**MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.**

**TECHNICAL SPECIFICATION FOR STATIC LT CT OPERATED TOD METER**

**SPECIFICATION NO: CE/DIST/ MM-IV / LTCT MTR / 008 Dt 01.02.2008**

## INDEX

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## 1.0 SCOPE:

This specification covers design, manufacture, testing, supply and delivery of ISI mark, static LTCT Operated TOD meter. Meters shall be suitable for measurement of energy (kWh) and demand (kWMD & kVAMD) as per power tariff requirement of A.C. balanced / unbalanced loads.

## 2.0 QUALIFYING REQUIREMENTS:-

I] Offers of only original manufacturers of L.T.A.C. Static Energy Meters shall be accepted against the Tender.

II] The following qualifying requirement shall be fulfilled by the bidders/ manufacturers

a) The bidder/manufacturer should have turnover of Rs.80 crores during any one of the last three financial years.

b) The bidder/manufacturer should have supplied 12.5 lakhs static meters during the last three financial years.

c) The bidder/manufacturer should have minimum experience of three years of supply or manufacturing for static meters up to the end of the last financial year.

III] The offers of Indian subsidiary company, whose parent company is located abroad fulfilling the qualifying requirements shall be considered provided the Indian participant subsidiary company fulfils the minimum experience of three years of supply or manufacturing for static energy meters up to the end of the last financial year. However, the conditions of turnover of Rs.80 crores during any one of the last three financial years and supply of minimum quantity of 12.5 lakhs static energy meters during last three financial years can be fulfilled by the parent company located in abroad on behalf of their Indian subsidiary company. The parent company shall furnish undertaking for accepting responsibility for supplying quality meters as per specifications and execution of the contract on behalf of its India based subsidiary unit who has participated in the tender in Annexure U-I

IV] In case of offers of Foreign bidders/manufacturers, they shall fulfill Qualifying Requirement as per Sr. No. 2.1 [I] and 2.1 [II] above.

## 3.0 MINIMUM TESTING FACILITIES

Manufacturer should posses fully computerized Meter Test Bench System for carrying out routine and acceptance Tests as per IS 14697/1999 (amended up to date). In addition this facility should produce Test Reports for each and every meter. The list of testing equipments shall be enclosed.

The manufacturer should have the necessary minimum testing facilities for carrying out the following tests:

1) Insulation resistance measurement
2) No load condition
3) Starting current test
4) Accuracy requirement
5) Power consumption in voltage circuit
6) Repeatability of error
7) Transportation test – as per clause no. 16.4 of MSEDCL specification
8) Tamper conditions - as per clause no. 8.00 of MSEDCL specification.
9) Shock and Vibration Test.
10) The manufacturer should have duly calibrated RSS meter of class 0.1 or better accuracy. The bidder should have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly.

## 4.0 SERVICE CONDITIONS:

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions

Environmental Condition

| | | |
|---|---|---|
| a) | Maximum ambient temperature | 55 $^0$C |
| b) | Maximum ambient temperature in shade | 45 $^0$C |
| c) | Minimum temperature of air in shade | 35 $^0$C |
| d) | Maximum daily average temperature | 40 $^0$C |
| e) | Maximum yearly weighted average temperature | 32 $^0$C |
| f) | Maximum Relative Humidity (%) | 10 TO 95 |
| g) | Maximum Annual rainfall (mm) | 1450 |
| h) | Maximum wind pressure (Kg/m.sq) | 150 |
| i) | Maximum altitude above mean sea level (meters) | 1000 |
| j) | Isoceraunic level (days/year) | 50 |

k) Seismic level (Horizontal acceleration) 0.3g

l) Climate:- Moderately hot and humid tropical climate Conducive to rust and fungus growth.

## 5.0 APPLICABLE STANDARDS:

- The Meter should conform to requirements of **IS:14697/1999**(amended up to date) and other relevant IS specifications including CBIP Tech-Report-88 amended up to date. The specifications given in this document supersedes the relevant clauses of IS: 14697/1999(amended up to date) wherever applicable.
- The meter must bear ISI Mark.
- The class of accuracy shall be 0.5S.

5.1 Current & Voltage rating

The energy meter shall be suitable for 100/5 A, A.C. 3 phase 4 wire 433 Volts 50 Hz system. These meters shall be of direct reading type without application of any multiplying factor. The meter shall be electronic (Static ) type,

The voltage range shall be +15% to -30% of rated voltage.

