TECHNICAL SPECIFICATION OF 10 POSITION FULLY AUTOMATIC METER TESTING EQUIPMENT WITH REFERENCE METER OF CLASS 0.02

1. OBJECTIVE:

To 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 Sub Standard Meter of Accuracy Class 0.05, 0.1 and electricity meters of class 0.2, 0.5, 1 and 2.0 available with utility can be tested (electronic and electromechanical type).

2. SCOPE:

Design, engineering, manufacture, delivery, installation and commissioning, spares for 2 years smooth running of 10 Position, fully Automatic Electronic Meter Testing Equipment with reference Meter of Accuracy Class 0.02. 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.

3. ESSENTIAL REQUIREMENTS:

a) 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.

b) 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 & with Multi Secondary Voltage Transformer (MSVT) for isolation in voltage circuit to test single phase meters with IP link short.

c) The Bidder shall submit Satisfactorily Performance report for the similar test benches having satisfactory operation for at least 01 (one) year of the similar tender equipment's or better equipment to any Govt. Power Utilities or NABL accredited Laboratories. Bid submitted without the performance letters from NABL accredited laboratories/ Govt. Power Utilities shall be treated non responsive.

d) Bidder should have fully equipped technical support office/laboratory for facilities of testing, calibration, diagnosis and repair of equipment in India itself. Bidder should have technical support staff permanently posted in India for technical support after sale. List of Plant and Machinery, tools and tackles to carry out service shall be submitted along with offer.

e) The Bidder shall have to comply necessary financial requirements, according to the purchase policy of WBSEDCL.

f) The bidder should have designed, manufactured, tested & supplied the similar or better type of meter test benches in the last 3 years to WBSEDCL or any power utility in India.

g) The bidder shall have to participate and have to quote for complete tender requirement.

h) On site inspection of offered equipment will be done as a part of techno – commercial evaluation.

Documentary proof furnished in support of Qualifying Requirement shall be Original/Notarized.

4. 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 up to 90%.
c) Mains voltage shall be 3x240V ± 10% for three phase supply.
d) Frequency 50Hz ± 5 %.
e) Cabinet for source must be dust proof.

5. APPLICABLE STANDARD:

Purpose	Applicable
Meter Testing	IEC 62052-11, 62053-11, 21, 22, 23
Safety	IEC 61010
Meter Testing Equipment	IEC 60736, IS 12346, IS15707

6. TEST 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

a) Pre-warming
b) Accuracy test as per IS/IEC
c) Starting current test
d) Creep test
e) Dial test
f) Influence quantity test related to accuracy test
   - Voltage, Frequency, reverse phase sequence, voltage unbalance
   - Influence of Harmonic component in voltage and current circuit, odd and sub harmonic and Voltage dip and interruption test.

Note: Details of different wave-form shall be submitted along with offer.

In addition, the offered meter-testing system shall be capable to perform the following tests on RSS and ERSS under testing using frequency output of built in ERSS.

g) Accuracy testing of reference standard used into test system against high precision reference standard

h) Accuracy testing of reference standard (low accuracy) against the built in reference standard.
i) The offered system shall be capable for testing/calibration of ABT panel mounted meters. Required cables set shall be provided with the test bench.
j) The offered system shall be capable for testing/calibration of LTCT operated meters without using ICTs (isolation current transformers). Required cables shall be provided along with the test bench.

7. CONSTRUCTION AND COMPONENT OF SYSTEM:

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 24" (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.8 and 9 respectively.

a) Three Phase Reference Meter (ERSS) – clause 10
b) Meter Mounting Rack with error display units – clause 12& 13
c) Windows based software to operate the system - clause 18

The cabinet shall be 24" (Maximum) rack mounted type in which the source and ERSS (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.

The cabinet shall have protective earth terminals which shall be earthed during installation at site. The cabinet shall have one mains-switch to switch-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 ERSS shall provide degree of protection equal to or better than IP-30.

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 60555.
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 2^{nd} to 20^{th} 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

Power Factor compensation shall be provided as per IEC 60555 so that the meter-testing system shall draw purely sinusoidal current from the mains A.C. supply without polluting it.

Source capacity shall be capable to test up to 10 nos. of Energy meters simultaneously by expanding Meter test racks.

