MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

THREE PHASE FULLY AUTOMATIC THREE POSITION TEST BENCH WITH REFERENCE STANDARD METER WITH ACCURACY CLASS OF 80 PPM

TECHNICAL SPECIFICATION NO.

CE / MMC / MSC-II / TP MTB,
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1.00 SCOPE

This specification covers the general and standard requirement, technical data design, engineering, manufacturing, assembly, inspection & testing at manufacture's works, supply & delivery at stores and commissioning at respective NABL laboratory of Three Phase fully automatic three position test bench with reference standard meter of 80 ppm.

Test bench must provide facilities for doing routine, acceptance and certification test (error test and dial test) on 1 phase, 3 phase whole current, 3 phase CT/PT operated, RSS, ERS and Energy meters. The following types of Reference Standard and portable Sub Standard Meter of Accuracy Class of 0.02, 0.05, 0.1, 0.2, 0.5 and electricity meters of class 0.2s, 0.5s, 1s, 1 and 2.0 available with utility can be tested (electronic and electromechanical type).

Scope covers design, engineering, manufacture, delivery, installation and commissioning, spares for 2 years smooth running of 3 Position, fully Automatic Electronic Meter Testing Equipment with reference Meter of Accuracy Class 0.008% (80PPM). In addition to above, bidder shall also be required to provide:

a) Operations & Maintenance Manuals including drawings.
b) Training to purchasers employees on all aspects of operation and maintenance.
c) Continued technical support during guarantee period.
d) The Major component like Source, Reference Standard Meter, and digital system of Meter Test System should be only from one manufacture to provide better integrity and after sales of offered product.

2.00 QUALIFYING REQUIREMENTS.

2.01 Bidder should be an original equipment manufacturer of offered items and must have at least 3 years of experience in supplying of similar or better equipment as on date of tender opening.

2.02 The bidder must also have supplied such meter test benches with fixed multiple turn wounded primary Isolation current Transformers for isolation in current circuit to test Link closed meters.

2.03 The manufacturer must have ISO17025 approved calibration and certification facility with measurement uncertainty of not less than 50 ppm. Manufacturer must ISO 9001 certification.

2.04 The manufacturer must have experience of minimum 3 years for supply of similar or better equipments to National / International

accredited laboratories or power utilities in India. The manufacturer shall enclose necessary purchase order copies along with their bid to prove the same.

2.05 The bidder shall submit satisfactorily performance report copies of supplied similar tender equipments from recognized NABL accredited laboratories if any or other power utilities.

2.06 Bidder or their principals shall have fully equipped technical support office / laboratory for facilities of testing, calibration, adjustment, diagnosis and repair of equipments in India itself. Bidder or their principals shall have technical support staff posted in India for technical support after sale.

2.07 The Bidder or their principals shall have their own service centers and trained engineers dedicated for trouble shooting and technical support permanently posted in India. The bidder shall enclose necessary proof that the firm / the manufacturer / the principal the bidder is participating for, has necessary facility to adjust and calibrate the offered measuring units within the country. The list of Plant and Machinery, tools and tackles to carry out services shall be submitted along with the offer.

3.00 OPERATING CONDITIONS

The meter test equipment shall be suitable for giving an uninterrupted service in following conditions:

a) Ambient temperature (-) 10°C to (+) 45°C for operation and from (-) 10°C to (+) 60°C for storage.
b) Relative humidity from 25% to 95%.
c) Mains voltage shall be 3x240V ± 15% for three phase supply.
d) Frequency 50Hz ± 5%.
e) Cabinet for source must be dust proof.

4.00 APPLICABLE STANDARDS

The Meter test bench shall conform in all respects including performance and testing thereof to the latest relevant and applicable Indian / International Standards to be read with up to date and latest amendments / revisions thereof but not limited to

Purpose	Applicable
Meter Testing	IEC 62052-11, 62053-11, 21, 22, 23, IEC 60687 IS 14697, IS 13779

Safety	IEC 61010
Meter Testing Equipment	IEC 60736, IS 12346, IS15707, IS/ISO: 10012

The equipment meeting with the requirements of other authoritative standards, which ensures equal or better quality than the standard mentioned above, also shall be considered.

In case the bidder wishes to offer material conforming to the other authoritative standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Copy of such standards with authentic English Translations, shall be furnished along with the offer.

In case of conflict related with other parts of the specification, the order of priority shall be – (i) this technical specification, (ii) IS 12346 (iii) IEC 60736 (iv) other authoritative standards.

In case of any difference between provisions of these standards, the provisions of this specification shall prevail.

5.00 TESTS TO BE PERFORMED

The offered meter test system shall be capable to perform the following tests on the meters as per IEC 62052-11, 62053-11, 21, 22, 23, IS 13010, IS13779 & IS14697

Test of Meter constant
Test of Starting Condition
Test of No Load
Test of Power Consumption
Voltage Dips and Short interruptions time with programmable interruption Time (Clause 7.1.2)of IEC 62052-11
Test of Self heating
Test of Heating
Test of Immunity to Earth fault

Test of Influence quantities:
Accuracy Test for Active & Re active Energy :
Limits of Error (Balanced & Unbalanced load in all 4 Quadrants)
Test of repeatability of error
Voltage variation
Frequency variation
Wave form: 10% of 3rd harmonic in the current

Harmonics Components in the Current & Voltage circuits (IEC 62053 -21 - Table 8)
DC & Even harmonics in AC current circuit(IEC 62053 -21 - Table 8)
Odd Harmonics in AC Current circuits(IEC 62053 -21 - Table 8)
Sub Harmonics in AC Current circuits(IEC 62053 -21 - Table 8)
Reverse Phase sequence test
Voltage Unbalance test
Simultaneous calibration / testing of ERS Meters
Accuracy testing of reference standard used into test system against high precision reference standard
Accuracy testing of reference standard (low accuracy) against the built in reference standard

6.0 CONSTRUCTION AND COMPONENT OF SYSTEM

6.01.1 The complete system shall consist of at least the following essential components, the specifications of which are defined hereinafter in this document.