Current :- Rated basic current 5 Amps.

The maximum continuous current of the meter is 2 times (200%) of Ib

The starting current for the meter should be 0.1% of Ib

5.2 Temperature

The standard reference temperature for performance shall be $27^0$C. The mean temperature co-efficient should not exceed 0.03%.

5.3 Frequency

The rated frequency shall be 50 Hz ± 5%.

5.4 Power Factor : Power Factor range - Zero Lag-Unity-Zero Lead. For leading Power factor the value of kVAh should be equal to kWh. For the purpose of calculation of average power factor (on the basis of kWh/ kVAh) i.e. The value of kVAh shall be based on lagging value of kVARh & kWh.

5.5 Power consumption - less than 1Watt and 4 VA/phase in voltage circuit and 2 VA in current circuit.

## 6.0 CONSTRUCTION

6.1 The meter shall be projection type, dust and moisture proof. The cover shall be made of Polycarbonate material so as to give it tough and non-breakable qualities. The meter body shall be type tested for IP51 degree of protection.

6.2 Moulded single terminal block for current & voltage connections as per IS: 14697/1999 (amended up to date) conforming to relevant standard to meet the requirement of terminal connection arrangement shall be provided. The termination arrangement shall be provided with an extended type transparent terminal cover and shall be sealable independently to prevent unauthorized

tampering. Proper size of grooves should be provided at bottom of this terminal cover for incoming & outgoing service wires.

6.3 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non aging and of tested quality.

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

6.5 The meter shall be pilfer-proof & tamper-proof. Sealing provision shall be made against opening of the terminal cover and front cover. It is necessary to provide unidirectional screws with two holes for sealing purpose.

6.6 The meter shall have Poly-carbonate translucent base and transparent cover of Poly-carbonate- material, which shall be ultra-sonically welded (continuous welding) so that once the meter is manufactured and tested at factory, it should not be possible to open the cover at site except the terminal cover. The thickness of material for meter cover and base shall be 2 mm (minimum).

6.7 The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. Facility for adjustment of real time should be provided through CMRI with proper security.

6.8 The meter shall be completely factory sealed except the terminal block cover. The provision shall be made on the Meter for at least two seals to be put by utility user. The Terminal cover should be transparent with one side hinge with sealing arrangement.

6.9 The meter shall have a suitable test output device for testing meter. Preferably the blinking LED/LCD shall be provided. The test output device should have constant pulse rate i.e. Pulse/kWh and pulse/kVARh and its value (meter constant) should be indelibly printed on the name plate.

6.10 The meter accuracy shall not be affected by AC/DC magnetic field upto 0.2 Tesla on all the sides of meter i.e. front, sides, top and bottom of the meter as per CBIP-88 Technical Report with latest amendments. Under influence of any magnetic field (AC/DC/Permanent) above 0.2 Tesla, meter shall record energy considering Imax and reference voltage at unity power factor.

6.11 Meter CTs are to be provided with magnetic shielding and they should be tested separately.

6.12 The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phases & neutral at least for 5 minutes.

6.13 The RTC battery & the battery for display in case of power failure should be separate.

6.14 In meter, Power supply unit should be micro control type instead of providing transformer and then conversion to avoid magnetic influence.

6.15 Non specified display parameter in the meter should be blocked and it should not be accessible for reprogramming at site.

6.16 Complete metering system should not be affected by the external electromagnetic interference such as electrical discharge of cables and

capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP Tech-report 88 (amended up to date).

6.17 The meter shall have RS 232 communication port for remote meter reading facility and data retrieval shall be possible through this port using CMRI, Laptop, PC and if possible, through Line carrier communication. Sealing arrangement for this Optical port shall be provided.

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

i) On any of the phases or neutral terminals

ii) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)

iii) At any place in load circuit

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

6.19 Self Diagnostic Features.

6.19.1 The meter shall keep log in its memory for unsatisfactory functioning or nonfunctioning of Real Time Clock battery, also it shall be recorded and indicated in reading file at base computer software.