8. 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) LED indication for faults such as overload, short-circuit, power-supply failure
c) Better efficiency
d) Stability 100 ppm / h with integration time of 60 seconds
e) Distortion factor 0.5 %
f) Provision for super- imposition of harmonics in the range of 2^{nd} to 20^{th} harmonics
g) Test voltage range: 40 -300 V (Phase-Neutral) and 70... 519 V. (Phase to Phase) continuously variable with two setting steps preferably of 160V and 320V.
h) Accuracy of the test setting amplitude in closed loop with reference meter: 0.05 %
i) Accuracy of the test setting phase adjustment 0.01 °

9. 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 1800 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 100 ppm / h 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. and facility to generate starting current in the range of 1 mA to 10 mA

10. SPECIFICATION OF ELECTRONIC REFERENCE STANDARD:

The class of accuracy of reference standard shall be 0.02% 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 shall have auto-range selection facility and facility of dial test (power dosing) and RS 232 serial communication port for communicating with PC. It must frequency output proportional to the power to calibrate against better standard.

Technical Data of Reference Standard Meter

a) Measuring modes

- 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 120 Amps. (working range)
- 50 mA to 120 Amps. (measurement range)

e) Accuracy

- Voltage : 0.01 % for the range of 30 V to 500 V (P-N)
- Current : 0.01 % (50 mA to 120 A)
  : 0.03 % (2 mA to 50 mA)

- Power / Energy (For active and reactive)
  : 0.02 % at cos ϕ =1 or sin ϕ =1 (50mA to 120A)

  : 0.04 % at cos ϕ =0.5 or sin ϕ =0.5

  : 0.04 % for the range of 2 mA to 50 mA at cos ϕ =1 or sin ϕ =1

The Accuracy shall be same for Active and reactive measurement.

- Phase Angle Accuracy < 0.02 °

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 power proportional to frequency output 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 <10 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.

11. SPECIFICATION OF HARMONIC INJECTION UNIT:

Over the range 2^{nd} to the 20^{th} 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. The super-imposition of harmonics shall be possible to carry out all the tests prescribed at above Clause 5 (f).

12. SPECIFCATION 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 10 Nos. energy meters of any type, single or three phase, 3 wire or 4 wire, whole-current or CT-VT operated can be safety and easily accommodated on it. One rack shall have capacity to mount 10 meters on one side shall be supplied along with test bench.
d) Necessary BNC type socket to test the ERSS 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 ERSS against a precision standard of higher accuracy without removing the inbuilt ERSS from the source cabinet.
f) The Meter Mounting Racks shall be provided with minimum one number of BNC type sockets for the testing of one ERSS of lower accuracy. The offered software shall have facility to test these ERSS in automatic mode by using these BNC type sockets.
g) Necessary cables shall be provided along with equipment to test ERSS 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) The offered Meter Test System should be capable to carry out following 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 and reverse current test for Three Phase Meters.

13. SPECIFICATION OF SCANNING HEADS AND ERROR INDICATION UNITS:

a) 1 photoelectric scanning head for each position suitable for reading the LED pulse output of the meters-under-test shall be provided.
b) 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.
c) The scanning head should be insensitive to ambient light. It should give optical indication of pulses by LED.
d) 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.

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.

14. SPECIFCATION OF DIGITAL PROCESS UNIT:

For the simultaneous error measurement of 10 meters under test, the basic unit shall be equipped with:

a) 10 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).

15. ISOLATING CURRENT TRANSFORMER (ICT):

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

Technical details of ICTs are.

Nominal Primary current I-prim	100A
Maximum Primary current	120A
Nominal Secondary current I-sec	100A
Maximum Secondary current	120A
VA rating	50VA @ Nominal current (100 Amp)

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)
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)
Operating burden	3 mΩ
Max. Burden	5 mΩ

- 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.
- 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.
- 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.
- LED indication shall be provided on ICT to indicate healthiness of ICT.
- 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.

16. MULTY SECONDARY VOLTAGE TRANSFORMER (MSVT):

The meter test system shall have Multi Secondary Voltage Transformer (MSVT) to test Single phase closed link meters. MSVT shall provide isolation in voltage circuit for testing of single phase meters with IP link short. The MSVT shall have single Primary and 11 nos. of secondary. Individual MSVT for each location shall not be acceptable.

