete with all components necessary for its effective and trouble free operation along with associated equipments, interlocks, protection schemes etc. Such components shall be deemed to be within the scope of supply, irrespective of whether those are specially brought out in this specification and/or the commercial order or not.

2.0 STANDARDS

The 12 KV vacuum circuit breaker Kiosks shall conform to latest revisions with amendments of standards as under unless specified otherwise. Equipment meeting any other authoritative standard which ensure equal or better quality than the standard mentioned above will also be acceptable. In such cases a copy of standard (English version) adopted, should be enclosed with the tender.

IEC62271/100-200	High Voltage Switchgear & Control gears.
IS:13118/IS-3427	Circuit Breaker/ metal enclosed Switchgear and control gear.
IS: 3156	Voltage transformers.
IS: 2705	Current transformers.
IS: 3231	Electrical Relays for power system.
IS:1248	Meters and Instruments
IS:14697-1999	Specification for AC static transformer operated watt hour and VAR hour meters class 0.2 S & 0.5 S.

IEC-62053-22-2003 IEC-62052-11-2003	Specification for AC Static Watt hour Meters, class 0.2 S & 0.5 S.
CBIP Technical Report No.88 revised July, 1996 read with amendment issued (April,99, September,99 and also any other amendment thereafter).	Specification for AC Static Electrical Energy Meter.

3.0 CLIMATIC CONDITIONS:

Equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions :-

i) Peak ambient air temperature in shade.	50 DEG C
ii) Minimum ambient air temperature in shade	(-) 5 DEG C
iii) Maximum relative humidity.	95 %
iv) Minimum relative humidity	10 %
v) Dust storms are liable to occur from the period March to July	
vi) Height above mean sea level	less than 1000M
vii) Average number of thunder storms days per annum.	40 DAYS
viii) Average annual rainfall	10-100 cm (Depending on area)
ix) Number of months of tropical monsoon conditions p.a.	4

4.0 PRINCIPAL PARAMETERS OF CIRCUIT BREAKERS

4.1 TYPE AND RATING	12 kV
4.1.1 Type	Vacuum circuit breaker
4.1.2 Service	Outdoor
4.1.3 Pole	3
4.1.4 Rated voltage (nominal/max.)	11/12 kV
4.1.5 Rated frequency	50 HZ

4.1.6 System Neutral earthing	Effectively grounded.
4.1.7 INSULTATION LEVEL	
4.1.7.1 Impulse withstand	75 kVp
4.1.7.2 One minute power frequency withstand voltage.	35 kV rms as per IS-3427
4.1.8 Rated Current	
4.1.8.1 Continuous at 50 C.	630 A
4.1.8.2 Short time current for 3 Sec.	16 kA
4.1.9 Rated Breaking Capacity	
4.1.9.1 Symmeterical	16 kA
4.1.9.2 Asymmeterical	As per relevant standard
4.1.10 Rated making capacity	2.50X16 KA
4.1.11 Rated short time withstand current 3 secs.	16 KA
4.1.12 Total break time Closing time	3 cycles(Max.) 4 cycles (Max.)
4.1.13 Creepage distance	300 mm or more
4.1.14 Protection class of kiosk	IP-55 as per IEC 529
4.1.15 Operating duty For gang operation	O-0.3 Sec-CO-3min-CO
4.1.16 Operating Mechanism	motor operated spring charged closing mechanism or Magnetic Actuator.
4.1.17 Spring charging Motor	220V-240V
4.1.17.1 Heater/Lamp/Socket.	240V AC
4.1.18 Terminal Connector	
4.1.18.1 Type	Bimetallic clamp type/ Al. alloy.

4.1.18.2	Suitable for ACSR conductor	10% Panther and 90% Dog Conductor
4.2	System details	
4.2.1	H.V. System Voltage (Nominal/Max.)	11/12 kV
	Phases	3
	System Neutral	Effectively earthed.
	Fault level	16 KA r.m.s. Symmetrical
4.2.2	Auxiliary power Supply	
4.2.2.1	A.C. Supply	1. 415 volts 3 ph 4 W 50 Hz 2. 240V 1 Ph 2 W 50 Hz

5. GENERAL TECHNICAL REQUIREMENTS:-

5.1 DESIGN CRITERIA

The bidder shall quote 12 KV Outdoor VCB Kiosks conforming to M-2 class only. The equipment will be used in high voltage system having characteristics as listed in the specification. The equipment will be installed outdoor in a hot, humid and tropical atmosphere. All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

The maximum temperature in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards.

The equipment shall be capable of withstanding the dynamic and thermal stresses of listed short circuit current without any damage or deterioration.

The safety clearances of all live parts of the equipment shall be as per relevant standards.

The cowling provision shall be provided on the roof of 12 KV outdoor VCB Kiosk to avoid direct inception of water at any joint.

5.2 SPECIFIC REQUIREMENTS

5.2.1 The vacuum circuit breaker kiosk shall be for outdoor installation. The duty of the circuit breaker shall involve satisfactory interruption of short circuit currents as listed in the specification. The breaker shall be capable of interruption of low reactive current (lagging/leading) without undue over voltage.

5.2.2 CONSTRUCTIONAL FEATURE

5.2.2.1

- a) The circuit breakers shall be triple pole horizontal fixed type enclosed in Kiosk of CRCA sheet steel of 3 mm thickness for load bearing members and 2 mm thickness for non-load bearing members and shall comply with latest edition of IS:13118/3427/IEC-56. The Kiosk shall be vermin proof and dust tight. The switchgears and Control gears shall be complete with all necessary supporting frame works, Nuts and bolts etc. for securing the same to the floor. The operating mechanism shall operate (close/open) all the three phases simultaneously. The operating mechanism links etc. should be accessible for maintenance. The circuit breakers and its operating mechanism shall be fully interlocked to prevent mal-operation. All the breakers shall be supplied with necessary clamps and connectors suitable for appropriate current ratings. Rigid type bimetallic/Al.alloy terminal connectors of 630 Amps. current rating form part of supply. Suitable arrangement of earthing the switchgears shall be provided. All the connecting bus bars shall be made of copper.
- b) Hinges of door shall be concealed type to avoid rusting and obstructive opening of the door.
- c) The quality of welding shall be good and there should not be any lumps and splatters on the panel.
- d) All the connecting bus bar and current carrying parts shall be made of copper.
- e) All the gasket shall be of chemically treated neoprene.
- f) Hole & Pin locking (Check nut) arrangement should also be provided while fixing the vacuum interrupter at bottom side.

5.2.2.2 Switchgear (Vacuum Circuit breakers etc.)and control gear (CTs.,PTs, relays etc.)shall be mounted on the same Kiosk. Bus bars shall be air insulated with PVC insulation/sleeves on electrostatic powder coating. The bus bars should be of electrolytic copper with permissible limits of current density. Size of the bus bars and current density should be specified in the tender. The bus bars conductor shall conform to Indian standard 8084 and 3427 and shall be rated for 630 A,STC 16 KA for 3 sec.

- 5.2.2.3 All the meters, instruments, relays etc. shall be mounted on the switchgear kiosk. The outdoor circuit breakers Kiosk shall be suitable for AC shunt tripping arrangement.
- 5.2.2.4 The Kiosk shall have an arrangement for emergency shunt tripping from remote place in addition to arrangement for local emergency tripping(Mechanical). The kiosk shall also have a system to check the "Trip circuit healthy check" in all the three phases. Necessary trip and closing coils shall be provided for operation of the breakers.
- 5.2.2.5 All the six terminals shall be brought out through appropriate class bushings.
- 5.2.2.6 The arcing contacts shall be made of homogeneous special alloy so that surge voltage are reduced to negligible level & multiple reignition is eliminated.
- 5.2.2.7 The circuit breaker kiosk shall be electrically and mechanically trip free under various conditions.
- 5.2.2.8 The provision shall be kept on the kiosk roof and roof bushing assembly to adopt arcing horns.
- 5.2.2.9 The lifting arrangement shall not cause any effective loss of creepage distance/ phase to earth clearances as specified in the ISS/IEC.

5.2.3 MAIN CONTACTS

The main contacts shall have adequate area and contact pressure for carrying rated continuous and short time current without excessive heating liable to cause pitting and welding.

The breakers may be provided with silver plated contacts, if necessary, to meet the requirement of IS:13118/IEC56 where higher temperature rise is permitted with silver plated contacts. The quantity of silver facing shall be such that after carrying out one tenth of total number of operations specified for mechanical endurance tests, there is still continuous layer of silver on contacts.

5.2.4 NUMBER & TYPE OF SPARE, AUXILIARY CONTACTS/ SWITCHES :

Adequate number of spare auxiliary switches/contacts both of normally open & normally close type but not less than four each shall be provided on the circuit breaker for use in the indication and controlling scheme of circuit breakers.

5.2.5 INTERLOCK

All electrical and mechanical interlocks which are necessary for safe and satisfactory operation of the circuit breaker shall be provided .

5.2.6 BUSHINGS FOR CIRCUIT BRAKER KIOSK

- a) The out door circuit breakers shall be metal enclosed fitted with weather proof/ suitable type bushing conforming to IS:2099 and shall be designed to have the necessary mechanical strength and rigidity required and shall be free from objectionable interference and external and internal corona. The porcelain shall be of the wet process type, homogeneous, free from laminations and cavities or other flaws which could effect its chemical & mechanical strength and shall not be injuriously stressed by temperature change. The porcelain shall be thoroughly vitrified tough and impervious to moisture and shall be evenly glazed. The glazing shall be free from blisters or burrs. The bushing shall be designed manufactured & tested in accordance with latest edition of IS:2099. The type and characteristic data bushing shall be clearly specified.
- b) The bushing shall not be subjected to direct point loading. They shall be provided with neck around clamps for evenly distributed pressure.
- c) The bushing shall be mounted using suitable clamps and gasket arrangement to provide required degree of protection.
- d) The bushing assembly shall be provided with lock nut and check nut which will be non-magnetic and non-corrosive.

5.2.7 OPERATING MECHANISM

Characteristics of Operating mechanism of circuit breaker and associated equipments :

Method of operation: The circuit breaker shall be equipped with power operated mechanism to operate all three phases simultaneously using 220/240 V AC Motor operated spring closing mechanism or magnetic actuator type. It shall be electrically & mechanically trip free under various conditions. Kiosk shall also be provided with hand operated spring charging closing mechanism. Operation counter and mechanically ON-OFF indicator shall be provided.

5.2.8 VACUUM CIRCUIT BREAKER

The three phase vacuum circuit breaker will have three vacuum interrupters (one interrupter per phase) mounted on same carriage. The interrupters shall be air insulated with epoxy resin / insulated phase barriers. Each interrupter shall have fixed and moving contacts in sealed envelopes having vacuum

below 10^{-6} torr. The metallic bellow shall permit axial movement of moving contact and act as vacuum seal. The contacts shall have requisite mechanical strength and good electrical and thermal conductivity and shall be made of copper chromium alloy. Complete literature of vacuum bottles shall be furnished with the tender.

In order to have safe operation under fetal conditions, the vacuum interrupter should be housed in epoxy pole unit and make of Vacuum Interrupter will be as "BEL, CGL, SIEMENS, ABB, ALSTOM/AREVA."

Any other equivalent make of V.I. shall also be acceptable subject to prior approval of S.E. (MM), JVVNL, Jaipur.

5.2.9 VOLTAGE TRANSFORMERS

i)	Highest equipment voltage	: 12 KV
ii)	No. of phases.	: 3 Nos. single phase VTs
iii)	Insulation level.	
	a) Impulse withstand voltage	: 75 KVP
	b) One minute power frequency withstand voltage on :	
	i) Primary winding	: 35 KV rms
	ii) Secondary winding	: 2 KV rms
iv)	Frequency.	: 50 Hz.
v)	Transformation ratio.	: 11000/110 V
vi)	Rated output.	: 100VA/Phase
vii)	Accuracy class.	: 0.5
viii)	Rated voltage factor.	: 1.2 continuous & 1.5 for 30 sec.
ix)	Type of insulation	: Resin cast.

