

**TECHNICAL SPECIFICATION OF 20 POSITION FULLY AUTOMATIC METER TEST BENCH  
WITH REFERENCE METER OF CLASS 0.05**

**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 Energy meters. Electricity meters of class 0.2S, 0.5S, 1.0 and 2.0 available with utility can be tested (electronic and electromechanical type).

**2. SCOPE:**

Supply, installation and commissioning of 20 Position fully Automatic Electronic Meter Testing Equipment with reference Meter of Accuracy Class 0.05. In addition to above, bidder shall also be required to provide:

1. Operations & Maintenance Manuals including drawings.
2. Training to purchasers employees on all aspects of operation and maintenance.
3. Continued technical support during guarantee period.
4. The major components of the test bench like source, reference standard meter should be from same make i.e. supplier's own product.
5. Handholding for 6 months from date of installation & commissioning shall be done by the successful bidder. The bidder shall depute their representative to operate the system for a period of six months at NIGAM Laboratories having an educational qualification of a Diploma in Engineering or equivalent Certificate holder. The normal working hours, weekly holidays and holidays of laboratory will be as per prevailing NIGAM regulations

**3. OPERATING CONDITIONS:**

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

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

**4. 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

**5. 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 (3rd and 5th harmonics test as per IS/IEC standard)
- g) The offered system shall be capable for testing/calibration of LTCT operated meters **with /without** using ICTs (isolation current transformers). Required cables shall be provided along with the test bench.

## 6. 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 having in-built Voltage Amplifier and Current Amplifiers, specifications of which are given subsequently in this specification as per clause nos.7and 8respectively.

- a) Controller- clause no.7
- b) Three Phase Reference Meter (ERSS) – clause 10
- c) Meter Mounting Rack with error display units – clause 11
- d) Windows based software to operate the system - clause 17

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, thermal, under voltage and over voltage through suitable protection devices.

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.

## 7. CONTROLLER:

The Controller shall receive information for setting from PC and delivers waveforms and phase angles to the amplifiers. It shall be easily programmable so as to give:

- a) Electronics protection against over load, short circuit & open circuit.
- b) Reference output frequency independent of mains, with quartz controlled operation range from 45 Hz. to 65 Hz. in steps of 0.01 Hz. with high efficiency, power-factor compensation according to IEC 60555.
- c) Stability at inductive, capacitive and non-linear loads for the power factor.
- d) Superimposition of harmonics in the range of 2<sup>nd</sup> to 21<sup>st</sup> harmonics.
- e) Any power factor in all 4 quadrants , 0 to 360 degree shall be available for phase adjustment:

## 8. SPECIFICATION OF VOLTAGE AMPLIFIER:

The voltage amplifier used in the Source shall be a digital resonant switch mode voltage amplifier. It should have output VA burden rating not less than 600 VA/phase. The voltage amplifier should have following capabilities and features:

- a. Protection against Overload & Short circuit.

- b. Digital controlled via RS232/ RS 485 connections
- c. Efficiency better than 85%.
- d. Stability 50 ppm / h with integration time of 60 seconds(range 50mA to 120A)
- e. Distortion factor <0.5 %
- f. Provision for super- imposition of harmonics in the range of 2<sup>nd</sup> to 21<sup>st</sup> harmonics, max. 40% of fundamental.
- g. Test voltage range: 30-300V (Phase-Neutral) and (52-520V) (Phase to Phase).
- h. Accuracy of the test setting amplitude <0.05 %
- i. Accuracy of the test setting phase adjustment <0.01 °

## 9. SPECIFICATION OF CURRENT AMPLIFIER :

The current amplifiers used in the Source shall be digital resonant switch mode type amplifiers. It should have output VA burden rating not less than 2000 VA. The current amplifiers should have following capabilities and features:

- a. Electronic protection against Overload, Open & Short circuit.
- b. LED indications for different faults such as overload, open-circuit , failure of power supply
- c. Efficiency better than <85%.
- d. Stability 200 ppm / h with integration time of 120 seconds
- e. Accuracy of the test setting amplitude: 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<sup>nd</sup> to 21<sup>st</sup> harmonics
- i. Test Current range 50 mA to 120 Amps. and facility to generate starting current in the range of 1 mA to 50 mA.

