



PASCHIM GUJARAT VIJ COMPANY LIMITED

REGD. & CORPORATE OFFICE:- "PASCHIM GUJARAT VIJ SEVA SADAN"

OFF NANA MAVA MAIN ROAD, LAXMINAGAR, RAJKOT-360004

CIN U40102GJ2003SGC042908

Telephone Nos:-0281-2380425/427/2360182

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TECHNICAL SPECIFICATION FOR SUPPLY, INSTALLATION AND COMMISSIONING OF THREE PHASE 20 POSITION FULLY AUTOMATIC COMPUTERIZED METER TESTING BENCH WITH REFERENCE STANDARD 0.02 CLASS

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Signature of bidder :		Company's Round Seal:
Date:	Place:	



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1. SCOPE:

This specification covers a Three-Phase Fully Automatic Electronic, Computer Controlled 20 position Meter test bench, suitable for one meter or more meters up to 20 Nos. of all type of meters (Single Phase and Poly Phase) and also simultaneous testing of either electromechanical and/or electronic, whole current (With close PT link) or CT operated type energy meters of accuracy class 2.0, 1.0, 0.5, 0.2 and 1.0s, 0.5s, 0.2s or better conforming to IS/IEC standards for active, reactive and apparent energy measurements for all four quadrant with or without opening meter cover. It shall facility to calibrate Reference Standard/ Working Standard meter of accuracy class 0.05/0.1/0.2 at all 20 positions.

2. APPLICABLE STANDRAD:

The meter test system must be designed to meet the demands of IEC-60736 & IS 12346 with latest amendments. The system shall test meters, which generally correspond to the requirements of IEC-1036, IEC-521, IEC-687, and IEC-1268, IS-13010, IS-13779, IS-14697, IS16444 (Part 1 & 2), IS15959 (Part 1, 2 & 3) and CBIP-325 etc. with latest amendments. Power Source should have Degree of Protection IP 30

Unless otherwise specified separately in this specification, the meter test equipment shall comply with the requirements of IS 12346 / IEC 60736. Over and above to this, all special requirements specified in this specification shall be complied.

3. QUALIFICATION CRITERIA:

The manufacturers shall have at least 5 years' experience in design and manufacture of such equipment. Also they shall have supplied at least 5 nos. equipment of particular accuracy class or better, which shall have been in successful operation for at least three years at a National Level certifying lab/ renowned meter manufacturing company / any power utility in India from the date of supply.

The bids may be submitted by the manufacturer or their sole authorized representative duly supported by certificate of authorization.

The bidder shall have trained engineers dedicated for trouble shooting and technical support permanently posted in India.

Details with type and model number etc. of offered equipments (like Reference Standard, ICTs, Voltage and Current Amplifire, Error Display units, PC, Printer etc.) of the test bench shall be provided with bid. Copy of calibration certificates of offered Reference Standard meter and ICTs shall be submitted with bid. Calibration certificate should cover minimum, maximum and intermediate load points of Voltage, Current, Energy, Power, Power factor, and Frequency parameters.

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4. OPERATING CONDITION:

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

1. Ambient temperature (-) 10°C to (+) 50°C for operation and from (-) 10°C to (+) 65°C for storage.
2. Relative humidity up to 95%.
3. Mains voltage shall be 3*240V/415V \pm 15% for Phase-Neutral/Phase-Phase supply even with minimum harmonic content in the supply.
4. Frequency 50Hz \pm 10 %.
5. Influence of magnetic field shall not affect the accuracy or the operation of equipment.

5. THE BIDDER SHALL PROVIDE:

1. Operation and maintenance manual including drawings in Indian English language.
2. Software in a CD in Indian English language.
3. Training to PGVCL personnel on all aspects of operation, maintenance and calibration.
4. Continued technical support for 15 years from the date of installation shall be provided by the supplier.
5. If there is any issue during guarantee period, the same should be resolved in 72 hours from information conveyed to supplier. If supplier fails to resolve the issue within stipulated time frame, it may lead to the action as per PGVCL terms and conditions. It may also be noted for performance in future tenders.
6. The bidder must have trained Engineers dedicated for trouble shooting and Technical support, permanently posted in India.
7. All major components used in the test bench like Power Source, Signal Generator, Voltage and Current amplifiers, Reference Standard meter, Isolated current transformer, all control switch gears & scanning head device etc. shall have of OEM (except PC and IT accessories) and CE/International Standard mark i.e. conformity to safety requirements.
8. The bidder should submit the Guaranteed Technical Particulars with comments & details enclosed, duly filled in.
9. List of spare parts and consumable.