A source, which shall be microprocessor-based, modular type, of 19" (Maximum) rack design and which shall, at least, have in-built Voltage Amplifier and Current Amplifiers, specifications of which are given subsequently in this specification as per clause nos.7 and 8 respectively. Source shall consist of frequency generator, Phase position adjuster & Harmonic Injection unit

6.01.2 The cabinet shall be 19" (Maximum) rack mounted type in which the source and Reference standard meter (including all their components) shall be placed. This cabinet shall have facility for easy opening and closing as and when required, with doors system. Screwed panels which take time in opening / closing shall not be acceptable. Doors shall be lockable to allow access by authorized personnel only. In the cabinet, a cooling fan of suitable capacity shall be provided to avoid temperature increase inside the cabinet during normal operation.

6.01.3 The cabinet shall have protective earth terminals which shall be earthed during installation at site. The cabinet shall have one mains-switch to switch-on-off the incoming power supply. The cabinet shall also be protected against overload, under voltage and over voltage through suitable protection devices. With its doors closed, the cabinet housing the source and Reference standard meter shall provide degree of protection equal to IP-41

6.01.4 The source shall be easily programmable so as to give:

- **a)** Reference output frequency independent of mains, with quartz controlled operation range from 40 Hz to 70 Hz in steps of 0.01 Hz. with high efficiency, power-factor compensation according to IEC 61000-3-2.
- **b)** Stability at inductive, capacitive and non-linear loads for the power factor.
- **c)** Protection against overload and short circuit and provision for superimposition of harmonics in the range of 2nd to 20th harmonics.
- **d)** Star system (phase angle 120°)
- **e)** Any asymmetrical system.
- **f)** Computer controlled adjustment of star system (120°) or asymmetrical system in steps of 0.01°.
- **g)** Any non-balanced system

6.01.5 Power Factor compensation shall be provided as per IEC 61000-3-2so that the meter-testing system shall draw purely sinusoidal current from the mains A.C. supply without polluting it.

6.01.6 Three phase Isolation Current Transformer (ICT) for 3 positions test system for three phase meters with closed current-voltage links

6.01.7 Voltage &current cables should be compensated in such a way that voltage& current should not drop at any stage

6.01.8 Source capacity shall be capable to test up to 3 nos. of Energy meters simultaneously by expanding Meter test rack

7.0 SPECIFICATION OF VOLTAGE AMPLIFIER

The voltage amplifier used in the Source shall be a digital resonant switch mode voltage amplifier. It should have closed control conception of the frequency generator for high stability and high precision of test voltage. It should have output VA burden rating not less than 500 VA per phase. The voltage amplifier should have following capabilities and features.

a) Electronic protection against Overload and Short Circuit
b) Digital controlled via RS232/ RS 485 connections
c) LED indication for faults such as overload, short-circuit, power-supply failure
d) Efficiency better than 85%
e) Stability 50 ppm /hr with integration time of 60 seconds
f) Distortion factor 0.5%
g) Provision for super- imposition of harmonics in the range of 2nd to 20th harmonics

h) Test voltage range: 0-320 V (Phase-Neutral) and 0.....555 V. (Phase to Phase) continuously variable with two setting steps preferably of 160V and 320V.
i) Accuracy of the test setting amplitude in closed loop with reference meter: 0.05 %
j) Accuracy of the test setting phase adjustment 0.01°
k) No load reaction

8.0 SPECIFICATION OF CURRENT AMPLIFIERS

The current amplifiers used in the Source shall be digital resonant switch mode type amplifiers. It should be closed control conception of the frequency generator for high stability and high precision of test current. It should have output VA burden rating not less than 600 VA per phase. The current amplifiers should have following capabilities and features

a) Electronic protection against Overload and Open Circuit
b) LED indications for different faults such as overload, open-circuit, and failure of power supply.
c) Better efficiency
d) Stability 50 ppm /hr with integration time of 60 seconds
e) Accuracy of the test setting amplitude in close loop with reference meter: 0.05 %
f) Accuracy of the test setting phase adjustment : 0.01°
g) Distortion factor : 0.5 %
h) Provision for super- imposition of harmonics in the range of 2^{nd} to 20^{th} harmonics
i) Test Current range 10 mA to 120 Amps with the ranges of 120-60-30-12-6-3-1.2-0.6-0.3-0.12-0.06-0.03 Amp and facility to generate starting current in the range of 0.2 mA to 10 mA
j) No load reaction

9.0 FREQUENCY GENERATOR

Easily programmable to give reference output frequency independent of mains, with quartz controlled operation range from 40 Hz to 70Hz in steps of 0.01Hz with high efficiency, P.F compensation according to IEC 61000-3-2, stability at inductive, capacitive and non-linear loads for the power factor, protection against O/L and short circuit and provision for superimposition of harmonics for the range of 2^{nd} and 20^{th} harmonics.