**Note:-** Here defined VA rating of current amplifier are just indicative, however manufacturer/supplier has to ensure that meter test bench is capable to run fully at maximum 120A current for 2hrs without any damaging and degradation of any performance of it.

## 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 10mA... 120 A direct connected and voltage range from 30-300V (phase - neutral), selectable through PC.

Reference standard 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 frequency output proportional to the power/energy 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 45...65 Hz and total detectable frequency range 0...3500 Hz

#### c) Voltage Range

30 ...300V (Phase to Neutral) & 52-520V (Phase to Phase)

**d) Current Ranges**

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

**e) Accuracy**

- Voltage : 0.025 % for the range of 30 V to 300V ( P-N)
- Current : 0.025 % (50 mA to 120 A)  
: 0.04 % (10 mA to 50 mA)
- Power / Energy (For active and reactive)  
: 0.02 % at  $\cos \phi = 1$  or  $\sin \phi = 1$  (50mA to 120A)  
: 0.04 % at  $\cos \phi = 0.5$  or  $\sin \phi = 0.5$   
: 0.1 % for the range of 10mA to 50 mA at  $\cos \phi = 1$  or  $\sin \phi = 1$

The Accuracy shall be same for Active and reactive measurement

- Phase Angle Accuracy  $< 0.01^\circ$

A common modular cabinet shall be used for housing source and reference standard.

**f) Display :**

The RSM shall have following display 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 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/touch screen /any suitable arrangement 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 precision reference standard. The output shall be in commonly used BNC type socket.

**k) Temperature Coefficient:**

Temperature coefficient of the reference meter will be  $< 10 \text{ ppm /K}$ .

**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 satisfactory commissioning.

## 11. SPECIFICATION OF METER MOUNTING RACK:

- a) Two nos. of Meter Mounting Racks 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 20 Nos. energy 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 10 meters on one side such type of two racks shall be supplied along with test bench.
- d) There should be a warning lamp and two emergency push-buttons fitted on the Meter Mounting Rack.
- e) Each meter test position should have communication facility to communicate with meter under test using DLMS, IEC1107, IEC62056 communication.
- f) Each meter test position should have intelligent meter disconnection / disable system which allows user to remove meter safety from any position while testing is going on and without affecting the other meter under test. Necessary stop button at each test position and also software should have provision for the control.
- g) At least one BNC type of socket should be available to test low accuracy class portable reference standard; and also used for calibrating the entire test system. Error calculator and software should have necessary provision to support this task.

## 12. SPECIFICATION OF SCANNING HEADS AND ERROR INDICATION AND CALCULATION UNITS :

- a. 1 photoelectric scanning head for each position suitable for sensing the LED pulse output of the meters-under-test shall be provided.
- b. Scanning head shall have mechanical type fixing arrangement 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 and calculation device shall be mounted on each test position. The resolution of error indication shall be 4 ½ digits with decimal point configurable by software.

## 13. SPECIFICATION OF DIGITAL PROCESS UNIT:

For the simultaneous error measurement of 20 meters under test, the basic unit shall be equipped with:

- a) 20 inputs for scanning head pulses.
- b) 1 input for reference output
- c) 1 interface for connection with PC.

## 14. ISOLATING CURRENT TRANSFORMER (ICT)& MULTI-SECONDARY VOLTAGE TRANSFORMER(MSVT):

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

**Technical details of ICTs are.**

Nominal Primary current	100A
Maximum Primary current	120A
Nominal Secondary current	100A
Maximum Secondary current	120A
VA rating	<b>60VA</b> @ Nominal current (100 Amp)with single turn in operation
Accuracy ratio error	$\pm 0.01\%$ (1 A to 120 A) $\pm 0.03\%$ (0.15 A to <1 A) $\pm 0.15\%$ (0.02 A to <0.15 A) $\pm 0.3\%$ (0.01 A to <0.02 A)
Phase angle error	$\pm 1$ minutes (1 A to 120 A) $\pm 3$ minutes (0.15 A to <1 A) $\pm 10$ minutes (0.02 A to <0.15 A) $\pm 20$ minutes (0.01 A to <0.02 A)
Max. Operating Burden	<b>6 m<math>\Omega</math></b>

- 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 in such a way that its secondary leads can be connected directly to Meter under Test. Ring type of design, which needed in operation to put multiple turns for actual connection to reach desired VA rating 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.
- **Overall accuracy of entire test system (including ICT) at each meter test position should not be more than class 0.02%. at UPF and 0.04% at 0.5lag/lead.**
- 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.