VTs, shall be provided with HRC type fuses on the secondary side. The VT fuses on primary side shall also be provided with all safety precautions. One of the secondary terminals of the VTs, shall be solidly earthed. Three numbers single phase voltage transformer of this rated output will be required for each circuit breaker kiosk. Voltage transformers shall be fixed type and shall be suitable for single phasing.

5.2.10 CURRENT TRANSFORMERS

i)	Rated voltage.	: 12 KV
ii)	Insulation level.	
	a) Impulse withstand voltage	: 75 KVP

b) One minute power frequency withstand voltage on :	
i) Primary winding	: 35 KV rms
ii) Secondary winding	: 3 KV rms
iii) Frequency.	: 50 Hz.
iv) Rated continuous thermal current:	120% of rated primary current
v) Short time thermal rating and its duration.	: 16 KA for 3 sec.
vi) Transformation ratio of : CTs 400-200-100/5-5A	Core-I Core.II -----
a) Rated output	15 VA 15 VA
b) Class of accuracy	5 P 0.5S
c) Accuracy limit factor.	15 -
d) Purpose	Relaying Metering
vii) Max.instrument security factor.	: - 5

12 KV current transformers shall be single phase. The core shall be of grade non ageing laminated silicon steel of low hysteresis loss and high permeability to ensure high accuracy at both normal and fault current.

5.2.11 The rating of secondary winding shall be 5 Amps. Required transformers ratio can be achieved in any manner, However, the current transformers will have to satisfy the requirement of rated VA burden, Class of accuracy , accuracy limit factor and short time thermal rating as have been specified above at all transformation ratio.

The rating of current transformers of all classes regarding ratio error, knee point voltage, resistance of secondary winding etc. shall have to be co-ordinate with the requirement of protective relays and protection scheme without any extra cost.

5.2.12 The tenderer shall also furnish along with the tender, complete general arrangement, schematic and outline diagrams indicating the mounting arrangement and position of current transformers, potential transformer, terminal block etc. Type of current transformers and potential transformers employed shall also be clearly stated.

5.2.13 INDICATING AND INTERGRATING METERS/INSTRUMENTS:

All indicating instruments shall be of switch board type, back connected suitable for flush mounting and provided with dust and vermin proof cases for tropical use and finished in suitable colour. All instruments shall have practical laboratory

means of adjustment of accuracy. The limits of errors for ammeters/voltmeter shall be permissible for class 1.5 instruments as per IS:1248. The ammeters and voltmeters shall be suitable scaled to indicate the current for all the ratings of current/voltage transformers. A phase selector switch with four/six positions shall be used to measure the current/voltage of each phase. The meter shall be located at eye level to facilitate observation of readings correctly.

Any alarm scheme shall have both audio-visual annunciations in redundancy of each other and appropriate accept and reset push buttons shall be part of alarm scheme.

5.2.14 RELAYS :

The circuit breaker shall be fitted with numerical relay having shunt trip coil for operation on 3 over current & one earth fault element. The numerical relay to be provided with the 12 KV Outdoor VCB Kiosk, should be so designed so as to operate/ trip on earth fault as well as on over current faults but should not operate on unbalance load conditions during single phasing (which can be achieved through residual voltage control or otherwise).

The circuit breaker shall have suitable arrangement for power supply of relay and breaker operation through shunt trip coil using power pack. The power pack should be suitable for 6 Nos. closing/ tripping operations and for future remote communication as well as breaker testing during long time power failure. The output voltage may be as per manufacturer's design. The charging of Power pack shall be through 230 V A.C. supply available at Sub-Station.

The make, model No., type and Technical specification of the relay as well as power pack are required to be mentioned in the bid.

The Relay & Power Pack arrangement system should be warranted for 5 years (in line with warranty of breaker).

The numerical relays shall have following features:-

- a. Self Diagnosis
- b. Minimum last five abnormal events recording (over current & earth fault) including fault level and phase along with date & time.
- c. On-line display of current.
- d. Communicable with open Protocol having RS-485 port.

- e. The relay should contain four shots, three phase, programmable & auto reclose control feature.

The relay shall be numerical type mounted in flush pattern on the panel board. The relay should be rated for 110V AC as well as DC & 5 Amp. CT secondary. The relay should conform to latest IEC specifications. The tenders shall furnish the detail in this regard along with the offer.

Relay TTB shall have trip bypass arrangement.

All the relays shall be provided with test blocks in panel so designed that the relays may be tested at site. The relays should have provision of testing either through test block or test plug easily accessible by injecting the voltage / current/frequency (as applicable) from external testing instruments /source without first disconnecting/ re-energizing the primary electrical circuit protected by the relays. Facilities for isolating the tripping circuit during such testing shall also be provided.

The requirement of test block shall not be applicable in case of drawout type relays which can be tested by using test plug without removing the relay from its casing.

The testing facilities provided in the relays shall be specifically stated in the bid. Necessary test plug etc. as may be required for proper testing shall be included in the contractor's scope of supply. One test plug with five panels or part thereof are to be supplied.

The technical suitability of relays/schemes may also be examined by Protection Wing of Discoms & acceptability will be judged appropriately.

The bidder must furnish type test reports as per relevant ISS/ IEC along with bid to suit the environmental conditions of our State, in respect of the relay (of the type and design offered) which should have been type tested in NABL accredited test laboratory in respect of such tests for which the lab has been accredited (for Indian make Relays)/ CPRI/ Nationally accredited testing laboratory (for Foreign make Relays). These type test reports should not be older than **Five years** from the date of opening of bid. Bids without Type Test reports will be treated as Non-Responsive.

The Following makes of Relays are acceptable:-

- a. Areva.
- b. ABB.
- c. Easun Reyrolle

- d. C&S
- e. JVS
- f. SEL
- g. ASHIDA
- h. MEGAWIN
- i. STELMEC
- j. CGL

Any other equivalent make of relays shall also be acceptable subject to prior approval of S.E. (MM), JVVNL, Jaipur.

5.2.15 WIRING :

All wiring shall be of switch board type consisting of copper conductor of 2.5 sq.mm cross section insulated with polyvinyl chloride insulation suitable for 660V service and in accordance with relevant IS:732. Polyvinyl chloride used shall have excellent resistance against burning, moisture, oil and vermin and shall be finished with clear colour. Rubber insulated wiring shall not be acceptable. Tenderers shall furnish the details of method being adopted by them for joint/connections.

All instruments and panel wiring shall be of heat resisting and self extinguishing type in compliance with British Standard Practice/IS. Plastic or porcelain cleats of the limited compression type shall be used for holding wiring runs. All wires shall be suitable for bending to meet the terminal studs at right angles. Metal cases of all apparatus mounted on kiosk shall be separately earthed by means of copper wire or strips. The following colour schemes of the wiring shall be used as per IS:375.

a) AC three phase circuits :

- i) No.1 phase : Red
- No.2 phase : Yellow
- No.3 phase : Blue

ii) Neutral conductor : Black

iii) Connection to earth : Green

5.2.16 TERMINAL BLOCKS :

Terminal blocks shall be 650 V grade, box clamp type ELMEX 10 sq.mm or approved equal. Not more than two wires shall be connected to any terminal.

Spare terminals equal in number to 20% of active terminals shall be furnished.

Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

5.2.17 TEST TERMINAL BLOCK :

Two Nos. test terminal blocks shall be provided one for testing of relays and other for testing meters. They shall be of switch board type back connected for front of panel mounting. The test blocks shall provide complete isolation of meters, instruments etc. and the arrangement shall be such that testing power could be connected at the test block from any external source or may be taken from the instrument transformers. Provision shall be made for short circuiting current transformers. Suitable sealing arrangement shall be provided in test terminal blocks.

5.2.18 INDICATING LAMPS :

Indicating lamps shall be provided on the control board to indicate the following:

- i) Visual indication of ON and OFF position of each circuit breaker.
- ii) PT supply indication.

Each lamp body shall be of moulded insulation and shall be able to withstand a high voltage test of appropriate value. All lamps shall be suitable for 240 V AC supply and shall have low power consumption and shall provide a wide angle of illumination of sufficient intensity for comfortable viewing. A glass of appropriate colour shall be screwed into the front of lamp body. The design of indication lamp shall be such as to facilitate replacement of burnt lamps. An engraved label indicating the purpose of the lamp shall be provided with each lamp.

5.2.19 FERRULES :

Ferrules engraved/printed with the same numbers, of symbols as indicated in the connections and wiring diagram shall be provided on the terminal ends of all wires for identification of circuits for inspection and maintenance. Ferrules shall be of strong and flexible insulating material with glossy finish to prevent adhesion. They shall be engraved/ printed and clearly marked and shall not be effected by dampness. Ferrule numbering shall be in

accordance with IS:375. The same ferrules number shall not be used on wires in different circuits on a panel.

5.2.20 HT TVM:-

3 phase 4 wire A.C. Static H.T. Trivector meter of accuracy class 0.5S for measurement of energy as per specification shall be provided on each Outdoor VCB Kiosks.

Following makes of HT TVMs are acceptable:

- i) Secure
- ii) L&T
- iii) ABB/Elster
- iv) Schlumberger
- v) Genus Infra

Any other make being procured by Nigam shall also be acceptable.

5.2.21 All interiors and exteriors of switchgear enclosure, breaker mechanism etc shall be finished and painted to produce a neat, fire resistant and durable surface which would prevent rusting and corrosion. Sheet metal component shall be pre-treated using 7 tank phosphating process consisting of de-greasing, acid pickling, de-rusting, phosphating and passivation including repeated rinsing in between. On completion of the passivation of the components, they shall be preheated and then epoxy powder coated or treated with one coat of primer & zinc chromate and finished with two coats of light gray enamel paint of shade 631 of IS 5 and stoved to achieve excellent anti-rusting and scratch resistance properties. The thickness of painting shall be around 60 microns.

5.3 SCHEDULE OF EQUIPMENTS, FITTING & ACCESSORIES :

12 KV 630 Amps Vacuum circuit breakers kiosks for out door installation :

- 5.3.1 1 No. - 12 KV 630 Amp. Vacuum Circuit Breaker horizontal fixed type with provision of manual tripping by means of push button and emergency shunt tripping.

Electrically operated through 230 V AC. A lockable Local/ Remote switch shall be provided, apart from Trip-Neutral-Close (TNC switch) control switch to select local/ remote operation of the switchgear. The breaker control switch shall have Trip-Neutral-Close position spring return sequence locking mechanism. The breaker control switch and selector switch shall be mounted on the front side of cubicle and located at a convenient height for easy operation.

- 5.3.2 1 No. - AC Motor charged spring operated closing mechanism or magnetic actuator type closing mechanism.

- 5.3.3 1 No. - Shunt tripping arrangement/ Coil for operation on over current (load) and earth fault by relays along with emergency shunt tripping from remote place in addition to local emergency tripping(Mech.) One additional shunt trip coil, fitted very near to the original coil (which will be unwired) is also required to be provided.

- 5.3.4 3 Nos. - Single phase 12 KV Current Transformer ratio 400-200-100/5-5A suitable for metering and protection. The class of accuracy shall be 0.5 for metering and 5P15 for protection. Rated burden (output) shall be 15 VA for each secondary winding and it should not be less than suitable for tripping arrangement provided. Instrument security factor for metering core shall not be exceed 5.

- 5.3.5 6 Nos. - Rigid type bimetallic/ aluminium alloy terminal connector suitable for ACSR (10% Panther and 90% Dog Conductor) for both horizontal/ vertical take-off.

- 5.3.6 1 No. - Mechanical ON/OFF indicator.

- 5.3.7 1 No. - Operating handle for independent manual closing mechanism.

- 5.3.8 1 No. - Red indicating lamp for ON indication.

- 5.3.9 1 No. - Green indicating lamp for OFF indication.