MSVT shall have accuracy as below:

Parameter	Value
No. of Windings	11
Primary Voltage	220 … 240 V, 50 … 60 Hz
Secondary Voltage	220 … 240 V
Range of Secondary burden	0 … 15 VA
Error Prim/Sec	< ± 0.1%, <± 2 Min.
Error between the secondary windings, concerning the a.m. range of secondary burden	< ± 0.05%, <± 1 Min

MSVT shall provide isolation in voltage circuit for testing of single phase meters with IP link short. The MSVT shall have single Primary and 11 nos. of secondary (10 nos. for meters and 1 nos. for reference meter). Individual MSVT for each location shall not be provided.

Connection/Disconnection of MSVT shall be done by provided software without changing in physical connection for primary.

One sample certificate of ICT and MSVT shall be submitted along with offer.

Detailed catalogue of offered ICT & MSVT and its working principle and lay out of these both parts i.e. MSVT and ICTs shall be submitted along with offer.

17. CONNECTION CABLES:

Apart from connection cable required to install and commission the meter test system itself, supplier shall provide the following set of connection cable for meter under test

Requirement / Meter Type	Qty. (minimum)
Voltage connection cables for phase (one side with omega pin and other side with 4 mm safety plug)	30 nos.
Voltage connection cables for neutral (one side with straight pin and other side with 4 mm safety plug)	10 nos.
Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (10 nos.) both side pin type lug to test without ICT	27 nos.
Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (10 nos.) one side pin type lug and other side connection to test bench to test without ICT	6 nos.
Looping colured current cables (for R, Y & B phase) of 2.5 sq. mm dia with spade type lugs for testing of 10 nos. of ABT rack mounted type meters.	1 set
Voltage and Current Connection cables for testing one no. ERSS at one time.	4 nos. for voltage and 6 nos. for current

Note: Closed link Direct Connected meters shall be directly connected to the secondary connection of ICTs.

18. SPECIFICATION OF COMPUTER SYSTEM (DESKTOP PC, PRINTER, MONITOR, SOFTWARES & ACCESSORIES THEREOF):

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.

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.

The licensed proprietary software of the meter-testing equipment shall be supplied 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.

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

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.

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 10 different meters with 10 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.

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

TECHNICAL DATA FOR PC:

Processor	Pentium Dual Core or equivalent / better
RAM	4GB minimum
HDD	500 GB minimum
Optical Drive	48X / 32X DVD / CD RW Combo Drive or better
Keyboard & Mouse	PS2/USB Multimedia / 107 keys Keyboard or better
I/O ports	Minimum 4 high-speed USB 2.0 (2 front) , Mic-In, Headphone-Out, Line- In, 1 serial, 1 parallel, 2 PS2, One RJ-11, One RJ-45 minimum or better
Networking Onboard	10/100/1000 Mbps / Gigabit LAN with slot available for Adding wireless networking card.
Modem & Communications	High-speed 56 K modem or better. Broadband ready.
Operation System	PC shall be supplied with licensed operating system installed Windows XP or better
Monitor	Minimum 17 inches flat screen, CRT / TFT / LCD color monitor, preferably with built-in speakers
Printer	Color LaserJet, suitable for paper size upto A4.

19. CALIBRATION AND TESTING

The equipment shall be supplied along with the manufacturer's test certificate/s of the individual components of the meter-testing system (excluding the PC system) such as Source, Voltage and Current Amplifiers, ERSS, Harmonics Injection Unit, Meter-Mounting Rack, Scanning-heads, Digital Process Unit, ICT or the complete meter- testing system (excluding the PC system), as well as a calibration certificate of the ERSS, valid for at least 12 months from the date of calibration. The calibration certificate of the ERSS shall be issued by any nationally or internationally recognized / accredited laboratory.

20. DOCUMENTATION

One 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
- Calibration certificate of reference standard
- Test certificate of complete test system

21. INSTALLATION AND COMMISSIOING

The supplier shall be responsible to install & commission the meter test equipment at the purchaser location. The supplier shall submit the layout plan, installation proposal and electric supply requirements within 4 weeks after receiving the purchase order. The Purchaser shall arrange the appropriate room, location, electric supply etc. as defined in IEC 62052-11 before the supply of the system so as to permit the smooth and proper installation of the system immediately upon its delivery to the designated location/s.