10.0 PHASE POSITION MODIFIER

This will allow adjustment of output power factor from 0.00 to 1.00 in all 4 quadrants in computer controlled steps of 0.01°i.e. 180 – 0 – Minus 180 degree.

Test voltage & test current system should be freely selectable as symmetrical

- Star systems (phase angle 120°)
- Any non-symmetrical system (only manually)
- Any non balanced system (only manually)
- Adjustment computer controlled in step 0.01°

11.0 SPECIFICATION OF REFERENCE STANDARD METER

The class of accuracy of reference standard meter shall be 80 ppm or better for active and reactive ranges, over the entire measurement load range & independent of the measuring mode. Current range of reference standard shall be 1 mA... 120 A direct connected and voltage range from 10-500 V (phase - neutral), selectable through PC. Reference standard meter shall have auto-range selection facility and facility of dial test (power dosing) and RS 232/RS 485 serial communication port for communicating with PC. It must have frequency output proportional to the power to calibrate against better standard.

Technical Data of Reference Standard Meter

a) Measuring modes

- 2 wire active / reactive
- 2 wire active / reactive
- 3 wire active / reactive mode
- 3 wire apparent
- 4 wire active / reactive mode
- 4 wire apparent

b) Frequency Range

Basic frequency 40... 70 Hz and total detectable frequency range 0...3000 Hz

c) Voltage Range

10 ...500 V Phase to Neutral

d) Current Ranges

- 1 mA to 160 Amps. (working range)
- 10 mA to 160 Amps. (measurement range)

e) Accuracy

Voltage : 30 ppm for the range of 30 V to 500 V (P-N)
Current : 50 ppm (50 mA to 160 A)
:100 ppm (2 mA to 50 mA)

Power / Energy (For active and reactive)
: 80 ppm at cosϕ =1 or sin ϕ =1 (50mA to 160A)

: 80 ppm at cosϕ =0.5 or sin ϕ=0.5

: 120 ppm for the range of 2 mA to 50 mA at cosϕ=1 or sin ϕ =1

The Accuracy shall be same for Active and reactive measurement.

Phase Angle Accuracy <0.005°

f) **Measurement drift**

Voltage, current and power measurement drift shall be better than 30 ppm/ year. Drift for individual parameter shall be defined clearly in the offer

g)Standard Deviation should be better than 20 ppm

h) Long term stability should be 50 ppm/year

A common modular cabinet with door on front and rear shall be used for housing source and reference standard.

f) Display :

The RSM shall have following display following parameters.

- True RMS value of each voltage & current input
- Phase angle between voltage / current and defined reference
- Power factor of each phase
- Active, reactive & apparent power of each phase
- Total active, reactive & apparent power
- Phase Sequence
- Frequency
- Integration time

The selection facility shall be provided to select any 6 parameters out of these parameters. The RSM shall have facility to maintain last setting when it is switched off.

g) Integration time

Facility to select integration time between 1 to 99 second shall be provided in the RSM.

h) Operation

Membrane key board with membranes push button to operate the RSM shall be provided in the front of the RSM.

i) Reference Channel

The RSM shall have facility to select reference for phase angle measurement. Selection of reference shall be provided manually & automatically.

j) Frequency output :

The bidder shall provide frequency output proportional to power/energy to calibrate the reference standard against high or lower precision reference standard. The output shall be in commonly used BNC type socket.

k) Temperature Coefficient:

Temperature coefficient of the reference meter will be <3 ppm/K. The bidder shall submit necessary documentary evidence to specify the same.

l) Calibration:

The reference meter shall be provided along with calibration certificate from national/international accredited laboratory. The bidder shall also arrange periodical calibration (once in a year) of reference standard meter from national/internationally accredited laboratory for the tenure of 5 years from the date of supply

12.0 SPECIFICATION OF HARMONIC INJECTION UNIT

Over the range 2nd to the 20th harmonics to the test voltage and test current, the magnitude of each harmonic shall be adjustable from 0-40% of the fundamental wave and the maximum peak value of the wave form shall be 130% of the magnitude of the fundamental wave. Facility of controlling the phase angle of harmonics shall also be provided. Necessary proof for generation of wave form and desired harmonics shall be submitted along with offer.

13.0 SPECIFICATION OF METER MOUNTING RACK

a) One no. of Meter Mounting Rack shall consist of a lightweight aluminum frame for mounting of sensor heads, display devices and meters-under-test.

b) Meters-under-test shall get connected to the voltage and current circuits by means of connecting leads.

c) Design of the frames should be such that 3 Nos. energy meters/reference meters of any type, single or three phase, 3 wire or 4 wire, whole-current or CT-VT operated can be safely and easily accommodated on it. One rack shall have capacity to mount 3 meters/reference meters on one side shall be supplied along with test bench.

d) Necessary BNC type socket to test the Reference standard meter against a precision standard of higher accuracy shall be provided on Meter Mounting Rack.

e) Necessary BNC type socket or any other suitable arrangement shall be provided on the Meter Mounting Rack to test the inbuilt reference standard meter against a precision standard of higher accuracy without removing the inbuilt reference standard meter from the source cabinet.

f) The Meter Mounting Racks shall be provided with minimum three number of BNC type sockets for the testing of three reference standard meter of lower accuracy. The offered software shall have facility to test this reference standard meter in automatic mode by using these BNC type sockets.

g) Necessary cables shall be provided along with equipment to test reference standard meter having frequency output on BNC type socket.

h) There should be a warning lamp and two emergency push-buttons fitted on the Meter Mounting Rack.

i) Each meter test position should have communication facility to communicate with meter under test using DLMS, IEC1107, IEC 62056 communication.

j) The offered Meter Test System should be capable to carry out following Accuracy/Tamper Test on energy meters.