6.19.2 All display segments: "LED/LCD Test" display shall be provided for this purpose.

6.20 The meter shall have facility to read the default display parameters during Power supply failure. An internal maintenance free battery (Ni-mh or Li-ion or NI CD) of long life of 15 years shall be provided for the same. A suitable Push Button arrangement for activation of battery shall be provided. This battery may be of external type with inductive coupling arrangement. External Battery is to be provided with inbuilt charger, in the ratio of one battery pack per 50 nos. meters.

6.21 Wire/Cable less design. The meter PCB should be wire less to avoid improper and loose connections / contacts.

6.22 PCB used in meter shall be made by Surface Mounting Technology.

## 7.0 TOD TIMINGS

There shall be provision for at least 6 (Six) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable.

At present the time zones shall be programmed as below:

TIME ZONE "A" 00-00 to 06.00hrs & 22.00 to 24.00 hrs.

TIME ZONE "B" 06.00 to 09.00 hrs & 12.00 to 18.00 hrs.

TIME ZONE "C" 09.00 to 12.00 hrs.

TIME ZONE “D” 18.00 to 22.00 hrs.

## 8.0 ANTI TAMPER FEATURES

The meter shall detect and correctly register energy (Active + Reactive) only in forward direction under following tamper conditions:

8.1 The meter accuracy shall not be affected by change of phase sequence. It should maintain the desired accuracy in case of reversal of phase sequence.

8.2 Reversal of line and load terminals. Even on interchanging the load and line wires, the meter should register correct energy passing through the meter.The meter shall also display the energy recorded in reverse mode separately.

8.3 Drawing of current through local Earth, the meter should register accurate energy even if load is drawn partially or fully through a local earth.

8.4 The three phase meter should continue to work even without neutral.

8.5 The three phase meter should work in absence of any two phases i.e. it should work on any one phase wire and neutral, to record relevant energy.

8.6 The meter should work without earth.

8.7 The potential link shall not be provided.

8.8 Visual indication shall be provided to safeguard against wrong connections to the meter terminals.

8.9 The meter shall be immune to the external magnetic field (AC/DC/Permanent) upto 0.2 Tesla. If it is more than 0.2 Tesla, then the same should be recorded as magnetic tamper event with date & time stamping and the meter should record Energy considering the maximum value current (Imax) at ref. voltage and unity PF in all the three phases.

## 9.0 TAMPER EVENTS

The meter should have features to detect the occurrence and restoration of the following abnormal events.

9.1 Missing potential and potential imbalance.

The meter shall be capable of detecting and recording occurrence and restoration with date and time the cases of potential failure and low potential, which could happen due to disconnection of potential leads (one or two). Meter shall also detect and log cases of voltage unbalance (10% or more for 5 Minutes.) Higher of the 3 phase voltages shall be considered as reference for this purpose.

9.2 Current unbalance:

The meter shall be capable of detecting and recording occurrence and restoration with date and time of current unbalance (30% or more for 15 minutes) Higher of the 3 phase currents shall be considered as reference for this purpose.

9.3 Current Reversal:

The meter shall be capable of detecting and recording occurrence and restoration with date and time of reversal of current with phase identification for persistence time of 5 minutes. It should also possess a current reversal counter.

9.4 Power ON / OFF

The meter shall be capable to record power ON/OFF events in the meter memory. All potential failure should record as power off event.

The meter shall keep records for the minimum 280 events. (Occurrence + Restoration). For above abnormal conditions the recording of events shall be on FIFO basis. It shall be possible to retrieve the abnormal event data along with all related snap shots data through the meter optical port with the help of CMRI & downloaded the same to the base computer. All the information shall be made available in simple & easy to understand format.

9.5 Current circuit short

The meter shall be capable of detecting and recording occurrences and restoration of shorting of any one or two phases of current, with date & time of occurrence and restoration.

**10.0 DISPLAY OF MEASURED VALUES**

10.1 The permanently backlit display shall show relevant information about the parameters to be displayed. The corresponding non-volatile memory shall have a minimum retention time of 10 years. In the case of multiple values presented by a single display it shall be possible to display the content of all relevant memories. When displaying the memory, the identification of each parameter applied shall be possible. The principal unit for the measured values shall be the kilowatthour (kWh) for active energy, kVARh for reactive energy and kVAh for apparent energy.