22. TRAINING

The supplier shall provide training on operation and maintenance of the meter test equipment to 2 engineers for three days of purchaser.

23. SPARES :

The bidder shall have to provide one spare reference meter, one no. of voltage amplifier and current amplifier and 2 nos. of scanner compatible to offered test bench and shall be offered along with test systems.

24. GUARANTEE PERIOD

The Fully Automatic Test System should be guaranteed for performance for a period of 60 (Sixty) Months from the date of commissioning. The equipment found defective within the above guarantee period shall be repaired/ replaced/calibrated by the supplier free of cost within 15 days of receipt of intimation.

Guaranteed Technical Specification of 10 Position fully Automatic Electronic Meter Testing Equipment with reference Meter of Accuracy Class 0.02

Sr. No.	Particulars	Offered
1.	Name & address of Bidder with contact no.	
2.	Name and Address of the Manufacturer	
3.	Model	
4.	Country of origin	
5.	Essential Requirement as per Clause no. 3 of Technical Specifications	
6.	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	
7.	FREQUENCY GENERATOR: a) MAKE b) Facilities shall be should be available for programming reference output frequency. c) The operating range shall be 40 Hz to 70 Hz in steps of 0.01 Hz. d) PF compensation should conform to IEC 555.	
8.	VOLTAGE AMPLIFIER: a) MAKE b) VA rating not less than 500VA per phase c) Electronic protection against O/L and Short Circuit. d) LED indication for faults such as overload, short-circuit, power-supply failure. e) Better efficiency f) Stability 100 ppm / h integration time 60 sec g) Distortion factor 0.5 % h) Test voltage range 40 - 300 V (Phase-Neutral) and 70... 519 V (Phase to Phase) with the two steps preferably of 160 and 320 V. i) Accuracy of the test setting amplitude in closed loop with reference meter: 0.05 % j) Provision for super position of harmonics in the range of 2^{nd} to 20^{th} harmonic k) Accuracy of the test setting phase adjustment 0.01 °	
9.	CURRENT AMPLIFIER: a) MAKE b) VA rating not less than 1800VA per phase c) Electronic protection against Overload and Open Circuit d) LED indications for different faults such as overload, open-circuit , failure of power supply	

	e) Better efficiency f) Stability 100 ppm / h with integration time of 60 seconds g) Accuracy of the test setting amplitude in closed loop with reference meter: 0.05 % h) Accuracy of the test setting phase adjustment : 0.01° i) Distortion factor : 0.5 % j) Provision for super- imposition of harmonics in the range of 2^{nd} to 20^{th} harmonics k) Test Current range 10 mA to 120 Amps. and facility to generate starting current in the range of 1 mA to 10 mA.	
10.	**PHASE POSITION ADJUSTER:** Test voltage & current system can be freely selectable for symmetrical / non symmetrical and balance / unbalance load system	
11.	**CONSTRUCTION FEATURES:** a) Source and Reference Standard Must be housed in one cabinet b) Cabinet must have door in front and rear to provide accessibility and for ease in maintenance. c) Meter Mounting Racks shall be constructed by Aluminum section	
12.	**HARMONIC INJECTION UNIT:** a) Facility of controlling the phase angle of harmonics shall be provided. b) The superimposition of harmonics shall be only possible in manual / automatic operation. c) Over the range 2^{nd} to the 20^{th} 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.	
13.	**REFERENCE STANDARD METER:** Bidder shall specify make of Reference meter: The class of accuracy of reference standard will be 0.02% for active and reactive ranges, over the entire measurement load range & independent of the measuring mode. Current range of reference standard will be 1 mA... 120 A direct connected and voltage range from 10-500 V (phase - neutral), selectable through PC. Reference standard will have auto-range selection facility and facility of dial test (power dosing) and RS 232 serial communication port for communicating with PC. It must frequency output proportional to the power to calibrate against better standard. **Technical Data of Reference Standard Meter** **a) Measuring modes** • 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 120 Amps. (working range)
- 50 mA to 120 Amps. (measurement range)

e) Accuracy

- Voltage : 0.01 % for the range of 30 V to 500 V (P-N)
- Current : 0.01 % (50 mA to 120 A)
  : 0.03 % (2 mA to 50 mA)