- Accuracy test for Single Phase Meter for phase & Neutral channel for same magnitude of current one by one.
- Accuracy test for Single Phase Meter in case of reverse power for phase & Neutral channel for same magnitude of current one by one.
- Facility to disconnection neutral for all meters physically by connection.
- CT open, Unbalance and reverse current test for Three Phase Meters
- PT missing, voltage unbalance and reverse phase sequence.

14.0 SPECIFICATION OF SCANNING HEADS AND ERROR INDICATION UNITS

14.01 1 photoelectric scanning head for each position suitable for reading the LED/LCD pulse output of the meters-under-test shall be provided

14.02 Scanning head shall have mechanical type fixing arrangement so that same can be fixed directly towards the meter body. Each scanning head should be designed in such a way that the scanning head can be fixed easily in a position which would facilitate accurate and proper testing of the meter-under-test.

14.03 The scanning head should be insensitive to ambient light. It should give optical indication of pulses by LED

14.04 The scanning head must be able to measure LED/LCD pulse output (as per IEC 62052-11, clause 5.11) of frequency up to 1 kHz

14.05 An Error Indication Device shall be mounted on each test position. The resolution of error indication shall be 4½ digits with decimal point configurable by software. There shall be provision on the error indication unit to reset the error or to repeat it if something is wrong. The same should have Acknowledgement function while doing testing of starting current and creep tests manually

15.0 ISOLATING CURRENT TRANSFORMER (ICT) :

The meter test system shall have isolating current transformer (ICT) to test three phase as well as single phase closed link whole current meters.

15.01 **Technical details**.

Sr. No.	Parameter	Range
1.	Nominal Primary current I-prim	100A
2.	Maximum Primary current	120A
3.	Nominal Secondary current I-sec	100A
4.	Maximum Secondary current	120A
5.	VA rating	50VA @ Nominal current (100 Amp)with single turn in operation
6.	Accuracy ratio error	± 0.01% (1 A to 120 A) ± 0.03% (0.15 A to <1 A) ± 0.15% (0.02 A to <0.15 A) ± 0.3% (0.01 A to <0.02 A)
7.	Phase angle error	± 1 min (1 A to 120 A) ± 3 min (0.15 A to <1 A) ± 10 min (0.02 A to <0.15 A) ± 20 min (0.01 A to <0.02 A)
8.	Operating burden	3 mΩ

9.	Max. Burden	5 mΩ

15.02 There shall be provision to bypass the individual ICT automatically when secondary of ICT is kept open. Sufficient protection shall be provided to protect the ICT in case if secondary of ICT remain open while full load is running in primary.

15.03 Secondary of ICT shall be designed permanently wounded core with multiple turns in such a way that its secondary leads can be connected directly to Meter under Test and fixed with ICT. Ring type or link connected of design with loose primary/secondary type of connection won't be acceptable.

15.04 Primary connection of ICT should be fixed type and all primary connection on each ICT terminal shall be connected permanently. Primary & Secondary leads of ICT should be designed in such a way that it can carry its maximum Current i.e. 120A for 2 hours continuously without any malfunction in ICT.

15.05 LED indication shall be provided on ICT to indicate healthiness of ICT

15.06 Associate Software shall have facility to indicate fault in ICT like open circuit and over load on PC. It should have facility to display message on computer screen about any fault in ICT during testing of meters.

15.07 Detailed catalogue of offered ICT and its working principle of these shall be submitted along with offer (own make)
One sample certificate of ICT shall be submitted along with offer.

16.0 COMPUTER SYSTEM (DESKTOP PC, PRINTER, MONITOR, SOFTWARES & ACCESSORIES THEREOF):

16.01 The operating of the test equipment, the display of the actual values, the processing and display of the test results and the print out of the test results, reports etc. should be effected by the associated Desktop PC (Personal Computer) system complete with licensed Windows based operating system, licensed proprietary software of the meter-testing equipment and a LaserJet printer having minimum specifications as given below to be supplied along with the meter testing system by the successful bidder

16.02 The Desktop PC (PC) shall be connected to the measuring device and power source and necessary leads and cables for making these connections shall be provided by the vendor at his cost

16.03 The licensed proprietary software of the meter-testing equipment shall be supplied and installed on the PC. This software should be Windows based, user friendly and menu driven, operated with the help of a mouse and keyboard in manual or automatic mode.