6. TECHNICAL REQUIREMENT:

This facility shall be used for testing/calibration of following types of energy meters.

1. Single phase two wire /Three phase electromechanical energy meters of class 0.2s ,0.2, 0.5s, 0.5, 1.0s,1.0, 2.0 up to rating of 120 A.
2. Single phase two wire /Three phase four wire electronic (static) energy meters of Class 0.2s ,0.2, 0.5s, 0.5, 1.0s,1.0, 2.0 up to rating of 120 A.
3. Single phase two wire /Three phase CT & PT operated /Three phase CT operated / whole

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- current (With close link) Tri-vector meters of class 0.2s, 0.2, 0.5s, 0.5, 1.0s, 1.0, 2.0 up to rating of 120 A.
4. Any other type of meter such as reactive, apparent type.
 5. It shall be also possible to calibrate reference standard meter of accuracy class 0.05/0.1/0.2

The complete meter test system shall be composed of minimum following principal component units:

- i. Static Power Supply Unit connected with a high Precision electronic reference Standard meter, designed and housed in a standard cabinet with doors at front and rear side of modular structure. Cabinet for source must be dust proof. Auto-Cooling system of suitable capacity shall be provided to avoid temperature rise inside the cabinet. Necessary protection MCB/ELCB/RCCB & emergency stop-release controls to be provided.
- ii. 1 nos. Meter mounting test rack with 20 testing positions with quick connector suitable for any type of meter and suitable space to place for working standard meter, individual LED/backlight LCD error calculators, electrical pulse input, with direct RJ & BNC connectors (without any external pulse divider) & optical scanners, and required accessories to test meters/calibrate PRS meters with any facility for each meter position etc. Optical scanners should be movable in all directions.
- iii. Voltage / Current cables being supplied shall be compensated in such way that the Voltage / Current should not drop at any stage. It should be capable to handle maximum voltage and maximum current continuously without overheating.
- iv. Personal Computer with a menu driven software for controlling and supervising various tests and test results, also displaying all measurement values and test results of meter under test including data management. Personal computer shall be provided with latest window operating system & sufficient nos of serial, parallel & USB port
- v. An auto dual Printer for printout of test results. Page layout should be configurable for printout of test results.
- vi. Digital Electronic Reference Standard Meter with inbuilt large display for observation of various ongoing test power parameters,
- vii. ICT for testing of whole current meters with multi-turn secondary and with closed link.
- viii. Error Calculation System with LED/back light LCD display visible from min. distance of 5 meter
- ix. LED/ Backlight LCD Error Indicator with minimum xx.xxx% digit resolution at each measurement position.
- x. Tariff device communication unit (i.e. optical data communication cable).
- xi. Appropriate latest Software.

All other accessories required for testing such as clips, contacts, quick connectors etc.

7. STATIC POWER SOURCE REQUIREMENT:

The static Power Source Unit, shall fully be computer controlled, designed as a Standard cabinet of modular structure including voltage and current amplifier unit, signal generator unit

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for generation of phase angle & frequency and super imposition of harmonics. The static Power Source Unit shall have a harmonic injection unit. The static power source unit should have auto-range selection facility and serial communication port (s) for communicating with PC. The power source shall have adequate over-current and short circuit protection. The required characteristics of various components of power supply unit shall be as follows:

The source should also generate voltage interruption of 20 ms at interval of 1 sec. (3 times) and voltage dip of 50% for a period of 1 minute as per IS 13779, IS 14697 & CBIP-TR No. 325.

Sr. No	Description	Range
1	Output voltage range	0-320V/ 0-554V (For each phase with neutral/Phase-Phase)
2	Resolution	0.01% adjustable
3	Output current range	0-120A
4	Current Resolution	0.0001A (min) adjustable
5	Power in voltage circuit	600VA/Phase
6	Power in current circuit	2000VA/Phase
7	Output accuracy of voltage & current Setting	0.01%
8	Output Stability	0.01 % / hrs with integration time of 60 sec
9	Output distortion factor current & voltage circuit	0.5% (max)
10	Output frequency range	45 to 65Hz adjustable in steps of 0.01 HZ
11	Frequency Resolution	0.01HZ
12	Accuracy of frequency setting	0.01HZ
13	Phase angle range	0°-360°/Phase
14	Phase Angle Resolution	0.1 ° adjustable
15	Output accuracy of phase angle setting	0.01° (max)/Phase
16	Power factor	CosØ or SinØ = 0.00 To 1.00 in all four quadrants
17	Harmonics and Amplitude	Up to 40 th – and up to 40% of Fundamental amplitude on each harmonics In-phase & out-phase.