- Power / Energy (For active and reactive)
  : 0.02 % at cos ϕ =1 or sin ϕ =1 (50mA to 120A)
  : 0.04 % at cos ϕ =0.5 or sin ϕ =0.5
  : 0.04 % for the range of 2 mA to 50 mA at cos ϕ =1 or sin ϕ =1
  The Accuracy will be same for Active and reactive measurement
  Phase Angle Accuracy < 0.02 °
  A common modular cabinet with door on front and rear will be used for housing source and reference standard.

f) Display :

The RSM will 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 will be provided in the RSM.

h) Operation

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

i) Reference Channel

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

j) Frequency output :

This will provide power proportional to frequency output to calibrate

	the reference standard against high or lower precision reference standard. This output will be in commonly used BNC type socket. **k) Temperature Coefficient:** Temperature coefficient of the reference meter will be <10 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 3 years from the date of supply.	
14.	**SCANNING HEAD:** a) One photoelectric scanning head for each position suitable for reading the LED pulse output of the meters-under-test shall be provided. b) Scanning head shall have mechanical type fixing arrangement so that same can be fixed directly on 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. c) The scanning head should be insensitive to ambient light. It should give optical indication of pulses by LED. d) 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.	
15.	**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 10 nos. energy meters of any type, single or three phase, 3 wire or 4 wire, whole-current or CT-VT operated can be safety and easily accommodated on it. One rack shall have capacity to mount 10 meters on one side shall be supplied along with test bench. d) Necessary BNC type socket to test the ERSS against a precision standard of higher accuracy shall be provided on Meter Mounting Racks. e) Necessary BNC type socket or any other suitable arrangement shall be provided on the either of Meter Mounting Racks to test the inbuilt ERSS against a precision standard of higher accuracy without removing the inbuilt ERSS from the source cabinet. f) The Meter Mounting Racks shall be provided with one number of BNC type sockets for the testing of one ERSS of lower accuracy. The offered software shall have facility to test these ERSS in automatic mode by using these BNC type sockets. g) Necessary cables shall be provided along with equipment to test	

	ERSS having frequency output on BNC type socket. h) There should be a warning lamp and two emergency push-buttons fitted on the Meter Mounting Racks. i) Tamper Testing facility for single Phase and Three Phase Meter as per clause no 11(i)	
16.	**ISOLATION CURRENT TRANSFORMER (ICT):** The meter- testing system shall have isolating current transformer (ICT) to test three phase closed link whole current meters. Technical details of ICTs shall be as follows. Nominal Primary current I-prim 100A Maximum Primary current 120A Nominal Secondary current I-sec 100A Maximum Secondary current 120A VA rating 50VA @ Nominal Current (100 Amp) Accuracy ratio error ± 0.01% (1 A to 120 A) ± 0.03% (0.15 A to <1 A) ± 0.15% (0.02A to <0.15 A) ± 0.3% (0.01 A to <0.02 A) 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) Operating burden 3 mΩ Max. Burden 5 mΩ • 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. • 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. • 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. • LED indication shall be provided on ICT to indicate healthiness of ICT. • 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.	
17.	MULTY SECONDARY VOLTAGE TRANSFORMER (MSVT): The meter test system shall have Multi Secondary Voltage Transformer (MSVT) to test Single phase closed link meters. MSVT shall provide isolation in voltage circuit for testing of single phase meters with IP link short. The MSVT shall have single Primary and 11 nos. of secondary. Individual MSVT for each location shall not be acceptable. MSVT shall have accuracy as below:	

Parameter	Value
No. of Windings	11
Primary Voltage	220 … 240 V, 50 … 60 Hz
Secondary Voltage	220 … 240 V
Range of Secondary burden	0 … 15 VA
Error Prim/Sec	< ± 0.1%, <± 2 Min.
Error between the secondary windings, concerning the a.m. range of secondary burden	< ± 0.05%, <± 1 Min

MSVT shall provide isolation in voltage circuit for testing of single phase meters with IP link short. The MSVT shall have single Primary and 11 nos. of secondary (10 nos. for meters and 1 nos. for reference meter). Individual MSVT for each location shall not be provided.
Connection/Disconnection of MSVT shall be done by provided software without changing in physical connection for primary.
One sample certificate of ICT and MSVT shall be submitted along with offer.
Detailed catalogue of offered ICT & MSVT and its working principle and lay out of these both parts i.e. MSVT and ICTs shall be submitted along with offer.