16.04 The manual mode of operation of the licensed proprietary software of the meter-testing equipment shall allow, at least, performance of the following tasks:

- Controlling of the source
- displaying of test parameters (actual values) on PC screen

- displaying the wave form of output voltage and current and harmonics analysis
- Performance of the accuracy tests

16.05 The automatic mode of operation licensed proprietary software of the meter testing equipment should have different modules to prepare meter test sequence so as to carry out the testing in fully automatic mode. These modules shall be designed in such a way that user can prepare the test sequence very easily

16.06 The licensed proprietary software of the meter-testing equipment shall allow, at least, performance of the following tasks:

- User interface to operate the system
- Easy to prepare test-tables by using “drag & drop” concept
- Supervision and control of the test procedure
- Supervision and display of the test current and voltage
- Indication of the errors of the meters- under- test
- Evaluation of the test results and generation of test-reports
- Manual testing and automatic testing facility
- Facility to define test parameters in terms of percentage and absolute terms
- Facility to define error limit in two levels
- Facility to protect the system from over voltage in manual mode and automatic mode
- Facility to check meters for short circuit and open circuit conditions prior to starting of the testing in fully automatic mode for each sequence
- Facility to interrupt the testing and restart it again
- Password facility for administrator and operator with different levels
- Print out facility of test-reports with desired header
- Facility to take back-up of data
- Absolute measurement with higher precision / more accurate standard in fully automatic mode using BNC type socket provided on Meter Mounting Rack
- Testing facility of at-least 3 different meters with 3 different constants
- Software shall have facility for display of different output voltages and currents
- Facility to display the curve of test voltage and current in presence of harmonics
- Protection of meters- under- test from high voltage and current
- Software shall have facility to indicate fault in ICT’s like open circuit and over load on PC for easy identification to operator

16.07 The licensed proprietary software of the meter-testing equipment shall have facility to display following parameters:

- Individual phase voltage
- Individual phase current
- Phase angle and power factor of symmetrical or asymmetrical star system
- Total Power Factor
- Individual phase power (Active , Reactive and Apparent)
- Total Power (Active , Reactive and Apparent)
- Frequency
- Phase Sequence
- Measurement mode
- Vectorial display.

16.08 **TECHNICAL DATA FOR PC**

Sr. No.	Component	Specification
1.	Processor Brand	Intel
2.	Processor Type	i5 Processer 6th generation or later
3.	Processor clock speed	Min. 1.5 GHz
4.	Processor Cache	3 MB or higher
5.	Operating System	Windows 10 Professional edition or latest version (preloaded with license)
6.	OS Architecture	64 bit
7.	Monitor	21.5 inch or higher
8.	Resolution	1920*1080
9.	Memory (RAM)	DDR4 RAM 8 GB or higher
10.	HDD RPM	Min. 5400
11.	HDD Capacity	Min. 1TB SATA HDD
12.	Display Type	LED
13.	Optical Drive	Tray load DVD drive (Read and Write DVD/CD)
14.	Ports	
a	USB	Min. 4 USB
b	RJ-45	1
c	HDMI	Integrated
15.	Slots	
a	Micro Card Reader	Integrated
b	DIMM slot	Integrated
16.	Speakers	

17.	Connectivity	
a	Wireless	Wi-fi
b	Bluetooth	Integrated
18.	Keyboard	USB Wired
19.	Mouse	USB Wired
20.	Webcam	Integrated
21.	Printer	Color LaserJet, suitable for paper size upto A4

17.0 DIGITAL PROCESS UNIT

For the simultaneous error measurement of 3 meters under test, the basic unit shall be equipped with:

a) 3 inputs for scanning head pulses.
b) 1 input for reference output
c) 1 interface for connection with PC.
d) Controlled output for Dosage Operation (Dial Test).
e) Error display per measuring position

18.0 TYPE TESTS

18.01 The tenderer shall furnish detailed type test certificates of the Reference standard meter for all the tests as relevant Indian (14697:1999) amended upto date / International standards and calibration certificate of complete meter- testing system (excluding the PC system). All the type tests of Reference standard meter and calibration certificate of complete meter- testing system (excluding the PC system) shall be carried out at laboratories which are accredited by the National Board of Accreditation of laboratories (NABL) of Government of India within five years of opening of the tender to prove that the instruments offered meet the requirements of specification. There shall be no change in the design of type tested instruments and those offered against this tender. Type test reports shall be submitted and got approved from Chief Engineer, MSEDCL, Material Management Cell, Prakashgad, Bandra (E), Mumbai – 400051 prior to commencement of supply.

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. For this purpose, the tenderer shall quote unit rates for carrying out each type test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in type test, the complete supply shall be rejected & expenditure incurred shall be recovered from the tenderer from his deposit

18.02 ACCEPTANCE & ROUTINE TESTS

All acceptance tests as per IS: 12346 shall be carried out on the equipment. All acceptance tests certificates, routine test certificates, calibration certificate & operation manual must be provided along with each equipment in the form of CD (Compact Disc) as well as a hard copy.

19.0 CALIBRATION CERTIFICATES

The Reference standard meter shall be supplied along with the calibration certificate as per relevant standards. The calibration certificate shall be issued by NABL labs / International Recognized Laboratories

20.0 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of meters in schedule `A' attached. The offers without the details in Schedule 'A' stand rejected.

21.0 ACCESSORIES

Each Meter test bench shall be supplied along with the following accessories:

- One set of connecting cables
- Operating Manual in English.
- One standard calibration report.
- Data download software to read out the module for transfer and presentation of data.
- Spares:

1. BNC type sockets (necessary to test frequency O/P device)- 2 nos of set.
2. Fuses : One set.
3. Connecting cables - One set.
4. Scanner set- 1 Nos

22.0 TRAINING

The successful bidder shall depute their representative to train MSEDCL's Engineers at their works of familiarization of design, application, operation & maintenance of the instrument of purchaser as and when they will be called for at no extra cost.

23.0 GUARANTEE

The instrument shall be guaranteed for a period of 5 years from the date of commissioning or five and half years from the date of receipt

whichever is earlier. The instrument found defective within above guarantee period shall be replaced / repaired / rectified by the supplier free of cost, within one month of receipt of intimation. After the replacement / repairs / rectification, the accuracy shall not be affected. Test certificate and calibration certificate shall invariably be submitted after rectification / repairs.