- 5.3.10 Spare auxilliary contacts/switch having minimum 4 NO + 4 NC
- 5.3.11 1 No. - Flush mounting pattern 96x96 sq.mm Moving Iron ammeter of class 1.5 accuracy suitable scaled for 5 Amps. CT secondary.
- 5.3.12 1 No. - Ammeter selector switch to indicate phase current in all three phases and with OFF position.
- 5.3.13 1 No. – Numerical 3 O/C + E/F relay.
- 5.3.14 1 No. HT TVM of accuracy class 0.5S as per requirement mentioned at Annexure-A.
- 5.3.16 2 Nos. - 240 V AC single phase 80 or 100 watt anti condensation heaters with thermostat and switch.
- 5.3.17 1 No. - Automatic door illumination lamp with switch.
- 5.3.18 3 Nos. - 11000/110 V single phase voltage transformers each having 100 VA/phase burden & class of accuracy 0.5 suitably connected to meters and indicating instruments etc.
- 5.3.19 1 No. - Flush pattern switch board mounting pattern 96x96 sq. mm moving iron AC voltmeter of class 1.5 accuracy suitable for 110 V phase to phase secondary suitably scaled.
- 5.3.20 1 No. - Voltmeter selector switch to indicate phase to phase & phase to neutral voltage of all the three phases.
- 5.3.21 3 Nos. - Indicating lamps coloured Red,Amber Blue for PT supply.
- 5.3.22 2 Nos. - Test terminal blocks to test meters and relays with sealing arrangement.
- 5.3.23 1 No. - Blank lable on the front of kiosks at the top.
- 5.3.24 Door locks with keys for all doors.
- 5.3.25 Pair of base channel for grouting in floor.

- 5.3.26 Arrangement to check healthy trip circuit in all three phases (separate lamps for R phase, Y phase and B phase) be provided.
- 5.3.27 1 set - Self auxiliary plug and socket.
- 5.3.28 1 No. - ground bus system, size 50x6mm copper may be provided and the earthing stud shall be capable of withstanding rated short circuit current and stud design shall be as per IS-133427 or IEC -200.
- 5.3.29 1 No. - Audio-Visual Annunciations.
- 5.3.30 1 No. - Operation counter.
- 5.3.31 1 No. - Name plate at front and back of each kiosk.
- 5.3.32 1 set - 3 phase air insulated main copper bus bar of 630 amp. continuous current rating having maximum current density 1.5 Amp./ MM² with minimum cross sectional area 600 MM² with PVC insulation or sleeves, STC rating 16 KA for 3 sec.
- 5.3.33 1 Set -Power Pack arrangement system as specified in cl. No. 5.2.14.
- 5.3.34 1 No. -Spring Charge Indication Lamp.

The busses within the cubical shall be of high conductivity electrolyte grade copper. The Bus bar joints shall be silver plated and bolted in such a manner that initial contact pressure around the square headed high tensile bolt will remain substantially undiminished at all temperature upto rated full load temperature. The Bus support and bushings shall be of epoxy resin cast type. All drop off from main bus to VCB and VCB to bushing terminations shall be suitable for current rating of circuit breaker . All the bus bar shall be sleeved with heat shrinkable sleeves of 12 KV voltage level (Insulated for a service voltage of 12 KV) and bus bar shall be shrouded wherever possible. All the bus bar joints shall be shrouded and where shrouding is not possible, it shall be taped with HV self amalgamation tape. All the tap off bus bar connections inside panel and PT jumpers shall be sleeved with HT heat shrinkable sleeves. Special care shall be taken in the design of bus bar system to provide for thermal expansion and to minimize the chances of bus fault. Bimetallic washers shall be provided at the joints of two different metal surfaces.

The bus supports and bushings shall be non hygroscopic non aging glass reinforced polymer.

5.4 MAKE AND TYPE OF BOUGHT OUT ITEMS :

The makes of all bought out items shall be acceptable if it is of "ISI Marked" or type tested for which tenderers shall furnish attested photostat copies of

ISI Certificate/type test report not older than **Five years** for the respective make offered along with tender.

5.4.2 Make / type of each relay, indicating instruments, integrating instruments, control switch for Circuit Breaker/Trip Transfer, selector switch for Voltmeter/Ammeter, Semaphore Indicator, indicating lamps, annunciator, Push Button, A.C. Hooter/Bell, D.C. Hooter, Heater, Link Type Test Terminal Block for testing of TVM, CFL Tube, 2/3 Pin Socket with Switch etc. shall be clearly and invariably indicated in the GTP (Guaranteed Technical Particulars), bill of material and unit price list. Only specific make accessories shall be indicated. The word "EQUIVALENT/REPUTED MAKE" will not be given for consideration.

Other standard accessories which are not specifically mentioned but are required to be supplied with circuit breaker kiosk of similar type and rating for efficient and trouble-free operation.

5.5 TEMPERATURE RISE :

The max. temperature rise of various parts of the circuit breakers when tested under rated condition shall not exceed the specified values at a peak ambient temperature of 50 deg.C . The breaker may be provided with silver plated contacts if necessary to meet the requirement of IS:13118/IEC:56 where higher temperature rise is permitted with silver plated contacts. The quantity of silver facing shall be such that after carrying out one tenth of the total number of operations specified for mech. Endurance test, there is a still continuous layer of silver on the contacts. The temperature rise of CTs and PTs shall also not exceed the permissible values as per relevant Indian standards when corrected for max. ambient temperature at site.

6.0 TESTS :

6.1 TEST BEFORE DESPATCH : The 12 KV vacuum circuit breakers and accessories shall be subjected at maker's works before despatch, to the following tests as per relevant IS/IEC.

A) ROUTINE TESTS ON EACH UNIT AS PER RELEVANT STANDARDS :

- (i) One minute power frequency voltage withstand dry test on main circuit.
- (ii) Voltage withstand test on control & auxiliary circuits.
- (iii) Measurement of the resistance of main circuit.
- (iv) Mechanical operating test.

- (v) Design and visual checks.

B) TYPE TESTS CONDUCTED ON ONE UNIT OF EACH RATING AS PER RELAVANT STANDARDS:

- (i) Dielectric tests.
 - a) Lightning Impulse Voltage Test.
 - b) One Minute Power Frequency Test (Wet & Dry).
- (ii) Short time withstand current and peak withstand current test.
- (iii) Basic short circuit duties test.
- (iv) Single phase short circuit test.
- (v) Mechanical Operation test as per M-2 class.
- (vi) Out of phase making & breaking test.
- (vii) Capacitive Current Switching Test.
 - a) Cable Charging Test.
 - b) Single Capacitor Bank Current Switching Test.
- (viii) Measurement of resistance of main circuit.
- (ix) Temp. rise test.
- (x) IP-55 Test (For cubicle/control cabinet).
- (xi) Any other type tests not specified above but covered as per amendment/latest edition of relevant IS/IEC.

C) The type test reports of Circuit Breakers, Current Transformers, Potential Transformers, Relays, Meters etc. shall be complete in all respect as per relevant IEC/ISS.

6.2 TYPE TESTS :

The 12 KV vacuum circuit breaker kiosk offered shall be fully type tested as per relevant standards.

The bidder must furnish type test reports along with bid as per the qualification requirement of the Tender Specification.

However, the purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative. For this purpose, the bidder should indicate unit rates for carrying out such type tests. These test charges shall not be taken into consideration for bid evaluation.

6.3 TEST ON BOUGHT OUT ITEMS :

Tests are not required to be performed on bought out equipments/items like motor, terminal connector, etc. at the works of manufacturer. Furnishing Test

Certificate of these items from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub-contractors works will be arranged by the supplier whenever required.

6.4 ROUTINE/ACCEPTANCE TESTS :

(i) The following acceptance and routine tests shall be got conducted in presence of purchaser's representative as per stipulation of the relevant standards, on each unit.

- a) One minute power frequency voltage withstand dry test on main circuit.
- b) Voltage withstand test on control & auxiliary circuits.
- c) Measurement of the resistance of main circuit.
- d) Mechanical operating test.
- e) Design and visual checks

(ii) Inspection & tests on control gear.

In addition to the above tests at 6.4 (i) above specified by IEC, the following shall also be performed at manufacturer's works in presence of purchaser's representative after completely assembling the kiosk.

- a) Checking wiring of circuits and their contacts.
- b) Insulation resistance of complete wiring, circuit by circuit with all equipment mounted on the panels.
- c) Checking of operational protective schedule , instruments and meters.
- d) Checking of phase faults between R&Y, Y&B and B&R phases. Kiosk should trip under all three conditions.
- (iii) **Temp. rise test on one No. Kiosk in the first offered lot shall also be done in the presence of the purchaser's representative.**
- (iv) Any other tests not specified above but covered as per amendment/latest edition of relevant IS/IEC.

6.5 TOLERANCE ON TEST RESULTS :

As per relevant standards/specification.

6.6 TEST AT SITE :

The purchaser reserves the right to conduct all tests on 12 KV circuit breakers after arrival at site and the contractor shall guarantee test certificate figures under actual service conditions.

7.0 INSPECTION :

All the tests (as mentioned at Clause 6.4) and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture/ before despatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be defective. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance/ routine testing of the bought out items.

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

8.0 QUALITY ASSURANCE PLAN

8.1 The tenderer shall invariably furnish following information along with his offer, failing which his offer shall be liable for rejection. Information shall be separately given for individual type of equipment offered.

- (i) Statement giving list of important raw materials names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of tenderer's representative, copies of test certificates.
- (ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.
- (iii) List of manufacturing facilities available.

- (iv) Level of automation achieved and list of areas where manual processing exists.
- (v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
- (vi) Special features provided in the equipment to make it maintenance free.
- (vii) List of testing equipments available with the tenderer 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.

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

- (i) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offer.
- (ii) Type test certificates of the raw material and bought out accessories.
- (iii) Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plan and purchaser's hold points shall be discussed between the purchaser and supplier before the QAP is finalized.

8.3 The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material viz oil, copper, aluminium, conductors, insulating materials, core material at the time of routine testing of the fully assembled equipment.

9.0 DOCUMENTATION

9.1 All drawings shall conform to International Standards Organization (ISO) 'A', series of drawing sheet/Indian Standards specification IS:13118/IEC-56. 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 four sets of following drawings along with his offer.

- a) General outline and assembly drawings of the equipment i.e. breaker, CTs,PTs etc.
 - b) Graphs showing the performance of equipments in regard to magnetization characteristics.
 - c) Sectional views showing -
 - i) General Constructional features.
 - ii) the materials/ gaskets /sealings used.
 - iii) the insulation, the winding arrangements, method of connection of the primary/secondary winding to the primary /secondary terminals etc.
 - iv) porcelain used and its dimensions along with the mechanical and electrical characteristics.
 - d) arrangement of terminal's and details of connection studs provided.
 - e) Name Plate
 - f) Schematic drawing
 - g) Type test reports in case the equipment has already been type tested.
 - h) Test reports, literature, pamphlets of the bought out items, and raw material.
- 9.3 The successful tender shall, within 2 weeks of placement of order, submit three sets of final versions of all the above said drawings for purchaser's approval. The purchaser shall communicate his comments/approval on the drawings to the supplier within four weeks. The supplier shall, if necessary, modify the drawings and resubmit three copies of the modified drawings for owners approval within two weeks from the date of owner's comments. After receipt of owner's approval, the supplier shall within two weeks, submit 12 prints and two good quality reproducibles of the approved drawings for purchasers use.
- 9.4 Six sets of the type test reports, duly approved by the purchaser, shall be submitted by the supplier for distribution before commencement of supply. Adequate copies of acceptance and routine test certificate, duly approved by the purchaser shall accompany the despatch consignment.
- 9.5 The manufacturing of the equipments 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.

- 9.6 16 sets of nicely printed and bound volumes of operation, maintenance and erection manuals in English language, for each type and rating of equipment supplied shall be submitted by the supplier for distribution, prior to the despatch of the equipment. The manual shall contain all the drawings and information required for erection, operation and maintenance of the circuit breaker. The manual shall also contain a set of all the approved drawings, type test reports etc.
- 9.7 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 requirement of the latest revision of applicable 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 judgement is not in full accordance therewith.