The value indicated are for general indication only, bidder has to ensure that the test gear shall be capable of testing and calibration 20 meters of all types mentioned under technical requirement. If as per requirement higher rating is necessary, they shall select the same. Source should be capable to run at peak load without abnormal deviation in current & voltage waveform.

The settings shall be programmable through PC.

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At output terminal of meter testing bench i.e. at meter under test the following must be achieved.

- a. Voltage variation : 0.02% of the applied voltage
- b. Current Variation : 0.02% of the applied current
- c. Frequency variation : ± 0.01 Hz applied frequency
- d. Phase angle variation : $\pm 0.01^\circ$ of applied phase angle
- e. Harmonics variation : Distortion factor should be less than 0.5%.

Electronic protection against over load & short circuit is required to be provided.

The source shall be microprocessor based modular 19" rack design consisting of:

- A. Signal (Frequency/Phase Angle) Generator.
- B. Voltage Amplifier.
- C. Current Amplifiers.
- D. Phase Position Adjuster.
- E. Harmonic Injection Unit.

Details of above:

A. SIGNAL (FREQUENCY/PHASE ANGLE) GENERATOR:

Easily programmable to give reference output frequency independent of mains, with quartz controlled operation range from 45 to 65Hz adjustable in steps of 0.01 Hz, with high efficiency, P.F. compensation according to IEC 555, 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 2nd to 40th harmonics. The signal generator shall be digitally controlled to give output frequency independent of mains supply with provision to vary the output frequencies from 45 Hz to 65 Hz in steps of 0.01Hz and also with network synchronism.

Power Factor compensation shall be provided as per IEC 555 so that Meter Test System shall draw purely sinusoidal current from mains without polluting the mains and keeping the power factor of mains nearly unity.

The output power factor adjustment shall be computer controlled and shall allow step less & continuous adjustment of power factor from 0.0 to 1.0 in all four quadrants in the steps of 0.01 or better, without affecting the test voltage or test current. Quick selection of any P.F shall be available / possible through meter testing software.

B. VOLTAGE AMPLIFIER:

The voltage amplifier shall have output VA burden rating at least 600 VA/Phase. The electronic voltage amplifier shall be computer controlled and should allow step less & continuous adjustment of output voltage for testing of meters. The digital resonant switch mode voltage amplifier shall have following typical characteristics /features:

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1. High efficiency (better than 85%)
2. Accuracy 0.01%
3. Better stability to test various types of energy meters.
4. Precision and high quality of output test voltage under applicable load conditions.
5. Provision for super imposition of harmonics in the range of 2nd to 40th harmonic
6. Electronic protection against overload, short circuit, indicated by proper acoustic and optic Signal.
7. Output Stability 100 ppm / Hour with integration time of 60 sec.
8. Distortion factor 0.5 % at inductive & capacitive loading
9. Test voltage range (40 to 320) V/ (69 to 554) V (Phase-Neutral/Phase-Phase) with auto internal range facility.
10. Accuracy of the test setting amplitude 0.01 %
11. Accuracy of the test setting phase adjustment 0.01°.

C. CURRENT AMPLIFIER

The current amplifier shall have output VA burden rating at least 2000 VA/Phase. The electronic current amplifier shall be computer controlled and should allow step less & continuous adjustment of output currents for testing of meters. The test current output shall be computer controlled with a range from 1mA to 120A, continuous with maximum current up to 120A per Phase. The current output range for accuracy measurement shall be 1 mA to 120A. The digital switch mode current amplifiers shall have following typical characteristics /features:

1. Electronic protection against overload, open circuit, indicated by acoustic and optic Signal.
2. Efficiency better than 85%.
3. Better output stability 100 ppm / Hour with integration time of 60 sec.
4. Accuracy of the test setting amplitude 0.01 %.
5. Accuracy of the test setting phase adjustment 0.01°.
6. Distortion factor 0.5 %.
7. Provision for super imposition of harmonics in the range of 2nd to 40th harmonic.
8. Test Current range 1 mA to 120A with auto internal range facility
9. Precision and high quality of output test current under all load conditions.

D. PHASE POSITION ADJUSTER :

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° – (+) 180°.