18. CONNECTION CABLES:
supplier shall provide the following set of connection cable for meter under test:

Voltage connection cables for phase (one side with omega pin and other side with 4 mm safety plug)	30 nos.
Voltage connection cables for neutral (one side with straight pin and other side with 4 mm safety plug)	10 nos.
Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (10 nos.) both side pin type lug to test without ICT	27 nos.
Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (10 nos.) one side pin type lug and other side connection to test bench to test without ICT	6 nos.
Looping coloured current cables (for R, Y & B phase) of 2.5 sq. mm dia with spade type lugs for testing of 10 nos. of ABT rack mounted type meters.	1 set
Voltage and Current Connection cables for testing one no. ERSS at one time.	4 nos. for voltage and 6 nos. for current

Note: Closed link Direct Connected meters shall be directly connected to the secondary connection of ICTs.

19. **SOFTWARE:**

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. 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. The licensed proprietary software of the meter-testing equipment shall be supplied 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. 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 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. 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 10 different meters with 10 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
- Indications of fault like open circuit and overload in ICT's during testing.

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

20. **TECHNICAL DATA FOR PC:**

Processor	Pentium Dual Core or equivalent / better
RAM	4GB minimum
HDD	500 GB minimum
Optical Drive	48X / 32X DVD / CD RW Combo Drive or better
Keyboard / Mouse	PS2/USB Multimedia / 107 keys Keyboard or better
I/O ports	Minimum 4 high-speed USB 2.0 (2 front) , Mic-In, Headphone-Out, Line- In, 1 serial, 1 parallel, 2 PS2, One RJ-11, One RJ-45 minimum or better
Networking Onboard	10/100/1000 Mbps / Gigabit LAN with slot available for Adding wireless networking card.
Modem & Communications	High-speed 56 K modem or better. Broadband ready.
Operation System	PC shall be supplied with licensed operating system installed Windows XP or better
Monitor	Minimum 17 inches flat screen, CRT / TFT / LCD colour monitor, preferably with built-in speakers
Printer	Colour LaserJet, suitable for paper size up to A4.

21. **CALIBRATION AND TESTING**

The equipment shall be supplied along with the manufacturer's test certificate/s of the individual components of the meter-testing system (excluding the PC system) such as Source, Voltage and Current Amplifiers, ERSS, Harmonics Injection Unit, Meter-Mounting Rack, Scanning-heads, Digital Process Unit, ICT or the complete meter- testing system (excluding

	the PC system), as well as a calibration certificate of the ERSS, valid for at least 12 months from the date of calibration. The calibration certificate of the ERSS shall be issued by any nationally or internationally recognized / accredited laboratory.	
22.	**DOCUMENTATION** One 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, Calibration certificate of reference standard Test certificate of complete test system	
23.	**INSTALLATION AND COMMISSIOING** The supplier shall be responsible to install & commission the meter test equipment at the purchaser location. The supplier shall submit the layout plan, installation proposal and electric supply requirements within 4 weeks after receiving the purchase order. The Purchaser shall arrange the appropriate room, location, electric supply etc. as defined in IEC 62052-11 before the supply of the system so as to permit the smooth and proper installation of the system immediately upon its delivery to the designated location/s.	
24.	**TRAINING** The supplier shall provide training on operation and maintenance of the meter test equipment to 2 engineers for three days of purchaser	
25.	**SPARES :** The bidder shall have to provide one spare reference meter, One no. of voltage amplifier and current amplifier and 2 nos. of scanner compatible to offered test bench shall be offered along with test systems.	
26.	**GUARANTEE PERIOD** The Fully Automatic Test System should be guaranteed for performance for a period of Sixty Months from the date of commissioning or Sixty Six Months from the date of receipt in stores, whichever date is earlier. The equipment found defective within the above guarantee period shall be repaired/ replaced by the supplier free of cost within Fifteen days of receipt of intimation	