10.2 The display shall be minimum full 6 digit type display. The size of digit should be minimum 8X5 mm. The decimal units shall not be displayed. The adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

10.3 The display parameters will be preprogrammed at factory as per Annexure-II & the scroll period for auto scroll should be 9 sec.

The meter should Auto reset kVAMD at 24.00 Hrs. of last day of the month and this value shall be stored in the memory along with the cumulative kWH reading. No reset push button shall be provided.

The display order shall be as per Annexure -II in addition to the above

parameters

The “record number field should be 10 digits Alphanumeric.(2digit for Zones,2 for Circle & 6 for consumer No.)

10.4 Maximum Demand Integration Period:-Integration period for kVAMD should be of 30 minutes real time based. However same shall be programmable to 15 minutes if required.

## 11.00 DEMONSTRATION

The purchaser reserves the right to ask to give the demonstration of the equipment offered at the purchaser's place.

## 12.0 BILLING HISTORY & LOAD SURVEY

The meter shall have sufficient non-volatile memory for recording history of billing parameters (Cumulative kWh at the time of reset and kVAMD) for last 6 months.

12.01 Load survey parameters :- kWh , kVAh , RkVAH, Voltage per phase and Current per phase.

The logging interval for load survey shall be 30 minutes. Load survey data shall be logged for last 60 days on non time based basis. i.e. if there is no power for more than 24 hours, the day should not be recorded Whenever meter is taken out and brought to laboratory the L/S data shall be retained for the period of actual use of meter. This load survey data can be retrieved as and when desired and load profiles shall be viewed graphically / analytically with the help of meter application software. The meter application software shall be capable of exporting / transmitting these data for analysis to other user software in spreadsheet format.

## 13.0 COMPUTER SOFTWARE.

For efficient and speedy recovery of data downloaded through CMRI on base computer, licensed copies of base computer software shall have to be supplied free of cost. This software will be used at number of places up to Division level.

The computer software shall be "Window" based & user friendly. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer by any means).The software shall have capability to convert all the data into ASCII format.

As many copies of base computer software as required up to Division level shall be provided by Supplier.

**The protocol used in the meter shall have to be provided at the time of supply for the purpose of Automatic Meter Reading System.**

## 14.0 CONNECTION DIAGRAM AND TERMINAL MARKINGS.

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking should appear in the above diagram. The diagram & terminal marking on sticker will not be allowed.

## 15.0 NAME PLATE AND MARKING

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars

as per relevant standards. Meter Serial Number shall be Bar Coded along with numeric number. The size of bar coded number should not be less than 35x5 mm. The manufacturer's meter constant shall be marked on the name plate. Meter serial number & bar code on sticker will not be allowed.

In addition to the requirement as per IS following shall be marked on the name plate.

1) Purchase order No.
2) Month and Year of manufacture
3) Name of purchaser i.e. MSEDCL
4) Guarantee Five Years
5) ISI mark.

**16.0 TESTS:-**

16.1 Type Tests:-The Meter shall be fully type tested as per **IS: 14697/1999** (amended upto date) and within the last 5 (five) years prior to the date of offer**.** The type test reports of the offered meters shall be submitted along with the offer. The offers without type test reports shall be rejected. All the Type Tests specified in the technical specifications and as per IS: 14697 shall be carried out at laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI Bangalore/ Bhopal, ERDA Baroda. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The type test reports shall clearly indicate the constructional features of the type tested meters. The type test reports for each offered type of meters shall be submitted separately. The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost. In case the meters is type tested prior to 5 years from the date of opening of tender, bidder have to carry out the fresh type tests at their cost before commencement of the supply.

16.2 Acceptance Tests:- All acceptance tests as per IS 14697/1999 shall be carried out on the meter.

16.3 Routine Test:- All routine tests as per IS:14697/1999 shall be carried out on all the meters.

16.4 Transportation Test:

At least 50% of the samples of the meters be tested for error at Imax, Ib and 5% Ib at unity power factor and 50% Imax and 10% Ib at 0.5 lagging Power Factor besides checking them for starting current. This test shall be conducted on ready to install meter i.e. meter cover ultrasonically welded & sealed. After recording these errors, the meters be put in their normal packing and transported for at least 50 km in any transport vehicle such as pick up van, Jeep, etc. on uneven rural roads and then re-tested at all these loads after the transportation. The variation in errors recorded before and after transportation should not exceed 1% at higher loads and 1.5% at loads below Ib.