10. PACKING AND FORWARDING

- 10.1 The equipments 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 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) Sign showing upper/lower side of the crate.
 - f) Handling and unpacking instructions.
 - g) Bill of material indicating contents of each package.
- 10.3 The supplier shall ensure that the packing list and bill of material are approved by the purchaser before despatch.

11.0 Optional Spares

The bidder shall also recommend optional spares that will be required for breakers along with their total and unit prices. However, the prices of operation spares will not be considered for bid evaluation.

12.0 PERFORMANCE WARRANTY PERIOD :

The performance warranty period shall be **5 (Five) years** from the date of receipt of equipment along with its all accessories.

The supplier will be required to furnish a Performance Bank Guarantee @ 10% (for new suppliers)/ @ 5% (for old & established suppliers) amount of the total ordered value, which is required to be valid for 5 years.

Successful bidder shall attend the complaint within 30 days from the date of receipt of complaint. The date of receipt of complaint shall be treated as the date of FAX/ 3 days from the date of despatch of complaint by the field officer/ stores/ Purchaser. If the supplier fails to attend the complaint within 30 days from the date of receipt of complaint intimated by the field officer/ purchaser then penalty @1/4% per week or part thereof for first 4 weeks in case delay is exceeds more than 4 weeks then @1/2% per week or part thereof shall be charged for entire delay, subject to a maximum of 5% of the for of breaker. This penalty will be in addition to the penalty leviable delay in delivery mentioned in purchase order.

Further to this, in case of emergency, breaker can be get rectified by the field officer at the risk & cost of the supplier firm. The rectification of breaker means satisfactory performance report duly signed by the field officer (AEn/JEn) i.e. incharge of 33/11 KV Sub-Station.

13.0 Delay in Delivery of Inspected Material at Store :

If the material are not delivered within 7 days at same station, 14 days for station within State and 20 days by the suppliers situated outside the State from the date of receipt of the Dispatch Instructions. Charges shall be recovered @ Half Percent per week or part thereof (for actual delay in receipt), maximum upto 3% of the Dispatch Instructions consignment value (Ex-works). This will be in addition to Clause No.1.24(1) of GCC.

14.0 PAYMENT:-

As per provision of clause No. 1.42.2 (c) of GCC, 5% payment against supply of each lot shall be retained by the Sr.A.O.(CPC) in order to ensure that PV claims are

furnished by the supplier timely, which shall be released on finalization of PV claim by the purchaser.

95% (Ninety Five percent) payment of each consignment shall be made along with taxes & duties by the concerned Sr. Accounts Officer/ Accounts Officer (CPC), subject to furnishing of SBG, PBG in terms of relevant clause of GCC and Bank Guarantee of 10% cost of breaker towards satisfactory installation & commissioning of 12 KV Outdoor VCB Kiosks. This Bank Guarantee of 10% cost of breaker shall be released on production of satisfactory Installation & Commissioning certificates from the Nodal Officer and deposition of penalty towards delay in Installation & Commissioning of Breaker.

15.0 **FURNISHING OF PROTO TYPE BREAKER:-**

One Proto Type 12 KV Outdoor VCB Kiosk conforming to various requirements of technical specification along with subsequent modifications made, has to be supplied by the successful bidder within two months of placement of detailed purchase order for our inspection & approval. The offer for inspection of subsequent material shall be entertained only after approval of proto type VCB Kiosk and successful bidder will have to complete the entire ordered quantity within **sixteen months** of approval of proto type VCB Kiosk. Prior to supply of prototype VCB Kiosk, the detailed drawings, Bill of Material & protection scheme shall be got approved.

The proto type sample shall be inspected by a team of two officers including one from M&P Wing.

If the bidder has already got approved Proto type sample in the previous tender with similar specification of the instant tender, furnishing of fresh proto type sample is not required.

16.0 **QUANTITY :**

12 KV OUTDOOR VCB KIOSKS : **7,216 Nos.**

The quantity as indicated above is approximate and may be increased or decreased to any extent at the time of finalization of this tender enquiry.

SCHEDULE-III (PART-B)

1 SCOPE

This specification is intended to cover the installation & commissioning of 12 KV Outdoor Vacuum Circuit Breaker (Kiosks), complete in all respect at various 33/11 KV Sub-Stations under Jaipur Discom/Ajmer Discom/Jodhpur Discom.

2.0 INSTALLATION & COMMISSIONING OF VCB

The 12 KV Outdoor Vacuum Circuit Breaker Kiosks supplied shall be installed & commissioned by the successful bidder, at various 33/11 KV Sub-Stations under Jaipur Discom/ Ajmer Discom/ Jodhpur Discom. The name of 33/11 KV Sub-Stations shall be intimated at the time of despatch instructions/ stores.

3.0 ACTIVITY

The following main activities are to be carried out by the supplier for installation & commissioning of 12 KV Outdoor Vacuum Circuit Breaker Kiosks:-

- a) Foundation of Bolts along with grouting.
- b) Installation & Commissioning of Kiosk.
- c) Laying & connection of control cables from breaker to Control & Relay panel (Control cables shall be supplied by Nigam).
- d) Connection of Earthing of breaker from the earth mesh of the GSS. Providing M.S. flat shall be in the scope of supplier.
- e) All Civil works related with foundation and installation & commissioning of 12 KV Outdoor VCB Kiosks.

Note:- The M.S. Earthing & Foundation bolts required for Installation & Commissioning shall be provided in a packet and shall put up in each breaker.

4.0 CIVIL FOUNDATION WORK:-

The foundation & grouting work along with all civil works required for installation of 12 KV outdoor vacuum circuit breaker kiosk shall be carried out by the supplier. The foundation drawing shall be furnished by the successful bidder(s), which shall be approved by SE(MM) in consultation with SE(Civil).

5.0 INSTALLATION & COMMISSIONING OF KIOSK

Installation & commissioning of 12 KV Outdoor Vacuum Circuit Breaker Kiosks complete with accessories including use of special tools & conducting all pre-

commissioning tests before energisation shall be carried out by the supplier. PG/T-Clamps of required size to connect incoming & outgoing terminals of VCB to main bus bar shall be arranged by the supplier, however, required ACSR conductor for jumpers shall be arranged by the Nigam.

The agency should engage team of experienced Engineers & skilled staff for the purpose of Installation & Commissioning of 12 KV Outdoor Vacuum Circuit Breaker Kiosks.

Mainly following pre-commissioning tests shall be carried out:-

- a) Visual inspection.
- b) Cleaning
- c) Testing of relays/ CTs/PTs.
- d) Testing of current circuitry by primary injection
- e) Testing of breaker by primary injection.
- f) IR value.
- g) Checking of various equipments viz. Ammeter, Voltmeter, Energy meter etc. and alarms/ flags/ trip circuit healthiness etc.

6.0 **NODAL OFFICER:**

The concern Assistant Engineer shall be the Nodal officer for supervision of installation & commissioning of 12 KV Outdoor Vacuum Circuit Breaker Kiosks.

7.0 **WORK COMPLETION SCHEDULE**

The Installation & Commissioning of 12 KV Outdoor Vacuum Circuit Breaker Kiosks shall be completed within 30 days from the date of receipt of intimation of location of 33/11 KV Sub-Stations where the supplied breakers are to be installed. The concerned Nigam's officer shall give intimation to the firm only after transporting the breaker to Sub-Station/Site.

8.0 **DELAY IN WORK COMPLETION:**

In case of delay in Installation & Commissioning of breaker beyond 30 days from the date of intimation to the supplier about the site (the date of receipt of intimation shall be treated as the date of FAX/ 3 days from the date of despatch of letter about intimation of site by the field officer/ stores/ Purchaser), Only 50% payment towards installation & commissioning charges of breaker will be payable and in case the supplier fails to complete installation & commissioning of the breaker within 60 days, no payment towards installation & commissioning will be payable and breaker will be installed & commissioned by the Nigam itself and penalty towards non-installation of breaker @ 10% cost of breaker shall be levied.

9.0 **PAYMENT:-**

The payment shall be released on production of satisfactory installation & commissioning report of 12 KV Outdoor Vacuum Circuit Breaker Kiosks duly verified by the Nodal Officer.

The payment shall be released by Sr.A.O. (CPC) on production of satisfactory installation & commissioning report of 12 KV Outdoor VCB Kiosks duly verified by the concerned Assistant Engineer of M&P Wing.

While issuing the Installation & Commissioning Report, the nodal officer (The AEn M&P concerned in this case) should ensure that activities as per clause No. 3.0 of Schedule-III (part-B) have been completed by the supplier. If the Installation & Commissioning of Breaker has been done on the existing foundation of the sub-station, then only 50% payment of the total Installation & Commissioning charge shall be admissible and accordingly the payment will be made by the Sr. A.O. (CPC).

10.0 **PRICES:**

Installation & Commissioning charges shall be on FIRM price basis. In the price schedule, the bidder shall quote separately the prices for supply of 12 KV Outdoor Vacuum Circuit Breaker Kiosks, Installation & Commissioning charges inclusive of all type of taxes & service charges, if any and cost of Civil Works per breaker.

Work Contract Tax (WCT), if applicable, shall be borne by the Nigam.

11.0 **Security bank Guarantee towards Installation & Commissioning:**

Successful bidders shall furnish Bank Guarantee equivalent to 10% cost of breaker, towards successful installation & commissioning, which should be initially valid for a period of one year and if bidders fail to carry out installation & commissioning work of breaker in time, Nigam may invoke their Bank Guarantee.



SECTION-III (PART-B)

TECHNICAL SPECIFICATION & SCHEDULE OF REQUIREMENT FOR SUPPLY OF 3 PHASE, 4 WIRE A.C.STATIC HT TRIVECTOR METER OF ACCURACY CLASS 0.5S

3.01 (A) SCOPE:

i) This specification covers the design, engineering, manufacture, assembly, inspection, testing at manufacturers works before despatch, supply and delivery at site/FOR destination any where in vicinity of Class 0.5S accuracy static HT Tri-vector Meters for energy account & tariff purpose along with software and interface cable as per requirement given in this specification. The meter should be 3-phase 4-wire type suitable for connection to a 3 phase 4 wires as well as 3-phase 3-wire system. The meter should be capable to record and display KWh, KVArh, KVAh and maximum demand in KVA for 3 phase 4 wire as well as 3 phase 3 wire AC balanced/unbalanced loads for a power factor range of zero (lagging) through unity up to zero (leading) as per requirement given in this specification.

(ii) It is not the intent to specify completely herein all the details of the design and construction of material. The material shall, however, conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing for 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 HT TVM shall be complete with all accessories, software and 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.

(iii) The meter shall be ISI mark & bidder shall furnish the details of ISI license at the time of bid or or within 60 days from the date of opening of bid.

3.02 STANDARDS APPLICABLE:

Unless otherwise specified elsewhere in this specification, the performance and testing of the meters shall conform to the following Indian/International Standards and all related Indian/International standards to be read with up to date and latest amendments/revisions thereof:

S. No.	Standard No.	Title
1.	IS 14697-1999 (With latest amendments)	: Specifications for AC Static Transformer Operated Watt-hour and VAR-Hour Meters, class 0.2S & 0.5S.
2.	CBIP technical report No. 88 of July 1996 read with amendments issued (April 1999, September 1999) and latest amendment(s) issued thereafter.	: Specification for AC Static Electrical Energy Meters. With latest amendments.
3.	IEC 62053-22-2003 IEC 62052-11-2003	: AC Static Watt-hour Meters for Active Energy, class 0.2S & 0.5S
4.	CBIP Technical Report No.111 Revised July 1996	: Specification for Common Meter Reading Instrument.
5.	IS: 9000	: Basic Environmental Testing Procedures for Electronic & Electrical items.

Meters matching with requirements of other national or international standards, which ensure equal or better performance than the standards mentioned above, shall also be considered. When the equipment offered by the tenderer conforms to standards other than those specified above, salient points of difference between standards adopted and the standards specified in this specification shall be clearly brought out in the relevant schedule and copy of such standards along with their English translation shall invariably be furnished along with the offer.