**If MSVT is required for isolation in voltage circuit for testing single phase whole current meter dual channel with IP link short. The following provision will be required:-**

2 Nos. MSVT shall provide isolation in voltage circuit for testing of single phase meters with IP link short. The each MSVT shall have single Primary and 22 nos. of secondary. Individual MSVT for each location will not be acceptable.

Each MSVT shall have accuracy as below:

Parameter	Value
No. of windings	22
Primary Voltage	165V...300V, 45...65 Hz
Secondary Voltage	165V...300V
Range of secondary burden	4...15 VA
Error between primary and secondary	$\leq \pm 0.1\%$ , $\leq \pm 2$ minutes
Error between the secondary windings, concerning the above mentioned range of secondary burden	$\leq \pm 0.05\%$ , $\leq \pm 1$ minutes

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

Detailed catalogue of offered ICT & MSVT and its working principle of these both parts i.e. MSVT and ICT's shall be submitted along with offer (own make).

#### 15. 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/crocodile and other side with 4mm safety plug i.e. connection to test bench)	60 nos.
Voltage connection cables for neutral (one side with straight pin and other side with 4mm safety plug i.e. connection to test bench)	20 nos.
Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (20 nos.) both side pin type lug to test without ICT	54nos.
Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (20 nos.) one side pin type lug and other side connection to test bench to test without ICT	12nos.
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 testing of 1 phase 2 wire Energy meter (for 20 Nos. meter) both side pin type lug and one side along with voltage cable to test with MSVT	18 Nos.
Current connection cables for testing of 1 phase 2 wire Energy meter (for 20 Nos. meter) one side pin type lug and other side connection to test bench to test with MSVT	4 Nos.
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.

## **16. 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 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
- Testing facility of at-least 20 different meters with 20 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

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
- Firm should have to arrange upgradation in software at least once in a year upto five years from date of satisfactory successful installation of testing bench failing which firms PBG may be invoked.

#### **TECHNICAL DATA FOR PC:**

Processor	:	Pentium i7 or equivalent / better
RAM	:	minimum 8 GB DDR
HDD	:	1 TB 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, 2 serial, One RJ-45 minimum or better.
Networking	:	Onboard 10/100/1000 Mbps / Gigabit LAN
Modem & Communications: Broadband ready.		
Operation System	:	PC shall be supplied with licensed operating system installed windows 10 or better.
Monitor	:	Minimum 17 inches flat screen, CRT / TFT / LCD color monitor,
Printer	:	B/W LaserJet, suitable for paper size up to A4.

#### **17. CALIBRATION AND TESTING**

The equipment shall be supplied along with the manufacturer's test certificate/s of 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.

#### **18. DOCUMENTATION**

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

- Operating manual of test equipment.
- Wiring diagram
- Calibration certificate of reference standard
- Test certificate of complete test system

## 19. INSTALLATION AND COMMISSIONING

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.

## 20. WARRANTY

The bidder shall provide warranty for **60 months** from the date of satisfactory commissioning in the designated Meter lab of Jaipur Discom.

**Firm will have to attend the test bench within three days from the date of intimation by the concerned Meter Lab. in charge otherwise it will be treated as breach of contract and action will be taken as per provisions of contract.**

## 21. TRAINING

The supplier shall provide training on operation and maintenance of the meter test equipment to **2 Nos. engineers and 6 Nos. technical staff of Nigam** for three days during installation and commissioning of the test bench.

**A refresher course shall also be arranged by the supplier during the warranty period periodically twice in a year at respective lab.**

## 22. Delivery schedule:-

Supply shall be commenced within two months from the date of receipt of purchase order and completion @ 8 Nos. in first quarter and balance 7 Nos. in next quarter where after. In case ordered quantity is different then quoted quantity then delivery shall be adjusted proportionately.

## 23. PAYMENT:-

70% of the payment shall be released after receipt of test bench at designated meter lab and Balance 30% of payment shall be released on production of satisfactory installation and commissioning report of the concern SE(M&P).