Test voltage and test current system shall be freely selectable as symmetrical

Adjustment computer controlled in step 0.01°

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E. HARMONIC INJECTION UNIT:

The source shall have harmonics injection unit with capability of generating harmonics over the range of 2nd to the 40th harmonic to the test voltage and test current, Magnitude of each harmonic shall be adjustable from 0-40% of fundamental wave, with 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 be provided, the super imposition of harmonics shall also be possible.

8. SPECIFICATION OF PRECISION ELECTRONIC REFERENCE STANDARD:

The high precision three phase electronic reference standard (ERS) used shall have a wide range, highly precise measurement capability and shall be directly connected type to the test circuit. The error for the current, voltage, power and energy measurement of reference standard shall be less than or equal to $\pm 0.02\%$ and for repeatability and reproducibility standard deviation should less than 0.002% for at least 5nos. of measurement at all load point of UPF at 100% of range value.

The equipment shall incorporate digital technology and shall offer multi-metric measurement function. The reference standard meter shall have auto-range selection facility and serial communication port for communicating with PC.

Sr.no	Description	Range
1	Class of accuracy	0.02 (for both active & reactive range for entire load range)
2	Current Range	1 mA to 120 A
3	Voltage range	10 ...320V Phase to Neutral/Phase
4	Basic frequency range	45 to 65 Hz
5	Total detachable frequency range	45-3500 HZ
6	Accuracy of voltage & current	0.02% or better (50 mA to 120 A) (10 to 520 V) 0.03% or better (2mA to 50mA)
7	Power/ energy (for active & reactive energy)	0.02% (50 mA to 120 A) (10 to 520 V) 0.03% (2 mA to 10mA) (10 to 520 V)
8	Accuracy of phase angle	0.01Deg.
9	Measuring modes	3P-4W,3P-3W,1P-2W active/ reactive mode and IMPORT/EXPORT mode (cross & true connected)
10	Temperature influence outside normal working range	$\pm 0.001\%$ per $^{\circ}\text{C}$ or better
11	Resolution up to (for any measurement)	Minimum Five and half digit or

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		better
12	Long Term Stability	Voltage - < 40 PPM/ year Current - < 60 PPM/ year Power/Energy - < 100 PPM/year
13	THD in Voltage and Curren	0.5% or better

The high precision electronic reference standard meter should be capable of measuring following electrical parameters including harmonics as a minimum, which during testing, shall also be directly displayed on the computer screen or on the Reference Standard Meter. Adequate protection of reference meter against abnormal overload & short circuit shall be provided such that this shall not invalidate reference standard characteristics.

A. DISPLAY :

The ERS Meter shall have following display parameters in LCD backlight graphical display:

1. Phase wise True RMS value of voltage
2. Phase wise True RMS value of Current
3. Phase wise Power factor / Phase angle
4. Phase wise Active, Reactive & Apparent power
5. Total Active, Reactive & Apparent Power
6. Total Active, Reactive & Apparent Energy
7. Frequency.
8. Phase sequence
9. Integration time

NABL accredited laboratory calibration certificate with full range of calibration for Active, Reactive, Apparent Energy and Power, Voltage, Current, PF and Frequency for reference standard meter shall be supplied.

B. TIME BASE

Time base for the actual measurement can be changed and defined in range from 1 to 99 seconds.

C. OPERATION

Membrane key board with push buttons to operate the ERS meter shall be provided in the front of the ERS Meter.

D. REFERENCE CHANNEL

The ERS Meter shall have facility to select reference for phase angle measurement. Selection of reference shall be provided manually & automatically. ERS shall also have facility to check quartz time base. This facility will be used to verify the accuracy of ERS for intermediate check.

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E. FREQUENCY OUTPUT :

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

F. FREQUENCY INPUT FOR CALIBRATION OF SUBSTANDARD METERS

The frequency input connections shall be provided with BNC/RJ socket to receive electrical pulses from substandard meters. It shall be possible to calibrate / test substandard meter at each 20 position simultaneously without any external pulse dividers.

9. SPECIFICATION OF FOR PC, PRINTER:

One PC of reputed make shall be provided loaded with user-application software for controlling, supervising the test System and displaying all measurement values in addition to error and data management.