If defective equipment is not replaced / repaired / rectified within the specified period as above, the Company shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier.

24.0 AFTER SALES SERVICE

The bidder has to indicate clearly the after sales service to be provided by the supplier within guarantee period and outside guarantee period and Addresses of Sales Service Centre, details of Engineers, etc. shall be submitted along with the offer.

25.0 PRE-DESPATCH INSPECTIONS

The successful bidder shall offer test bench at their works for inspection before dispatch. The offered lot shall be tested for acceptance tests and any other test as per relevant IS / IEC as required by inspecting officers. During inspection, if the instrument does not meet the required specification & test results found not satisfactory then it shall be liable for rejection. Calibration Certificates of all associated equipments shall be furnished at the time of factory inspection.

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 shall carry out testing as per relevant IS / IEC & as per this technical specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

The instrument shall be inspected jointly by the Executive Engineer, Testing Division (with respective laboratory engineers) & the Executive Engineer, Inspection Wing.

26.0 QUALITY CONTROL

The purchaser may send a team of experienced engineers for assessing the capability of the bidder or their principals for manufacturing of instrument as per this specification. The team shall

be given all assistance and co-operation for inspection and testing at the bidder's works.

Three tender samples shall be kept ready for assessing and testing. The tenderer has to give all facilities for carrying out the testing of these samples.

27.0 MINIMUM TESTING FACILITIES

The bidder or their principals / manufacturer shall have the necessary minimum testing facilities for carrying out various acceptance and routine tests. A list of machinery / equipment and testing facility available at their Works shall also be furnished along with the offer.

28.0 PACKING

28.01 The instrument shall be suitably packed to avoid damage or disturbance during transit or handling. Each instrument 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 cartoon 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.

28.02 The following information shall be furnished with the consignment :

- Name of 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.

29.0 SCHEDULES

The tenderer shall fill in the following schedules which are part and parcel 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. The order copies of the order executed mentioned in the list of order shall be invariably enclosed along with the offer. Only those orders mentioned in the list shall be considered whose order copies shall be enclosed with the offer.

Schedule A – Guaranteed and technical particulars.

Schedule C – Tenderer's experience.

The tenderer shall submit the list of orders for similar type of equipment, executed or under execution during the last three years, with full details in the schedule of tenderer's experience (Schedule - C) to enable the purchaser to evaluate the tender.

30.0 DOCUMENTATION

Two set of following documents shall be supplied along with each test system.

- Operating manual of each components of test equipment like reference standard, amplifier, etc
- Wiring diagram
- Service manual
- Calibration certificate of reference standard
- Test certificate of complete test system

SCHEDULE – "C"

TENDERER'S EXPERIENCE

Tenderer shall furnish here list of similar orders executed / under execution for supplying Three Phase fully automatic three position test bench with reference standard meter of accuracy class 80 ppm by him to whom a reference may be made by purchaser in case he considers such a reference necessary.

Sr. No.	Name of client	Order No. & date	Qty. ordered	Qty. supplied

NAME OF FIRM _____

NAME & SIGNATURE _____

DESIGNATION _____

DATE _____

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 `200.00.

The Chief Engineer,
Maharashtra State Electricity Distribution Co. Ltd.,
Material Management Cell,
1st Floor, Prakashgad, Bandra (E),
Mumbai – 400 056.

Dear Sir:

Sub: Undertaking against Tender No. _____ 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 equipments 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 _____

SCHEDULE – "A"

GUARANTEED AND TECHNICAL PARTICULARS

ITEM NAME	THREE PHASE FULLY AUTOMATIC THREE POSITION TEST BENCH WITH REFERENCE STANDARD METER	
SR. NO.	**PARTICULARS**	**GTP VALUES**
(1)	MANUFACTURER NAME & ADDRESS	TEXT
(2)	COUNTRY OF MANUFACTURE	TEXT
(3)	TYPE / MODEL DETAILS OF EQUIPMENT	TEXT
(4)	OPERATING EXPERIENCE OF THE BIDDER	TEXT
(5)	MANUFACTURER HAS EXPERIENCE OF MINIMUM THREE YEARS FOR SUPPLY OF SIMILAR OR BETTER EQUIPMENTS TO NATIONAL / INTERNATIONAL ACCREDITED LABORATORIES OR POWER UTILITIES IN INDIA.	TEXT
(6)	NECESSARY PURCHASE ORDER COPIES ENCLOSED IN SUPPORT OF ABOVE (4) &(5)	BOOLEAN
(7)	PURCHASE ORDER NOS. & DATES IN SUPPORT OF ABOVE (4) &(5)	TEXT
(8)	SATISFACTORILY PERFORMANCE REPORT SUBMITTED FROM NABL LABS/ POWER UTILITY ENCLOSED WITH OFFER	BOOLEAN
(9)	DECLARATION AS PER CL NO 2.05 OF TECH SPECS ENCLOSED.	BOOLEAN
(10)	NAME & ADDRESS OF BIDDERS TESTING FACILITIES IN INDIA ENCLOSED WITH OFFER	TEXT
(11)	NAME & ADDRESS OF BIDDERS OR THEIR PRINCIPALS OWN SERVICE CENTRE IN INDIA ENCLOSED WITH OFFER	TEXT
(12)	LIST OF PLANT AND MACHINERY, TOOLS AND TACKLES TO CARRY OUT SERVICE ENCLOSED	TEXT