## 24. WORK COMPLETION SCHEDULE:-

The installation and commissioning of fully automatic test bench shall be completed within 45 days from the date of receipt of meter test bench along with intimation of location of place i.e. designated meter lab where test bench is to be installed. The concern AEn meter lab shall give intimation to the firm only after transporting the test bench to meter lab.

## 25. DELAY IN WORK COMPLETION:-

In case of delay in installation and commissioning of test bench beyond 45 days from the date of intimation to the supplier about the designated meter lab (the date of receipt of letter about intimation of lab), penalty @ 0.5% of the cost of bench per week maximum upto 5% shall be livable, further to this action as deemed appropriate shall also be initiated against the firm which includes invocation of bank guarantee etc.



**Guaranteed Technical Specification of 20 Position fully Automatic Electronic Meter Testing Equipment with reference Meter of Accuracy Class 0.05**

Sr. No.	Particulars	Offered
1.	Name and Address of the Manufacturer	
2.	Model	
3.	Country of origin	
4.	The major components of the test bench like source, reference standard meter should be from one make.	
5.	<p><b>CONTROLLER:</b></p> <ol style="list-style-type: none"> <li>Reference output frequency independent of mains, with quartz controlled operation range from 45 Hz. to 65 Hz. in steps of 0.01 Hz. with high efficiency, power-factor compensation according to IEC 60555.</li> <li>Stability at inductive, capacitive and non-linear loads for the power factor.</li> <li>Superimposition of harmonics in the range of 2<sup>nd</sup> to 21<sup>st</sup> harmonics.</li> <li>Any power factor in all 4 quadrants , 0 to 360 degree shall be available for phase adjustment:</li> </ol>	
6.	<p><b>VOLTAGE AMPLIFIER:</b></p> <ol style="list-style-type: none"> <li>VA rating not less than 600VA/phase</li> <li>Protection against Overload&amp; Short circuit.</li> <li>Digital controlled via <b>RS 232/ RS485</b> connections</li> <li>Efficiency better than 85%.</li> <li>Stability 50 ppm / h with integration time of 60 seconds</li> <li>Distortion factor &lt;0.5 %</li> <li>Provision for super- imposition of harmonics in the range of 2<sup>nd</sup> to 21<sup>st</sup> harmonics, max. 40% of fundamental.</li> <li>Test voltage range: <b>30 -300 V</b> (Phase-Neutral) and <b>52-520V</b> (Phase to Phase) .</li> <li>Accuracy of the test setting amplitude &lt;0.05 %</li> <li>Accuracy of the test setting phase adjustment &lt;0.01 °</li> </ol>	
7.	<p><b>CURRENT AMPLIFIER:</b></p> <ol style="list-style-type: none"> <li>VA rating not less than 2000VA</li> <li>Electronic protection against Overload, Open &amp; Short circuit.</li> <li>LED indications for different faults such as overload, open-circuit , failure of power supply</li> <li>Efficiency better than &lt;85%.</li> <li>Stability 200 ppm / h with integration time of 120 seconds</li> <li>Accuracy of the test setting amplitude: 0.05 %</li> <li>Accuracy of the test setting phase adjustment : 0.01 °</li> <li>Distortion factor : &lt;0.5 %</li> <li>Provision for super- imposition of harmonics in the range of 2<sup>nd</sup> to 21<sup>st</sup> harmonics</li> </ol>	