3.03 CLIMATIC CONDITIONS:

The meters to be supplied against this specification should be capable of performing and maintaining required accuracy under extreme hot, cold, tropical and dusty climate and solar radiation typically existing in the state of Rajasthan (India). The meter shall be required to operate satisfactorily and continuously under the following tropical climate conditions: -

a) Maximum ambient air temperature	: 50° C
b) Maximum ambient air temperature in shade	: 45° C
c) Maximum temperature attainable by the meter exposed to Sun.	: 60° C
d) Minimum ambient temperature in shade	: (-) 5° C
e) Average daily ambient air temperature	: 40° C
f) Maximum relative humidity.	: 95%.
g) No. of months of tropical monsoon condition	: 4 Months.
h) Maximum attitude above mean sea level	: 1000 Meters.
i) Average rain fall.	: 10-100 cms.
j) Maximum wind pressure	: 200Kg/ Sq. meter.
k) Isoceran level (days/ year)	: 40
l) Seismic level (Horizontal Accn.)	: 0.30 g.
m) Permitted noise level	: 45 db.

3.04 SUPPLY SYSTEM:

Rated Voltage (Vref) (Through PT)	3 x 63.5 V - Phase to Neutral (3 phase 4 wire system) 3 x 110 V - Phase to Phase Meter shall be programmed for PT ratio 11KV/110V (Ph.to Ph.)
Rated current (Ib) (Connected through CT)	3 x -/5 Amps

Multiplying factor to arrive at actual primary values wherever applicable shall be calculated from the CT and PT ratio of the installed CTs and PTs.

3.05 POWER FACTOR RANGE:

The meter shall be suitable for full power factor range from zero (lagging) through unity to zero (leading). The meter should work as an active energy import and export and reactive (lag and lead) energy meter.

3.06 POWER SUPPLY VARIATION:

The supply system shall be 3x110V Phase to Phase, 3 phase 4 wires. The extreme power supply variations for which an operating meter should withstand without damage and without degradation of its meteorological characteristics when it is subsequently operated under its normal operating conditions shall be as follows: -

Specified operating range	- 0.8 to 1.15 V ref.
Limit range of operation	- 0.7 to 1.20 V ref.
Frequency	- 50 Hz. +/- 5%

However, the bidder can offer meter, which can withstand higher variations. The limit of power supply variations should be as per IS: 14697-1999.

3.07 ACCURACY:

Class of accuracy of the meter shall be 0.5S. The accuracy should not drift with time.

3.08 POWER CONSUMPTION:

(i) Voltage circuit: The active and apparent power consumption in each voltage circuit including the power supply of meter at reference voltage, reference temperature and reference frequency shall not exceed 1.0 Watt per phase and 8 VA per phase respectively.

(ii) Current circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature shall not exceed 1 VA per phase.

3.09 STARTING CURRENT:

The meter should start registering the energy at 0.1% Ib and unity power factor.

3.10 MAXIMUM CURRENT:

The rated maximum current of the meter shall be 200% Ib.

3.11 GENERAL AND CONSTRUCTIONAL REQUIREMENTS:

i) Meters shall be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions. However, the following should be ensured: -

- a) Personnel safety against electric shock
- b) Personnel safety against effects of excessive temperature.
- c) Protection against spread of fire.
- d) Protection against penetration of solid objects, dust and water.
- e) Protection against fraud.
- f) Protection against Pilferage.

ii) All the materials and electronic power components used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

iii) (a) The manufacturer should use application specific integrated circuit (ASIC) for metering functions.

(b) The meter should not have any form of mechanical adjustment such as trim-pots, potentiometer etc. for calibration. The meter shall be factory calibrated and no adjustment of calibration shall be possible at site by any means.

(c) The electronic components shall be mounted on the printed circuit board using latest Surface Mount Technology (SMT). The PCB material should be made of glass epoxy FR-4 grade conforming to relevant standards or better grade.

iv) All insulating materials used in the construction of meters shall be non-hygroscopic, non-ageing and of tested quality. All parts that are likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

v) The meter shall have an operation indication device such as a blinking LED. The operation indicator shall be visible from the front window.

vi) The meter shall have test out put device in the form of calibrating LED accessible from the front and capable of being monitored conveniently with suitable testing equipment.

vii) The meter shall conform to the degree of protection IP 51 of IS: 12063/IEC: 60529 for protection against ingress of dust, moisture and vermin.

viii) The meter shall be immune to tampering through application of external magnetic field (A.C. electro-magnet or D.C. magnet) as per the value specified in CBIP technical report 88 (with latest amendments). However the meter alone should comply up to 0.27 Tesla Magnetic field with a permanent magnet.

ix) The meter should continue to function even if any spurious signals are injected on the neutral of the meter such as D.C signals through diodes etc. and /or High Frequency Signals.

x) The meter shall be supplied with a transparent extended terminal-block cover (ETBC).

xi) The meter shall have two push buttons, one for forward scrolling and other for reverse scrolling of different parameters available in push button mode.

xii) Meter Base And Cover:

(a) The meter -base, meter cover; terminal block and ETBC shall be made of unbreakable, high grade, flame retardant polycarbonate with thickness more than 2.0 mm, and of good dielectric and mechanical strength. The material of meter base & terminal block shall be glass reinforced.

(b) Meter cover and extended terminal block cover (ETBC) should be injection moulded in UV stabilized polycarbonate in natural colour. The ETBC shall be kept fully transparent and the meter cover except the window portion shall be semi-transparent / non-transparent/corrugated. The moulded meter case and terminal cover(s) should not change in colour, shape, size, and dimensions, when subjected to 200 hours on UV ageing test. It should withstand 650 deg. C glow wire test and heat deflection test as per ISO 75.

(c) The manufacturer shall emboss on the base/cover(s), the name of the material they have used in an abbreviated form e.g. PCFR 10 GF (to denote that they have used polycarbonate flame retardant 10 % glass filled polycarbonate)

(d) The window portion shall be of transparent, unbreakable, silicon coated, scratch resistant surface UV stabilized polycarbonate material for easily reading all the displayed values/parameters, nameplate details and calibrating LED. It should not fade in course of time and become opaque causing inconvenience in reading. The window portion shall be ultrasonically welded with the meter cover such that it cannot be removed undamaged without breaking the cover.

(e) The meter cover shall be ultrasonically welded with the meter base. The sample meter to be sent along with bid may not be ultrasonically welded with the meter base, as at the time of sample testing it has to be opened to ascertain conformity of meter as per specification. However, before commencement of supply, sample has to be got approved with ultrasonically welded meter by the successful bidder.

xiii) Terminal Block:

(a) The detachable terminal block shall be moulded type made of non-hygroscopic, flame retardant material having good dielectric and mechanical strength. The moulded terminal block shall be made from best quality phenol formaldehyde or 10-20% glass filled polycarbonate material or any

equivalent/better material conforming to FH-1 of IS 11731 (Part-I) having adequate insulating properties and mechanical strength with brass inserts for connecting terminals.

The terminal block should satisfy all the conditions specified in IEC-62052 & IS-14697 and shall be made from best quality phenol formaldehyde or 10-20% glass filled polycarbonate material or any equivalent/better material. The glass filled polycarbonate should fulfill the requirement of following tests

- (i) The flame retardant rating of VO as per UL94 testing.
- (ii) The glow wire temperature of 960 deg. C as per IS-11000 (part-2/Sec-1) or IEC 695-2-1.
- (iii) Heat deflection temperature (HDT) test of 135 deg. C.
- (iv) Ball pressure test at 125 deg. C.

(b) The terminal block, the ETBC and the meter case shall ensure reasonable safety against the spread of fire and shall not be ignited by the thermic overload of live parts in contact with them

c) The current circuit conductors of a meter shall be connected to its current terminals inside the meter terminal block adopting procedure prescribed either B-1 or B-2 of the recommended methods under Clause 6.4-Annexure-B of IS 14697. Any other method which meets this requirement in a better manner/way shall also be considered. The bidder should elaborate the arrangement adopted.

(d) The meter terminal block shall have tin-plated brass terminals.

The terminals shall have suitable construction with barriers and transparent cover to provide firm and safe connections of incoming and out going leads. The terminal screws shall have flat bottom so as not to pierce in the external conductors. The terminals shall be of suitable rating to carry continuously I_{max} current and made of electroplated (or tinned) brass and shall be of replaceable type. Any other provision which meets this requirement in a better manner/ way shall also be considered. The bidder should elaborate the procedure adopted.

(e) (i) The manner of fixing the external conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings, which may be tightened and loosened several times during the life of the meter, shall screw into the body of brass terminal.

All parts of each terminal shall be such that the risk of corrosion is minimized. Two screws shall be provided in each current terminal for effectively clamping the external leads or thimbles. Each clamping screw shall engage a minimum of three threads in the terminal. The ends of screws shall not pierce and cut the conductors used. Electrical connection shall be so designed that contact pressure shall not be transmitted through insulating materials. If the manner of fixing of terminals is through thimbles /lugs/reducer type terminals. The supplier shall supply a set of the same along with each meter.

(ii) The internal diameter of the terminal hole shall be minimum 4.0mm. The holes in the insulation material of the terminal block, which form an extension of the terminal holes, shall be of sufficient size to accommodate the insulation of the conductors also. The clearance and creepage distance shall not be less than the values specified in clause 6.6 of IS 14697:1999.

Further, the supporting webs between two terminals of the terminal block should be sufficiently high to ensure that dust does not bridge the two neighboring terminals or a flash over does not take place.

f) The fixing screw(s) used on the ETBC for fixing and sealing of extended terminal cover shall be held captive on the terminal cover.

g) To facilitate sealing, a raised support arrangement with minimum 2 mm hole nearby sealing screws, which shall constitute an integral part of the terminal cover or a slot type arrangement underneath/alongside the sealing screw shall be provided.

xiv) The termination of current circuit wires inside the meter (i.e. CT primary conductor) on the terminal block shall be through lugs and washers of proper size. The loop length of the primary current circuit should be kept minimum. Alternatively the CT primary conductor may be flattened to form a 'lug' like shape for proper termination on terminal block without using lug or any other better arrangement may also be provided.

xv) The meter shall have minimum three fixing holes, one at the top and other two inside the terminal block. The top hole shall be key-hole type on the back of the meter base so that the hanging-screw is not accessible after fixing of the meter and it shall not be possible to remove the meter from the hanging-screw without removing the terminal cover and screw(s) from the terminal block. Any alternate better arrangement shall also be considered for acceptance.

The lower fixing holes shall be provided under the extended terminal cover. A set of fixing screws shall be supplied with each meter.

xvi) Extended terminal block cover shall be provided to ensure that the internal parts are not accessible for tampering etc. without breaking the seals. The ETBC shall be extended by about 30 mm \pm 5 mm below the terminal block. A firm connection shall be established with in the meter case to energies the voltage circuit.

Arrangement for display, optical port, auxiliary supply source, push buttons for manual mode, meter nameplate and display sequence should be made in such a manner that it is accommodated in size of 170mm(W) x 140 mm (H) from opposite side of ETBC. This is required for facilitating of fixing of the HT Tri-vector meter in HT pane box.

3.12 MANUFACTURING ACTIVITIES:

i) The meter should employ latest technology such as Application Specific Integration Circuit (ASIC) to ensure reliable performance. The mounting of component on the PCB (Printed Circuit Board) must be SMT (Surface Mounted Technology) type by deploying the automatic SMT pick and place machine and reflow soldering process. The electronic component used in the meter shall be of high quality such that the meter shall remain in the accuracy class for at least up to 10 years. Further, the Bidder should own or have assured access (through hire, lease or subcontract) of above facilities.

ii) Quality should be ensured at the following stages:

a) At PCB manufacturing stage, each board shall be subjected to computerised bare board testing.

b) At insertion stage, all components should under go computerised testing for conforming to design parameters and orientation.

c) Complete assembled and soldered PCB should under go functional testing using Automatic Test Equipments (Testing Jig)

d) Prior to final testing and calibration, all electronic components of the meter shall be subjected to accelerated ageing test to eliminate infant mortality.

iii) The calibration of meters shall be done in house.

iv) The bidders should submit the list of all major components used in meter along with the offer.

v) A detailed list of bought-out items, which are used in the manufacture of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.