- A. Processor: INTEL Core i5-(3.90 GHz , turbo up to 3.2Ghz, 1333Mhz FSB, 8MB cache)
- B. Operating system: MS Windows 10
- C. Hard Disk: 1 TB SATA hard disk drive
- D. CD drive : DVD \pm RW 16x.dual layer write capability
- E. Keyboard : Standard keyboard (Desirably wireless)
- F. Monitor: Min.21" color LCD digital monitor with graphic care-64 bit SVGA controller on AGP with min. 4Mb RAM
- G. Printer: Laser Jet printer with duplex facility 12 ppm
- H. Communication port : 6 USB ports, 4 serial ports inter phase for test bench hardware, 1 dedicated mouse port, 1 dedicated key board port
- I. Memory: Min. 6 GB (2X2GB)DDR3 SD RAM 1066Mhz Memory.
- J. Mouse: Optical scroll mouse (desirably wireless)
- K. LAN:10/100/1000 Gigabit Ethernet cord
- L. UPS:Online UPS, 650VA with minimum 30 minutes backup capacity to operate above system
- M. Guarantee : 5 years on site guarantee after installation.

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The configuration of computer is such that all hardware parts are available in Indian Market.

10. TESTING SOFTWARE:

Application software in English language shall be Windows based, user friendly, menu driven type to facilitate sequential (fully automatic) and continuous mode of testing on meters. The procedure for validation of software should be furnished.

The software shall support at least the following tasks:

A. The Automatic operation mode shall allow following tasks :

1. Automatic test and calibration runs for the different load points in the area of Routine verification, acceptance and certification
2. User interface to operate the system
3. Easy to prepare test points.
4. Supervision and control of the test procedure
5. Supervision and display of the test parameters
6. Injection of harmonics up to 40th harmonics in voltage and current waveform. Also, waveform can be configured and stored with name.
7. Indication of the errors of the meters under test.
8. Capable of storage of test results automatically at the end of testing which should be in non-editable format.
9. Testing data with test procedures, meter details and test results should be stored daily at the end of day/shutting down of test bench. It should be append on data of earlier day. Data of each day should be available in separate files. Last file should have data of all previous days also. Size of file should be minimum for easy storage and handling (Size should be in few MB for data up to one year).
10. It shall have facility to interrupt the testing at any point of time and restart it again.
11. Change in voltage, current, test pulses etc. parameter during test in test sequence shall be possible.
12. Simultaneous task like printout and view of old test data, preparation of new test procedure shall be possible also during test operation of the bench.
13. Printout facility for test reports as per user's editable format and facility to save it in required file format such as PDF, Notepad, ASCII, Excel etc.,
14. Backup facility on CD drive, PenDrive/Hard Disk & in built drive of computer also.
15. Simultaneous Testing facility of meters with different meter constant.
16. Shall have a precise control to start/ stop current & voltage source with test (i.e Minimum time delay to control sources)
17. Search and retrieval of the saved meter test results shall be available only by referring to some special identification no. e.g. Meter serial number, certification report no., date of testing etc.
18. The software also should have facility so that the Meter Under Test can be protected from high voltage and high current applied by operator by any mistake. (Basic and Maximum voltage and current can be set by software)

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19. The software has facility to display pulse in case of starting current test and meter constant test for all 20 locations.
20. The test procedure or meter technical data shall be import/export through software.
21. Inserting error limit for any load point & all kind of tests should be provided.
22. Error tolerance for meter under test must be available with indication of meter pass or fail during test with + or – sign.
23. Facility for error compensation (offset) should be available
24. Display and recording of Total and Fundamental Energy/Power.
25. For DLMS compatible meter, the test can be performed with energy reading from the meter under test for dial test.
26. The software should be able to link with other database such as SQL,ORACLE etc.,
27. Software must be able to control test for defined nos. of pulse or defined time duration precisely.
28. Real Time Display of following quantities as displayed in reference meter:
 - a. Phase wise True RMS value of Voltage
 - b. Phase wise True RMS value of Current
 - c. Phase wise Power factor and Phase angle
 - d. Phase wise Active, Reactive & Apparent power
 - e. Total Active , Reactive & Apparent Power
 - f. Total Active, Reactive & Apparent Energy
 - g. Frequency.
 - h. Voltage and current harmonics shall be provided in bar graph mode and numerical display Sinusoidal wave form.
 - i. Phase wise and total THD in voltage and current.
 - j. Display showing energy flow for each quadrant / Phasor.
 - k. All 20 position result display

The computer shall be connected to the measuring device and power source.

B. The Manual operation and test mode shall allow following tasks :

1. Control the source Voltage, Current, PF, Phase angle and Frequency by set value as well as by percentage of set basic value
2. Actual value on PC screen
3. Wave form of output with injection of harmonics and Harmonic analysis
4. Perform the accuracy test , meter constant test, dial test etc.