	ALONG WITH OFFER.	
(13)	THE MAJOR COMPONENT LIKE SOURCE, REFERENCE STANDARD METER, AND DIGITAL SYSTEM OF METER TEST SYSTEM SHOULD BE ONLY FROM ONE MANUFACTURE TO PROVIDE BETTER INTEGRITY AND AFTER SALES OF OFFERED PRODUCT. BIDDER SHALL SPECIFY THE MAKE OR NAME OF OEM	BOOLEAN
(14)	FREQUENCY GENERATOR: i. MAKE ii. FACILITIES SHALL BE SHOULD BE AVAILABLE FOR PROGRAMMING REFERENCE OUTPUT FREQUENCY iii. THE OPERATING RANGE SHALL BE 40 HZ TO 70 HZ IN STEPS OF 0.01 HZ iv. PF COMPENSATION SHOULD CONFORM TO IEC 61000-3-2	TEXT
(15)	VOLTAGE AMPLIFIER: i. MAKE ii. VA RATING iii. LED INDICATION FOR FAULTS SUCH AS OVERLOAD, SHORT-CIRCUIT, POWER SUPPLY FAILURE iv. STABILITY IN PPM / H INTEGRATION TIME 60 SEC v. TEST VOLTAGE RANGE (PHASE-NEUTRAL) & (PHASE TO PHASE)	TEXT
(16)	CURRENT AMPLIFIER: i. MAKE ii. VA RATING iii. LED INDICATIONS FOR DIFFERENT FAULTS SUCH AS OVERLOAD, OPEN-CIRCUIT FAILURE OF POWER SUPPLY iv. STABILITY PPM / H WITH INTEGRATION TIME OF 60 SEC v. TEST CURRENT RANGE vi. FACILITY TO GENERATE STARTING CURRENT IN THE RANGE OF 1 MA TO 10	TEXT

	MA	
(17)	FREQUENCY GENERATOR : i. OPERATION RANGE ii. P.F COMPENSATION ACCORDING TO IEC 61000-3-2, STABILITY AT INDUCTIVE, CAPACITIVE AND NON-LINEAR LOADS FOR THE POWER FACTOR, PROTECTION AGAINST O/L AND SHORT CIRCUIT iii. PROVISION FOR SUPERIMPOSITION OF HARMONICS FOR THE RANGE OF 2ND AND 20TH HARMONICS	
(18)	PHASE POSITION ADJUSTER TEST VOLTAGE & CURRENT SYSTEM CAN BE FREELY SELECTABLE FOR SYMMETRICAL / NON SYMMETRICAL AND BALANCE / UNBALANCE LOAD SYSTEM	BOOLEAN
(19)	HARMONIC INJECTION UNIT : i. FACILITY OF CONTROLLING THE PHASE ANGLE OF HARMONICS SHALL BE PROVIDED ii. THE SUPERIMPOSITION OF HARMONICS SHALL BE ONLY POSSIBLE IN MANUAL / AUTOMATIC OPERATION iii. OVER THE RANGE 2ND TO THE 20TH HARMONICS TO THE TEST VOLTAGE AND TEST CURRENT, THE MAGNITUDE OF EACH HARMONIC SHALL BE ADJUSTABLE FROM 0-40% OF THE FUNDAMENTAL WAVE, AND THE MAXIMUM PEAK VALUE OF THE WAVE FORM SHALL BE 130% OF THE MAGNITUDE OF THE FUNDAMENTAL WAVE	TEXT/BOOLEAN
(20)	REFERENCE STANDARD METER: i. MAKE ii. CLASS OF ACCURACY OF REFERENCE STANDARD FOR ACTIVE AND REACTIVE RANGES iii. CURRENT RANGE(WORKING RANGE) & (MEASUREMENT RANGE)	TEXT

	iv. VOLTAGE RANGE (PHASE - NEUTRAL) v. ACCURACY vi. FREQUENCY RANGE vii. INTEGRATION TIME viii. TEMPERATURE COEFFICENT ix. REFERENCE STANDARD HAS AUTO-RANGE SELECTION FACILITY AND FACILITY OF DIAL TEST (POWER DOSING) x. REFERENCE STANDARD METER HAS RS 232 SERIAL COMMUNICATION PORT FOR COMMUNICATING WITH PC	
(21)	SCANNING HEAD: i. ONE PHOTOELECTRIC SCANNING HEAD FOR EACH POSITION SUITABLE FOR READING THE LED PULSE OUTPUT OF THE METERS-UNDER-TEST SHALL BE PROVIDED ii. SCANNING HEAD SHALL HAVE MECHANICAL TYPE FIXING ARRANGEMENT SO THAT SAME CAN BE FIXED DIRECTLY ON THE METER BODY iii. THE SCANNING HEAD SHOULD BE INSENSITIVE TO AMBIENT LIGHT. IT SHOULD GIVE OPTICAL INDICATION OF PULSES BY LED iv. THE SCANNING HEAD MUST BE ABLE TO MEASURE LED PULSE OUTPUT (AS PER IEC 62052-11, CLAUSE 5.11) OF FREQUENCY UP TO 1 KHZ	
(22)	METER MOUNTING RACK: i. ONE RACK SHALL HAVE CAPACITY TO MOUNT 3 METERS OF ANY TYPE, SINGLE OR THREE PHASE, 3 WIRE OR 4 WIRE, WHOLE-CURRENT OR CT-VT OPERATED ON ONE SIDE SHALL BE SUPPLIED ALONG WITH TEST BENCH. ii. NECESSARY BNC TYPE SOCKET TO TEST THE REFERENCE STANDARD METER AGAINST A PRECISION STANDARD OF HIGHER ACCURACY SHALL BE PROVIDED ON METER MOUNTING RACKS. iii. NECESSARY BNC TYPE SOCKET OR ANY OTHER SUITABLE ARRANGEMENT SHALL BE PROVIDED ON THE EITHER OF METER	