16.5 Other Acceptance Test

i. The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage/problems.

ii. Meters shall be tested for tamper conditions as stated in this specification.

iii. Glow wire testing for poly-carbonate body.

iv. Power consumption tests shall be carried out.

v. The meter shall comply all the test for external AC/DC magnetic field as per CBIP Tech Report 88 with latest amendments. Moreover, the magnetic influence test for permanent magnet of 0.5 Tesla for minimum period of 15 minutes shall be carried out. After removal of magnet. meter shall be subjected to accuracy test as per IS 14697/1999 (amended up to date). No deviation in error is allowed in the accuracy as per specification.

vi. The meter shall withstand impulse voltage at 10 kV.

The test 16.5, (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 16.5 (v) & (vi) shall be carried out on one sample from first lot as per procedure laid down in IS14697/1999( amended up to date) and CBIP Tech-Report 88.( with latest amendments) in NABL LAB. The test report shall be got approved from CE(Dist.) before commencement of supply.

16.6 For influence quantities like, voltage variation, frequency variation, voltage unbalance etc. the limits of variation in percentage error will be as per IS:14697/1999.( amended up to date)

16.7 Guaranteed Technical Particulars:- The tenderer should also furnish the particulars giving specific required details of Meters in schedule `A' attached. The offers without the details in Schedule `A' stand rejected.

## 17.0 PRE-DESPATCH INSPECTION

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchases. The manufacturer shall offer to the inspector representing the purchaser all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The MSEDCL's representative/Engineer attending the above testing will carry out testing as per IS:14697/1999 & this specification and issue test certificate approval to the manufacturer and give clearance for despatch. The first lot of meter may be jointly inspected by the representative of the Chief Engineer (DISTRIBUTION) and the Executive Engineer (INSPECTION WING).

## 18 JOINT INSPECTION AFTER RECEIPT AT STORES (Random Sample Testing)

From each lot (lot means the total number of meters received in a Store out of inspected and approved lot by E.E.(IW) or purchaser's representative under one approval letter) of meters received at Stores, 5 sample meters shall be

drawn (meters received in damage condition shall not be selected as samples) and these meters will be tested by Our Testing Engineer in presence of Supplier's representative jointly for (i) no load condition, (ii) limits of error test (iii) starting Condition & (iv) repeatability of error test and (v) tamper conditions as per this specification. The 5 days advance intimation will be given to the supplier and if the suppliers fails to attend the joint inspection on the date informed, the Testing will be carried out by our Testing Engineer in absence of suppliers representative. If the meters failed in above random sample testing, the lot will be rejected.

## 19.0 GUARANTEE

The Meter shall be guaranteed for the period of five years from the date of commissioning or five and half year from the date of despatch whichever is earlier. The meters found defective within the above guarantee period shall be replaced/repaired by the supplier free of cost within one month of receipt of intimation. If the defective meters are not replaced/repaired within the specified period above, the MSEDCL shall recover an equivalent amount plus 15 % supervision charges from any of the bills of the supplier.

## 20.0 PACKING

20.1 The meters shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each meter may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning, if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

20.2 The following information shall be furnished with the consignment:

- Name of the consignee.
- Details of consignment
- Destination
- Total weight of consignment
- Sign showing upper/lower side of the crate
- Sign showing fragility of the material.
- Handling and unpacking instructions.
- Bill of Materials indicating contents of each package and spare materials.

## 21.0 TENDER SAMPLE

Tenderers are required to submit 07 nos. of meter samples of each offered type / item as per technical specification of tender document , from any one of the factories on or before the time and date stipulated for

submission of offer , for evaluations. The samples shall be clearly marked with each type / item for which sample submitted and name of bidder. Out of these, two samples should be without ultrasonic welding to confirm constructional features.

## 22.0 QUALITY CONTROL

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification. The team should be given all assistance and co-operation for inspection and testing at the bidder's works. 3 tender samples should be kept ready for assessing and testing. The tenderer has to give all facilities for carrying out the testing of these samples

## 23.0 MANUFACTURING ACTIVITIES:-

(i) Meter should be manufactured using SMT (Surface Mount Technology) components and by deploying automatic SMT pick and place machine and reflow solder process. Further, the Bidder should own or have assured access (through hire, lease or sub-contract) of above facilities.