C. The program shall support the following tasks:

1. Easy to prepare test table (i.e test type , test procedure) by using “ drag & drop” concept
2. Evaluation and report of the test results
3. Manual testing, semiautomatic and automatic testing facility
4. Adjustment testing i.e. software shall guide to the operator for the adjustment of particular screw in case of Ferrari meters
5. It shall have facility to interrupt the testing and restart it again.

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6. Password facility for each main and sub-option (user login)
7. Print out facility with desired header
8. Back up facility in the CD/Pen drive and any other drive of the computer.
9. Absolute measurement with more precious standard
10. Testing facility of at-least 20 different meter with 20 different constant.
11. Software shall have facility to display of different voltage and current
12. Display of curve of test voltage and current in presence of harmonics.
13. Protection of Meter under test from high voltage and current
14. Selection capacity of different curve
15. Test format shall be flexible to have desired type of format from available formats.
16. Test data shall be available as raw data format/ ASCII/MS-excel format
17. Large and graphical color display.
18. Measurement mode
19. Vectorial display

D. On the computer monitor

During the automatic certification, the following values shall be displayed:

1. Applied load point
2. Error of the meter
3. Deviation between actual value & pre-adjusted value of test voltage and current
4. Evaluation pass / fail

An interruption and re-continuation of the test procedure should be possible anytime. Method for software validation shall be provided.

11. TEST BENCH:

The test bench shall be provided and shall be suitable for test/ calibrating 20 meters at a time. It shall contain the following:

A. METER TEST RACK

The test rack should be rough and tough in construction and shall consist of a non-ferrous, preferably aluminum, frame for mounting of scanning heads, error calculator/display units and meters. It shall carry the rails on which three phase meters can be quickly mounted / connected for testing. Design of the frame shall be such that meters could safely and easily accommodate on it. The Rack shall have necessary arrangement to connect externally (with necessary quick connector for current on the rack) for energy meters and suitable space to place any reference meter/calibrator for calibration. It should withstand heavy load of 20 nos. of bulky equipments under calibration without any sag. The distance between the scanner head and the meter under test shall be in the range of 0.5cm. to 10cm. Two racks with 10 positions each shall be supplied with a provision to place, back to back or at L shape or parallel as and when required. It is preferable to accommodate ICTs, reference standard, power source, CPU and other equipments of the test bench inside the one rack for space

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saving and better utilization of test/calibration area. The width of test table space shall be provided accordingly. Any patching with test table shall not be allowed.

To facilitate quick loading/un loading of meters on to test bench suitable provision like quick connector for current shall be made to reduce loading time while ensuring proper electrical connection.

1. Scanning heads should be movable in all direction and with suitable switch and intensity adjustment pot for electromechanical and electronic meters. It should have focused light source to adjust in line of output LED/disk marking of meters. It should have proper fixing arrangement.
2. Infrared scanning heads to read electronics meter as per IEC 1107.
3. Error Indicators to display error at each position with auto update of last error.
4. Interface for connection with PC such as RS232, etc.,
5. Meter testing is also possible with meter reading port such as optical Port/RJ45 etc., without pulse output and direct reading energy from meter in case of DLMS compliant meter.
6. Testing with frequency output facility should be available.
7. Rough and tough, 18 inch width platform to be provided at both side of the test bench for keeping working/reference standards for calibration at each positions

B. SCANNING HEADS

20 numbers of scanning head shall be capable to detect the red / black mark of rotor disc electromechanical (Ferraris) meters and LCD & LED pulses of hybrid or static meters. During testing these photoelectric scanners shall give optical indication of pulses by LCD & LED to indicate the status of scanning/ sensing. Each scanning head shall also have a provision of selector switch to select either to scan the marking on the disk or the LCD or pulse LED.

The communications with tariff meters shall be performed according to IEC-1107 regulations via an infrared scanning head and over another interface such as RS232 for DLMS compliant meter etc.

Scanners shall not respond to scratches or uneven marks on the discs. A light beam is to be provided to facilitate focusing.

Mounting arrangement for scanning head shall have facility to move vertical, horizontal, forward or backward directions.

It shall be insensitive to ambient light flickering. It shall give optical indication of pulses by LED. The scanner must be able to measure LED pulse output.

Technical data of Scanner as general:

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The technical data of scanner viz, wavelength, distance to meter LED, pulse data, square wave etc. are to be stated by bidder. Some of the typical data are as under:-

Wavelength: 450-950 nm

Distance to meter LED: 25 to 100 mm

Optical Pulse data: Max. Frequency 1000Hz

Max. rising time : 20 μ s, Min. pulse width: 100 μ s, Max. falling time 20 μ s, min. pulse pause 400 μ s Square wave 1:1, Amplitude modulation 8 kHz:

Rotor marks scanning :

Wavelength LED in front 450nm distance to rotor disk 25.45mm uncertainty of switching edge detection $\pm 1\mu$ s.