3.13 SEALING ARRANGEMENT OF THE METER:

Atleast two sealing screws shall be provided for proper fixing of meter cover so that access to the working parts shall not be possible without breaking the seals. One screw provided on left side shall be used by manufacturer to provide his own sealing with high quality double anchor polycarbonate seal bearing laser etched monogram of JVVNL/AVVNL/JdVVNL along with meter serial number and other provided on right side by purchaser, which should be left unsealed. Provision shall also be kept for one no. seal on terminal cover. All the sealing screws shall be captive type so that they cannot be detached when they are in open condition. The holes in the head of sealing screw shall be of min. 2mm dia. The sealing screws for meter base and cover shall be unidirectional and slotless (2 No.) .Two No. tamper indicative paper seal(s) on either side of the meter case shall be provided by the manufacturer. For this, at least two (2) Nos. seals on meter body and provision for, one (1) no. seal on meter terminal cover and one (1) no. seal on communication port shall be provided.

For the above sealing arrangement for the purchaser, the manufacturer shall provide at least one seal on the meter body at the factory after calibration and testing. Provision for all the seals should be provided on front side only. Rear side sealing arrangement will not be accepted. The Suppliers in their offer should explain the sealing arrangement.

3.14 MARKING OF METER:

The meter terminal marking and mounting arrangement should be as per Indian installation practices. The marking on every meter shall be in accordance with IS 14697-1999/ IEC 62052-11-2003.

Every meter shall have nameplate beneath the meter cover such that the nameplate cannot be accessed without opening the meter cover and without breaking the seals of the meter cover and the nameplate shall be marked indelibly. The nameplate marking should not fade or otherwise be adversely affected by UV exposure with lapse of time. The basic markings on the meter nameplate shall be as follows:

- i. Manufacturer's name or trademark and place of manufacturer.
- ii. Type & Designation.
- iii. Number of phases and wires for which the meter is suitable.
- iv. Serial number.
- v. Month & year of manufacture.
- vi. Reference voltage / PT ratio, frequency and temperature.
- vii. Basic current and rated maximum current in Amp.
- viii. Principal unit(s) of measurement.
- ix. Meter constant (Impulse/Kwh, KVARh, KVAh).
- x. Class index of meter.
- xi. "Property of JVVNL/AVVNL/JDVVNL".
- xii. JVVNL/AVVNL/JDVVNL Purchase Order Number & Date.
- xiii. Guarantee Period.
- xiv. Sign of Insulation.
- xv. Bar coding of serial number, month and year of manufacture.

3.15 CONNECTION DIAGRAM & TERMINAL MARKINGS:

The connection diagram of the meter shall be clearly shown for 3 phase 4 wire system as well as 3 phase 3 wire system, on inside portion of the terminal cover and shall be of permanent nature. The meter terminals shall also be marked and this marking should appear in the above diagram.

3.16 SOFTWARES AND INTERFACE BETWEEN METER & CMRI:

Adequate number of licensed copies of the following software shall be made available and shall be installed in CMRI and Base Computer System (BCS) by the Supplier without extra cost. The Supplier shall impart necessary training regarding installation and use of the above softwares. The exact quantity of each type of software to be so supplied shall be intimated to the Supplier prior to/at the time of ordering subject to maximum 30 Nos./sets.

- i) Software for reading, down loading meter data, as well as configuration change activity in meter such as time setting, reactive energy for apparent energy calculations reprogramming, MD integration period change and TOD reprogramming (changing TOD time-zones, subject to maximum 8 time zones, and/ or, change of any one or more TOD time-zone timings in the meter), normally resident in the Common Meter Reading Instrument (CMRI); Software suitable for MS Window XP or higher version. *The software shall be installed in and be compatible to all makes of the CMRIs (Analogic/Sands/any other make) and PC/Laptop as well as supplied separately in the form of floppies/CDs.*

ii) Configuration change activity (programming) should be enabled at BCS under multilevel password protected security system for specified/selected meter(s) identified by the meter serial number(s). Configuration change activity can only be possible after written consent of SE(M&P), JVVNL/AVVNL/JDVVNL, Jaipur and a password available with SE(M&P) Jaipur is to be entered first for enabling any configuration change activity. Without entering the password provided by SE(M&P) Jaipur, configuration change activity shall not at all possible. Such configuration change in the meter shall be immediately preceded automatically by meter-data reading such that entire meter data prior to change is downloaded from the meter before the change is effected in the meter. Details of minimum 10 such change/s (event/s) made in the meter shall be logged in the meter memory, each with date and time-stamp, and shall be capable of downloading through CMRI and shall be available for viewing at the BCS end. The logging shall be roll-over type on first-in, first-out basis.

iii) Windows based Base Computer Software (BCS) for receiving data from CMRI and downloading instructions from base computer to CMRI. This BCS should have, amongst other requirements and features and facilities described later in this specification, the facility to convert meter reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. The necessary training, if required, and documentation for this purpose shall also be provided free of charge. **The bidder shall obtain billing format from the purchaser before commencement of supply.**

iv) The BCS should be user friendly. The data transfer should be reliable and fraud proof. The BCS should give all details pertaining to billing and load survey data.

The meter condition details should also be transferred into the BCS including abnormal/anomalies of voltage current conditions or tamper conditions which can occur due to mistake in connections or intentionally done for the purpose of tamper.

v) Necessary software for loading application programme via CMRI serial port. *The time taken for downloading the complete meter data should not be more than **Five** minutes.*

vi) Any other special application software of the manufacturer for the meter.

Any future up gradation made by the supplier in any of the above softwares shall also be provided free of cost.

(a) Platform:

The BCS should be executable on MS WINDOWS 95/98/2000/XP or higher operating system. The BCS shall be suitable to run on IBM PC or compatible hardware platform.

(b) Meter Data Display:

i) The BCS should show electrical conditions existing at the time of reading the meter in tabular forms as well as in graphical format (Phasor diagram).

ii) All the information about energy, maximum demand and their respective TOD register readings, billing register readings and billing history readings should be shown in a manner which user can understand quickly, preferably in tabular format.

iii) All the load survey data should be available in numerical as well as graphical format. It should also be possible to view this data in daily, weekly and monthly formats. The load survey graph should show values where the cursor/pointer is placed for the selected or all parameters.

iv) All the information about tamper events should be accompanied with date and time stamping along with the 'snap-shots' (details) of the respective electrical conditions. This information should be displayed in the sequence in which it happened, in cumulative format as well as in summary format. The cumulative format should segregate a particular tamper

information and summary report shall show count of tamper occurrence and the duration for which meter has remained under tamper condition.

v) The BCS should be capable of preparing *all available makes of CMRIs* to read the meter information or for Configuration Change activity in the meter after entering the password provided by SE(M&P) Jaipur such as time-setting, Reactive Energy for Apparent Energy calculation re-programming, MD integration period change and TOD re-programming (changing TOD time-zones, subject to max. 8 time-zones, and/or, change of any one or more TOD time-zone timings in the meter).

(c) Support Display:

There should be "user friendly" approach for viewing meter data for the reading collected now or for the reading collected in the past. All information about a particular consumer should be segregated and available at one place so that locating any consumer's past data is easy. It should be possible to locate/retrieve data on the basis of one of the following particulars:

- i) Consumer ID/Number.
- ii) Meter Sr. No.
- iii) Date of meter reading.
- iv) Location.

(d) The Data Transfer:

It should be possible to transfer the data to and from CMRI through serial interface/port. *The data transfer shall be in the desired format, which suits to billing software of the Nigam.*

(e) Configurability:

It should be possible to have selective printing out of all the available data of the meter. Print out should not include anything and everything available with the BCS. The software should support "Print Wizard" or similar utility whereby user can decide what to print out. The user of the software need not revert back to the supplier of the software for modifying the software just to print what he desires.

It is very important that the BCS shall have the feature to export available data to ASCII or spreadsheet format for integrating with the JVVNL/AVVNL/JDVVNL billing system and it may be amended as desired by Nigam from time to time.

"Export billing Wizard" should be provided and a drop down should be available to select from various options for exporting the data or similar utility should be available whereby user can select file format (for ASCII or for spreadsheet), what data to export, the field width selection (whether 8 characters or 10 characters, to include decimal point or not, number of digits after decimal point etc.)

(f) Security:

The BCS shall have multi level password for data protection and security. The first level shall allow the user to enter the system. The different software features shall be protected by different passwords. The configuration of passwords shall be user definable. The software installed on one PC shall not be copiable on to another PC.

(g) Help:

Exhaustive on-line Help should be available with the software so that user can use all the features of the software by just reading the Help contents.

3.17 SALIENT FEATURES:

The meter shall have the following additional salient features:

- i)** It should be possible to check the healthiness of phase voltages by displaying all the voltages on the meter display.
- ii)** The meter display shall have phase indicators to indicate the status of phase voltages, which shall keep coming with every display.
- iii)** The meter should work accurately irrespective of phase sequence of the mains supply.
- iv)** It should be possible to check the correctness of connections of CT and PT to the meter with proper polarity. This shall be made available on CMRI by displaying phasor diagram. For this purpose, a suitable software for field diagnosis of meter connections with the help of meter and CMRI should be supplied as per Annex G15 of IS 14697/ 1999.

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

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

vii) The meter shall be provided with adequate magnetic shielding so that any external magnetic field (AC Electro Magnet or DC Magnet as per the values specified in CBIP Technical Report No.88, with latest amendments) applied on the meter shall not affect proper functioning and recording of energy as per error limits prescribed by CBIP. However the meter alone should comply up to 0.27 Tesla D.C magnetic field. On application of 0.27 Tesla DC magnet at anywhere on meter body, the meter shall record energy at I_{max} , rated voltage and unity power factor as per CBIP / IS, in case of Magnetic Interference beyond 0.27 Tesla and the event of Magnetic Interference and restoration shall be available with date & time stampings along with other snap shots.

viii) Meter shall have Scroll Lock facility to display any one desired parameter continuously from display parameters, which will keep on displaying till the lock is released.

ix) The meter should continue to function even if any spurious signals are injected on the neutral of the meter, such as D.C signals through diodes etc.

x) The meter reading count should increase by one digit every time the meter is read successfully through CMRI or computer or any other device and be available at BCS end as well as on meter display. The count shall not increase through CMRI operations as instantaneous parameters view and other similar CMRI operations, which do not download any data from meter memory.

xi) Data Alteration Count: Meter should be capable to display the data alteration count This count should increase by one digit whenever there is any programme or meter data change in the meter *through CMRI or computer or any other device and be available at BCS end as well as on meter display*. This count should not increment on any data read-only communication.

xii) The meter shall be capable of detecting condition of power-off if mains supply is not present. It shall record such occurrence and restoration of power failures as separate events in the meter memory with date and time stamp. Snapshot of electrical parameters is not necessary during this condition.

xiii) The meter shall have provision to be read in the absence of power through an external /internal source as per provision of Annex G14 of IS 14697/1999 such that it should not be possible to damage the internal circuitry of the meter by applying any voltage on /through the device /port provided for powering up the meter in the absence of power supply. The bidder should explain the method adopted by them for this purpose in their offer.

Minimum 20 such events (either off or on) shall be logged in meter memory and be available for downloading through a CMRI for viewing at the BCS end. These events shall be logged in a separate compartment on roll-over, first-in, first-out basis. Electrical values snap shots shall not be required for the logging of Power -off / Power - on events.

- xiv)** The manufacturer shall provide drivers for interoperability of meters so that meters of different makes can be read by a common software for reading and data conversion. The meter manufacturer shall provide application programme interface (APIs) for exporting data in common format so that third party software which is using data for further processing will have uniform way of handling the data irrespective of the manufacturers from which meter is bought.