	<p>10. Test Current range 50 mA to 120 Amps. and facility to generate starting current in the range of 1mA to 50 mA.</p> <p><b>Note:-</b> Here defined VA rating of current amplifier are just indicative, however manufacturer/supplier has to ensure that meter test bench is capable to run fully at maximum 120A current for 2hrs without any damaging and degradation of any performance of it.</p>	
8.	<p><b>REFERENCE STANDARD METER:</b></p> <p>The class of accuracy of reference standard shall be 0.02% for active and reactive ranges, over the entire measurement load range &amp; independent of the measuring mode. Current range of reference standard shall be 10mA... 120 A direct connected and voltage range from 30-300V (phase - neutral) &amp; 52-520V (phase –phase), selectable through PC.</p> <p>Reference standard 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 frequency output proportional to the power to calibrate against better standard.</p> <p><b>Technical Data of Reference Standard Meter</b></p> <p><b>a) Measuring modes</b></p> <ul style="list-style-type: none"> <li>• 3 wire active / reactive mode</li> <li>• 3 wire apparent</li> <li>• 4 wire active / reactive mode</li> <li>• 4 wire apparent</li> </ul> <p><b>b) Frequency Range</b></p> <p>Basic frequency 45... 65 Hz and total detectable frequency range 0...3500 Hz</p> <p><b>c) Voltage Range</b></p> <p>30 ...300V Phase to Neutral &amp; 52-520V Phase-Phase</p> <p><b>d) Current Ranges</b></p> <ul style="list-style-type: none"> <li>• 1mA to 120 Amps. ( working range )</li> <li>• 50 mA to 120 Amps. (measurement range)</li> </ul> <p><b>e) Accuracy</b></p> <ul style="list-style-type: none"> <li>• Voltage : 0.025 % (30 V to 380 V<sub>P-N</sub>)</li> <li>• Current : 0.025 % (50 mA to 120 A) : 0.04 % (10 mA to 50 mA)</li> <li>• Power / Energy ( For active and reactive ) : 0.02 % at <math>\cos \phi = 1</math> or <math>\sin \phi = 1</math> (50mA to 120A) : 0.04 % at <math>\cos \phi = 0.5</math> or <math>\sin \phi = 0.5</math> : 0.1 % for the range of 10mA to 50 mA at <math>\cos \phi = 1</math> or <math>\sin \phi = 1</math></li> </ul> <p>the Accuracy will be same for Active and reactive measurement</p> <ul style="list-style-type: none"> <li>• Phase Angle Accuracy &lt; 0.01</li> </ul>	

	<p>A common modular cabinet shall be used for housing source and reference standard.</p> <p><b>f) Display :</b> The RSM will have following display parameters.</p> <ul style="list-style-type: none"> <li>- True RMS value of each voltage &amp; current input</li> <li>- Phase angle between voltage / current and defined reference</li> <li>- Power factor of each phase</li> <li>- Active , reactive &amp; apparent power of each phase</li> <li>- Total active , reactive &amp; apparent power</li> <li>- Phase Sequence</li> <li>- Frequency</li> <li>- Integration time</li> </ul> <p>The selection facility will be provided to select any parameters out of these parameters. The RSM will have facility to maintain last setting when it is switched off.</p> <p><b>g) Integration time</b> Facility to select integration time between 1 to 99 second will be provided in the RSM.</p> <p><b>h) Operation</b> Membrane key board with membranes push button/<b>touch screen/any suitable arrangement</b> to operate the RSM will be provided in the front of the RSM</p> <p><b>i) Reference Channel</b> The RSM will have facility to select reference for phase angle measurement. Selection of reference will be provided manually &amp; automatically.</p> <p><b>j) Frequency output :</b> 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.</p> <p><b>k) Temperature Coefficient:</b> Temperature coefficient of the reference meter will be <b>&lt;10 ppm /K.</b></p> <p><b>l) Calibration:</b> 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 <b>5 years</b> from the date of <b>satisfactory commissioning.</b></p>	
9.	<p><b>SCANNING HEADS and ERROR INDICATION AND CALCULATION UNITS:</b></p> <p>a) 1 photoelectric scanning head for each position suitable for reading the LED pulse output of the meters-under-test shall be provided.</p>	