	MOUNTING RACKS TO TEST THE INBUILT REFERENCE STANDARD METER AGAINST A PRECISION STANDARD OF HIGHER ACCURACY WITHOUT REMOVING THE INBUILT REFERENCE STANDARD METER FROM THE SOURCE CABINET. iv. THE METER MOUNTING RACKS SHALL BE PROVIDED WITH ONE NUMBER OF BNC TYPE SOCKETS FOR THE TESTING OF ONE REFERENCE STANDARD METER OF LOWER ACCURACY. v. NECESSARY CABLES SHALL BE PROVIDED ALONG WITH EQUIPMENT TO TEST REFERENCE STANDARD METER HAVING FREQUENCY OUTPUT ON BNC TYPE SOCKET vi. THERE SHOULD BE A WARNING LAMP AND TWO EMERGENCY PUSH-BUTTONS FITTED ON THE METER MOUNTING RACKS vii. TAMPER TESTING FACILITY FOR SINGLE PHASE AND THREE PHASE METER AS PER CLAUSE NO. 13 (j)	
(23)	ISOLATION CURRENT TRANSFORMER (ICT): i. NOMINAL PRIMARY CURRENT ii. MAXIMUM PRIMARY CURRENT iii. NOMINAL SECONDARY CURRENT iv. MAXIMUM SECONDARY CURRENT v. OPERATING BURDEN vi. MAX. BURDEN vii. LED INDICATION SHALL BE PROVIDED ON ICT TO INDICATE HEALTHINESS OF ICT viii. ASSOCIATE SOFTWARE SHALL HAVE FACILITY TO INDICATE FAULT IN ICT LIKE OPEN CIRCUIT AND OVER LOAD ON PC. IT SHOULD HAVE FACILITY TO DISPLAY MESSAGE ON COMPUTER SCREEN ABOUT ANY FAULT IN ICT DURING TESTING OF METERS	
(24)	**SOFTWARE & PC:** i. MANUAL MODE OF OPERATION OF THE LICENSED PROPRIETARY SOFTWARE OF	

	THE METER-TESTING EQUIPMENT SHALL ALLOW, AT LEAST, PERFORMANCE OF THE TASKS MENTIONED UNDER CLAUSE NO. 16.04 ii. THE LICENSED PROPRIETARY SOFTWARE OF THE METER-TESTING EQUIPMENT SHALL ALLOW, AT LEAST, PERFORMANCE OF THE TASKS MENTIONED UNDER CLAUSE NO. 16.06 iii. THE LICENSED PROPRIETARY SOFTWARE OF THE METER-TESTING EQUIPMENT SHALL HAVE FACILITY TO DISPLAY PARAMETERS MENTIONED UNDER CLAUSE NO. 16.07 iv. TECHNICAL DATA FOR PC AS PER CLAUSE NO. 16.08	
(25)	SUPPLIER AGREES TO IMPART NECESSARY TRAINING REGARDING INSTALLATION AND USE OF SOFTWARE.	BOOLEAN
(26)	WHETHER REFERENCE STANDARD METER IN METER TEST BENCH IS TYPE TESTED	BOOLEAN
(27)	TYPE TEST / CALIBRATION CERTIFICATE SUBMITTED ALONG WITH OFFER	BOOLEAN
(28)	TYPE TEST / CALIBRATION CERTIFICATE NOS. & DATE	TEXT
(29)	SUPPLIER AGREES TO SUPPLY REFERENCE STANDARD METER WITH ALL ACCESSORIES AS PER TECHNICAL SPECIFICATION	BOOLEAN
(30)	SUPPLIER AGREES TO DEPUTE THEIR REPRESENTATIVE TO EDUCATE ENGINEERS OF PURCHASER AS AND WHEN THEY WILL BE CALLED FOR AT NO EXTRA COST	BOOLEAN
(31)	GUARANTEE OF METER TEST BENCH AS PER CLAUSE NO. 24.00 OF THIS SPECIFICATION	TEXT
(32)	DETAILS OF AFTER SALES SERVICE WITHIN GUARANTEE PERIOD ENCLOSED WITH OFFER	TEXT

(33)	DETAILS OF AFTER SALES SERVICE OUTSIDE GUARANTEE PERIOD ENCLOSED WITH OFFER	TEXT
(34)	ADDRESSES OF SALES SERVICE CENTRE, DETAILS OF ENGINEERS ENCLOSED WITH OFFER	TEXT
(35)	DETAILS OF NECESSARY MINIMUM TESTING FACILITIES FOR CARRYING OUT VARIOUS ACCEPTANCE AND ROUTINE TESTS SUBMITTED ALONG WITH OFFER.	BOOLEAN
(36)	LIST OF MACHINERY / EQUIPMENT AND TESTING FACILITY AVAILABLE AT SUPPLIER'S WORKS IS FURNISHED ALONG WITH OFFER.	BOOLEAN