(ii) Quality should be ensured at the following stages:

(a) At PCB manufacturing stage each board shall be subjected to computerized bare board testing.

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

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

(d) Prior to final testing and calibration, all meters shall be subjected to aging test (i.e. Meters will be kept in ovens for 72 hours at 55 $^{0}$C temperature and atmospheric humidity under real life condition at it's full load current .After 72 hours meters should work satisfactory) to eliminate infant mortality.

(e) The calibration of meters shall be done in-house.

(f) The bidders should submit the list of all imported & indigenous components separately used in meter along with the offer.

(g) Bought out items:- 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.

**List of Plant and Machinery:**

| Sr. No. | List of Plant and Machinery used for Energy meter Production |
|---|---|

| | | |
|---|---|---|
| 1 | Fully automatic testing Bench with ICT for testing linkless meters | Routine Testing and Calibration of Meters |
| 2 | Semi automatic testing Bench with MSVT | Routine Testing and Calibration of Meters |
| 3 | IR Tester | Insulation testing |
| 4 | HV Tester | Insulation testing |
| 5 | Error calculators | Error testing |
| 6 | Long duration Running test set ups | Reliability Testing |
| 7 | Reference Meters Class 0.01 accuracy | Error calculation |
| 8 | Ultrasonic welding Machines | Welding of meters |
| 9 | Automatic Pick and Place Machines | Automatic placing of SMT components |
| 10 | Solder Paste Printing Machine | SMT soldering |
| 11 | Soldering Furnace IR reflow | SMT soldering |
| 12 | PCB Scanner | For testing of PCBs |
| 13 | ATE functional tester | For testing of Components |
| 14 | Programmers and Program Loaders | Chip Programming Tools |
| 15 | CAD PCB designing setups | PCb designing |
| 16 | Furnace IR type for Hybrid Micro Circuits | resistance network and HMC manufacturing |
| 17 | Laser Trimming Machines | trimming of resistances for higher accuracy measurement |
| 18 | Wave Soldering Machines | Wave soldering of PCBs |
| 19 | Humidity Chamber | Accelerated testing for Life cycle |
| 20 | Dry Heat Test Chamber | Accelerated testing for Life cycle |
| 21 | Thermal Shock Chamber | Accelerated testing for Life cycle |
| 22 | PRO -E Mechanical Design Stations | Mechanical CAD stations |
| 23 | Spark Erosion Tool fabricating Machine | Tool fabrication and Die manufacturing |
| 24 | CNC wire Cut Tool Fabrication machine | Tool fabrication and Die manufacturing |
| 25 | CNC Milling Machine for composite tool fabrication | Tool fabrication and Die manufacturing |
| 26 | Injection Moulding Machine | Moulding of plastic parts |
| 27 | Vibration testing Machine | Vibration testing of Meters |
| 28 | Glow Wire Test machine | Testing of Plastic Material |

| | | |
|---|---|---|
| 29 | Fast transient burst testing setup | Type testing of Meters |
| 30 | Short term over Current testing setup | Type testing of Meters |
| 31 | Magnetic and other tamper testing setups | Tamper Testing |
| 32 | Impulse Voltage Testing Setup | Type testing of Meters |
| 33 | Composite Environmental testing chambers | Type testing of Meters |

## 24.0 QUALITY ASSURANCE PLAN

24.1 The tenderer shall invariably furnish QAP as specified in **Annexure-I** along with his offer. The QAP shall be adopted by him in the process of manufacturing.

24.2 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.

## 25.0 The COMPONENT SPECIFICATION as per Annexure -III enclosed.

## 26.0 SCHEDULES:-

The tenderer shall fill in the following schedules which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule `A' ... Guaranteed and technical particulars (As per GTP uploaded on e-tendering site).

Schedule `C' ... Tenderer's Experience

The discrepancies if any between the specification and the catalogs and/or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained.