The manufacturer API shall have the following features:-

- a) All APIs will be executable exes.
- b) All APIs are controlled by CFW. No API will handle screen or keyboard request directly.
- c) All messages will either be passed on via configuration file or via the command structure described.
- d) APIs will transfer the messages via MII protocol. Longer message to API will be passed on via configuration file.
- e) APIs should pass on meaningful message in case particular command is not handled by it.
- f) Error reported can be meter specific or API specific. API should give clarity about it.
- g) Success of the work is to be declared only if last step of the operation is done such as file generated for a given commands is stored at the indicated (or predefined) location.
- h) APIs may drop some of the tags due to unavailability of information from the meter.
- i) No APIs will work standalone. CFW will have to pass on license key information for this.
- j) API will give acknowledgement of any command within 3 seconds.

e.g. The naming conventions of different meter manufacturers are as below:-

API function	SML	L&T	C.G.S.	Elster	TTL Ltd.
MRD	SMLMRD	LNTMRD	CGSMRD	ELSMRD	TTLMRD
MRI	SMLMRI	LNTMRI	CGSMRI	ELSMRI	TTLMRI
CFC	SMLCFC	LNTCFC	CGSCFC	ELSCFC	TTLCFC
CHK	SMLCHK	LNTCHK	CGSCHK	ELCHK	TTLCHK

The parameter code list is enclosed at Annexure `A`.

xv) **The meter should be compatible to GSM technology for remote metering.**

3.18 DISPLAY OF MEASURED VALUES:

The measured value(s) shall be displayed on seven segments, seven digits Liquid Crystal Display (LCD) display unit/register; having minimum character height of 8 mm. LCD to be of 'STN' (super tested kneumatics) type construction suitable for temperature 70 Deg.C continuously.

The data should not be lost in the event of power failure and should be stored in non-volatile memory. The non-volatile memory should retain data for a period of not less than 10 years under un-powered condition i.e. the non-volatile memory shall have a storage life (without use) of ten (10) years. Battery backup memory will not be considered as NVM.

It should be possible to easily identify the single or multiple displayed parameters through symbols/legend on the meter display itself or through display annunciator alongwith a separate legend plate fixed on the front face of the meter cover. The different legends for display parameters are available at Annexure 'A'

The register shall be able to record and display starting from zero, for a minimum of 1500 hours, the energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.

3.19 METER SERIAL NUMBER:

In addition to providing serial number of the meter on the display plate, the meter serial number shall also be programmed into meter memory for identification through CMRI/meter reading print out.

3.20 DISPLAY SEQUENCE:

“The meter shall display the required parameters in two different modes i.e. Auto Display Mode and Push Button Mode in the sequence as detailed hereunder without leaving any specified parameter or adding any additional parameter”

A) Auto Display Mode:

The following parameters hereinafter referred to as "Billing Parameters" (B.P) shall be displayed in an auto-cyclic mode, in the following sequence: -

- a) Cumulative Active energy import reading (KWh) of predefined date & time for billing purpose (BP import KWh).
- b) Cumulative Active energy exports reading (KWh) of predefined date & time for billing purpose (BP exports KWh).
- c) Cumulative Apparent energy reading (KVAh) of predefined date & time for billing purpose (BP KVAh).

- d) Maximum demand (KVA) up to predefined date & time for billing purpose (BP KVA).
- e) Average power factor of the consumption month up to predefined date and time for billing purpose (BP AVG PF).
(Note: the average power factor displayed for billing purpose should match the average power factor worked out through KWH/KVAh)
- f) “Cumulative tamper count reading of predefined date & time for the last two consumption months (BP TC)”
- g) “Cumulative power-On hours reading of predefined date & time of the last two consumption months (BP POH)”

The first parameter shall be on meter display for 5-10 seconds and thereafter, each parameter shall be on meter display for 10 seconds subject to 10 % tolerance and the time between two auto-display cycles shall be maximum 120 seconds.

B) Push Button Mode:

The following parameters strictly in the sequence given below, shall be displayed on pressing the push button(s). *The billing parameters as shown at (a) to (e) in the auto-display mode shall also be displayed in the push-button mode at the start.*

- a) LCD segment check.
- b) Real time.
- c) Date - dd, mm,yy.
- d) Meter serial number.
- e) Rising demand with elapsed time.
- f) Cumulative Meter Reading Count in accordance with Cl 3.17 (ix)
- g) Cumulative Power-On hours.
- h) Cumulative MD reset count.
- i) Cumulative Data Alteration Count as per Clause 3.17 (xi)
- j) Cumulative Active energy import (kWh).
- k) Cumulative Active energy export (kWh).
- l) Cumulative Reactive energy lag (kVArh lag).
- m) Cumulative Reactive energy lead (kVArh lead).
- n) Cumulative Apparent energy (kVAh).
- o) High Resolution energies registers: -

(Min. 4 digit after decimal)

- i. KWh - xx.xxxx
- ii. KVArh lag - xx.xxxx
- iii. KVArh lead - xx.xxxx
- iv. KVAh - xx.xxxx

Note: If energy readings up to 4 decimals or more digits are provided on the main registers, then high-resolution energy registers as given at sequence (o) above will not be required separately.

- o) Instantaneous power factor with sign for lag/lead.
- p) Cumulative maximum demand (KVA).
- q) Instantaneous phase voltage.
 - i) R phase voltage.
 - ii) Y phase voltage.
 - iii) B phase voltage.
- r) Instantaneous line currents (Amps.)
 - i) R phase line current.
 - ii) Y phase line current.
 - iii) B phase line current.
- s) Frequency.
- t) Phase sequence of voltages (Alternatively, this may be provided at CMRI/ BCS end.
- u) Instantaneous load in
 - i) KW
 - ii) KVA
- v) Maximum demand in KVA since last reset.
- w) Tamper data:
 - i) Present status of tamper
 - a)-Missing potential with phase identification.
 - b)-Neutral disturbance
 - c)-Current circuit polarity reversal with phase identification.
 - d)-Current unbalance.
 - e)-Current circuit short (bypass) & current circuit (failure) open (applicable when meter is connected in 3 phase 4 wire mode only).
 - f) Magnetic influence.
 - ii) Date and time of last tamper occurrence with tamper identification.
 - iii) Date & time of last tamper restoration with tamper identification.
 - iv) Cumulative tamper count of all types of tampers & all phases.

Detailed phase-wise tamper information of missing potential and current circuit polarity reversal tamper should, however, be logged in the meter memory and be capable of downloading through the CMRI and be available for viewing at the BCS end.

x) TOD Maximum Demand (KVA) Registers

006:00- 09:00 Hrs
 09:00 - 18:00 Hrs
 18:00 - 22:00 Hrs
 22:00 - 06:00 Hrs

y) TOD Active Energy (Cumulative KWh) Registers

006:00- 09:00 Hrs
 09:00 - 18:00 Hrs
 18:00 - 22:00 Hrs
 22:00 - 06:00 Hrs

Note: 1. Apparent Energy should be based on reactive Lag + Lead.

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

2. Apparent energy calculation should be configurable for reactive energy so that either Lag + Lead or Lag only can be selected as required. This selection shall be possible at BCS end and communicated to the meter through CMRI/computer.

3. The TOD wise bill point active energy, apparent energy and maximum demand though not provided on meter display, should be logged in the meter memory and be capable of downloading to the BCS through the CMRI and be available for viewing at the BCS end.

4. Bill point shall be 00.00 Hrs of the first day of every calendar month (or say 24.00 Hrs on the last day of the month for each calendar month) .In case the meter is not in powered up condition at the predefined date and time, the specified operation should be done at the instant of first powering up of the meter, thereafter.

3.21 OUT PUT DEVICE:

The meter shall have a test output accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator, if fitted, must be visible from the front. Test output device shall be provided in the form of one common LED for kWh, kVArh and optionally kVAh with the provision of selecting the parameter being tested. Alternatively, test output device in the form of separate LEDs for kWh, kVArh and optionally kVAh is also acceptable.

The relation between test output and the indication on display shall comply with the marking on the name plate (imp per kWh/kVArh/kVAh).

The bidder shall state the necessary number of pulse count(s) to ensure measurement accuracy of at least 1/10th of class of the meter at the different test points.

The resolution of the test output pulse(s) should be sufficient to enable conduction of the starting current in less than 10 minutes and accuracy test at the lowest load with desired accuracy within 5 minutes.

3.22 COMMUNICATION PORT:

The meters shall have a galvanically isolated optical communication port as per only IEC 1107 so that it can be easily connected to a handheld common meter reading instrument for data transfer or subsequently hooked to a remote metering device such as modem etc.

The interference between meter and CMRI shall consist of meter optical sensor terminating into a 9 pin D type male connector along with a flexible, shielded cable of 500 mm. + 10 mm. length. It shall be the responsibility of the meter manufacturer to provide such cables without extra cost along with meters to use CMRI for reading the meter. The exact quantity of this cable to be so

supplied shall be intimated to the supplier at the time of placing order subject to *maximum 2% of ordered quantity of meters*. The bidder shall also quote separately the unit price for such cable for future requirement.

3.23 AUXILIARY POWER:

The auxiliary power shall be drawn from all the three phases and the meter should be able to remain powered up with availability of any two phases or any one phase and neutral.

Alternative power packs one percent of ordered quantity for taking reading during power down conditions shall be supplied free of cost.

3.24 (A) MAXIMUM DEMAND (MD) REGISTRATION:

The meter shall continuously monitor and calculate the average demand in KVA during the integration period set and the maximum, out of these, shall be stored along with date and time when it occurred in the meter memory. The maximum registered value shall also be made available on meter-display.

The maximum demand will be computed from the main apparent energy register.

The rising demand under the current integration period should be displayed alongwith the elapsed time.

The integration period shall be set as 30 minutes, on real time basis starting from 00.00 H

The principle of maximum demand calculation used by the Bidder should be explained in the offer.

3.24 (B) Maximum Demand Registration and MD resets :

Meter shall continuously monitor and calculate the average maximum demand of each demand interval time of 30 minutes (with a sliding window of 15 minutes) on real time basis and maximum of these in a calendar month shall be stored. The maximum demand shall automatically reset at 24.00 hrs. of the last date of each calendar month for which minimum 30 years calendar shall be programmed by the manufacturer. The cumulative kWh should also be recorded at 24.00 hrs. on the last date of each calendar month for previous 6 months.

3.25 MAXIMUM DEMAND RESET:

The auto reset facility of MD at pre-defined date & time shall be provided. The meter shall log on in the meter memory, average value of voltage & current for 30 minutes integration period, the maximum demand reset count, which should increment by one digit every time the MD is reset.

3.26 LOAD SURVEY CAPABILITY & BILLING POINT REQUIREMENTS:

The meter shall be capable of recording half an hour KW and KVA demand, or, kWh and KVAh energy & P.F. of 30 (thirty) minutes integration period for at least last 180 (one hundred eighty) days. It shall be possible to select either demand or energy at the BCS end.

(The integration period shall be configurable for 15/30/60 minutes from the BCS using a MRI transaction in the meter).

The load survey data should be available in the form of bar charts as well as in spreadsheets. The BCS shall have the facility to give complete load survey data both in numeric and graphic form with option for either of them.

The figures of 24 hours kWh import and kVAh should also be made available under each date in the load survey and it should be possible to represent this at BCS end.

The predefined date and time for registering the billing parameters of kWh, kVAh, PF and kVA MD as well as Tamper Count and Power-On hours readings shall be 00.00 hours of the first day of each calendar (billing) month. All billing parameters shall be transferred to billing registers and shall be displayed on auto cyclic display mode referred to as "BILLING PARAMETERS".

In case the meter is not in powered-up condition at the predefined date and time, the specified operations should be done at the instant of the first powering-up of the meter thereafter.

The above billing data, TOD registers data, load survey data, tamper information and instantaneous parameters data shall all be retrievable through the meter's communication port through a common meter reading instrument (CMRI) and shall be transferred (downloaded) to a PC with Windows based software to get complete details in numerical and/or graphic form. The necessary base computer software (BCS) for this purpose shall be provided by the supplier with complete details.

Further, apart from instantaneous parameters like voltage, current, PF, and reading of billing parameters, energy registers, TOD registers etc., the following additional parameters should be available at the BCS end: -

- a) Meter Reading Count.
- b) MD reset count.
- c) Billing Parameters for last 12 months.
- d) Billing Point (BP) Cumulative Power-On/Power-Off Hours for the last 12 months.
- e) Data Alteration count.