	<ul style="list-style-type: none"> <li>b) Scanning head shall have mechanical type fixing arrangement 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.</li> <li>c) The scanning head should be insensitive to ambient light. It should give optical indication of pulses by LED.</li> <li>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.</li> </ul> <p>An Error Indication and calculation device shall be mounted on each test position. The resolution of error indication shall be 4 ½ digits with decimal point configurable by software.</p>	
10.	<p><b>METER MOUNTING RACK:</b></p> <ul style="list-style-type: none"> <li>a) Two nos. of Meter Mounting Rack shall consist of a lightweight aluminum frame for mounting of sensor heads, display devices and meters-under-test.</li> <li>b) Meters-under-test shall get connected to the voltage and current circuits by means of connecting leads.</li> <li>c) Design of the frames should be such that 20 nos. energy 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 10 meters on one side such two racks shall be supplied along with test bench.</li> <li>d) There should be a warning lamp and two emergency push-buttons fitted on the Meter Mounting Racks.</li> <li>e) Each meter test position should have communication facility to communicate with meter under test using DLMS, IEC1107, IEC62056 communication.</li> <li>f) Each meter test position should have intelligent meter disconnection / disable system which allows user to remove meter safety from any position while testing is going on and without affecting the other meter under test. Necessary stop button at each test position and also software should have provision for the control.</li> <li>g) At least one BNC type of socket should be available to test low accuracy class portable reference standard; and also used for calibrating the entire test system. Error calculator and software should have necessary provision to support this task.</li> </ul>	
11.	<p><b>ISOLATION CURRENT TRANSFORMER (ICT)&amp; MSVT:</b></p>	

The meter- testing system shall have isolating current transformer (ICT) to test **single phase and three phase closed** link whole current meters. Technical details of ICTs shall be as follows.

Nominal Primary current 100A

Maximum Primary current 120A

Nominal Secondary current 100A

Maximum Secondary current 120A

VA rating Minimum **60VA** @ Nominal Current (100 Amp)with single turn in operation

Accuracy ratio error  $\pm 0.01\%$  (1 A to 120 A)

$\pm 0.03\%$  (0.15 A to <1 A)

$\pm 0.15\%$  (0.02A to <0.15 A)

$\pm 0.3\%$  (0.01 A to <0.02 A)

Phase angle error  $\pm 1$  minutes (1 A to 120 A)

$\pm 3$  minutes (0.15 A to <1 A)

$\pm 10$  minutes (0.02 A to <0.15 A)

$\pm 20$  minutes (0.01 A to <0.02 A)

**Max. operating Burden 6 m $\Omega$**

- 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 in such a way that its secondary leads can be connected directly to Meter under Test. Ring type of design, which needed in operation to put multiple turns for actual connection to reach desired VA rating 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.

- **Overall accuracy of entire test system (including ICT) at each meter test position should not be more than class 0.02%. at UPF and 0.04% at 0.5lag/lead.**

- 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.

### **Multi Secondary Voltage Transformer (MSVT)**

**If MSVT is required for isolation in voltage circuit for testing single phase whole current**



meter dual channel with IP link short. The following provision will be required:-

**2Nos.** MSVT shall provide isolation in voltage circuit for testing of single phase meters dual channel with IP link short. The MSVT shall have single Primary and 22 nos. of secondary. Individual MSVT for each location will not be acceptable.

**Each** MSVT shall have accuracy as below:

Parameter	Value
No. of windings	22
Primary Voltage	165V...300V, 45...65 Hz
Secondary Voltage	165V...300V
Range of secondary burden	4...15 VA
Error between primary & secondary	$\leq \pm 0.1\%$ , $\leq \pm 2$ minutes
Error between the secondary windings, concerning the above mentioned range of secondary burden	$\leq \pm 0.05\%$ , $\leq \pm 1$ minutes

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

Detailed catalogue of offered ICT & MSVT and its working principle of these both parts i.e. MSVT and ICT's shall be submitted along with offer (own make).