If it is observed that there are deviations in the offer in Guaranteed Technical Particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

SCHEDULE - "C"

TENDERER'S EXPERIENCE

Tenderer shall furnished here list of similar orders executed/under execution for supplying single phase static energy meters by him to whom a reference may be made by purchaser in case he consider such a reference necessary.

| SR.NO. | Name of client | Order No.& date | Qty. ordered | Qty. supplied |
|---|---|---|---|---|

NAME OF FIRM _____

NAME & SIGNATURE OF TENDERER_____

DESIGNATION _____

DATE _____

## ANNEXURE I

**Quality Assurance Plan**

A) The bidder shall invariably furnish the following information alongwith his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i) Statement giving list of important raw materials, names of sub- suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder'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) List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitation shall be very clearly bought out in schedule of deviation from specified test requirements.

B) The successful bidder 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 alongwith offers.

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

iii) Quality assurance plan (QAP) with hold points for purchaser's inspection.

The quality assurance plan and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C) The contractor shall operate systems which implement the following :

i) Hold point : A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorise work to progress beyond the hold points indicated in quality assurance plans.

ii) Notification point : A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented

notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

D) The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i) The structure of the organization.

- The duties and responsibilities assigned to staff ensuring quality of work.
- The system for purchasing taking delivery and verification of material.
- The system for ensuring quality workmanship.
- The system for retention of records.
- The arrangements for contractor's internal auditing.

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

ii) Quality Plans :

- An outline of the proposed work and programme sequence. The structure of the contractor's organization for the contract.
- The duties and responsibilities assigned to staff ensuring quality of work.
- Hold and notification points.
- Submission of engineering documents required by the specification.
- The inspection of materials and components on receipt. Reference to the contractor's work procedures appropriate to each activity.
- Inspection during fabrication/ construction.
- Final inspection and test.

## ANNEXURE II

DISPLAY SEQUENCE FOR THE PARAMETERS.

**(A) Default Display** ( With Scrolling time 9 sec.)

1. LCD Test
2. Date – Day/Month/Year
3. Time – Hrs:Min:Sec.
4. Cumulative kWh reading
5. Cumulative kWh reading TOD Zone A
6. Cumulative kWh reading TOD Zone B
7. Cumulative kWh reading TOD Zone C
8. Cumulative kWh reading TOD Zone D
9. Current Month kVAMD in TOD Zone A
10. Current Month kVAMD in TOD Zone B
11. Current Month kVAMD in TOD Zone C
12. Current Month kVAMD in TOD Zone D
13. Previous Month kVAMD in TOD Zone A
14. Previous Month kVAMD in TOD Zone B
15. Previous Month kVAMD in TOD Zone C
16. Previous Month kVAMD in TOD Zone D
17. Cumulative kVAh reading
18. Power Factor (Average P.F. based on kVAh)
19. Total number of Tamper Counts

**(B) On – Demand Display**

1 Instantaneous Phase to Neutral voltage R phase.
2 Instantaneous Phase to Neutral Voltage Y phase
3 Instantaneous Phase to Neutral voltage B phase.
4 Instantaneous Line current R phase
5 Instantaneous Line current Y phase
6 Instantaneous Line current B phase
7 Last date & time of reset (M.D.)
8 Cumulative kVAh reading TOD Zone A
9 Cumulative kVAh reading TOD Zone B
10 Cumulative kVAh reading TOD Zone C
11 Cumulative kVAh reading TOD Zone D
12 Cumulative RkVAh lag
13 Cumulative RkVAh lead
14 High resolution kWh (For calibration)

15 Rising MD with remaining time up to EOI (For calibration)
16 kVAMD value M2 Zone A
17 kVAMD value M2 Zone B
18 kVAMD value M2 Zone C
19 kVAMD value M2 Zone D
20 Number of MD reset

**Note :**

**(a) TOD Zones**

**zone "A" :- 00=00 Hrs. to 06=00 Hrs. and 22=00 Hrs. to 24=00 Hrs.**

**zone "B" :- 06=00 Hrs. to 09=00 Hrs. and 12=00 Hrs. to 18=00 Hrs.**

**zone "C" :- 09=00 Hrs. to 12=00 Hrs.**

**zone "D" :-_ 18=00 Hrs. to 22=00 Hrs.**

(b) The meter display should return to Default Display Mode if the "On Demand Push Button" is not operated for more than 15 sec.