Scanning head shall have one potentiometer to adjust the sensitivity of scanning head

Scanning head shall have one selector switch to select LED Mark or rotor mark

C. ERROR CALCULATOR & DISPLAY UNIT

For simultaneous error measurement of meters under test, each meter position in the test rack shall be equipped with individual error calculator and display unit. Display resolution for error shall be $\pm xx.xxx\%$ or better. LED/LCD display should have 170 degree readability from each side. Multi-color graphical error display unit is preferable. Provision for serial optical communication interface along with error calculator per measuring position shall be made.

D. ISOLATION CURRENT TRANSFORMER (ICT)

Meter shall get connected to the voltage and current circuit by means connecting leads. The offered system shall have facility to test three phase meters with closed PT link i.e. without opening the link between voltage and current circuit.

Technical details of ICTs are.

Nominal Primary current Iprim	100A
Maximum Primary current	120A
Nominal Secondary current Isec	100A
Maximum Secondary current	120A
VA rating	50VA @ Nominal current (100 Amp)
Accuracy ratio error	$\pm 0.02\%$ (1 A to 120 A) $\pm 0.04\%$ (0.15 A to < 1 A) $\pm 0.15\%$ (0.01 A to <0.15 A)
Phase angle error	± 1 min (1 A to 120 A) ± 3 min (0.15 A to <1 A) ± 10 min (0.01 A to <0.15 A)
Operating burden	3 m Ω
Max. Burden	5 m Ω

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

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- Secondary of ICT shall be designed in such a way that its secondary leads can be connected directly to Meter under Test. Ring type of design with loose primary/secondary type of connection won't be acceptable. ICT's secondary & primary windings shall be permanently wounded on core with multiple turns.
- 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 10 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.

12. 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	Required quantity (minimum)	Spare quantity
Voltage connection cables for phase (one side with omega pin and other side with 4 mm safety lug)	60 nos.	6
Voltage connection cables for neutral (one side connected with QCD and other side with 4 mm safety lug)	20 nos.	2
Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (20 nos.) both side connection detachable to QCD to test without ICT	60 nos.	6
Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (20 nos.) one side detachable connection to QCD and other side connection to test bench to test without ICT	12 nos.	2
Looping colored current cables (for R, Y & B phase) of 2.5 sq. mm dia with spade type lugs for testing of 20 nos. of ABT rack mounted type meters.	1 set	---
Current connection cables for calibration of portable working standard in CT mode having capacity of carrying 150 A continuously for 2 hours and double the length of testing rack.	3 Nos	---
Cable with BNC connection for calibration of reference/working standard at each position.	20 nos.	2

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

Any required accessories which are not covered in above table shall also supplied with the test bench.

All above cables must be of copper with silver plating or similar corrosion proof plating at its connections.

13.CALIBRATION:

Periodic calibration procedure is to be furnished by vendor and procedure for forecasting error in between range.

All the factors which are responsible for type B uncertainty calculation shall be clearly furnished with values by the bidder.

14.SAFETY ASPECTS:

All necessary safety aspects /interlocks for men & machine wherever applicable such as guard, emergency switch, earth leakage protection, short circuit protection, leakage free hydraulic system etc., are to be provided in the system. The system as a whole and each equipment / component individually have adequate safety devices against mal-operation, over load, over/under temperature, over/under air/oil pressure, electrical short circuit etc. List of all protections and indications/ warnings illustrating the status of working of various equipments / components as listed above shall be detailed out.

15.SELF DIAGNOSTIC:

- Scanning Head check
- Working of static source.
- Error calculator working.
- Healthy communication between computer and all related parts.

16.SERVICE REQUIREMENT:

All service requirements wherever applicable such as special foundation arrangements, antistatic flooring (if required), minimum area requirement, air conditioners, no. of earthing points with value of earth resistance, UPS/CVT etc. with capacity have to be listed in bid documents and intimated well in advance before installation of test bench. PGVCL shall provide only one input power supply near control panel. Any other requirements like compressed air, water lubricants etc. shall be arranged by the supplier.

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17.ENVIRONMENT REQUIREMENT:

Hazard to environment being of highest concern, the machine and auxiliaries shall be suitably compliant in all respect

18.SPARES:

Spare items mentioned in table at clause no. 12 is to be provided in free of cost with the test bench. However, List of recommended spares use and its price list is to be provided along with the offer by the bidder. The sufficient spares shall be stocked in INDIA to cater to urgent requirements.