12.	<p><b>CONNECTION CABLES:</b> supplier shall provide the following set of connection cable for meter under test:</p> <table border="1" data-bbox="411 268 1072 1796"> <thead> <tr> <th data-bbox="418 268 849 336">Requirement / Meter Type</th> <th data-bbox="849 268 1066 336">Qty. (minimum)</th> </tr> </thead> <tbody> <tr> <td data-bbox="418 336 849 510">Voltage connection cables for phase (one side with omega pin/crocodile and other side with 4mm safety plug i.e. connection to test bench)</td> <td data-bbox="849 336 1066 510">60 nos.</td> </tr> <tr> <td data-bbox="418 510 849 685">Voltage connection cables for neutral (one side with straight pin and other side with 4mm safety plug i.e. connection to test bench)</td> <td data-bbox="849 510 1066 685">20 nos.</td> </tr> <tr> <td data-bbox="418 685 849 860">Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (20 nos.) both side pin type lug to test without ICT</td> <td data-bbox="849 685 1066 860">54 nos.</td> </tr> <tr> <td data-bbox="418 860 849 1052">Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (20 nos.) one side pin type lug and other side connection to test bench to test without ICT</td> <td data-bbox="849 860 1066 1052">12 nos.</td> </tr> <tr> <td data-bbox="418 1052 849 1227">Looping colored current cables (for R, Y &amp; B phase) of 2.5 sq. mm dia. with spade type lugs for testing of 20 nos. of ABT rack mounted type meters.</td> <td data-bbox="849 1052 1066 1227">1 set</td> </tr> <tr> <td data-bbox="418 1227 849 1460">Current connection cables for testing of 1 phase 2 wire Energy meter (for 20 Nos. meter) both side pin type lug and one side along with voltage cable to test with MSVT</td> <td data-bbox="849 1227 1066 1460">18 Nos.</td> </tr> <tr> <td data-bbox="418 1460 849 1662">Current connection cables for testing of 1 phase 2 wire Energy meter (for 20 Nos. meter) one side pin type lug and other side connection to test bench to test with MSVT</td> <td data-bbox="849 1460 1066 1662">4 Nos.</td> </tr> <tr> <td data-bbox="418 1662 849 1796">Voltage and Current Connection cables for testing one no. ERSS at one time.</td> <td data-bbox="849 1662 1066 1796">4 nos. for voltage and 6 nos. for current</td> </tr> </tbody> </table> <p data-bbox="370 1832 1082 1926">Note: Closed link Direct Connected meters shall be directly connected to the secondary connection of ICTs.</p>	Requirement / Meter Type	Qty. (minimum)	Voltage connection cables for phase (one side with omega pin/crocodile and other side with 4mm safety plug i.e. connection to test bench)	60 nos.	Voltage connection cables for neutral (one side with straight pin and other side with 4mm safety plug i.e. connection to test bench)	20 nos.	Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (20 nos.) both side pin type lug to test without ICT	54 nos.	Current connection cables for testing of 3 phase 4 wire CT-VT operated meters (20 nos.) one side pin type lug and other side connection to test bench to test without ICT	12 nos.	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 testing of 1 phase 2 wire Energy meter (for 20 Nos. meter) both side pin type lug and one side along with voltage cable to test with MSVT	18 Nos.	Current connection cables for testing of 1 phase 2 wire Energy meter (for 20 Nos. meter) one side pin type lug and other side connection to test bench to test with MSVT	4 Nos.	Voltage and Current Connection cables for testing one no. ERSS at one time.	4 nos. for voltage and 6 nos. for current	
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13.	<p><b>SOFTWARE:</b> The operating of the test equipment, the display of the actual values, the processing and display of the</p>																			

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.

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 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 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
- Testing facility of at-least 20 different meters with 20 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

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)

	<ul style="list-style-type: none"> <li>• Frequency</li> <li>• Phase Sequence</li> <li>• Measurement mode</li> <li>• Vectorial display</li> <li>• Firm should have to arrange upgradation in software at least once in a year upto five years from date of satisfactory successful installation of testing bench failing which firms PBG may be invoked.</li> </ul>	
14.	<p><b>TECHNICAL DATA FOR PC:</b></p> <p><b>Processor</b> : Pentium i7 or equivalent / better</p> <p><b>RAM</b> : minimum 8 GB DDR</p> <p><b>HDD</b> : 1 TB minimum</p> <p><b>Optical Drive</b> : 48X / 32X DVD / CD RW Combo Drive or better</p> <p>Keyboard &amp; Mouse: PS2/USB Multimedia / 107 keys Keyboard or better.</p> <p><b>I/O ports</b> : Minimum 4 high-speed USB 2.0 (2 front), Mic-In, Headphone-Out, Line- In, 2 serial, One RJ-45 minimum or better.</p> <p><b>Networking</b> : Onboard 10/100/1000 Mbps / Gigabit LAN Modem &amp; Communications: Broadband ready.</p> <p><b>Operation System:</b> PC shall be supplied with licensed operating system installed windows 10 or better.</p> <p><b>Monitor</b> : Minimum 17 inches flat screen, CRT / TFT / LCD color monitor,</p> <p><b>Printer</b> : B/W LaserJet, suitable for paper size up to A4.</p>	