**ANNEXURE III**

| Sr. No. | Component function | Requirement | Makes and Origin |
|---|---|---|---|
| 1 | Current Transformers | The Meters should be with the current transformers as measuring elements. | The current transformer should withstand for the clauses under 5&9 of IS-14697 /1999 |
| 2 | Measurement or computing chips | The measurement or computing chips used in the Meter should be with the Surface mount type along with the ASICs. | USA:Teridian, Analog Devices, Cyrus Logic, Atmel, Philips ,<br>South Africa :SAMES<br>Japan : NEC |
| 3 | Memory chips | The memory chips should not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. | USA:Teridian, Atmel, National Semiconductors, Texas Instruments, Philips, ST,<br>Japan : Hitachi |
| 4 | Display modules | a) The display modules should be well protected from the external Uv radiations.<br>b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters.<br>c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display ( PIN Type ).<br>d) It should be trans-reflective HTN or STN type industrial grade with extended temperature range. | Hongkong : Genda<br>Singapore: Bonafied Technologies.<br>Korea: Advantek<br>China Success ,Truly<br>Japan : Hitachi,<br>Sony. |
| 5 | Communication Modules | Communication modules should be compatible for the two ports ( one optical port for communication with | USA: National Semi conductors,Agilent, Fairchild, HP, Optonica |

| | | | |
|---|---|---|---|
| | | meter reading instruments & the other hardwired RS 232 or RS 485 port to communicate with various modems for AMR ) | Holland / Korea : Phillips<br>Japan : Hitachi<br>Taiwan: Ligitek |
| 6 | Optical port | Optical port should be used to transfer the meter data to meter reading instrument.<br>The mechanical construction of the port should be such to facilitate the data transfer easily. | USA: National<br>Semiconductors HP,<br>Holland / Koread : Phillips<br>Japan : Hitachi<br>Taiwan: Ligitek,Everlight<br>Germany : Osram |
| 7 | Power supply | The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections | SMPS Type |
| 8 | Electronic components | The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. | USA : National Semiconductors, Atmel,, Philips, Taxas Instruments<br>Japan : Hitachi, Oki, AVZ or Ricon Korea; Samsung<br>Germany : Epcos |
| 9 | Mechanical parts | a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc.<br>b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods. | |
| 10 | Battery | Chargeable maintenance free | Varta, Tedirun, |

| | | | |
|---|---|---|---|
| | | guaranteed life of 15 years. | Sanyo or National.<br>Korea : Tekcell |
| 11 | RTC & Micro controller. | The accuracy of RTC shall be as per relevant IEC / IS standards. | USA : ST, Philips, Dallas Atmel, Motorola, Microchip,Teridian<br>Japan : NEC or Oki,<br>Epson |
| 12 | P.C.B. | Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm. | |

**ANNEXURE U-I**
**"INDEMNITY BOND"**

UNDERTAKING TO BE SUBMITTED BY THE PARENT COMPANY SITUATED ABROAD IN CASE OF THE PARTICIPANT BIDDER WHO IS AN INDIAN BASED SUBSIDIARY ON GENERAL STAMP OF RUPEES 200/-

The Executive Director (Stores),
Maharashtra State Electricity Distribution Co. Ltd.,
Prakashgad, Bandra (E),
Mumbai – 400 056.

Dear Sir:

Sub:- Undertaking against Tender _____
for procurement of _____

We, M/s ._____having registered office at _____ are the Parent Company of M/s. _____ who have participated against your tender No. _____ for procurement of _____.

We have carefully read and have thoroughly understood and agree to the terms and conditions of the subject tender.

We hereby undertake that in case of placement of order against the subject tender on our subsidiary company, M/s._____, in the event of we accept all the responsibilities and liabilities for supply of quality meters as per specification of the tender and execution of the contract. We further hereby undertake that we shall be responsible for any liability arising out of the contract placed on M/s._____. and to pay MSEDCL on demand the sum of rupees as per agreement in the event of any breach of condition of the purchase order, loss and damage of the material till expiry of guarantee period as stipulated in the order.

Our liability here under shall not be impaired or discharged by extension of time or variation or alteration made with or without our knowledge or consent by or between the parties to the said contract. This undertaking shall be valid and binding on us upto and including the execution and guarantee period of the order and shall not be terminable by notice or change in the constitution of any of the companies. In case of any dispute arising out of or in connection with this tender or contract, if concluded, the same shall be subject to the exclusive jurisdiction of the **"Court in Mumbai (India)."**

Yours faithfully,
(Authorised Signatory)
FOR _____