19. TECHNICAL SUPPORT:

The bidder must have trained engineers based in INDIA who can attend to trouble shooting at the shortest notice during guarantee period and further also. The bidder shall provide technical support at least up to fifteen years for the supplied test bench. If new version of testing software develops, shall be provided free of cost during guarantee period.

20.MAINTENANCE:

Bidder should supply three sets of complete O&M manual which shall contain detailed information of the equipment parts, make of the critical parts with type no., complete schematic and wiring diagram, troubleshooting etc.

Operation, maintenance & spare parts manual shall be supplied in triplicate for main equipment and its auxiliaries. Details & literature of control system along with diagnostic.

Trouble shooting details, maintenance manual with plan for control system comprising of interface circuit, mounting instruction, troubleshooting devices circuit diagram etc. Drawing for control schematic & electronic modules, electrical wiring diagram, pneumatic system, hydraulic circuit diagram, lubrication system, details if any spare parts manual including pictorial views as applicable showing each part identified by part number.

Bidder shall furnish details of Annual Maintenance Contract (AMC) for the equipment along with price.

21.TEST CERTIFICATE:

The equipment shall be supplied along with the test certificate/s in triplicate of the complete meter testing system, as well as a calibration certificate of the Reference Standard Meter & ICTs, valid for at least 12 months from the date of calibration. The calibration certificate of the Reference Standard Meter & ICTs shall be issued by any national or international laboratory, traceable as per ISO / IEC 17025. Sample certificate from any recognized laboratory shall be submitted along with bid.

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Reference stander and ICTs provided with test bench must be Pre-calibrated with higher accuracy standard from NABL ACCREDITED LAB OF INDIA/ILAC MRA INTERNATIONAL LABORATORY with load point as given by PGVCL. Calibration report should not be older than one month at the time of installation of the test bench.

22.ERECTION AND COMMISSIONING:

Bidder shall erect & commission the equipment free of cost at PGVCL's Meter testing laboratories. All specified parameters shall be checked for its compliance , to meet PGVCL's requirement.

23.TRAINING:

Three Engineers of PGVCL per ordered test bench shall be trained free of cost for 5 days on the aspect of operation, maintenance, trouble shooting, etc. at supply end.

24.GUARANTEE:

The equipment shall be guaranteed for trouble free operation for a period of 66 months from supply/60 month from installation including RSM and PC. If any parts required to repair/replace during guarantee period, the same must be get calibrated through NABL accredited laboratory by supplier before reinstallation. Calibration charges shall be borne by supplier. During guarantee period, complain shall be rectify within 3 days from the date of complain registration.

If the defective instrument is not repaired /replaced within specified period as above, the PGVCL shall recover an equivalent amount plus 15 % supervision charges for cost of repairing/replacement of instrument from any of the bills of supplier.

Also the Vendor shall confirm that, the after sales services and necessary spare parts required if any, shall be made available in India at least for a period of 10 year from the date of expiry of guarantee period.

At least four free preventive services shall have to be carried out in the guarantee period.

25.DESIGN AND CONSTRUCTION:

It is not the intent to specify in this specification all the details of design and construction of equipment.

A. However the equipment shall conform in all aspects to high standards of engineering design and workmanship and shall be capable of performing in continuous operation in manner acceptable to purchase who will interpret the meaning of drawing and specification and shall have right to reject the equipment which in his judgment is not in accordance there with.

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B. The offered equipment shall be complete in all respects for the effective and trouble free operation. such parts/ accessories shall be deemed to be within the scope of bidder's to supply irrespective of whether these are specifically brought out in the specification and/or commercial order or not

26. **DRAWING:**

Overall general arrangement drawing is to be furnished along with the offer.

27. **DEMONSTRATION:**

The bidder shall arrange demonstration of the tendered functionality of any one test bench of single phase and three phase meter testing facility during technical evaluation at bidder's cost at any installation at government utility or at manufacturer/bidder's place. If the bidder fail to arrange the same, their bid shall not be consider for further evaluation.

28. **PROTOTYPE INSPECTION**

The delivery, installation & commissioning of 1 No. of ordered item shall have to be made first at the place decided by PGVCL. After successful installation /commissioning, PGVCL inspector shall carry out Proto-type inspection as per technical specification. Only after specific written approval of the prototype Meter Testing Bench from PGVCL, further clearance of supply of balance order quantity shall be given.

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