3.27 TIME-OF-DAY (TOD) TARIFF/DEMAND:

The meter should be capable of registering the time-of-day energy and maximum demand. The defined time-zones shall be as follows:-

006:00- 09:00 Hrs
09:00 - 18:00 Hrs
18:00 - 22:00 Hrs
22:00 - 06:00 Hrs

The display registers for energy and demand for the above-defined four time zones as well as 00:00 to 24:00 Hrs zone shall be provided on meter display. Further the meter should have in-

built capacity to define up to four more time zones through operation of CMRI thus making a total of 8 time zones. The change of the TOD time-period(s) or defining additional TOD zones should be possible through CMRI with special authenticated command from the BCS so that only authorized person(s) can make such changes. The main control of this system along with proper security password/code should be available on one or more computers located at the authorized location(s) as per the directions to be given by the Purchaser.

3.28 HARMONICS MEASUREMENTS:

The accuracy of the meter shall not be affected by harmonics circulating in the system of magnitudes within permissible limits stipulated in relevant ISS/ IEC/ CBIP Standards and CEA Regulations-2004. The meter shall indicate and record the total resultant quantities of fundamental frequency and harmonics or alternatively the meter shall record fundamental frequency quantities and harmonics related quantities (such as KWh, KVAh and KVARh) separately.

“The meter shall comply with the provisions of IS: 14697/1999 and shall be capable of measuring 50 Hz energy and total energy. In this case, meter shall indicate mechanism of 50Hz energy measurement, sampling rate, accuracy of current measurement under the presence of harmonics. Alternatively meter shall comply with IEC 62053-22:2003 and shall be capable of measuring total energy consisting of fundamental energy and harmonics energy. In this case percentage distortion due to harmonics should be available in the graphics.

The fundamental and total energy shall be logged in the meter memory and be capable of downloading to the BCS through the CMRI and be available for viewing at the BCS end.

3.29 SELF DIAGNOSTIC FEATURE:

The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time. The meter shall have indications for unsatisfactory / nonfunctioning / malfunctioning of the following as per the requirement under Annex G 19 of IS 14697. :

- (a) Time and date.
- (b) Real Time Clock (RTC) battery.
- (c) All display segments.
- (d) Non-volatile memory.

The details of unsatisfactory/non-functioning /malfunctioning of time and date should additionally be recorded in the meter memory and available for viewing at BCS end either directly or through comparison with CMRI date and time.

The details of self-diagnostic capability feature should be furnished by the bidder.

3.30 TAMPER AND FRAUD PROTECTION:

The meter shall atleast be immune to tampers elaborated in IS: 14697(Annexure G-10). The meter should have features to detect the occurrence and restoration of, at least, the following common ways of tamper and fraud:

a) Missing Potential: The meter shall be capable of detecting and recording phasewise occurrences and restoration events of missing potential (one phase or two phases) as on meter terminals which can happen due to intentional / accidental disconnection of potential links (leads) with date and time, along with the total number of such events for all phases. Absence of one or more phase voltage from mains side should not be recorded as missing potential.

b) Neutral Disturbance: The meter shall be capable of detecting occurrences and restoration of injection of spurious signals on the neutral of the meter, such as DC signals through diodes etc., which affect the meter functionality and energy recording.

c) Current Reversal: The meter shall be capable of detecting and recording phase wise occurrences and restoration of current reversal of one or more phases

d) CT Short (Bypass) & Current Circuit Open (Failure): The meter shall be capable of detecting and recording occurrences and restoration of shorting (bypassing) and opening (failure) of any one or two phases of current circuit when the meter is connected to a 3 phase 4 wire system or 3 phase 3 wire system. The No-load condition should not be recorded as tamper.

e) Current Unbalance: The meter shall be capable of detecting and recording occurrences and restoration of current unbalance as a tamper event only

The threshold values for voltage, current and power factor etc. for the purpose of logging occurrence and restoration of various type of tamper shall be as per Annexure `B`

f) Magnetic Influences:

The meter should record the presence of abnormal external magnetic fields alongwith date and time.

Snapshots (numerical values) of voltage, current, power factor and energy (kWh) readings as well as the date and time of logging of the occurrence and restoration of all tamper events, subject to meter-memory space as described herein under, should be logged in the meter-memory and available for retrieving through the meter's optical port via CMRI and downloading to the BCS.

g) The accuracy of the meter should not be affected with the application of abnormal voltage/ frequency generating device such as spark discharger of approximately 35 KV. The meter shall be tested by feeding the output of such device(s) to meter in any of the following manner for 10 minutes:-

- i) **On phase or neutral terminals.**
- ii) **On any connecting wires of the meters.**
- iii) **Voltage discharge with 0 to 10mm spark gap.**

- iv) **Spark on meter body.**
- v) **At any place in load circuit.**

The accuracy of the meter shall be checked before & after the application of above device(s) with site conditions.

The abnormal voltage/frequency devices are available at Nigam's MT labs and the bidders may check their samples with one of the device before submission of the same to the purchaser. The device with which the respective bidder will check his sample meters will be sealed in the Nigam's MT lab under sign. of his representative and concerned XEN/AEn of MT lab and the same device will be used during sample testing against this offer and final inspection of meters in case of placement of order.

h) **Cover Open Tamper** – If the meter cover is opened, the meter shall log this as tamper and shall display “Open” with date and time of such opening and should not restore in any condition (in power on as well as power off condition) in blinking display on the LCD alongwith other display parameters, so that it is immediately noticed by the meter reader and same shall be downloaded in CMRI.

3.31 TAMPER LOGIC:

A properly designed meter tamper logic should be provided. The tamper logic should be capable of discriminating the system abnormalities from source side and load side and it should not log/record tamper due to source side abnormalities.

There shall be three separate compartments for logging of different types of tampers as follows:

Compartment No.1:

(i) 40% of total tamper memory space shall be allocated for the following current related tampers:

- CT polarity & current circuit reversal.
- Current circuit short (By pass)
- Current circuit open (Failure)
- Current unbalance

Compartment No.2:

(ii) 30% of total tamper memory space shall be allocated for potential related tampers including missing potential.

Compartment No.3:

(iii) 30% of total tamper memory space shall be allocated for Neutral disturbance and magnetic influence related tampers.

Minimum hundred (100) events (occurrence & restoration as one event) of all types of tamper with date and time shall be available in the meter memory on first-in, first-out basis (one event means occurrence & restoration). It shall be possible to retrieve the tamper data along-with alongwith date and time of logging through the meter's optical port with the help of a CMRI and download the same to the BCS where it shall be available for viewing. All this information shall be available in simple and easily understandable format. It should not be possible to reset the tamper data through CMRI or BCS software.

The logging of various tampers in each compartment should be as under:

The first tamper event of each compartment should always remain in the memory and should not get overwrite. Once one or more compartments have become full, the last tamper event pertaining to the same compartment will be entered and the earliest (second one) tamper event should disappear. Thus, in this manner each succeeding tamper event will replace the earliest recorded event (second one), compartment wise. Events of one compartment/category should overwrite the events of their own compartment/category only.

The bidder should furnish the details as to how the tamper logic is able to detect and protect the meter against the abovementioned tamper and fraud with sketches and phasor diagrams wherever necessary. If a bidder has any better proposal for tamper logic, the same may be submitted alongwith the offer for purchaser's consideration. Bids without such details shall be considered as non-responsive. Additional features, if any, in their meter may also be clearly indicated for purchaser's consideration.

Tamper count should increase as per occurrence (not restoration) of tamper events. The total number of tamper counts should also be provided on the meter-display as well as at the BCS end.

3.32 TAMPER PERSISTENCE TIME:

The persistence time for logging/ registration of an occurrence of a tamper should be 5 minutes +/- 10 seconds. The persistence time for logging of restoration of tamper should not be more than 120 seconds.

3.33 ACCURACY REQUIREMENT:

The accuracy of parameters measured by meters shall be tested in accordance with the relevant standards described in clause 3.02 of this specification. For apparent energy, accuracy testing shall be done in accordance with the provisions of Annexure G-7 of IS: 14697-1999. Time accuracy of the meter should be as per Annexure G-18 of IS: 14697-1999.

3.34 ELECTRICAL REQUIREMENT:

The electrical requirement of the meter shall be as specified in the relevant Standards described in clause 3.02 of this specification.

3.35 ELECTROMAGNETIC COMPATIBILITY AND INTERFERENCE:

The meter shall meet EMI/EMC requirement as specified in the relevant Standards described in clause 3.02 of this specification and shall also be protected against radiated interferences from either magnetic or radio frequency sources.

3.36 MECHANICAL REQUIREMENT:

The meter shall be capable of meeting the mechanical requirement as specified in the relevant standards described in clause 3.02 of this specification.

3.37 CLIMATIC INFLUENCE REQUIREMENT:

The meter shall meet the requirement of dry heat / cold / damp heat / cold / damp heat cyclic test as per the relevant standards described in clause 3.02 of this specification.

3.38 MINIMUM TESTING FACILITIES:

The tenderer should have the necessary testing facility for carrying out the following tests: -

- i. AC voltage test.
- ii. Insulation resistance test.
- iii. Test of limits of errors.
- iv. Test of meter constant.
- v. Test of starting condition.
- vi. Test of no load condition.
- vii. Repeatability of error test.
- viii. Test for power consumption
- ix. Vibration test.
- x. Tamper conditions-as per purchaser specification.
- xi. Shock test.

Notes: -

- a) Manufacturer should possess fully computerized Meter Test Bench system for carrying out the relevant routine/acceptance tests as well facility to generate Test Reports for each and every meter tested.
- b) Manufacturer should have duly calibrated Electronic Reference Standard (ERS) meter of class 0.05 accuracy or better. Where testing facilities do not exist at the Supplier's Works for Shock and Vibration Testing as per the relevant standards, these two tests may be carried out in accordance with the provisions of IS: 13010 with latest amendments.

3.39 TESTS:

The test reports/certificate/records for all type tests specified having been successfully performed on the type of the meter offered shall be submitted with the tender. The bidder shall clearly bring out the deviations from this specification clause whether on account of tests or

manufacturing process or features incorporated in the meter. The tender lacking with above information and without supporting test reports for meter meeting the requirement of tests laid in this specification are likely to be rejected.

a)- Type tests :

The Energy meter offered shall be fully type tested at any of the test laboratories mentioned below by the bidder as per relevant standards but test reports shall not be more than two years old from the date of opening of bid. The bidder shall furnish two sets of type test reports along with the bid.

<u>S.No</u>	<u>Name of Testing Laboratory.</u>
1.	N.P.L; New Delhi.
2.	<i>E.R.T. L (N) New Delhi.</i>
3.	<i>E.R.T .L (W) Mumbai.</i>
4.	<i>E.R.T .L (E) Kolkata.</i>
5.	<i>E.R.T .L (S) Thiruaanandapuram.</i>
6.	C.P.R.I Bangalore/Bhopal.
7.	<i>ERDA, Vadodara.</i>

b)- Acceptance tests :

The Supplier in the presence of the Purchaser's representative shall carry out all acceptance tests as stipulated in the relevant standards. The following additional tests shall also be carried out on meters from each lot offered for inspection as per the relevant standards on selected samples:

- Shock test.
- Vibration test.
- Magnetic Induction of External Origin, and
- Verification of tamper and fraud detection features and threshold values as per specifications and subsequent agreement between the Supplier and Purchaser.

Note: Where testing facilities do not exist at the Supplier's works for shock and vibration testing as per the relevant standards, these two tests may be carried out in accordance with the provisions of IS: 3010 with latest amendments.

c)- Routine test :

All routine tests as stipulated in the relevant standards shall be carried out and routine test certificates/reports shall be submitted to the Purchaser for approval and also placed inside individual meter packing.

3.40 FIELD/LABORATORY TESTING OF METER:

The supplier should furnish detailed write up for the procedure to be adopted for error testing of the meters in the laboratory and at site/field.